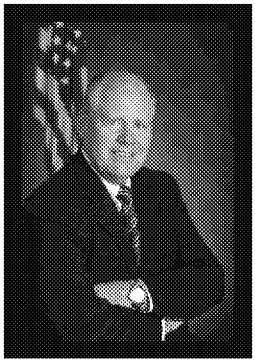
SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

FINAL 2016
AIR QUALITY MANAGEMENT PLAN

MARCH 2017

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT
GOVERNING BOARD



Dedicated in remembrance of

John J. Benoit

Supervisor, Fourth District, Riverside County

South Coast Air Quality Management District
Governing Board Member 2010–2016

The 2016 Air Quality Management Plan (AQMP) is dedicated to the late SCAQMD Governing Board Member John J. Benoit, who actively participated in the development of the 2016 AQMP as well as the extensive public dialog on its contents.

> *"The basic theme of this year's AQMP is to reach specific air quality goals in an integrated way, through collaboration and innovation, while continuing to support our region's growth and livability. What this means is, as a resident of the South Coast Air Basin, you're part of the team that will oversee how this plan is finalized and carried out."*
>
> – From Supervisor Benoit's opening remarks at a July 14, 2016 Public Workshop in Palm Desert on the Draft 2016 AQMP

Supervisor Benoit was a champion for clean air and a positive force on the Governing Board throughout his term of service. He was highly respected by his colleagues and will be greatly missed. His legacy will live on, as a role model for strong leadership toward balanced clean air progress.

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ATTACHMENT A
RESOLUTION NO. 17-2

A Resolution of the South Coast Air Quality Management District (SCAQMD or District) Governing Board certifying the Final Program Environmental Impact Report (PEIR) for the 2016 Air Quality Management Plan (AQMP or Plan), and adopting the 2016 AQMP, which is to be submitted into the California State Implementation Plan (SIP).

WHEREAS, the United States Environmental Protection Agency (U.S. EPA) promulgated the 8-hour ozone national ambient air quality standard (NAAQS or standard) of 75 parts per billion (ppb) in 2008, followed up by implementation rules which set forth the classification and planning requirements for SIPs; and

WHEREAS, the 2008 8-hour ozone standard became effective on July 20, 2012. The South Coast Air Basin was classified as "extreme" nonattainment for this standard with an attainment date of July 20, 2032 and the Coachella Valley is classified as "severe" nonattainment with an attainment date of July 20, 2027; and

WHEREAS, the U.S. EPA revoked the 1997 8-hour ozone standard (80 ppb) in 2015, but the South Coast Air Basin has continuing anti-backsliding requirement obligations until this standard is attained by June 15, 2024; and

WHEREAS, the U.S. EPA revoked the 1-hour ozone standard (120 ppb) effective June 15, 2005, but on September 3, 2014 U.S. EPA approved the portion of the SIP in the 2012 AQMP that demonstrated attainment of the 1-hour ozone standard by December 31, 2022; and

WHEREAS, the U.S. EPA strengthened the annual average fine particulate matter (PM2.5) standard from 15 $\mu g/m^3$ to 12 $\mu g/m^3$ in 2012, with an attainment date of December 31, 2021 for "moderate" nonattainment areas and an December 31, 2025 for "serious" nonattainment areas; and

WHEREAS, the U.S. EPA promulgated a 24-hour PM2.5 standard in 2006 and the South Coast Air Basin was originally classified as "moderate" nonattainment on December 14, 2009, with an attainment date of December 14, 2014; and

WHEREAS, it was determined impractical to meet the 2006 24-hour PM2.5 standard by the original attainment date, primarily due to unexpected drought conditions, such that the South Coast Air Basin was re-classified to "serious" nonattainment for the 24-hour PM2.5 standard, with a new attainment date of December 31, 2019; and

WHEREAS, the federal Clean Air Act (CAA) requires SIPs for regions not in attainment with the 2008 ozone NAAQS to be submitted no later than four years after the nonattainment area designation effective date of July 20, 2012, whereby, a SIP for the South Coast Air Basin should be submitted for the attainment of the 2008 8-hour ozone standard by July 20, 2016. Sanctions may be imposed 18 months after a finding of non-submittal; and

WHEREAS, the federal Clean Air Act requires SIPs for regions not in attainment with the fine particulate standards be submitted no later than 18 months after the standards became effective, whereby, SIPs for the South Coast Air Basin must be submitted for the 2012 annual PM2.5 standard by October 15, 2016; and

WHEREAS, the SCAQMD has jurisdiction over the South Coast Air Basin and the desert portion of Riverside County known as the Coachella Valley; and

WHEREAS, the SCAQMD is committed to comply with the requirements of the federal Clean Air Act; and

WHEREAS, the Lewis-Presley Air Quality Management Act requires the SCAQMD's Governing Board to adopt an AQMP to achieve and maintain all state and federal air quality standards; to contain deadlines for compliance with federal primary ambient air quality standards; and, to achieve the state standards and federal secondary air quality standards by the application of all reasonably available control measures, by the earliest date achievable (Health and Safety Code Section 40462). Further, the California Clean Air Act (CCAA) requires the SCAQMD to endeavor to achieve and maintain the state ambient air quality standards for ozone, carbon monoxide, sulfur dioxide, and nitrogen dioxide by the earliest practicable date (Health and Safety Code Section 40910); and

WHEREAS, the CCAA requires a nonattainment area to evaluate and, if necessary, update its AQMP under Health and Safety Code §40910 triennially to incorporate the most recent available technical information; and

WHEREAS, the SCAQMD Governing Board is committed to comply with the requirements of the CCAA; and

WHEREAS, the SCAQMD is unable to specify an attainment date for the state ambient air quality standards for 8-hour ozone, PM2.5, and PM10; however, the 2016 AQMP, in conjunction with earlier AQMPs, contains every feasible control strategy and measure to ensure progress toward attainment and the AQMP will be reviewed and revised to ensure that progress toward all standards is maintained; and

WHEREAS, the 2016 AQMP must meet all applicable requirements of California law and the CAA; and

WHEREAS, the SCAQMD Governing Board is committed to achieving healthful air in the South Coast Air Basin and all other parts of the District at the earliest possible date; and

WHEREAS, the 2016 AQMP is the result of 36 months of staff work, public review, and debate, and has been revised in response to public comments; and

WHEREAS, the 2016 AQMP incorporates updated emissions inventories, ambient measurements, new meteorological episodes, improved air quality modeling analyses, and updated control strategies by the SCAQMD and will be combined with the portions of the Plan provided by the California Air Resources Board (CARB), and the Southern California Association of Governments (SCAG), and will be forwarded to the CARB for any necessary additions and submission to U.S. EPA; and

WHEREAS, as part of the preparation of an AQMP, in conjunction or coordination with public health agencies, such as CARB and the Office of Environmental Health Hazard Assessment (OEHHA), a report has been prepared and peer-reviewed by the Advisory Council on the health impacts of particulate matter air pollution in the South Coast Air Basin pursuant to California Health and Safety Code § 40471, which has been included as part of Appendix I (Health Effects) of the 2016 AQMP; and

WHEREAS, the 2016 AQMP establishes transportation conformity budgets for the 8-hour ozone and annual PM2.5 standards based on the latest planning assumptions; and

WHEREAS, the 2016 AQMP demonstrates attainment of federal ambient air quality standards for 2008 and 1997 8-hour ozone, 1979 1-hour ozone, 2012 annual and 2006 24-hour PM2.5 NAAQS in the South Coast Air Basin; and

WHEREAS, the 2016 AQMP also demonstrates attainment of federal ambient air quality standards for 2008 8-hour ozone NAAQS in the Coachella Valley; and

WHEREAS, the 2016 AQMP satisfies the planning requirements set forth in the federal and California Clean Air Act; and

WHEREAS, the 2016 AQMP includes the annual average and summer planning emission inventory for criteria and precursor pollutants, attainment demonstrations, reasonably available control measure (RACM) and

reasonably available control technology (RACT) analyses, reasonable further progress (RFP), PM precursor requirements, vehicle miles traveled (VMT) demonstrations, and transportation conformity budgets for the South Coast Air Basin and Coachella Valley; and

WHEREAS, Title 40 of the Code of Federal Regulations, Part 93 (40 CFR Part 93) requires that transportation emission budgets for certain criteria pollutants be specified in the SIP; and

WHEREAS, 40 CFR Part 93.118 (e)(4)(iv) requires a demonstration that transportation emission budgets submitted to U.S. EPA are "consistent with applicable requirements for reasonable further progress, attainment, or" maintenance (whichever is relevant to the given implementation plan submission); and

WHEREAS, the 2016 AQMP updates the ozone control plan with new measures designed to reduce reliance on the CAA Section 182(e)(5) long-term measures for NOx and VOC reductions; and

WHEREAS, significant emission reductions must be achieved from sources under state and federal jurisdiction for the South Coast Air Basin to attain the federal air quality standards; and

WHEREAS, in order to reduce reliance on the CAA Section 182(e)(5) long-term measures, the SCAQMD needs emission reductions from sources outside of its primary regulatory authority and from sources that may lack, in some cases, the financial wherewithal to implement technology with zero or near-zero air pollutant emissions; and

WHEREAS, the State SIP Strategy "Further Deployment of Cleaner Technologies" measures identify the SCAQMD as co-implementing agency relative to implementing incentive programs and help quantify potential emission reduction benefits from operational efficiency improvements and the deployment of connected vehicles and intelligent transportation systems; and

WHEREAS, the Final 2016 AQMP has provided four facility-based mobile source measures (MOB-01, MOB-02, MOB-03, and MOB-04), an on-road heavy-heavy-duty vehicles measure (MOB-08), and an emissions growth management measure (EGM-01) which will go through a one-year public process to identify actions that are either voluntary or regulatory in nature to help meet the emission reduction commitments provided in the State SIP Strategy "Further Deployment of Cleaner Technologies" measures; and

WHEREAS, a majority of the measures identified to reduce reliance on the CAA Section 182(e)(5) long-term measures rely in part on continued, new

and sustained funding to incentivize the deployment of the cleanest stationary and mobile combustion equipment; and

WHEREAS, the 2016 AQMP integrates a variety of control measures and implementation approaches in a cost-effective, feasible, and targeted fashion while considering the co-benefits from climate change and air toxics control programs that may also produce concurrent benefits for ozone and PM2.5; and

WHEREAS, the 2016 AQMP relies on a combination of strong regulatory actions and incentive programs as the most effective means of achieving emission reductions in order to attain the federal health-based standards; and

WHEREAS, the 2016 AQMP prioritizes maximizing emission reductions from zero-emitting technologies where cost-effective and feasible, and near-zero emission technologies in all other applications; and

WHEREAS, an accelerated deployment of current and emerging near-zero emission natural gas engine technologies will provide significant, cost-effective and near-term benefits to regional and local air quality, energy supply security, and public health; and

Amended 3/3/17 O'Hagan

WHEREAS, the 2016 AQMP includes voluntary incentive measures in the near-term to achieve attainment of the fast approaching deadline of federal 8-hour ozone standard in 2023, create opportunities and make it more cost-effective to replace equipment, transition to zero or near-zero technologies, encourage earlier change-out of higher-emitting equipment, drive technology development and cost reductions, and enhance public acceptability of new technologies; and

WHEREAS, the SCAQMD will design programs such that the NOx emission reductions from these incentive measures are proven to be real, quantifiable, surplus, enforceable, and permanent in order for the U.S. EPA to approve such reductions as creditable emission reductions in the SIP; and

WHEREAS, the SCAQMD Governing Board finds and determines with certainty that the 2016 AQMP is considered a "project" pursuant to the California Environmental Quality Act (CEQA); and

WHEREAS, the SCAQMD staff reviewed the 2016 AQMP and determined that it may have the potential to generate significant adverse environmental impacts; and

WHEREAS, pursuant to CEQA, a Notice of Preparation (NOP) of a Draft PEIR and Initial Study (IS) for the 2016 AQMP was prepared and released for a 30-day public comment period, preliminarily setting forth the potential adverse environmental impacts of adopting and implementing the 2016 AQMP; and

WHEREAS, pursuant to CEQA, a Draft PEIR on the 2016 AQMP (State Clearinghouse Number 2016071006), including comments received relative to the NOP/IS and responses to the comments, was prepared and released for a 60-day public comment period from September 16, 2016 to November 15, 2016, setting forth the potential adverse environmental impacts of adopting and implementing the 2016 AQMP; and

WHEREAS, the Draft PEIR on the 2016 AQMP included an evaluation of project-specific and cumulative direct and indirect impacts from the proposed project and four project alternatives; and

WHEREAS, the Draft PEIR has been revised to include the comments received on the Draft PEIR and the responses, as well as to reflect the comments received and modifications made to the Draft Final 2016 AQMP subsequent to the release of the Draft PEIR for public review and comment, such that it is now a Final PEIR; and

WHEREAS, the SCAQMD Governing Board finds and determines, taking into consideration the factors in §30.5 (4)(D)(i) of the Governing Board Procedures, that the modifications which have been made to the 2016 AQMP subsequent to the publication of the notice of public hearing **are a logical outgrowth of the proposed 2016 AQMP** ~~do not significantly change the meaning of the proposed project within the meaning of the Health and Safety Code §40726~~ and would not constitute significant new information requiring recirculation of the Draft PEIR pursuant to CEQA Guidelines §15088.5; and

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WHEREAS, it is necessary that the adequacy of the Final PEIR, including responses to comments received relative to the Draft PEIR, be determined by the SCAQMD Governing Board prior to its certification; and

WHEREAS, it is necessary that the SCAQMD prepare Findings and a Statement of Overriding Considerations pursuant to CEQA Guidelines §§15091 and 15093, respectively, regarding potentially significant adverse environmental impacts that cannot be mitigated to insignificance, and a Mitigation Monitoring Plan pursuant to Public Resources Code §21081.6, regarding the mitigation included in the Final PEIR; and,

WHEREAS, Findings, a Statement of Overriding Considerations, and a Mitigation Monitoring Plan have been prepared and are included in Attachment 2 to this Resolution, which is attached and incorporated herein by reference; and

WHEREAS, the SCAQMD Governing Board voting on the 2016 AQMP, has reviewed and considered the Final PEIR, including responses to comments relative to the Draft PEIR, the Findings, Statement of Overriding

Considerations, and the Mitigation Monitoring Plan, prior to the certification of the Final PEIR; and

WHEREAS, the Draft Socioeconomic Report on the 2016 AQMP was prepared and released for public review and comment; and

WHEREAS, the Draft Socioeconomic Report for the 2016 AQMP has been revised based on comments received and the Revised Draft 2016 AQMP such that it is now a Draft Final Socioeconomic Report for the 2016 AQMP; and

WHEREAS, the 2016 AQMP includes every feasible stationary and mobile source control measure and an expeditious adoption and implementation schedule; and

WHEREAS, CARB and the U.S. EPA have the primary responsibility to control emissions from motor vehicles, motor vehicle fuels, and non-road engines and consumer products which are primarily under their jurisdiction representing over 80 percent of ozone precursor emissions in 2023; and

WHEREAS, the 2016 AQMP shows that command and control programs alone will not provide the emission reductions needed to meet the federal Clean Air Act requirements for the federal 8-hr ozone and PM2.5 standards; and

WHEREAS, financial incentive programs such as the Carl Moyer Memorial Air Quality Standards Attainment Program allow the SCAQMD to achieve emission reductions from these types of sources in an accelerated manner; and

WHEREAS, the U.S. EPA requires that the proposed incentive programs be federally enforceable commitments, and sources of funding, staff resources, technical analyses, outreach, and legal authority be provided; and

WHEREAS, the SCAQMD's past experience demonstrates that substantial reductions in actual emissions can be cost-effectively achieved through implementation of financial incentive programs; and

WHEREAS, the SCAQMD's 2016 AQMP identifies a control measure (2016 AQMP CM#MOB-14) for including emission reductions from past and future projects funded by financial incentive programs for SIP purposes; and

WHEREAS, U.S. EPA requires that all incentive-based reductions be real and surplus to those obtained from regulations, quantifiable, enforceable, and permanent for inclusion in the SIP; and

WHEREAS, the SCAQMD will ensure the emission reductions obtained through projects funded by financial incentive programs will meet the above federal requirements for inclusion in the SIP; and

WHEREAS, the SCAQMD Governing Board adopted a Policies and Procedures Manual for Administration of the Carl Moyer Program on October 6, 2006, which contains the SCAQMD's procedures for selection, implementation, monitoring and enforcement of projects funded by the Carl Moyer Memorial Air Quality Standards Attainment Program; and

WHEREAS, the SCAQMD Governing Board directed staff to abide by said procedures for administration and implementation of the Carl Moyer Memorial Air Quality Standards Attainment Program; and

WHEREAS, an appropriate public comment period was allowed prior to the Board's adoption of the Policies and Procedures Manual for Administration of the Carl Moyer Memorial Air Quality Standards Attainment Program; and a 30-day public comment period opportunity for hearing was provided prior to submitting these policy and procedures to U.S. EPA; and

WHEREAS, the SCAQMD will ensure that all projects selected for funding through the Carl Moyer Memorial Air Quality Standards Attainment Program will comply with the project criteria and other requirements specified in the Carl Moyer Program Guidelines developed by CARB; and

WHEREAS, the SCAQMD Governing Board in accepting funding from Proposition 1B – Goods Movement Emissions Reduction Program adopted resolutions to accept Proposition 1B funds and directed staff to enter into a Grant Agreement with CARB accepting the funding and adhering to the terms and provisions of the Proposition 1B Program and Guidelines.

WHEREAS, the SCAQMD held six public workshops/CEQA Scoping meetings on the Draft 2016 AQMP in July 2016, four public hearings throughout the four-county region in November 2016, 15 AQMP Advisory Group meetings, 16 Scientific, Technical, and Modeling, Peer Review Advisory Group meetings over a 3-year period, **one public hearing in February 2017,** and one adoption hearing in ~~February~~ **March** 2017 pursuant to Section 40466 of the Health and Safety Code; and

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WHEREAS, pursuant to Section 40471(b) of the Health and Safety Code, as part of the six public workshops and the four public hearings on the 2016 AQMP, and the adoption hearing, public testimony and input were taken relative to Appendix I (Health Effects); and

WHEREAS, the record of the public hearing proceedings is located at SCAQMD, 21865 Copley Drive, Diamond Bar, California 91765, and the custodian of the record is the Clerk of the Board; and

WHEREAS, an extensive outreach program took place that included over 200 meetings with local stakeholders, key government agencies, and focus groups, topical workshops, and over 200 presentations relative to the 2016 AQMP; and

WHEREAS, the record of the CEQA proceedings is located at SCAQMD, 21865 Copley Drive, Diamond Bar, California 91765, and the custodian of the record is the Deputy Executive Officer, Planning, Rule Development, and Area Sources; and

NOW, THEREFORE BE IT RESOLVED, that the SCAQMD Governing Board does hereby certify that the Final PEIR for the 2016 AQMP including the responses to comments was completed in compliance with the requirements of CEQA and SCAQMD Rule 110 provisions; and finds that the Final PEIR was presented to the SCAQMD Governing Board, whose members reviewed, considered and approved the information therein prior to acting on the 2016 AQMP; and finds that the Final PEIR reflects the SCAQMD's independent judgment and analysis.

BE IT FURTHER RESOLVED, that the SCAQMD will develop, adopt, submit, and implement the 8-hour ozone measures in Tables 4-2 and 4-4 of Chapter 4 in the 2016 AQMP (Main Document) and the PM2.5 control measures as identified in Table 4-7 and as expeditiously as possible in order to meet or exceed the commitments identified in Tables 4-8 through 4-11 of the 2016 AQMP (Main Document), and to substitute any other measures as necessary to make up any emission reduction shortfall.

BE IT FURTHER RESOLVED, the SCAQMD commits to update AQMP emissions inventories, baseline assumptions and control measures as needed to ensure that the best available data is utilized and attainment needs are met.

BE IT FURTHER RESOLVED, that the SCAQMD Governing Board, adopts Findings and a Statement of Overriding Considerations pursuant to CEQA Guidelines §15091 and §15093, respectively, and a Mitigation Monitoring Plan pursuant to Public Resources Code §21081.6 regarding potentially significant adverse environmental impacts that cannot be mitigated to insignificance, as required by CEQA, and which are included in Attachment 2 and incorporated herein by reference.

BE IT FURTHER RESOLVED, that the SCAQMD Governing Board finds that the mobile source control measures contained in Appendix IV-A of the 2016 AQMP are technically feasible and cost-effective and requests that CARB consider them in any future incentives programs or rulemaking.

BE IT FURTHER RESOLVED, that the mobile source incentive program for heavy-duty vehicles outlined in the 2016 AQMP place priority on the most cost-effective technologies to reach short-term air quality goals such as current and emerging near-zero emission natural gas engine technologies.

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BE IT FURTHER RESOLVED, that the SCAQMD Governing Board hereby requests that CARB commit to submitting contingency measures as required by Section 182(e)(5) as necessary to meet the requirements for demonstrating attainment of the 8-hour ozone standards.

BE IT FURTHER RESOLVED, that the SCAQMD Governing Board commits under control measure MOB-14 to achieve by December 2023 and December 2031, 9.47 and 5.62 tons per day (tpd) of reductions in NOx emissions, from the 2023 and 2031 annual average emissions inventories, respectively through the implementation of vehicle and equipment replacement projects under the Carl Moyer Memorial Air Quality Standards Attainment Program and Proposition 1B – Goods Movement Emissions Reduction Program as provided in control measure MOB-14.

BE IT FURTHER RESOLVED, that the SCAQMD will take all actions necessary to ensure that emission reductions resulting from projects funded by the Carl Moyer Memorial Air Quality Standards Attainment Program and the Proposition 1B – Goods Movement Emissions Reduction Program will meet U.S. EPA criteria (real, surplus, quantifiable, enforceable, and permanent for life of project) and requirements for SIP creditability to meet federal Clean Air Act requirements. The specific commitments that the SCAQMD will meet to ensure the reductions obtained through implementation of the Carl Moyer Memorial Air Quality Standards Attainment Program and the Proposition 1B – Goods Movement Emissions Reduction Program will meet federal Clean Air Act requirements are as follows:

1. The SCAQMD will implement projects funded by the Carl Moyer Memorial Air Quality Standards Attainment Program and the Proposition 1B – Goods Movement Emissions Reduction Program through legally enforceable contracts between the SCAQMD and the grantee. These contracts will specify the emission reductions anticipated for the project and describe the actions that the grantee must take to achieve those reductions. The SCAQMD will seek enforcement

of the terms of the contracts against non-compliant sources to obtain the agreed-upon reductions or may reallocate any returned funds to a new project or use excess reductions from a different project funded by the Carl Moyer Memorial Air Quality Standards Attainment Program or the Proposition 1B – Goods Movement Emissions Reduction Program to obtain the necessary reductions.

2. The SCAQMD will ensure that all emission reductions calculated for projects funded by the Carl Moyer Memorial Air Quality Standards Attainment Program and the Proposition 1B – Goods Movement Emissions Reduction Program will be done using established protocols for the Carl Moyer Program. The SCAQMD will use the quantification protocols specified in the applicable Carl Moyer Memorial Air Quality Standards Attainment Program and the Proposition 1B – Goods Movement Emissions Reduction Program Guidelines in effect at the time of project award to calculate creditable emission reductions for use in the SIP.

3. The SCAQMD will verify surplus emission reductions through a comprehensive inspection, monitoring, and reporting program for each project funded by the Carl Moyer Memorial Air Quality Standards Attainment Program and the Proposition 1B – Goods Movement Emissions Reduction Program, and only surplus emission reductions will be credited to the SIP.

4. The SCAQMD will continue to conduct onsite inspections and other monitoring activities for each project funded by the Carl Moyer Memorial Air Quality Standards Attainment Program and the Proposition 1B – Goods Movement Emissions Reduction Program to enforce the required reductions. Each project will undergo a pre- and post-inspection to verify the project was implemented according to the terms of the contract. Digital photographs will be taken during the field inspections to verify project conditions. In addition, the SCAQMD requires the grantee to submit annual reports for at least five years following the project implementation. After the five-year annual reporting period, the grantee is required to submit biannual reports for the remaining life of the project. For any project funded by the Carl Moyer Memorial Air Quality Standards Attainment Program and the Proposition 1B – Goods Movement Emissions Reduction Program that did not submit its required annual report, the SCAQMD will field inspect the said project within six months of the final due date of the annual report and may continue with on-site monitoring of the project until the annual report is submitted.

5. The SCAQMD will conduct random audits on at least ten percent of the projects funded by the Carl Moyer Memorial Air Quality Standards Attainment Program and the Proposition 1B – Goods Movement Emissions Reduction Program. Project audits will also be performed when the grantee fails to submit an annual report. The audit includes verification that the project is still operational and is meeting the terms of the contract including the equipment usage requirements. This is accomplished by, but not limited to: checking the serial number on the engine, witnessing engine operation, checking the odometer reading or other device/method used to track and report equipment usage.

6. The SCAQMD will prepare and submit annual reports to the U.S. EPA by November 30 of each calendar year for the preceding Carl Moyer Memorial Air Quality Standards Attainment Program and the Proposition 1B – Goods Movement Emissions Reduction Program funding cycle and after Board approval. At a minimum, each annual report will contain the information required by CARB for the Carl Moyer Program annual reports. The report will also include the amount of actual emission reductions versus predicted emission reductions, a discussion of any quantification or surplus issues that have arisen during the reporting period and how they were resolved, a summary of any key issues from field inspections and audits, and include or reference publicly available information or records for each grant issued.

7. If an annual report indicates a shortfall of emission reductions, the SCAQMD will flag the project and take appropriate action to ensure the contracted emission reductions are realized. The SCAQMD will hold the grantee responsible for offsetting the shortfall by using any excess reductions generated over the life of the project or the project life may be extended until the required emission reductions are achieved. In the event the shortfall cannot be remedied by the project, the grantee will be subject to the stipulated penalties in the contract and required to return a prorated share of the funds provided by the Carl Moyer Memorial Air Quality Standards Attainment Program or the Proposition 1B – Goods Movement Emissions Reduction Program. The SCAQMD may consider reallocating the returned funds to a new project or using excess reductions from a different project funded by the Carl Moyer Memorial Air Quality Standards Attainment Program and the Proposition 1B – Goods Movement Emissions Reduction Program to obtain the necessary reductions. The returned funds may be used to fund an eligible project that was placed on a back-up list. SCAQMD creates a back-up list of eligible projects when the requested funds by all projects exceed the available funding limits. Projects on the back-

up list have already been approved by the Board in the event a selected project cannot be completed and to ensure that all Carl Moyer Program funds are fully encumbered and expended within the requested timeframes.

8. The remedy used to make up any shortfall in emission reductions will be described in the annual report submitted to the U.S. EPA. The SCAQMD will separately track and report on any reductions that are tied to transportation conformity emissions budgets, and will work with local agencies to remedy specific shortfalls to the emissions budgets if needed.

9. The SCAQMD will use information from annual reports and field inspections to track actual emission reductions from projects funded by the Carl Moyer Memorial Air Quality Standards Attainment Program and the Proposition 1B – Goods Movement Emissions Reduction Program on a real-time basis, and will provide quality-assured data on such emission reductions to the public annually via website posting. The real-time tracking and evaluation of emission reductions from projects funded by the Carl Moyer Memorial Air Quality Standards Attainment Program and the Proposition 1B – Goods Movement Emissions Reduction Program will ensure the projects are meeting the program requirements and achieving the required emission reductions.

10. The Board hereby finds, based on evidence and information presented at the meeting upon which its decision is based, that all notices required to be given by law have been duly given, and that the Board has allowed public testimony.

11. Adoption of these commitments is necessary to identify emission reductions for meeting the federal requirements for the 8-hr ozone and PM2.5 standards and to therefore promote the health and welfare of the residents of the South Coast Air Basin.

12. SCAQMD staff is hereby authorized to make any minor typographical and technical changes in the Resolution that are necessary to correct minor errors, clarify wording, or to satisfy CARB and U.S. EPA technical requirements.

BE IT FURTHER RESOLVED, that the SCAQMD Governing Board finds, pursuant to U.S. EPA's 2008 ozone standard implementation requirements in 40 CFR Part 51.1114, that SCAQMD's existing New Source Review rules (Regulation XIII) that have been adopted by the Governing Board and submitted

into the SIP satisfy the Clean Air Act's Sections 182(e)(1) and (e)(2) New Source Review requirements for extreme nonattainment areas.

BE IT FURTHER RESOLVED, that the SCAQMD Governing Board does hereby direct staff to work with state agencies and state legislators, federal agencies and U.S. Congressional and Senate members to identify funding sources and secure funding for the expedited replacement of older existing, high NOx-emitting equipment, on-road vehicles, and off-road equipment with zero-emission technologies whenever and wherever technically feasible and cost-effective, and near-zero technologies in all other applications, to help reduce the reliance on the CAA Section 182(e)(5) long-term measures.

BE IT FURTHER RESOLVED, that the SCAQMD Governing Board does hereby direct staff to work with affected stakeholders including members from the public, CARB, and U.S. EPA to identify specific emission reduction actions for each of the facility-based measures and the emissions growth management measure. In addition to identifying specific actions, staff shall work with affected stakeholders to develop quantification protocols and develop enforceable mechanisms that will be needed to demonstrate to the U.S. EPA that such actions are real, surplus, quantifiable, enforceable and permanent, and any other evidence that will be needed for the U.S. EPA to approve such actions as part of a future rate-of-progress reporting or be used in future AQMP revisions, or other approval mechanisms. Any enforceable mechanisms (e.g., memorandum of understanding, etc.) that are not in the form of a rule or regulation adopted by the SCAQMD, CARB, or U.S. EPA shall go through a full public process to receive public comments and input on the enforceable mechanism prior to the SCAQMD Governing Board's consideration and/or approval of the enforceable mechanism.

BE IT FURTHER RESOLVED, that staff shall report on the progress of implementation of the facility-based measures, the on-road heavy-heavy-duty vehicle measure, and the emissions growth management measure to the SCAQMD Mobile Source Committee no later than one year after the submittal of the 2016 AQMP to the U.S. EPA. As part of the report, staff shall recommend to the SCAQMD Governing Board what steps will be taken to ensure that the actions identified will be permanent and enforceable including the potential for rule development or identification of other enforceable mechanisms for the SCAQMD Governing Board's consideration.

BE IT FURTHER RESOLVED, that staff shall report on the progress in identifying the necessary funding to accelerate deployment of zero and near-zero emission technologies in the near-term every six months to the SCAQMD Legislative Committee and other Board Committees as appropriate. As part of this report, staff shall provide a discussion on the progress to identify new funding

sources and potential prospects for sustained funding. If significant funding levels are not identified within one year from the date of submittal of the 2016 AQMP to the U.S. EPA, staff shall initiate discussions with the California Air Resources Board and U.S. EPA on potential rulemaking that the state and federal government will need to adopt to meet applicable ozone air quality standards. In addition, staff shall initiate rule development for stationary and mobile sources that are within the District's legal authority to adopt unless sufficient actions have been identified as part of the public process in implementing the facility-based measures (MOB-01 through MOB-04), on-road heavy-heavy-duty measure (MOB-08), and the emissions growth management measure (EGM-01).

BE IT FURTHER RESOLVED, that the SCAQMD Governing Board directs staff to prioritize funding in Environmental Justice areas and disadvantaged communities as defined by the agency providing the funds or if there is no definition provided, using the definitions set by the state legislature and CARB in implementing the Low Carbon Transportation Funding programs.

BE IT FURTHER RESOLVED, that the SCAQMD Governing Board does hereby direct staff to move as expeditiously as possible on the technology reviews, life-cycle emissions assessment, regulations, and incentive programs envisioned in 2016 AQMP control measures CMB-01 and CMB-02. Staff is further directed to report to the SCAQMD Governing Board within one year of 2016 AQMP adoption on the results of the reviews and assessments, including recommendations and schedules consistent with 2016 AQMP commitments, for rulemaking that maximizes emissions reductions from zero-emission technologies where cost-effective and feasible, and near-zero emission technologies in other applications.

BE IT FURTHER RESOLVED, that the SCAQMD Governing Board directs staff to promote and encourage the use of solar energy systems and technology in applications where it can be shown to be cost-effective and result in emission reductions.

BE IT FURTHER RESOLVED, that the SCAQMD Governing Board directs staff to develop guidelines for incentive programs that do not have guidelines from the agency providing the funding and the emission reduction benefits are proposed to be included into the SIP. The guidelines will include creditability demonstration, enforceable commitments, technical analyses/support, demonstration of funding and legal authority, procedures for public disclosure of information, and provisions to measure and track programmatic results.

BE IT FURTHER RESOLVED, the SCAQMD Governing Board hereby approves, pursuant to the authority granted by law, the adoption of incentive

programs as an implementation tool of the incentive measures for the Final 2016 AQMP.

BE IT FURTHER RESOLVED, that the SCAQMD Governing Board commits under control measure CMB-01 to achieve by December 2023, 2.5 and 1.2 tpd of reductions in NOx and VOC emissions, respectively, from the 2023 summer planning inventory and by December 2031, 6 and 2.8 tpd of reductions in NOx and VOC emissions, respectively, from the 2031 summer planning inventory in the 2016 AQMP through the implementation of either replacement of approximately 5,800 diesel internal combustion engines (ICEs) in accordance with the incentive program guidelines to be developed in the future along with a regulatory element or a demonstration that the emission reductions associated with CMB-01 have been achieved through other enforceable actions.

BE IT FURTHER RESOLVED, that in each annual demonstration report for Calendar Years 2018 through 2031 submitted to U.S. EPA by April 1 of the following year, the SCAQMD Governing Board commits to (1) identify each of these 5,800 projects by project identification number, project life and implementation date, description of both baseline and new equipment, applicable incentive program guideline, and quantified emission reductions; (2) document the SCAQMD's actions to monitor selected projects for compliance with contract requirements; (3) determine whether the identified projects are projected to achieve the full amount of NOx emission reductions identified; and (4) report on emission reductions in the reporting year due to other enforceable actions.

BE IT FURTHER RESOLVED, that the SCAQMD Governing Board commits under control measure CMB-02 to achieve by December 2023 and December 2031, 1.1 and 2.84 tpd of reductions in NOx emissions, respectively, from the 2023 and 2031 summer planning inventory in the 2016 AQMP through the implementation of either the replacement of approximately 82,000 – 152,000 commercial boilers, water heaters, and residential pool heaters in accordance with the incentive program guidelines to be developed in the future along with a regulatory element or a demonstration that the emission reductions associated with CMB-02 have been achieved through other enforceable actions.

BE IT FURTHER RESOLVED, that in each annual demonstration report for Calendar Years 2020 through 2031 submitted to U.S. EPA by April 1 of the following year, the SCAQMD Governing Board commits to (1) identify each of these [82,000–152,000] projects by project identification number, project life and implementation date, description of both baseline and new equipment, applicable incentive program guideline, and quantified emission reductions; (2) document the District's actions to monitor selected projects for compliance with contract requirements; (3) determine whether the identified projects are projected to achieve

the full amount of NOx emission reductions identified; and (4) report on emission reductions in the reporting year due to other enforceable actions.

BE IT FURTHER RESOLVED, that the SCAQMD Governing Board commits under control measure ECC-03 to achieve by December 2023, 1.2 and 0.2 tpd of reductions in NOx and VOC emissions, respectively, from the 2023 summer planning inventory and by December 2031, 2.1 and 0.3 tpd of NOx and VOC emissions from the 2031 summer planning inventory in the 2016 AQMP through the implementation of either advanced energy efficiency programs for residential sectors, such as advanced highly efficient zero and near-zero emission appliance technologies and weatherization along with renewable energy sources, in accordance with the incentive program guidelines to be developed in the future or a demonstration that the emission reductions associated with ECC-03 have been achieved through other enforceable actions.

BE IT FURTHER RESOLVED, that in each annual demonstration report for Calendar Years 2020 through 2031 submitted to U.S. EPA by April 1 of the following year, the SCAQMD Governing Board commits to (1) identify each of these projects by project identification number, project life and implementation date, description of both baseline and new equipment, applicable incentive program guideline, and quantified emission reductions; (2) document the District's actions to monitor selected projects for compliance with contract requirements; and (3) determine whether the identified projects are projected to achieve the full amount of NOx emission reductions identified; and (4) report on emission reductions in the reporting year due to other enforceable actions.

BE IT FURTHER RESOLVED, that the SCAQMD Governing Board does hereby direct staff to modify the 2016 AQMP NOx RECLAIM measure (CMB-05) to achieve the five (5) tons per day NOx emission reduction commitment as soon as feasible, and no later than 2025, and to transition the RECLAIM program to a command and control regulatory structure requiring BARCT level controls as soon as practicable, and to request staff to return in 60 days to report feasible target dates for sunsetting the RECLAIM program.

Amended 3/3/17

BE IT FURTHER RESOLVED, if U.S. EPA determines that information submitted by the SCAQMD is insufficient to demonstrate that the required emission reductions will occur on schedule and are not approvable under applicable provisions of the Clean Air Act, the SCAQMD will develop substitute rules and/or measures no later than one year from the date of the U.S. EPA finding published in the Federal Register, that will achieve the 2023/2031 committed emission reductions addressing the shortfall as expeditiously as practicable, but no later than December 2023 and December 2031, respectively.

BE IT FURTHER RESOLVED, that the SCAQMD Governing Board finds that the transportation emission budgets are "consistent with applicable requirements for reasonable further progress, attainment, or maintenance (whichever is relevant to the given implementation plan submission)" pursuant to 40 CFR 93.118(e)(4)(iv).

BE IT FURTHER RESOLVED, that the Executive Officer is hereby directed to finalize the 2016 AQMP including the main document, appendices, and related documents as adopted at the ~~February~~ **March** 3, 2017 public hearing.

Amended 3/3/17 DJ

BE IT FURTHER RESOLVED, that the SCAQMD Governing Board, whose members reviewed, considered and approved the information contained in the documents listed herein, adopts the 2016 AQMP dated ~~February~~ **March** 3, 2017 consisting of the document entitled 2016 AQMP as amended by the final changes set forth by the SCAQMD Governing Board and the associated documents listed in Attachment 1 to this Resolution.

Amended 3/3/17 DJ

BE IT FURTHER RESOLVED, the Executive Officer is hereby directed to work with CARB and the U.S. EPA to ensure expeditious approval of this 2016 AQMP for PM2.5 and 8-hour ozone attainment.

BE IT FURTHER RESOLVED, that the 2016 AQMP serves to demonstrate attainment of the 2008 8-hour ozone standard for South Coast Air Basin and Coachella Valley with respect to emissions inventories, RACT/RACM demonstration, attainment demonstration, RFP, and transportation emissions budgets and any other required SIP elements.

BE IT FURTHER RESOLVED, the SCAQMD Governing Board determines that the 2016 AQMP includes as the SIP revision submittal for the 24-hour PM2.5 attainment demonstration plan including the BACM/BACT determinations for the PM2.5 standard for the South Coast Air Basin, and the PM2.5 Transportation Conformity Budgets for the South Coast Air Basin.

BE IT FURTHER RESOLVED, that the 2016 AQMP serves as a revision to the previously approved 1997 8-hour ozone standard SIP for South Coast Air Basin with respect to emissions inventories, attainment demonstration, RFP, and transportation emissions budgets and any other required SIP elements.

BE IT FURTHER RESOLVED, that the SCAQMD Governing Board finds Appendix VI-E of the 2016 AQMP demonstrates compliance with the vehicle miles traveled requirements for the 2008 ozone NAAQS, as set forth in section 182(d)(1)(A) of the CAA.

BE IT FURTHER RESOLVED, that the SCAQMD Governing Board finds the clean fuels for boilers requirement, set forth in section 182(e)(3) of the

CAA, has been satisfied by the SCAQMD's Rule 1146, Rule 2002, and Rule 1303, which have been submitted into the SIP.

BE IT FURTHER RESOLVED, that the Executive Officer is hereby directed to forward a copy of this Resolution, the 2016 AQMP and its appendices as amended by the final changes, to CARB, and to request that these documents be submitted to the U.S. EPA for approval as part of the California State Implementation Plan. In addition, the Executive Officer is directed to forward comments on the 2016 AQMP and responses to comments, public notices, and any other information requested by the CARB and/or U.S. EPA for informational purposes.

BE IT FURTHER RESOLVED, that the SCAQMD Governing Board directs the Executive Officer to work with CARB and the U.S. EPA and take appropriate action to resolve any completeness or approvability issues that may arise regarding the SIP submission.

BE IT FURTHER RESOLVED, that the SCAQMD Governing Board authorizes the Executive Officer to include in the SIP submittal or supplement(s) to the SIP any technical updates, corrections, clarifications, or additional information that may be necessary to secure U.S. EPA approval.

AYES: Ashley, Benoit, Burke, Buscaino, Cacciotti, Kuehl, Lyou, Mitchell, Parker, Robinson and Rutherford.

NOES: McCallon and Nelson.

ABSENT: None.

Dated: March 3, 2017

Denise Garzaro, Clerk of the Boards

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Preface

Southern California's historic battles with poor air quality are well documented. Since the mid-20th century, the greater Los Angeles region has been at the forefront of air pollution science, low-emissions technology development, and innovative air quality regulation. As long-time residents of the South Coast Air Basin can attest, these efforts have led to substantial and noticeable improvements in air quality and public health, all during a period of dramatic increases in economic activity, population, and vehicle miles traveled. Technological advances in pollution controls, pollution prevention, clean fuels, alternative energy, and combustion processes have been and will be the key to past and future progress. Less than two decades ago, newly established PM2.5 standards seemed unattainable. However, through strong emission reduction efforts at the local, state and federal levels, the Basin has met the original standards and is on track to meet the revised, more stringent standards by their statutory deadlines.

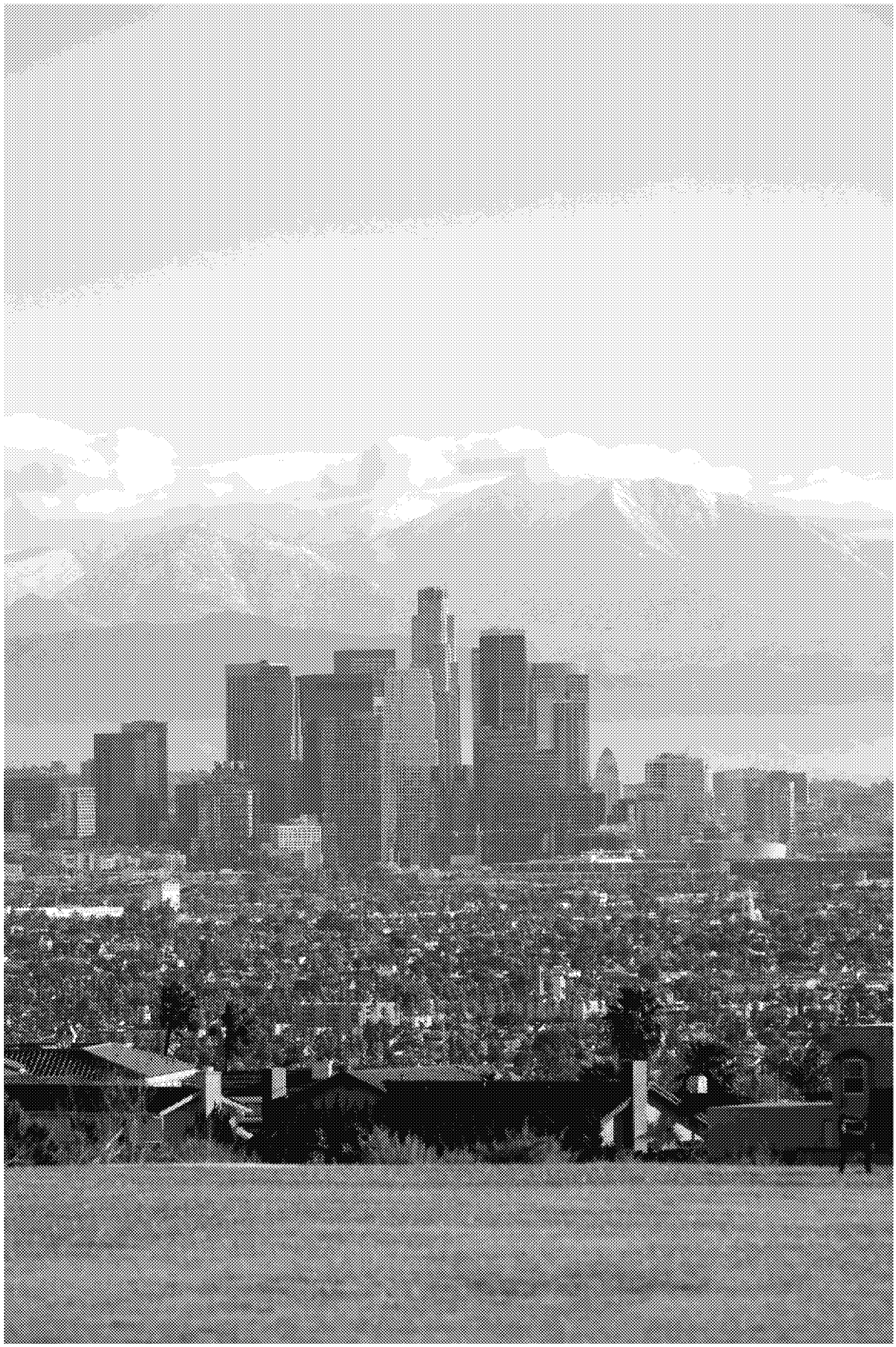
Despite these successes, the health of our residents continues to be seriously affected by the poor air quality that confronts the region. Our unique topography and meteorology, along with emissions from millions of vehicles and a thriving goods movement industry, continue to produce the worst ozone pollution in the nation. New scientific information on the health impacts of air pollution has led to progressively more stringent air quality standards to better protect public health. Limited local authority to control certain sectors of mobile sources that account for the majority of emissions poses policy challenges. Future climate variation and the effect of drought conditions add further uncertainties. Finally, as the most cost-effective emissions controls are implemented, it becomes harder to identify and implement new cost-effective control measures while minimizing impacts to the local economy and businesses.

Existing rules, regulations and programs are not sufficient to fulfill the South Coast Air Quality Management District's public health mandate. In the next seven to fifteen years, the region must achieve substantial additional reductions in nitrogen oxide emissions in order to attain the ozone standards by the approaching deadlines. Previous Air Quality Management Plans have relied heavily on unspecified future technological developments to get us there. But given the short time horizons and the emission reduction needs, there is now a need to develop specific pathways to attainment in order to clarify and accelerate the required actions to achieve our air quality goals. These actions necessarily include aggressive new regulatory approaches, and a significant expansion of incentives programs. More stringent mobile source emission standards are desperately needed to spur further development and production of zero- and near-zero emission technologies. But even with more stringent standards, natural turnover of existing vehicles and equipment will not be fast enough to achieve the requisite technology penetration. Therefore, regulations and incentives to accelerate fleet turnover in the Basin are a major element of this Plan. While previous incentive programs have been very successful in achieving real emission reductions, the incentive funding levels needed for attainment are significantly more than what has been allocated to date. Securing the necessary funding will not be easy, and will require coordinated advocacy and outreach, integrated planning, coalition building, key partnerships, and political will.

Fortunately, there is reason to be optimistic. For the first time, the specific technologies needed to achieve the ozone standards are well-defined. Many are or will be commercially available within the next few years. New technology costs have dropped and will continue to do so with refinements and higher-volume production. We can now envision future technology deployment scenarios that are consistent with attainment.

When the public, health advocates, business stakeholders, and policy makers come together and express that the national poster-child of poor air quality can actually achieve what was once thought impossible, when we articulate the benefits to public health, the local economy, and the attractiveness of the region, and when we demonstrate how disparate interests can unite in a common cause to solve environmental problems, the investments in our future should follow. This 2016 Air Quality Management Plan provides the basis to continue and strengthen the region's campaign for clean air and a healthful future for our residents.

Executive Summary



The 2016 Air Quality Management Plan is the regional blueprint for achieving air quality standards in the South Coast Air Basin, an area that includes Orange County and the non-desert portions of Los Angeles, Riverside and San Bernardino counties. Through a combination of regulatory and incentive approaches via partnerships at all levels of government, the elusive goal of healthy air is within reach.

In This Chapter

Overview

The 2016 Air Quality Management Plan (2016 AQMP or Plan) is a regional blueprint for achieving the federal air quality standards and healthful air. The South Coast Air Quality Management District (SCAQMD or District) is responsible for clean air in the South Coast Air Basin (SCAB or Basin), an area that includes Orange County and the non-desert portions of Los Angeles, Riverside and San Bernardino counties. While air quality has dramatically improved over the years, the Basin still exceeds federal public health standards for both ozone and particulate matter (PM) and experiences some of the worst air pollution in the nation. The 2016 AQMP represents a thorough analysis of existing and potential regulatory control options, includes available, proven, and cost-effective strategies, and seeks to achieve multiple goals in partnership with other entities promoting reductions in greenhouse gases and toxic risk, as well as efficiencies in energy use, transportation, and goods movement. The Plan recognizes the critical importance of working with other agencies to develop funding and incentives that encourage the accelerated transition to cleaner vehicles, and the modernization of buildings and industrial facilities to cleaner technologies in a manner that benefits not only air quality, but also local businesses and the regional economy. These "win-win" scenarios are key to implementation of this Plan with broad support from a wide range of stakeholders.

Air Quality Standards

The federal Clean Air Act (CAA) requires areas not attaining the national ambient air quality standards (NAAQS) to develop and implement an emission reduction strategy that will bring the area into attainment in a timely manner. The region is given a classification that describes the degree of nonattainment. This classification dictates specific planning requirements under the CAA, including the time provided to attain the standard. The CAA requires attainment of the standard to be achieved as "expeditiously as practicable," but no later than the attainment years listed in Table ES-1 below. It should be noted that the years listed in Table ES-1 are the latest calendar year to achieve the requisite emission reductions, and not the statutory attainment date. For example, the attainment date for the 2008 8-hour ozone standard in an extreme non-attainment attainment area is July 20, 2032. But attainment must be demonstrated with projected emissions reductions in the prior year (2031).

Five NAAQS are being evaluated in this integrated Plan. Three standards – the 8-hour ozone NAAQS established in 2008 (2008 8-hour Ozone), the annual PM2.5 NAAQS established in 2012 (2012 annual PM2.5), and the 24-hour PM2.5 NAAQS established in 2006 (2006 24-hour PM2.5) are required to have new attainment demonstration in this Plan. However, given the overlaps in emissions and control strategies for other yet-to-be-attained NAAQS, this integrated Plan will also include revisions to the attainment demonstrations for two other standards: the 1997 8-hour ozone NAAQS and the 1979 1-hour ozone NAAQS. While the 2012 AQMP focused on attainment of the 2006 24-hour PM2.5 standard, it has since been determined, primarily due to unexpected drought conditions, that it was impracticable to meet the standard by the original attainment year. Since that time, U.S. Environmental Protection Agency (U.S. EPA) has approved a re-classification to "serious" nonattainment for the 24-hour PM2.5 standard, which requires a new attainment demonstration with a new attainment deadline.

TABLE ES-1

Standard	Concentration	Classification	Latest Attainment Year
2008 8-hour Ozone	75 ppb	Extreme	2031
2012 Annual PM2.5	12 µg/m^3	Moderate Serious	2021 2025
2006 24-hour PM2.5	35 µg/m^3	Serious	2019
1997 8-hour Ozone	80 ppb	Extreme	2023
1979 1-hour Ozone	120 ppb	Extreme	2022

Challenges

The 2016 AQMP includes both stationary and mobile source strategies to ensure that rapidly approaching attainment deadlines are met, that public health is protected to the maximum extent feasible, and that the region is not faced with burdensome sanctions if the Plan is not approved or if the NAAQS are not met on time. As with every AQMP, a comprehensive analysis of emissions, meteorology, atmospheric chemistry, regional growth projections, and the impact of existing control measures is updated with the latest data and methods. The most significant air quality challenge in the Basin is to reduce nitrogen oxide (NOx) emissions sufficiently to meet the upcoming ozone standard deadlines. Based on the inventory and modeling results, 522 tons per day (tpd) of total Basin NOx 2012 emissions are projected to drop to 255 tpd and 214 tpd in the 8-hour ozone attainment years of 2023 and 2031 respectively, due to continued implementation of already adopted regulatory actions ("baseline emissions"). The analysis suggests that total Basin emissions of NOx must be reduced to approximately 141 tpd in 2023 and 96 tpd in 2031 to attain the 8-hour ozone standards. This represents an additional 45 percent reduction in NOx in 2023, and an additional 55 percent NOx reduction beyond 2031 levels. The following chart presents the future projections of NOx emissions, the reductions from the proposed control strategy and the levels necessary to attain the standards. The chart also illustrates how the strategy to meet the 8-hour ozone standard in 2023 should lead to sufficient NOx emission reductions to attain the 1-hour ozone standard by 2022. Since NOx emissions also lead to the formation of PM2.5, the NOx reductions needed to meet the ozone standards will likewise lead to improvement of PM2.5 levels and attainment of PM2.5 standards.

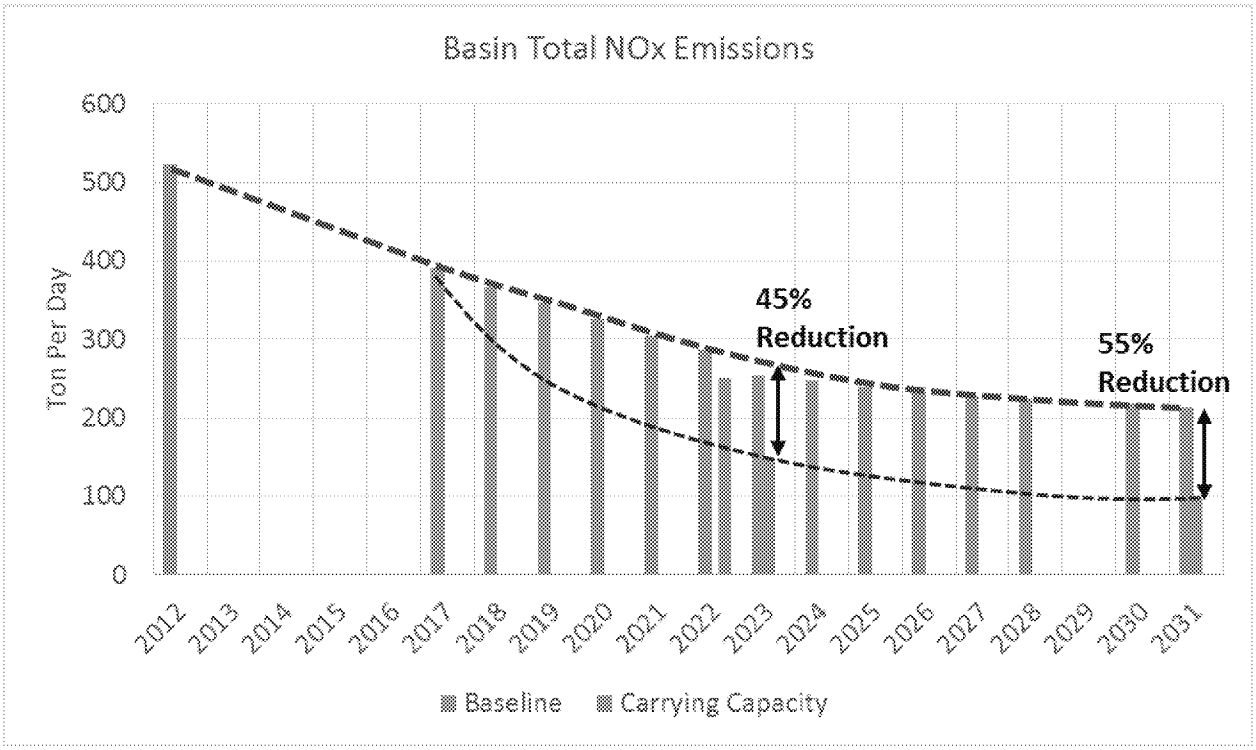


FIGURE ES-1. BASIN TOTAL NOX EMISSIONS (2012–2031)

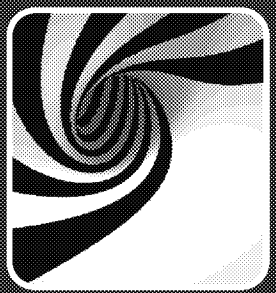
Plan Objectives

To ensure air quality goals will be met while maximizing benefits and minimizing adverse impacts to the regional economy, the following policy objectives have guided the development of the 2016 AQMP:

Eliminate reliance on future technologies (CAA §182(e)(5)) measures to the maximum extent feasible. As an "extreme" nonattainment area for ozone, the CAA allows the Basin to rely on unspecified future technological advancements to show future attainment of air quality standards. Given the fast approaching deadlines – as early as 2022 and 2023, and given that the majority of the zero and near-zero technologies needed for attainment have already or will soon be commercially available, it is now possible to specify the technologies and the implementation pathways to attainment. Some CAA §182(e)(5) flexibility may still be needed for Plan approval by U.S. EPA given the need for continued technological and cost improvements and new funding and incentive programs.

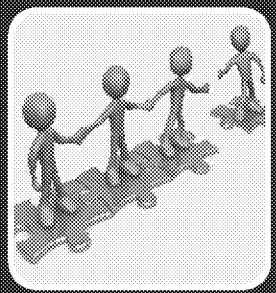
Calculate and take credit for co-benefits from other planning efforts. Other local, state and federal efforts addressing GHG reductions, energy efficiency, transportation, and goods movement have and will continue to lead to air quality improvements. Where possible, this Plan seeks to quantify and include emission reductions from these parallel and complementary programs.

2016 AQMP Policy Objectives



Eliminate reliance on future technologies (CAA §182(e)(5)) measures to the maximum extent possible by providing specific control measures which have quantifiable emission reductions and associated costs.

Calculate and take credit for co-benefits from other planning efforts (e.g., GHG reduction targets, energy efficiency, and transportation).



Develop a strategy with fair-share emission reductions at the federal, state, and local levels.

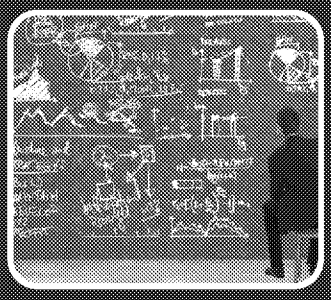
Develop a strategy with fair-share emission reductions at the federal, state, and local levels. SCAQMD will make full use of its legal authorities to seek a cleaner air future. But with limitation on SCAQMD authority over the mobile sources that contribute the most to our air quality problems, attainment cannot be achieved without State and federal actions. Proposed measures include a new ultra-low NOx federal engine emission standard for heavy duty trucks and other State mobile source regulations. In some cases, additional authority provided to the State or SCAQMD for sources traditionally under the jurisdiction of the federal government (e.g., locomotives, aircraft, and ships) should be considered.

Invest in strategies and technologies meeting multiple objectives regarding air quality, climate change, air toxics exposure, energy, and transportation. With multiple environmental and societal objectives, targets, deadlines, and strategies underway, it is critical that planning efforts are integrated at all levels and across all agencies. To this end, when progress towards multiple goals is possible, those strategies should be designed to maximize the co-benefits and then prioritized for implementation and investment. The Plan embraces strategies that reduce toxic risk impacting local neighborhoods and disadvantaged communities adjacent to goods movement and transportation corridors.

Identify and secure significant funding for incentives to implement early deployment and commercialization of zero and near-zero technologies. The 2016 AQMP control strategy strongly relies on a transition to zero and near-zero emission technologies in the mobile source sector, including automobiles, transit buses, medium- and heavy-duty trucks, and off-road applications. The plan focuses on existing commercialized technologies and energy sources including their supporting infrastructure, along with newer technologies that are nearing commercialization based on recent demonstration programs and limited test markets. Prioritizing and expanding funding in Environmental Justice (EJ) areas will be sought.

Invest in strategies and technologies meeting multiple objectives regarding air quality, climate change, air toxics exposure, energy, and transportation. Prioritize strategies that meet fast approaching deadlines and assist EJ impacted areas.

Seek and identify significant secured funding for incentives to implement early deployment and commercialization of known zero and near-zero technologies, particularly in the mobile source sector.



Enhance the socioeconomic analysis and select the most efficient and cost-effective path to achieve multi-pollutant and multi-deadline targets.

Prioritize non-regulatory, innovative and "win-win" approaches for emission reductions. As shown in the past, air quality standards can be achieved while maintaining a healthy economy.

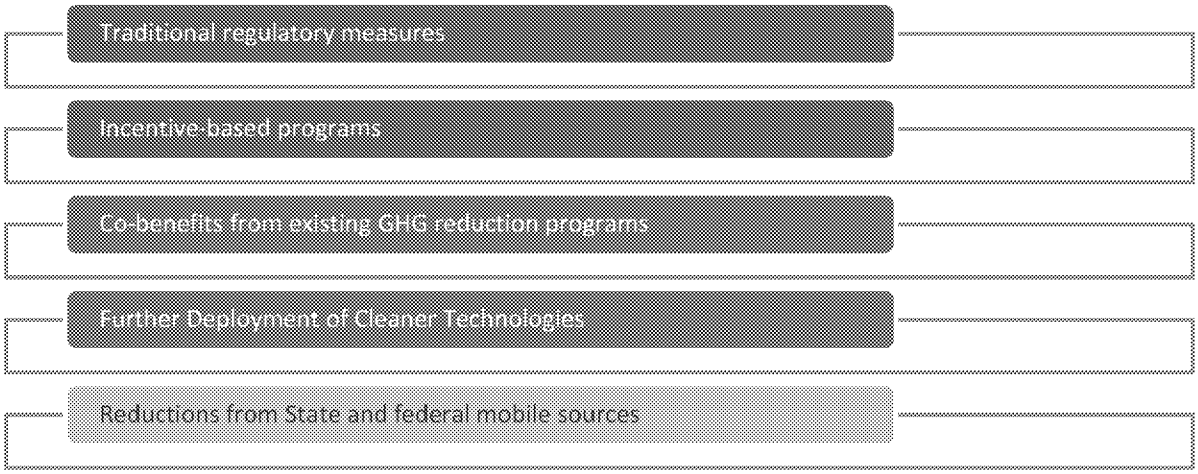
Enhance the socioeconomic analysis and pursue the most efficient and cost-effective path to achieve multi-pollutant and multi-deadline targets. Integrated planning across multiple pollutants and multiple deadlines allows for efficient and cost-effective control strategy design. An enhanced socioeconomic impact analysis also quantifies the impacts of the strategy on health, jobs, businesses and the local economy.

Prioritize enforceable regulatory measures as well as non-regulatory, innovative and "win-win" approaches for emission reductions. As shown in the past, significant air quality improvements can be achieved while maintaining a healthy economy. The 2016 AQMP calls for a priority on maximizing emission reductions utilizing zero-emission technologies wherever feasible and cost-effective, near-zero emission technologies in other applications, and innovative "win-win" approaches for emission reductions when new regulations are not yet practical. A full life-cycle in-Basin emissions analysis will be considered in determining the full emissions profile and cost-effectiveness of these technologies. In designing the control strategy needed to achieve the ozone and PM2.5 air quality standards, there will be special consideration of strategies that can contribute to the economic vitality of the region and the needs of both the public and local small businesses. The Plan will prioritize distribution of incentive funding to maximize emissions reductions in the most disadvantaged communities in the region.

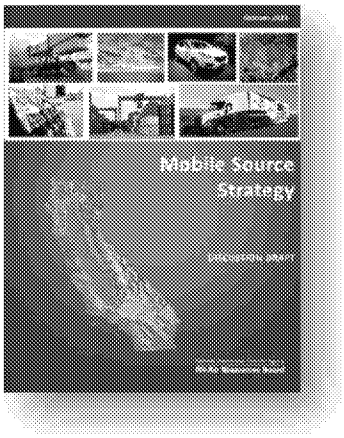
Control Strategies

The overall control strategy is an integral approach relying on fair-share emission reductions from federal, state and local levels. The 2016 AQMP is composed of stationary and mobile source emission reductions from traditional regulatory control measures, incentive-based programs, co-benefits from climate programs, mobile source strategies and reductions from federal sources, which include aircraft, locomotives and ocean-going vessels. These strategies are to be implemented in partnership with the California Air Resources Board (CARB) and U.S. EPA. In addition, the Southern California Association of Governments (SCAG) recently approved their 2016 Regional Transportation Plan/Sustainable Communities Strategies (RTP/SCS)[1] that include transportation programs, measures, and strategies generally designed to reduce vehicle miles traveled (VMT), which are contained within baseline emissions inventory in the Plan.

[1] http://scagrtpscs.net/Pages/FINAL2016RTPSCS.aspx.



Mobile sources contributed about 88 percent of the region's total NOx emissions in 2012. Since the SCAQMD has limited authority to regulate mobile sources, staff worked closely with CARB and U.S. EPA, which have primary authority over mobile sources, to ensure mobile sources perform their fair share of pollution reduction responsibilities. In May 2016, CARB released an updated Mobile Source Strategy[2] and a Proposed State SIP Strategy[3] supporting multiple planning efforts to meet air quality standards, greenhouse gas (GHG) emission reduction targets, petroleum consumption reduction, and reduced health risks from transportation emissions over the next 15 years. The integrated approach allows consideration of the multi-pollutant co-benefits, and identification of interaction between control measures to guide policy and maximize program effectiveness. Specifically, the mobile source strategy outlines a coordinated suite of measure concepts for on-road light- and heavy-duty vehicles, off-road equipment, as well as federal and international sources. The strategy also provides regulatory and programmatic mechanisms to implement the measures and estimated NOx reductions for the South Coast Air Basin. A subset of the statewide strategy is a mobile source strategy for the South Coast SIP. The reductions from these mobile source measures are included in the attainment demonstration and are critical for meeting the standards. Without significant reductions from the mobile source sector demonstration of attainment is not possible.

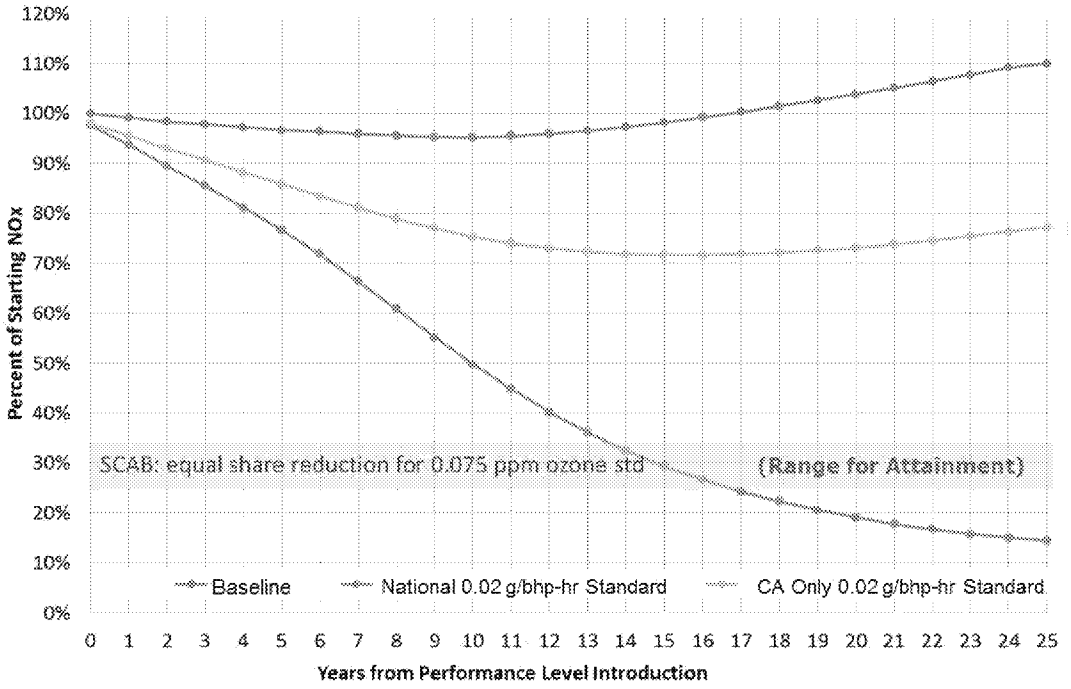


In June 2016, SCAQMD and 10 co-petitioners requested the U.S. EPA Administrator to undertake rulemaking to revise the national on-road heavy-duty engine exhaust NOx emission standard from 0.2 g/bhp-hr to 0.02 g/bhp-hr. It was recommended that the regulation be implemented by January 2022 or if not feasible, by January 2024, with a phase-in starting in January 1, 2022. A national standard is estimated to result in NOx emission reductions from this source category from 70 to 90 percent in 14 to 25 years, respectively. Given that the Basin must attain the 75 ppb ozone NAAQS by 2031 (within the

[2] http://www.arb.ca.gov/planning/sip/2016sip/2016mobsrc.htm.

[3] http://www.arb.ca.gov/planning/sip/2016sip/2016sip.htm.

next 15 years), a new on-road heavy-duty engine exhaust emissions standard for NOx is critical given the time needed for such standards to be adopted, for manufacturers to develop and produce compliant vehicles, and for national fleet turnover to occur. The following chart shows the difference in NOx reductions from heavy duty trucks between baseline (no action) emissions (in blue), a low NOx standard adopted only in California (yellow) and reductions if the same low NOx standard is implemented nationally (orange).



Source: Presentation by Mr. Cory Palmer, ARB at the Symposium on California's Development of its Phase 2 Greenhouse Gas Emission Standards for On-Road Heavy-Duty Vehicles (April 22, 2015)

FIGURE ES-2. YEARS FROM PERFORMANCE LEVEL INTRODUCTION

Some of the control measures achieve emission reductions by continuing existing regulatory requirements and programs and extensions of those programs, while some control measures are not regulatory in form, but instead focus on incentives, outreach, and education to bring about emission reductions through voluntary participation and behavioral changes needed to complement regulations.

Regulatory Measures

In order to meet ozone standards, both NOx and volatile organic compounds (VOC) emissions need to be addressed. However, air quality modeling demonstrates that NOx reductions prove to be much more effective in reducing ozone levels and will also lead to significant improvement in PM2.5 concentrations. NOx-emitting stationary sources regulated by the SCAQMD include RECLAIM facilities (e.g., refineries, power plants, etc.), natural gas combustion equipment (e.g., boilers, heaters, engines, burners, flares) and other combustion sources that burn wood or propane. The 2016 AQMP proposes robust NOx reductions

from new regulations on RECLAIM facilities, non-refinery flares, commercial cooking, and residential and commercial appliances. Such combustion sources are already heavily regulated with the lowest NOx emissions levels achievable but there are opportunities to require and accelerate replacement with cleaner zero-emission alternatives, such as residential and commercial furnaces, pool heaters and back-up power equipment. Such replacements can be achieved through a combination of regulations and incentives. Technology-forcing regulations can drive development and commercialization of clean technologies, with future year requirements for new or existing equipment. Incentives can then accelerate deployment and enhance public acceptability of new technologies.

It should be emphasized that beginning in 2012, continued implementation of previously adopted regulations will lead to NOx emission reductions of 68 percent by 2023 and 80 percent by 2031. Examples of stationary source reductions include 12 tpd from RECLAIM facilities, 4.1 tpd from Rule 1147 sources, 3.2 tpd from Rule 1110, 1146, and 1146.1 sources and 3 tpd from the implementation of Rule 1111. With the addition of 2016 AQMP proposed regulatory measures, a 30 percent reduction of NOx from stationary sources is expected in the 15 year period between 2008 and 2023. This is in addition to significant NOx reductions from stationary sources achieved in the decades prior to 2008. This Plan builds upon these past successes with new regulatory commitments for additional emissions reductions to the same extent as past AQMPs.

Incentive Funding

Given the significant NOx emission reductions needed to attain the federal ozone air quality standards by 2023 and 2031, a combination of regulatory actions and public funding incentives are needed. With fast approaching ozone standard attainment deadlines, faster reductions are critical to complying with federal requirements and improving public health in the short term. The purpose of incentive programs is to advance deployment of new cleaner technologies at a pace that is not feasible through regulation alone. The approach that the SCAQMD and CARB are proposing to achieve the incentive-based emission reductions identified in the State Mobile Source Strategy (Appendix IV-B) and the SCAQMD's mobile and stationary source measures (Appendix IV-A) is predicated on securing the amount of funding needed to achieve the NOx emission reductions by 2023 and 2031.

The amount of incentive funding needed is estimated to be approximately $11–14 billion in total funding over a seven to fifteen year period. Given this significant funding level needed to attain the federal ozone air quality standards, an action plan is being developed as part of the 2016 AQMP public adoption process to identify the necessary actions by the District, the region, the state, the federal government, and other partnerships to ensure the requisite levels of funding are secured as early as possible and sustained through 2031.

Currently, the SCAQMD receives around $56 million per year in incentives funding to accelerate turnover of on- and off-road vehicles and equipment under SB 1107, a portion of the state's Tire Fee, and AB923. AB 923 will sunset in 2024. In addition, the District has received close to $550 million in Proposition 1B funding. The last round of Proposition 1B will be ending in the next couple of years. The District has also received funding under the DERA program on a competitive basis. However, the amount of funding needed to achieve the NOx emission reductions associated with the "Further Deployment"

measures proposed in the State Mobile Source Strategy and the 2016 AQMP will require on the order of $1 billion per year if funding is available beginning in 2017.

Attainment Demonstration

The 2016 AQMP demonstrates how and when the South Coast Air Basin, as well as the Coachella Valley, will attain the ozone and PM2.5 standards as "expeditiously as practicable," but no later than the latest statutory attainment date. For the three ozone standards, the control strategy will reduce baseline emissions below the amount of allowable emissions in the region that would still meet the standards also referred to as the region's "carrying capacity." The following table provides the projected NOx baseline emissions and reductions in tons per day for the three ozone attainment years from implementing the different measures, programs and strategies in the overall control strategy. Traditional regulatory measures are a mix of SCAQMD and CARB control measures. Incentive measures include SCAQMD stationary and mobile source as well as CARB mobile source programs. Further deployment of cleaner technologies focus on additional incentives for the cleanest on-road vehicles and off-road equipment. Federal sources are comprised of aircraft, locomotives, and ocean-going vessels.

TABLE ES-2

Proposed NOx Reductions to Achieve Ozone Carrying Capacities

NOx Emissions (tpd)	2022 – 1-hour Ozone (120 ppb)	2023 – 8-hour Ozone (80 ppb)	2031 – 8-hour Ozone (75 ppb)
Baseline Inventory	287	255	214
Carrying Capacity	**245**	**141**	**96**
Traditional Regulatory Measures	2.6	3.2	18.2
Incentive-based Programs	18.2	23.9	25.7
CARB's Further Deployment of Cleaner Technologies (On-Road, Off-Road)	0	62	34
Federal Reductions in State Strategy	9	46	64
TOTAL Reductions	30	135	142
Remaining NOx Emissions†	257	120	72
Set Aside Account	3	3	1
TOTAL Remaining NOx Emissions	**260***	**123**	**73**

† Baseline Inventory minus Total Reductions

* Concurrent VOC reduction will assist in meeting the carrying capacity

The 2016 AQMP also demonstrates that the 24-hour PM2.5 standard will be met by the 2019 attainment year with no additional reductions needed beyond already adopted measures. Therefore, no additional measures are necessary for this standard. The annual PM2.5 standard, however, cannot be met by 2021 by implementing all feasible measures, which is the attainment year for our current "moderate" nonattainment area classification. As a "serious" nonattainment area, four more years are provided to attain the annual PM2.5 standard by 2025.

Since NOx emissions also lead to the formation of PM2.5, the NOx reductions needed to meet the ozone standards will lead to significant improvements in PM2.5 levels. The modeling results show that the ozone strategy will greatly assist in reducing PM2.5 concentrations, reaching attainment for the annual PM2.5 standard in 2023 when the benefits from the ozone strategy are fully realized. However, it is impracticable to demonstrate attainment by 2021, the "moderate" PM2.5 nonattainment area deadline. Thus, the SCAQMD is seeking to reclassify the South Coast Air Basin as a "serious" nonattainment area that will meet annual standard as "expeditiously as practicable," but no later than the attainment year of 2025. The impracticability demonstration can be found in Appendix VI-B.

Clean Air Act Requirements

This Plan complies with applicable federal CAA includes a series of requirements to be included in State Implementation Plans for nonattainment areas. The following required elements have been included and/or analyzed in the 2016 AQMP and corresponding appendices.

- Emission Inventory
- Reasonably Available Control Measures (RACM)
- Best Available Control Measures (BACM)
- Control Strategy and Needed Other Measures
- Attainment Demonstration
- Impracticability Demonstration (for "moderate" annual PM2.5 area)
- Reasonable Further Progress (RFP) and Milestones
- Contingency Measures
- General Conformity
- Transportation Conformity
- Vehicle Miles Traveled (VMT) Offset Demonstration
- PM Precursors
- New Source Review (NSR)
- Emissions Statements

Collaboration and Outreach

The 2016 AQMP relies on significant integration and coordination with other agencies in order to successfully meet the Basin's clean air goals. This integration included the traditional collaboration between the SCAQMD, CARB, U.S. EPA and SCAG but also includes the California Energy Commission (CEC), the California Public Utilities Commission, and the California State Transportation Agency (Caltrans). Regional and local governments, such as counties, cities, coalitions of governments, and regional transportation agencies, have also been part of the integrated planning process. Such a process is useful when implementing strategies that are consistent with the State's Vision for Clean Air[4] and strategies and goals of the 2016 AQMP. In addition to an integrated planning process with other agencies, the 2016 AQMP development process incorporates collaborative efforts by a wide range of non-government stakeholders. These efforts focus on businesses, environmental and health organizations, community groups, and academia. For example, in the months leading to the 2016 AQMP development, a series of AQMP White Papers were published in close collaboration with stakeholders.[5] These provided the technical and policy foundation for many aspects of the Plan. A two-day Control Strategy Symposium took place as a forum of ideas for new control technologies, efficiencies and innovative approaches to reduce emissions. The 2016 AQMP Advisory Group also continues to meet to discuss specific plan elements, requirements, and control strategies. The SCAQMD has a long and productive history of reducing health risk from air toxics and criteria pollutant emissions through an extensive control program including traditional and innovative rules and policies. A continuing commitment to an inclusive, transparent, and collaborative process is key to program success.

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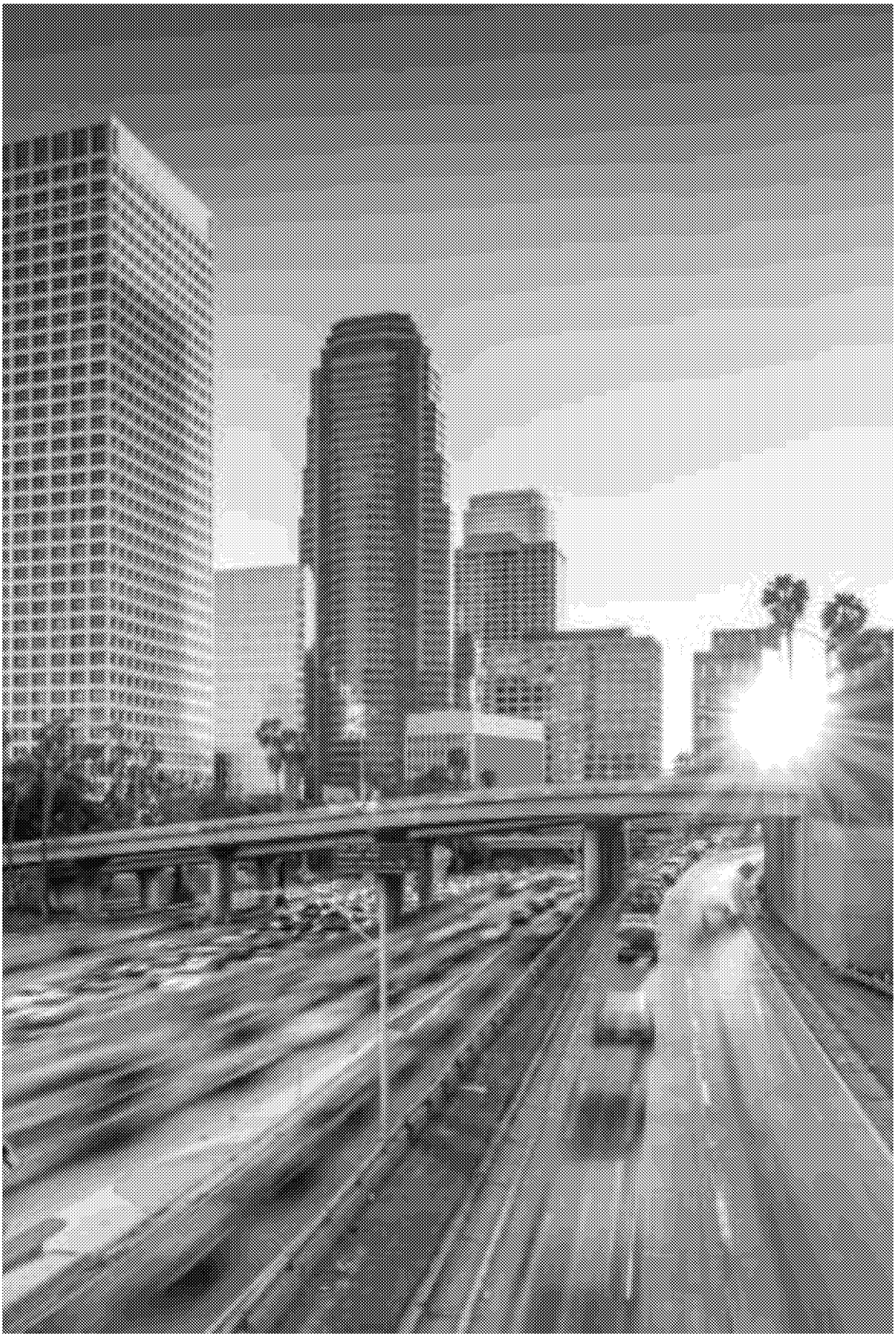
[4] http://www.arb.ca.gov/planning/vision/vision.htm.

[5] http://www.aqmd.gov/home/about/groups-committees/aqmp-advisory-group/2016-aqmp-white-papers.

Chapter 1
Introduction



Substantial progress improvements in air quality have been made, but the region still does not meet all federal and state health standards. The 2016 AQMP is designed to provide a path to clean air and address Clean Air Act requirements for ozone and PM2.5 standards.

In This Chapter

Purpose

The federal Clean Air Act (CAA or Act) requires areas that are not attaining the National Ambient Air Quality Standards (NAAQS or federal standards) to develop and implement an emission reduction strategy that will bring the area into attainment in a timely manner. The State of California also requires all feasible measures towards achievement of State of California ambient air quality standards (CAAQS or State standards) at the earliest practicable date. This strategy and the underlying technical analyses are integrated into Air Quality Management Plans (AQMPs or Plans) for the region. The South Coast Air Quality Management District (SCAQMD or District), with contributions from and collaborations with the California Air Resources Board (CARB) and Southern California Association of Governments (SCAG), has developed four comprehensive AQMPs since the late 1990's to address updates to air quality standards and attainment deadlines.

The 2016 AQMP evaluates integrated strategies and control measures to meet the NAAQS in Figure 1-1 as expeditiously as practicable, but no later than the statutory attainment deadlines. A Plan integrating several NAAQS and deadlines avoids wasted resources, streamlines efforts to demonstrate compliance and review of CAA requirements, and takes advantage of the co-benefits resulting from implementation of the integrated strategies.

The 2016 AQMP also provides a preliminary evaluation of the most recent federal 8-hour ozone standard (70 ppb), and incorporates energy, transportation, goods movement, infrastructure and other planning efforts that affect future air quality.

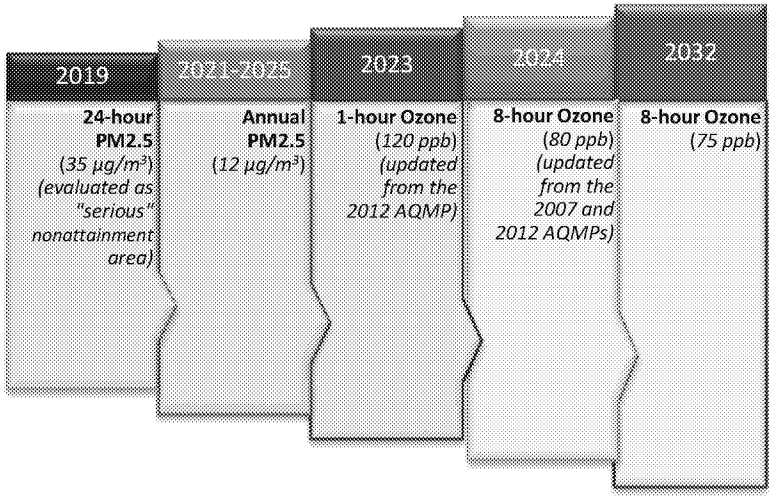


FIGURE 1-1
ATTAINMENT DEADLINES FOR NATIONAL AMBIENT AIR QUALITY STANDARDS EVALUATED IN 2016 AQMP

Historical Perspective

Photochemical smog is air pollution containing ozone and other reactive chemical compounds formed by nitrogen oxides (NOx) and hydrocarbons in sunlight. Los Angeles recorded its first smog event on July 26, 1943, although the region was experiencing smog for years before that due to the region's industrial smoke and fumes, as well as a growing population and increasing number of motor vehicles. In 1945, the City of Los Angeles established a Bureau of Smoke Control, and in 1947, State law authorized the creation of county-wide districts with jurisdiction across cities. The Los Angeles Board of Supervisors created the Air Pollution Control District (APCD), the first in the nation, as a county-wide air quality agency with broad powers to adopt and enforce air pollution regulations. That same year, the newly-formed agency required all major industries to have air pollution permits and adopted a rule to require metal melting plants to control dust and fumes with baghouse[1] controls. In 1948, Arie J. Haagen-Smit, a biochemistry professor at the California Institute of Technology in Pasadena, started examining the biology of plants and crops that had been damaged by smog. By the early 1950's, Dr. Haagen-Smit had determined smog caused eye irritation and damage to plants and materials, including rubber tubing that cracked in seven minutes when exposed to high smog levels. In 1953, the Los Angeles County APCD started requiring controls to reduce hydrocarbon emissions from industrial gasoline storage tanks, and vapor leaks from the filling of gasoline tank trucks and underground storage tanks at service stations. These actions were critical in helping to reduce the estimated 2,000 tons per day (tpd) of hydrocarbons and 250 tpd of NOx[2] at a time when the population in the region was only five million residents.

Downtown Los Angeles, 1950s
Smog got so bad in the shadow of City Hall that pedestrians would carry handkerchiefs to wipe away tears.

A Smog Emergency Warning System was launched in 1955 when the highest one-hour ozone level of 680 parts per billion (ppb) was recorded in downtown L.A. The first network of air monitors was initiated in 1956 and backyard trash incinerators were banned in 1958 when trash collection programs were established in the region. Other regulated sources included petroleum-based solvents, landfills, refineries, power plants, and industrial facilities.

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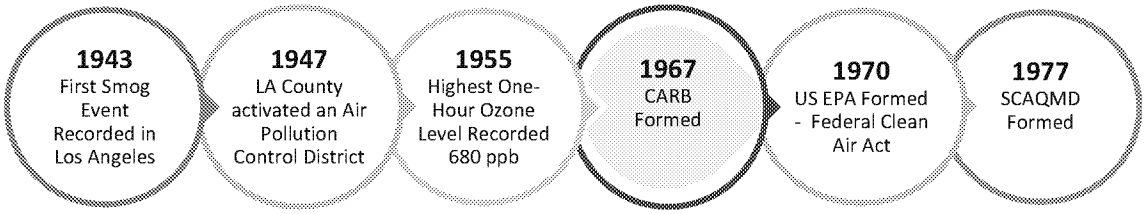
[1] A baghouse or bag filter is an air pollution control device that removes particulates out of air or gas released from commercial or industrial processes.

[2] "Second Technical and Administrative Report on Air Pollution in Los Angeles County," Annual Report 1950–51, Air Pollution Control District, Los Angeles County, California, 1952.

Recognizing that counties could not adequately regulate motor vehicle pollution, the California Legislature established the California Motor Vehicle Pollution Control Board in 1960 to test vehicle emissions and certify emission control devices. Six years later, California became the first state in the nation to establish automobile tailpipe emission standards, one year before the creation of the CARB. By 1969, the first state ambient air quality standards were enacted in California. In the following year, the U.S. Environmental Protection Agency (U.S. EPA) was formed and the federal CAA became law. It soon became apparent that local programs were not enough to solve regional problems, as air pollution is not contained within city and county jurisdictional boundaries. Thus, air basins, defined by logical geographical/topographical boundaries, became the basis for regulatory programs.

U.S. EPA first adopted NAAQS in 1971 and California adopted regulations requiring the installation of a vehicle pollution control device, the catalytic converter, starting with the 1975 model year. Over time, motor vehicle fuels were reformulated to reduce photochemically reactive olefins, remove lead in gasoline, and utilize fewer smog-forming and toxic ingredients.



In 1977, the Los Angeles County APCD merged with the APCDs of Orange, Riverside, and San Bernardino counties to form the South Coast Air Quality Management District, pursuant to the Lewis Air Quality Management Act adopted by the California Legislature in 1976. The following year, gas stations were required to install vapor recovery "boots" on gasoline nozzles, further reducing hydrocarbon losses when filling the vehicle tank. SCAQMD has continued to adopt and implement regulatory measures in order to reduce air pollution emissions from a wide range of sources and to reduce public exposure to unhealthful air pollution. In addition, efforts on the federal and state level continue to contribute toward reducing air pollution from mobile and area sources in order to fulfill commitments to achieve the ground-level ozone and fine particulate matter (PM2.5) NAAQS.

Regional Setting

The SCAQMD has jurisdiction (Figure 1-2) over an area of approximately 10,743 square miles, consisting of the South Coast Air Basin (Basin), and the Riverside County portions of the Salton Sea Air Basin (SSAB) and Mojave Desert Air Basin (MDAB). The Basin, which is a sub-region of the District's jurisdiction, is bounded by the Pacific Ocean to the west and the San Gabriel, San Bernardino, and San Jacinto mountains to the north and east. It includes all of Orange County and the non-desert portions of Los Angeles, Riverside, and San Bernardino counties. The Riverside County portion of the SSAB is bounded by the San Jacinto Mountains in the west and spans eastward to the Palo Verde Valley. The Coachella Valley Planning Area is a federal nonattainment area that is part of a sub-region of Riverside County in the SSAB that is bounded by the San Jacinto Mountains to the west and the eastern boundary of the Coachella Valley to the east. The Los Angeles County portion of the MDAB (known as North County or Antelope Valley) is bounded by the San Gabriel Mountains to the south and west, the Los Angeles/Kern County border to the north, and the Los Angeles/San Bernardino County border to the east. The SSAB and MDAB were previously included in a single large basin called the Southeast Desert Air Basin (SEDAB).

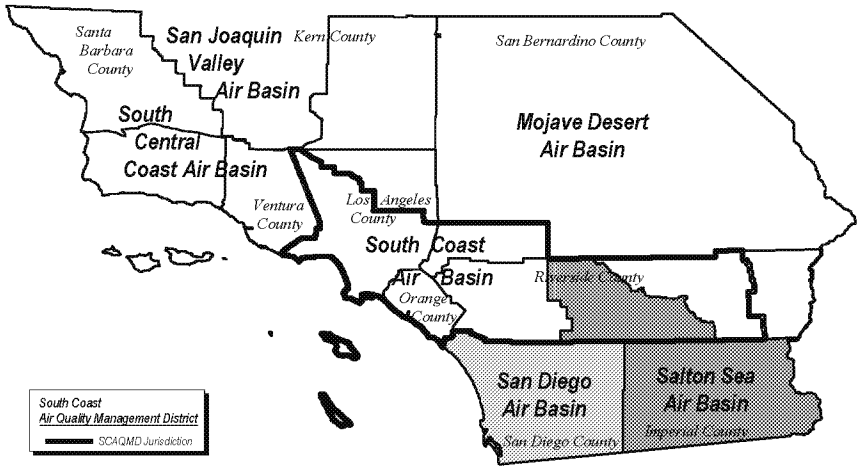


FIGURE 1-2
BOUNDARIES OF THE SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT AND NEIGHBORING FEDERAL PLANNING AREAS

The Coachella Valley Planning Area is impacted by pollutant transport from the Basin. In addition, pollutant transport also impacts the Antelope Valley, Mojave Desert, Ventura County, and San Diego County. As part of this AQMP, an update on the status of the Coachella Valley ozone nonattainment area is provided in Chapter 7.

The topography and climate of Southern California combine to make the Basin an area of high air pollution potential. A warm air mass frequently descends over the cool, moist marine layer produced by the interaction between the ocean's surface and the lowest layer of the atmosphere. The warm upper layer forms a cap over the cooler surface layer, which traps the pollutants near the ground. Light winds can further limit ventilation. Additionally, abundant sunlight triggers the photochemical reactions which produce ozone and the majority of the particulate matter. The region experiences more days of sunlight than any other major urban area in the nation except Phoenix, AZ.

The Basin's economic base is diverse. Historically, the four counties of the Basin have collectively comprised one of the largest and fastest-growing local economies in the United States. Significant changes have occurred in the composition of the industrial base of the region in the past twenty years. As in many areas of the country, a large segment of heavy manufacturing, including steel and tire manufacturing as well as automobile assembly, has been phased down. Due to growth in shipping and trade, service and logistics, businesses have replaced some of the heavy industry, although there are still significant manufacturing operations (recent report in *The Wall Street Journal*[3]).

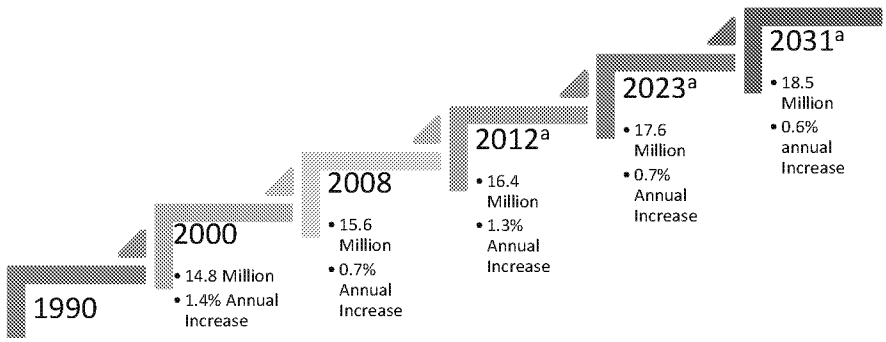
Emission Sources

In spite of substantial reductions already achieved through effective control strategies, additional significant reductions of NOx and PM in the Basin and limited, strategic reductions of volatile organic compounds (VOCs) are needed to attain the federal and State air quality standards.

Air pollution forms either directly or indirectly from pollutants emitted from a variety of sources. These sources can be natural, such as oil seeps, vegetation, or windblown dust, but the majority of emissions in the Basin are related to human activity. The air pollution control strategy in the 2016 AQMP is directed at controlling man-made sources. Examples of man-made emission sources include fuel combustion sources, such as cars and trucks, evaporation of organic liquids, such as those used in coating and cleaning processes, and abrasion processes, such as tires on roadways. The emission sources in the Basin are described in Chapter 3. Natural emissions are included in the air quality modeling analysis in Chapter 5.

Population

Since the end of World War II, the Basin has experienced faster population growth than the rest of the nation. The annual average percent growth has slowed but the overall population of the region is expected to continue to increase through 2023 and beyond. Figure 1-3 shows the estimated population and projections based on SCAG's regional growth forecast.



[a] Based on SCAG's 2016 Regional Transportation Plan

[b] Average percent increase per year over the period

FIGURE 1-3

REGIONAL POPULATION GROWTH

Despite this population growth, air quality has improved significantly over the years, primarily due to the impacts of air quality

[3] http://blogs.wsj.com/economics/2015/07/15/where-are-the-most-u-s-manufacturing-workers-los-angeles/.

control programs at the local, state and federal levels. Figure 1-4 shows the trends since 1990 of the 8-hour ozone levels, the 1-hour ozone levels, and annual average PM2.5 concentrations (since 1999), compared to the regional gross domestic product, total employment and population. The 2007–2009 recession had a clear impact on gross domestic product and employment, but as depicted by Figure 1-4, the economy is recovering with rebounding employment numbers. Human activity in the region has an impact on achieving reductions in emissions. However, the ozone and PM levels continue to trend downward as the economy and population increase, demonstrating that it is possible to maintain a healthy economy while improving public health through air quality improvements.

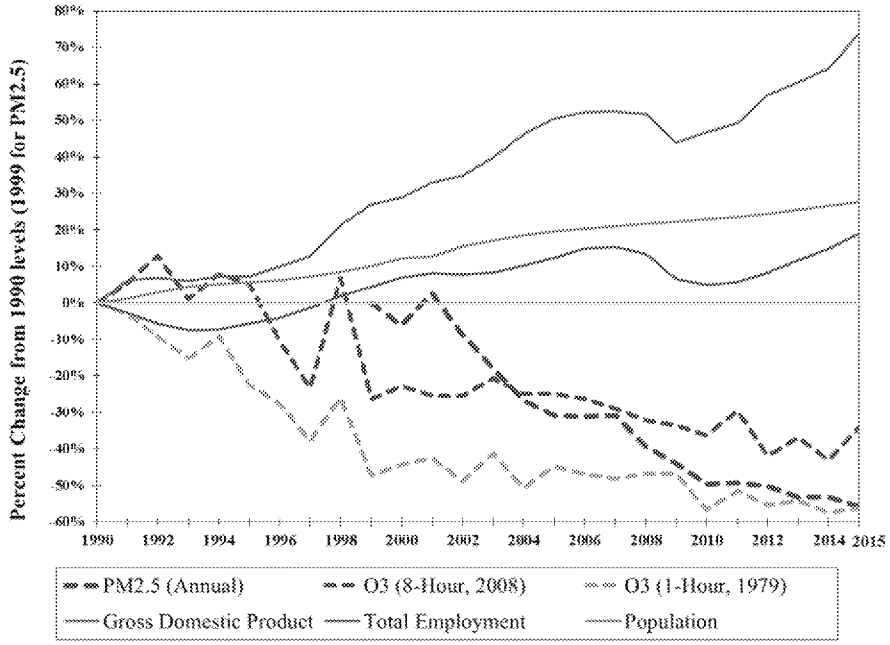


FIGURE 1-4
PERCENT CHANGE IN AIR QUALITY ALONG WITH DEMOGRAPHIC DATA FOR THE 4-COUNTY REGION (1990–2015)

U.S. EPA Standards

The federal CAA requires U.S. EPA to review NAAQS every five years considering the most recent scientific and health effects information, air quality information, and quantitative risk (e.g., size of at-risk groups affected). The review must consider the uncertainties and limitations of the scientific evidence as well as conclusions from U.S. EPA experts and advice from the Clean Air Scientific Advisory Committee (CASAC), which is an independent scientific advisory committee established by the CAA charged with providing advice to U.S. EPA. The purpose of the review is to determine if the current standards are "requisite to protect public health with an adequate margin of safety."

It should be noted that there are both primary and secondary air quality standards. Primary standards are designed to protect public health such as the health of "sensitive" populations including persons with asthma, children, and the elderly. Secondary standards protect public welfare such as protection against decreased visibility and damage to animals, crops, vegetation, and buildings.

After approving a standard, the U.S. EPA designates areas across the nation as attainment or as nonattainment of the standard. If an area is designated nonattainment of the NAAQS, the State is required to submit a State Implementation Plan (SIP) demonstrating compliance with a series of CAA

requirements. Chapter 6 provides a detailed explanation of the federal CAA requirements along with how the requirements are being addressed.

In addition, the U.S. EPA requires that transportation conformity budgets be established based on the most recent planning assumptions (i.e., within the last five years) and approved motor vehicle emission models. Transportation conformity ensures that transportation plans and programs do not cause or contribute to any new violation of a standard, increase the frequency or severity of any existing violation, or delay the timely attainment of the air quality standards. The 2016 AQMP is based on the most recent assumptions provided by both CARB and SCAG for motor vehicle emissions and demographic updates and includes updated transportation conformity budgets, located in Chapter 6.

Chapter 2 provides more detail on the federal and State ambient air quality standards, attainment status trends, and specific pollutant information such as the health effects due to exposure. The following is a brief overview of the ozone and PM NAAQS and attainment requirements that are included in the 2016 AQMP.

Ozone

U.S. EPA classifies areas of ozone nonattainment (e.g., "extreme," "severe," "serious," "moderate" or "marginal") based on how much an area exceeds the standard, which in turn affects the required attainment date. The higher the current exceedance, the more time is allowed to demonstrate attainment in recognition of the greater challenge involved. However, the higher classifications are also subject to more stringent requirements.

In 1979, the U.S. EPA approved a 1-hour ozone standard (120 ppb) that was replaced in 1997 with a more stringent 8-hour ozone standard (80 ppb) (U.S. EPA subsequently revoked the 1-hour standard entirely, effective in 2005). In 2008, the 8-hour ozone standard was lowered to 75 ppb. Because the Basin was designated as "extreme" nonattainment, the region has 20 years[4] to attain the ozone standards from the effective date of the final designation. For the 1997 and 2008 8-hour ozone standards, the attainment dates are June 15, 2024 and July 20, 2032, respectively. Because the attainment dates are mid-year deadlines, the demonstration of attainment and implementation of all emission reduction measures must take place by the previous calendar year, 2023 and 2031, respectively. Chapter 3 provides the emission inventory for these milestone years and Chapter 5 provides the modeled projected air quality in those years to demonstrate attainment of the standards. Although revoked in 2005, the 1-hour ozone standard originally should have been met by November 2010. The U.S. EPA then set a new deadline of February 6, 2023, with demonstration of the 1-hour ozone standard by December 31, 2022 in the Basin.

As an "extreme" nonattainment area, the Basin ozone SIP for the 2008 8-hour ozone NAAQS is required to be submitted within four years[5] after the designation effective date of July 20, 2012, thus by July 20, 2016. U.S. EPA has some discretion under the Act with submittal deadlines, and penalties are not incurred until 18 months after a finding of late submittal.

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[4] CAA, Title I, Part D, Subpart 2, Section 181.

[5] CAA, Title I, Part D, Subpart 2, Section 182(e) that "extreme" areas submit according to Section 182(c)(2).

Particulate Matter

In July 1987, U.S. EPA promulgated a 24-hour NAAQS of 150 micrograms per cubic meter (μg/m^3) for particulate matter less than 10 microns (PM10), which the Basin has not violated since 2008. SCAQMD requested re-designation as attainment, and the re-designation and PM10 maintenance plan were approved by U.S. EPA effective July 26, 2013.

On December 17, 2006, the U.S. EPA strengthened the 24-hour PM2.5 NAAQS from 65 μg/m^3 to 35 μg/m^3 and the Basin was subsequently designated "moderate" nonattainment for 2006 24-hour PM2.5 NAAQS on December 14, 2009. U.S. EPA requires the SIP to be submitted no later than three years after the designation, hence December 14, 2012. The 2012 AQMP projected attainment of the 2006 24-hour PM2.5 NAAQS by 2014; however, due to the region's long-running drought conditions, attainment by 2014 or 2015 has been deemed not possible. The later date would have been an acceptable attainment date pursuant to the federal CAA.[6] Thus, the SCAQMD requested that U.S. EPA reclassify the Basin as "serious" nonattainment and committed[7] to demonstrate attainment of the 24-hour PM2.5 NAAQS as expeditiously as practicable, but not beyond December 31, 2019[8] as part of the 2016 AQMP. In addition, more stringent "serious" area requirements now apply including implementation of Best Available Control Measures / Best Available Control Technology (BACM/BACT), a lower major source threshold (from 100 tons per year to 70 tons per year), and an update to the reasonable further progress (RFP) analysis.

In 1997, U.S. EPA approved an annual PM2.5 NAAQS at 15 μg/m^3. In 2012, U.S. EPA revised the NAAQS for the annual PM2.5 standard from 15.0 μg/m^3 to 12.0 μg/m^3. The PM2.5 standard is attained when the 3-year average of the annual averages does not exceed 12.0 μg/m^3. States have until 2021 to meet the 2012 PM2.5 standard for "moderate" nonattainment areas, and if necessary, up to four additional years if the area is re-classified as "serious" nonattainment, or 2025. Annual PM2.5 emissions in the Basin have experienced a steady decline over the years since 2001, attaining the 1997 annual PM2.5 standard (15.0 μg/m^3) in 2013. On July 8, 2016 U.S. EPA issued a final rule for "Clean Data Determination" based on 2011–2013 monitoring period in South Coast Air Basin attaining the 1997 annual PM2.5 (15 μg/m^3) and 1997 24-hour PM2.5 (65 μg/m^3). The determination was published in Federal Register on July 25, 2016 *(with effective date on August 24, 2016).*

The 2016 AQMP demonstrates how the region will achieve the 2012 annual PM2.5 (12.0 μg/m^3) as expeditiously as practicable, but no later than the statutory attainment deadline.

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[6] For a "moderate" nonattainment area, "the attainment date shall be as expeditiously as practicable, but no later than the end of the sixth calendar year after the area's designation as nonattainment." (*CAA, Title 1, Part D, Subpart 4, § 188(c)(1)*).

[7] SCAQMD Reclassification letter to U.S. EPA, July 28, 2015.

[8] Based on CAA, Title 1, Part D, Subpart 4, § 188 (c)(2) for PM2.5 attainment at the end of the 10th calendar year after effective date of designations for "serious" nonattainment areas.

For PM standards, "moderate[9]" nonattainment areas and areas reclassified as "serious[10]" nonattainment are required to submit a SIP 18 months from the effective date of designation.

Air Quality Progress

Today, the population in the region is over 16 million people, with 2012 emissions of approximately 500 tpd of VOCs and 522 tpd of NOx. Based on current regulations and actions already taken, emissions are projected to be approximately 379 tpd of VOC and 255 tpd of NOx by 2023. By 2031, emissions are projected to be further reduced to approximately 362 tpd of VOC emissions and 214 tpd of NOx emissions (see Appendix III for 2012, 2023, and 2031 summer planning inventory emissions). However, these levels are not low enough to meet the NAAQS for the Basin, so additional emission reductions are necessary.

Winter day photo of downtown L.A. under snow-capped San Gabriel Mountains

Substantial progress has been made in reducing ozone and PM emissions through regulatory measures, voluntary actions and partnerships with other agencies and stakeholders. Figure 1-5 illustrates the ozone and PM ambient air concentrations as a percentage of the federal standard, demonstrating that while air quality progress has been dramatic since the 1990s, the five NAAQS that are analyzed and updated in the 2016 AQMP have yet to be met. Detailed ozone and PM concentrations and trends can be found in Chapter 2.

Even with the substantial progress, more action must occur to meet the federal and California health-based standards. The 2016 AQMP explores new and innovative ways to accomplish these goals through

[9] CAA, Title I, Part D, Subpart 4, Section 189 (a)(2)(B).

[10] CAA, Title I, Part D, Subpart 4, Section 189 (b)(2).

incentive programs, efficiency improvements, recognizing co-benefits from other programs, regulatory measures, and other voluntary actions.

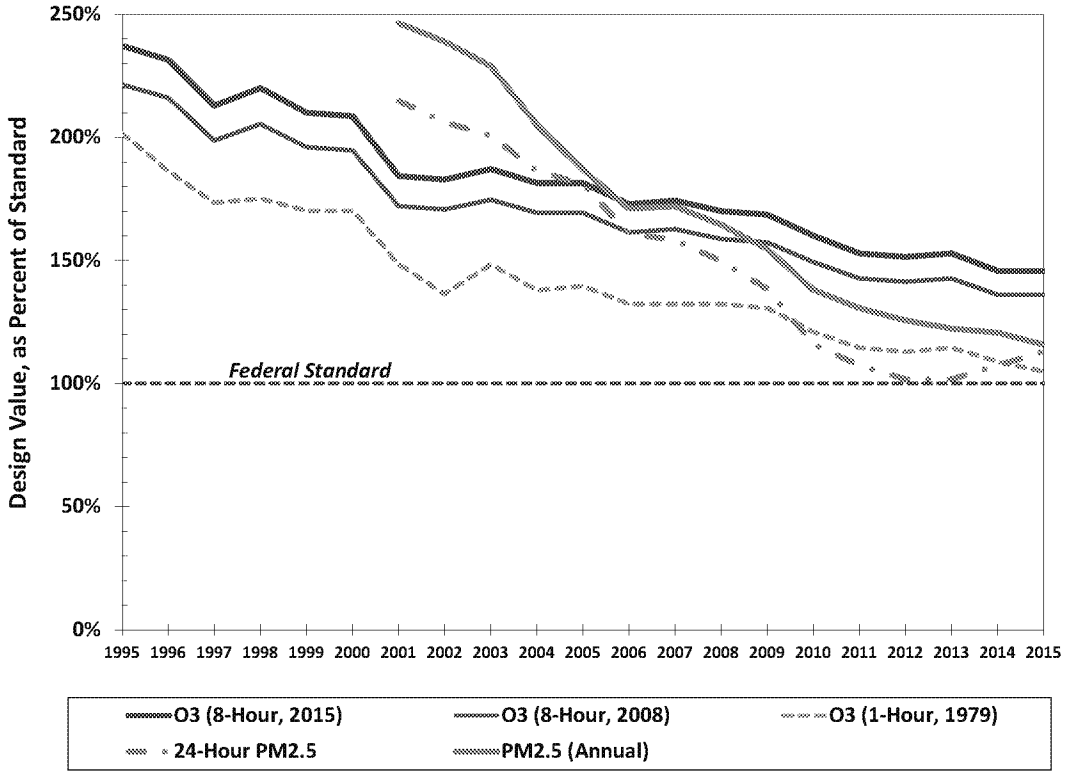


FIGURE 1-5
DESIGN VALUES IN PERCENTAGES OF THE FEDERAL STANDARDS

As vowed by Dr. Haagen-Smit 64 years ago in 1952, "Smog is on the way out; let us speed up its departure and let us keep it out."[11]

[11] Haagen-Smit, A.J. (May 1952), "Smog Research Pays Off." *Engineering and Science, Volume XV*.

Progress in Implementing the 2007/2012 AQMP

District's Actions

The ozone portion of the 2007 AQMP has been approved by U.S. EPA into the SIP. The "moderate" 24-hour PM2.5 elements of the 2012 AQMP have also been approved by U.S. EPA, and in January 2016 the U.S. EPA approved the Basin's re-designation as a "serious" nonattainment area for PM2.5. These approvals include SIP revisions submitted in response to U.S. EPA's initial findings.

The District continues to implement the 2012 AQMP, which received a limited approval and limited disapproval by U.S. EPA on April 14, 2016. Progress in implementing the 2012 AQMP can be measured by the progress in implementing control measures and the resulting emission reductions. Emission reduction commitments and reductions which were achieved in 2014 and will be achieved in 2023 through already-adopted measures are based on the emission inventories and milestone years from the 2012 AQMP.

2013	In 2013, several rulemaking efforts were completed or initiated to implement the 2012 AQMP. Specifically, Rules 444 (Open Burning) and 445 (Residential Wood Burning Devices) were amended to implement control measures BCM-01 and BCM-02, which were expected to achieve PM2.5 reductions estimated at 11.7 tons during winter episodic conditions. In addition, Rule 1114 (Petroleum Refinery Coking Operations) was adopted to implement Control Measure MCS-01, and is expected to result in a VOC reduction of 129 tons per year, a methane reduction of 547 tons per year and a reduction in hazardous air pollutants of 26 tons per year.
2014	In 2014, there were 13 rule amendments approved by the SCAQMD Governing Board. Five of these rules were amended as a result of SIP rule implementation issues (e.g., availability of advanced technology) and two of these rules were amended to strengthen public health protections with more stringent toxic emission requirements. The remaining rule amendments provided administrative revisions.
2015	In 2015, rulemaking concluded to implement Control Measure CMB-01 (Further Reductions from RECLAIM), which committed to achieve 3 tpd of NOx emissions by 2023 in the 2012 AQMP. In December 2015, the SCAQMD Governing Board approved amendments to Regulation XX which will reduce 12 tpd of NOx RECLAIM Trading Credits by 2023.

In addition, Rule 1113 was amended in 2016 achieving almost 1 tpd of VOC reductions, primarily by limiting the small container exemption. Other ongoing rulemaking efforts committed to in the 2012 AQMP seek further VOC reductions from emission sources such as adhesive and sealant applications (Rule 1168), mold release products (Rule 1161) and vacuum trucks (Rule 1188). However, these rules, and other VOC rules, have not been adopted or implemented yet as staff addresses technical and policy challenges. In lowering limits on the VOC content of coatings, solvents, adhesives, sealants, lubricants, inks and other VOC-containing products, manufacturers, in many cases, are using compounds that have

been exempted from the definition of VOC. These exemptions are based primarily on evidence that the compound does not significantly contribute to ozone formation. However, some exempt compounds may increase toxic risk to nearby receptors or workers. During the development of the VOC Controls White Paper[12] overseen by a 2016 AQMP Advisory Group, the need for regulating VOCs to assist in meeting the ozone standard was evaluated. The white paper discusses the role of VOCs in ozone and PM2.5 formation, including atmospheric chemistry, potential detrimental effects, and the rationale for the NOx heavy control strategy. Finally, the white paper considered and prioritized potential VOC control approaches such as sensitivity analysis, temporal or geographical, seasonality and incentives. It was determined that VOC reduction measures that lead to the increased use of chemicals that are known or suspected to be toxic should be avoided until it can be demonstrated that these replacement products do not lead to increased toxic risk for workers or the general public.

There were 12 amendments to rules or guidelines approved by the SCAQMD Governing Board in 2015. Two of these rules reduced NOx emissions, two rules reduced VOC emissions, two amendments focused on improving transportation rules, and six amendments strengthened public health protections by reducing air toxic emissions.

Table 1-1 lists the SCAQMD's 2012 AQMP commitments and the control measures or rules that were adopted through 2015. As shown in Table 1-1, for the control measures adopted by the SCAQMD over this period, 11.7 tons per day of PM2.5 reductions were achieved by 2014 and 2.4 tons per day of VOC reductions and 19.5 tons per day of NOx reductions will be achieved by 2023. The new control strategy and attainment demonstrations in the 2016 AQMP are expected to supersede any previous commitments not achieved and not re-introduced in the proposed control strategy.

N/A in the tables indicate a measure designed to ensure that reductions assumed to occur will in fact occur. TBD reductions are to be determined once the technical assessment is complete, and inventory and specific control approach are identified.

[12] Final VOC Controls White Paper (October 2015): http://www.aqmd.gov/docs/default-source/Agendas/aqmp/white-paper-working-groups/wp-voc-final.pdf?sfvrsn=2.

TABLE 1-1

2012 AQMP Emission Reductions (tons per day) by Measure/Adoption Date

Control Measure #	Control Measure Title	Adoption Date	COMMITMENT		ACHIEVED	
			2014	2023	2014	2023
PM2.5 EMISSIONS						
BCM-01	Further Reductions from Residential Wood Burning Devices (R445)	2013	7.1	--	7.1	--
BCM-02	Further Reductions from Open Burning (R444)	2013	4.6	--	4.6	--
BCM-03	Emission Reductions from Under-Fired Charbroilers	TBD	--	TBD	--	TBD
BCM-04	Further Ammonia Reductions from Livestock Waste	TBD	--	TBD	--	TBD
		TOTAL PM2.5 REDUCTIONS	**11.7**	**--**	**11.7**	**--**
NOx EMISSIONS						
OFFRD-01	Extension of the SOON Provision for Construction/Industrial Equipment	Ongoing	--	7.5	--	7.5
CMB-01	Further Reductions from RECLAIM [Regulation XX]	2015	2	3	0	12
CMB-02	NOx Reduction from Biogas Flares	Rulemaking Underway	--	TBD	--	TBD
CMB-03	Reductions from Commercial Space Heating	2016	--	0.18	--	TBD
		TOTAL NOx REDUCTIONS	**2**	**10.7**	**0**	**19.5**
VOC EMISSIONS						
CTS-01	Further VOC Reductions from Architectural Coatings [R1113]	2016	--	2	--	1
CTS-02	Further Emission Reductions from Miscellaneous Coatings, Adhesives, Solvents and Lubricants	Rulemaking Underway	--	1	--	--
CTS-03	Further VOC Reduction from Mold Release Products [R1161]	Rulemaking Underway	--	0.8	--	--
FUG-01	VOC Reductions from Vacuum Trucks [R1188]	Rulemaking Underway	--	TBD	--	--
FUG-02	Emission Reduction from LPG Transfer and Dispensing [R1177]	Rulemaking Underway	--	1	--	--
FUG-03	Emission Reduction from Fugitive VOC Emissions	2016	--	1	--	--
MCS-01	Application of All Feasible Measure Assessment [R1114]	Ongoing	TBD	TBD	0.4	1.4
		TOTAL VOC REDUCTIONS	**0**	**5.8**	**0.4**	**2.4**

TABLE 1-1 (CONCLUDED)

2012 AQMP Emission Reductions (tons per day) by Measure/Adoption Date

Control Measure #	Control Measure Title	Adoption Date	COMMITMENT		ACHIEVED	
			2014	2023	2014	2023
MULTI-POLLUTANT						
IND-01	Backstop Measure for Indirect Sources of Emissions from Ports and Port-Related Facilities [PR4001]	Rulemaking Underway	N/A[13]	N/A	N/A	N/A
MCS-02	Further Emission Reductions from Greenwaste Processing (Chipping and Grinding Operations not associated with composting)	Rulemaking Underway	--	TBD	--	TBD
MCS-03	Improved Start-Up, Shutdown and Turnaround Procedures [R1123]	2014	--	TBD[14]	--	TBD
INC-01	Economic Incentive Programs to Adopt Zero and Near-Zero Technologies	Ongoing	--	--	--	--
INC-02	Expedited Permitting and CEQA Preparation Facilitating the Manufacturing of Zero and Near-Zero Technologies [All Pollutants]	Ongoing	--	--	--	--
EDU-01	Further Criteria Pollutant Reductions from Education, Outreach and Incentives [All Pollutants]	Ongoing	--	--	--	--

[13] Measure is designed to ensure reductions projected to occur are achieved.

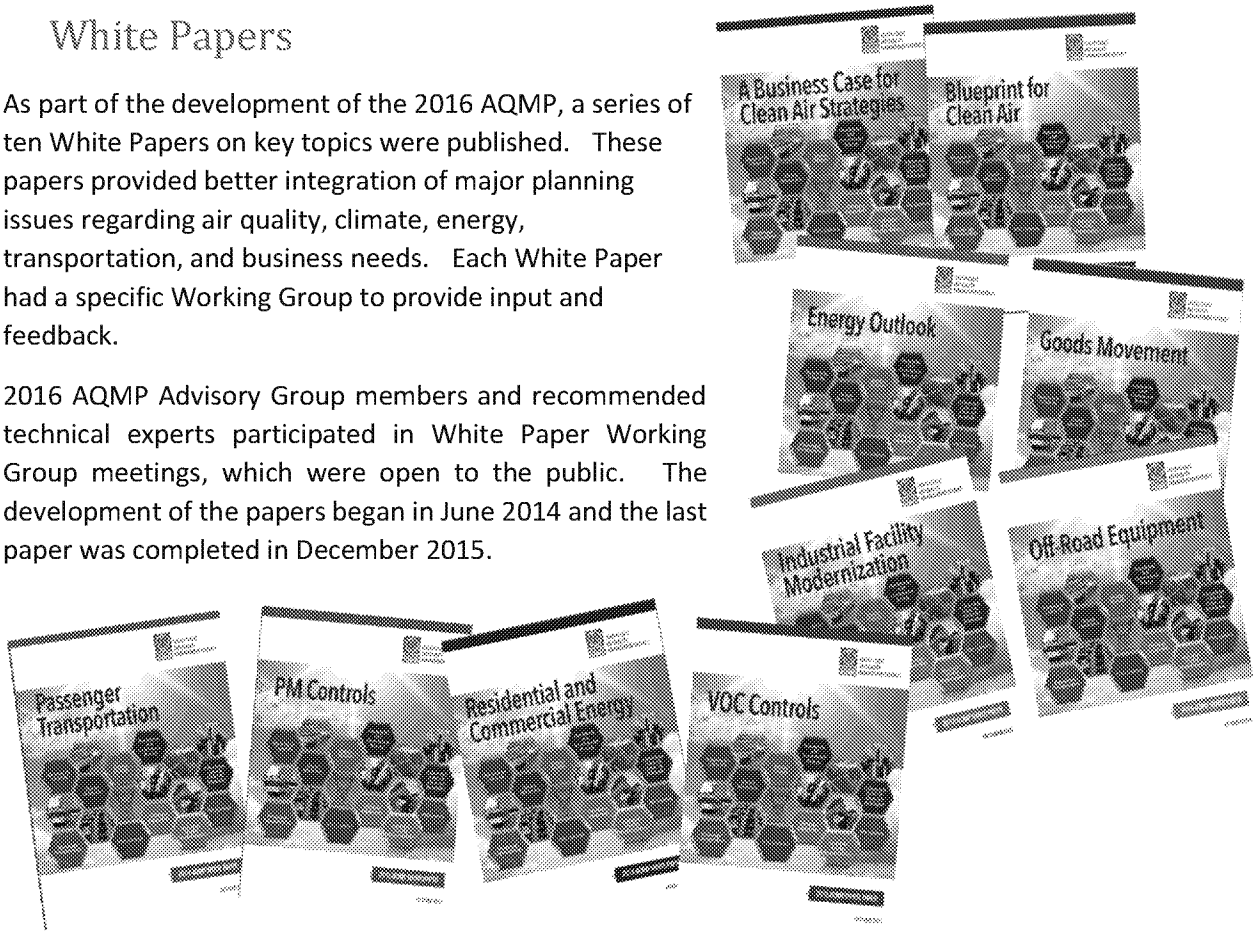
[14] Reductions to be determined once the technical assessment is complete, and inventory and control approach are identified.

2016 AQMP

White Papers

As part of the development of the 2016 AQMP, a series of ten White Papers on key topics were published. These papers provided better integration of major planning issues regarding air quality, climate, energy, transportation, and business needs. Each White Paper had a specific Working Group to provide input and feedback.

2016 AQMP Advisory Group members and recommended technical experts participated in White Paper Working Group meetings, which were open to the public. The development of the papers began in June 2014 and the last paper was completed in December 2015.



All versions of the white papers, including the final versions presented to the SCAQMD Governing Board, are available online at http://www.aqmd.gov/home/about/groups-committees/aqmp-advisory-group/2016-aqmp-white-papers along with working group meeting materials. Each of the White Papers are summarized below.

Blueprint for Clean Air

The Blueprint for the Clean Air White Paper provides background information regarding the 2016 AQMP as well as introductory discussions relevant to the other white papers. The white paper discusses the health benefits of clean air, the standards evaluated in the 2016 AQMP, the additional analysis needed, and what it will take to achieve the standards. In addition, the white paper discusses the general approaches in developing the 2016 AQMP control strategies such as striving to eliminate reliance on the CAA Section 182(e)(5) measures to the extent feasible, fair share reductions at federal, state and local levels, incentivizing zero and near-zero emission technologies, and developing efficient and cost-effective strategies.

Goods Movement

Advanced vehicle technologies will be needed to achieve clean air goals. The Goods Movement White Paper evaluates goods movement sectors such as ships, locomotives, and trucks and analyzes a variety of advanced technologies such as hybrid-electric, advanced natural gas, fuel cells, electric, as well as potential infrastructure needs and commercialization schedules. This white paper also develops scenarios that assume different future mixes of these advanced technologies.

Passenger Transportation

The Passenger Transportation White Paper examines advanced technologies and operational efficiency opportunities, as well as programs that can help accelerate fleet turnover. Advantages that could be gleaned from the implementation of other programs such as SB 375 – *The Sustainable Communities and Climate Protection Act of 2008* are also discussed.

Energy Outlook

The Energy Outlook White Paper evaluates the energy implications due to deployment of various types of advanced technologies. Some of these advanced pollution control technologies for mobile sources will be based on traditional energy sources, while others will rely on alternative energy sources such as electricity or hydrogen. The Energy Outlook White Paper describes the demand and supply of all energy sources for the Basin and explores how that might change under current and future programs to reduce greenhouse gas (GHG) and criteria pollutant emissions. In addition, this white paper evaluates the existing and needed infrastructure for various energy sources. This white paper also evaluates the cost of these energy sources – including the cost to distribute the energy, cost impact to the end user, and infrastructure costs.

Residential and Commercial Energy Use

Reducing, managing, and changing the way energy is used in the commercial and residential sectors can provide emission reductions, reduced energy costs, and cross sector benefits such as reduced water consumption. The Residential and Commercial Energy Use White Paper provides insight and analysis on energy usage, while reviewing resulting emissions within the residential and commercial sectors.

Industrial Facility Modernization

The Industrial Facility Modernization White Paper identifies the hurdles to replace older equipment and mechanisms to incentivize use of clean equipment technologies and the modernization of industrial stationary source equipment.

VOC Controls

The VOC Controls White Paper studies the role VOCs play in the ozone and PM2.5 attainment strategy. The potential contribution of intermediate and semi-volatile organic compounds are also explored. The need for VOC reductions to achieve clean air goals is re-examined, along with the requisite quantity and timing of VOC emission reductions.

PM Controls

The PM Controls White Paper continues to evaluate feasible control technologies for sources of directly emitted PM2.5 as well as precursor emission sources including commercial cooking, fugitive dust, ammonia, and SOx sources. This white paper addresses how modeling results can assist in demonstrating the benefits of targeting both direct and indirect PM2.5 emission sources, including source categories for potential control through traditional approaches as well as through seasonal, episodic or geographically focused controls.

Off-Road Equipment

The Off-Road Equipment White Paper examines advanced technology opportunities as well as programs to accelerate the transition to newer equipment. This category consists of a wide variety of emission sources including construction and mining equipment such as forklifts, cranes, and portable engines. The focus of this white paper is on advanced technologies that go beyond current emission standards and what efforts will be needed to further reduce emissions from these sources.

A Business Case for Clean Air Strategies

A Business Case for Clean Air Strategies White Paper develops principles and concepts for control measures and related programs to be included in the 2016 AQMP that, to the extent possible, create a business case for deployment of needed technologies and efficiency measures towards attaining upcoming federal air quality standards. A business case exists where a technology, fuel, or other strategy reduces emissions and also improves energy efficiency, reduces fuel or maintenance costs, creates new job opportunities, or has other economic benefits. In addition to seeking to minimize potential adverse impacts, this white paper examines how SCAQMD staff, in developing the 2016 AQMP, will explore means to maximize emission control strategies that have a business case for implementation.

Scope

As mentioned earlier in this chapter, this 2016 AQMP is designed to address the federal 2008 8-hour ozone NAAQS, 2012 annual PM2.5 NAAQS and the 2006 24-hour PM2.5 NAAQS, to satisfy the planning requirements of the federal CAA, and to provide an update on the strategy to meet the 1997 8-hour ozone NAAQS and 1979 1-hour ozone NAAQS. Specific federal CAA requirements to be included in the 2016 AQMP are discussed later in this section. Once approved by the SCAQMD Governing Board and CARB, the 2016 AQMP will be submitted to U.S. EPA as the SIP for the Basin.

In addition, the 2016 AQMP includes a chapter reporting on the air quality status of the Riverside County portion of the Salton Sea Air Basin (Coachella Valley) (Chapter 7) and future air quality requirements (Chapter 8). An additional chapter provides the proposed air toxics control program that will reduce toxic risk (Chapter 9) and another examines the interplay between air quality and other planning efforts addressing climate change, energy and transportation (Chapter 10).

Approach

As demonstrated in Chapter 5, with the existing control program and the new control strategy in the 2016 AQMP, the Basin can attain the 2008 8-hour ozone NAAQS by 2031, the 2012 annual PM2.5 NAAQS by

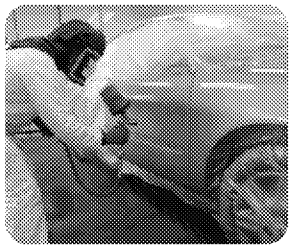
2025, and the 2006 24-hour PM2.5 NAAQS by 2019, as well as the now revoked 1-hour and 8-hour standards. Under the federal CAA, the Basin must achieve the federal NAAQS "as expeditiously as practicable." Therefore, if feasible measures are available, they must be adopted and implemented in the SIP. Chapter 4 of the 2016 AQMP outlines a comprehensive control strategy that meets the requirement for expeditious progress towards an attainment date for the five NAAQS being analyzed. A provision of the federal CAA, Section 182(e)(5), allows "extreme" ozone nonattainment areas to take credit for emission reductions from future improvements and breakthroughs in control techniques and technologies (known as the "black box"). As shown in the ozone strategy in Chapter 4, "black box" emission reductions strategies are now fully defined in terms of technology, but rely heavily on incentives to successfully achieve the emission reductions needed to reach attainment with the 8-hour ozone NAAQS. Given the magnitude of these needed emission reductions, it is critical that the SCAQMD maintain its continuing progress and work actively towards defining and achieving as many emission reductions as possible, and not wait until subsequent AQMPs to begin to address this looming shortfall.

With regard to the PM2.5 standards, only a few air monitoring stations currently exceed, and only one is projected to exceed the NAAQS. Further controls for PM2.5 are included to ensure attainment with the PM2.5 standards.

The control measures contained in the 2016 AQMP can be categorized as follows:

Ozone Measures. These measures provide for necessary actions to attain the 2008 8-hour ozone NAAQS in 2031, including incentive-based measures, co-benefits from other programs such as climate change mitigation and energy efficiency, NOx and VOC regulatory measures, technology assessments, and key investments. In addition, the accelerated measures allow for attainment of the 1997 8-hour ozone NAAQS in 2023 and the 1-hour ozone NAAQS in 2022. Ozone measures include actions to reduce NOx and VOC emissions from both stationary (point and area) and mobile sources. The mobile source measures include actions to be taken by the SCAQMD, CARB and the U.S. EPA.

PM2.5 Measures. These measures serve to reduce emissions locally and regionally in order to ensure attainment of the annual PM2.5 NAAQS. The 24-hour PM2.5 NAAQS is anticipated to be met without further controls. PM measures can be implemented as contingency measures, given that attainment of the annual PM2.5 NAAQS will be achieved through implementation of NOx reductions included in the ozone strategy.



Contingency Measures. These measures are to be automatically implemented if the Basin fails to achieve the PM2.5 standards by the latest statutory attainment date or Reasonable Further Progress requirements. Reductions achieved through adopted rules that reduce ambient levels below the NAAQS provide an alternative method to comply with contingency measure requirements.

Transportation Control Measures. These measures are generally designed to reduce vehicle miles traveled (VMT) as included in SCAG's 2016 Regional Transportation Plan.

Some of the control measures achieve emission reductions by taking advantage of existing programs, while some control measures focus on incentives, outreach, and education to bring about emission reductions through voluntary participation and behavioral changes needed to complement regulations.

Need for Integrated and Coordinated Planning

The Basin faces several ozone and PM2.5 attainment challenges, as strategies for significant emission reductions become harder to identify and the federal standards continue to become more stringent. California's greenhouse gas reduction targets under AB 32 add new challenges and timelines that affect many of the same sources that emit criteria pollutants. In finding the most cost-effective and efficient path to meet multiple deadlines for multiple air quality and climate objectives, an integrated planning approach is optimal. Responsibilities for achieving these goals span all levels of government, and coordinated and consistent planning efforts among multiple government agencies are a key component of this integrated approach.

Federal CAA Planning Requirements Addressed by 2016 AQMP

In November 1990, Congress enacted a series of amendments to the Clean Air Act (CAA), intended to intensify air pollution control efforts across the nation. One of the primary goals of the 1990 CAA Amendments was an overhaul of the planning provisions for those areas not currently meeting NAAQS. The CAA identifies specific emission reduction goals, requires both a demonstration of reasonable further progress and an attainment demonstration, and incorporates more stringent sanctions for failure to attain or to meet interim milestones.

There are several sets of general planning requirements in the federal CAA, both for nonattainment areas (Section 172(c)) and for implementation plans in general (Section 110(a)(2)). These requirements are listed and briefly described in Tables 1-2 and 1-3, respectively. The general provisions apply to all applicable pollutants unless superseded by pollutant-specific requirements. Chapter 6 and Appendix 6 describe the pollutant-specific CAA requirements and how these requirements are satisfied by the 2016 AQMP.

TABLE 1-2

Nonattainment Plan Provisions [CAA Section 172(c)]

REQUIREMENT	DESCRIPTION
Reasonably available control measures	Implementation of all reasonably available control measures as expeditiously as practicable [Section 172(c)(1)]
Reasonable further progress	Provision for reasonable further progress, which is defined as "such annual incremental reductions in emissions of the relevant air pollutant as are required for the purpose of ensuring attainment of the applicable national ambient air quality standard by the applicable date" [Section 172(c)(2)]
Inventory	Development and periodic revision of a comprehensive, accurate, current inventory of actual emissions from all sources [Section 172(c)(3)]
Allowable emission levels	Identification and quantification of allowable emission levels for major new or modified stationary sources [Section 172(c)(4)]
Permits for new and modified stationary sources	Permit requirements for the construction and operation of new or modified major stationary sources [Section 172(c)(5)]
Other measures	Inclusion of all enforceable emission limitations and control measures as may be necessary to attain the standard by the applicable attainment deadline [Section 172(c)(6)]
Contingency measures	Implementation of contingency measures to be undertaken in the event of failure to make reasonable further progress or to attain the NAAQS [Section 172(c)(9)]

TABLE 1-3

General CAA Requirements for Implementation Plans [CAA Section 110(a)]

REQUIREMENT	DESCRIPTION
Enforceable emission limitations	Enforceable emission limitations or other control measures as needed to meet the requirements of the CAA [Section 110(a)(2)(A)]
Ambient monitoring	An ambient air quality monitoring program [Section 110(a)(2)(B)]
Enforcement and regulation	A program for the enforcement of adopted control measures and emission limitations and regulation of the modification and construction of any stationary source to assure that the NAAQS are achieved [Section 110(a)(2)(C)]
Interstate transport	Adequate provisions to inhibit emissions that will contribute to nonattainment or interfere with maintenance of NAAQS or interfere with measures required to prevent significant deterioration of air quality or to protect visibility in any other state [Section 110(a)(2)(D)]
Adequate resources	Assurances that adequate personnel, funding, and authority are available to carry out the plan [Section 110(a)(2)(E)]
Source testing and monitoring	Requirements for emission monitoring and reporting by the source operators [Section 110(a)(2)(F)]
Emergency authority	Ability to bring suit to enforce against source presenting imminent and substantial endangerment to public health or environment [Section 110(a)(2)(G)]
Plan revisions	Provisions for revising the air quality plan to incorporate changes in the standards or in the availability of improved control methods [Section 110(a)(2)(H)]
Other CAA requirements	Adequate provisions to meet applicable requirements relating to new source review, consultation, notification, and prevention of significant deterioration and visibility protection contained in other sections of the CAA [Section 110(a)(2)(I),(J)]
Impact assessment	Appropriate air quality modeling to predict the effect of new source emissions on ambient air quality [Section 110(a)(2)(K)]
Permit fees	Provisions requiring major stationary sources to pay fees to cover reasonable costs for reviewing and acting on permit applications and for implementing and enforcing the permit conditions [Section 110(a)(2)(L)]
Local government participation	Provisions for consultation and participation by local political subdivisions affected by the plan [Sections 110(a)(2)(M) & 121]

The CAA requires that submitted plans include information on tracking plan implementation and milestone compliance. Requirements for these elements are described in CAA Section 182(g), and Chapter 4 addresses these issues.

The U.S. EPA also requires a public hearing on many of the required elements in SIP submittals before considering them officially submitted. The SCAQMD's AQMP public process includes multiple public workshops and public hearings on all of the required elements prior to submittal. Chapter 11 describes the public process, participation and comprehensive outreach program for the 2016 AQMP.

State Law Requirements Addressed by the 2016 AQMP

The California Clean Air Act (CCAA) (*Health & Safety Code §§ 40910 et seq.*) was signed into law on September 30, 1988, became effective on January 1, 1989, and was amended in 1992. Also known as the Sher Bill (AB 2595), the CCAA established a legal mandate to achieve health-based State air quality standards at the earliest practicable date. The Lewis Presley Act provides that the District's plan must also contain deadlines for compliance with all State ambient air quality standards and the federally mandated primary ambient air quality standards (Health and Safety Code (H&SC) 40462(a)). Chapter 6 describes how the 2016 AQMP meets the State planning requirements under the CCAA, including plan effectiveness, emission reductions of 5 percent per year or adoption of all feasible measures, reducing population exposure to criteria pollutants, and ranking control measures by cost-effectiveness.

Format of This Document

This document is organized into eleven chapters, each addressing a specific topic. Each of the chapters is summarized below.

Chapter 1, "Introduction," introduces the 2016 AQMP including purpose, historical air quality progress, and the approach for the 2016 AQMP.

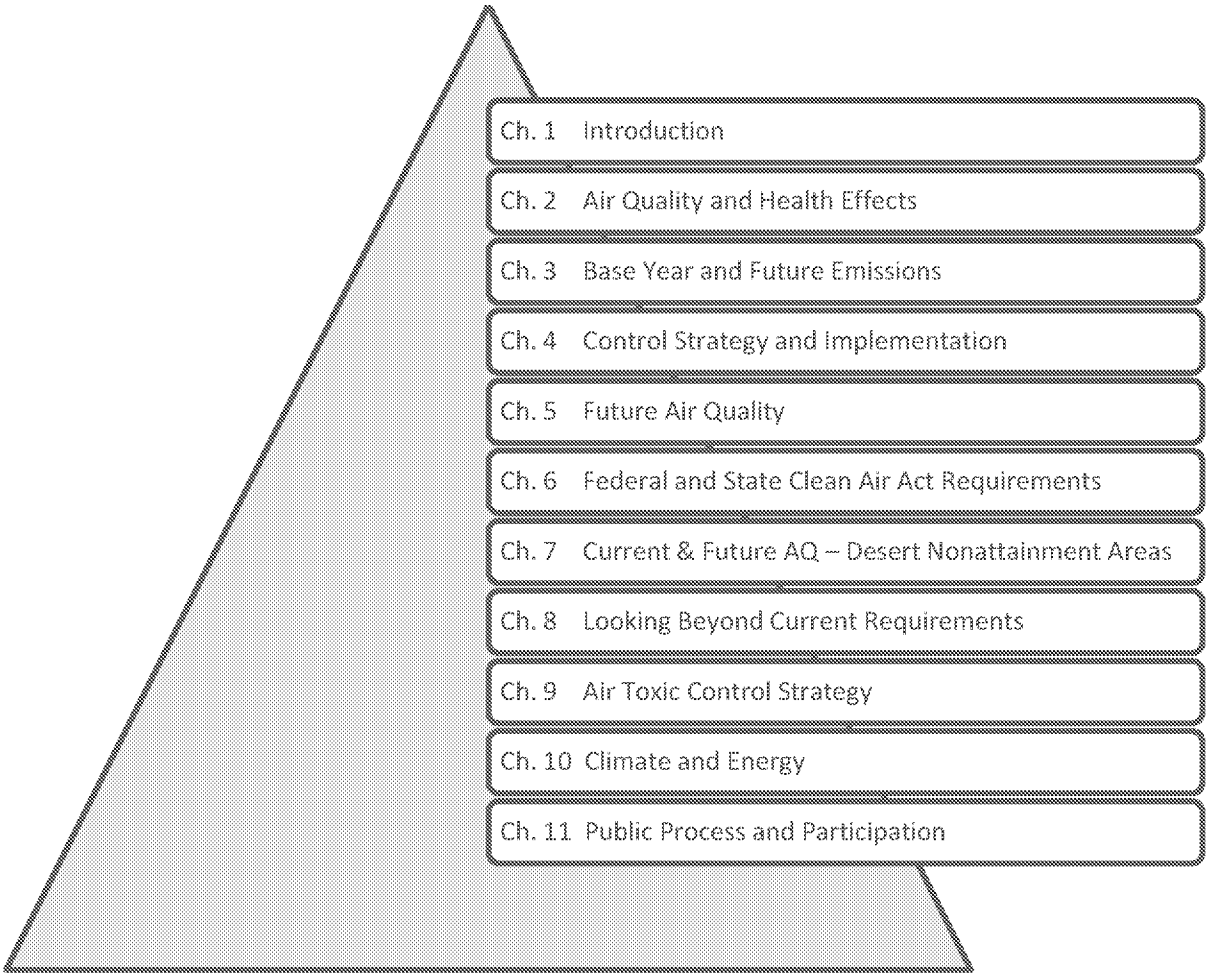
Chapter 2, "Air Quality and Health Effects," discusses the Basin's current air quality in comparison with federal and State health-based air pollution standards.

Chapter 3, "Base Year and Future Emissions," summarizes emissions inventories, estimates current emissions by source and pollutant, and projects future emissions with and without growth.

Chapter 4, "Control Strategy and Implementation," presents the control strategy, specific measures, and implementation schedules to attain the air quality standards by the specified attainment dates.

Chapter 5, "Future Air Quality," describes the modeling approach used in the AQMP and summarizes the Basin's future air quality projections with and without the control strategy.

Chapter 6, "Federal and State Clean Air Act Requirements," discusses specific federal and State requirements as they pertain to the 2016 AQMP, including anti-backsliding requirements for revoked standards.



Chapter 7, "Current and Future Air Quality – Desert Nonattainment Areas," describes the air quality status of the Coachella Valley, including emissions inventories, designations, and current and future air quality.

Chapter 8, "Looking Beyond Current Requirements," assesses the Basin's status with respect to the 2015 lowering of the 8-hour ozone standard from 75 ppb to 70 ppb.

Chapter 9, "Air Toxic Control Strategy," examines the ongoing efforts to reduce health risk from toxic air contaminants, co-benefits from reducing criteria pollutants, and potential future actions.

Chapter 10, "Climate and Energy," provides a description of current and projected energy demand and supply issues in the Basin, and the relationship between air quality improvement and greenhouse gas mitigation goals.

Chapter 11, "Public Process and Participation," describes the District's public outreach effort associated with the development of the 2016 AQMP.

A "Glossary" is provided at the end of the document, presenting definitions of commonly used terms found in the 2016 AQMP.

Numerous technical appendices are included and are listed below:

Appendix I (Health Effects) presents a summary of scientific findings on the health effects of ambient air pollutants, portions of which satisfy the requirements of California Health and Safety Code Section 40471(b).

Appendix II (Current Air Quality) contains a detailed summary of the air quality in 2014, along with prior year trends, in both the Basin and the Coachella Valley, as monitored by the SCAQMD.

Appendix III (Base and Future Year Emission Inventory) presents the 2012 base year emissions inventory and projected emission inventories of air pollutants in future attainment years for both annual average and summer planning inventories.

Appendix IV-A (SCAQMD's Stationary and Mobile Source Control Measures) describes SCAQMD staff's proposed stationary and mobile source control measures to attain the federal ozone and PM2.5 standards.

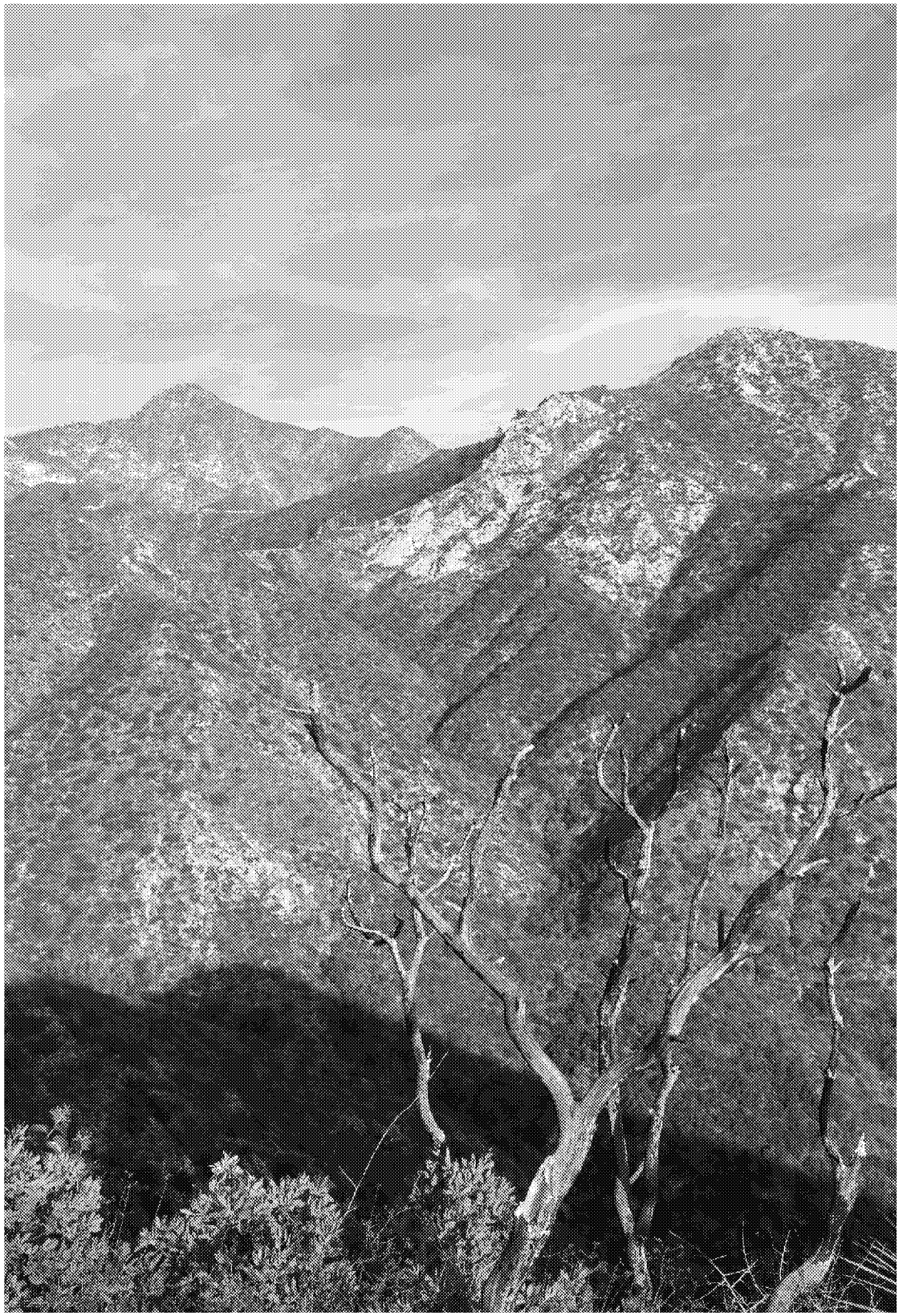
Appendix IV-B (CARB's Mobile Source Strategy) describes CARB staff's proposed 2016 strategy to attain health-based federal air quality standards as part of the SIP.

Appendix IV-C (SCAG's Regional Transportation Strategy and Control Measures) describes the SCAG's Final 2016–2040 Regional Transportation Plan/Sustainable Communities Strategy and Transportation Control Measures to be included in the 2016 AQMP for the Basin.

Appendix V (Modeling and Attainment Demonstrations) provides the details of the regional modeling for the attainment demonstrations that illustrate that the proposed emission reductions will achieve the federal air quality standards by the regulatory attainment deadlines.

Appendix VI (Compliance with Other Clean Air Act Requirements) provides the details demonstrating that the 2016 AQMP complies with specific the federal and California Clean Air Act requirements.

Chapter 2
Air Quality and Health Effects



The air pollution problem in the Basin is the result of a combination of emissions, meteorological conditions and the mountainous terrain surrounding the region. High air pollution levels can have an adverse effect on public health and result in not meeting federal and State air quality standards.

In This Chapter

Introduction

The South Coast Air Basin's air pollution problems are a consequence of the combination of emissions from the nation's second largest urban area, meteorological conditions adverse to the dispersion of those emissions, and mountainous terrain surrounding the Basin that traps pollutants as they are pushed inland with the sea breeze. The average wind speed for Los Angeles is the lowest of the nation's 10 largest urban areas. In addition, the summertime daily maximum mixing heights[1] in Southern California are the lowest, on average, due to strong temperature inversions in the lower atmosphere that effectively trap pollutants near the surface. Southern California also has abundant sunshine, which drives the photochemical reactions that form pollutants such as ozone (O_3) and a significant portion of fine particulate mass (PM2.5, particles less than 2.5 microns in diameter).

In the Basin, high concentrations of ozone are normally recorded during the late spring and summer months, when more intense sunlight drives enhanced photochemical reactions. Elevated PM10 (particles less than 10 microns in diameter) and PM2.5 concentrations can occur in the Basin throughout the year, but occur most frequently in fall and winter. Although there are some changes in emissions by day-of-week and season, the observed variations in pollutant concentrations are primarily the result of seasonal differences in weather conditions.

Chapter 1 introduces the National Ambient Air Quality Standards (NAAQS or federal standards), as well as the District's attainment status and progress toward meeting those standards. U.S. EPA has set NAAQS for six principal pollutants, which are called "criteria" pollutants, including ozone, PM (PM10 and PM2.5), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), and lead (Pb).

In this chapter, ambient air quality as monitored by SCAQMD is summarized for the year 2015, along with prior year trends, in both the Basin and the Riverside County portion of the Salton Sea Air Basin (SSAB), which is primarily the Coachella Valley. The District's recent air quality is compared to the NAAQS and to the California Ambient Air Quality Standards (CAAQS or State standards). Data presented indicate the current attainment or nonattainment status for the various NAAQS and CAAQS, showing the progress made to date and assisting the District in planning for future attainment. Maps are included to spatially compare the air quality throughout the Basin in 2015, for ozone and PM2.5, the main pollutants for which the U.S. EPA has designated the Basin to be a federal nonattainment area. Nationwide air quality data is also briefly summarized in this chapter, comparing air quality in the Basin to that of other major U.S. and California urban areas. Additional details on current air quality and trends and comparisons to the federal and State standards, including spatial and temporal variability and location-specific air monitoring data can be found in Appendix II: Current Air Quality.

The health effects due to exposure to criteria air pollutants are briefly discussed in this chapter. More detailed information on the health effects of air pollution can be found in Appendix I: Health Effects. In addition to the information presented in this chapter for the Coachella Valley, current air quality and trend

[1] The maximum mixing height is an index of how well pollutants can be dispersed vertically in the atmosphere.

information specific to that planning area is also included in Chapter 7, along with the ozone attainment demonstration SIP for that area.

The Basin is designated non-attainment for current and former federal and State ozone standards, as well as the current PM2.5 standards. The Los Angeles County portion of the Basin is also designated a nonattainment area for the federal lead standard on the basis of source-specific monitoring at two locations as determined by U.S. EPA using 2007–2009 data. However, all stations in the Basin, including the near-source monitoring in Los Angeles County, have remained below the lead NAAQS for the 2012 through 2015 period. The District will request that U.S. EPA re-designate the Los Angeles County portion of the Basin as attainment for lead.

In June 2013, the U.S. EPA approved re-designation of the Basin as an attainment area for the 24-hour PM10 federal standard. The Basin also continues to be in attainment of the CO, NO_2, and SO_2 NAAQS. The Coachella Valley remains a nonattainment area for both the ozone and the PM10 NAAQS. However, with recent data from a new monitoring station and consideration of high-wind exceptional events, a re-designation to attainment of the PM10 NAAQS should be possible in the near future. Further details on the federal and State standards are presented in this chapter by pollutant, along with the District's current attainment status.

Ambient Air Quality Standards

Federal and State Standards

Ambient air quality standards have been set by both the federal government and the State of California for six air pollutants: Ozone, CO, NO_2, SO_2, PM (includes both PM10 and PM2.5), and lead. The State has also set a standard for sulfates (SO_4^{2-}), which are a component of particulate matter, and a nuisance odor standard for hydrogen sulfide (H_2S). The NAAQS and CAAQS for each of these pollutants and their effects on health and welfare are summarized in Table 2-1.

Two changes to the NAAQS have occurred since the 2012 AQMP. In a final rulemaking action on January 15, 2013, effective March 18, 2014, U.S. EPA strengthened the annual average PM2.5 standard from 15 to 12 $\mu g/m^3$. This rule also required near-roadway PM2.5 monitoring at two locations in the Basin, which was implemented by the January 1, 2015 U.S. EPA deadline. Since this NAAQS rule was proposed in 2012, it is often referred to as the 2012 annual PM2.5 federal standard.

Most recently, on October 1, 2015, U.S. EPA finalized the new 2015 ozone standard at 0.070 ppm for an 8-hour average, retaining the same form as the previous 8-hour standards. The 2015 ozone NAAQS became effective as of December 28, 2015. Attainment/nonattainment designations are expected to be finalized for the new standard by October 1, 2017, likely based on 2014–2016 ozone measurement data. It is expected that the Basin and the Coachella Valley, as well as much of California, will be designated nonattainment. SIP submittals to demonstrate attainment of the 2015 ozone standard will likely be due in the 2020–2021 time frame, with attainment dates between 2020 and 2037, depending on the severity of the ozone problem.

In this chapter and in Appendix II: Current Air Quality, air quality statistics are presented for the maximum concentrations measured at stations in each of the SCAQMD air basins, as well as for the number of days

exceeding State or federal standards. These metrics are instructive with regard to trends and control strategy effectiveness. However, it should be noted that an exceedance of the concentration level of a federal standard does not necessarily mean that the NAAQS was violated or that it would cause nonattainment. The form of the standard must also be considered. For example, for 24-hour PM2.5, the form of the standard is the annual 98th percentile measurement of all of the 24-hour PM2.5 daily samples at each station. For 8-hour ozone, the form of the standard is the annual fourth highest measured 8-hour average daily maximum concentration at each station.

For NAAQS attainment/nonattainment decisions, the most recent three years of data are considered (one year for CO and 24-hour SO_2), along with the form of the standard, to calculate a *design value* for each station.[2] The overall design value for an air basin is the highest design value of all the stations in that basin. Table 2-2 shows the NAAQS, along with the design value and form of each federal standard. The California State air quality standards are values not to be exceeded, typically evaluated over a 3-year period, and the data is evaluated in terms of a *State designation value*, which allows for some statistical data outliers and exceptional events. Attainment deadlines for the State standards are 'as soon as practicable.'

[2] Note that for modeling attainment demonstrations, the U.S. EPA modeling guidance requires a 5-year weighted average for the design value instead of the 3-year.

TABLE 2-1

Ambient Air Quality Standards and Key Health and Welfare Effects

AIR POLLUTANT	FEDERAL STANDARD (NAAQS)	STATE STANDARD (CAAQS)	KEY HEALTH & WELFARE EFFECTS[#]
	Concentration, Averaging Time, Year of NAAQS Review	Concentration, Averaging Time	
Ozone (O_3)	**0.070 ppm, 8-Hour (2015)** 0.075 ppm, 8-Hour (2008) 0.08 ppm, 8-Hour (1997) 0.12 ppm, 1-Hour (1979)	**0.070 ppm, 8-Hour** **0.09 ppm, 1-Hour**	(a) Pulmonary function decrements and localized lung injury in humans and animals; (b) Risk to public health implied by alterations in pulmonary morphology and host defense in animals; (c) Increased mortality risk; (d) Increased respiratory related hospital admissions and emergency room visits; (e) Vegetation damage; (f) Property damage
Fine Particulate Matter (PM2.5)	**35 µg/m³, 24-Hour (2006)** **12.0 µg/m³, Annual (2012)** 15.0 µg/m³, Annual (1997)	**12 µg/m³, Annual**	(a) Exacerbation of symptoms in sensitive patients with respiratory or cardiovascular disease; (b) Decline in pulmonary function or growth in children; (c) Increased risk of premature death; (d) Increased risk of lung cancer; (e) increased asthma-related hospital admissions; (f) increased school absences and lost work days; (g) possible link to reproductive effects; (h) visibility reduction
Respirable Particulate Matter (PM10)	**150 µg/m³, 24-Hour (1997)**	**50 µg/m³, 24-Hour** **20 µg/m³, Annual**	
Carbon Monoxide (CO)	**35 ppm, 1-Hour (1971)** **9 ppm, 8-Hour (1971)**	**20 ppm, 1-Hour** **9.0 ppm, 8-Hour**	(a) Aggravation of angina pectoris and other aspects of coronary heart disease; (b) Decreased exercise tolerance in persons with peripheral vascular disease and lung disease; (c) Possible impairment of central nervous system functions; (d) Possible increased risk to fetuses
Nitrogen Dioxide (NO_2)	**100 ppb, 1-Hour (2010)** **0.053 ppm, Annual (1971)**	**0.18 ppm, 1-Hour** **0.030 ppm, Annual**	(a) Potential to aggravate chronic respiratory disease and respiratory symptoms in children with asthma; (b) Increased airway responsiveness in asthmatics; (c) Contribution to atmospheric discoloration
Sulfur Dioxide (SO_2)	**75 ppb, 1-Hour (2010)**	**0.25 ppm, 1-Hour** **0.04 ppm, 24-Hour**	Respiratory symptoms (bronchoconstriction, possible wheezing or shortness of breath) during exercise or physical activity in persons with asthma
Lead (Pb)	**0.15 µg/m³, rolling 3-month average (2008)**	**1.5 µg/m³, 30-day average**	(a) Learning disabilities; (b) Impairment of blood formation and nerve conduction; (c) cardiovascular effects, including coronary heart disease and hypertension
Sulfates-PM10 (SO_4^{2-})	**N/A**	**25 µg/m³, 24-Hour**	(a) Decrease in lung function; (b) Aggravation of asthmatic symptoms; (c) Vegetation damage; (d) Degradation of visibility; (e) Property damage
Hydrogen Sulfide (H_2S)	**N/A**	**0.03 ppm, 1-hour**	Exposure to lower ambient concentrations above the standard may result in objectionable odor and may be accompanied by symptoms such as headaches, nausea, dizziness, nasal irritation, cough, and shortness of breath

ppm – parts per million by volume; ppb – parts per billion by volume (0.01 ppm = 10 ppb)

Standards in bold are the current, most stringent standards; there may be continuing obligations for former standards

State standards are "not-to-exceed" values based on State designation value calculations

Federal standards follow the 3-year design value form of the NAAQS

[#] List of health and welfare effects is not comprehensive; detailed health effects information can be found in Appendix I: Health Effects or in the U.S. EPA NAAQS documentation at http://www.epa.gov/ttn/naaqs/

TABLE 2-2

National Ambient Air Quality Standards (NAAQS) and Design Value Requirements

Pollutant	Averaging Time**	NAAQS Level	Design Value Form of NAAQS*
Ozone (O_3)	1-Hour (1979) [revoked 2005]	0.12 ppm	Not to be exceeded more than once per year averaged over 3 years
	8-Hour (2015)	**0.070 ppm**	**Annual fourth highest 8-hour average concentration, averaged over 3 years**
	8-Hour(2008) [revised 2015]	0.075 ppm	
	8-Hour(1997) [revoked 2015]	0.08 ppm	
Fine Particulate Matter (PM2.5)	**24-Hour (2006)**	**35 µg/m³**	**3-year average of the annual 98th percentile of daily 24-hour concentration**
	Annual (2012)	**12.0 µg/m³**	**Annual average concentration, averaged over 3 years** *(annual averages based on average of 4 quarters)*
	Annual (1997) [revised 2012]	15.0 µg/m³	
Respirable Particulate Matter (PM10)	**24-Hour (1987)**	**150 µg/m³**	**Not to be exceeded more than once per year averaged over 3 years**
	Annual (1987) [revoked 2006]	50 µg/m³	Annual average concentration, averaged over 3 years
Carbon Monoxide (CO)	**1-Hour (1971)**	**35 ppm**	**Not to be exceeded more than once a year**
	8-Hour (1971)	**9 ppm**	
Nitrogen Dioxide (NO_2)	**1-Hour (2010)**	**100 ppb**	**3-year avg. of the annual 98th percentile of the daily maximum 1-hour average concentrations (rounded)**
	Annual (1971)	**0.053 ppm**	**Annual avg. concentration, averaged over 3 years**
Sulfur Dioxide (SO_2)	**1-Hour (2010)**	**75 ppb**	**99th percentile of 1-hour daily maximum concentrations, averaged over 3 years**
	24-Hour (1971)#	0.14 ppm	Not to be exceeded more than once per year
	Annual (1971)#	0.03 ppm	Annual arithmetic average
Lead (Pb)	**3-Month Rolling Average (2008)##**	**0.15 µg/m³**	**Highest rolling 3-month average of the 3 years**

Bold text denotes the current and most stringent NAAQS

* The NAAQS is attained when the design value (form of concentration listed) is equal to or less than the level of the NAAQS; for pollutants with the design values based on "exceedances" (1-hour ozone, 24-hour PM10, CO, and 24-hour SO_2), the NAAQS is attained when the concentration associated with the design value is less than or equal to the standard level:

- For 1-hour ozone and 24-hour PM10, the NAAQS is attained when the fourth highest daily concentrations of the 3-year period is less than or equal to the standard level
- For CO and 24-hour SO_2, the standard is attained when the second highest daily concentration of the most recent year is equal to or less than the standard level

** Year of U.S. EPA NAAQS update review shown in parenthesis and revoked or revised status in brackets; for revoked or revised NAAQS, areas may have continuing obligations until that standard is attained: for 1-hour ozone, the Basin has continuing obligations under the former 1979 standard; for 8-hour ozone, the NAAQS was lowered from 0.08 ppm to 0.075 ppm to 0.070 ppm, but the previous 8-hour ozone NAAQS and most related implementation rules remain in place until that standard is attained

\# Annual and 24-hour SO_2 NAAQS are expected to be revoked 12/2021, one year from final attainment designations for the (2010) 1-hour SO_2 NAAQS expected 12/2020

\## 3-month rolling averages of the first year (of the three year period) include November and December monthly averages of the prior year; the 3-month average is based on the average of "monthly" averages

Under the Exceptional Events Rule,[3] U.S. EPA allows certain air quality data to not be considered for NAAQS attainment status when that data is influenced by exceptional events that meet strict evidence requirements, such as high winds, wildfires, volcanoes, or some cultural events (such as Independence Day or New Year's fireworks). For a few PM measurements in the Basin and the Coachella Valley in 2012 through 2015, the District applied the U.S. EPA Exceptional Events Rule to flag some PM10 and PM2.5 data due to high-wind natural events, wildfires, and fireworks on Independence Day and New Year's Eve. All of the exceptional event flags through 2015 have been submitted with the affected data to U.S. EPA's Air Quality System (AQS) database. The preparation of the District's documentation for those events that effect regulatory decisions is under way and U.S. EPA concurrence will be requested. The process to achieve PM10 re-designation for the Coachella Valley to attainment status will likely depend upon U.S EPA's concurrence with the exceptional event flags and the appropriate treatment of high-wind natural events that are uncontrollable in spite of stringent control measures on anthropogenic emissions.

Attainment Status

Figure 2-1 shows the South Coast and Coachella Valley 3-year design values (2013–2015) for ozone, PM2.5, and PM10, as a percentage of the corresponding current and former federal standards. The current status of NAAQS attainment for all the criteria pollutants is presented in Table 2-3 for the Basin and in Table 2-4 for the Riverside County portion of the SSAB (Coachella Valley).

[3] The U.S. EPA Exceptional Events Rule, *Treatment of Data Influenced by Exceptional Events*, became effective May 21, 2007. The previous U.S. EPA *Natural Events Policy* for Particulate Matter was issued May 30, 1996. On September 16, 2016, U.S. EPA promulgated revisions to the Exceptional Event Rule.

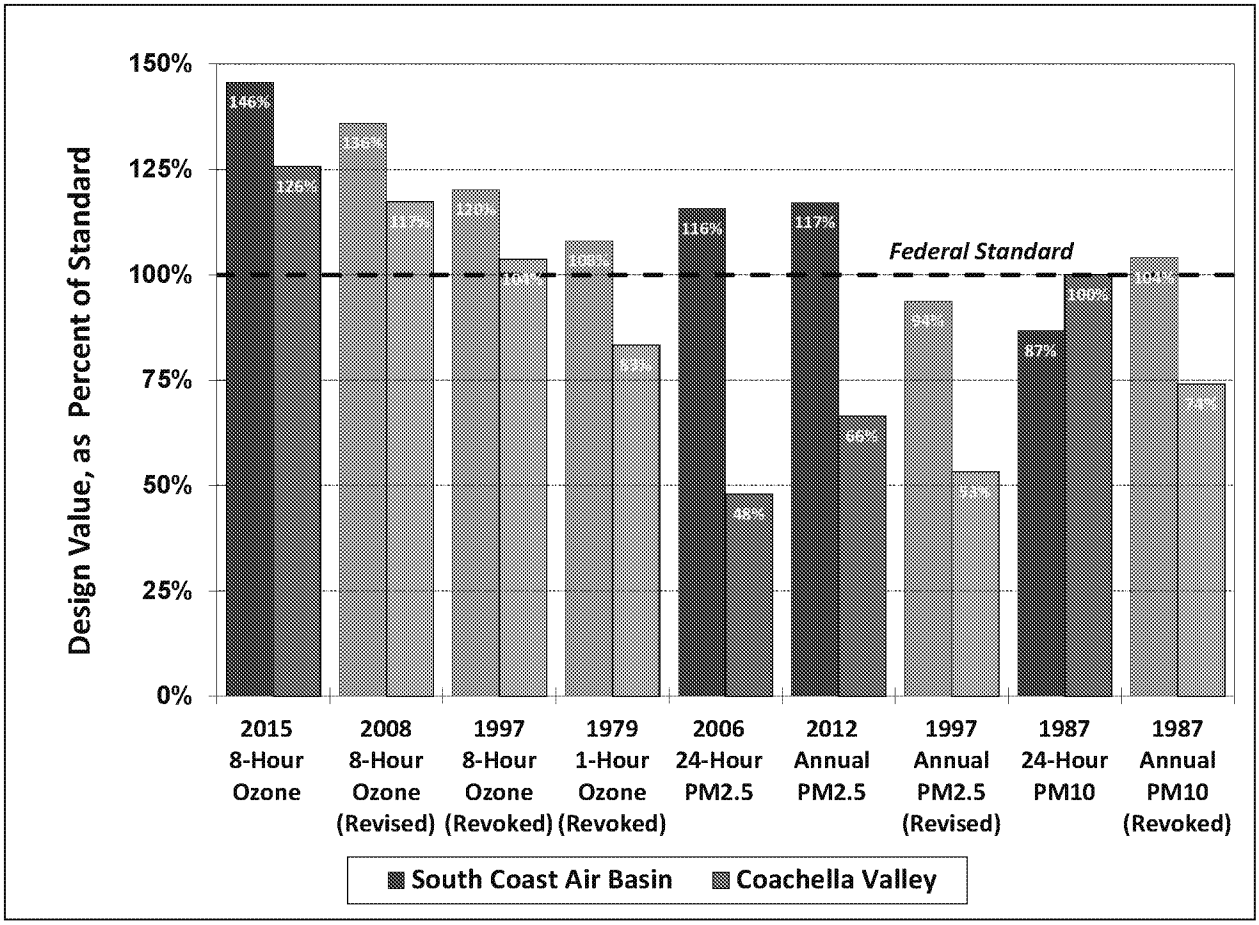


FIGURE 2-1

SOUTH COAST AIR BASIN AND COACHELLA VALLEY 2013–2015 3-YEAR DESIGN VALUES

(PERCENTAGE OF CURRENT AND FORMER FEDERAL STANDARDS, BY CRITERIA POLLUTANT; PM10 DATA FLAGGED FOR EXCEPTIONAL EVENTS EXCLUDED BUT SUPPORTING DOCUMENTATION AND U.S. EPA CONCURRENCE STILL NEEDED; PM10 DATA SHOWN USES COMBINED FEDERAL REFERENCE METHOD AND FEDERAL EQUIVALENT DATA; DARKER COLORS INDICATE THE MOST STRINGENT STANDARD)

TABLE 2-3

National Ambient Air Quality Standards (NAAQS) Attainment Status - South Coast Air Basin

Criteria Pollutant	Averaging Time	Designation[a]	Attainment Date[b]
Ozone (O_3)	(1979) **1-Hour** (0.12 ppm)[c]	Nonattainment ("extreme")	2/26/2023 (revised deadline)
	(2015) **8-Hour** (0.070 ppm)[d]	Pending – Expect Nonattainment ("extreme")	Pending (beyond 2032)
	(2008) **8-Hour** (0.075 ppm)[d]	Nonattainment ("extreme")	7/20/2032
	(1997) **8-Hour** (0.08 ppm)[d]	Nonattainment ("extreme")	6/15/2024
PM2.5[e]	(2006) **24-Hour** (35 μg/m³)	Nonattainment ("serious")	12/31/2019
	(2012) **Annual** (12.0 μg/m³)	Nonattainment ("moderate")	12/31/2021
	(1997) **Annual** (15.0 μg/m³)	Attainment (final determination pending)	4/5/2015 (attained 2013)
PM10[f]	(1987) **24-hour** (150 μg/m³)	Attainment (Maintenance)	7/26/2013 (attained)
Lead (Pb)[g]	(2008) **3-Months Rolling** (0.15 μg/m³)	Nonattainment (Partial) (Attainment determination to be requested)	12/31/2015
CO	(1971) **1-Hour** (35 ppm)	Attainment (Maintenance)	6/11/2007 (attained)
	(1971) **8-Hour** (9 ppm)	Attainment (Maintenance)	6/11/2007 (attained)
NO_2[h]	(2010) **1-Hour** (100 ppb)	Unclassifiable/Attainment	N/A (attained)
	(1971) **Annual** (0.053 ppm)	Attainment (Maintenance)	9/22/1998 (attained)
SO_2[i]	(2010) **1-Hour** (75 ppb)	Designations Pending (expect Unclassifiable/Attainment)	N/A (attained)
	(1971) **24-Hour** (0.14 ppm) (1971) **Annual** (0.03 ppm)	Unclassifiable/Attainment	3/19/1979 (attained)

a) U.S. EPA often only declares Nonattainment areas; everywhere else is listed as Unclassifiable/Attainment or Unclassifiable

b) A design value below the NAAQS for data through the full year or smog season prior to the attainment date is typically required for an attainment demonstration

c) The 1979 1-hour ozone NAAQS (0.12 ppm) was revoked, effective 6/15/05 ; however, the Basin has not attained this standard and therefore has some continuing obligations with respect to the revoked standard; original attainment date was 11/15/2010; the revised attainment date is 2/6/23

d) The 2008 8-hour ozone NAAQS (0.075 ppm) was revised to 0.070 ppm, effective 12/28/15 with classifications and implementation goals to be finalized by 10/1/17; the 1997 8-hour ozone NAAQS (0.08 ppm) was revoked in the 2008 ozone NAAQS implementation rule, effective 4/6/15; there are continuing obligations under the revoked 1997 and revised 2008 ozone NAAQS until they are attained

e) The attainment deadline for the 2006 24-hour PM2.5 NAAQS was 12/31/15 for the former "moderate" classification; U.S.EPA approved reclassification to "serious," effective 2/12/16 with an attainment deadline of 12/31/2019; the 2012 (proposal year) annual PM2.5 NAAQS was revised on 1/15/13, effective 3/18/13, from 15 to 12 μg/m³; new annual designations were final 1/15/15, effective 4/15/15; on July 25, 2016 U.S. EPA finalized a determination that the Basin attained the 1997 annual (15.0 μg/m³) and 24-hour PM2.5 (65 μg/m³) NAAQS, effective August 24, 2016

f) The annual PM10 NAAQS was revoked, effective 12/18/06; the 24-hour PM10 NAAQS deadline was 12/31/2006; the Basin's Attainment Re-designation Request and PM10 Maintenance Plan was approved by U.S. EPA on 6/26/13, effective 7/26/13

g) Partial Nonattainment designation – Los Angeles County portion of the Basin only for near-source monitors; expect to remain in attainment based on current monitoring data; attainment re-designation request pending

h) New 1-hour NO_2 NAAQS became effective 8/2/10, with attainment designations 1/20/12; annual NO_2 NAAQS retained

i) The 1971 annual and 24-hour SO2 NAAQS were revoked, effective 8/23/10; however, these 1971 standards will remain in effect until one year after U.S. EPA promulgates area designations for the 2010 SO2 1-hour NAAQS; final area designations expected by 12/31/20 due to new source-specific monitoring requirements; Basin expected to be in attainment due to ongoing clean data

TABLE 2-4
National Ambient Air Quality Standards (NAAQS) Attainment Status
Coachella Valley Portion of the Salton Sea Air Basin

Criteria Pollutant	Averaging Time	Designation[a]	Attainment Date[b]
Ozone (O_3)	(1979) **1-Hour** (0.12 ppm)[c]	Attainment	11/15/2007 (attained 12/31/2013)
	(2015) **8-Hour** (0.070 ppm)[d]	Pending – Expect Nonattainment (Severe)	Pending
	(2008) **8-Hour** (0.075 ppm)[d]	Nonattainment (Severe-15)	7/20/2027
	(1997) **8-Hour** (0.08 ppm)[d]	Nonattainment (Severe-15)	6/15/2019
PM2.5[e]	(2006) **24-Hour** (35 µg/m³)	Unclassifiable/Attainment	N/A (attained)
	(2012) **Annual** (12.0 µg/m³)	Unclassifiable/Attainment	N/A (attained)
	(1997) **Annual** (15.0 µg/m³)	Unclassifiable/Attainment	N/A (attained)
PM10[f]	(1987) **24-hour** (150 µg/m³)	Nonattainment ("serious")	12/31/2006
Lead (Pb)	(2008) **3-Months Rolling** (0.15 µg/m³)	Unclassifiable/Attainment	Unclassifiable/ Attainment
CO	(1971) **1-Hour** (35 ppm)	Unclassifiable/Attainment	N/A (attained)
	(1971) **8-Hour** (9 ppm)	Unclassifiable/Attainment	N/A (attained)
NO_2[g]	(2010) **1-Hour** (100 ppb)	Unclassifiable/Attainment	N/A (attained)
	(1971) **Annual** (0.053 ppm)	Unclassifiable/Attainment	N/A (attained)
SO_2[h]	(2010) **1-Hour** (75 ppb)	Designations Pending	N/A
	(1971) **24-Hour** (0.14 ppm) (1971) **Annual** (0.03 ppm)	Unclassifiable/Attainment	Unclassifiable/ Attainment

a) U.S. EPA often only declares Nonattainment areas; everywhere else is listed as Unclassifiable/Attainment or Unclassifiable
b) A design value below the NAAQS for data through the full year or smog season prior to the attainment date is typically required for an attainment demonstration
c) The 1979 1-hour ozone NAAQS (0.12 ppm) was revoked, effective 6/15/05; the Southeast Desert Modified Air Quality Management Area, including the Coachella Valley, had not timely attained this standard by the 11/15/07 "severe-17" deadline, based on 2005-2007 data; on 8/25/14, U.S. EPA proposed a clean data finding based on 2011–2013 data and a determination of attainment for the former 1-hour ozone NAAQS for the Southeast Desert nonattainment area; this rule was finalized by U.S. EPA on 4/15/15, effective 5/15/15, that included preliminary 2014 data
d) The 2008 8-hour ozone NAAQS (0.075 ppm) was revised to 0.070 ppm, effective 12/28/15 with classifications and implementation goals to be finalized by 10/1/17; the 1997 8-hour ozone NAAQS (0.08 ppm) was revoked in the 2008 ozone NAAQS implementation rule, effective 4/6/15; there are continuing obligations under the 1997 and 2008 ozone NAAQS until they are attained
e) The annual PM2.5 standard was revised on 1/15/13, effective 3/18/13, from 15 to 12 µg/m³
f) The annual PM10 standard was revoked, effective 12/18/06; the 24-hour PM10 NAAQS attainment deadline was 12/31/2006; the Coachella Valley Attainment Re-designation Request and PM10 Maintenance Plan was postponed by U.S. EPA pending additional monitoring and analysis in the southeastern Coachella Valley
g) New 1-hour NO_2 NAAQS became effective 8/2/10; attainment designations 1/20/12; annual NO_2 NAAQS retained
h) The 1971 Annual and 24-hour SO_2 NAAQS were revoked, effective 8/23/10; however, these 1971 standards will remain in effect until one year after U.S. EPA promulgates area designations for the 2010 SO_2 1-hour standard; final area designations expected by 12/31/2020 with SSAB expected to be designated Unclassifiable/Attainment

The current status of CAAQS attainment for the pollutants with State standards is presented in Table 2-5 for the Basin and the Riverside County portion of the SSAB (Coachella Valley).

TABLE 2-5

California Ambient Air Quality Standards (CAAQS) Attainment Status
South Coast Air Basin and Coachella Valley portion of Salton Sea Air Basin

Pollutant	Averaging Time and Level[b]	Designation[a]	
		South Coast Air Basin	Coachella Valley
Ozone (O_3)	**1-Hour** (0.09 ppm)[c]	Nonattainment	Nonattainment
	8-Hour (0.070 ppm)[d]	Nonattainment	Nonattainment
PM2.5	**Annual** (12.0 μg/m^3)	Nonattainment	Attainment
PM10	**24-Hour** (50 μg/m^3)	Nonattainment	Nonattainment
	Annual (20 μg/m^3)	Nonattainment	Nonattainment
Lead (Pb)	**30-Day Average** (1.5 μg/m^3)	Attainment	Attainment
CO	**1-Hour** (20 ppm)	Attainment	Attainment
	8-Hour (9.0 ppm)	Attainment	Attainment
NO_2	**1-Hour** (0.18 ppm)	Attainment	Attainment
	Annual (0.030 ppm)	Attainment	Attainment
SO_2	**1-Hour** (0.25 ppm)	Attainment	Attainment
	24-Hour (0.04 ppm)	Attainment	Attainment
Sulfates	**24-Hour** (25 μg/m^3)	Attainment	Attainment
H_2S[c]	**1-Hour** (0.03 ppm)	Unclassified	Unclassified[c)]

a) CA State designations shown were updated by CARB in 2016, based on the 2013–2015 3-year period; stated designations are based on a 3-year data period after consideration of outliers and exceptional events; Source: http://www.arb.ca.gov/desig/statedesig.htm#current

b) CA State standards, or CAAQS, for ozone, CO, SO_2, NO_2, PM10 and PM2.5 are values not to be exceeded; lead, sulfates, and H_2S standards are values not to be equaled or exceeded; CAAQS are listed in the Table of Standards in Section 70200 of Title 17 of the California Code of Regulations

c) SCAQMD began monitoring H_2S in the southeastern Coachella Valley in November 2013 due to odor events related to the Salton Sea; three full years of data are not yet available for a State designation, but nonattainment is anticipated for the H_2S CAAQS in at least part of the Coachella Valley

The 1979 federal 1-hour ozone standard (0.12 ppm) was revoked by the U.S. EPA and replaced by the 8-hour average ozone standard (0.08 ppm), effective June 15, 2005. However, the Basin and the former Southeast Desert Modified Air Quality Management Area (which included the Coachella Valley) had not attained the 1-hour federal ozone NAAQS by the attainment dates in 2010 and 2007, respectively, and, therefore, had continuing obligations under the former standard. On August 25, 2014, U.S. EPA

proposed a clean data determination based on 2011-2013 data and a determination of attainment for the 1-hour ozone NAAQS for the Southeast Desert nonattainment area. This rule was finalized, with the inclusion of the preliminary 2014 ozone data, by U.S. EPA on April 15, 2015, effective May 15, 2015. The Basin has not yet attained the 1-hour ozone NAAQS.

The 1997 8-hour ozone NAAQS was subsequently strengthened from 0.08 ppm to 0.075 ppm, effective May 27, 2008. The 1997 8-hour ozone standard was revoked in implementation rules for the 2008 ozone NAAQS, effective April 6, 2015. On October 1, 2015, U.S. EPA again strengthened the 8-hour ozone NAAQS to 0.070 ppm, effective December 28, 2015, retaining the same form as the previous 1997 and 2008 standards. Attainment designations for the new 2015 standard are expected to be finalized by late 2017, with SIP attainment demonstrations likely due in 2020 or 2021. The 2008 ozone NAAQS is a primary focus of this AQMP, as it is the SIP submittal to demonstrate future attainment of the 2008 standard. While the statistics presented in this chapter, and in Appendix II: Current Air Quality, primarily refer to the current (2015) and former (2008) 8-hour ozone standards, the former 1997 8-hour and 1979 1-hour ozone standards will also be presented, to show the progress toward those standards and for historical comparison.

In 2015, one or more stations in the Basin exceeded the most current federal standards on a total of 146 days (40 percent of the year), including: 8-hour ozone (113 days over the 2015 ozone NAAQS), 24-hour PM2.5 (30 days, including near-road sites; 25 days for ambient sites only), PM10 (2 days), and NO_2 (1 day). Despite substantial improvement in air quality over the past few decades, some air monitoring stations in the Basin still exceed the NAAQS for ozone more frequently than any other areas in the United States. Seven of the top 10 stations in the nation most frequently exceeding the 2015 8-hour ozone NAAQS in 2015 were located within the Basin, including stations in San Bernardino, Riverside, and Los Angeles Counties. Regarding the former ozone NAAQS,[4] 81 days exceeded the revised 2008 8-hour ozone NAAQS, 47 days exceeded the revoked 1997 8-hour ozone NAAQS, and 10 days exceeded the revoked 1-hour ozone NAAQS at one or more stations in the Basin in 2015. Table 2-6 summarizes the number of days exceeding current and former federal and State 1-hour and 8-hour ozone standard levels by county in the Basin and the Coachella Valley in 2015.

[4] While the former federal 8-hour and 1-hour ozone NAAQS have been revised or revoked by U.S. EPA, nonattainment areas, including the Basin, still have continuing obligations under each standard until it is attained.

TABLE 2-6

2015 Number of Days Exceeding Current and Former Ozone Standards
at the Peak Station by Basin and County

Basin/County	2015 # Days > Current (2015) 8-Hour Ozone NAAQS (0.070 ppm)	Area of Max Current Federal Standard Exceedances	2015 # Days > Former (2008) 8-Hour Ozone NAAQS (0.075 ppm)	2015 # Days > Former (1997) 8-Hour Ozone NAAQS (0.08 ppm)	2015 # Days > Former (1979) 1-Hour Ozone NAAQS (0.12 ppm)	2015 # Days > Current 8-Hour State Ozone Standard (0.07 ppm)	2015 # Days > Current 1-Hour State Ozone Standard (0.09 ppm)
South Coast Air Basin							
Los Angeles	74	Santa Clarita Valley	54	25	4	80	52
Orange	12	Saddleback Valley	4	0	0	14	5
Riverside	76	Metropolitan Riverside County	51	29	2	81	43
San Bernardino	**102**	**Central San Bernardino Mountains**	**75**	**42**	**8**	**102**	**65**
Salton Sea Air Basin							
Riverside	58	Coachella Valley (Palm Springs)	30	5	0	54	3

Bold text denotes the peak value

The 2015 8-hour ozone NAAQS became effective at the end of 2015; the 2008 ozone NAAQS was still in effect during the 2014 and 2015 ozone seasons; 2014–2016 data will likely be evaluated by U.S. EPA for 2015 ozone NAAQS attainment determinations; although the 2015 8-hour NAAQS and the 8-hour CAAQS are both at an equivalent level, the rounding conventions differ

PM2.5 levels in the Basin have improved significantly in recent years. By 2013 and again in 2014 and 2015, there were no stations measuring PM2.5 in the Basin violating the former 1997 annual PM2.5 NAAQS (15.0 µg/m^3) for the 3-year design value period with the filter-based federal reference method (FRM).[5] On July 25, 2016 U.S. EPA finalized a determination that the Basin attained the 1997 annual (15.0 µg/m^3) and 24-hour PM2.5 (65 µg/m^3) NAAQS, effective August 24, 2016. Of the 17 FRM PM2.5 monitors at ambient stations in the Basin and the Coachella Valley for the 2013–2015 period, five stations had design values over the current 2012 annual PM2.5 NAAQS (12.0 µg/m^3), including: Mira Loma (Basin maximum at 14.1 µg/m^3), Rubidoux, Fontana, Ontario (2013 and 2014 data only, prior to closing), Central Los Angeles, and Compton. The new near-road PM2.5 measurements, now fully implemented at two

[5] SCAQMD also employs continuous monitors at several stations in the Basin to provide real-time data for the public and to support daily air quality forecasting. U.S. EPA has granted SCAQMD a waiver from using these continuous monitors for regulatory/attainment determination purposes, since they do not meet the accuracy requirements to be considered federal equivalent method (FEM) measurements.

stations, will be evaluated for NAAQS compliance once sufficient data has been collected. These source-specific measurements are often higher than the nearest ambient measurements and may affect the Basin-wide design value. The Coachella Valley is in attainment of both the annual and 24-hour PM2.5 NAAQS.

In 2015, 14 of the stations in the Basin with FRM PM2.5 monitors had one or more PM2.5 daily average concentrations exceeding the level of the federal 24-hour PM2.5 NAAQS (35.0 $\mu g/m^3$), with a total of 25 days over that standard in the Basin (30 days with the new near-road stations included). However, in the 2013–2015 period, only two stations (in Metropolitan Riverside County at Mira Loma and Rubidoux), had design values over the 24-hour PM2.5 NAAQS.[6] While it was previously anticipated that the Basin 24-hour PM2.5 NAAQS would be attained by 2015, this did not occur, based on the data for 2013 through 2015. The higher number of days exceeding the 24-hour NAAQS, over what was expected based on the current control strategy, is largely attributed to the severe drought conditions in California in the past three years. The deficit of normal storm systems from late fall through the winter and early spring allowed for more stagnant conditions in the Basin and multi-day buildups of higher PM2.5 concentrations. This was caused by the lack of storm-related dispersion and rain-out of PM and its precursors.

The Basin is in attainment of the current PM10 24-hour NAAQS. The Coachella Valley monitored data also shows that it will meet the PM10 NAAQS, pending SCAQMD documentation submittal and subsequent U.S. EPA approval of days flagged for high-wind exceptional events. However, U.S. EPA has requested that SCAQMD conduct additional monitoring in the southeastern portion of the Coachella Valley before a re-designation can be considered. This station has been in operation since 2013 in the community of Mecca, so the District intends to propose that a re-designation decision can be based on the 2014–2016 or 2015–2017 period when the data is finalized and exceptional event exclusions can be addressed.

The District continues to be in attainment of the NAAQS for SO_2, CO, and NO_2. While the concentration level of the current 1-hour NO_2 federal standard (100 ppb) was exceeded in the Basin at one station on one day in 2015 (in the South Los Angeles County Coastal Area at the Long Beach – Hudson station), the NAAQS NO_2 design value[7] has not been exceeded. Therefore, the Basin remains in attainment of the NO_2 NAAQS. The near-road NO_2 and CO measurements, now completely phased in, will also be evaluated for NAAQS compliance once sufficient data has been collected. These source-specific NO_2 and CO measurements are often higher than the nearest ambient measurements. However, the longest running NO_2 near-road station, on I-5 in Anaheim, did not exceed the level of the NAAQS since the measurements began on January 1, 2014. Likewise, a shorter period of data from the other stations has also not exceeded the level of the NO_2 NAAQS to date. Similarly, the near-road CO measurements have not exceeded the level of the CO NAAQS to date.

U.S. EPA designated the Los Angeles County portion of the Basin (excluding the San Clemente and Santa Catalina Islands and the Antelope Valley) as nonattainment for the revised (2008) federal lead standard (0.15 $\mu g/m^3$, rolling 3-month average). This designation was based on two source-specific monitors in Vernon and in the City of Industry exceeding the 2008 standard over the 2007–2009 period. For the

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[6] The 24-hour PM2.5 design value is based on the annual 98th percentile concentration for each station averaged over the 3-year period; for stations that monitor every day, this is typically the eighth highest concentration.

[7] The 1-hour NO_2 design value is the 3-year average of the annual 98th percentile of the daily 1-hour maximums.

most recent two design value periods, 2012–2014 and 2013–2015, no stations in Los Angeles County showed violations of the federal lead standard, with a maximum 3-month rolling average 2013–2015 design value of 0.08 $\mu g/m^3$ (at the highest source-specific monitor at the beginning of 2013). A request to U.S. EPA to re-designate Los Angeles County to attainment of the lead NAAQS is being prepared. The remainder of the Basin outside the Los Angeles County nonattainment area, as well as the Coachella Valley, remain in attainment of the 2008 lead standard, including both ambient monitors and source-oriented monitors.

Current Air Quality

In 2015, ozone, PM2.5, PM10, and NO_2 peak values exceeded federal standard concentration levels at one or more of the routine monitoring stations in the Basin, while ozone and PM10 exceeded those standard levels in the Coachella Valley. However, an exceedance of the concentration level does not necessarily mean a violation of the NAAQS, because the design value form of the standard must also be considered for attainment determination. For example, the 2015 1-hour maximum NO_2 concentration in the Basin was 101 ppb at the Long Beach – Hudson station, but the Basin did not violate the federal NO_2 NAAQS, based on the form of the standard, because the station's 98th percentile daily maximum hourly concentration was not over the federal standard of 100 ppb for the 2013–2015 period.

At this time, the only pollutants in the Basin with design values in violation of the respective NAAQS are ozone, (all current and former federal standards) and PM2.5 (current annual and 24-hour federal standards). In the Coachella Valley, only ozone has design values in violation of the NAAQS for the current and former 8-hour federal ozone standards. The Coachella Valley is expected to be in attainment of the 24-hour PM10 NAAQS, after accounting for days with high-wind natural events through the U.S. EPA Exceptional Event Rule.

Figure 2-2 shows the trend of the Basin maximum 3-year design value concentrations for ozone (1-hour and 8-hour) and PM2.5 (24-hour and annual) since 1995, as percentages of the corresponding current federal standards (note that PM2.5 monitoring began in 1999 so the first 3-year design value was in 2001). Although there is some year-to-year variability, these pollutants show significant improvement over the years, with PM2.5 showing the most dramatic decreases.

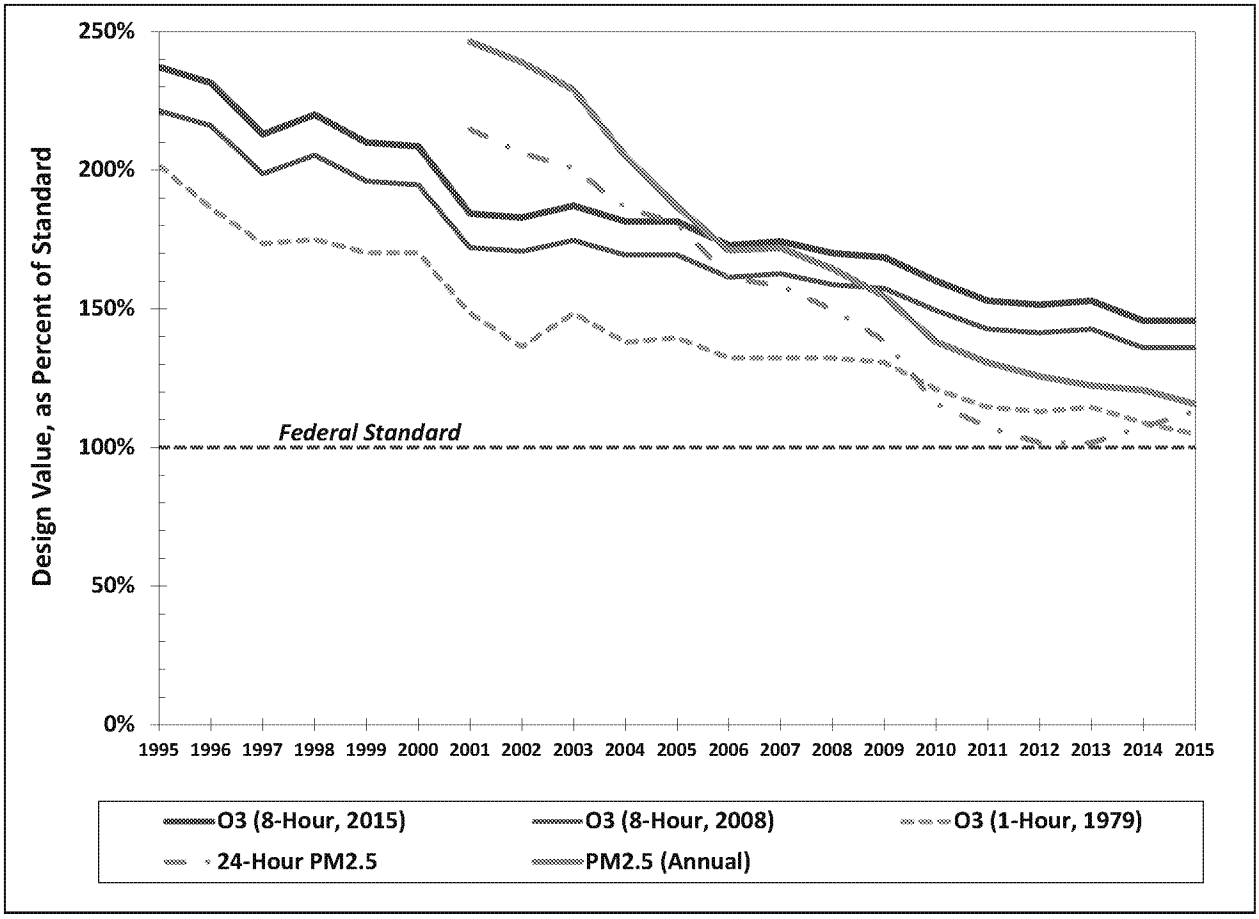

FIGURE 2-2

TRENDS OF SOUTH COAST AIR BASIN MAXIMUM 3-YEAR DESIGN VALUES FOR OZONE (2015 8-HOUR, 2008 8-HOUR, AND 1979 1-HOUR NAAQS) AND PM2.5 (24-HOUR AND ANNUAL), 1995–2015 *(AS PERCENTAGES OF CURRENT FEDERAL STANDARDS)*

Monitoring Network Status

There have been some changes to the SCAQMD ambient air monitoring network since the previous AQMP, which was finalized in 2012 and summarized air quality through 2011. A new special-purpose monitoring station was added, starting in January 2013, in the southeastern Coachella Valley in the City of Mecca to measure PM10 and hydrogen sulfide (H_2S). A second H_2S monitor was added on Torres-Martinez tribal property to measure naturally occurring odors from the Salton Sea close to the shoreline.

Long-term monitoring stations at North Long Beach and Burbank had to be closed due to lease decisions beyond the District's control; replacements for these two stations are being sought at this time. Filter-based PM2.5 measurements have continued at North Long Beach until a suitable replacement station can be obtained. The PM10 and PM2.5 monitors at the Ontario Fire Station were also removed in 2014, due to lack of space at the Ontario site. The Riverside-Magnolia station was also closed at the end of 2014, with those measurements (PM2.5, lead, CO and NO_2) consolidated at the nearby Riverside-Rubidoux station in 2015. Replacements for the Ontario Fire Station and Riverside-Magnolia air monitoring stations are not required and the measurements from these locations are well-represented by other SCAQMD stations.

To implement recent U.S. EPA requirements to monitor NO_2, CO, and PM2.5 near major roadways in large urban areas, four new near-road monitoring stations were installed. The NO_2 measurements began on January 1, 2014 at a near-road site at Vernon Street in Anaheim, Orange County, adjacent to Interstate Highway 5. This was followed by a new near-road site near Etiwanda Avenue in San Bernardino County next to Interstate Highway 10 in July 2014. CO measurements began at both the I-5 and I-10 near-road sites in December 2014. These two sites represent high traffic volume routes. Near-road NO_2 and PM2.5 measurements began in 2015 next to California Highway 60, west of Vineyard Avenue near the San Bernardino/Riverside County border, and next to Interstate Highway 710, at Long Beach Blvd. in Los Angeles County. These two sites represent high traffic volumes with a high fraction of diesel truck traffic.

The near-road monitoring is source-specific, that is, the pollutant measurements are directly impacted by the close proximity of the traffic-related emissions from the roadways. As a result, higher measured air pollutant concentrations are generally expected at the near-road sites than those found further away from the freeways. The near-road measurements provide representative pollutant exposure information for people who live, work, or go to school adjacent to freeways or who spend significant time traveling on the busiest southern California roadways. Once sufficient near-road data is collected for a full 3-year design value[8] calculation, it can be included in analyses for attainment of the NAAQS.

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[8] A design value is a statistic that describes the air quality status of a given area relative to the level and form of the NAAQS. For most criteria pollutants, the design value is a 3-year average and takes into account the form of the short-term standard (e.g., 98th percentile, fourth high value, etc.). Design values can also be calculated for standards that are exceedance-based (e.g., 1-hour ozone and 24-hour PM10) so that they can be expressed as a concentration instead of an exceedance count, in order to allow a direct comparison to the level of the standard. Note that the modeling design values used for the AQMP attainment demonstration are based on a 5-year period, weighted toward the center year, as specified in U.S. EPA modeling guidelines.

Ozone (O_3)

Health Effects, Ozone

The adverse effects of ozone air pollution exposure on health have been studied for many years, as documented by a significant body of peer-reviewed scientific research, including studies conducted in Southern California. The 2013 U.S. EPA document, *Integrated Science Assessment of Ozone and Related Photochemical Oxidants*,[9] describes these health effects and discusses the state of the scientific knowledge and research. A summary of health effects information and additional references can also be found in Appendix I: Health Effects.

Individuals working outdoors, children (including teenagers), older adults, people with preexisting lung disease, such as asthma, and individuals with certain nutritional deficiencies are considered to be the sub-groups most susceptible to ozone effects. Short-term exposures (lasting for a few hours) to ozone at levels typically observed in Southern California can result in breathing pattern changes, reduction of breathing capacity, increased susceptibility to infections, inflammation of the lung tissue, and some immunological changes. Elevated ozone levels are associated with increased school absences and daily hospital admission rates, as well as increased mortality. An increased risk for asthma has been found in children who participate in multiple sports and live in high-ozone communities.

Ozone exposure under exercising conditions is known to increase the severity of respiratory symptoms. Although lung volume and airway resistance changes observed after a single exposure diminish with repeated exposures, biochemical and cellular changes appear to persist, which can lead to subsequent lung structural changes.

Air Quality, Ozone

In 2015, SCAQMD routinely monitored ambient ozone at 29 locations in the Basin and the Coachella Valley portion of the SSAB. The 2015 Basin maximum ozone concentrations continued to exceed federal standards by wide margins, although significant improvement has been achieved through the years. Figure 2-3 shows the trend from 1976 through 2015 of the annual number of Basin days exceeding various metrics for ozone. These metrics include the 1-hour Stage 1[10] level (0.20 ppm), the 1-hour Health Advisory level (0.15 ppm), the former (1979) 1-hour NAAQS (0.12 ppm), the former (1997 and 2008) 8-hour NAAQS (0.08 and 0.075 ppm), and the new 2015 8-hour NAAQS (0.070 ppm). All the ozone trends

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[9] U.S. EPA. (2013). Integrated Science Assessment of Ozone and Related Photochemical Oxidants (Final Report). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R-10/076F. http://cfpub.epa.gov/ncea/isa/recordisplay.cfm?deid=247492.

[10] While the 1-hour ozone episode levels and the related 1-hour ozone health warnings still exist, they are essentially replaced by the more protective health warnings associated with the current 8-hour ozone NAAQS. The 1-hour ozone episode warning levels include the State Health Advisory (0.15 ppm), Stage 1 (0.20 ppm), Stage 2 (0.35 ppm), and Stage 3 (0.50 ppm). The State 1-hour ozone Health Advisory was last exceeded in the Basin in 2013. The Basin's last 1-hour ozone Stage 1 episode occurred in 2003. The last 1-hour ozone Stage 2 episode occurred in 1988 and the last Stage 3 episode occurred in 1974.

show significant improvements achieved through the period. However, they also show the need for continued efforts in order to meet all the 8-hour ozone standards and the 1979 1-hour standard.

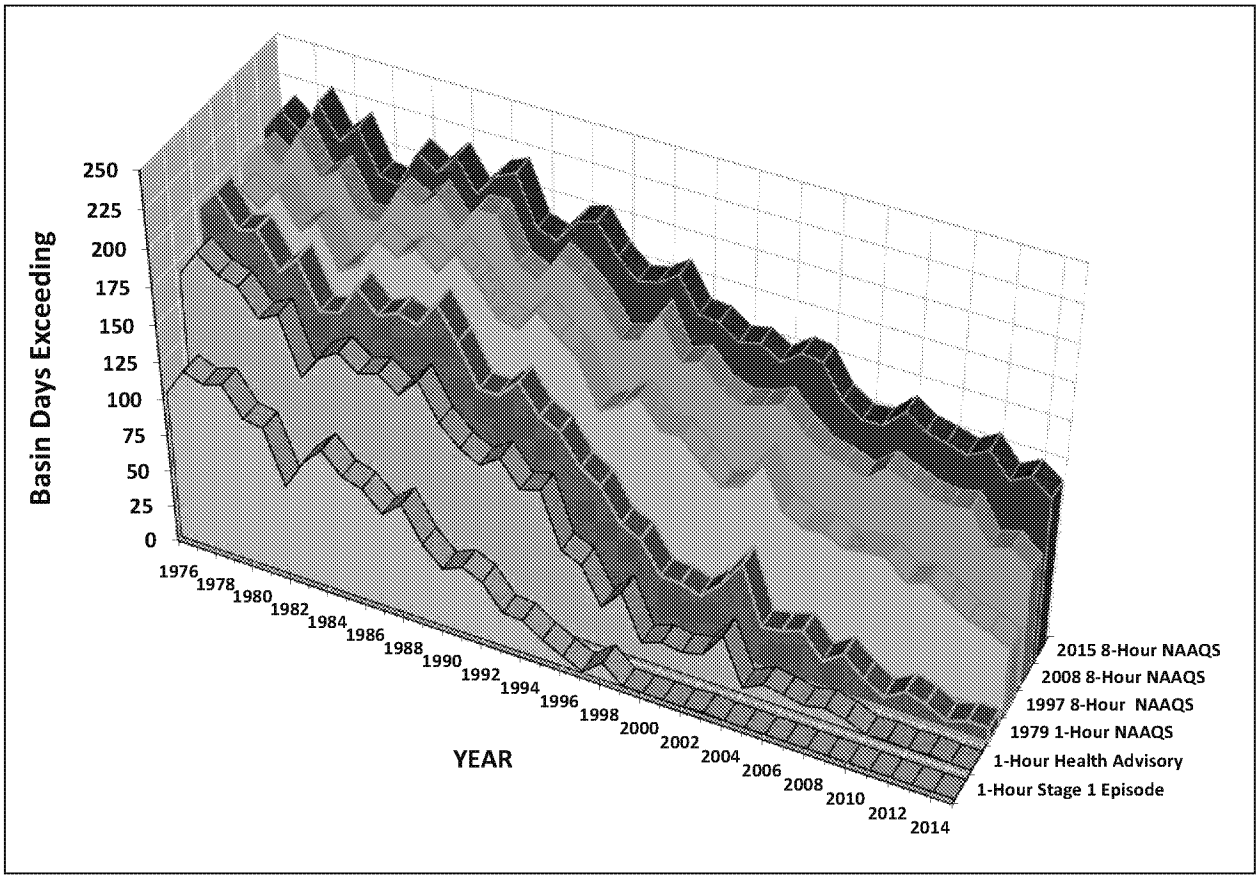

FIGURE 2-3

TREND OF NUMBER OF BASIN DAYS EXCEEDING CURRENT AND FORMER OZONE NAAQS AND 1-HOUR OZONE EPISODE LEVELS (HEALTH ADVISORY AND STAGE-1), 1976 THROUGH 2015

All counties in the Basin, as well as the Coachella Valley, exceeded the level of the new 2015 (0.070 ppm) and the former 2008 (0.075 ppm) and 1997 (0.08 ppm) 8-hour ozone NAAQS in 2015. While not all stations had days exceeding the previous 8-hour standards, all monitoring stations had at least one day over the 2015 federal standard, except the coastal station near the Port of Los Angeles/Long Beach in South Coastal Los Angeles County (Elisabeth Hudson Elementary School station).

On one or more days in the Basin, the 2015 ozone federal standard was exceeded on a total of 113 days exceeded in 2015 (81 days over the 2008 standard and 47 days over the 1997 standard). 2015 had the fewest days exceeding the 8-hour ozone standards than were recorded in any previous year since these measurements began. The 8-hour State ozone standard (0.070 ppm, although the rounding convention differs from federal standard) was exceeded in the Basin on 115 days in 2015. The Coachella Valley exceeded the 2015 8-hour ozone NAAQS on 47 days (26 days for the 2008 ozone NAAQS, five days for the 1997 ozone NAAQS, and 51 days for the State 8-hour ozone NAAQS). The station with the highest

number of days in 2015 over the 2015, 2008, and 1997 8-hour federal ozone standards (86, 61, and 30 days, respectively) was in the Central San Bernardino Mountains (Crestline-Lake Gregory). The 2015 maximum 8-hour average ozone concentration of 0.127 ppm was also measured at the Central San Bernardino Mountains station.

When compared to the design value form of the federal standard, all four of the Basin's counties were above the 2015 8-hour ozone NAAQS for the 2013–2015 design values. Three of the Basin's four counties (all but Orange County) were above both the 2008 and 1997 8-hour ozone NAAQS for the 2013-2015 design values. The Basin's highest 2013–2015 8-hour ozone design value (0.102 ppm, measured in the Central San Bernardino Mountains at Crestline-Lake Gregory) was 146 percent of the 2015 8-hour ozone NAAQS (136 percent of the 2008 NAAQS and 121 percent of the 1997 NAAQS). This was the same as the 2014 peak Basin design value and they were the lowest maximum 8-hour ozone design values in the Basin since ozone measurements began. Table 2-7 shows the 2015 maximum 8-hour ozone concentrations and design values by air basin and county, compared to current and former federal, and current State standards.

TABLE 2-7

2015 Maximum 8-Hour Average Ozone Concentrations and Design Values by Basin and County

Basin/ County	2015 Maximum 8-Hour Ozone Average (ppm)	2013–2015 8-Hour Ozone Design Value (ppm)	Percent of Current (2015) 8-Hour Ozone NAAQS (0.070 ppm)	Percent of Former (2008) 8-Hour Ozone NAAQS (0.075 ppm)	Percent of Former (1997) 8-Hour Ozone NAAQS (0.08 ppm)	Area of Design Value Maximum	2013–2015 8-Hour Ozone State Designation Value# (ppm)	Percent of State 8-hour Ozone Standard (0.070 ppm)
South Coast Air Basin								
Los Angeles	0.108	0.094	134	125	112	Santa Clarita Valley	0.109	**156**
Orange	0.088	0.075	107	100*	89	Saddleback Valley	0.082	117
Riverside	0.105	0.093	133	124	111	Metropolitan Riverside County	0.106	151
San Bernardino	**0.127**	**0.102**	**146**	**136**	**121**	**Central San Bernardino Mountains**	**0.114**	**163**
Salton Sea Air Basin								
Riverside	0.092	0.088	126	117	105	Coachella Valley (Palm Springs)	0.093	133

Bold text denotes the peak value

* 100 percent of the NAAQS is not violating that standard

\# The *State 8-Hour Designation Value* is the highest State 8-hour ozone average, rounded to three decimal places, during the last 3 years (State designation value source: https://www.arb.ca.gov/adam/select8/sc8start.php)

All monitored locations measured maximum 1-hour average ozone concentrations well below the Stage 1 episode level (0.20 ppm, 1-hour) and below the ozone health advisory level (0.15 ppm, 1-hour) in 2015. Except for one day in 2003 (at a special-purpose monitor in the San Bernardino Mountains), the Stage 1 ozone episode level has not been exceeded in the Basin since 1998.

The Basin exceeded the level of the revoked (1979) 1-hour federal ozone standard (0.12 ppm) on 10 days in 2015, with exceedances in Los Angeles, Riverside, and San Bernardino Counties; Orange County did not exceed the 1979 standard. The most exceedances of the former 1-hour standard in 2015 (6 days) occurred in the Central San Bernardino Valley at the San Bernardino air monitoring station. The 2015 peak 1-hour ozone concentration in the Basin was 0.144 ppm, measured in the Central San Bernardino Mountains (Crestline-Lake Gregory air monitoring station). This value was slightly higher than the 2014 peak of 0.141 ppm, which was the Basin's lowest annual peak 1-hour concentration since ozone measurements started in the mid-1950s. In the Coachella Valley, 1-hour ozone concentrations did not exceed the revoked 1-hour federal standard in 2015 and the peak 1-hour concentration of 0.102 ppm was the lowest annual peak ever monitored in that area. The State 1-hour ozone standard (0.09 ppm) was exceeded in the Basin on 71 days and in the Coachella Valley on 3 days.

The calculated peak 2013–2015 1-hour ozone design value[11] (0.130 ppm in the Central San Bernardino Mountains at the Crestline-Lake Gregory air monitoring station) was 104 percent of the former 1-hour NAAQS. The Coachella Valley design value did not exceed the former 1-hour federal ozone standard in 2015 and has remained in attainment of the former NAAQS since 2008. Table 2-8 shows the 2015 maximum 1-hour ozone concentrations and calculated design values by air basin and county, compared to the former federal and current State standards.

[11] The former 1979 1-hour ozone NAAQS allows for one exceedance per year on average when averaged over three years. The calculated design value is the fourth highest value over a 3-year period, allowing the design value to be expressed in terms of a concentration. When shown in parts-per-million to 3 decimal places the design value is compared to 0.125 ppm, which would exceed the NAAQS.

TABLE 2-8

2015 Maximum 1-Hour Average Ozone Concentrations and Design Values by Basin and County

Basin/ County	2015 Maximum 1-Hour Ozone Average (ppm)	2013–2015 1-Hour Ozone Design Value (ppm)	Percent of Former (1979) 1-Hour Ozone NAAQS (0.125 ppm)	Area of Design Value Max	2013–2015 1-Hour Ozone State Designation Value# (ppm)	Percent of State 1-Hour Ozone Standard (0.09 ppm)
South Coast Air Basin						
Los Angeles	0.136	0.127	102	East San Gabriel Valley	**0.13**	**144**
Orange	0.103	0.102	82	North Orange County & Saddleback Valley	0.10	111
Riverside	0.132	0.121	97	Metropolitan Riverside County	**0.13**	**144**
San Bernardino	**0.144**	**0.130**	**104**	**Central San Bernardino Mountains**	**0.13**	**144**
Salton Sea Air Basin						
Riverside	0.102	0.104	83	Coachella Valley (Palm Springs)	0.11	122

Bold text denotes the peak value

The *State 1-Hour Designation Value* is the highest hourly ozone measurement during the last 3 years, rounded to two decimal places. In practice, the designation value is the highest measured concentration in the 3-year period that remains, after excluding measurements identified as affected by highly irregular or infrequent events (State designation value source: https://www.arb.ca.gov/adam/select8/sc8start.php)

The number of days exceeding the current and former ozone standards in the Basin varies widely by area. Figures 2-4 through 2-6 map the number of days in 2015 exceeding the new 2015 8-hour ozone NAAQS and the former 2008 and 1997 8-hour ozone NAAQS in different areas of the Basin. The number of exceedances of the federal 8-hour ozone standards was lowest in the coastal areas, due in large part to the prevailing sea breeze which transports emissions inland before photochemistry produces high ozone concentrations. The concentrations increase downwind towards the Riverside County valleys and the San Bernardino County valleys and adjacent mountain areas, as well as the area around Santa Clarita in Los Angeles County. The Central San Bernardino Mountains area recorded the greatest number of exceedances of the current and former 8-hour federal standards (86 days for the 2015 ozone NAAQS, 61 days for the 2008 NAAQS, and 30 days for the 1997 NAAQS).

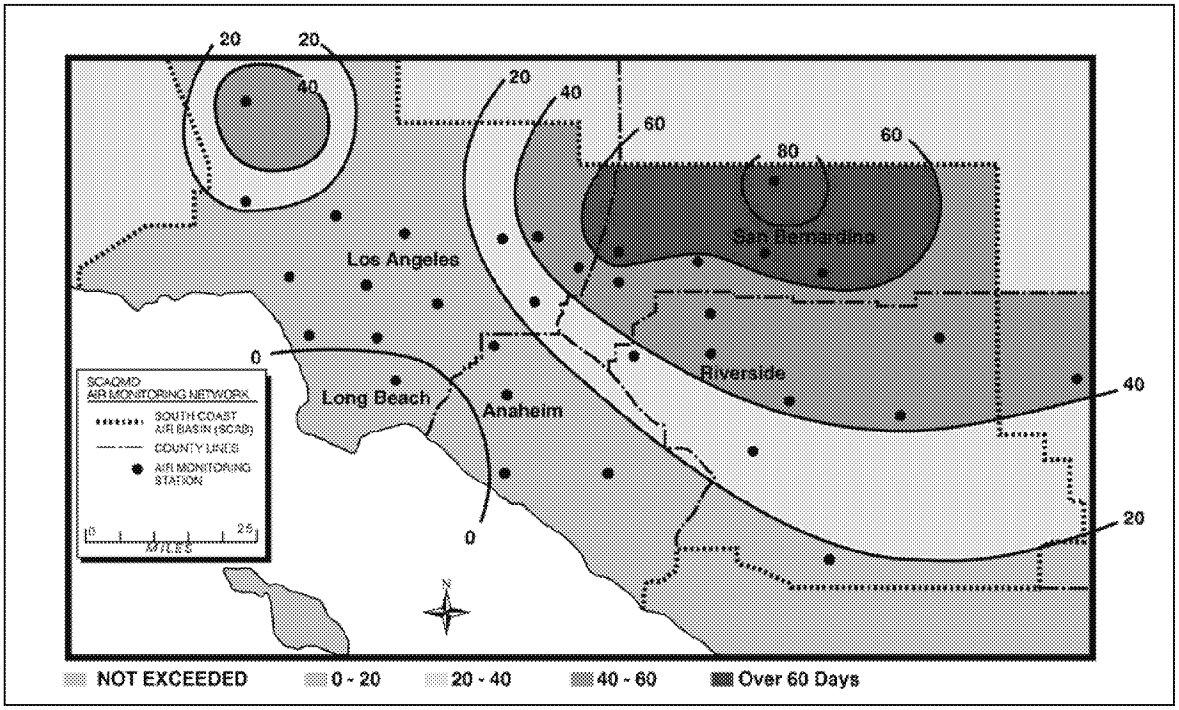

FIGURE 2-4

NUMBER OF DAYS IN 2015 EXCEEDING THE 2015 8-HOUR OZONE FEDERAL STANDARD

(8-HOUR AVERAGE OZONE > 0.070 PPM)

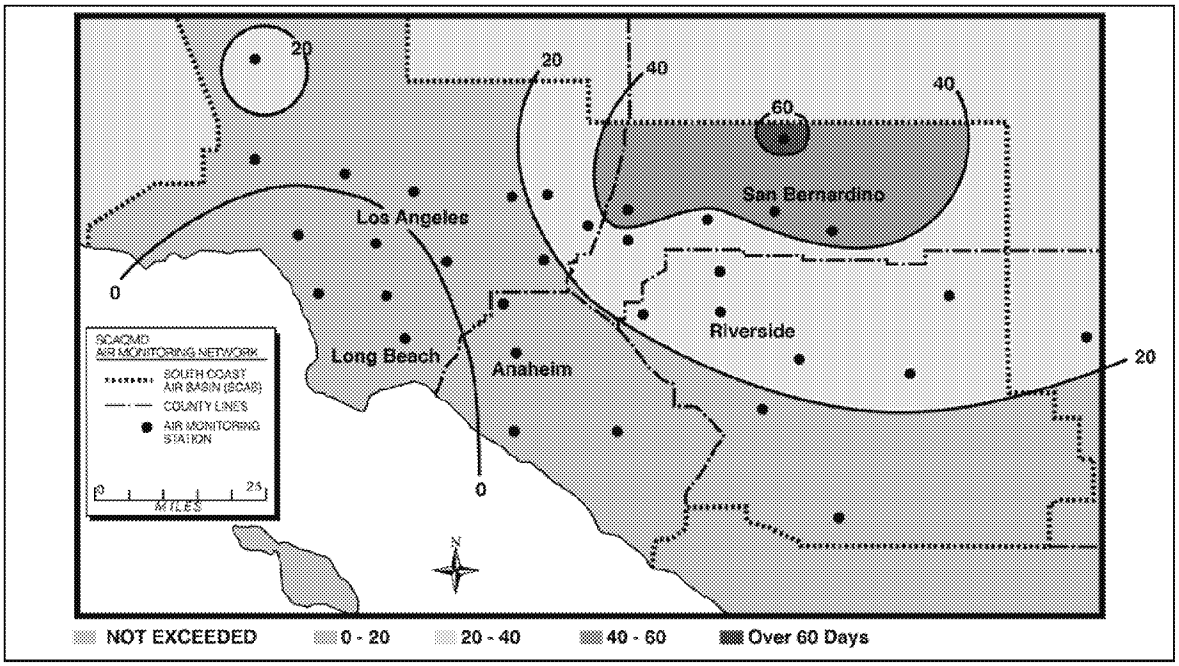

FIGURE 2-5

NUMBER OF DAYS IN 2015 EXCEEDING THE REVISED 2008 8-HOUR OZONE FEDERAL STANDARD

(8-HOUR AVERAGE OZONE > 0.075 PPM)

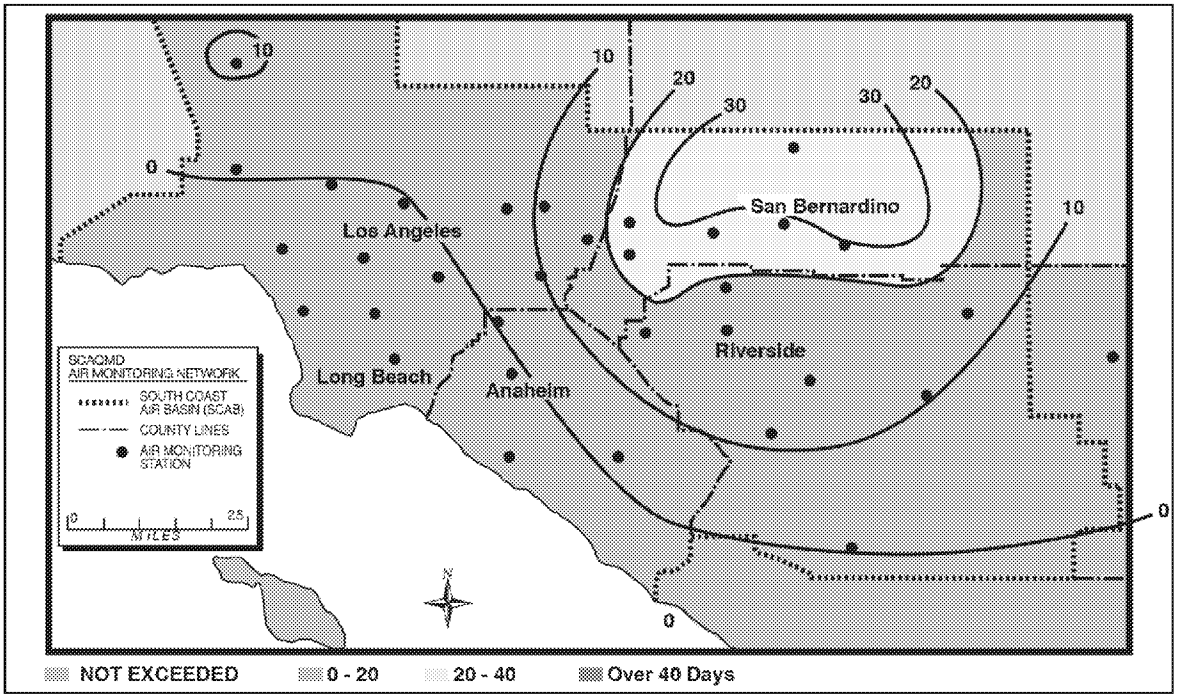

FIGURE 2-6

NUMBER OF DAYS IN 2015 EXCEEDING THE REVOKED 1997 8-HOUR OZONE FEDERAL STANDARD

(8-HOUR AVERAGE OZONE > 0.08 PPM)

Figure 2-7 maps the number of days in 2015 exceeding the revoked 1979 1-hour ozone NAAQS in different areas of the Basin. The former 1-hour federal standard was not exceeded in a large portion of the Basin. It was exceeded the most (six days) in the Central San Bernardino Valley at the San Bernardino air monitoring station. Exceedances of the 1-hour ozone standard extended to all areas monitored in San Bernardino County and in Metropolitan Riverside County, as well as in Santa Clarita and the eastern San Gabriel Valley in Los Angeles County. The Coachella Valley did not exceed the former 1-hour ozone standard in 2015.

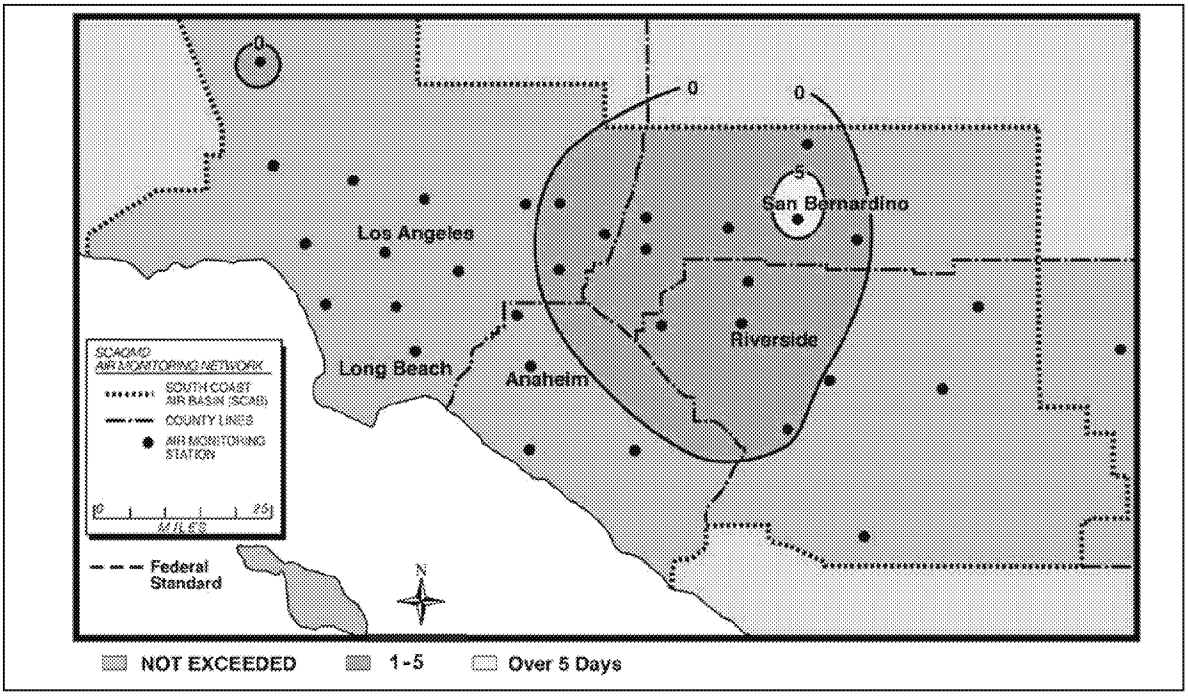

FIGURE 2-7

NUMBER OF DAYS IN 2015 EXCEEDING THE REVOKED 1979 1-HOUR FEDERAL OZONE STANDARD

(1-HOUR AVERAGE OZONE > 0.12 PPM; GREEN SHADED AREA INDICATES AREAS WITH EXCEEDANCES)

Particulate Matter (PM2.5 and PM10)

Health Effects, Particulate Matter

A significant body of peer-reviewed scientific research, including studies conducted in Southern California, points to adverse impacts of particulate matter air pollution on both increased illness (morbidity) and increased death rates (mortality). The 2009 U.S. EPA *Integrated Science Assessment for Particulate Matter*[12] describes these health effects and discusses the state of the scientific knowledge. A summary of health effects information and additional references can also be found in Appendix I: Health Effects.

There was considerable debate surrounding the review of particulate matter health effects and the consideration of ambient air quality standards when U.S. EPA promulgated the initial PM2.5 standards in 1997. Since that time, numerous additional studies have been published and key studies supporting the 1997 standards were closely scrutinized and the analyses was repeated and extended. These re-analyses confirmed the initial findings associating adverse health effects with PM2.5 exposures.

Several studies have found correlations between elevated ambient particulate matter levels and an increase in mortality rates, respiratory infections, number and severity of asthma attacks, and the number of hospital admissions in different parts of the United States and in various areas around the world. In recent years, studies have reported an association between long-term exposure to PM2.5 and increased total mortality (reduction in life-span and increased mortality from lung cancer).

Higher levels of PM2.5 have also been related to increased mortality due to cardiovascular or respiratory diseases, hospital admissions for acute respiratory conditions, school absences, lost work days, a decrease in respiratory function in children, and increased medication use in children and adults with asthma. Long-term exposure to PM has been found to be associated with reduced lung function growth in children, and increased risk of cardiovascular diseases in adults. Elderly persons, young children, and people with pre-existing respiratory and/or cardiovascular disease appear to be more susceptible to the effects of PM10 and PM2.5.

The U.S. EPA, in its most recent review, has concluded that both short-term and long-term exposure to PM2.5 are causally related to increased mortality risk. An expanded discussion of studies relating to PM exposures and mortality, including a brief description of how studies accounted for potential confounding factors, is contained in Appendix I of this document.

Air Quality, PM2.5

The District began regular monitoring of PM2.5 in 1999 following the U.S. EPA's adoption of the national PM2.5 standards in 1997. In 2015, ambient PM2.5 concentrations were monitored at 26 locations throughout the District, including two stations in the SSAB in the Coachella Valley and two near-road sites. Filter-based FRM PM2.5 sampling was employed at 19 of these stations and eight of the FRM measurement stations sampled daily to improve temporal coverage with the FRM measurements beyond

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[12] U.S. EPA. (2009). Integrated Science Assessment for Particulate Matter (Final Report). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R-08/139F. http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=216546.

the required 1-in-3-day sampling schedule, including the two near-road sites. Fourteen stations, including one near-road site, employed continuous PM2.5 monitors and seven of these were collocated with FRM measurements. The continuous federal equivalent method (FEM) PM2.5 monitors in the Basin do not meet the U.S. EPA criteria to be used for NAAQS comparison[13] and SCAQMD has been granted annual waivers by U.S. EPA precluding their use in NAAQS attainment consideration, although the waiver decision for 2015 data is not yet finalized. The continuous data is used for forecasting, real-time air quality alerts, and for evaluating hour-by-hour variations.

The 2015 FRM 24-hour PM2.5 concentrations are summarized in Table 2-9. PM2.5 concentrations were higher in the inland valley areas of metropolitan Riverside County and San Bernardino County. The Basin 2015 PM2.5 maximum 24-hour average concentration of 70.3 $\mu g/m^3$ was measured in the East San Gabriel Valley area at the Azusa air monitoring station on July 5, associated with fireworks on Independence Day. The next highest 24-hour PM2.5 concentration in 2015 was 56.6 $\mu g/m^3$, measured in the Metropolitan Riverside County area at the Mira Loma air monitoring station. PM2.5 concentrations also exceeded the level of the 24-hour NAAQS (35 $\mu g/m^3$) in Los Angeles and Orange Counties in 2015.

Although maximum 24-hour concentrations exceed the standard at multiple stations, the 98th percentile form of the 2013–2015 design value only exceeded the standard at two Basin stations in Metropolitan Riverside County (Mira Loma and Riverside-Rubidoux stations), with design values of 41 $\mu g/m^3$ and 36 $\mu g/m^3$, respectively (117 percent and 103 percent of the 24-hour NAAQS). Mira Loma had been the only station with a design value violating the 24-hour PM2.5 NAAQS since the 2008-2010 design value period. There is no State 24-hour PM2.5 standard.

The higher PM2.5 concentrations in the Basin are mainly due to the secondary formation of smaller particulates resulting from precursor gas emissions (i.e., NOx, SOx, NH_3, and VOC) that are converted to PM in the atmosphere. The precursors are from mobile, stationary and area sources, with the largest portion resulting from fuel combustion. Most of the 24-hour PM2.5 exceedances in the Basin occur in the late fall and winter months. The lack of storm events and rainfall in the last three years has contributed to an increase in the number of high PM2.5 concentration days over the standard, as the precursors and particulates are not dispersed or washed out as frequently.

In contrast to PM10, PM2.5 concentrations were relatively low in the Coachella Valley area of the SSAB. PM10 concentrations are normally higher in the desert areas due to windblown and fugitive dust emissions; PM2.5 is relatively low in the desert area due to fewer combustion-related emissions sources and less secondary aerosol formation in the atmosphere. The PM2.5 federal standards were not exceeded in the Coachella Valley in 2015 and the highest 24-hour and annual average 2013–2015 design values (17 and 8.0 $\mu g/m^3$, respectively, both at the Indio air monitoring station) are well below the PM2.5 NAAQS.

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[13] The continuous PM2.5 monitors deployed by SCAQMD are FEM-designated Beta Attenuation Monitor (BAM) instruments, but in use they do not meet the correlation and bias requirements set by U.S. EPA for equivalency to FRM filter measurements. The U.S. EPA waiver from NAAQS compliance for the continuous samplers is re-evaluated annually as part of the SCAQMD Annual Air Quality Monitoring Network Plan [http://www.aqmd.gov/home/library/clean-air-plans/monitoring-network-plan].

TABLE 2-9

2015 Maximum 24-hour Average PM2.5 Concentrations and 2013–2015 Design Values by Basin and County#

Basin/County	2015 Maximum PM2.5 24-Hour Average (µg/m³)*	2013–2015 PM2.5 24-Hour Design Value (µg/m³)	Percent of Current (2006) PM2.5 NAAQS (35 µg/m³)	Area of Design Value Max
South Coast Air Basin				
Los Angeles	**70.3****	34	97	Central Los Angeles and South San Gabriel Valley
Orange	45.8	28	80	Central Orange County
Riverside	56.6	**41**	**117**	**Metropolitan Riverside County**
San Bernardino	50.5	35	100	Central San Bernardino Valley
Salton Sea Air Basin				
Riverside	24.6	17	49	Coachella Valley (Indio)

Bold text denotes the peak value

Based on FRM filter data

* 100 percent of the NAAQS is not in violation of that standard

** Peak value associated with Independence Day fireworks – flagged as an exceptional event

The 2015 annual average PM2.5 concentrations are summarized in Table 2-10, based on the FRM measurements. The maximum annual average of 14.5 µg/m³ was measured at the CA-60 Near-Road site, located west of Vineyard Avenue near the San Bernardino/Riverside County border (near the cities of Ontario, Mira Loma, and Upland). The second highest maximum annual average PM2.5 concentration (13.3 µg/m³) was measured in the Metropolitan Riverside County area at the Mira Loma station. The Basin maximum 2013–2015 annual average design value was 14.1 µg/m³ at the Mira Loma station (118 percent of the current 2012 annual average PM2.5 NAAQS, 12.0 µg/m³). This design value is below the former 1997 annual average PM2.5 NAAQS (15.0 µg/m³), for which the Basin remains in attainment. This is the lowest PM2.5 Basin design value since these measurements began in 1999. Since the near-road PM2.5 sites only became operational in 2015, the data period is insufficient for design value calculations. The CA-60 freeway near-road station could potentially become the design value site for the Basin for the PM2.5 annual average NAAQS, once sufficient data is collected. The annual PM2.5 State standard is based on the highest annual average over the 3-year period. It is still violated in all counties of the Basin, but not in the Coachella Valley. Figure 2-8 shows the distribution of annual average PM2.5 concentrations in different areas of the Basin.

TABLE 2-10

2015 Maximum Annual Average PM2.5 Concentrations and 2013–2015 Design Values by Basin and County

Basin/ County	2015 Maximum PM2.5 Annual Average (µg/m³)#	2013–2015 PM2.5 Annual Design Value (µg/m³)#	Percent of Current (2012) PM2.5 Annual NAAQS (12.0 µg/m³)#	Percent of Former (1997) Annual NAAQS (15.0 µg/m³)	Area of Design Value Max	2013–2015 3-Year High State Annual Average PM2.5 Designation Value (µg/m³)##	Percent of State PM2.5 Annual Standard (12 µg/m³)
South Coast Air Basin							
Los Angeles	12.4	12.3	103	82	Central Los Angeles	**19**	**158**
Orange	9.4	10.0	83	67	Central Orange County	16	133
Riverside	**13.3**	**14.1**	**118**	**94**	**Metropolitan Riverside County**	**19**	**158**
San Bernardino	11.0	12.5	104	83	Southwest San Bernardino Valley	17	142
Salton Sea Air Basin							
Riverside	7.5	8.0	67	53	Coachella Valley (Indio)	8	67

Bold text denotes the peak value

Based on FRM filter data, excluding near-road stations due to insufficient period of record for design value calculation; the federal design value is based on the average of the 3 annual averages in the period

Based on combined FRM filter and continuous FEM data (federal FEM waiver is not applied to State designation value); data may include exceptional events; the State annual designation value is the highest year in the 3-year period

(State designation value source: https://www.arb.ca.gov/adam/select8/sc8display.php)

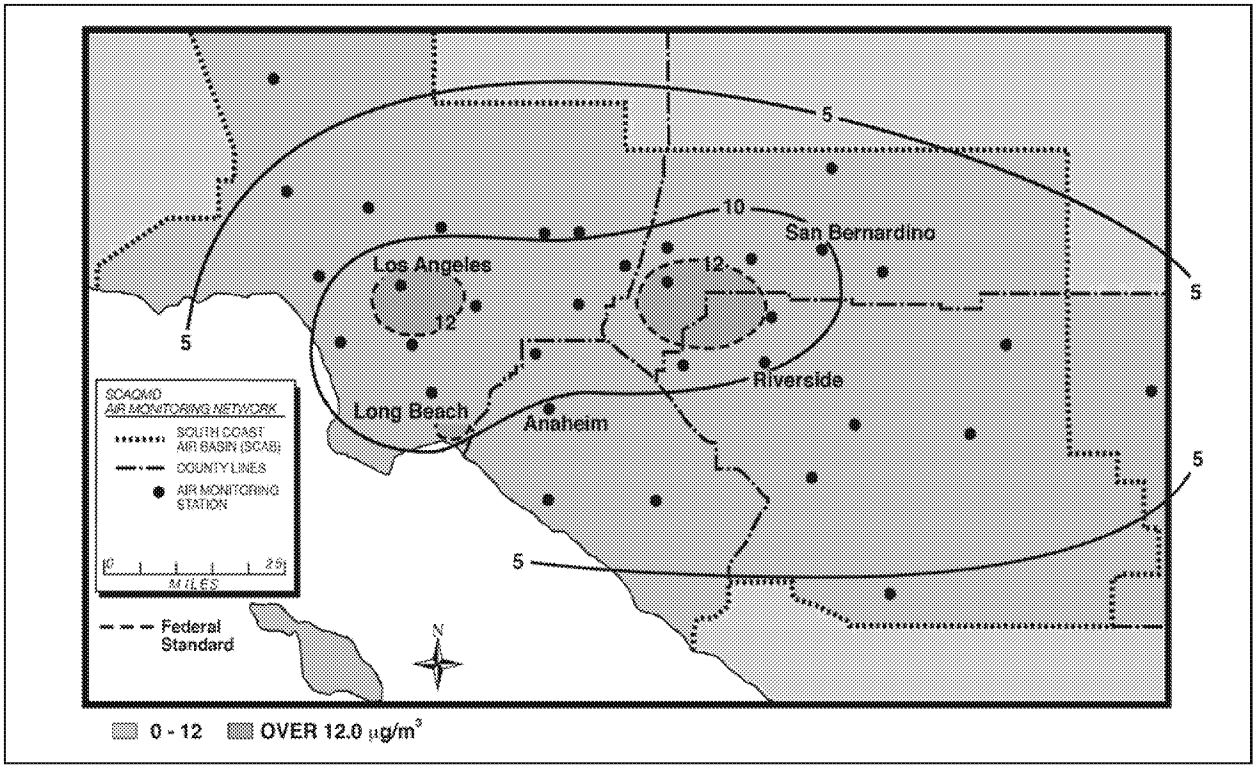

FIGURE 2-8
2015 PM2.5: ANNUAL AVERAGE CONCENTRATION COMPARED TO THE CURRENT FEDERAL STANDARD
(ANNUAL PM2.5 NAAQS = 12 µg/m³, ANNUAL ARITHMETIC MEAN)

Near-Road PM2.5

On December 14, 2012, U.S. EPA strengthened the NAAQS for PM2.5 and, as part of the revisions, a requirement was added to monitor near the most heavily trafficked roadways in large urban areas. Particle pollution is expected to be higher along these roadways as a result of direct emissions from cars and heavy-duty diesel trucks and buses. SCAQMD has installed the two required PM2.5 monitors by January 1, 2015, at locations selected based upon the existing near-roadway NO_2 sites that were ranked higher for heavy-duty diesel traffic. The locations are: (1) I-710, located at Long Beach Blvd. in Los Angeles County near Compton and Long Beach; and (2) CA-Route 60, located west of Vineyard Avenue near the San Bernardino/Riverside County border near Ontario, Mira Loma and Upland. These near-road sites measure PM2.5 daily with FRM filter-based measurements.

Table 2-11 summarizes the 2015 annual and 24-hour PM2.5 data from the near-road sites and nearby ambient monitoring stations. The 2015 PM2.5 annual averages from the Route 710 and Route 60 Near-Road sites were 12.89 and 14.48 µg/m³, respectively. The nearby ambient stations in South Coastal Los Angeles County (North Long Beach Station) and in Metropolitan Riverside County (Mira Loma station) measured 12.81 and 13.34 µg/m³, respectively, for the 2015 annual average. Thus, the PM2.5 measurements from these sites for 2015 indicate that the near-road sites do indeed measure higher than the nearby ambient stations, on average. If this pattern holds for the long term, the CA-60 near-road station could potentially become the 3-year design value site for the Basin for the PM2.5 annual average NAAQS, once sufficient data is collected.

While it reasonably could be expected that the highest near-road site would also become the basin-maximum design value site for the 24-hour PM2.5 NAAQS, this may not be the case for the Basin. The 2015 98th percentile 24-hour PM2.5 concentration is higher at the I-710 Near-Road than at the nearby N. Long Beach station. However, the 98th percentile 24-hour concentration remains higher at Mira Loma (43.2 µg/m^3) than at the CA-60 Near-Road site (39.9 µg/m^3). The number of days over the 24-hour PM2.5 NAAQS was also significantly higher at the Mira Loma station, with 17 days over the 24-hour NAAQS compared to 10 days at the CA-60 Near-Road site. PM2.5 24-hour concentrations at the Mira Loma station are likely higher than the near-road site on the highest days, due to the influence of enhanced secondary particle formation at Mira Loma.

TABLE 2-11

2015 Annual Arithmetic Mean, Maximum and 98th Percentile 24-Hour PM2.5 Concentrations, and Number of Samples Exceeding the 24-Hour PM2.5 NAAQS at South Coast Air Basin Near-Road Sites and Nearby Ambient Stations

Near-Road PM2.5*					Nearby Ambient PM2.5*				
	Annual Average PM2.5 (µg/m^3)	Peak 24-Hour PM2.5 (µg/m^3)	98th Pctl. 24-Hour PM2.5 (µg/m^3)	No. Samples Exceeding 24-Hour PM2.5 NAAQS		Annual Average PM2.5 (µg/m^3)	Peak 24-Hour PM2.5 (µg/m^3)	98th Pctl. 24-Hour PM2.5 (µg/m^3)	No. Samples Exceeding 24-Hour PM2.5 NAAQS
Near-Road Station	**2015**	**2015**	**2015**	**2015**	**Ambient Station**	**2015**	**2015**	**2015**	**2015**
Route 710 N. R. (@ Long Beach Bl., Los Angeles County)	12.89	48.8	35.7	7	**North Long Beach**	10.81	54.6	32.1	3
Route 60 N. R. (West of Vineyard Av., San Bernardino/Riverside County)	**14.48**	52.7	39.9	10	**Mira Loma**	13.34	**56.6**	**43.2**	**17**

Bold text denotes the peak value

* Filter-based FRM measurements shown

The annual PM2.5 NAAQS is 12.0 µg/m^3; the 24-hour PM2.5 NAAQS is 35 µg/m^3

Impacts of Drought on PM2.5 Air Quality

The drought conditions that have persisted in Southern California and the southwestern United States over the past few years have negatively affected air quality in many areas. The low amount and frequency of rainfall leads to less washing of road surfaces and brings drier ground surfaces, which reduces the natural crusting of soils that is improved by moisture. This can lead to enhanced resuspension of fugitive dust by moving vehicles and winds. Fugitive dust can raise concentrations of both PM10 and PM2.5. More importantly, the ongoing drought conditions have caused a reduction of the natural air pollution cleansing effect of precipitation due to washout – particulate matter and its precursors captured

and removed by raindrops. The reduced frequency of storms also translates to fewer days of enhanced pollutant dispersion. Without the storm systems and related winds, there is less mixing of air pollutants with cleaner air in the atmosphere and less of the transport that moves pollutants out of the region. The lack of windy, unstable weather conditions during storms results in longer episodes of stagnant air when particulate pollution builds to unhealthful levels. The dry conditions have also contributed to increased frequency and intensity of wildfire events throughout the State, with resulting impacts to both particulate and ozone air quality. The net impact of the drought on air quality in the Basin over the past several years has been to disrupt the steady progress seen in prior years toward attainment of the 24-hour PM2.5 NAAQS, for which the design value is based on the 3-year average of the 98th percentile measurement.

Table 2-12 shows the rainfall statistics for the National Weather Service Downtown Los Angeles meteorological station, 2006–2015. Figure 2-9 shows the 2002–2015 trend of both 98th percentile 24-hour PM2.5 values and the 3-year design value, along with the trends of PM2.5-equivalent emissions[14] and the number of rainfall days during the first and fourth quarters of the year. The first and fourth quarters are the most important to consider, since the vast majority of the days that exceed the federal 24-hour standard in the Basin occur during this period. This is also the time period that the Basin typically experiences the most rainfall and more frequent storm events.

[14] PM2.5 equivalent emissions are directly emitted PM2.5 emissions plus PM2.5 precursor emissions weighted by potential to create PM2.5 (see 2012 AQMP, Appendix V: Modeling and Attainment Demonstrations).

TABLE 2-12

Trends of Annual and Quarters 1 & 4 Rainfall Totals and Number of Rain Days for Downtown Los Angeles, 2006–2015

30-Year Average	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Annual Rainfall (inches)										
14.93	11.61	5.66	14.43	9.39	23.09	12.26	8.15	3.60	9.77	7.66
Quarter 1 & Quarter 4 (Jan., Feb., Mar., Oct., Nov., Dec.) Rainfall (inches)										
13.38	8.61	4.40	14.28	9.21	21.39	11.80	6.42	2.80	9.37	3.82
Annual Rain Days										
35.7	36	24	35	25	53	32	38	27	24	26
Quarter 1 & Quarter 4 Rain Days										
29	27	19	31	21	44	27	31	21	18	17

Rainfall data from National Weather Service, Downtown Los Angeles Meteorological Station (USC Campus);
Rainfall totals in inches; rain days defined as measured rainfall ≥ 0.01 inches;
30-year normal precipitation averages based on 1981-2010 data

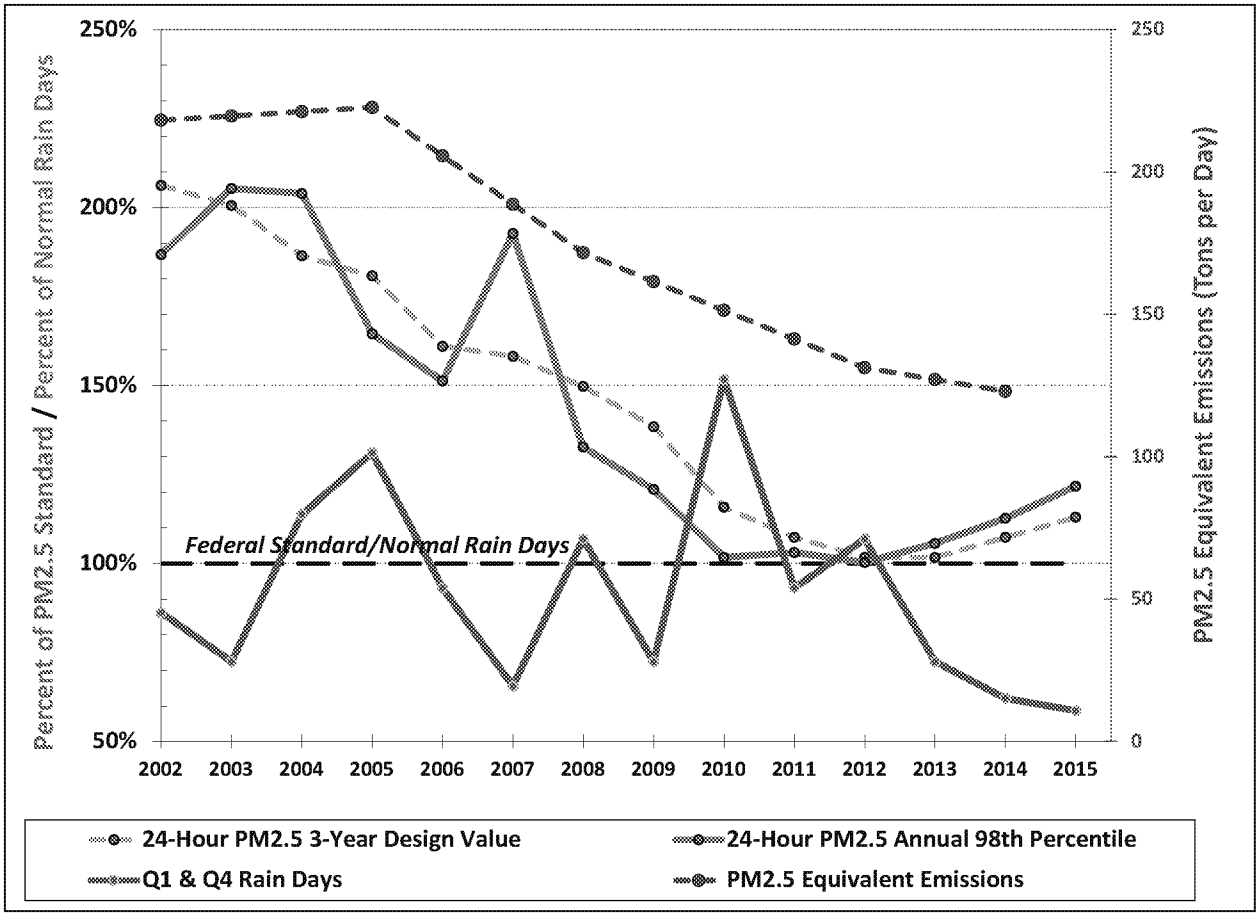

FIGURE 2-9

TREND OF SOUTH COAST AIR BASIN MAXIMUM 24-HOUR PM2.5 YEAR DESIGN VALUES AND CORRESPONDING ANNUAL 98TH PERCENTILE CONCENTRATION AS PERCENT OF THE 24-HOUR PM2.5 NAAQS (35 μg/m^3), WITH ANNUAL TRENDS OF PM2.5 EQUIVALENT EMISSIONS AND PERCENT OF NORMAL NUMBER OF RAIN DAYS FOR QUARTERS 1 (JAN.–MAR.) AND 4 (OCT.–DEC.)

(PM2.5 FROM RIVERSIDE-RUBIDOUX AIR MONITORING STATION THROUGH 2006, THEN MIRA LOMA AFTER THAT STATION WAS INSTALLED)

Annual precipitation totals have been below the normal, or average, value of 14.93 inches (30-year average, 1981–2010) at Downtown Los Angeles from 2011 through most of 2015. Similar relative rainfall deficits were seen at stations throughout Southern California in this time period. After a very wet year in 2010, Downtown Los Angeles measured 82 percent of normal annual rainfall in 2011, with the number of rain days in the first and fourth quarters at 93 percent of the average of 29 days that typically occur during those months. Annual rainfall in 2012 was only 55 percent of normal, but the number of rain days in the first and fourth quarters was a little above normal. Although these initial signs of the emerging drought existed in 2011 and 2012, the cumulative effect of multiple dry years had not yet taken a significant toll on air quality and the amount of storm systems and rain events was not significantly below average. The 98th percentile 24-hour PM2.5 concentrations continued the steady decline in 2012, as had been seen in most years since the PM2.5 measurements started in 1999. This consistent trend

of improving fine particulate air quality is associated with the continued implementation of PM2.5-related emission reductions in the Basin. In 2012, the Basin maximum annual 98th percentile 24-hour PM2.5 was at an all-time low of 35.1 μg/m^3 at Mira Loma, the Basin's highest station, which was under the federal PM2.5 standard (35.5 μg/m^3 is needed to exceed the standard due to rounding conventions).

The 2013 annual rainfall total measured at Downtown Los Angeles was just 3.6 inches, 24 percent of normal. Rainfall events of 0.01 inches or more were 27 percent fewer in 2013 than the average of 29 days that typically occur during the first and fourth quarters of the year, when the Basin historically experiences its highest 24-hour PM2.5 concentrations. As the drought intensified, the impact on PM2.5 air quality became evident in 2013. The 2013 Mira Loma annual 98th percentile concentration increased to 37.5 μg/m^3. The Basin's PM2.5-related emissions continued to decrease, while the long-term trend of steady progress seen in prior years started to reverse due to the drought-related meteorological conditions.

By 2014 the rainfall deficit from the ongoing drought in Southern California had become severe, with annual rainfall totals at 65 percent of normal at Downtown Los Angeles. With only 62 percent of the normal number of rain days and the smaller rain amounts due to the weaker and less frequent storm systems in 2014 and that year's maximum 98th percentile PM2.5 concentration increased to 40.0 μg/m^3.

Southern California annual rainfall totals for 2015 were again quite low, with only 7.66 inches measured at Downtown Los Angeles, 51 percent of normal for the year. The first quarter of 2015 had very little rain, 2.79 inches, which is 30 percent of normal rainfall for that quarter. Only 50 percent of the normal number of rain days were recorded in the first quarter of 2015. A strong El Niño pattern developed by the end of 2015, but the rainfall increased only slightly in the fourth quarter. However, the storm track frequently reached Southern California. Even though there was little precipitation, the improved ventilation from the systems led to significantly improved PM2.5 concentrations in the fourth quarter of 2015. Unfortunately, the effect on the annual 98th percentile PM2.5 concentration was already significant due to the first quarter of 2015. That value for the year 2015 increased to 43.2 μg/m^3 at Mira Loma, the highest 98th percentile concentration measured in the Basin since 2008.

With daily measurements in the Basin for PM2.5, the 98th percentile concentration is typically the eighth highest measurement at the Mira Loma air monitoring station. In recent years, the eighth or ninth highest concentration at Mira Loma may still have been over the level of the federal standard, but with the ongoing effect of the long-term drought and lack of storm systems, the 17th highest concentration, in only the first quarter of 2015, was still over the level of the NAAQS at Mira Loma. This was the highest number of days over the standard at a single station since 2007. Basin-wide, 25 days exceeded the 24-hour standard in 2015, the most in a single year since 2009. Notably, there were no additional exceedances of the 24-hour PM2.5 standard occurring at Mira Loma through the remaining three quarters of 2015, including the fourth quarter which typically includes several days over the standard.

The preliminary PM2.5 data for the first quarter of 2016 indicates that only three days exceeded the 24-hour NAAQS at Mira Loma in that quarter, as compared to 17 days for the first quarter of 2015. Only four days Basin-wide had exceedances of the NAAQS in the first quarter of 2016 at one or more stations, compared to 25 days in 2015. Likewise, the preliminary 2016 first quarter average at Mira Loma was 15.1 μg/m^3, compared to 18.4 μg/m^3 for the first quarter of 2015. As was seen in the fourth quarter of 2015, the Basin did not receive the anticipated high rainfall in the first quarter of 2016 with the El Niño

conditions, but the number of days with unsettled, breezy weather conditions was significantly greater than in 2014 and 2015, leading to fewer days with elevated PM2.5 levels.

While the 2012 AQMP PM2.5 attainment demonstration and the 2015 associated supplemental SIP submission indicated that attainment of the 24-hour standard was predicted to occur by the end of 2015, it could not anticipate the effect of the ongoing drought on the measured PM2.5. The 2006 to 2010 base period used for the 2012 attainment demonstration had near-normal rainfall. While the trend of PM2.5-equivalent emission reductions continued through 2015, the severe drought conditions contributed to the PM2.5 increases observed after 2012. As a result of the disrupted progress toward attainment of the federal 24-hour PM2.5 standard, SCAQMD submitted a request and the U.S. EPA approved, in January 2016, a "bump up" to the nonattainment classification from "moderate" to "serious," with a new attainment deadline as soon as practicable, but not beyond December 31, 2019. Further discussion of drought effects on future air quality is contained in Appendix V: Modeling and Attainment Demonstrations.

Air Quality, PM10

In 2015, SCAQMD routinely monitored PM10 concentrations at 25 locations in the Basin and the Coachella Valley. Of these, 19 employed FRM filter samplers. The FRM PM10 minimum sampling schedule set by U.S. EPA requires one 24-hour filter sample every sixth day. At the Riverside-Rubidoux, Mira Loma, and Indio stations, the 24-hour filter sample is collected once every three days. In addition, nine stations have FEM[15] continuous monitors, which supplement the collocated FRM measurements at five stations and are the primary measurement at four more stations. Unlike PM2.5 FEM measurements, there is no waiver for PM10 FEM instruments and those measurements serve as the official reading for attainment determination on the days with no collocated FRM filter sample.

The maximum 24-hour PM10 levels in 2015 are summarized by county and basin in Table 2-13, along with the design values and state designation values. The federal 24-hour standard level (155 $\mu g/m^3$ is the exceedance level) was only exceeded at two stations in the Basin on two different days in 2015, in the Perris Valley on September 9 (188 $\mu g/m^3$) and in the Central San Bernardino Valley on December 26 (187 $\mu g/m^3$), measured with FRM monitors. These high 24-hour averages were both due to high-wind exceptional events and also do not jeopardize the attainment design value at this time, which allows for one exceedance per year at a station, averaged over three years. The Basin has remained in attainment of the PM10 NAAQS since 2006. The Basin maximum 2013–2015 design value for 24-hour PM10 is 126 $\mu g/m^3$ (81 percent of the NAAQS), in Metropolitan Riverside County at the Mira Loma monitoring station. The much more stringent State 24-hour PM10 standard (50 $\mu g/m^3$) was exceeded at many stations in the Basin and in the Coachella Valley.

The Coachella Valley had eight days in 2015 exceeding the 24-hour PM10 NAAQS, with concentrations as high as 337 $\mu g/m^3$ at the Indio monitoring station – all of which were due to windblown dust and sand associated with high-wind exceptional events. The Palm Springs monitoring station only exceeded on

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[15] The continuous FEM PM10 monitors deployed by SCAQMD are primarily Beta Attenuation Monitor (BAM) instruments, although some PM10 Tapered Element Oscillating Microbalance (TEOM) instruments are also used, most notably in the Coachella Valley.

two of those days. The recent FEM monitor at Saul Martinez Elementary School, in the town of Mecca in the southeastern portion of the Coachella Valley, exceeded the standard on five days in 2015, all related to high-wind events. The Coachella Valley 2013–2015 design value for 24-hour PM10 is 150 µg/m^3, at Indio, after the exclusion of the exceptional events, which would not violate the PM10 NAAQS, if U.S. EPA concurs with exceptional events upon submittal of supporting documentation.

TABLE 2-13

2015 Maximum 24-hour Average PM10 Concentrations and 2013–2015 Design Values by Basin and County

Basin/County	2015 Maximum PM10 24-Hour Average (µg/m^3)*	2013–2015 PM10 24-Hour Design Value (µg/m^3)*	2013–2015 Percent of PM10 NAAQS (150 µg/m^3)#	Area of Design Value Max	2013–2015 High State PM10 24-Hour Designation Value (µg/m^3)##	2013–2015 Percent of State PM10 24-Hour Standard (50 µg/m^3)
South Coast Air Basin						
Los Angeles	101	93	60	East San Gabriel Valley	75.6	151
Orange	66	85	55	Central Orange County	12.1	24
Riverside	**139****	**126**	**81**	**Metropolitan Riverside County**	**123.8**	**248**
San Bernardino	96**	103	66	Central San Bernardino Valley	19.2	38
Salton Sea Air Basin						
Riverside	**152****	**150**	**100**	**Coachella Valley (Indio)**	**128.2**	**256**

Bold text denotes the peak value

* Based on the FRM data when available, otherwise FEM data is included

** Higher 24-hour PM10 concentrations were measured in 2015, up to 337 µg/m^3 in the Coachella Valley and up to 188 µg/m^3 in Riverside County (Perris station), that were related to high-wind events and have been flagged for exclusion from NAAQS comparison in accordance with the U.S. EPA Exceptional Events Rule; U.S. EPA concurrence is required for exclusion of exceptional events after submittal of supporting documentation

\# 155 µg/m^3 is needed to exceed the level of the PM10 NAAQS

The State 24-hour Expected Peak Day Concentration (EPDC) is a calculated 3-year value after accounting for statistical outliers; the State 24-hour Designation Value is the highest concentration at or below the EPDC over the 3-year period; State data may include exceptional events; State PM10 24-hour average designation value includes FRM and BAM FEM data, but not TEOM FEM instruments since the TEOM is not a California Approved Sampler (CAS) for standard compliance (SCAQMD uses TEOM instruments to supplement FEM measurements in the Coachella Valley)

The maximum annual average PM10 in 2015 is summarized by county and air basin in Table 2-14, along with the design values and state designation values. In 2015, the revoked annual average PM10 NAAQS (50 µg/m^3) was not exceeded in the Basin, with an annual averaged concentration of 48.8 µg/m^3 in Metropolitan Riverside County at the Mira Loma station. However, the 3-year annual PM10 design value for 2013–2015 exceeded the former NAAQS at Mira Loma, at 51.8 µg/m^3. No other stations in the Basin or the Coachella Valley exceeded the former standard in 2015 or for the 2013–2015 design value. The

much more stringent State annual PM10 standard (20 µg/m^3) was exceeded in most stations in each county in the Basin and in the Coachella Valley.

TABLE 2-14

2015 Maximum Annual Average PM10 Concentrations and 2013–2015 Design Values by Basin and County

Basin/County	2015 Maximum PM10 Annual Average (µg/m^3)*	2013–2015 PM10 Annual Design Value (µg/m^3)	2013–2015 Percent of Former PM10 Annual NAAQS** (50 µg/m^3)	Area of Design Value Max	2013–2015 3-Yr. High State PM10 Annual Designation Value (µg/m^3)#	2013–2015 Percent of Current PM10 State Standard (20 µg/m^3)
South Coast Air Basin						
Los Angeles	37.1	38.0	76	East San Gabriel Valley	43	215
Orange	24.8	26.1	52	Central Orange County	27	135
Riverside	**48.8**	**51.8**	**104**	**Metropolitan Riverside County**	**45**	**225**
San Bernardino	37.8	39.4	79	Central San Bernardino Valley	39	195
Salton Sea Air Basin						
Riverside	36.5	37.2	74	Coachella Valley (Indio)	**45**	**225**

Bold text denotes the peak value

* Based on the FRM data when available, otherwise FEM data is used; flagged exceptional event days are excluded

** The federal annual PM10 standard was revoked in 2006

\# State data may include exceptional events; State PM10 annual average designation value includes FRM and BAM FEM data, but not TEOM FEM instruments since the TEOM is not a California Approved Sampler (CAS) for standard compliance (SCAQMD uses TEOM instruments to supplement FEM measurements in the Coachella Valley); State annual designation value is the highest year in the 3-year period

Other Criteria Air Pollutants

Carbon Monoxide (CO)

Health Effects, CO

The adverse effects of ambient carbon monoxide air pollution exposure on health have been reviewed in the 2010 U.S. EPA *Integrated Science Assessment for Carbon Monoxide.*[16] This document presents a detailed review of the available scientific studies and conclusions on the causal determination of the health effects of CO. A summary of health effects information and additional references can also be found in Appendix I: Health Effects.

Individuals with a deficient blood supply to the heart are the most susceptible to the adverse effects of CO exposure. The effects observed include earlier onset of chest pain with exercise, and electrocardiograph changes indicative of worsening oxygen supply delivery to the heart.

Inhaled CO has no known direct toxic effect on the lungs, but exerts its effect on tissues by interfering with oxygen transport, by competing with oxygen to combine with hemoglobin present in the blood to form carboxyhemoglobin (COHb). Hence, people with conditions requiring an increased oxygen supply can be adversely affected by exposure to CO. Individuals most at risk include patients with diseases involving heart and blood vessels, fetuses, and patients with chronic hypoxemia (oxygen deficiency), such as is seen at high altitudes.

Reductions in birth weight and impaired neurobehavioral development have been observed in animals chronically exposed to CO resulting in COHb levels similar to those observed in smokers. Recent studies have found increased risks for adverse birth outcomes with exposure to elevated CO levels, including pre-term births and heart abnormalities.

Air Quality, CO

Ambient carbon monoxide concentrations were measured at 25 locations in the Basin and neighboring SSAB areas in 2015, including one station in the Coachella Valley and two year-road monitors. Tables 2-15 and 2-16 summarize the 2015 maximum 1-hour and 8-hour average concentrations of CO by air basin and county. In 2015, no areas in the Basin or the Coachella Valley exceeded the CO air quality standards, including the near-road stations. The highest concentrations of CO continued to be recorded in the areas of Los Angeles County, where vehicular traffic is most dense, with the maximum 8-hour and 1-hour concentration (4.3 ppm and 3.0 ppm, respectively) recorded in the South Central Los Angeles County area. The new near-road monitors in Orange and San Bernardino counties did not increase the Basin's maximum CO values or design values in 2015 over that from Los Angeles County, although the near-road concentrations were often higher than the nearest ambient stations.

All areas of the Basin have continued to remain below the federal standards (35 ppm 1-hour and 9 ppm 8-hour) since 2003. U.S EPA re-designated the Basin to attainment of the federal CO standards, effective June 11, 2017. There also have been no exceedances of the State 1 episode (federal alert) level (8-hour

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[16] U.S. EPA. (2010). Integrated Science Assessment for Carbon Monoxide (Final Report). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R-09/019F. http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=218686.

CO ≥ 15 ppm). The Basin and the Coachella Valley are also well below the State CO standards (20 ppm 1-hour and 9.0 ppm 8-hour).

TABLE 2-15

2015 Maximum 1-Hour CO Concentrations and 2015 Design Values by Basin and County

Basin/County	2015 Maximum CO 1-Hour Average (ppm)	2015 CO 1-Hour Design Value* (ppm)	Percent of CO 1-Hour NAAQS (35 ppm)	Area of Design Value Max	Percent of CO 1-Hour State Standard (20 ppm)
South Coast Air Basin					
Los Angeles	**4.4**	**4.3**	**11**	**South Central L.A. County**	**22**
Orange	3.1	2.9	8	North Orange County	15
	(3.1 at I-5 N.R.)	*(2.9 at I-5 N.R.)*	*(8)*		*(15)*
Riverside	2.5	2.2	6	Metropolitan Riverside County	11
San Bernardino	2.8	2.2	6	Central San Bernardino Valley	11
	(2.7 at I-10 N.R.)	*(2.7 at I-10 N.R.)***	*(8)*		*(14)*
Salton Sea Air Basin					
Riverside	2.0	1.9	5	Coachella Valley	10

Bold text denotes Basin maximum; I-5 and I-10 near-road monitors are shown in parenthesis

* The 1-hour CO design value is the 2nd highest 1-hour average concentration at a station in a single year

** The 2015 1-hour CO design value maximum in San Bernardino County was at the I-10 near-road station

TABLE 2-16

2015 Maximum 8-Hour CO Concentrations and 2015 Design Values by Basin and County

Basin/County	2015 Maximum CO 8-Hour Average (ppm)	2015 CO 8-Hour Design Value* (ppm)	Percent of CO 8-Hour NAAQS (9 ppm)	Area of Design Value Max	Percent of CO 8-Hour State Standard (9.0 ppm)
South Coast Air Basin					
Los Angeles	**3.3**	**3.0**	**33**	**South Central L.A. County**	**33**
Orange	2.2 *(2.3 at I-5 N.R.)*	2.0 *(2.3 at I-5 N.R.)*	22 *(26)*	Central Orange County	22 *(26)*
Riverside	1.7	1.5	17	Metropolitan Riverside County	17
San Bernardino	1.8 *(2.6 at I-10 N.R.)*	1.8 *(2.5 at I-10 N.R.)*	20 *(28)*	Central San Bernardino Valley	20 *(28)*
Salton Sea Air Basin					
Riverside	0.7	0.5	6	Coachella Valley	6

Bold text denotes Basin maximum; I-5 and I-10 near-road monitors are shown in parenthesis

* The 8-hour CO design value is the 2nd highest 8-hour average concentration at a station in a single year

Near-Road CO

On August 12, 2011 U.S. EPA issued a decision to retain the existing NAAQS for CO, determining that those standards provided the required level of public health protection. However, U.S. EPA added a monitoring requirement for near-road CO monitors in urban areas with population of 1 million or more, utilizing stations that would be implemented to meet the 2010 NO_2 near-road monitoring requirements. The two new CO monitors are at the I-5 Near-Road site, located in Orange County near Anaheim, and the I-10 Near-Road site, located near Etiwanda Avenue in San Bernardino County near Ontario, Rancho Cucamonga and Fontana.

The near-road CO measurements began at these two locations in late December 2014. From that time to the end of 2015, the data shows that while the near-road measurements were often higher than the nearest ambient monitors, as would be expected in the near-road environment, they did not exceed the levels of the 1-hour or 8-hour CO NAAQS. Tables 2-17 and 2-18 compare the available near-road measurements for annual peak 1-hour and 8-hour CO, respectively, to the comparable measurements from the nearby ambient stations at Anaheim and Fontana. The form of the CO standard is such that the peak concentration is not to be exceeded more than once per year. The tables include the second highest concentration for comparison to this design value form of the standard.

The 2015 near-road peak 1-hour CO concentration measured was 3.1 ppm, measured at the I-5 Near-Road site, while the peak 8-hour CO concentration was 2.6 ppm at the I-10 Near-Road site, both well below the respective NAAQS levels (35 ppm and 9 ppm, respectively). The 2015 near-road CO design values were higher than that of the nearest ambient stations for both federal standards. Based on this limited period

of data, it appears that the near-road CO design values will be very unlikely to affect the Basin's attainment status for the State and federal CO standards.

TABLE 2-17

2014 and 2015 Maximum and Second Highest 1-Hour CO Concentrations
at South Coast Air Basin Near-Road Sites and Nearby Ambient Stations

Near-Road CO						Nearby Ambient CO				
		Peak 1-Hour CO (ppm)		2nd Maximum 1-Hour CO (ppm)			Peak 1-Hour CO (ppm)		2nd Maximum 1-Hour CO (ppm)	
Near-Road Station	**Start Date**	**2014**	**2015**	**2014**	**2015**	**Ambient Station**	**2014**	**2015**	**2014**	**2015**
Route 5 N. R. (at Vernon St., Orange County)	12/18/2014	N/A	3.1	N/A	**2.9**	**Anaheim**	3.1	3.1	2.6	2.6
Route 10 N. R. (at Etiwanda Av., San Bernardino County)	12/23/2014	N/A	**2.7**	N/A	**2.7**	**Fontana**	2.6	2.8	2.2	2.2

Bold text denotes maximum concentration between near-road and nearby ambient stations
N/A = complete data not available for valid calculation
The 1-hour CO NAAQS is 35 ppm, not to be exceeded more than once at a station in a single year

TABLE 2-18

2014 and 2015 Maximum and Second Highest 8-Hour CO Concentrations
at South Coast Air Basin Near-Road Sites and Nearby Ambient Stations

Near-Road CO						Nearby Ambient CO				
		Peak 8-Hour CO (ppm)		2nd Maximum 8-Hour CO (ppm)			Peak 8-Hour CO (ppm)		2nd Maximum 8-Hour CO (ppm)	
Near-Road Station	**Start Date**	**2014**	**2015**	**2014**	**2015**	**Ambient Station**	**2014**	**2015**	**2014**	**2015**
Route 5 N. R. (at Vernon St., Orange County)	12/18/2014	N/A	2.3	N/A	2.3	**Anaheim**	**2.1**	**2.2**	**2.1**	**2.0**
Route 10 N. R. (at Etiwanda Av., San Bernardino County)	12/23/2014	N/A	**2.6**	N/A	**2.5**	**Fontana**	1.2	1.2	1.1	1.1

Bold text denotes maximum concentration between near-road and nearby ambient stations
N/A = complete data not available for valid calculation
The 8-hour CO NAAQS is 9 ppm, not to be exceeded more than once at a station in a single year

Nitrogen Dioxide (NO_2)

Health Effects, NO_2

The adverse effects of ambient nitrogen dioxide air pollution exposure on health were reviewed in the 2008 U.S. EPA *Integrated Science Assessment for Oxides of Nitrogen – Health Criteria*,[17] and more recently in the 2016 U.S. EPA *Integrated Science Assessment for Oxides of Nitrogen – Health Criteria.*[18] These documents present detailed reviews of the available scientific studies and conclusions on the causal determination of the health effects of NO_2, including evidence supporting the short-term NO_2 standard (1-hour, 100 ppb), which was adopted in 2010. A summary of health effects information and additional references can also be found in Appendix I: Health Effects.

The 2016 U.S. EPA review noted the respiratory effects of NO_2, and evidence suggestive of impacts on cardiovascular health, mortality and cancer. Evidence for low-level nitrogen dioxide (NO_2) exposure effects is derived from laboratory studies of asthmatics and from epidemiological studies. Additional evidence is derived from animal studies. In the 2016 ISA, the U.S. EPA cited the coherence of the results

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[17] U.S. EPA. (2008). Integrated Science Assessment for Oxides of Nitrogen – Health Criteria (Final Report). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R-08/071. http://cfpub.epa.gov/ncea/isa/recordisplay.cfm?deid=194645.

[18] U.S. EPA. (2016). Integrated Science Assessment for Oxides of Nitrogen – Health Criteria (Final Report). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R-15/068. https://cfpub.epa.gov/ncea/isa/recordisplay.cfm?deid=310879.

from a variety of studies, and a plausible biological mechanism to support the determination of a causal relationship between short-term NO_2 exposures and asthma exacerbations ("asthma attacks"). The long-term link with respiratory outcomes was strengthened by recent experimental and epidemiological studies, and the strongest evidence available is from studies of asthma development.

Experimental studies have found that NO_2 exposures increase responsiveness of airways, pulmonary inflammation, and oxidative stress, and can lead to the development of allergic responses. These biological responses provide evidence of a plausible mechanism for NO_2 to cause asthma. Additionally, results from controlled exposure studies of asthmatics demonstrate an increase in the tendency of airways to contract in response to a chemical stimulus (airway responsiveness) or after inhaled allergens. Animal studies also provide evidence that NO_2 exposures have negative effects on the immune system, and therefore increase the host's susceptibility to respiratory infections. Epidemiological studies showing associations between NO_2 levels and hospital admissions for respiratory infections support such a link, although the studies examining respiratory infections in children are less consistent.

Based on the review of the NO_2 standards, U.S. EPA established the 1-hour NO_2 standard to protect the public health against short-term exposure. The standard is set at 100 ppb over a 1-hour average and became effective on April 7, 2010.

Air Quality, NO_2

In 2015, ambient NO_2 concentrations were monitored at 27 locations, including one in the Coachella Valley and four near-road monitoring stations. The Basin has not exceeded the federal annual standard for NO_2 (0.0534 ppm) since 1991, when the Los Angeles County portion of the Basin recorded the last violation of that standard in the U.S. The current 1-hour average NO_2 NAAQS (100 ppb) was exceeded on one day in 2015 in the South Coastal Los Angeles County area at the Long Beach – Hudson air monitoring station (a location close to periodic diesel truck and bus activity). However, the 98th percentile form of the standard was not exceeded and the 2013–2015 design value is not in violation of the NAAQS.

The higher relative concentrations in the Los Angeles area are indicative of the concentrated emission sources, especially heavy-duty vehicles. Although the Basin is in attainment of the State and federal standards, NO_2 is still of concern, since oxides of nitrogen (NOx) are precursors to both ozone and particulate matter. Further control of NO_x will be required to attain the ozone and particulate standards. The Basin has not exceeded the federal annual standard for NO_2 (0.053 ppm or 53 ppb) since 1991, when the Los Angeles County portion of the Basin recorded the last violation of that standard in the U.S. No State NO_2 standards were exceeded in 2015. Tables 2-19 and 2-20 summarize the 2015 maximum 1-hour and annual average concentrations of NO_2 by air basin and county. These tables do not include the new near-road stations, since the period of record is not yet sufficient to calculate the 3-year NO_2 design values. The near-road NO_2 data is summarized further below.

TABLE 2-19

2015 Maximum 1-Hour NO_2 Concentrations and 2013–2015 Design Values by Basin and County

Basin/County	2015 Maximum NO_2 1-Hour Average (ppb)	2013–2015 NO_2 1-Hour Design Value (ppb)	Percent of NO_2 1-Hour NAAQS (100 ppb)	Area of Design Value Max	2013–2015 NO_2 1-Hour State Designation Value (ppm)	Percent of NO_2 1-Hour State Standard (0.18 ppm)
South Coast Air Basin						
Los Angeles	**101.8***	**74**	**74**	**South Coastal LA Co.**	**0.14**	**78**
Orange	59.1	58	58	Central Orange County	0.09	50
Riverside	68.1	54	54	Metropolitan Riverside County	0.07	39
San Bernardino	89.1	64	64	Central San Bernardino Valley	0.09	50
Salton Sea Air Basin						
Riverside	41.5	39	39	Coachella Valley	0.05	28

Bold text denotes the peak value

This table does not include near-road stations since the data period is insufficient for 3-year design value calculation (see near-road discussion below)

The 1-hour NO_2 design value is the annual 98th percentile daily maximum 1-hour concentration, averaged over 3 years at a station

* Although the maximum 1-hour concentrations exceeded the standard on one day, the 98th percentile form of the design value did not exceed the NAAQS

TABLE 2-20

2015 Maximum Annual Average NO_2 Concentrations and 2013–2015 Design Values by Basin and County

Basin/County	2015 Maximum NO_2 Annual Average (ppm)	2013–2015 NO_2 Annual Design Value (ppm)	Percent of NO_2 Annual NAAQS (0.053 ppm)	Area of Design Value Max	2013–2015 NO_2 Annual State Designation Value# (ppm	Percent of NO_2 Annual State Standard (0.030 ppm)
South Coast Air Basin						
Los Angeles	**0.0222**	**0.022**	**42**	**Central Los Angeles County**	**0.023**	**77**
Orange	0.0150	0.016	30	Central Orange County	0.018	60
Riverside	0.0144	0.016	30	Metropolitan Riverside County	0.017	57
San Bernardino	0.0187	0.020	38	Central San Bernardino Valley	0.021	70
Salton Sea Air Basin						
Riverside	0.0062	0.007	13	Coachella Valley	0.008	27

Bold text denotes the peak value

The annual NO_2 design value is the annual average of the quarterly averages, averaged over 3 years at a station

This table does not include near-road stations since the data period is insufficient for the design value calculation

Near-Road NO_2

With the revised NO_2 federal standard in 2010, near-road NO_2 measurements were required to be phased in for larger cities. The four near-road monitoring stations are: (1) I-5 Near-Road, located in Orange County near Anaheim; (2) I-710 Near-Road, located at Long Beach Blvd. in Los Angeles County near Compton and Long Beach; (3) CA-60 Near-Road, located west of Vineyard Avenue near the San Bernardino/Riverside County border near Ontario, Mira Loma and Upland; and (4) I-10 Near-Road, located near Etiwanda Avenue in San Bernardino County near Ontario, Rancho Cucamonga and Fontana.

The longest operating near-road station in the Basin, adjacent to I-5 in Orange County, has not exceeded the level of the 1-hour NO_2 NAAQS (100 ppb) since the measurements began on January 1, 2014. The peak 1-hour NO_2 concentration at that site in 2014 was 78.8 ppb and the peak concentration for 2015 was 70.2 ppb. This can be compared to the annual peak values measured at the nearest ambient monitoring station in Central Orange County (Anaheim station), where the 2014 and 2015 peaks were 75.8 and 59.1, respectively. In terms of the design value form of the NAAQS, the 98th percentile daily maximum 1-hour concentrations at the Anaheim near-road site were 66.0 ppb and 61.4 ppb, respectively, for 2014 and 2015, compared to 59.8 ppb and 54.6 ppb from the Anaheim ambient monitoring station. The annual average NO_2 NAAQS (0.053 ppm, or 53 ppb) was also not exceeded. Thus, while the Anaheim near-road NO_2 measurements are higher than the ambient Orange County measurements, as would be expected close to traffic emissions sources, it does not appear that NO_2 design values will violate the NAAQS or CAAQS at this location.

Likewise, the shorter period of data available from the remaining three near-road stations indicates that these locations will also likely measure higher NO_2 than the nearest ambient stations, but they have not exceeded the level of the 1-hour or annual NO_2 NAAQS or CAAQS through the end of 2015. Tables 2-21 and 2-22 compare the available near-road NO_2 measurements for peak 1-hour and annual average NO_2, respectively, to the nearest ambient measurements. The 98th percentile concentration is included for comparison to the design value form of the 1-hour NO_2 NAAQS of 100 ppb. Based on this limited period of data, it appears that the near-road NO_2 measurements will be unlikely to affect the Basin's attainment status for the State and federal NO_2 standards.

TABLE 2-21

2014 and 2015 Maximum and 98th Percentile 1-Hour NO_2 Concentrations
at South Coast Air Basin Near-Road Sites and Nearby Ambient Stations

Near-Road NO_2						Nearby Ambient NO_2				
		Annual Peak 1-Hour NO_2 (ppb)		98th Percentile 1-Hour NO_2 (ppb)			Annual Peak 1-Hour NO_2 (ppb)		98th Percentile 1-Hour NO_2 (ppb)	
Near-Road Station	**Start Date**	**2014**	**2015***	**2014**	**2015***	**Ambient Station**	**2014**	**2015**	**2014**	**2015**
I-5 N. R. (at Vernon St., Orange County)	1/1/2014	**78.8**	**70.2**	**66.0**	**61.4**	**Anaheim**	**75.8**	59.1	59.8	54.6
I-710 N. R. (at Long Beach Bl., Los Angeles County)	2/18/2015	N/A	**94.7**	N/A	**74.8**	**Compton**	68.2	73.6	59.2	58.7
CA-60 N. R. (West of Vineyard Av., San Bernardino/Riverside County)	7/9/2015	N/A	**79.2**	N/A	**77.2**	**Upland**	74.1	71.6	56.7	55.7
I-10 N. R. (at Etiwanda Av., San Bernardino County)	10/8/2014	**93.0**	87.2	**69.5**	**73.0**	**Fontana**	70.4	**89.1**	63.6	66.1

Bold text denotes the peak value

N/A = data not available (monitoring not started)

* 2015 data is incomplete for I-710 and CA-60 Near-Road Sites

The 1-hour NO_2 NAAQS is 100 ppb

TABLE 2-22

2014 and 2015 Annual NO_2 Concentrations at South Coast Air Basin
Near-Road Sites and Nearby Ambient Stations

Near-Road NO_2				Nearby Ambient NO_2		
		Annual Average NO_2 (ppb)			Annual Average NO_2 (ppb)	
Near-Road Station	**Start Date**	**2014**	**2015***	**Ambient Station**	**2014**	**2015**
I-5 N. R. (at Vernon St., Orange County)	1/1/2014	**27.2**	**25.4**	**Anaheim**	15.2	14.6
I-710 N. R. (at Long Beach Bl., Los Angeles County)	2/18/2015	N/A	23.9	**Compton**	15.6	16.9
CA-60 N. R. (West of Vineyard Av., San Bernardino/Riverside County)	7/9/2015	N/A	N/A	**Upland**	16.6	15.9
I-10 N. R. (at Etiwanda Av., San Bernardino County)	10/8/2014	N/A	**29.8**	**Fontana**	20.2	18.7

Bold text denotes the peak value
N/A = data not available (monitoring not started)
* 2015 data is incomplete for I-710 and CA-60 Near-Road Sites
The annual average NO_2 NAAQS is 0.053 ppm, or 53 ppb

Sulfur Dioxide (SO_2)

Health Effects, SO_2

The adverse effects of SO_2 air pollution exposure on health were reviewed in the 2008 U.S. EPA *Integrated Science Assessment (ISA) for Sulfur Oxides – Health Criteria*.[19] This document presents a detailed review of the available scientific studies and conclusions on the causal determination of the health effects of SO_2, including the justification to rescind the 24-hour standard and replace it with the new 2010 1-hour standard (75 ppb). A summary of health effects information and additional references can also be found in Appendix I: Health Effects.

Individuals affected by asthma are especially sensitive to the effects of SO_2. Exposure to low levels (0.2 to 0.6 ppm) of SO_2 for a few (5–10) minutes can result in airway constriction in some exercising asthmatics. Increased resistance to air flow and reduction in breathing capacity leading to severe breathing

[19] U.S. EPA. (2008). Integrated Science Assessment (ISA) for Sulfur Oxides – Health Criteria (Final Report). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R-08/047F. http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=198843#Download.

difficulties, are observed after acute high exposure to SO_2 in asthmatics. In contrast, healthy individuals do not exhibit similar acute responses even after exposure to higher concentrations of SO_2.

Animal studies suggest that SO_2 at ambient concentrations can cause allergic sensitization and airway inflammation. Some population-based studies indicate that the mortality and morbidity effects associated with fine particles show a similar association with ambient SO_2 levels. In these studies, efforts to separate the effects of SO_2 from those of fine particles have not been successful. It is not clear whether the two pollutants act synergistically or one pollutant alone is the predominant factor.

Based on the review of the SO_2 standards, U.S. EPA has established the 1-hour SO_2 standard to protect the public health against short-term exposure. The 1-hour average NAAQS was set at 75 ppb and the annual (0.03 ppm) and 24-hour (0.14 ppm) federal standards were revoked, effective August 2, 2010.

Air Quality, SO_2

No exceedances of federal or State standards for sulfur dioxide occurred in 2015, or in any recent year, at any of the six SCAQMD ambient monitoring locations. The annual and 24-hour federal standards were last exceeded in the 1960's and the State standards were last exceeded in 1990. Though sulfur dioxide concentrations remain well below the standards, sulfur dioxide is a precursor to sulfate, which is a component of fine particulate matter. Tables 2-23 and 2-24 summarize the 2015 maximum 1-hour and annual average concentrations of SO_2 by air basin and county. Sulfur dioxide was not measured at the Coachella Valley sites in 2015. Historical measurements and source emission profiles show that expected concentrations in the Coachella Valley will be well below State and federal standards.

TABLE 2-23

2015 Maximum 1-Hour SO_2 Concentrations and 2013–2015 Design Values by Basin and County

Basin/County	2015 Maximum SO_2 1-Hour Average (ppb)	2013–2015 SO_2 1-Hour Design Value (ppb)	Percent of SO_2 1-Hour NAAQS (75 ppb)	Area of Design Value Max	Percent of SO_2 1-Hour State Standard (0.25 ppm = 250 ppb)
South Coast Air Basin					
Los Angeles	**37.5**	**11**	**15**	**South Coastal LA County**	**4**
Orange	4.5	3	4	North Coastal Orange County	1
Riverside	1.9	3	4	Metropolitan Riverside County	1
San Bernardino	4.0	3	4	Central San Bernardino Valley	1
Salton Sea Air Basin					
Riverside	N.D.	N.D.	N.D.	Coachella Valley	N.D.

Bold text denotes the peak value

N.D. = No Data. Historical measurements and lack of emissions sources indicate concentrations are well below standards

The 1-hour SO_2 design value is the annual 99th percentile 1-hour daily maximum concentration, averaged over 3 years at a station

TABLE 2-24

2015 Maximum 24-Hour Average SO_2 Concentrations and 2013–2015 Design Values by Basin and County

Basin/County	2015 Maximum SO_2 24-Hour Average (ppm)	2013–2015 SO_2 24-Hour Design Value (ppm)	Percent of SO_2 24-Hour former NAAQS (0.14 ppm)	Area of Design Value Max	Percent of SO_2 24-Hour State Standard (0.04 ppm)
South Coast Air Basin					
Los Angeles	**0.005**	**0.003**	**2**	**South Coastal LA County**	**8**
Orange	0.001	0.001	1	North Coastal Orange County	3
Riverside	0.001	0.001	1	Metropolitan Riverside County	3
San Bernardino	0.001	0.001	2	Central San Bernardino Valley	3
Salton Sea Air Basin					
Riverside	N.D.	N.D.	N.D.	Coachella Valley	N.D.

Bold text denotes the peak value

N.D. = No Data. Historical measurements and lack of emissions sources indicate concentrations are well below standards

The 24-hour SO_2 design value is the 2nd highest 24-hour average concentration at a station in a single year

Sulfates (SO_4^{2-})

Health Effects, SO_4^{2-}

In 2002, CARB reviewed and retained the State standard for sulfates, retaining the concentration level (25 µg/m^3) but changing the basis of the standard from a Total Suspended Particulate (TSP) measurement to a PM10 measurement. In their 2002 staff report,[20] CARB reviewed the health studies related to exposure to ambient sulfates, along with particulate matter, and found an association with mortality and the same range of morbidity effects as PM10 and PM2.5, although the associations were not as consistent as with PM10 and PM2.5. The 2009 U.S. EPA *Integrated Science Assessment for Particulate Matter*[21] also contains a review of sulfate studies.

Most of the health effects associated with fine particles and SO_2 at ambient levels are also associated with sulfates. Thus, both mortality and morbidity effects have been observed with an increase in ambient sulfate concentrations. However, efforts to separate the effects of sulfates from the effects of other pollutants have generally not been successful.

Air Quality, SO_4^{2-}

Sulfates, as measured from FRM PM10 filters, was sampled at 18 stations in 2015 in the SCAQMD jurisdiction, including two locations in the Coachella Valley. Two stations were closed in 2014, Burbank and Ontario Fire Station, with only partial-year data available. The North Long Beach station was closed in 2013. New locations are pending for the Burbank and North Long Beach stations. Since the sulfate measurement is analyzed in the laboratory from the collected 24-hour PM10 filters, the sulfate network is identical to the FRM PM10 monitoring network. The measurements are done every sixth day, except that two stations in Metropolitan Riverside County (Rubidoux and Mira Loma) and one in the Coachella Valley (Indio) measure every third day.

In 2015, the State 24-hour PM10-sulfate standard (25 µg/m^3) was not exceeded anywhere in the Basin or the Coachella Valley, nor has it been exceeded since 1990. The peak Basin sulfate concentration of 21.0 µg/m^3 (84 percent of the State standard) was measured in the East San Gabriel Valley. This was higher than the peaks in recent years, due to the impact of Independence Day fireworks on the July 5 measurements. Several other stations in the Basin also had annual peaks on this day and it is anticipated that they will not be included in the State designation value calculation. There is no corresponding federal standard for sulfates. Maximum 24-hour concentrations and 3-year maximum State designation values by air basin and county are summarized in Table 2-25.

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[20] CARB. (2002). Staff Report: Public Hearing to Consider Amendments to the Ambient Air Quality Standards for Particulate Matter and Sulfates. California Air Resources Board, Sacramento, CA. http://www.arb.ca.gov/regact/aaqspm/isor.pdf.

[21] U.S. EPA. (2009). Integrated Science Assessment for Particulate Matter (Final Report). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R-08/139F. http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=216546.

TABLE 2-25

2015 Maximum 24-Hour Average Sulfate (SO_4^{2-} from PM10) Concentrations by Basin and County

Basin/County	2015 Maximum SO_4^{2-} 24-Hour Average (µg/m³)	2013–2015 SO_4^{2-} 24-Hour State Designation Value (µg/m³)	2015 Percent of SO_4^{2-} State Standard (25 µg/m³)	Area of Max
South Coast Air Basin				
Los Angeles	**21.0***	**6.9***	**33**	**South Coastal Los Angeles County**
Orange	4.2	4.2	17	Central Orange County
Riverside	5.9*	4.2*	17	Metropolitan Riverside County
San Bernardino	14.7*	4.6*	18	Central San Bernardino Valley
Salton Sea Air Basin				
Riverside	4.6**	2.6**	10	Coachella Valley (Palm Springs)

Bold text denotes the peak value

* The 2015 Basin maximum sulfate concentration of 21.0 µg/m³ in Los Angeles County, as well as the peaks in Riverside and San Bernardino Counties, occurred on July 5, 2015, due to fireworks on Independence Day; it is anticipated that these may be excluded from the State designation value calculations for a peak 2015 Basin designation value of 6.9 µg/m³

** The 2015 Coachella Valley maximum sulfate concentration of 4.6 µg/m³ at the Palm Springs station was associated with a high-wind exceptional event; it is anticipated that this may be excluded from the State designation value calculations for a peak 2015 Basin designation value of 2.6 µg/m³

Lead (Pb)

Health Effects, Lead

The adverse effects of ambient lead exposures on health were reviewed in the 2013 U.S. EPA document, *Integrated Science Assessment for Lead: Final Report.*[22] This document presents a detailed assessment of the available scientific studies and presents conclusions on the causal determination of the health effects of lead, including the rationale to retain the current federal lead standard. A summary of health effects information and additional references can also be found in Appendix I: Health Effects.

Fetuses, infants, and children are more sensitive than others to the adverse effects of lead exposure. Long-term exposure to low levels of lead can adversely affect the development and function of the central

[22] U.S. EPA. (2013). Integrated Science Assessment for Lead (Final Report). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R-10/075F. http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=255721#Download.

nervous system, leading to learning disorders, distractibility, inability to follow simple commands, and lower intelligence quotients. In adults, increased lead levels are associated with increased blood pressure and risk of coronary heart disease. Lead is linked to important hematological effects, such as impaired red blood cell function.

Lead poisoning can cause anemia, lethargy, seizures, and death. Lead can be stored in the bone from early-age environmental exposure, and elevated blood lead levels can occur due to breakdown of bone tissue during pregnancy, hyperthyroidism (increased secretion of hormones from the thyroid gland), and osteoporosis (breakdown of bony tissue). Fetuses and breast-fed babies can be exposed to higher levels of lead because of previous environmental lead exposure of their mothers.

Air Quality, Lead

Lead (Pb), as analyzed from Total Suspended Particulate (TSP) samples, was measured at eight ambient locations and an additional five source-specific stations in the Basin in 2015. This includes a new source-specific lead monitor that was installed in Fontana near a recycling facility starting in January 2015.

Based on the review of the NAAQS for lead, U.S. EPA established the current standard of 0.15 $\mu g/m^3$ for a rolling 3-month average, effective October 15, 2008. There have been no violations of the lead standards at the District's regular population-based ambient air monitoring stations since 1982, primarily as a result of removal of lead from gasoline. However, monitoring at two stations immediately adjacent to stationary sources of lead recorded exceedances of the current standard in Los Angeles County over the 2007–2009 time period. These data were used for designations under the revised standard that also included new requirements for near-source monitoring. As a result, a nonattainment designation was finalized for much of the Los Angeles County portion of the Basin when the current standard was implemented.

Table 2-26 summarizes the Basin's maximum 3-month rolling average lead concentrations recorded in 2015 and in the 2013–2015 design value period, by county. The current lead concentrations in Los Angeles county are now well below the NAAQS, including the monitoring at the source-oriented locations, the highest of which is now 53 percent of the NAAQS for the maximum 3-month rolling average occurring near the beginning of the 3-year design value period. More recent lead data from the source-specific locations have been even lower due, in part, to the implementation of stricter SCAQMD rules for these sources. The peak 3-month average in 2015 (0.04 $\mu g/m^3$) was only 27 percent of the NAAQS. The other three counties in the Basin have also remained well below the NAAQS. The less-stringent State 30-day standards for lead were not exceeded in any area of the District in 2015, or in recent years.

While near-source lead measurements in Los Angeles County had previously violated the current NAAQS, there have been no exceedances of the federal standard in the Basin for either the 2012–2014 or 2013–2015 design value periods. As a result, SCAQMD will be petitioning U.S. EPA for a re-designation to attainment for the federal lead standard for the Los Angeles County nonattainment area. Stringent SCAQMD rules governing lead-producing sources will help to ensure that there are no future violations of the federal standard. Furthermore, one business that had been responsible for the highest measured lead concentrations in Los Angeles County has closed and is in the process of demolition and site clean-up.

TABLE 2-26

2015 Maximum 3-Month Rolling Average Lead (Pb) Concentrations
and 2013–2015 Design Values by Basin and County

Basin/County	2015 Max Pb 3-Month Rolling Average Design Value (µg/m³)	2013–2015 Max Pb 3-Month Rolling Average Design Value (µg/m³)	Percent of Current Pb NAAQS (0.15 µg/m³)	Area of Design Value Max	2015 Max Pb 30-Day Average (µg/m³)	Percent of State Pb Standard (1.5 µg/m³)
South Coast Air Basin						
Los Angeles*	**0.04**	**0.08**	**53**	**Southeast Los Angeles**	**0.05**	**3**
Orange	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
Riverside	0.01	0.01	7	Metropolitan Riverside County	0.01	1
San Bernardino	0.03	0.03	20	Northwest San Bernardino Valley, Central San Bernardino Valley	0.04	3
Salton Sea Air Basin						
Riverside	N.D.	N.D.	N.D.	Coachella Valley	N.D.	N.D.

Bold text denotes the peak value

N.D. = No Data. Historical measurements and emissions profiles indicate concentrations would be well below standards

* The higher lead concentrations in Los Angeles and San Bernardino Counties were measured at sites immediately downwind lead sources; the maximum 3-month average design value was measured at a near-source station in Los Angeles County (Santa Fe Springs) for February through April of 2013; the single year of data from the San Bernardino County near-source lead monitor is insufficient for a complete 3-year design value calculation, but is included here

Air Quality Compared to Other U.S. Metropolitan Areas

In spite of significant improvement, the Basin still has some of the worst air quality in the nation. In 2015, seven of the country's top ten locations most frequently exceeding the 2015 8-hour ozone NAAQS were located within the Basin, including stations in San Bernardino, Riverside and Los Angeles Counties.[23] The location with the highest number of days over the 2015 8-hour ozone NAAQS was in the Basin's Central San Bernardino Mountains (86 days in the community of Crestline). The Basin exceeded the 2008 8-hour ozone NAAQS on 81 days, more days than any other areas in the country. The Basin exceeded the 2015 ozone NAAQS on 113 days. Similarly, seven out of the top ten locations with the highest maximum 8-hour average ozone concentrations in the nation were also located in the Basin. Of the top ten locations, only one area (Houston, Texas) was located outside of California. The highest maximum 8-hour average ozone concentration recorded was 0.127 ppm (in the Central San Bernardino Mountains area), almost 180 percent of the 2015 ozone NAAQS.

Figures 2-10 and 2-11 show the maximum pollutant concentrations in 2015 for the Basin compared to other major metropolitan areas in the U.S. and California air basins, respectively. Maximum concentrations in all of these areas exceeded both the 2015 and 2008 8-hour ozone NAAQS. The current annual PM2.5 standard was exceeded in the South Coast Air Basin, Houston, and Chicago metropolitan areas, as well as in California's San Joaquin Valley. The 24-hour PM2.5 standard, was exceeded in the Basin, Phoenix, and Chicago, as well as in all of the California air basins shown except San Diego.

The 24-hour PM10 standard was not exceeded in any of the U.S. areas and California air basins shown, once data flagged for exceptional events was excluded from the analysis. Of the areas shown for 2015, the level of the 1-hour NO_2 federal standard was exceeded in the Basin, Houston, and New York areas, as well as in the San Joaquin Valley. SO_2 concentrations were below the 1-hour federal standard in the Basin and in all of the urban areas shown in Figures 2-10 and 2-11. However, the SO_2 standard was exceeded in other U.S. urban and rural areas, with the highest 2015 concentrations recorded in the State of Arizona (Gila County). The CO standards were not exceeded in the U.S. in 2015 and are not shown in the figures. Nationwide, the federal lead standard (not shown) was exceeded at six locations in 2015, at source-oriented monitoring stations, in Pennsylvania and Arizona.

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[23] The top 10 stations in the nation for number of exceedances in 2015 of the 2015 8-hour ozone NAAQS (0.070 ppm) include Basin stations in the areas of Central San Bernardino Mountains (in the Crestline-Lake Gregory community), Central San Bernardino Valley (San Bernardino and Fontana), East San Bernardino Valley (Redlands), Northwest San Bernardino Valley (Upland), San Gorgonio Pass (Banning), and Metropolitan Riverside County (Riverside-Rubidoux), as well as stations in the San Joaquin Valley Air Basin (Bakersfield and Fresno) and the Antelope Valley Air Basin (Lancaster).

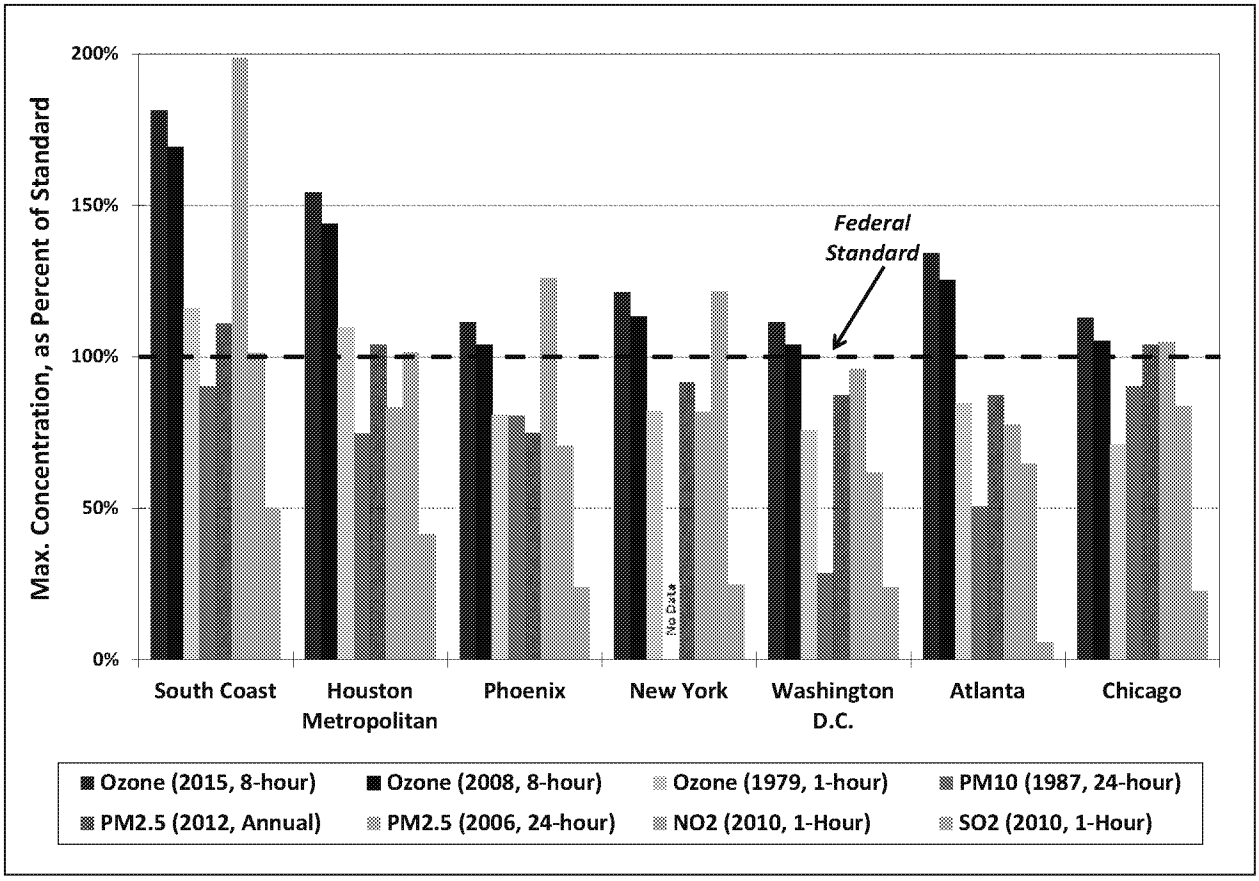


FIGURE 2-10

2015 SOUTH COAST AIR BASIN AIR QUALITY COMPARED TO OTHER U.S. URBAN AREAS

(MAXIMUM POLLUTANT CONCENTRATIONS AS PERCENTAGES OF THE NAAQS, FLAGGED EXCEPTIONAL EVENTS ARE EXCLUDED)

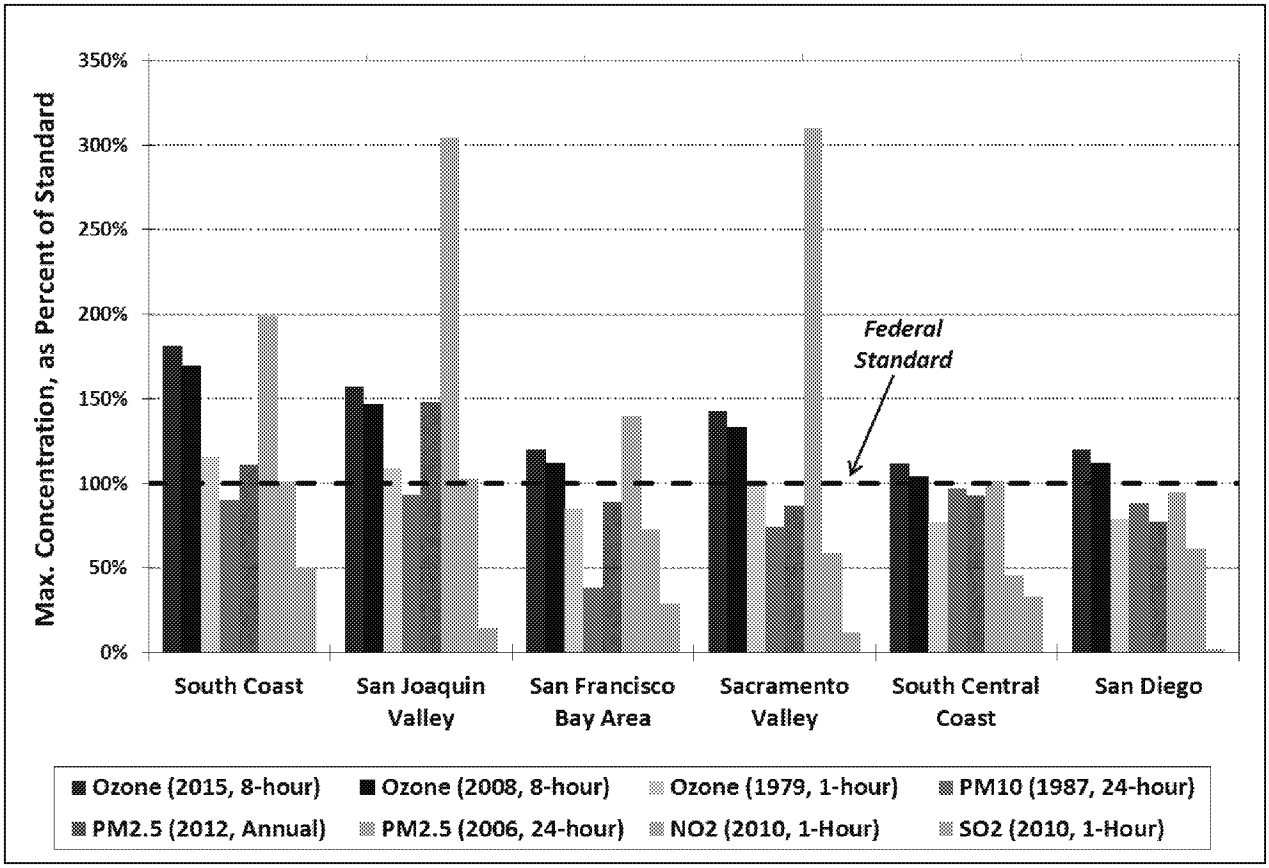


FIGURE 2-11

2015 SOUTH COAST AIR BASIN AIR QUALITY COMPARED TO OTHER CALIFORNIA AIR BASINS

(MAXIMUM POLLUTANT CONCENTRATIONS AS PERCENTAGES OF THE NAAQS, FLAGGED EXCEPTIONAL EVENTS ARE EXCLUDED)

As noted previously, maximum pollutant concentrations do not necessarily indicate NAAQS violations and subsequent attainment/nonattainment designation changes, which is determined by the design value form of the NAAQS. Figures 2-12 and 2-13 show the 2013–2015 3-year design values for the Basin compared to other urban areas in the U.S. and California, respectively. While the 2015 maximum ozone concentrations for all the urban areas shown above in Figures 2-10 and 2-11 are over the 2015 and 2008 ozone NAAQS, 2013–2015 ozone design values in some of these urban areas shown in Figures 2-12 and 2-13 are not in violation of these 8-hour ozone NAAQS. For the revoked 1979 1-hour ozone NAAQS, only the Basin had 1-hour design values over the federal standard for the 2013–2015 period. The design values for annual averaged PM2.5 are over the 2012 annual PM2.5 NAAQS for the Basin, along with Houston, the San Joaquin Valley, and California's South Central Coast. The 24-hour PM2.5 design values are over the 24-hour PM2.5 NAAQS in the Basin and the San Joaquin Valley; no other urban areas shown exceeded that standard. PM10 design values are over the standard in Phoenix and the San Joaquin Valley, although some of these may have been influenced by pending exceptional events. The design

values for NO_2, SO_2, and CO (not shown) did not violate the NAAQS for any of the urban areas shown for the 2013–2015 period.

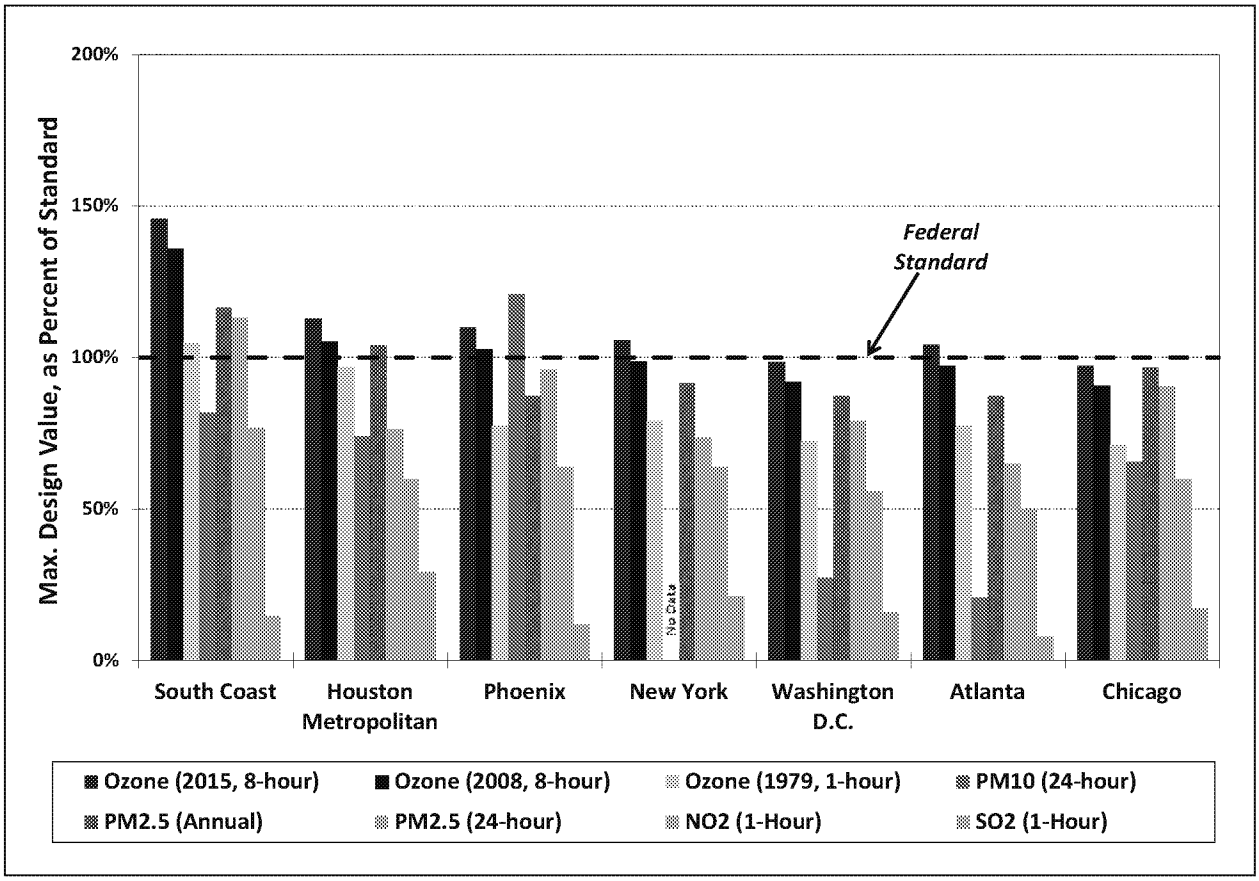


FIGURE 2-12

2015 SOUTH COAST AIR BASIN AIR QUALITY COMPARED TO OTHER U.S. URBAN AREAS

(MAXIMUM 3-YEAR DESIGN VALUE CONCENTRATIONS AS PERCENTAGES OF THE CORRESPONDING NAAQS, FLAGGED EXCEPTIONAL EVENTS ARE EXCLUDED)

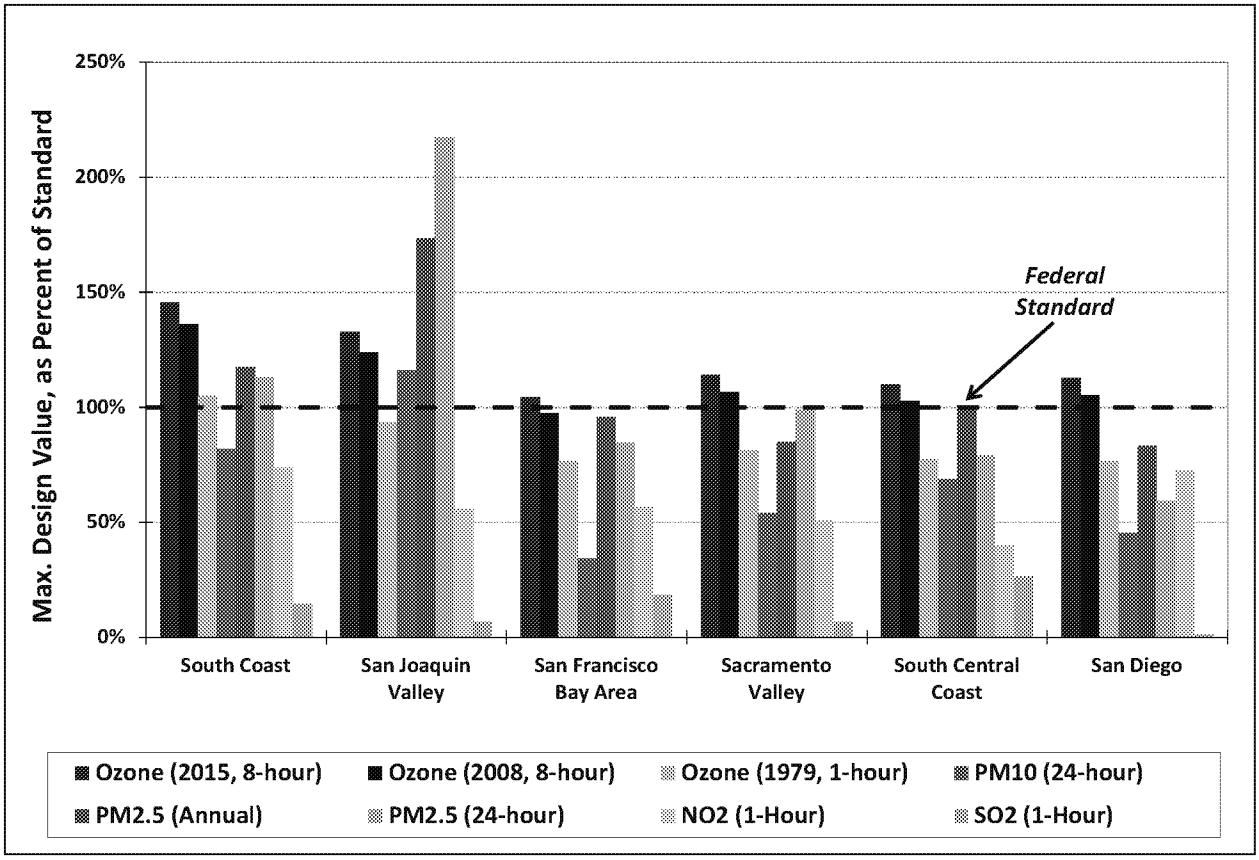


FIGURE 2-13

2015 SOUTH COAST AIR BASIN AIR QUALITY COMPARED TO OTHER CALIFORNIA AIR BASINS

(MAXIMUM 3-YEAR DESIGN VALUE CONCENTRATIONS AS PERCENTAGES OF THE CORRESPONDING NAAQS, FLAGGED EXCEPTIONAL EVENTS ARE EXCLUDED)

Summary

In the year 2015, the Basin exceeded the most recent federal standards on 40 percent of the days, mainly due to exceedances of ozone and to a lesser extent, PM2.5. The maximum measured concentrations for these pollutants in 2015 were among the highest in the country. In 2015, the Basin exceeded the level of the new 2015 8-hour ozone NAAQS on 113 days, with all four counties. It exceeded the 2008 and 1997 8-hour ozone NAAQS on 81 and 47 days, respectively. Seven of the top 10 stations in the nation most frequently exceeding the 8-hour federal ozone NAAQS in 2015 were located within the Basin, including stations in San Bernardino and Riverside Counties. However, the Basin's maximum 3-year 8-hour ozone design value was the same for the 2012–2014 and 2013–2015 periods and the lowest recorded in the Basin since measurements began in the 1950s. Also, the number of Basin days in 2015 exceeding the current and former 8-hour NAAQS was the lowest recorded since the measurements began.

The Basin exceeded the PM2.5 24-hour standard on 30 days in 2015, including the near-road measurements (25 days for ambient stations only). Significant improvement has been seen over the past decade for both 24-hour and annual PM2.5 concentrations and only one location in the Basin is currently exceeding the 24-hour design value form of the PM2.5 federal standards. However, the 24-hour PM2.5 design value trend in the Basin increased in 2014 and again in 2015. This is due in large part to the extreme drought conditions in Southern California and the associated lack of periodic storm events in the winter months that would bring better dispersion and washout of pollutants. The Basin's federal 3-year design values for annual PM2.5 have continued to exhibit downward trends through 2015.

The Coachella Valley area in the Riverside County portion of the Salton Sea Air Basin exceeded federal and State standards for ozone and PM10. However, the high PM10 concentrations exceeding the federal 24-hour PM10 standard occurred on days influenced by high-wind natural events, which the District has flagged in the U.S. EPA AQS database such that U.S. EPA will consider excluding such data when determining the NAAQS attainment status in accordance with U.S. EPA's Exceptional Events Rule. For the stations in the Coachella Valley, the federal 3-year design values for 8-hour ozone have continued to exhibit downward trends through 2015.

The NO_2 concentrations in Los Angeles County exceeded the recently established short-term (1-hour) federal standard on one day at one location in 2015, but did not exceed the standards anywhere on any other day in the Basin. The 98th percentile form of the federal NO_2 standard was not exceeded and the Basin's attainment status remains intact. The Los Angeles County lead nonattainment area portion of the Basin no longer exceeds the 3-month rolling average lead NAAQS as of the 2013–2015 design value period, including the source-specific monitors. A request to U.S. EPA for re-designation to attainment is being prepared. Maximum concentrations for SO_2, CO, and sulfate (measured from PM10) continued to remain below the State and federal standards.

Chapter 3
Base Year and Future Emissions

An inventory of regional emissions from all stationary, area and mobile sources is a requirement for the State Implementation Plan. Base year emissions are projected into the future using approved growth factors for each source category. These emissions assist in projecting the level of reductions needed to attain standards in the future.

In This Chapter

Introduction

This chapter summarizes criteria pollutant emissions that occurred in the Basin during the 2012 base year as well as projected emissions for the years 2019, 2022, 2023, 2025, and 2031. A more detailed description of emissions and methodologies is presented in Appendix III. The 2012 base year emissions inventory reflects actual and estimated emissions subject to adopted regulations with current compliance dates as of 2012, whereas future baseline emissions inventories are based on economic projections and adopted regulations with both current and future compliance dates. A list of District and CARB rules and regulations that are part of the base year and future year baseline emissions inventories is presented in Appendix III. The District continues to implement rules that are incorporated in the 2016 AQMP future baseline emissions inventories.

The emissions inventory is divided into two major source classifications: stationary and mobile sources. The 2012 base year point source emissions are based principally on reported data from facilities using the District's Annual Emissions Reporting Program. The area source emissions are estimated jointly by CARB and the District using established inventory methods. The on-road emissions are calculated using CARB's EMFAC 2014 model and the travel activity data provided by the Southern California Association of Governments (SCAG) from their adopted 2016 Regional Transportation Plan / Sustainable Communities Strategy (RTP/SCS). CARB provides emission inventories for off-road equipment which includes construction and mining equipment, industrial and commercial equipment, lawn and garden equipment, agricultural equipment, ocean-going vessels, commercial harbor craft, locomotives, cargo handling equipment, pleasure craft, and recreational vehicles. Aircraft emissions are based on an updated analysis by the District, developed in conjunction with the airports in the region. The future emission forecasts are primarily based on demographic and economic growth projections provided by SCAG. In addition, emission reductions resulting from District regulations amended or adopted by December 2015 and CARB regulations adopted by November 2015 are included in the future baseline projections.

This chapter summarizes the major components of developing the base year and future baseline inventories. More detailed information, such as CARB's and the District's emission reductions resulting from adopted rules and regulations since the 2012 AQMP, growth factors, and demographic trends, are presented in Appendix III. In addition, the top source categories contributing to the 2012, 2019, 2022, 2023, 2025, and 2031 emission inventories are identified in this chapter. An understanding of the highest emitting source categories leads to the identification of potentially more effective control strategies for improving air quality.

Emission Inventories

Two inventories are prepared for the 2016 AQMP for the purpose of regulatory and SIP performance tracking, including transportation conformity[1]: an annual average inventory and a summer planning inventory. Baseline emissions data presented in this chapter are based on average annual daily

[1] Transportation conformity is required under CAA Section 176(c) to ensure that federally supported highway and transit project activities "conform" to the purpose of the SIP. More details are provided in Chapter 4.

emissions (i.e., total annual emissions divided by 365 days) and seasonally adjusted summer planning inventory emissions. The 2016 AQMP uses annual average day emissions to estimate the cost-effectiveness of PM2.5 control measures and to perform PM2.5 modeling and analysis. The summer planning inventory emissions are developed to capture the emission levels during the high ozone season and are used to perform ozone modeling and analysis, estimate the cost-effectiveness of ozone control measures, and to report emission reduction progress as required by the federal and California Clean Air Acts.

Detailed information regarding the emissions inventory development for the base year and future years, the emissions by major source category in the base year and future baseline emission inventories are presented in Appendix III. Attachments A and B to Appendix III list the annual average and summer planning emissions by major source category for 2012, 2019, 2021, 2022, 2023, 2025, and 2031. Attachment C to Appendix III has the top VOC and NOx point source categories that emitted greater than or equal to 10 tons per year in 2012. Attachment D to Appendix III contains the on-road emissions by vehicle class and pollutant. Attachment E to Appendix III shows emissions associated with the combustion of diesel fuel for various source categories.

Stationary Sources

Stationary sources can be divided into two major subcategories: point and area sources. Point sources are permitted facilities with one or more emission sources at an identified location (e.g., power plants, refineries). These facilities generally have annual emissions of 4 tons or more of either Volatile Organic Compounds (VOC), Nitrogen Oxide (NOx), Sulfur Oxide (SOx), or total Particulate Matter (PM), or annual emissions of over 100 tons of Carbon Monoxide (CO). Facilities are required to report their criteria pollutant emissions pursuant to Rule 301 and selected air toxics to the District on an annual basis, subject to audit, if any of these thresholds are exceeded. The 2012 annual reported emissions are used to update the stationary source inventory.

Area sources consist of many small emission sources (e.g., residential water heaters, architectural coatings, consumer products and permitted sources that are smaller than the above thresholds) which are distributed across the region and are not required to individually report their emissions. There are about 400 area source categories for which emission estimates are jointly developed by CARB and the District. The emissions from these sources are estimated using activity information and emission factors. Activity data are usually obtained from survey data or scientific reports (e.g., Energy Information Administration (EIA) reports for fuel consumption other than natural gas fuel, Southern California Gas Company for natural gas consumption, paint suppliers under Rule 314 and District databases). The emission factors are based on rule compliance factors, source tests, manufacturer's product or technical specification data, default factors (mostly from AP-42, U.S. EPA's published emission factor compilation), or weighted emission factors derived from the point source facilities' annual emissions reports. Additionally, the emissions over a given area may be calculated using socioeconomic data.

Appendix III has more detail regarding emissions from specific source categories such as architectural coatings, dairy cattle, oil and gas production operations, gasoline dispensing facilities, and green waste composting. Since the 2012 AQMP was finalized, new area source inventory updates include:

- Architectural Coatings Category: Over 60 area sources in this category were updated based on information provided as part of SCAQMD Rule 314 – "Fees for Architectural Coatings" annual reports.
- Oil and Gas Production Category: The emission estimation methodology for this area source category was revised to incorporate U.S. EPA's oil and gas production inventory model modified with California-specific emission factors and technologies.
- Gasoline Dispensing Facilities Category: The emission estimation methodology for this area source category was revised to include CARB staff's updated emission factors and activity data.
- Dairy Cattle: Ammonia and VOC emissions from dairy farms were revised based on the animal head count data reported to the Santa Ana Regional Water Quality Control Board.
- LPG Combustion Categories: The emissions from this category were revised based on the LPG consumption estimation for the Basin. The fraction of California LPG use in the Basin was estimated based on GHG data reported to the CARB. The statewide total LPG consumption was retrieved from State Energy Data (2013).
- Commercial and Industrial Natural Gas Combustion Categories: 2012 actual natural gas consumption data were used, instead of the projection from the 2012 AQMP.
- Composting Waste Disposal: Ammonia and VOC emissions expected from compostable mulch were added in this category.
- REgional CLean Air Incentives Market (RECLAIM) NOx emissions: The future baseline was revised to include the 12 tons per day of RECLAIM Trading Credits (RTCs) reduction by December 2022 that was approved in December 2015.

Mobile Sources

Mobile sources consist of two subcategories: on-road sources and off-road sources. On-road vehicle emissions are calculated with CARB's EMFAC 2014 model and the travel activity data provided by SCAG from their adopted 2016 RTP/SCS. Spatial distribution data from Caltrans' Direct Travel Impact Model (DTIM4) are used to place the emissions at the proper time and place. Off-road emissions are calculated using CARB's category specific inventory models.

On-Road

CARB's EMFAC 2014 model has undergone extensive revisions from the previous version (EMFAC 2011) to make it more user-friendly, flexible, and to allow incorporation of larger amounts of data demanded by the current regulatory and planning processes. In addition to the model structural changes, other changes include:

- Revision of heavy-duty diesel (HD Diesel) truck emission rates: The emission factors for heavy heavy-duty diesel trucks were also updated using new test data on newer trucks (Model Year 2007 and newer) that more accurately represent the effectiveness of the control equipment used to meet the more stringent 2007 and 2010 emission standards.
- Incorporation of natural gas vehicles for select vehicle classes: Emission factors for natural gas powered solid waste collection vehicles and urban buses are now included in EMFAC 2014 as these classes of vehicles have sufficient penetration of natural gas engines to warrant separate treatment.

- Accounting for federal and California regulations and standards adopted post-2010: The adopted regulations and standards include the State's Advanced Clean Car Program, the April 2014 amendment to the Truck and Bus Regulation, the Tractor-Trailer Greenhouse Gas Regulation and the federal HD Greenhouse Gas Regulation.
- Socio-econometric modeling of population and VMT: EMFAC 2014 incorporates the use of socioeconomic regression model forecasting methods to predict new vehicle sales and Vehicle Miles Traveled (VMT) growth trends. This allows the use of State and national economic indicators, fuel prices, and regional human population and vehicle ownership characteristics as parameters to more accurately predict vehicle sales and VMT trends.

More detailed information on the changes incorporated in EMFAC 2014 can be found at http://www.arb.ca.gov/msei/categories.htm.

Figure 3-1 compares the on-road emissions estimated using EMFAC 2011 in the 2012 AQMP and EMFAC 2014 used in the 2016 AQMP, respectively for milestone years 2012, 2023, and 2031. It should be noted that the comparison for 2012 reflects changes in methodologies, whereas the comparison for 2023 and 2031 also includes adopted rules and updated growth projections since the release of EMFAC 2011, which was the basis of the 2012 AQMP on-road emissions.

For 2012, EMFAC 2014's newer methodologies show higher emissions of NOx and VOCs. For the future years 2023 and 2031, in general, the emissions are lower in EMFAC 2014 as compared to EMFAC 2011. The lower emissions can be attributed to additional rules and regulations, more stringent standards, and updates to the heavy-duty emission factors.

Also evident in Figure 3-1 is the change in the rate of emission reductions. The rate of change in the emissions in the early years (2012 to 2023) is significantly larger than that shown further in the later years (2023–2031). This is due to the implementation of the rules and regulations, most of which will be fully implemented by 2023 (e.g., CARB's Truck and Bus rule requires all trucks to meet the 2010 standards by 2023). The effect of the rules and regulations are significant, showing reductions of about 70 percent NOx emissions and close to 60 percent VOC emissions between 2012 and 2023, even with increases in fleet population. More modest reductions are predicted from continued fleet turnover, but fleet growth is beginning to outpace the emissions benefits of fleet turnover in the later years. Further emission reductions will require fleets to adopt the use of even cleaner equipment than the current standards require.

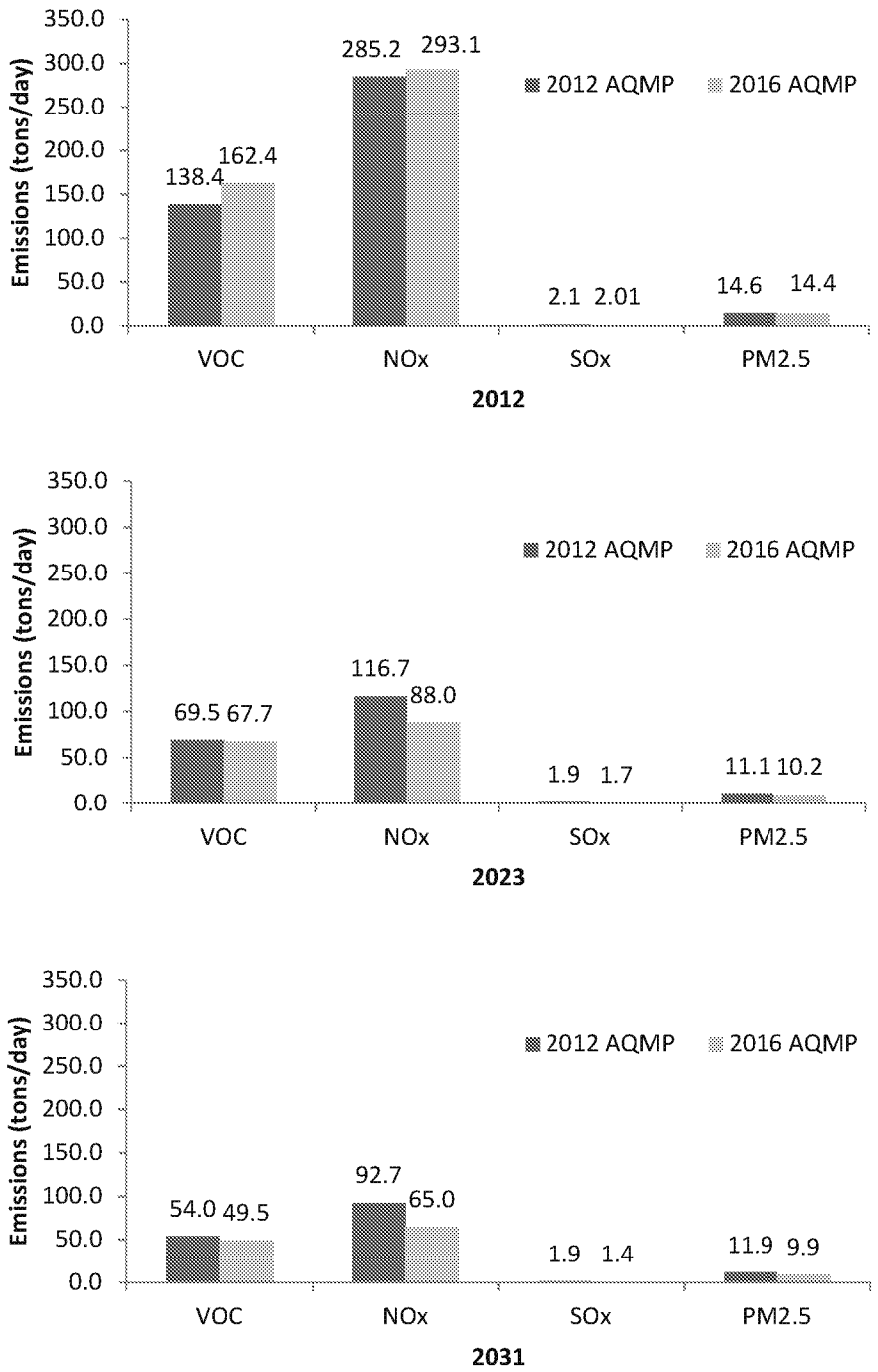


FIGURE 3-1

COMPARISON OF ON-ROAD EMISSIONS ESTIMATED USING EMFAC 2011 IN THE 2012 AQMP AND EMFAC 2014 IN THE 2016 AQMP. VOC AND NOX EMISSIONS REPRESENT SUMMER PLANNING AND SOX & PM2.5 ARE ANNUAL AVERAGE INVENTORY.

Off-Road

Emissions from off-road vehicle categories are primarily based on estimated activity levels and emission factors. Separate emission estimation models have been developed for the many categories of off-road equipment. More information on these models can be found at the following link: http://www.arb.ca.gov/msei/categories.htm. Several of these models have been updated since the release of the 2012 AQMP. The major updates include:

- Locomotives: The emissions model methodology for the freight locomotive category was completely revised. In addition, activity was updated using data from the Surface Transportation Board and Federal Highway Administration's Freight Analysis Framework. Population information was derived from the Association of American Railroads' population data.

- Ocean Going Vessels: New lower growth projections were developed and incorporated into the model using more recent information from the Federal Highway Administration's Freight Analysis Framework model and other forecasts performed for the San Pedro Bay Ports. NOx control factor calculations were updated to more appropriately represent the engine Tier levels.

- Commercial Harbor Craft: The vessel turnover rate methodology was improved to better reflect the observed age distribution. A more representative reduced turnover rate is used, which improves consistency with other off-road emissions model methodologies.

- Pleasure Craft and Off-Highway Recreational Vehicles: New survey information and DMV data were used to update the population and activity, and new emissions testing data were used to update the emission factors in newly developed models for these two categories.

- Cargo Handling Equipment: The model was updated to use growth factors consistent with those developed for ocean going vessels.

- Farm Equipment: The inventory was completely revised resulting in a new inventory based on updated equipment population, equipment age distribution, activity, load factors, and turnover practices.

- Aircraft: The aircraft emissions inventory is updated for the 2012 base year based on the 2012 aircraft activity data and latest calculation methodologies. A total of 43 airports were identified as having aircraft operations within the District boundaries including commercial air carrier, air taxi, general aviation, and military aircraft operations. The sources of activity data included airport operators and Federal Aviation Administration's (FAA) databases. The emissions calculation methodology was based on the application of FAA's Emissions and Dispersion Modeling System (EDMS) model for commercial airports with detailed aircraft activity data (by aircraft make and model). For other airports and aircraft types (e.g., general aviation, air taxi, military), the total number of aircraft operations was used in conjunction with the U.S. EPA's latest average emission factors by major aircraft type (e.g., general aviation, air taxi, military). For commercial air carrier operations, SCAG's 2040 aircraft operations forecasts from the SCAG's 2016 Regional Transportation Plan (RTP) was used.

The revised 2016 AQMP incorporated the 2040 emissions forecast (based on SCAG's latest forecasts) with interim years interpolated between 2012 and 2040.

Figure 3-2 shows a comparison between the off-road baseline emissions in the 2012 AQMP and the 2016 AQMP for the milestone years 2012, 2023, and 2031. Overall, the updates to the off-road categories result in lower emissions than those used in the 2012 AQMP. It should be noted that the comparison for 2012 reflects changes in methodology, but the comparison for the rest of the years also includes adopted rules and updated growth projections since the release of off-road inventory in the 2012 AQMP. Similar to what is shown for the on-road category, the rate of reductions in emissions of NOx and VOC is significantly larger in early years (2012 to 2023) compared to the rate seen in the later years (2023 to 2031). This is the result of the rules and regulations adopted at the State and federal levels for most of the off-road categories. As most will be fully implemented by 2023, only modest reductions will be achieved as a result of continued fleet turnover beyond 2023. Without additional rules or programs for further reductions, growth in emissions from increases in vehicle population outweighs the emissions benefits associated with fleet turnover to newer equipment. As projected for the on-road fleet, further emission reductions will require off-road fleets to use even cleaner equipment than current standards require.

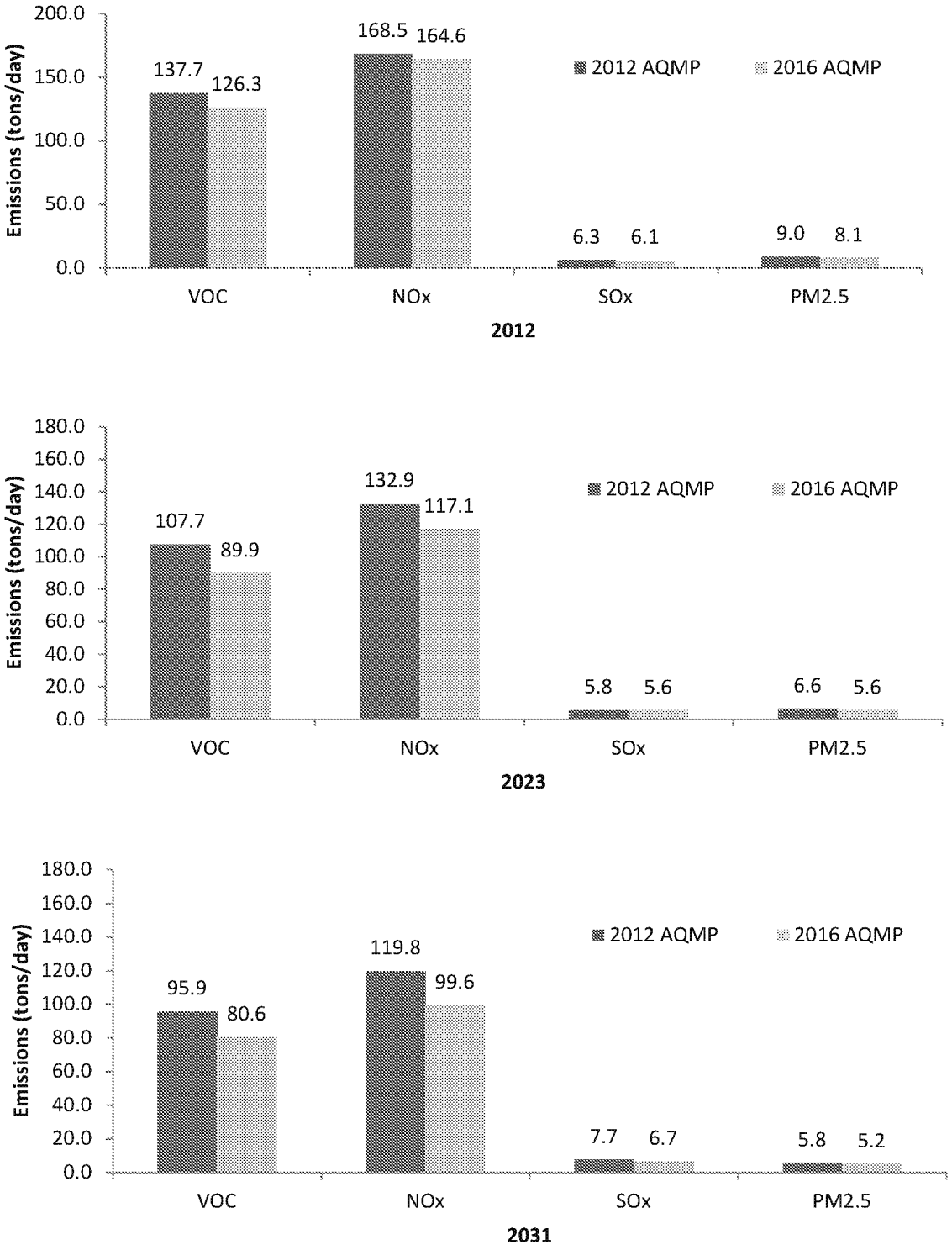


FIGURE 3-2

COMPARISON OF OFF-ROAD EMISSIONS BETWEEN 2012 AQMP AND 2016 AQMP.
VOC & NOx – SUMMER PLANNING; SOx & PM2.5 – ANNUAL AVERAGE INVENTORY

Uncertainties in the Emissions Inventory

An effective AQMP relies on a complete and accurate emissions inventory. Over the years, significant improvements have been made to quantify emission sources for which control measures are developed. Increased use of continuous monitoring and source testing has contributed to the improvement in point source inventories. Technical assistance to facilities and auditing of reported emissions by the District have also improved the accuracy of the emissions inventory. Area source inventories that rely on average emission factors and regional activities have inherent uncertainty. Industry-specific surveys and source-specific studies during rule development have provided much-needed refinement to these emissions estimates. Mobile source inventories are also continuously updated and improved. As described earlier, many improvements are included in the on-road mobile source model EMFAC 2014, which estimates emissions from trucks, automobiles, and buses. Improvements and updates are included in the off-road models for locomotives, ocean going vessels, commercial harbor craft, pleasure craft and off-highway recreational vehicles, cargo handling equipment, and farm equipment. Overall, the 2016 AQMP inventory is based on the most current data and methodologies, resulting in the most accurate inventory available.

Relative to future growth, there are many challenges inherent in making accurate projections, such as where vehicle trips will occur, the distribution between various modes of transportation (such as trucks and trains), as well as estimates for population growth and the number and type of jobs. Forecasts are made with the best information available; nevertheless, there is uncertainty in emissions projections. AQMP updates are generally developed every three to four years, thereby allowing for frequent updates and improvements to the inventories.

Gridded Emissions

For air quality modeling purposes, the domain extends to Southern Kern County in the north, the Arizona border to the east, northern Mexico to the south and more than 100 miles offshore to the west. The modeling area is divided into a grid system comprised of 4 km by 4 km grid cells. Both stationary and mobile source emissions are allocated to individual grid cells within this system. In general, the modeling emissions data features daily emissions. Variations in temperature, hours of operation, speed of motor vehicles, or other factors are considered in developing gridded motor vehicle emissions. The "gridded" emissions data used for both PM2.5 and ozone modeling applications differ from the annual average day or planning inventory emission data in two respects: (1) the modeling region covers larger geographic areas than the Basin; and (2) emissions represent day-specific instead of average or seasonal conditions. Emission inventories are generated for both the PM2.5 and ozone modeling applications. For PM2.5, the annual average day is used, which represents the characteristic of emissions that contribute to year-round particulate impacts. The summer planning inventory focuses on the warmer months (May through October) when evaporative VOC emissions and more sunlight, play an important role in ozone formation.

Base Year Emissions

2012 Emission Inventory

Table 3-1A compares the summer planning emissions between the 2012 base year in the 2016 AQMP and the projected 2012 emissions in the Final 2012 AQMP by major source category for VOC and NOx. Table 3-1B compares the annual average emissions between the 2012 base year in the 2016 AQMP and the projected 2012 emissions in the Final 2012 AQMP for SOx and PM2.5. It should be noted that the comparison for 2012 reflects updates in methodology, differences between growth projections and actual data, and adopted rules since the release of the 2012 AQMP. Specifically, the growth projection employed in the 2012 AQMP did not fully capture the impact of the economic recession which occurred between 2008 and 2010.

Overall, there is a minor net decrease in VOC emissions in the 2016 AQMP inventory as compared to the 2012 AQMP projections. Estimates of stationary source VOC emissions have decreased by approximately 12 percent, but mobile VOC source emissions have increased by 5 percent. NOx emissions remain unchanged between the 2016 AQMP inventory and the 2012 projection. As in the VOC category, stationary source NOx emissions have been revised downward and mobile source emissions have been revised slightly upward. Of note in the stationary source categories are the emission changes associated with the architectural coatings, RECLAIM categories, natural gas and LPG combustion sources, and farming operations. Architectural coatings emissions were updated for the 2016 AQMP using information provided as part of SCAQMD Rule 314 – "Fees for Architectural Coatings" annual reports, resulting in the lower emission estimate. The RECLAIM emissions cap was used to project the NOx emissions in the 2012 AQMP inventory, while in 2012, the actual emissions were lower than the cap by 7 tons per day (TPD). Use of additional actual reported information in lieu of projected emissions (used in the 2012 AQMP to estimate the 2012 emissions) explain the majority of the remaining emission differences. Refer to Appendix III for details.

For the mobile source category, the updates described earlier to the on-road emissions model EMFAC 2014 resulted in the 17 percent and 3 percent increase in VOC and NOx emissions, respectively. Updates to several of the off-road category emission estimates resulted in the 8 percent decrease in VOC emissions and a modest 2 percent decrease in NOx emissions. Updates were completed for locomotives, ocean going vessels, cargo handling equipment, commercial harbor craft, farming equipment, pleasure craft, and off-highway recreational vehicles.

Estimates of SOx emissions are 23 percent lower in the 2016 AQMP emissions inventory than 2012 projections. This is largely due to the difference in the use of actual reported information in lieu of projected emissions in the RECLAIM sources. Estimates of direct PM2.5 from stationary and mobile sources are modestly lower in the 2016 AQMP leading to a decrease of 7 percent. This revised estimation is largely due to changes in the emissions estimates from miscellaneous stationary processes and decreases in off-road vehicle emissions.

Table 3-2 shows the 2012 annual average and summer planning emissions inventory by major source category. Stationary sources are subdivided into point (e.g., chemical manufacturing, petroleum production, and electric utilities) and area sources (e.g., architectural coatings, residential water heaters,

consumer products, and permitted sources smaller than the emission reporting threshold – generally 4 tpy). Mobile sources consist of on-road (e.g., passenger cars and heavy-duty trucks) and off-road sources (e.g., trains and ships). Entrained road dust is also included.

Figure 3-3 characterizes relative contributions by stationary and mobile source categories. On- and off-road sources continue to be major contributors for each of the five pollutants. Overall, total mobile source emissions account for almost 60 percent of the VOC and 90 percent of the NOx emissions for these two ozone-forming pollutants and 95 percent of the CO emissions. The on-road mobile category alone contributes over 30 percent of the VOC and 56 percent of the NOx emissions. For directly emitted PM2.5, mobile sources represent 34 percent of the emissions with another 13 percent due to vehicle-related entrained road dust. Stationary sources emit the majority of the SOx emissions with the point source category contributing 50 percent of the SOx emissions in the Basin. Area sources play a major role in VOC emissions, emitting about 3.5 times more than point sources. Area sources, including sources such as commercial cooking, are the predominant source of directly emitted PM2.5 emissions (42 percent).

Figure 3-4 shows the fraction of the 2012 inventory by responsible agency for VOC, NOx, SOx, and directly emitted PM2.5. U.S. EPA and CARB have primary authority to regulate emissions from mobile sources. U.S. EPA's authority applies to aircraft, locomotives, ocean going vessels, and some categories of on- and off-road mobile equipment. CARB has authority over the remainder of the mobile sources, and consumer products. SCAQMD has authority over most area sources and all point sources. As can be seen in Figure 3-4, most of the NOx and VOC emissions in the District are from sources that fall under the primary jurisdiction of U.S. EPA and CARB. For example, almost 90 percent of the NOx and over 75 percent of the VOC emissions are from sources primarily under CARB and U.S. EPA control. Conversely, 56 percent of the SOx emissions and 66 percent of the directly emitted PM2.5 emissions are from sources under SCAQMD control. NOx and VOC are important precursors to ozone and PM2.5 formation, and SOx along with directly emitted PM2.5, contribute to the region's PM2.5 nonattainment challenges. This illustrates that actions at the local, State, and federal level are needed to ensure the region attains the federal ambient air quality standards.

TABLE 3-1A
Comparison of VOC and NOx Emissions By Major Source Category of
2012 Base Year in 2016 AQMP and Projected 2012 in Final 2012 AQMP
Summer Planning Inventory (tpd[1])

SOURCE CATEGORY	2012 AQMP	2016 AQMP	% Change	2012 AQMP	2016 AQMP	% Change
	VOC			NOx		
STATIONARY SOURCES						
Fuel Combustion	12.9	11.4	-12%	29.4	27.9	-5%
Waste Disposal	12.1	14.1	17%	1.5	2.3	50%
Cleaning and Surface Coatings	41.7	35.6	-15%	0	0	0%
Petroleum Production and Marketing	40.2	29.2	-27%	0	0	0%
Industrial Processes	13.8	10.8	-21%	0	0	0%
Solvent Evaporation:						
Consumer Products	86.6	86.5	0%	0	0	0%
Architectural Coatings	21.5	13.3	-38%	0	0	0%
Others	2.0	2.4	17%	0	0	0%
Misc. Processes	9.7	7.8	-20%	15.5	14.5	-6%
RECLAIM SOURCES	0	0	0%	27.2	19.6	-28%
Total Stationary Sources	**240**	**211**	**-12%**	**74**	**65**	**-13%**
MOBILE SOURCES						
On-Road Vehicles	138.4	162.4	17%	285.2	293.1	3%
Off-Road Vehicles	137.7	126.3	-8%	168.5	164.6	-2%
Total Mobile Sources	**276**	**289**	**5%**	**454**	**458**	**1%**
TOTAL	**516**	**500**	**-3%**	**528**	**522**	**-1%**

[1] Values may not sum due to rounding errors

TABLE 3-1B
Comparison of SOx and PM2.5 Emissions By Major Source Category of
2012 Base Year in 2016 AQMP and Projected 2012 in 2012 AQMP
Annual Average (tpd[1])

SOURCE CATEGORY	2012 AQMP	2016 AQMP	% Change	2012 AQMP	2016 AQMP	% Change
	SOx			PM2.5		
STATIONARY SOURCES						
Fuel Combustion	1.9	1.9	-1%	5.6	5.6	1%
Waste Disposal	0.4	0.5	20%	0.2	0.2	-13%
Cleaning and Surface Coatings	0	0	0%	1.5	1.4	-5%
Petroleum Production and Marketing	0.6	0.4	-26%	1.6	1.5	-6%
Industrial Processes	0.02	0.1	400%	6.7	6.4	-6%
Solvent Evaporation:						
Consumer Products	0	0	0%	0	0	0%
Architectural Coatings	0	0	0%	0	0	0%
Others	0	0	0%	0	0	0%
Misc. Processes	1.0	0.5	-47%	32.5	28.8	-11%
RECLAIM SOURCES	11.8	6.9	-42%	0	0	0%
Total Stationary Sources	**16**	**10**	**-34%**	**48**	**44**	**-9%**
MOBILE SOURCES						
On-Road Vehicles	2.1	2.0	-2%	14.6	14.4	-1%
Off-Road Vehicles	6.3	6.1	-2%	9.0	8.1	-10%
Total Mobile Sources	**8**	**8**	**-2%**	**24**	**23**	**-5%**
TOTAL	**24**	**18**	**-23%**	**72**	**66**	**-7%**

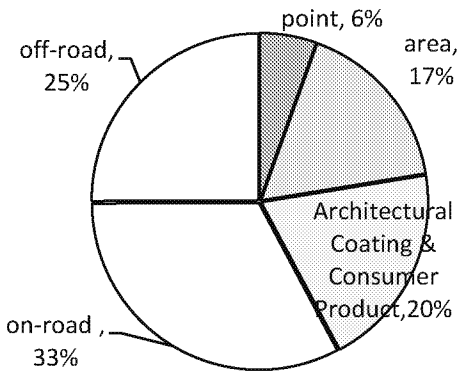
[1] Values may not sum due to rounding errors

TABLE 3-2

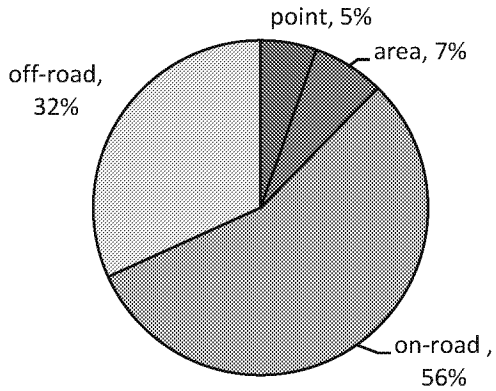
Summary of Emissions By Major Source Category: 2012 Base Year
Average Annual Day and Summer Planning (tpd[1])

SOURCE CATEGORY	Annual Average						Summer Planning	
	VOC	NOx	CO	SOx	PM2.5	NH3	VOC	NOx
STATIONARY SOURCES								
Fuel Combustion	11	28	49	2	6	9	11	28
Waste Disposal	13	2	1	0	0	5	14	2
Cleaning and Surface Coatings	34	0	0	0	1	0	36	0
Petroleum Production and Marketing	29	0	5	0	2	0	29	0
Industrial Processes	10	0	0	0	6	9	11	0
Solvent Evaporation:								
Consumer Products	87	0	0	0	0	0	87	0
Architectural Coatings	13	0	0	0	0	0	13	0
Others	2	0	0	0	0	1	2	0
Misc. Processes	13	21	54	1	29	38	8	15
RECLAIM SOURCES	0	19	0	7	0	0	0	20
Total Stationary Sources	**212**	**70**	**109**	**10**	**44**	**63**	**211**	**65**
MOBILE SOURCES								
On-Road Vehicles	158	317	1328	2	14	18	162	293
Off-Road Vehicles	100	153	686	6	8	0	126	165
Total Mobile Sources	**258**	**470**	**2014**	**8**	**23**	**18**	**289**	**458**
TOTAL	**470**	**540**	**2123**	**18**	**66**	**81**	**500**	**522**

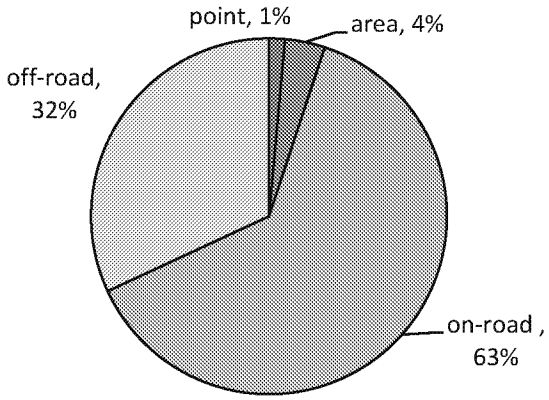
[1] Values may not sum due to rounding errors
[2] Includes entrained road dust



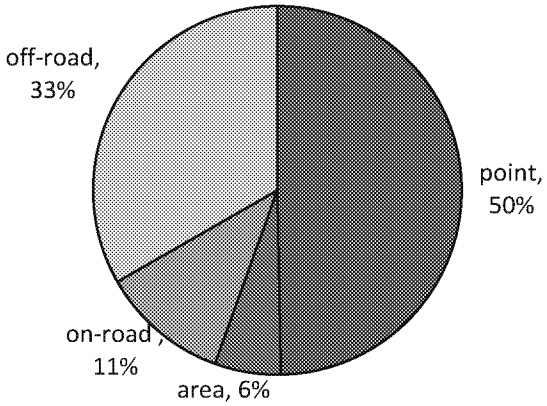
VOC Emissions: 500 tons/day



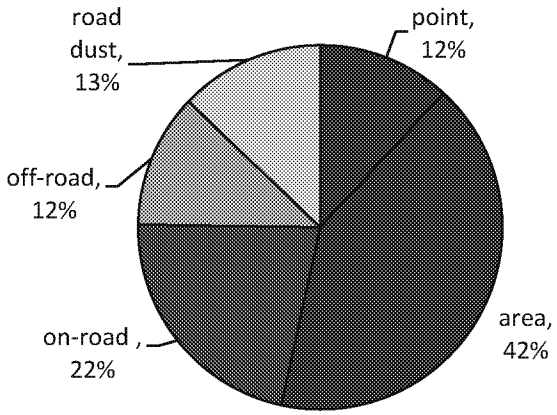
NOx Emissions: 522 tons/day



CO Emissions: 2123 tons/day



SOx Emissions: 18 tons/day



Directly Emitted PM2.5 Emissions: 66 tons/day

FIGURE 3-3

RELATIVE CONTRIBUTION BY SOURCE CATEGORY TO 2012 EMISSION INVENTORY

(VOC & NOX – SUMMER PLANNING; CO, SOX, & PM2.5 – ANNUAL AVERAGE INVENTORY VALUES ARE ROUNDED TO NEAREST INTEGER AND MAY NOT SUM DUE TO ROUNDING)

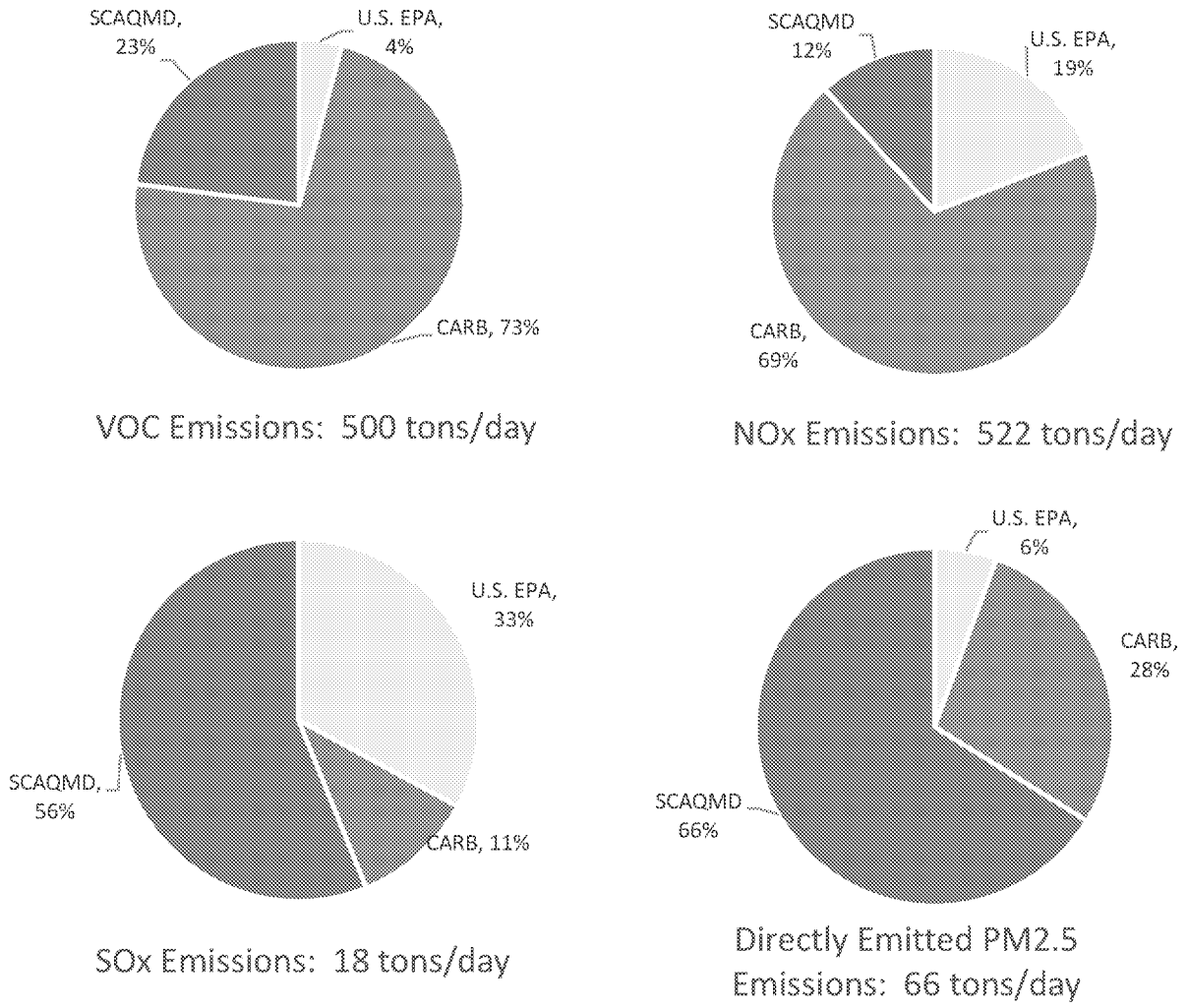


FIGURE 3-4

2012 EMISSION INVENTORY AGENCY PRIMARY RESPONSIBILITY

(VOC & NOX – SUMMER PLANNING; SOX, & PM2.5 – ANNUAL AVERAGE INVENTORY. VALUES ARE ROUNDED TO NEAREST INTEGER AND MAY NOT SUM DUE TO ROUNDING)

Future Emissions

Inventory Development

Inventories were developed for 2012, 2019, 2022, 2023, 2025, and 2031. Year 2012 is the base-year for the attainment demonstrations. Years 2023 and 2031 are the attainment years for the federal 8-hour ozone standards of 80 ppb (revoked) and 75 ppb, respectively. The 2022 inventory was developed to show attainment for the revoked 1-hour ozone standard (120 ppb). The 2019 and 2025 inventories were used to demonstrate attainment for the federal 24-hour and annual PM2.5 standards, respectively.

Future-year stationary source emissions are divided into RECLAIM and non-RECLAIM emissions. Future NOx and SOx emissions from RECLAIM sources are estimated based on their allocations as specified by District Rule 2002 –Allocations for NOx and SOx. The forecasts for non-RECLAIM emissions were derived using: (1) emissions from the 2012 base year, (2) expected controls after implementation of District rules adopted by December 2015 and CARB rules adopted as of November 2015, and (3) activity growth in various source categories between the base and future years.

Demographic growth forecasts for various socioeconomic categories (e.g., population, housing, employment by industry), developed by SCAG for their 2016 RTP/SCS, were used. Industry growth factors for 2012, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2025, 2026, 2031, and 2037 are also provided by SCAG, and interim years are calculated by linear interpolation. Table 3-3 summarizes key socioeconomic parameters used in the 2016 AQMP for emissions inventory development.

In this chapter, the inventories for 2019, 2022, 2023, 2025, and 2031, the 8-hour ozone, 1-hour ozone, along with the annual and 24-hour PM2.5 attainment target years are discussed.

TABLE 3-3
Baseline Demographic Forecasts in the 2016 AQMP and the Final 2012 AQMP

CATEGORY	2012	2023	2023 % GROWTH FROM 2012	2031	2031 % GROWTH FROM 2012
Population (Millions)	15.9	17.1	7%	17.9	12%
Housing Units (Millions)	5.1	5.7	10%	6.0	16%
Total Employment (Millions)	6.7	7.8	16%	8.2	23%
Daily VMT (Millions)	380	407	7%	409	8%

Current forecasts indicate that this region will experience a population growth of 7 percent between 2012 and 2023, with a 7 percent increase in vehicle miles traveled (VMT) and a population growth of 12 percent by the year 2031 with an 8 percent increase in VMT.

As compared to the projections in the 2012 AQMP, the current 2023 projections in the 2016 AQMP predict a population of about 200,000 fewer people (2.8 percent less), 100,000 more total employment (1.2 percent more), and 11 million miles more in the daily VMT forecast (2.7 percent more).

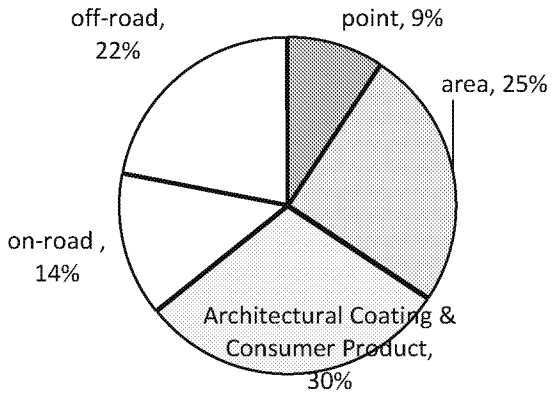
Summary of Future Baseline Emissions

To illustrate trends in the future baseline emissions inventories, emissions data by source categories (point, area, on-road mobile and off-road mobile sources) and by pollutant are presented in Tables 3-4A through 3-4E for the years 2019, 2022, 2023, 2025, and 2031. Baseline inventories are projected future emissions that reflect already adopted rules and regulations, but not additional controls proposed in the 2016 AQMP. This is in contrast to the 2012 base year emission inventory, which captures the actual 2012 emissions and is used as a basis for the projection of future inventories. Tables 3-4 provide annual average, as well as summer planning inventories. Emissions inventories for 2021, the "moderate" annual PM2.5 attainment deadline and milestone years for the Reasonable Further Progress (RTP) analysis (2024, 2027, 2028, 2029 and 2030) can be found in Appendix III.

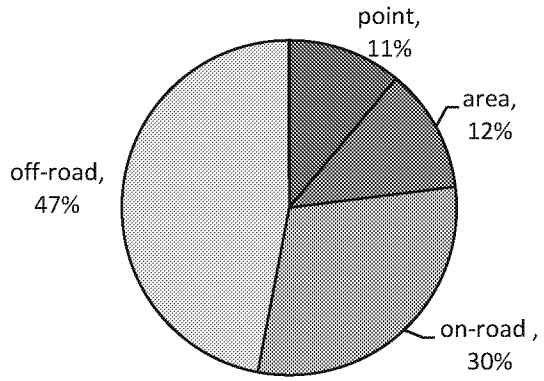
Without any additional control measures, VOC and NOx emissions are expected to decrease due to existing regulations, such as controls for on- and off-road equipment, new vehicle standards, and the RECLAIM program. However, consistent with what was shown earlier with the mobile source categories, the emissions of SOx and PM2.5 show increases after 2022, when most of the rules and regulations will be fully implemented. Increases in emissions due to increase in population and activity outpace the emission reductions from introducing newer and cleaner equipment and vehicles. Figure 3-5 illustrates the relative contribution to the 2031 inventory by source category. A comparison of Figures 3-3 and 3-

5 indicates that the on-road mobile category continues to be a major contributor to CO and NOx emissions. However, because of the implementation of most of the mobile source rules and regulations by 2023, 2031 on-road mobile sources account for much less of the VOC, NOx, and CO emissions as compared to 2012: about 14 percent of total VOC emissions compared to 33 percent in 2012; about 30 percent of total NOx emissions compared to 56 percent in 2012; and about 26 percent of total CO emissions compared to 63 percent in 2012. For directly emitted PM2.5, mobile sources will represent 23 percent of the emissions with another 14 percent due to vehicle-related entrained road dust, a reduction from the mobile source contribution in the base-year. It is projected that stationary sources will emit the majority of the SOx emissions with the point source category, contributing 55 percent of the SOx emissions in the Basin. In 2031, area sources will play even a larger role in VOC emissions, emitting more than point sources and mobile sources combined. Area sources will become the major contributor to VOC emissions from 37 percent in 2012 to 55 percent in 2031 and are projected to remain as the predominant source of directly emitted PM2.5 emissions (49 percent). See Figures 3-7 through 3-30 for the highest-ranking source categories for 2012, 2019, 2022, 2023, 2025, and 2031.

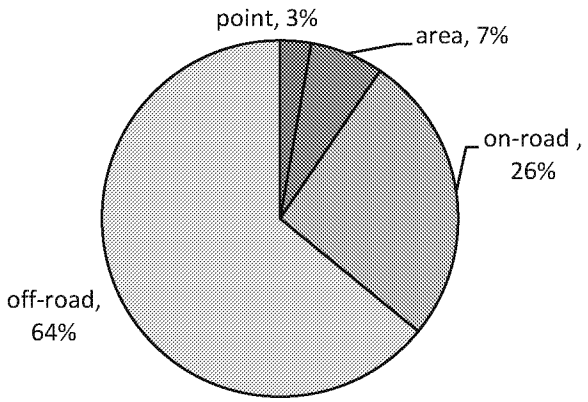
Figure 3-6 shows the fraction of the 2031 inventory by responsible agency for VOC, NOx, SOx, and directly emitted PM2.5. In 2031, a larger fraction of the NOx and VOC emissions will fall under the SCAQMD control. However, the majority of VOC and NOx emissions will remain primarily under CARB and EPA jurisdiction. The fraction of SOx emissions that fall under SCAQMD control will remain largely unchanged from the 2012 base-year inventory. However, the increasing contribution of area and point sources towards direct PM2.5 emissions in 2031 will result in a larger fraction of emissions falling under SCAQMD control.



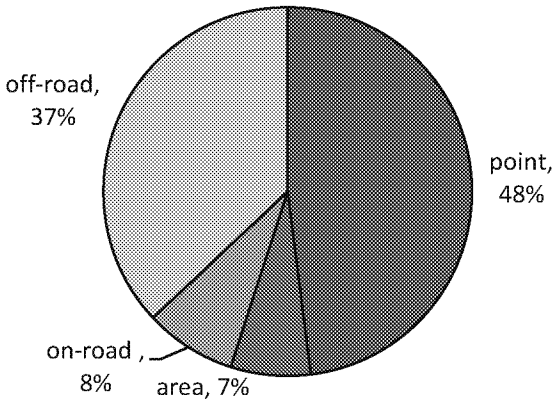
VOC Emissions: 362 tons/day



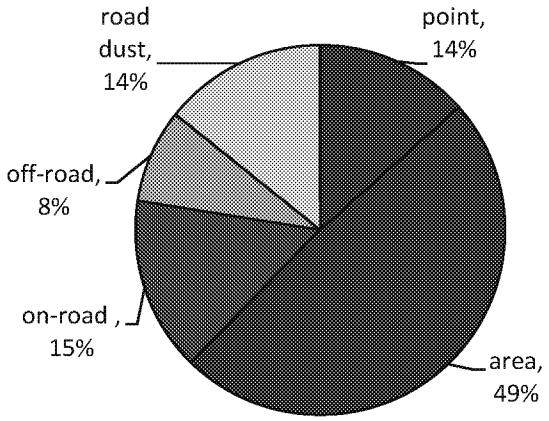
NOx Emissions: 214 tons/day



CO Emissions: 1118 tons/day



SOx Emissions: 18 tons/day



Directly Emitted PM2.5 Emissions: 65 tons/day

FIGURE 3-5

RELATIVE CONTRIBUTION BY SOURCE CATEGORY TO 2031 EMISSION INVENTORY

(VOC & NOX – SUMMER PLANNING; CO, SOX, & PM2.5 – ANNUAL AVERAGE INVENTORY - VALUES ARE ROUNDED TO NEAREST INTEGER AND MAY NOT SUM DUE TO ROUNDING)

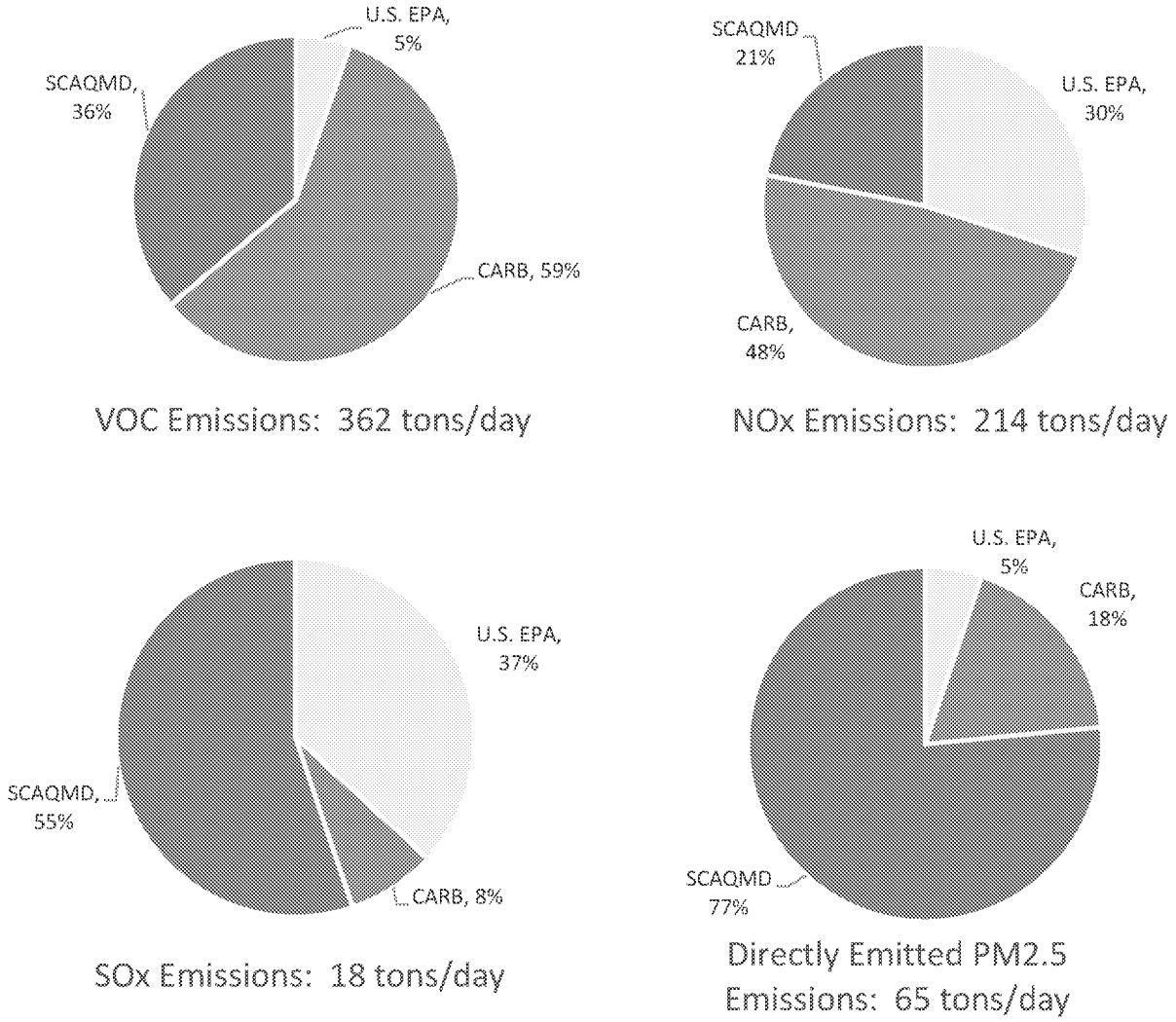


FIGURE 3-6

2031 EMISSION INVENTORY AGENCY RESPONSIBILITY

(VOC & NOX – SUMMER PLANNING; SOX & PM2.5 – ANNUAL AVERAGE INVENTORY. VALUES ARE ROUNDED TO NEAREST INTEGER AND MAY NOT SUM DUE TO ROUNDING)

TABLE 3-4A

Summary of Emissions By Major Source Category: 2019 Baseline (24-hr PM2.5 attainment year)
Average Annual Day and Summer Planning (tpd[1])

SOURCE CATEGORY	ANNUAL AVERAGE						SUMMER PLANNING	
	VOC	NOx	CO	SOx	PM2.5	NH3	VOC	NOx
STATIONARY SOURCES								
Fuel Combustion	11	23	48	2	6	9	11	23
Waste Disposal	14	2	1	1	0	6	16	2
Cleaning and Surface Coatings	42	0	0	0	2	0	43	0
Petroleum Production and Marketing	21	0	5	0	2	0	21	0
Industrial Processes	12	0	1	0	7	9	13	0
Solvent Evaporation:								
Consumer Products	88	0	0	0	0	0	88	0
Architectural Coatings	12	0	0	0	0	0	12	0
Others	2	0	0	0	0	1	3	0
Misc. Processes[2]	13	14	56	1	31	35	7	10
RECLAIM Sources[3]	0	23	0	6	0	0	0	23
Total Stationary Sources	**214**	**62**	**111**	**10**	**47**	**60**	**213**	**59**
MOBILE SOURCES								
On-Road Vehicles	82	167	639	2	11	14	86	155
Off-Road Vehicles	79	124	697	5	6	0	98	133
Total Mobile Sources	**161**	**291**	**1336**	**7**	**17**	**14**	**184**	**289**
TOTAL	**376**	**353**	**1447**	**17**	**64**	**74**	**398**	**347**

[1] Values are rounded to nearest integer and may not sum due to rounding
[2] Includes entrained road dust
[3] Includes 2015 RECLAIM NOx shaves

TABLE 3-4B

Summary of Emissions By Major Source Category: 2022 Baseline (1-hr ozone attainment year)
Average Annual Day and Summer Planning (tpd[1])

SOURCE CATEGORY	Annual Average						Summer Planning	
	VOC	NOx	CO	SOx	PM2.5	NH3	VOC	NOx
STATIONARY SOURCES								
Fuel Combustion	11	22	49	2	6	9	11	22
Waste Disposal	15	2	1	1	0	6	17	3
Cleaning and Surface Coatings	45	0	0	0	2	0	47	0
Petroleum Production and Marketing	20	0	5	0	2	0	20	0
Industrial Processes	12	0	1	0	7	9	13	0
Solvent Evaporation:								
Consumer Products	90	0	0	0	0	0	90	0
Architectural Coatings	12	0	0	0	0	0	12	0
Others	2	0	0	0	0	1	3	0
Misc. Processes[2]	13	13	56	1	31	35	7	10
RECLAIM Sources[3]	0	15	0	6	0	0	0	15
Total Stationary Sources	**220**	**53**	**112**	**10**	**48**	**60**	**220**	**50**
MOBILE SOURCES								
On-Road Vehicles	68	125	498	2	10	13	71	117
Off-Road Vehicles	74	113	715	5	6	0	92	120
Total Mobile Sources	**142**	**238**	**1213**	**7**	**16**	**13**	**163**	**237**
TOTAL	**362**	**290**	**1325**	**17**	**64**	**73**	**383**	**287**

[1] Values are rounded to nearest integer and may not sum due to rounding
[2] Includes entrained road dust
[3] Includes 2015 RECLAIM NOx shaves

TABLE 3-4C

Summary of Emissions By Major Source Category: 2023 Baseline (1997 8-hr ozone attainment year)
Average Annual Day and Summer Planning (tpd[1])

SOURCE CATEGORY	Annual Average						Summer Planning	
	VOC	NOx	CO	SOx	PM2.5	NH3	VOC	NOx
STATIONARY SOURCES								
Fuel Combustion	11	22	49	2	6	9	11	22
Waste Disposal	15	2	1	1	0	6	17	3
Cleaning and Surface Coatings	46	0	0	0	2	0	47	0
Petroleum Production and Marketing	20	0	5	0	2	0	20	0
Industrial Processes	13	0	1	0	8	9	14	0
Solvent Evaporation:								
Consumer Products	90	0	0	0	0	0	90	0
Architectural Coatings	12	0	0	0	0	0	12	0
Others	2	0	0	0	0	1	3	0
Misc. Processes[2]	13	13	56	1	32	35	7	10
RECLAIM Sources[3]	0	15	0	6	0	0	0	15
Total Stationary Sources	**222**	**52**	**112**	**10**	**48**	**60**	**220**	**50**
MOBILE SOURCES								
On-Road Vehicles	65	94	465	2	10	13	68	88
Off-Road Vehicles	73	110	721	6	6	0	90	117
Total Mobile Sources	**137**	**204**	**1186**	**7**	**16**	**13**	**158**	**205**
TOTAL	**359**	**257**	**1298**	**17**	**64**	**72**	**379**	**255**

[1] Values are rounded to nearest integer and may not sum due to rounding
[2] Includes entrained road dust
[3] Includes 2015 RECLAIM NOx shaves

TABLE 3-4D

Summary of Emissions By Major Source Category: 2025 Baseline (annual PM2.5 attainment year)
Average Annual Day and Summer Planning (tpd[1])

SOURCE CATEGORY	Annual Average						Summer Planning	
	VOC	NOx	CO	SOx	PM2.5	NH3	VOC	NOx
STATIONARY SOURCES								
Fuel Combustion	11	22	50	2	6	9	11	22
Waste Disposal	16	2	1	1	0	6	18	3
Cleaning and Surface Coatings	47	0	0	0	2	0	49	0
Petroleum Production and Marketing	19	0	5	0	2	0	20	0
Industrial Processes	13	0	1	0	8	9	14	0
Solvent Evaporation:								
Consumer Products	91	0	0	0	0	0	91	0
Architectural Coatings	12	0	0	0	0	0	12	0
Others	3	0	0	0	0	1	3	0
Misc. Processes[2]	13	13	56	1	32	35	7	9
RECLAIM Sources[3]	0	15	0	6	0	0	0	15
Total Stationary Sources	**224**	**52**	**112**	**10**	**49**	**60**	**223**	**49**
MOBILE SOURCES								
On-Road Vehicles	58	85	403	2	10	12	61	79
Off-Road Vehicles	71	104	731	6	5	0	87	110
Total Mobile Sources	**129**	**189**	**1134**	**7**	**15**	**12**	**148**	**190**
TOTAL	**353**	**241**	**1247**	**17**	**64**	**72**	**372**	**239**

[1] Values are rounded to nearest integer and may not sum due to rounding
[2] Includes entrained road dust
[3] Includes 2015 RECLAIM NOx shaves

TABLE 3-4E

Summary of Emissions By Major Source Category: 2031 Baseline (2008 8-hr ozone attainment year)
Average Annual Day and Summer Planning (tpd[1])

SOURCE CATEGORY	Annual Average						Summer Planning	
	VOC	NOx	CO	SOx	PM2.5	NH3	VOC	NOx
STATIONARY SOURCES								
Fuel Combustion	11	22	51	2	6	9	11	22
Waste Disposal	16	2	1	1	0	6	19	3
Cleaning and Surface Coatings	50	0	0	0	2	1	52	0
Petroleum Production and Marketing	18	0	5	0	2	0	18	0
Industrial Processes	13	0	1	0	8	9	14	0
Solvent Evaporation:								
Consumer Products	94	0	0	0	0	0	94	0
Architectural Coatings	13	0	0	0	0	0	13	0
Others	3	0	0	0	0	1	3	0
Misc. Processes[2]	13	11	56	1	33	36	7	9
RECLAIM Sources[3]	0	15	0	6	0	0	0	15
Total Stationary Sources	**231**	**51**	**113**	**10**	**50**	**61**	**231**	**50**
MOBILE SOURCES								
On-Road Vehicles	47	69	309	1	10	12	49	65
Off-Road Vehicles	66	94	766	7	5	0	81	100
Total Mobile Sources	**114**	**163**	**1074**	**8**	**15**	**12**	**130**	**165**
TOTAL	**345**	**214**	**1188**	**18**	**65**	**73**	**362**	**214**

[1] Values may not sum due to rounding
[2] Includes entrained road dust
[3] Includes 2015 RECLAIM NOx shaves

Impact of Growth

The 2016 AQMP forecasts the 2031 emissions inventories ''with growth'' through a detailed consultation process with SCAG. The region is projected to see a 12 percent growth in population, 16 percent growth in housing units, 23 percent growth in employment, and 8 percent growth in vehicle miles traveled between 2012 and 2031. To illustrate the impact of demographic growth on emissions, year 2031 no-growth emissions were estimated by removing the growth factors from the 2031 baseline emissions. Table 3-5 presents the comparison of the projected 2031 emissions with and without growth. In this analysis, the benefit of potential applications of BACT under District's Regulation XIII – New Source Review (NSR) is not included. The growth impacts to year 2031 for VOC, NOx, CO, SOx and PM2.5 are 48, 35, 251, 2, and 8 tons per day, respectively.

While economic growth for the region is desirable, it presents a challenge to our air quality improvement efforts since the projected growth could offset the impressive progress made in reducing VOC, NOx, and PM2.5 emissions through adopted regulations. Meeting the U.S. EPA's current and more-stringent future air quality standards will require the continuation of emission reduction efforts from all levels of government.

TABLE 3-5

Growth Impact to 2031 Emissions[1] in Tons per Day

WITH GROWTH	VOC	NOx	CO	SOx	PM2.5
Point	30	21	34	9	9
Area	201	29	80	1	32
Road Dust	0	0	0	0	9
On-Road	47	69	309	1	10
Off-Road	66	94	766	7	5
Total	**345**	**214**	**1188**	**18**	**65**
NO GROWTH	**VOC**	**NOx**	**CO**	**SOx**	**PM2.5**
Point	24	20	31	8	8
Area	178	32	78	1	28
Road Dust	0	0	0	0	8
On-Road	46	51	299	1	9
Off-Road	49	76	519	5	4
Total	**297**	**179**	**927**	**16**	**57**
IMPACT OF GROWTH	**VOC**	**NOx**	**CO**	**SOx**	**PM2.5**
Point	6	1	3	0	1
Area	23	-3	2	0	4
Road Dust	0	0	0	0	1
On-Road	1	18	10	0	1
Off-Road	18	19	237	2	1
Total	**48**	**35**	**251**	**2**	**8**

[1]Annual Average Inventory

Top Ten Source Categories (2012, 2019, 2022, 2023, 2025, and 2031)

The rankings of the top ten source contributors to the emissions inventories for specific years for VOC, NOx, SOx and PM2.5 are listed and briefly discussed in this section. The summer planning inventories for VOC and NOx, along with the annual average inventories for SOx and PM2.5 for 2012, 2019, 2022, 2023, 2025, and 2031 are shown in Figures 3-7 to 3-30.

Figures 3-7 to 3-12 provide the top ten categories for each of the six inventory years for VOCs. Two of top four categories are on-road mobile sources in the 2012 inventory, but none of the on-road categories are found in the top four categories for 2023, 2025 or 2031. This demonstrates the effect of more-stringent on-road standards in the future. Consumer products, and off-road equipment remain as high-emitting categories over time. The coatings and related processes category becomes much more significant in future years. The top 10 categories account for 78 percent of the total VOC inventory in 2012 and continue to account for over 72 percent through 2031.

NOTE: Figures 3-7, and 3-14 through 3-30 have been updated from the Draft Plan to reflect the latest emission inventory values (e.g., aircraft NOx and SOx, paved road dust PM2.5).

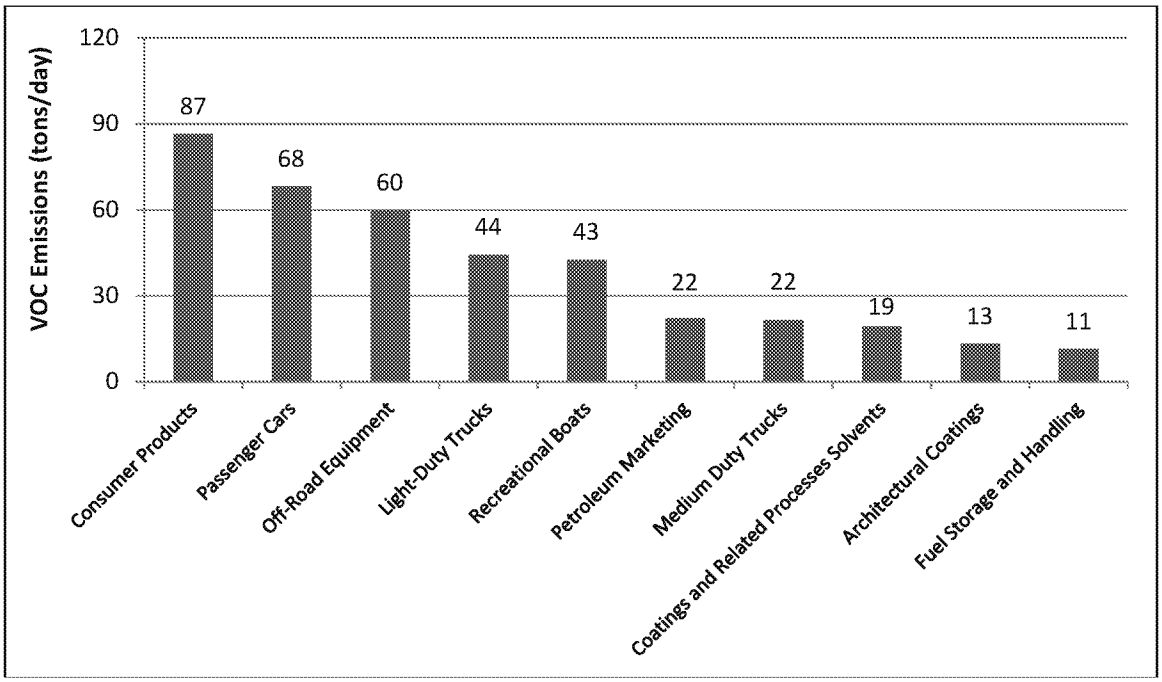


FIGURE 3-7

TOP TEN EMITTER CATEGORIES FOR VOC IN 2012 (SUMMER PLANNING)

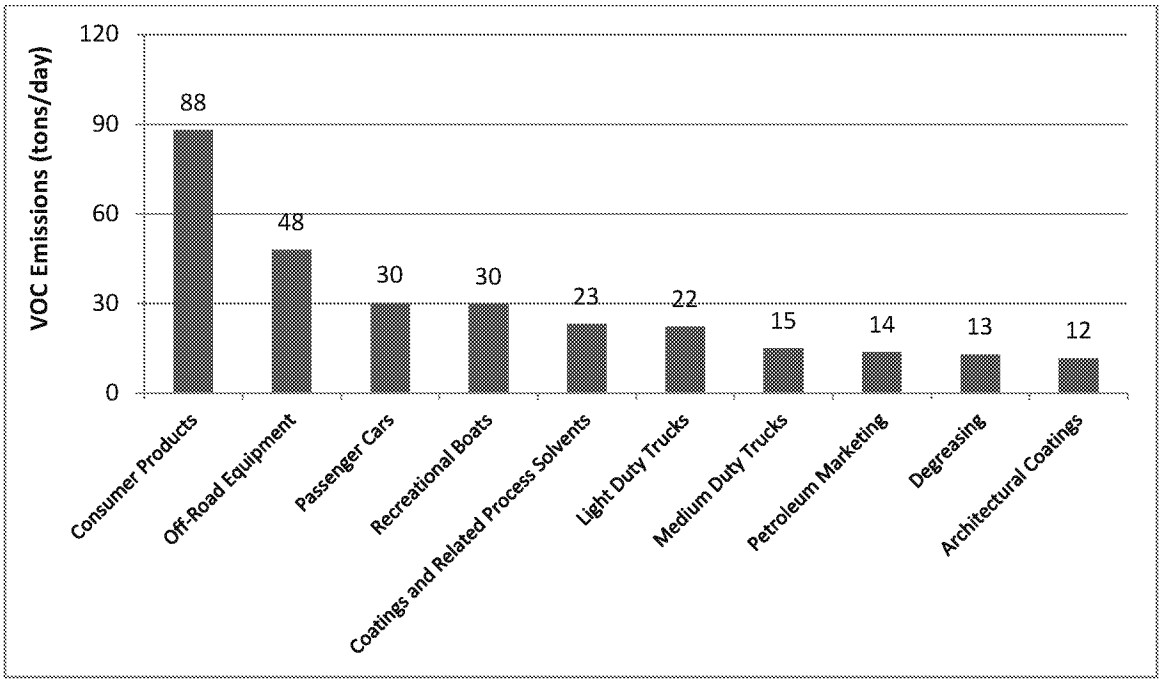


FIGURE 3-8

TOP TEN EMITTER CATEGORIES FOR VOC IN 2019 (SUMMER PLANNING)

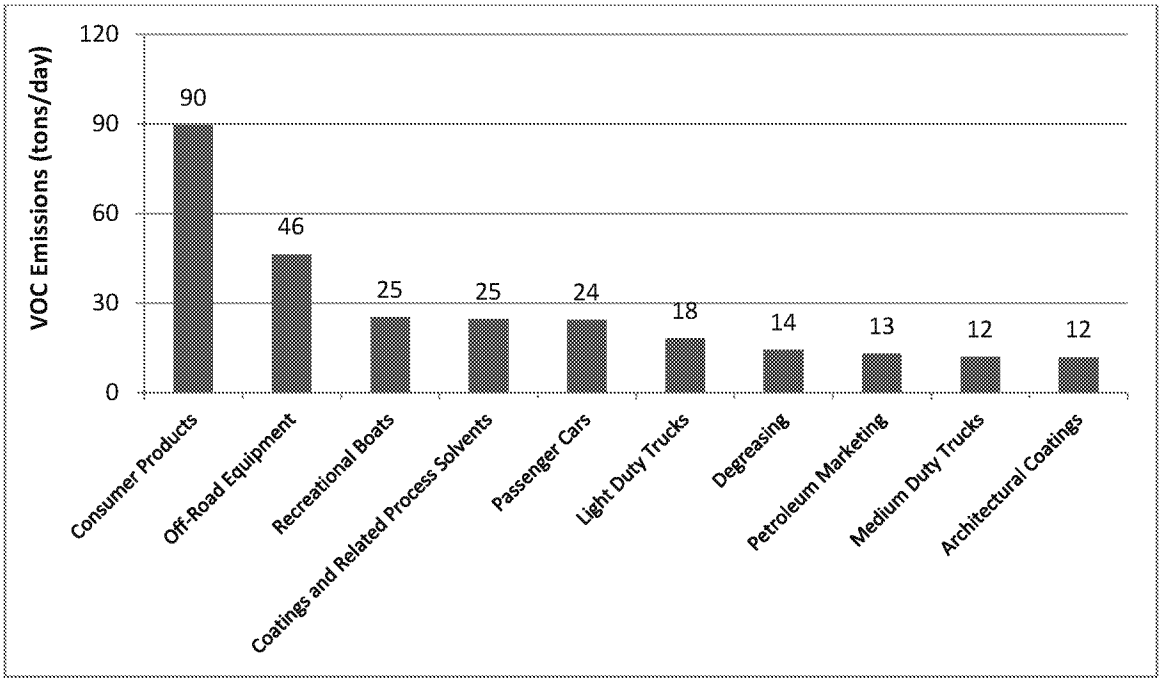


FIGURE 3-9

TOP TEN EMITTER CATEGORIES FOR VOC IN 2022 (SUMMER PLANNING)

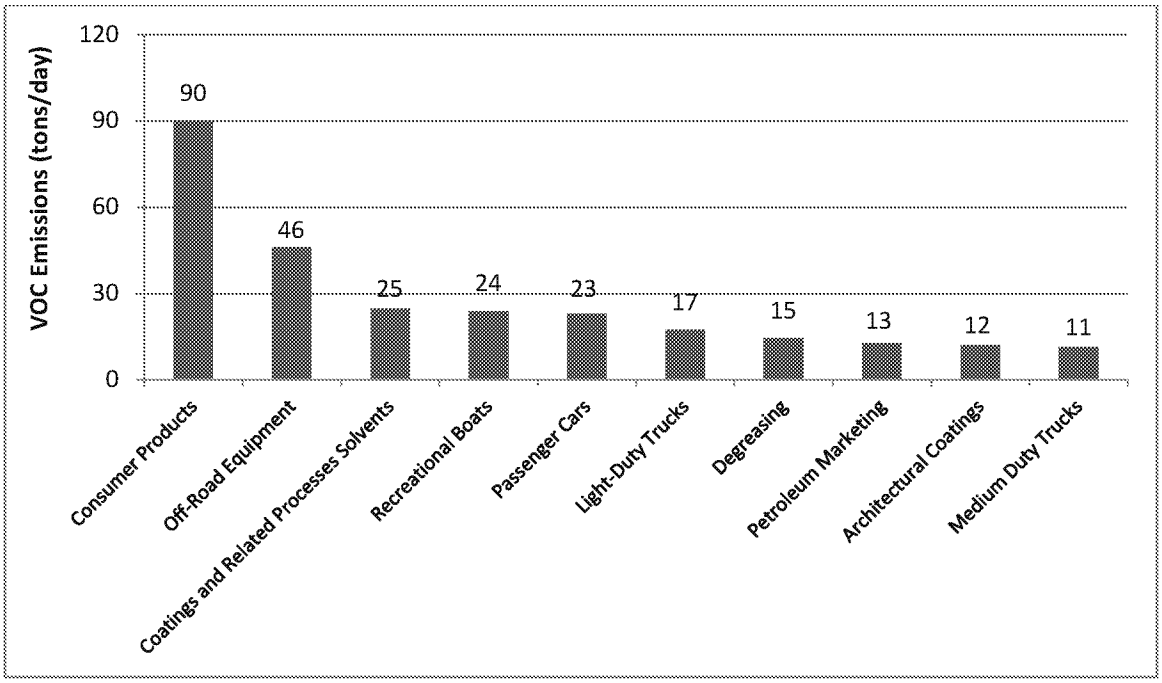


FIGURE 3-10

TOP TEN EMITTER CATEGORIES FOR VOC IN 2023 (SUMMER PLANNING)

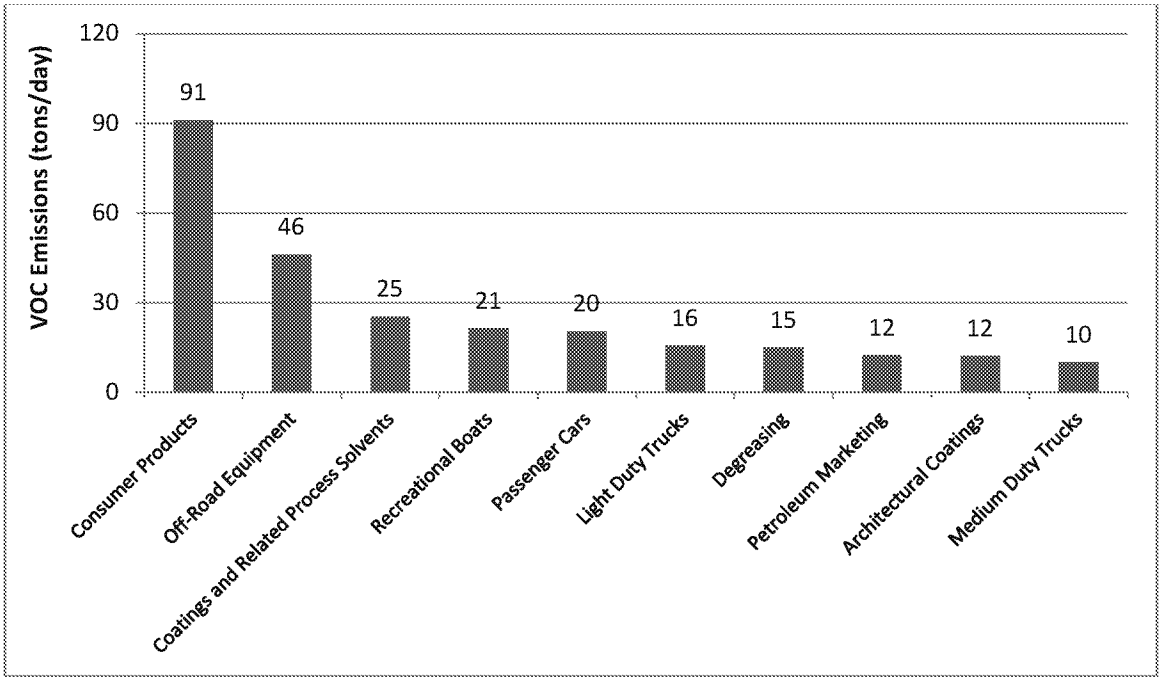


FIGURE 3-11

TOP TEN EMITTER CATEGORIES FOR VOC IN 2025 (SUMMER PLANNING)

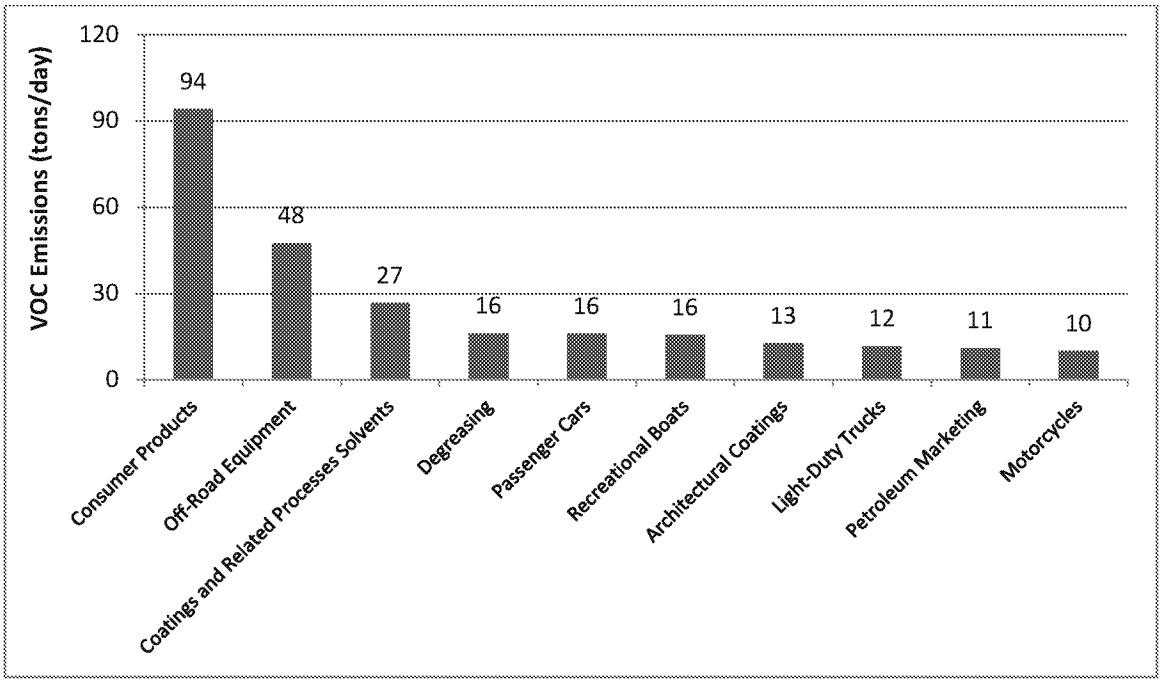


FIGURE 3-12

TOP TEN EMITTER CATEGORIES FOR VOC IN 2031 (SUMMER PLANNING)

Figures 3-13 to 3-18 show the top ten categories for NOx emissions for specific years. Mobile source categories remain the predominant contributor to NOx emissions. Heavy-duty diesel trucks, off-road equipment, and ships and commercial boats are the top three emitters on the list for all six years. NOx RECLAIM and residential fuel combustion are the only non-mobile categories which make it to the top ten list in 2012, but as the mobile source categories clean up due to the implementation of regulations, the number of non-mobile sources appearing in the top 10 categories increases with time, with four non-mobile categories in 2025 and 2031. The top ten categories account for 85 percent of the total NOx inventory in 2012, 84 percent in 2019, 83 percent in 2022, 82 percent in 2023, 83 percent in 2025 and 86 percent in 2031.

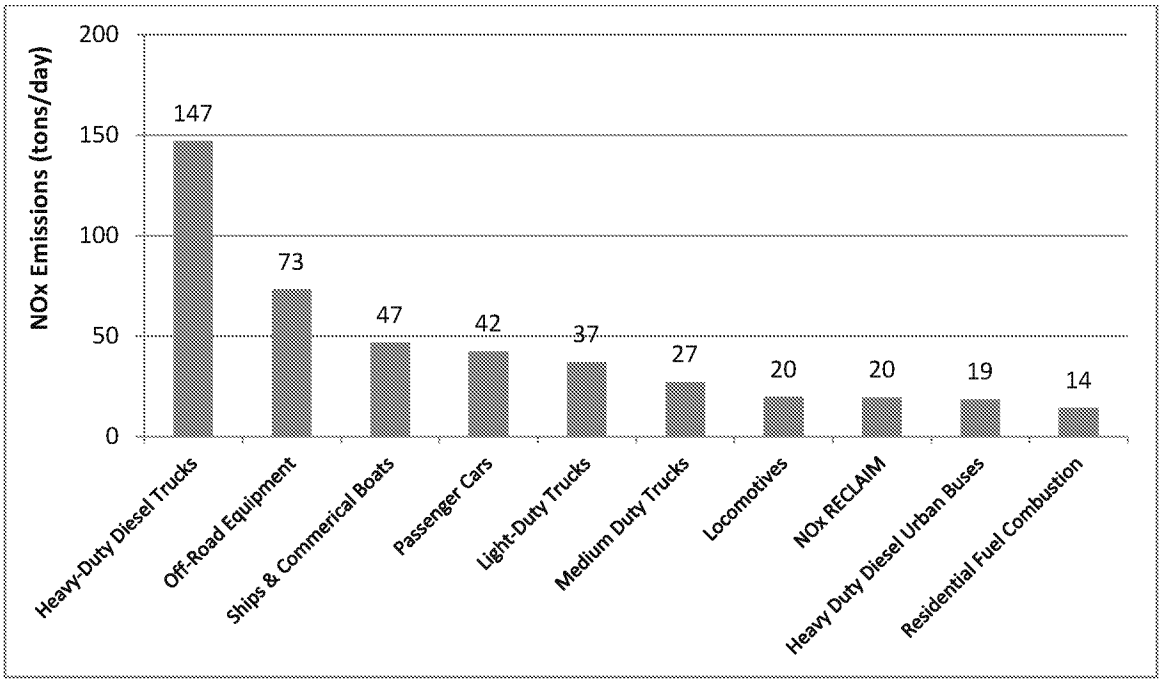


FIGURE 3-13

TOP TEN EMITTER CATEGORIES FOR NOX IN 2012 (SUMMER PLANNING)

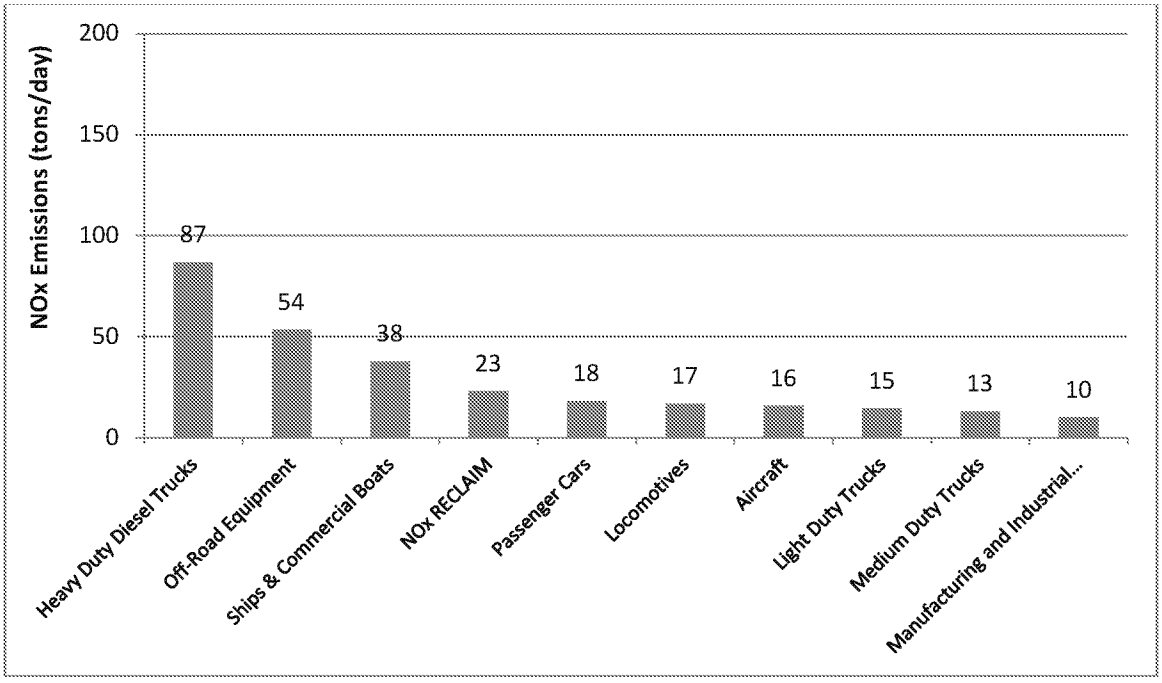


FIGURE 3-14

TOP TEN EMITTER CATEGORIES FOR NOX IN 2019 (SUMMER PLANNING)

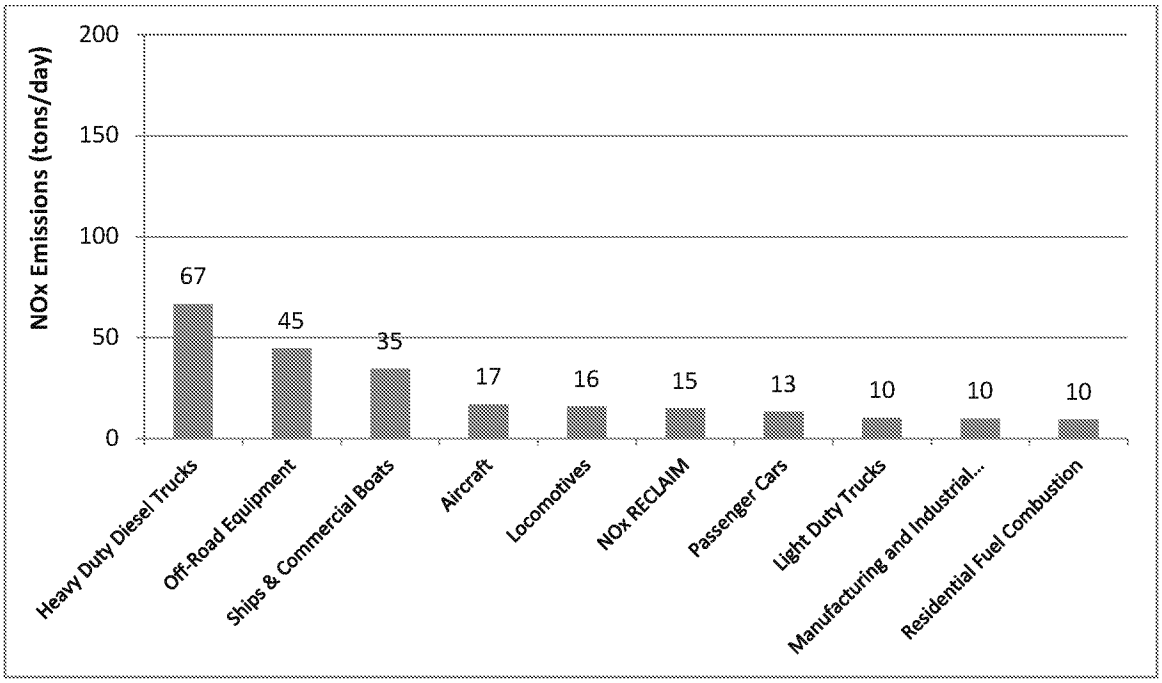


FIGURE 3-15

TOP TEN EMITTER CATEGORIES FOR NOX IN 2022 (SUMMER PLANNING)

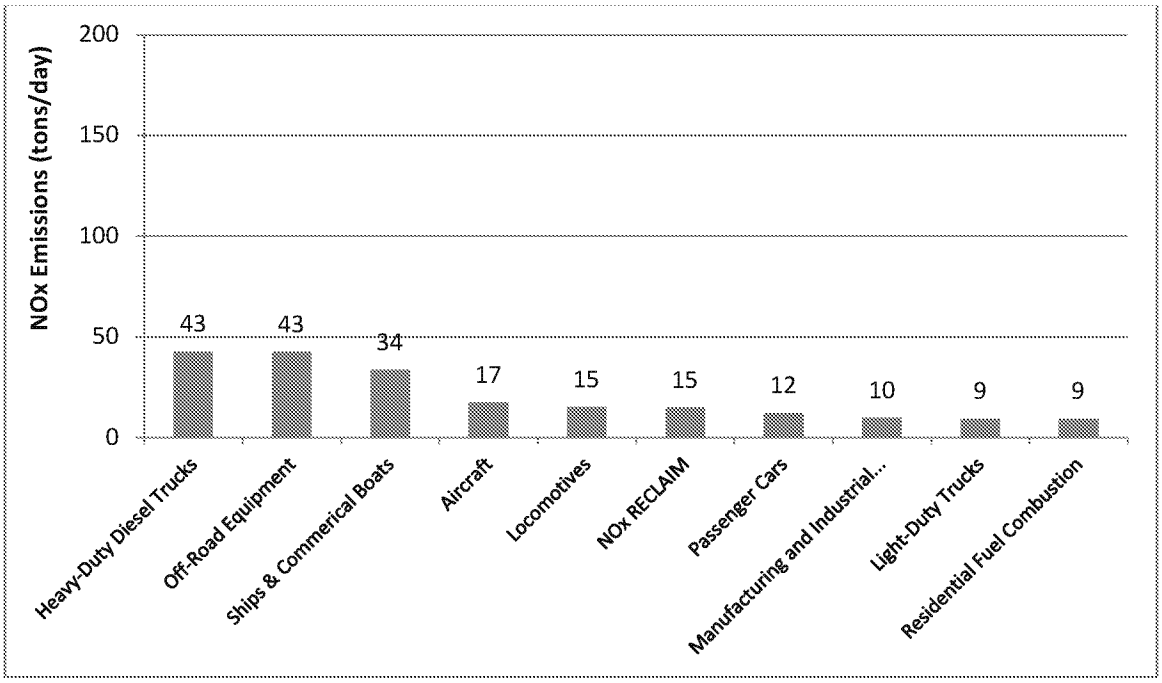


FIGURE 3-16

TOP TEN EMITTER CATEGORIES FOR NOX IN 2023 (SUMMER PLANNING)

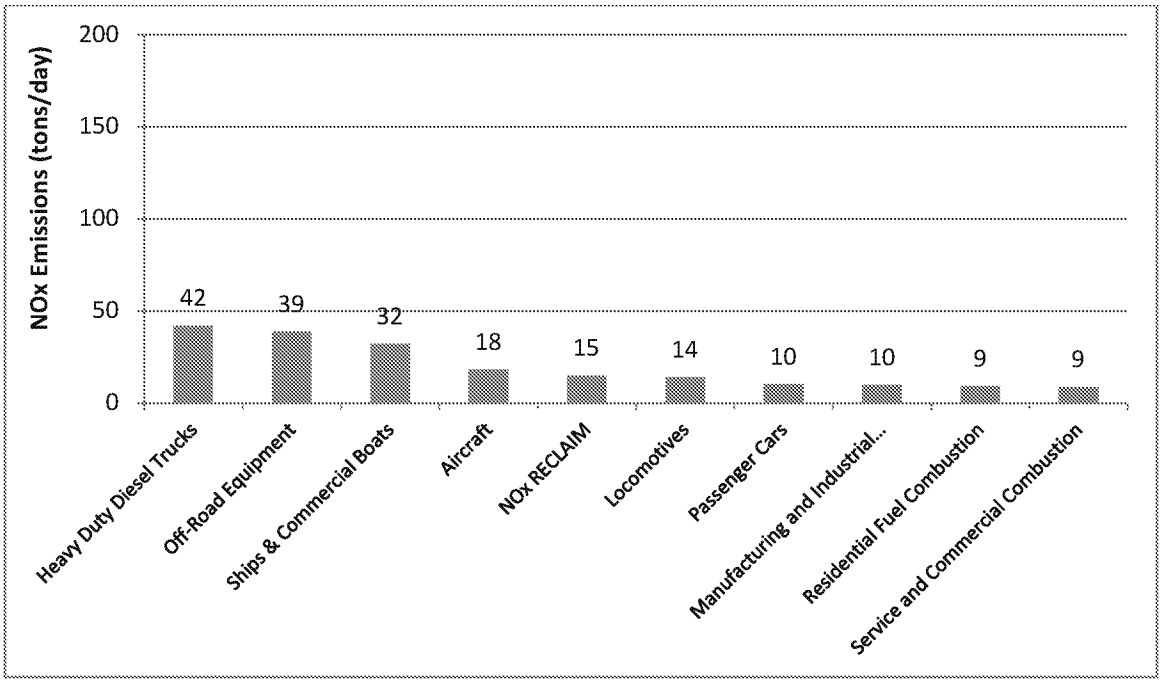


FIGURE 3-17

TOP TEN EMITTER CATEGORIES FOR NOX IN 2025 (SUMMER PLANNING)

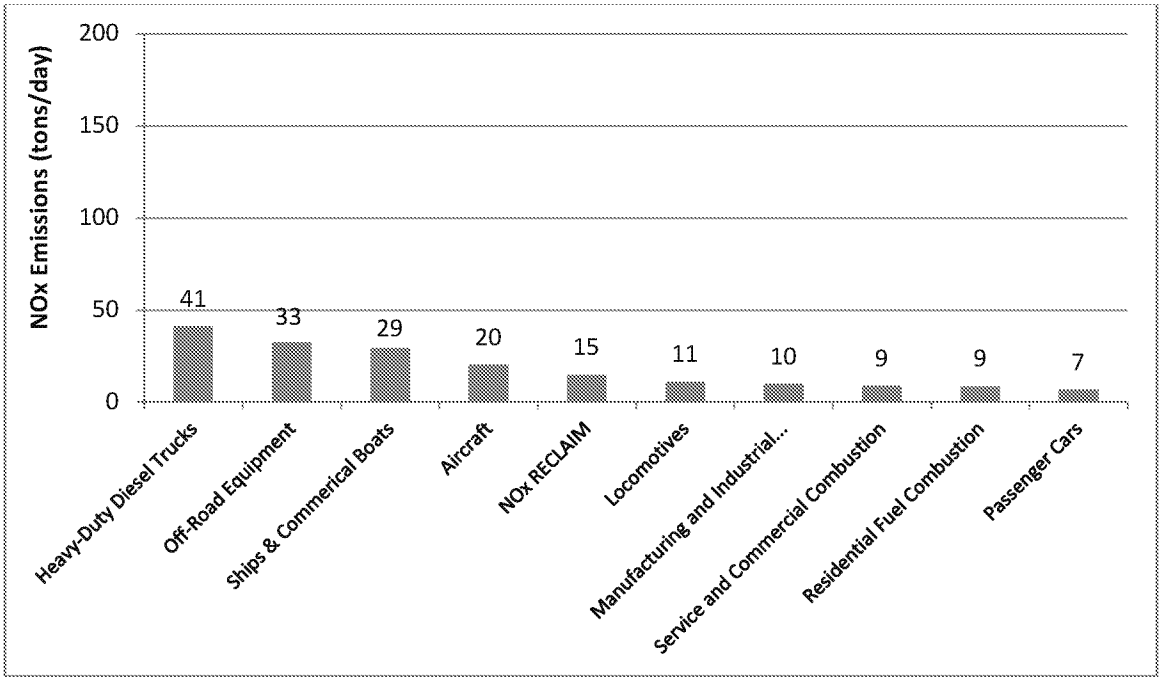


FIGURE 3-18

TOP TEN EMITTER CATEGORIES FOR NOX IN 2031 (SUMMER PLANNING)

Figures 3-19 to 3-23 show the top source categories for SOx emissions in the years 2012, 2019, 2022, 2023, 2025 and 2031. The emission levels of SOx are relatively low. Therefore, only the categories that emit more than 0.5 tons per day of SOx are ranked and listed. The top five high emitting source categories remain the same in all years. SOx RECLAIM and Ships & Commercial Boats are the most significant contributors. The top categories represent 81 percent, 79 percent, 79 percent, 79 percent, 80 percent and 81 percent of the total SOx inventory in 2012, 2019, 2022, 2023, 2025, and 2031, respectively.

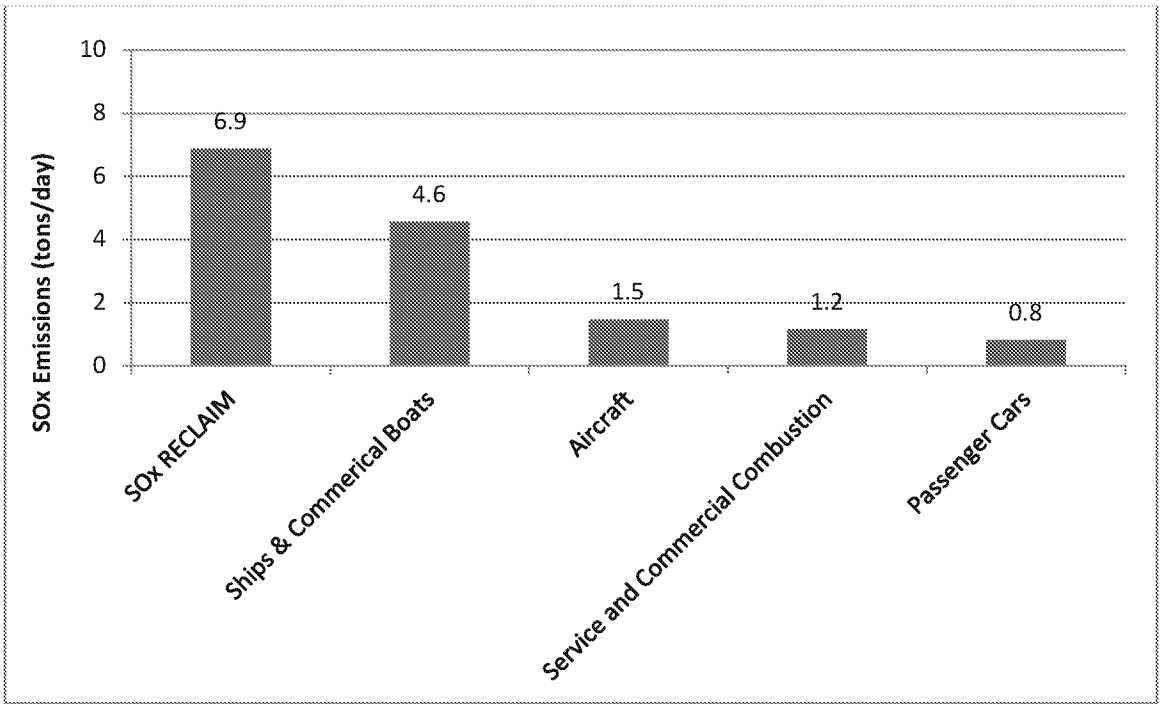


FIGURE 3-19

TOP EMITTER CATEGORIES FOR SOX 0.5 TPD AND OVER IN 2012 (ANNUAL AVERAGE)

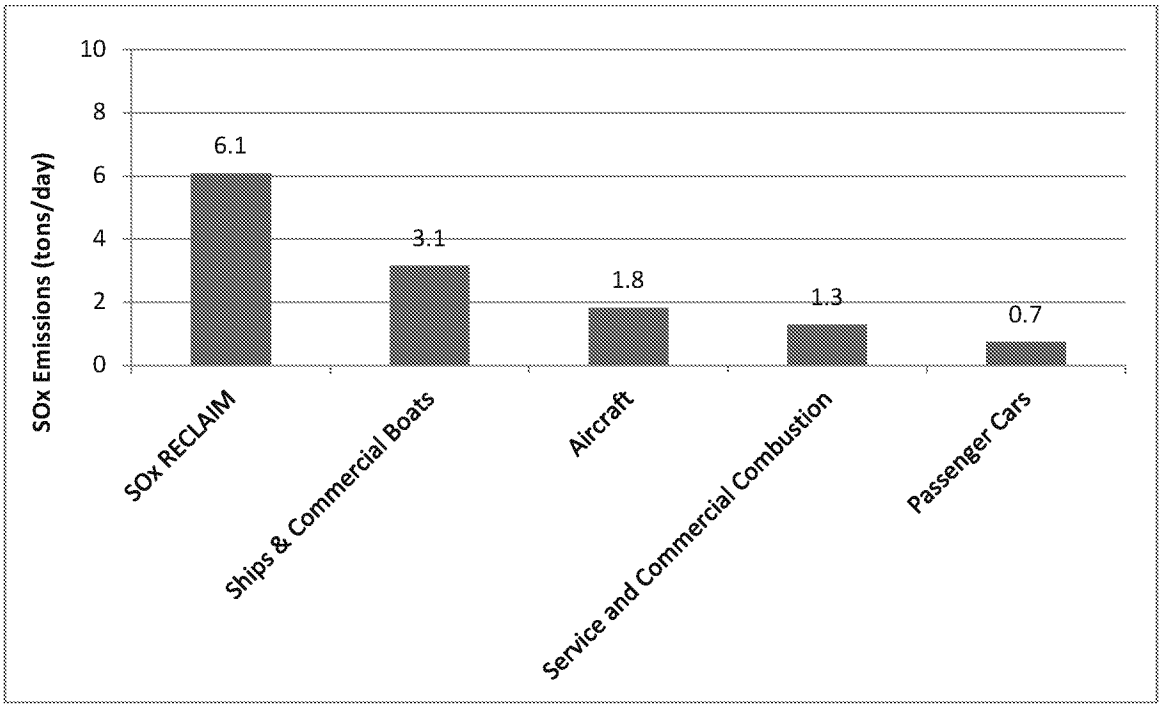


FIGURE 3-20

TOP EMITTER CATEGORIES FOR SOX 0.5 TPD AND OVER IN 2019 (ANNUAL AVERAGE)

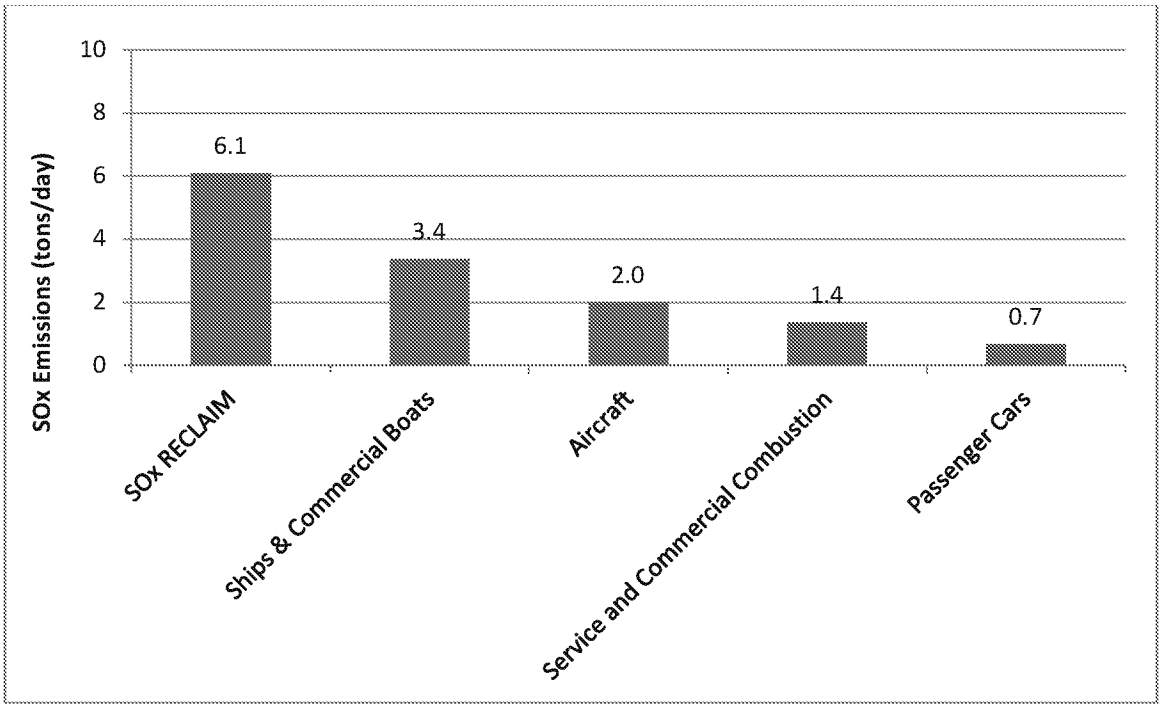


FIGURE 3-21

TOP EMITTER CATEGORIES FOR SOX 0.5 TPD AND OVER IN 2022 (ANNUAL AVERAGE)

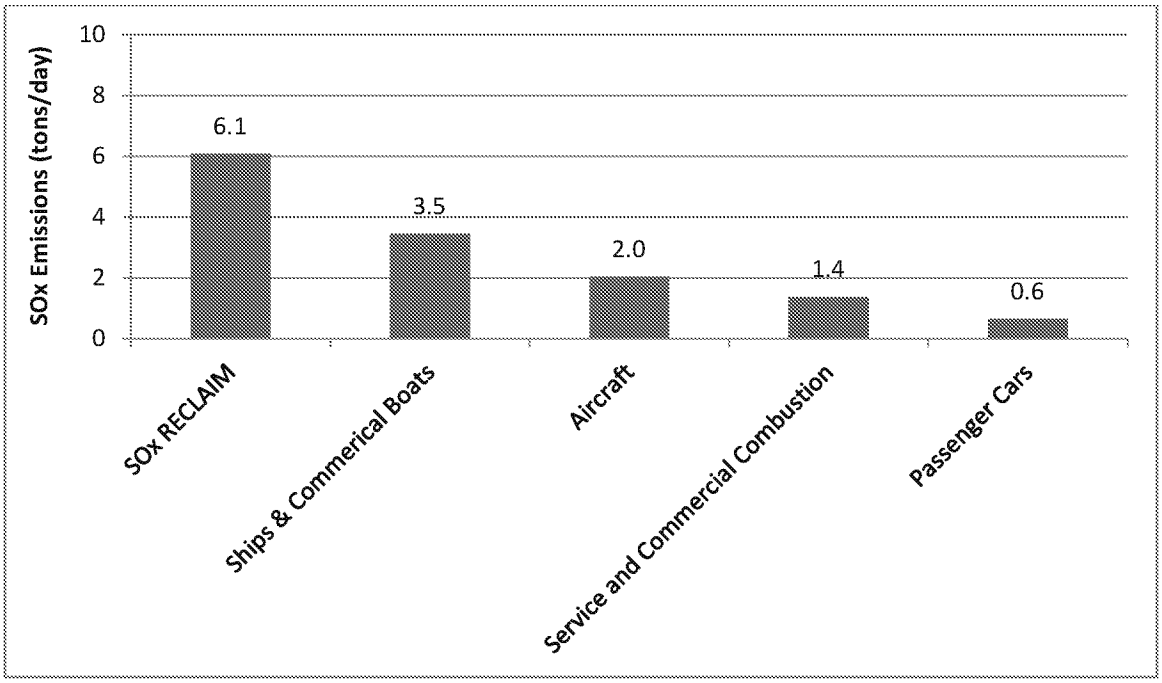


FIGURE 3-22

TOP EMITTER CATEGORIES FOR SOX 0.5 TPD AND OVER IN 2023 (ANNUAL AVERAGE)

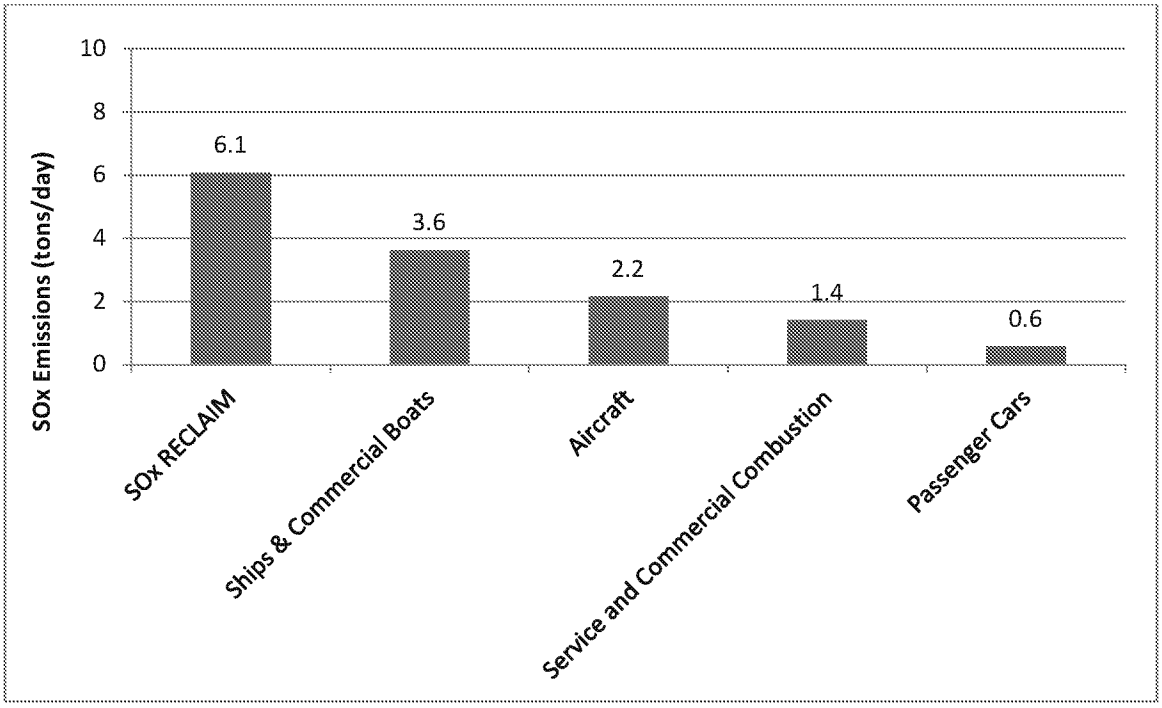


FIGURE 3-23

TOP EMITTER CATEGORIES FOR SOX 0.5 TPD AND OVER IN 2025 (ANNUAL AVERAGE)

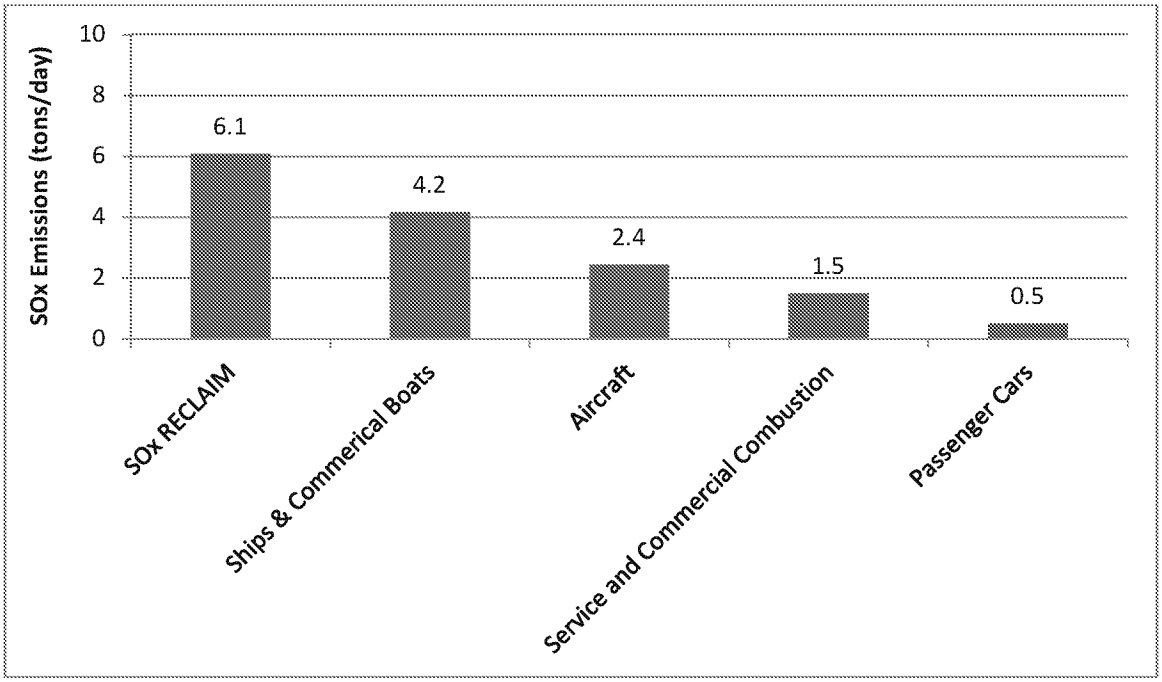


FIGURE 3-24

TOP EMITTER CATEGORIES FOR SOX 0.5 TPD AND OVER IN 2031 (ANNUAL AVERAGE)

Figures 3-25 to 3-30 show the top ten source categories in specific years for directly emitted PM2.5. Commercial cooking, paved road dust, and residential fuel combustion are the top three highest emitting categories for all six years. The top ten categories represent 72 percent of the total directly emitted PM2.5 inventory in 2012 and 2019, and 73 percent in 2023 through 2031.

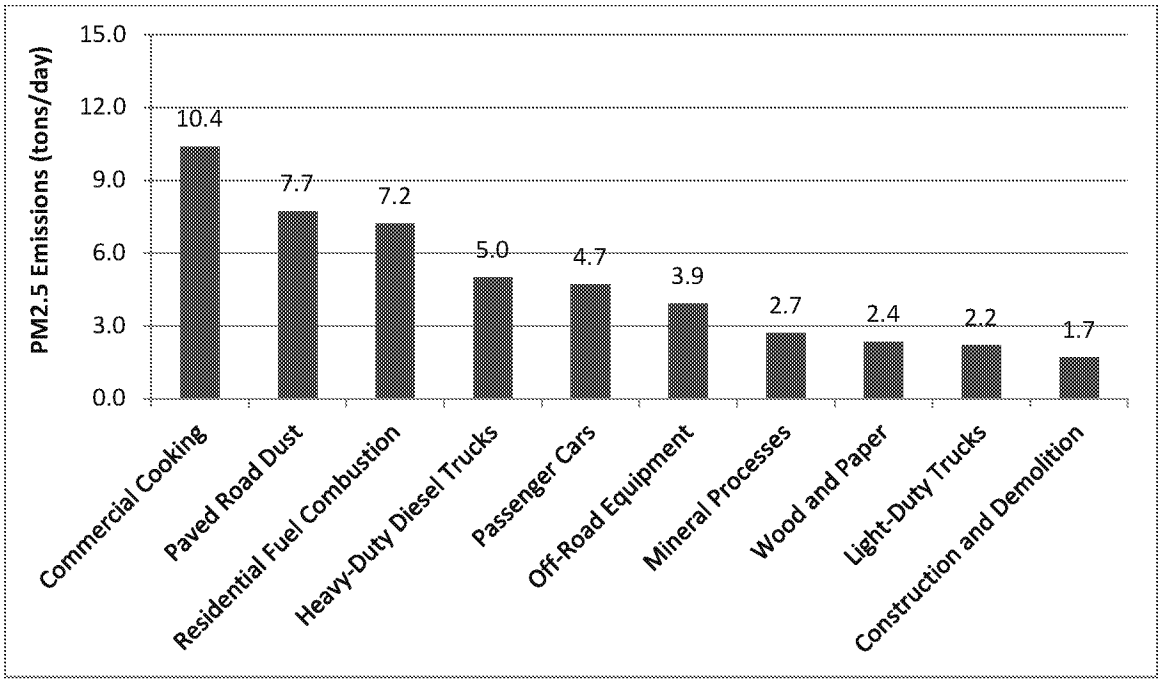


FIGURE 3-25

TOP TEN EMITTER CATEGORIES FOR DIRECTLY EMITTED PM2.5 IN 2012 (ANNUAL AVERAGE)

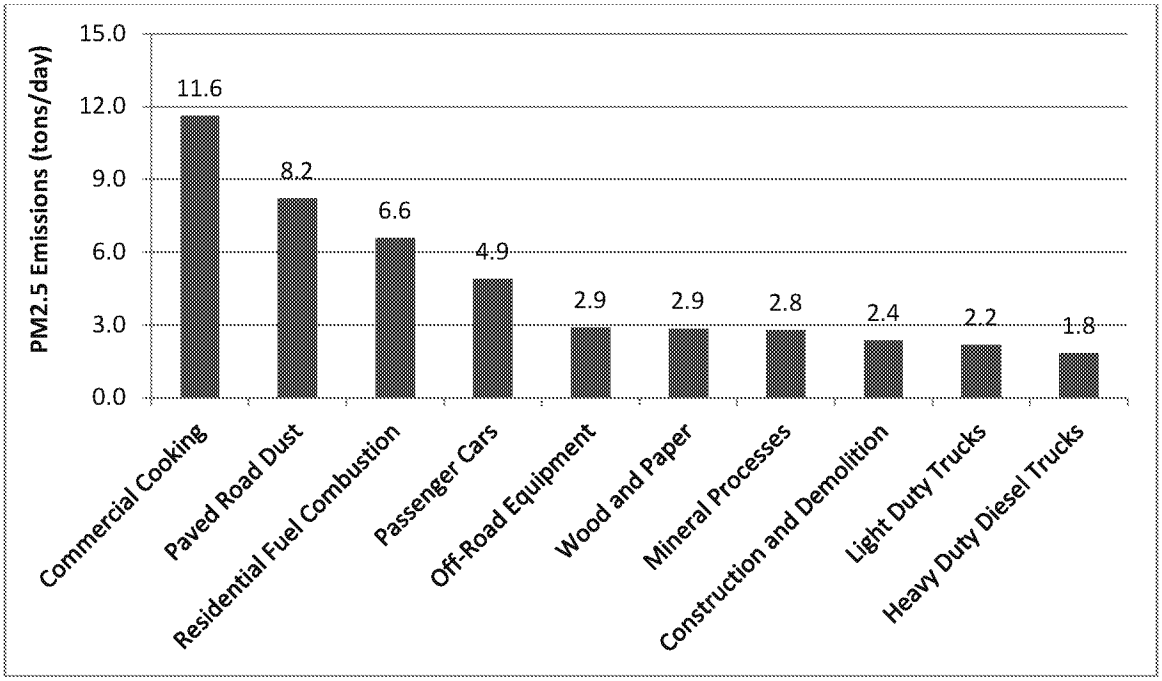


FIGURE 3-26

TOP TEN EMITTER CATEGORIES FOR DIRECTLY EMITTED PM2.5 IN 2019 (ANNUAL AVERAGE)

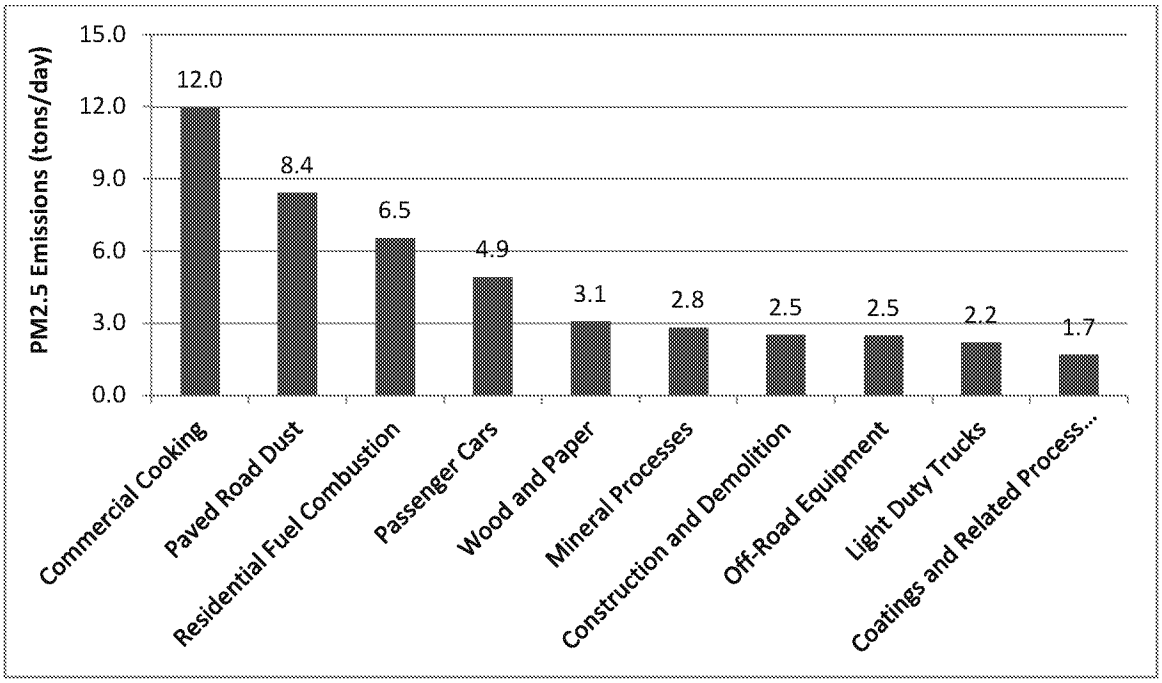


FIGURE 3-27

TOP TEN EMITTER CATEGORIES FOR DIRECTLY EMITTED PM2.5 IN 2022 (ANNUAL AVERAGE)

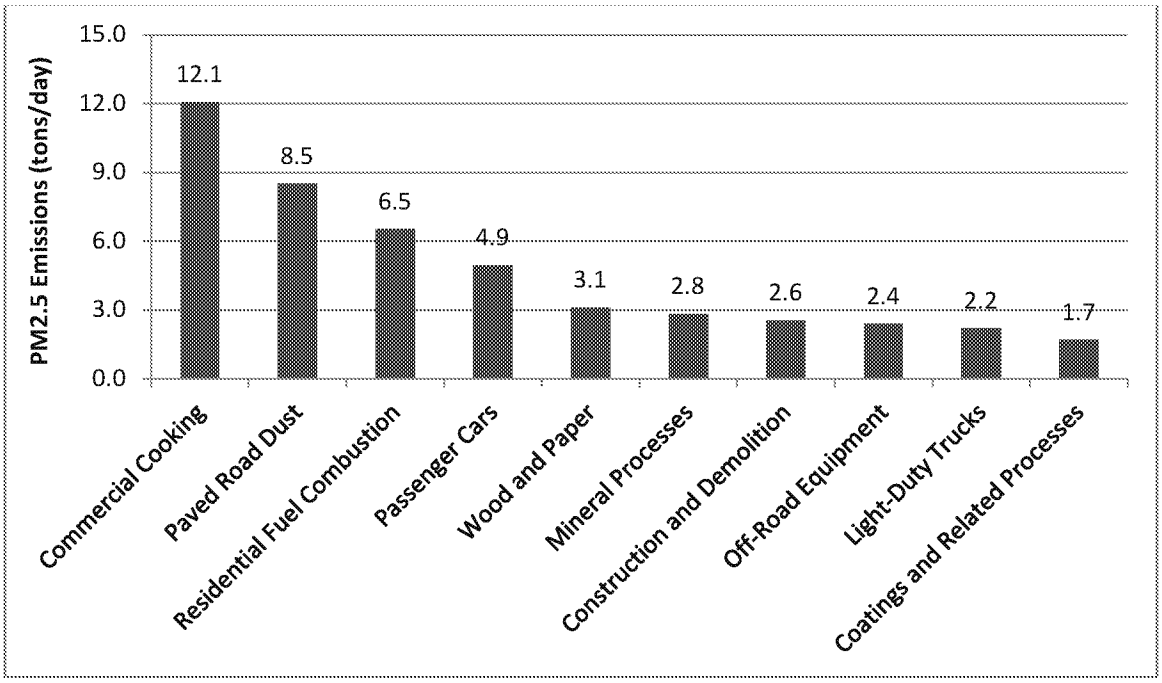


FIGURE 3-28

TOP TEN EMITTER CATEGORIES FOR DIRECTLY EMITTED PM2.5 IN 2023 (ANNUAL AVERAGE)

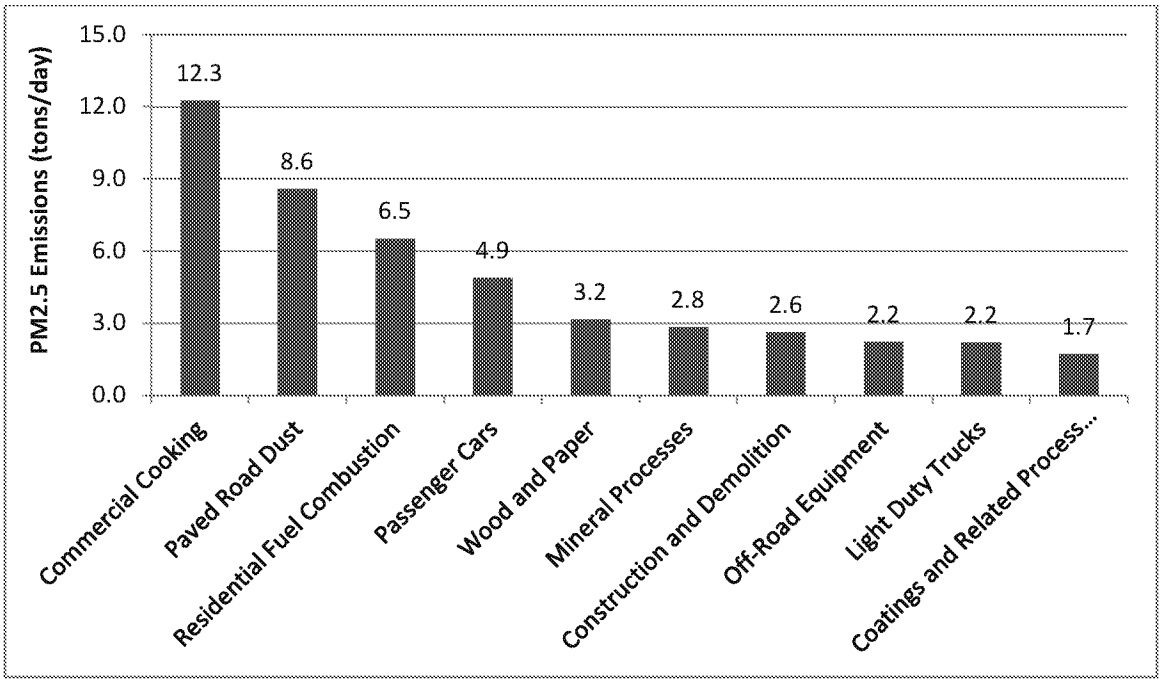


FIGURE 3-29

TOP TEN EMITTER CATEGORIES FOR DIRECTLY EMITTED PM2.5 IN 2025 (ANNUAL AVERAGE)

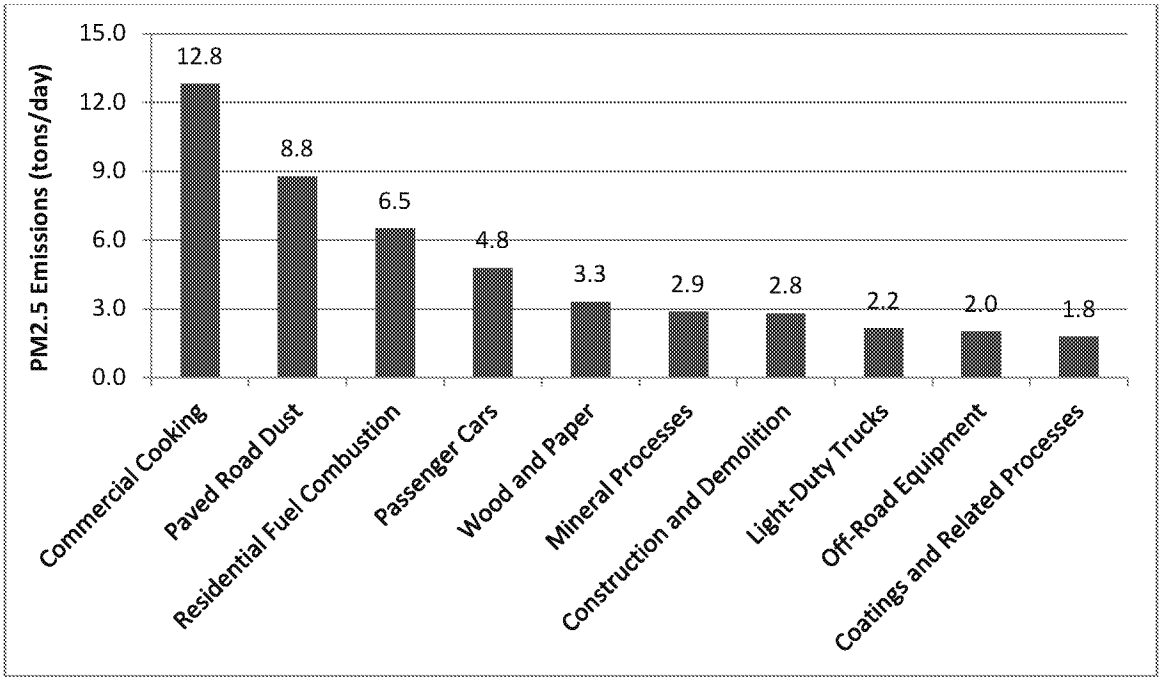


FIGURE 3-30

TOP TEN EMITTER CATEGORIES FOR DIRECTLY EMITTED PM2.5 IN 2031 (ANNUAL AVERAGE)

Chapter 4
Control Strategy and Implementation

Substantial emission reductions from mobile and stationary sources are needed to meet the federal health standards. Traditional regulatory opportunities are proposed along with innovative, non-traditional control approaches including recognizing co-benefits from other programs and incentives for advanced cleaner technology deployment.

In This Chapter

Introduction

The overall control strategy in the Draft 2016 Air Quality Management Plan (AQMP or Plan) provides a path to achieving emission reductions to meet air quality goals. Implementation of the 2016 AQMP will be based on a series of control measures and strategies that vary by source type (i.e., mobile or stationary) as well as by the pollutant that is being addressed. Although great strides have been made in air pollution control programs, health-based air quality standards cannot be achieved without significant further emission reductions. An integrated control strategy addressing multiple objectives provides for a more efficient path in meeting all clean air standards, including the federal PM2.5 and ozone standards. For example, the NOx emission reductions that are needed for ozone attainment also reduce PM2.5 to attainment levels. Therefore, allocating resources towards NOx reductions is a more cost-effective strategy than separately implementing controls that only benefit PM2.5. Furthermore, in designing an integrated control strategy to achieve the ozone and PM2.5 air quality standards, consideration must be given to the health of the public, the economic well-being of the region, and challenges for local business. History has shown that air quality levels can be greatly improved while maintaining a growing and vibrant economy.

The 2016 AQMP is designed to achieve the federal 2008 8-hour ozone standard (75 ppb) by 2031 and the 2012 annual PM2.5 standard (12 $\mu g/m^3$) by 2025 as a "serious" nonattainment area. The Plan also addresses attainment of the 2006 24-hour PM2.5 standard (35 $\mu g/m^3$) by 2019, which was recently reclassified as "serious" nonattainment for this standard. It also updates previous plans for the revoked 1-hour (120 ppb) and 1997 8-hour (80 ppb) ozone national ambient air quality standards (NAAQS) that have not yet been met. The California state ambient air quality standard is identical to the federal standard for annual PM2.5 and there is no state 24-hour PM2.5 standard. The State has very stringent PM10 standards (annual PM10: 20 $\mu g/m^3$ and 24-hour PM10: 50 $\mu g/m^3$). While there is no effective attainment date for the state PM standards, the state standards must be achieved as soon as practicable to protect the public health and welfare of Southern Californians. Progress towards achieving the federal PM2.5 standards is most expeditious approach for attaining both the federal and state PM standards, even though state PM10 standards are more stringent than the federal standard.

The magnitude of the NOx emission reductions needed for attainment of the ozone NAAQS poses the most significant challenge. This challenge requires an aggressive mobile source control strategy supplemented with focused and strategic stationary source control measures, and close collaboration with federal, state, and regional governments, businesses, and the public. The 2016 AQMP uses a variety of implementation approaches such as regulation, accelerated deployment of available cleaner technologies (e.g., zero emission technologies, when cost effective and feasible, and near-zero emission technologies in other applications), best management practices, co-benefits from existing programs (e.g., climate, energy efficiency), and incentives. Additional demonstration and commercialization projects will be crucial to help deploy and reduce costs for zero and near-zero emission technologies. A key element of Plan implementation will be private and public funding to help further the development and deployment of these advanced technologies. Many of the same technologies will address both air quality and climate goals, such as increased energy efficiency and reduced fuel usage. The total required emission reductions, technology readiness, cost-effectiveness, economic impacts, and interaction with

other attainment deadlines for all pollutants are critical considerations in developing an integrated multi-pollutant control strategy. This chapter outlines the proposed control strategy and the adoption and implementation schedule for the 2016 AQMP to achieve the federal health-based air quality standards in the Basin.

Overall Strategy

Need for Emission Reductions

As a consequence of the region's air quality control programs at local, State, and federal levels, the concentrations of ambient PM2.5 and ozone in the Basin have improved dramatically over the previous decades. For example, by 2013 and again in 2014, no stations measuring PM2.5 in the Basin violated the former (1997) annual PM2.5 NAAQS (15.0 $\mu g/m^3$). Yet, the Basin still exceeds federal health-based standards for both ozone and PM2.5, and experiences some of the worst air pollution in the nation. The three-year (2012–2014) design values for PM2.5 and 8-hour ozone are exceeding the 2012 annual (12 $\mu g/m^3$) and 2006 24-hour (35 $\mu g/m^3$) PM2.5 standards and the 1997 (80 ppb) and 2008 (75 ppb) 8-hour ozone standards, respectively. Details on the Basin's current air quality, historical trends, and comparisons to the NAAQS are provided in Chapter 2.

Challenges

The most significant air quality challenge in the Basin, and the primary driver for the control strategy, is the need to reduce NOx emissions sufficiently to meet the upcoming ozone standard deadlines (1-hour ozone: 120 ppb by 2023[1] and 8-hour ozone: 80 ppb by 2024 and 75 ppb by 2032). For all ozone NAAQS standards, emission reductions must be in place the previous year (2022, 2023, and 2031). The approximately 522 tons per day of total Basin NOx emissions in 2012 are projected to decrease to approximately 255 tons per day and 214 tons per day in the attainment years of 2023 and 2031, respectively, due to continued implementation of already adopted control measures. Chapter 3 describes the 2012 and future year baseline (no additional actions beyond already adopted regulations) inventories in detail. However, in the absence of additional actions, these emission reductions are not sufficient to meet the ozone standards. An additional 45 percent NOx emission reductions are needed in 2023, and an additional 55 percent NOx reductions are needed in 2031 to attain the 8-hour ozone NAAQS. These percentages are based on meeting the "carrying capacity" (the maximum amount of emissions allowable in the region that would still meet the standards) of 141 tons per day in 2023 and 96 tons per day in 2031.

Strategy

To meet the targeted carrying capacity, a comprehensive emission control strategy has been developed. The 2016 AQMP integrates a variety of control measures and implementation approaches in a cost-

[1] The standard was revoked, but the Basin has not yet met the standard. Ten years from the designation date of February 6, 2013 is the latest statutory deadline (February 6, 2023).

effective, feasible, and targeted fashion considering the co-benefits from climate change and air toxics control programs that may also produce concurrent benefits for ozone and PM2.5. Regional air quality modeling indicates that significant NOx reductions with additional strategic, limited VOC reductions will lead to attainment of the ozone standards. Maximizing emission reductions utilizing zero-emission technologies, when cost effective and feasible, and near-zero emission technologies in other applications can promote significant NOx reductions with additional VOC and PM2.5 co-benefits.

The 2016 AQMP relies strongly upon partnerships at federal, state, and local levels, seeking to expand existing collaborations and establish new coalitions. These strategies include aggressive new regulations and development of incentive funding and supporting infrastructure for early deployment of advanced control technologies. Incentive funding for stationary sources can be pursued and best applied where controls are cost-effective, but not necessarily affordable, especially when controls are considered for smaller businesses or residences. Incentive funds can be used to subsidize low-emitting equipment purchases or encourage the use of alternative approaches. Additional funding for replacement of older, high-emitting vehicles with the cleanest vehicles available is the most significant need. Expansion of supporting infrastructure for implementation of cleaner fuels also helps to accelerate the use of ultra-low emitting vehicles. The SCAQMD will continue to support technology demonstration projects for both mobile and stationary sources and will work to create new or expanded funding opportunities for earlier deployment of cleaner technologies, thus contributing to a smooth transition to zero and near-zero emission technologies in the mobile and stationary source sectors. The SCAQMD will prioritize distribution of incentive funding in environmental justice (EJ) areas and seek opportunities to expand funding to benefit the most disadvantaged communities.

Control measure ideas were developed from a number of sources, including the AQMP Advisory Group, AQMP Control Strategy Symposium, development of the AQMP White Papers, Reasonably Available Control Technology (RACT)/Reasonable Available Control Measures (RACM) Analysis, Best Available Control Technology (BACT)/Best Available Control Measures (BACM) analysis (see Appendix VI), SCAQMD staff and public input, and previous Plan proposals. As part of the 2016 AQMP control measure development, SCAQMD staff conducted an AQMP Control Strategy Symposium in June 2015 to solicit new control concepts and innovative ideas from industry experts, professional consultants, government specialists, environmental and community representatives, and other stakeholders. Suggestions from staff and stakeholder recommendations assisted in identifying additional potential control measures and assessing control measure feasibility. For each control measure, the amount of emission reductions and the cost-effectiveness is considered in the selection of the measures.

The control measures were developed based on technical and economic feasibility, as well as other factors such as promoting fair share responsibility for sources under different regulatory authorities and maximizing private/public partnerships. Table 4-1 provides an overview of the criteria used in evaluating and selecting feasible control measures. The criteria are presented in alphabetical order.

TABLE 4-1

Criteria for Evaluating 2016 AQMP Control Measures (not ranked by priority)

Criteria	Description
Cost-Effectiveness	The cost of a control measure per reduction of emissions of a particular pollutant (cost includes purchasing, installing, operating, and maintaining the control technology).
Emission Reduction Potential	The total amount of pollution that a control measure can reduce.
Enforceability	The ability to ensure compliance with a control measure.
Legal Authority	Ability of the SCAQMD or other adopting agency to legally implement the measure.
Public Acceptability	The likelihood that the public will approve or cooperate in the implementation of a control measure.
Rate of Emission Reduction	The time it will take for a control measure to reduce a certain amount of air pollution.
Technological Feasibility	The likelihood that the technology for a control measure is or will be available.

Solar Energy Technology

In accordance with California Health and Safety Code Section 40404.5, the SCAQMD continues to fulfill its directive to require the use of BACT for new sources. In consideration of the State policy (Health and Safety Code Section 40404.5) to promote and encourage the use of solar energy systems, staff has made a reasonable effort to incorporate solar energy technology into the 2016 AQMP in applications where it can be shown to be cost-effective. The generation of energy through solar collectors reduces dependence on existing fossil-fuel power plants and substantial renewable energy generating capacity from solar, wind and geothermal may reduce the need to build new power plants in the future. Even as transportation is increasingly electrified, this would have a direct criteria pollutant emission reduction impact over time and would assist in meeting the federal ozone standards. It should be noted that California Health and Safety Code Section 40414 restricts the SCAQMD from infringing on existing authority of counties and cities to plan or control land use. However, the SCAQMD is tasked to reduce criteria pollutants to meet the federal and state pollutant standards and has developed innovative approaches to achieve the standards in the 2016 AQMP. These approaches have been incorporated in a few of the control measures described below and provide an opportunity to incorporate solar energy

technology. Great progress has already been achieved in California, which is leading the nation with over half a million solar projects.[2]

Control measure ECC-01 seeks to recognize criteria pollutant co-benefits from federal, state (e.g., AB 32 – *California Global Warming Solutions Act*) and local mandates and programs to reduce greenhouse gas (GHG) emissions through several mechanisms such as market programs, renewable energy targets, incentive and rebate programs, and promoting implementation and development of new technologies. Solar programs are widely incentivized across the state and under these mandates and programs, will continue to be installed at industrial, commercial, institutional, and residential sites. As such, the criteria pollutant benefits from actions to meet climate and energy goals will be recognized under this control measure.

Similarly, control measure ECC-02 will seek criteria pollutant co-benefits from the implementation of required energy efficiency mandates such as California's Title 24 program and Senate Bill (SB) 350 (*Clean Energy Pollution Reduction Act*). The 2020 target for Title 24 will be to achieve Zero Net Energy consumption from new residential buildings utilizing new building materials, more efficient appliances, and renewable energy resources. SB 350 doubles the targeted energy efficiency savings in electricity and natural gas uses of retail customers and increases renewable energy sources to 50 percent by 2030. Solar is one form of renewable energy being implemented to assist buildings in reducing energy usage and this control measure will recognize the co-benefits from such actions. Further, control measure ECC-03 seeks to provide financial incentives to go beyond the goals achieved under ECC-02. Thus, existing residential and commercial buildings can apply for incentive monies to improve weatherization and to reduce energy use for heating, cooling, lighting, cooking, and other needs. This measure would incentivize energy efficient means such as a solar thermal pool heating system or pool covers. The most cost-effective means to achieve those reductions will vary depending on the facility, the amount of energy to be replaced, the cost of such equipment, and the life of the project. However, it is expected that applicants for the incentive money will seek the most cost-efficient options.

Modernizing industrial facilities constitutes approximately 30 percent of the total NOx emission control strategy from stationary sources in the 2016 AQMP. Control measure CMB-01 anticipates future rulemaking in combination with financial incentives for the replacement of older equipment with zero and near-zero emission technologies. Equipment electrification, use of fuel cells, battery storage, and/or combined heating and power are possible alternatives in achieving this effort. An increased need for electricity may result in increased power demand and potential emissions. Incorporating newer technologies such as solar collectors, smart grid, and energy storage with better power system management at the transmission, distribution, and behind the meter applications can reduce the need for redundant infrastructure and emissions from fossil-based generation.

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[2] http://www.gosolarcalifornia.ca.gov/.

Chapter Overview

The following sections discuss the control measures, SIP commitments, overall emission reductions, and implementation as outlined below:

- SCAQMD Proposed 8-hour Ozone Strategy (see Appendix IV-A for detailed descriptions of the SCAQMD stationary source and mobile source control measures)
- State and Federal Control Measures (see Appendix IV-B for detailed descriptions of the CARB Strategy)
- SCAG's Regional Transportation Strategy and Transportation Control Measures (see Appendix IV-C for detailed descriptions of the regional transportation strategy and control measures)
- SCAQMD Proposed PM2.5 Strategy (see Appendix IV-A for detailed descriptions of the SCAQMD stationary source control measures)
- SCAQMD Proposed Contingency Measures (see Chapter 6 for a detailed discussion of the contingency requirements)
- SIP Emission Reduction Commitment
- Overall Emission Reductions
- Implementation

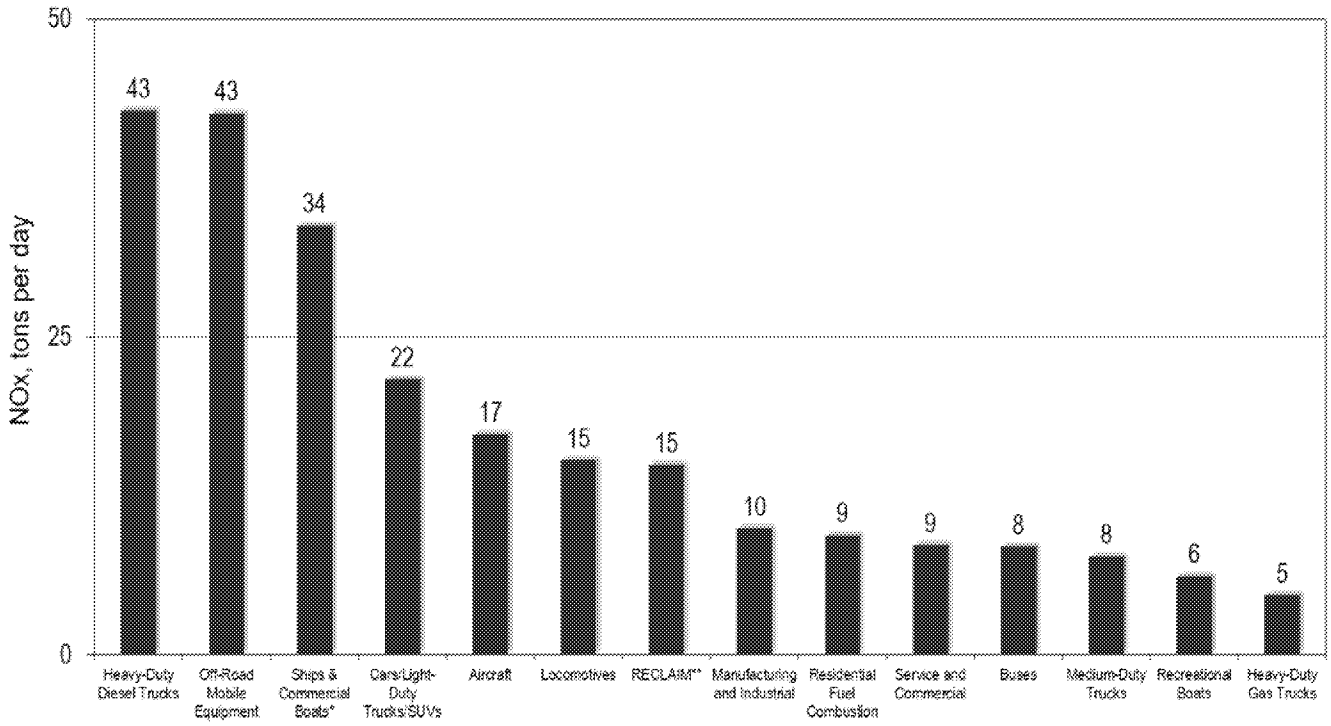
SCAQMD Proposed 8-Hour Ozone Strategy

Ozone reduction strategies must be continued and accelerated to ensure that the Basin will meet the federal 8-hour ozone standards by the latest statutory deadlines in 2024 and 2032. Proposed measures to reduce ozone include stationary and mobile source NOx reduction strategies, supplemented by limited, strategic VOC emission reductions.

To ultimately achieve the ozone ambient air quality standards, significant additional emission reductions will be necessary from a variety of sources, including those primarily under the jurisdiction of CARB (e.g., on-road motor vehicles, off-road equipment, and consumer products) and U.S. EPA (e.g., aircraft, ships, trains, and pre-empted off-road equipment). Without an adequate and fair-share level of reductions from all sources, the emission reduction burden would unfairly be shifted to stationary sources, most of which are already subject to the most stringent controls in the nation. The SCAQMD will continue to use its available regulatory authority to further control mobile source emissions where federal or state actions do not meet regional needs and to ensure the effectiveness of state and federal measures. SCAQMD's proposed 8-hour ozone control measures are comprised of stationary source measures and mobile source measures. The previous 2007 SIP for the 8-hour ozone NAAQS contained commitments for emission reductions that relied on advancement or improvement of technologies, as authorized under Section 182(e)(5) of the federal CAA. These measures, which are sometimes known as the "black box", accounted for a substantial portion of the NOx emission reductions needed to attain the federal ozone standards—approximately 200 tons per day. Given that CAA deadlines are fast approaching and the

technologies needed for attainment are identifiable, reliance on 182(e)(5) measures should be minimized to the extent feasible.

Mobile sources currently emit over 80 percent of regional NOx emissions, and therefore mobile source controls must be a significant part of the control strategy. As provided in Figure 4-1, the on-road heavy-duty truck category is projected to comprise the single largest contributor to regional NOx in 2023. Other equipment involved in goods movement, such as marine vessels, locomotives and aircraft, are also substantial NOx sources.



**Ocean going vessels = 23 tons/day*
***RECLAIM: 275 largest stationary sources, including refineries and power plants*

FIGURE 4-1

TOP NOX EMISSIONS CATEGORIES AND CORRESPONDING NOX EMISSIONS (TONS PER DAY) IN 2023 IN THE SOUTH COAST AIR BASIN (SOURCE: 2016 AQMP SUMMER PLANNING EMISSIONS INVENTORY – DECEMBER 2016)

Figure 4-2 shows projections indicating that the region must reduce regional NOx emissions by an additional 45 percent in 2023, and an additional 55 percent in 2031 (beyond projected 2023 and 2031 baseline emissions, respectively) to attain the 1997 and 2008 8-hour ozone NAAQS.

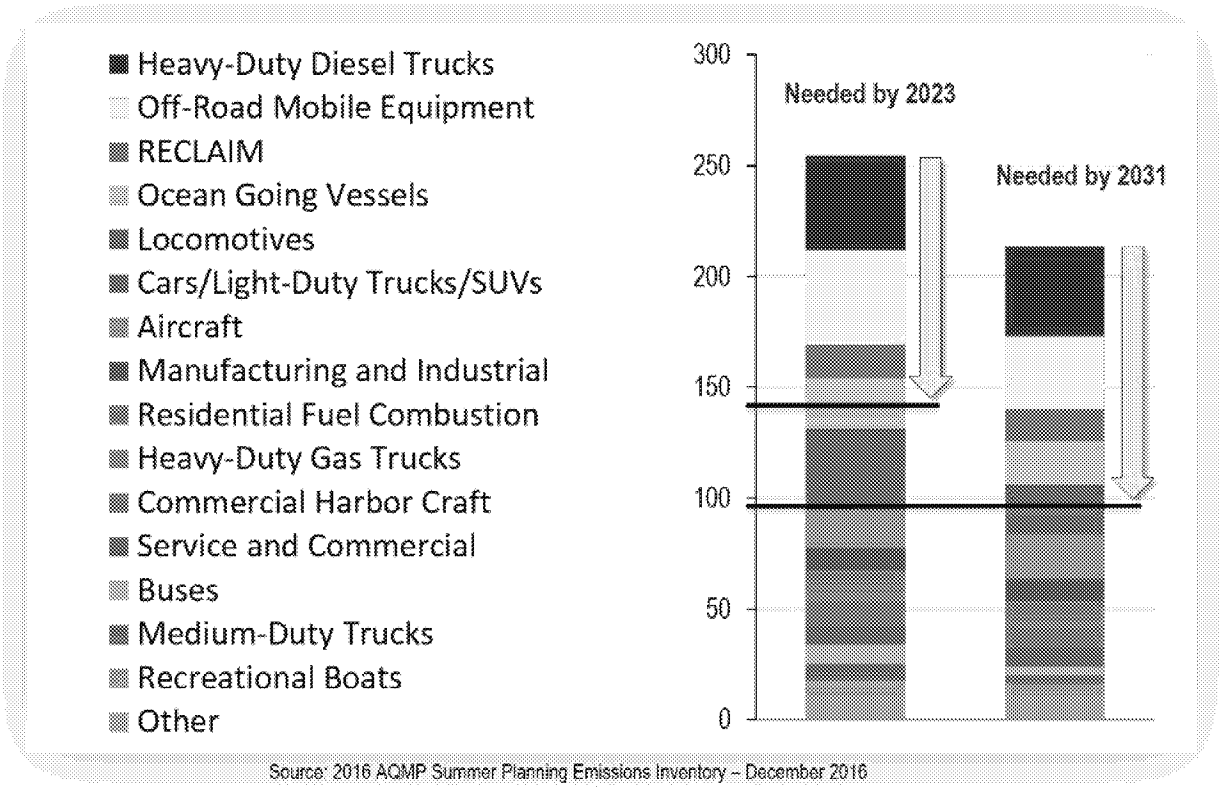


FIGURE 4-2
NEEDED NOX EMISSION REDUCTIONS TO ACHIEVE
FEDERAL 8-HOUR OZONE AMBIENT AIR QUALITY STANDARDS

Since the most significant emission sources are already subject to stringent emissions controls, attainment of the ozone standards will require broad deployment of zero and near-zero NOx emission technologies in the 2023 to 2031 timeframe. Traditional stationary combustion sources can be replaced with new lower or zero-emitting technologies, including low-NOx or more efficient equipment, electrification, or fuel cells for combined heat and power (CHP). Such replacement can apply to a single source or an entire facility. Electrification of equipment is one way to shift away from combustion sources generating NOx emissions, especially when combined with renewable, non-combustion power generation. Such combustion equipment includes engines, turbines, boilers, microturbines, etc. located at industrial and commercial facilities. The modification of residential and commercial water and space heating equipment is addressed in control measure CMB-02. Mobile sources such as trucks, locomotives, and cargo handling equipment have technological potential to achieve zero- and near-zero emission levels. Current and potential technologies include ultra-low NOx engines, hybrid-electric, battery-electric, and hydrogen fuel cell on-road vehicle technologies. New types of hybrids could also serve long-term needs while providing additional fuel diversity. These could include, for example, natural gas-electric hybrid technologies for on-road and other applications, particularly if coupled with improved after-treatment technologies. Alternative fuels such as natural gas have historically helped the region make progress toward attaining air quality standards and are generally cleaner than conventional fuels. Given the

region's need to attain air quality standards, alternative fueled engines will continue to play a major role in emission reductions. In addition, lower on-road heavy-duty engine exhaust emission standards for NOx will play an essential role for the Basin to attain the federal ozone standards since the majority of the NOx emissions from heavy-duty trucks in the Basin come from trucks that are registered out-of-state and are under federal authority. The SCAQMD Governing Board recently authorized staff to petition U.S. EPA to adopt a 0.02 g/bhp-hr NOx engine exhaust emissions standard on a nationwide basis. If successful, this action will greatly assist the region in reaching ozone air quality standards. A natural gas engine has already been certified to the 0.02 g/bhp-hr California optional NOx exhaust emissions standard, and work is underway to develop, certify and commercialize additional engines of all sizes and fuel types at or near the 0.02 g/bhp-hr level. Air quality regulatory agencies have traditionally set policies and requirements that are performance-based, and thus technology- and fuel-neutral. This is a policy that the SCAQMD intends to continue.

All technologies and fuels should be able to compete on an equal footing to meet environmental needs. This policy is consistent with the current priority on maximizing emission reductions utilizing zero-emission technologies in all applications that are shown to be cost-effective and feasible. In other applications, near-zero technologies remain essential to meet all attainment goals. In assessing these technologies for stationary sources, the SCAQMD will convene a workgroup to assess the in-basin life-cycle criteria pollutant emissions related to energy use from technologies and/or other applications such as efficiency improvements. This assessment, in part, will include future energy scenarios that are anticipated as more renewable resources are incorporated into the energy usage within the Basin. The assessments will consider emissions associated with energy time-of-use, impact of higher efficiencies, fuel switching, and future energy and regulatory markets. In addition, the assessments will consider life-cycle GHG emissions, potential toxic impacts or benefits, and utilize experts and materials from other government agencies and universities.

The SCAQMD staff believes that a combination of strong regulatory actions and incentives is the most effective means of achieving these emission reductions. In some cases, the incentive approach is the only way to address those sources currently without legal mandates to reduce emissions or not within SCAQMD authority. Other voluntary incentive programs, such as the Carl Moyer Program, provide a means to accelerate fleet turnover of outdated equipment to the cleanest commercially available equipment in a way that complements regulations. A majority of the on-road and off-road measures proposed are based on regulations combined with existing or expanded funding programs implemented by the SCAQMD or CARB. Developing, demonstrating, and deploying new technologies will require significant investments, public/private partnerships and regulatory actions.

The measures proposed in this section and further discussed in Appendices IV-A and IV-B are feasible steps that must commence in the near-term to hasten a broad transition to the technologies needed to attain federal air quality standards. Given the magnitude of needed emission reductions and the time remaining until attainment deadlines, it is important that progress and momentum to identify, and deploy needed technologies be accelerated.

Transitioning to cleaner transportation technologies will involve major costs, but also have significant public health and climate change benefits. Adopting a plan with sufficient measures to attain the ozone and PM2.5 air quality standards is not only required by federal law, but will also improve public health

and mitigate climate change. By transitioning to cleaner transportation technologies, NOx and PM2.5 emissions from transportation sources will be reduced, subsequently resulting in cleaner air quality, lower health risk across the region, and reductions in toxic risk and GHGs along goods-movement corridors. Not meeting air quality standards would not only have negative public health consequences, but would also have adverse economic impacts on the region due to potential federal sanctions.

SCAQMD Proposed Stationary Source 8-Hour Ozone Measures

The proposed stationary source ozone measures are designed to assist in the attainment of the 1997 and 2008 8-hour ozone standards (80 ppb and 75 ppb, respectively) via reductions in emissions from stationary sources of NOx and VOC. Since NOx and VOC are primary pollutants in forming ground-level ozone, the stationary source ozone measures are divided into stationary source measures for NOx and VOC. These measures target a number of source categories, including Energy and Climate Change Programs (ECC), Combustion Sources (CMB), Petroleum Operations and Fugitive VOC Emissions (FUG), Coatings and Solvents (CTS), Multiple Component Sources (MCS), Best Available Control Measures (BCM), and Compliance Flexibility Programs (FLX). Each control measure may rely on a number of control methods. There are 15 stationary source ozone measures with the majority anticipated to be adopted in the next few years and implemented after 2016. Table 4-2 provides a list of the SCAQMD proposed ozone measures for stationary sources along with the anticipated adoption date, implementation period, and emission reductions. These control measures are further categorized by the type of the measures, for example, recognition of co-benefits or incentives. Some VOC measures recognize co-benefit VOC reductions from other NOx or PM2.5 measures. There are also limited, strategic VOC control measures proposed.

The "TBD" (to be determined) measures require further technical and feasibility evaluations to determine the emission reduction potential and thus, the attainment demonstration is not dependent on these measures. However, they are included in the AQMP as part of a comprehensive plan with all feasible measures. These measures will require further development after the approval of the Plan, but could be proposed for rule or program development at a later date. Emissions reductions achieved and quantified by these measures can be applied towards contingency requirements, make up for any shortfalls in reductions from other quantified measures, be credited towards rate-of-progress reporting, and/or be incorporated into future Plan revisions.

TABLE 4-2

SCAQMD Proposed Stationary Source 8-Hour Ozone Measures

Number	Title	Adoption	Implementation Period	Implementing Agency	Emission Reductions (tpd) (2023/2031)
SCAQMD Stationary Source NOx Measures:					
Stationary Source Regulatory Measures:					
CMB-01	Transition to Zero and Near-Zero Emission Technologies for Stationary Sources [NOx, VOC]	N/A	Ongoing	SCAQMD	2.5 / 6
CMB-02	Emission Reductions from Replacement with Zero or Near-Zero NOx Appliances in Commercial and Residential Applications [NOx]	2018	2020–2031	SCAQMD	1.1 / 2.8
CMB-03	Emission Reductions from Non-Refinery Flares [NOx, VOC]	2018	2020	SCAQMD	1.4 / 1.5
CMB-04	Emission Reductions from Restaurant Burners and Residential Cooking [NOx]	2018	2022	SCAQMD	0.8 / 1.6
CMB-05	Further NOx Reductions from RECLAIM Assessment [NOx]	2022	2025	SCAQMD	0 / 5 [a]
Recognition of Co-Benefits:					
ECC-01	Co-Benefit Emission Reductions from GHG Programs, Policies, and Incentives [All Pollutants]	N/A	Ongoing	Various Agencies	TBD [b]
ECC-02	Co-Benefits from Existing Residential and Commercial Building Energy Efficiency Measures [NOx, VOC]	N/A	Ongoing	SCAQMD	0.3 / 1.1
ECC-04	Reduced Ozone Formation and Emission Reductions from Cool Roof Technology [All Pollutants]	N/A	Ongoing	SCAQMD, CEC	TBD [b]

TABLE 4-2 (CONTINUED)

SCAQMD Proposed Stationary Source 8-Hour Ozone Measures

Number	Title	Adoption	Implementation Period	Implementing Agency	Emission Reductions (tpd) (2023/2031)
SCAQMD Stationary Source NOx Measures (*continued*):					
Incentive-Based Measure:					
ECC-03	Additional Enhancements in Reducing Existing Residential Building Energy Use [NOx, VOC]	N/A	Ongoing	SCAQMD	1.2 / 2.1
Other Measures:					
FLX-01	Improved Education and Public Outreach [All Pollutants]	N/A	Ongoing	SCAQMD, Other Parties	N/A [c]
MCS-01	Improved Breakdown Procedures and Process Re-Design [All Pollutants]	TBD	TBD	SCAQMD	N/A [c]
MCS-02	Application of All Feasible Measures [All Pollutants]	TBD	TBD	SCAQMD	TBD [b]
SCAQMD Stationary Source VOC Measures:					
Corresponding VOC Reductions from NOx and PM Measures:					
ECC-02	Co-Benefits from Existing Residential and Commercial Building Energy Efficiency Measures [NOx, VOC]	N/A	Ongoing	SCAQMD	0.07 / 0.29 [d]
ECC-03	Additional Enhancements in Reducing Existing Residential Building Energy Use [NOx, VOC]	N/A	Ongoing	SCAQMD	0.2 / 0.3 [d]
CMB-01	Transition to Zero and Near-Zero Emission Technologies for Stationary Sources [NOx, VOC]	N/A	Ongoing	SCAQMD	1.2 / 2.8 [d]
CMB-03	Emission Reductions from Non-Refinery Flares [NOx, VOC]	2018	2020	SCAQMD	0.4 / 0.4 [d]
BCM-10	Emission Reductions from Greenwaste Composting [VOC, NH3]	2019	2020	SCAQMD	1.5 / 1.8 [d]

TABLE 4-2 (CONCLUDED)

SCAQMD Proposed Stationary Source 8-Hour Ozone Measures

Number	Title	Adoption	Implementation Period	Implementing Agency	Emission Reductions (tpd) (2023/2031)
SCAQMD Stationary Source VOC Measures (*continued*):					
Limited, Strategic VOC Control:					
FUG-01	Improved Leak Detection and Repair [VOC]	2019	2022	SCAQMD	2 / 2
CTS-01	Further Emission Reductions from Coatings, Solvents, Adhesives, and Sealants [VOC]	2017/2021	2020–2031	SCAQMD	1 / 2
FLX-02	Stationary Source VOC Incentives [VOC]	N/A	Ongoing	SCAQMD	TBD [b]

[a] 5 tpd reduction by 2025

[b] TBD are reductions to be determined once the measure is further evaluated, the technical assessment is complete, and inventories and cost-effective control approaches are identified, and are not relied upon for attainment demonstration purposes

[c] N/A are reductions that cannot be quantified due to the nature of the measure (e.g., outreach) or if the measure is designed to ensure reductions that have been assumed to occur will in fact occur

[d] Corresponding VOC reductions from other measures

The following provides a brief description of the proposed stationary source ozone measures. Detailed descriptions of the measures are provided in Appendix IV-A.

Stationary Source Regulatory Measures

There are five stationary source regulatory measures for NOx. The first measure is to reduce NOx emissions from traditional combustion sources, such as diesel back-up generators, by replacing older, high-emitting equipment with new, lower or zero-emitting equipment. The second measure seeks NOx emission reductions from unregulated commercial space heating furnaces and from regulations and incentives to replace existing older boilers, water heaters, and space heating furnaces and other natural gas or liquefied petroleum gas (LPG) equipment with zero emitting or lower NOx technologies. The third measure seeks to reduce NOx and utilize excess gas from non-refinery flares, the fourth measure would seek reductions from commercial restaurant burners and residential cooking appliances, and the last measure would involve transitioning the RECLAIM program into a command and control regulatory structure.

CMB-01 – TRANSITION TO ZERO AND NEAR-ZERO EMISSION TECHNOLOGIES FOR STATIONARY SOURCES: This proposed control measure reduces emissions of NOx from traditional combustion sources through replacement of old equipment with zero and near-zero emission technologies including low NOx emitting equipment, electrification, battery storage, alternative process changes, efficiency measures, or fuel cells for CHP. Replacing older higher-emitting equipment with newer lower or zero-emitting equipment can apply to a single source or an entire facility. These sources include, but are not limited to, engines, turbines, microturbines, and boilers that generate power for electricity for distributed generation, facility power, process heating, and/or steam production. Another type of combustion source identified for equipment replacement includes ovens, kilns, and furnaces. New businesses can be required or incentivized to install and operate zero-emission equipment, control equipment, technology and processes beyond the current BACT requirements. Fuel cells are also an alternative to traditional combustion methods, resulting in a reduction of NOx emissions with the co-benefit of reducing other criteria air pollutants and GHGs. Incentives may be used towards alternative process changes, such as biogas cleanup. This would help modernize a facility towards zero and near-zero technologies. This control measure would also seek energy storage systems and smart grid control technologies that provide a flexible and dispatchable resource with zero emissions. Grid based storage systems can replace the need for new peaking generation, be coupled with renewable energy generation, and reduce the need for additional energy infrastructure. Mechanisms will be explored to incentivize businesses to choose the cleanest technologies as they replace equipment and upgrade facilities, and to provide incentives to encourage businesses to move into these zero and near-zero emission technologies sooner. Over the anticipated timeline of this Plan, as emerging technologies become more widely available and costs decline, the SCAQMD will undertake rulemaking to maximize emission reductions utilizing zero emission equipment where cost-effective and feasible and near-zero emission equipment in all other applications.

CMB-02 – EMISSION REDUCTIONS FROM REPLACEMENT WITH ZERO OR NEAR-ZERO NOx APPLIANCES IN COMMERCIAL AND RESIDENTIAL APPLICATIONS: This control measure seeks annual average NOx emission reductions from unregulated commercial space heating furnaces through regulations and incentives that will replace existing older NOx appliances such as boilers, water heaters, and space heating furnaces and other natural gas or LPG equipment with zero emitting or lower NOx technologies. The measure calls for a priority on maximizing emission reductions utilizing zero-emission technologies in all applications that are shown to be cost-effective and feasible. In other applications, near-zero technologies will be incentivized to meet attainment goals. In assessing the cost-effectiveness of these technologies, full life-cycle in-Basin emissions related to energy and fuel production and transmission pathways will be considered, along with GHG emissions, toxic impacts, and anticipated future changes to the energy portfolio in the Basin. This control measure will apply to manufacturers, distributors, sellers, installers and purchasers of commercial and residential appliances and equipment. The control measure has two components. The first component is to continue to implement the Rule 1111 emission limit of NOx for residential space heaters which is 14 ng/J (20 ppm) starting in 2014. The second component is to incentivize the replacement of older boilers, water heaters and space heaters with newer and more efficient low NOx boilers, water heaters and space heaters, and/or "green technologies" such as solar heating or heat pumps. The SCAQMD will also consider potential future regulatory actions to support replacement of older space heating furnaces, water heaters and boilers with lower emissions and zero or near zero emission technologies. The new boilers and water heaters replaced through incentives would

comply with current SCAQMD rule emission limits and new space heaters would meet a specified emission limit. If required, the SCAQMD will consider amending Rules 1121 and 1111 to put in place a heat input based emission limit which will result in lower NOx emissions for high efficiency units compared with standard efficiency units. Because of the rules' heat output based limits, high efficiency water heaters and furnaces emit the same amount of NOx per day as standard efficiency units. In addition, the SCAQMD will also consider developing a rule to limit NOx emissions from those commercial and residential heating furnaces which are currently unregulated.

CMB-03 – EMISSION REDUCTIONS FROM NON-REFINERY FLARES: Flare NOx emissions are regulated through NSR and BACT, but there are currently no source-specific rules regulating NOx emissions from existing flares at non-refinery sources, such as organic liquid loading stations, tank farms, and oil and gas production, landfills and wastewater treatment facilities. This control measure proposes that, consistent with the all feasible control measures, all non-refinery flares meet current BACT for NOx emissions and thermal oxidation of VOCs. The preferred method of control would involve capturing the gas that would typically be flared and converting it into an energy source (e.g., transportation fuel, fuel cells, facility power generation). If gas recovery is not cost-effective or feasible, the installation of newer flares utilizing clean enclosed burner systems implementing BACT will be considered.

CMB-04 – EMISSION REDUCTIONS FROM RESTAURANT BURNERS AND RESIDENTIAL COOKING: This control measure applies to retail restaurants and quick service establishments utilizing commercial cooking ovens, ranges and charbroilers by funding development of, promoting and incentivizing the use and installation of low-NOx burner technologies. In addition, the SCAQMD would consider developing a manufacturer based rule to establish emission limits for cooking appliances used by restaurants and residential applications. Finally, co-benefit reductions will be sought through existing or enhanced energy efficiency programs being implemented by other entities.

CMB-05 – FURTHER NOX REDUCTIONS FROM RECLAIM ASSESSMENT: The California Health and Safety Code requires the SCAQMD to implement Best Available Retrofit Control Technology (BARCT) in the RECLAIM program as well as other stationary sources, and if BARCT advances, the SCAQMD is required to periodically re-assess the overall program caps, and reduce the RECLAIM Trading Credit (RTC) holdings to a level equivalent to command-and-control BARCT levels. The emission reductions resulting from the programmatic RTC reductions will help the Basin attain the NAAQS for ozone and PM2.5 as expeditiously as practicable. This control measure identifies a series of approaches, assessments, and analyses that can be explored to make the program more effective in ensuring equivalency with command and control regulations implementing BARCT, and to generate further NOx emission reductions at RECLAIM facilities. This would be achieved in two ways: 1) the 5 tpd NOx emission reduction commitment as soon as feasible, and no later than 2025, and 2) a transition to a command and control regulatory structure requiring BARCT level controls as soon as practicable. As many of the program's original advantages appear to be diminishing, an orderly sunset of the RECLAIM program may be the best way to maximize emissions reductions, create more regulatory certainty, and potentially reduce compliance burdens for RECLAIM facilities. A working group of stakeholders and experts will convene in the spring of 2017 to examine the future of the RECLAIM program and develop options and timing for the transition to a command-and-control regulatory structure.

Recognition of Co-Benefits

This category includes three proposed emission reduction measures that recognize emission reductions from energy and climate change related programs that consist of general GHG programs, existing residential and commercial building energy efficiency improvement, and cool roof technology.

ECC-01 – CO-BENEFIT EMISSION REDUCTIONS FROM GHG PROGRAMS, POLICIES, AND INCENTIVES: Combustion sources that emit GHGs are typically sources of criteria pollutants. Significant efforts are currently being planned and implemented to reduce GHG emissions under the State's 2020, 2030 and 2050 targets. As these GHG reduction efforts continue across multiple sectors, the reductions of criteria pollutants should be considered along with any additional enhancements needed to achieve further criteria pollutant reductions under the GHG programs. Existing and further GHG emission reductions mechanisms, including market programs, renewable energy targets, incentive and rebate programs, and promoting implementation and development of new technologies, would be evaluated and refined to maximize criteria pollutant emission reductions.

ECC-02 – CO-BENEFITS FROM EXISTING RESIDENTIAL AND COMMERCIAL BUILDING ENERGY EFFICIENCY MEASURES: This control measure would seek to account for criteria pollutant co-benefits from the implementation of required energy efficiency mandates such as California's Title 24 program and SB 350 (Clean Energy Pollution Reduction Act). The 2020 target for Title 24 will be to achieve zero net energy consumption from new residential buildings by utilizing new building materials and more efficient appliances. SB 350 doubles the additional achievable energy efficiency savings in electricity and natural gas energy uses in existing buildings and increases renewable energy sources as a share of a utility's power sources from 33 to 50 percent by 2030. This control measure will take advantage of the co-benefit emission reductions from implementation of these state regulations.

ECC-04 – REDUCED OZONE FORMATION AND EMISSION REDUCTIONS FROM COOL ROOF TECHNOLOGY: Cool roofs reflect a higher fraction of incident sunlight than traditional roofing materials. Widespread adoption of cool roofs can mitigate the urban heat island effect and can lower daytime ambient temperatures, thus slowing the rate of ozone formation. In addition, buildings equipped with cool roofs require less electricity for cooling, leading to reductions in emissions from the power generation sector. This control measure has the potential to reduce ambient ozone concentrations directly along with NOx, CO, PM, and CO2 emissions from the power generation sector. Evaporative VOC emissions will be reduced due to lower ambient temperatures in the urban areas of the Basin. However, ultra-violet solar energy can also be reflected, leading to increased ozone formation in the air column above the building. Depending on the extent of this potential adverse impact, additional physical property requirements on cool roof materials may be necessary. Three possible aspects of cool roof technology, including solar reflectance, radiative properties, and roof replacements will be incorporated into a technical modeling analysis to quantify the impact of this control measure on air quality.

Incentive-Based Measure

The 2016 AQMP includes voluntary incentive measures that are part of the overall Plan to satisfy the CAA emission reduction requirements needed to achieve attainment of the federal ozone standards in 2023 and 2031. Prior AQMPs relied primarily on the adoption of rules to implement the measures provided in those AQMPs. Such regulations involve mandatory requirements and result in generally

straightforward and enforceable reductions. With the need for reliance on voluntary incentive measures in the near-term to achieve attainment of the federal air quality standards, the SCAQMD must design programs such that the emission reductions from these incentive measures are proven to be real, quantifiable, surplus, enforceable, and permanent in order for U.S. EPA to approve the emission reduction as part of the Plan.

There are key components required of a SIP submittal in order to rely on discretionary incentive programs to satisfy the CAA emission reduction requirements.

The components include a demonstration satisfying "integrity elements," an enforceable commitment, technical support, funding, legal authority, public disclosure and provisions to track results in accordance with the U.S. EPA's economic incentive programs (EIP) guidelines.[3] The following lists the necessary elements that will be included in each of the incentive measures:

- **Integrity Elements**
- **Commitment (Federal Enforceability)**
- **Technical Analyses**
- **Funding**
- **Resources**
- **Outreach and Public Disclosure**
- **Legal Authority**

Details regarding each of these necessary elements can be found in Appendix IV-A.

This category includes one proposed incentive-based measure for additional enhancements in building energy use. This measure may exclusively rely on incentives to achieve NOx reductions from the corresponding emission sources.

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[3] References:

- "Guidance on Incorporating Voluntary Mobile Source Emission Reduction Programs in State Implementation Plans (SIPs)," October 24, 1997.
- "Improving Air Quality with Economic Incentive Programs," January 2001.
- "Guidance on SIP Credits for Emission Reductions from Electric-Sector Energy Efficiency and Renewable Energy Measures," August 5, 2004.
- "Incorporating Emerging and Voluntary Measure in a State Implementation Plan (SIP)," October 4, 2004.
- "Guidance on Incorporating Bundled Measures in a State Implementation Plan," August 16, 2005.
- "Roadmap for Incorporating Energy Efficiency/Renewable Energy Policies and Programs into State and Tribal Implementation Plans," July 2012.
- "Diesel Retrofits: Quantifying and Using Their Emission Benefits in SIPs and Conformity: Guidance for State and Local Air and Transportation Agencies," February 2014.

ECC-03 – ADDITIONAL ENHANCEMENTS IN REDUCING EXISTING RESIDENTIAL BUILDING ENERGY USE: This control measure would seek to provide incentives to go beyond the goals within ECC-02 and CMB-02. Incentive programs would be developed for existing residences that include weatherization, upgrading older appliances with highly efficient technologies and renewable energy sources to reduce energy use for water heating, lighting, cooking and other large residential energy sources. Incorporating newer, efficient appliance technologies, weatherization measures along with renewables such as solar thermal and solar photovoltaics can provide emission reductions within the residential sector above current SCAQMD and state regulations along with reduced energy costs. When implementing this measure the SCAQMD will collaborate with utilities, agencies, and other organizations to help leverage funding and coordinate incentives with similar existing programs. This measure will also track the requirements of the upcoming Title 24 Zero Net Energy for new residential energy building standards. SCAQMD will begin to participate in this development process to advocate for criteria and GHG emission consideration in the new standards.

Other Measures

There are three proposed measures in this category. One measure seeks improved education and public outreach. The next measure proposes breakdown limitations to be consistent with federal requirements. The third measure involves implementation of all feasible measures for stationary sources consistent with State law.

FLX-01 – IMPROVED EDUCATION AND PUBLIC OUTREACH: This proposed control measure seeks to provide education, outreach, and incentives for consumers and businesses to contribute to clean air efforts. Examples include consumer choices such as the use of energy efficient products, new lighting technology, "super-compliant" coatings, tree planting, and the use of lighter colored roofing and paving materials, which reduce energy usage by lowering the ambient temperature. In addition, this proposed measure intends to increase the effectiveness of energy conservation programs through public education and awareness as to the environmental and economic benefits of conservation. Educational and incentive tools to be used include social comparison applications (comparing your personal environmental impacts with other individuals), social media, and public/private partnerships.

This control measure is a voluntary program that provides education and outreach to consumers, business owners, and residences regarding the benefits of making clean air choices in purchases, conducting efficiency upgrades, installing clean energy sources, and approaches to conservation. These efforts will be complemented with currently available incentive programs and developing additional incentive programs. Lastly, the SCAQMD staff may develop an EIP to offer technical and financial assistance to help implement efficiency measures and other low emission technologies.

MCS-01 – IMPROVED BREAKDOWN PROCEDURES AND PROCESS RE-DESIGN: SCAQMD Rule 430 applies to breakdowns that result in a violation of any rule or permit condition, with some exceptions. U.S. EPA's May 2015 final action on startups, shutdowns, and malfunctions (SSM) stipulates that exemptions from emission limits during periods of breakdown are not allowed. This control measure would introduce breakdown limits and procedures and potential process re-designs that would apply to breakdowns from all emission sources, providing pollutant concentration or emission limits to comply with U.S. EPA's SSM policy, as applicable.

MCS-02 – APPLICATION OF ALL FEASIBLE MEASURES: This control measure is to address the state law requirement for all feasible measures for ozone. Existing rules and regulations for pollutants such as VOC, NOx, SOx and PM reflect current BARCT. However, BARCT continually evolves as new technology becomes available that is feasible and cost-effective. The SCAQMD staff will continue to review new emission limits or controls introduced through federal, state or local regulations to determine if SCAQMD regulations remain equivalent or more stringent than rules in other regions. If not, a rulemaking process will be initiated to perform a BARCT analysis with potential rule amendments if deemed feasible. In addition, the SCAQMD will consider adopting and implementing new retrofit technology control standards, based on research and development and other information, that are feasible and cost-effective.

Corresponding VOC Reductions from NOx and PM Measures

The following four measures recognize corresponding VOC reductions from other measures designed to achieve NOx and NH3 reductions.

ECC-02 – CO-BENEFITS FROM EXISTING RESIDENTIAL AND COMMERCIAL BUILDING ENERGY EFFICIENCY MEASURES: This control measure would seek to account for criteria pollutant co-benefits from the implementation of required energy efficiency mandates such as California's Title 24 program and SB 350 (Clean Energy Pollution Reduction Act). The 2020 target for Title 24 will be to achieve Zero Net Energy from new residential buildings utilizing new building materials and more efficient appliances. SB 350 doubles the additional achievable energy efficiency savings in electricity and natural gas energy uses in existing buildings and increases renewable energy sources as a share of a utility's power sources from 33 to 50 percent by 2030. This control measure will take advantage of the co-benefit VOC emission reductions from implementation of these state regulations.

ECC-03 – ADDITIONAL ENHANCEMENTS IN REDUCING EXISTING RESIDENTIAL BUILDING ENERGY USE: This control measure would seek to provide incentives to go beyond the goals within ECC-02 and CMB-02. Incentive programs would be developed for existing residences that include weatherization, upgrading older appliances with highly efficient technologies and renewable energy sources to reduce energy use for water heating, lighting, cooking and other large residential energy sources. Incorporating newer, efficient appliance technologies, weatherization measures along with renewables such as solar thermal and solar photovoltaics can provide emission reductions within the residential sector above current SCAQMD and state regulations along with reduced energy costs. The SCAQMD will participate in the Title 24 residential Zero Net Energy rulemaking to advocate for criteria pollutant and GHG emissions consideration.

CMB-01 – TRANSITION TO ZERO AND NEAR-ZERO EMISSION TECHNOLOGIES FOR STATIONARY SOURCES: This proposed control measure would seek corresponding VOC reductions from NOx-focused measures addressing traditional combustion sources by replacement with zero and near-zero emission technologies including low NOx emitting equipment, electrification, battery storage, alternative process changes, efficiency measures, or fuel cells for CHP. Replacing older higher-emitting equipment with newer lower or zero-emitting equipment can apply to a single source or an entire facility. These sources include, but are not limited to, engines, turbines, microturbines, and boilers that generate power for electricity for distributed generation, facility power, process heating, and/or steam production. Another type of combustion source identified for equipment replacement includes ovens, kilns, and furnaces.

New businesses can be required or incentivized to install and operate zero-emission equipment, control equipment, technology and processes beyond the current BACT requirements. Fuel cells are also an alternative to traditional combustion methods, resulting in a reduction of NOx emissions with the co-benefit of reducing VOCs and GHGs. Incentives may be used towards alternative process changes, such as biogas cleanup. This would help modernize a facility towards zero and near-zero technologies. This control measure would also seek energy storage systems and smart grid control technologies that provide a flexible and dispatchable resource with zero emissions. Grid based storage systems can replace the need for new peaking generation, be coupled with renewable energy generation, and reduce need for additional energy infrastructure. Mechanisms will be explored to incentivize businesses to choose the cleanest technologies as they replace equipment and upgrade facilities, and to provide incentives to encourage businesses to move into these zero and near-zero emission technologies sooner. Over the anticipated timeline of this Plan, as emerging technologies become more widely available and costs decline, the SCAQMD will undergo rulemaking to require zero emission equipment be installed where economically feasible, and require near-zero emissions levels in all other applications.

CMB-03 – EMISSION REDUCTIONS FROM NON-REFINERY FLARES: Flare NOx emissions are regulated through NSR and BACT, but there are currently no source-specific rules regulating NOx emissions from existing flares at non-refinery sources, such as organic liquid loading stations, tank farms, and oil and gas production, landfills and wastewater treatment facilities. This control measure proposes that, consistent with the all feasible control measures, all non-refinery flares meet current BACT for NOx emissions and thermal oxidation of VOCs. The preferred method of control would involve capturing the gas that would typically be flared and converting it into an energy source (e.g., transportation fuel, fuel cells, facility power generation). If gas recovery is not cost-effective or feasible, the installation of newer flares utilizing clean enclosed burner systems implementing BACT will be considered.

BCM-10 – EMISSION REDUCTIONS FROM GREENWASTE COMPOSTING: VOCs and ammonia, which are PM precursor gases, are emitted from composting of organic waste materials including greenwaste and foodwaste and are currently regulated by existing SCAQMD Rule 1133.3. Although Rule 1133.3 covers foodwaste composting, the level of emissions from foodwaste composting has not been fully characterized, mainly due to the lack of related emissions test data. This control measure proposes potential emission minimization through emerging organic waste processing technology and potential emission reductions through restrictions on the direct land application of chipped and ground uncomposted greenwaste and through increased diversion to anaerobic digestion. This proposed control measure includes a 15-day pathogen reduction process of chipped and ground uncomposted greenwaste with composting best management practices (BMPs) to reduce potential VOC and ammonia emissions from land applied greenwaste.

Limited, Strategic VOC Control

This category seeks limited, strategic VOC controls that contribute to controlling ozone levels in the Basin. The first measure utilizes more advanced, fugitive VOC leak detection systems. The second measure targets limited reductions of VOC emissions from VOC-containing products such as coatings, solvents, adhesives, and lubricants, or utilization of alternative products/equipment. The last measure proposes to incentivize efficient clean equipment purchases, efficiency projects, and conservation techniques that lead to VOC and other emission reductions.

FUG-01 – IMPROVED LEAK DETECTION AND REPAIR: This control measure seeks to reduce emissions from a variety of VOC emission sources including, but not limited to, oil and gas production facilities, petroleum refining and chemical products processing, storage and transfer facilities, marine terminals, and other sources, where VOC emissions occur from fugitive leaks in piping components, wastewater system components, and process and storage equipment leaks. Most of these facilities are required under SCAQMD and federal rules to maintain a leak detection and repair (LDAR) program that involves individual screening of all of their piping components and periodic inspection programs of equipment to control and minimize VOC emissions. This measure would utilize advanced remote sensing techniques (Smart LDAR), such as Fourier transform infrared spectroscopy (FTIR), Ultraviolet Differential Optical Absorption Spectroscopy (UV-DOAS), Solar Occultation Flux (SOF), and infrared cameras, that can identify, quantify, and locate VOC leaks in real time allowing for faster repair in a manner that is less time consuming and labor intensive than traditional LDAR.

This control measure would pursue two goals. The first is to upgrade a series of SCAQMD's inspection/maintenance rules (Rules 462, 1142, 1148.1, 463, 1178, 1173, and 1176) to require, at a minimum, a self-inspection program, or utilization of an optical gas imaging-assisted LDAR program where feasible. The second is to explore the use of new technologies to detect and verify VOC fugitive emissions in order to supplement existing programs, explore opportunities where Smart LDAR might substitute for existing LDAR programs, and achieve additional emission reductions. Both goals will be pursued in a public process allowing interested stakeholders to participate in pilot projects and the rule development process.

For new detection technology this control measure will be implemented in two phases: Phase I will be a pilot LDAR program to demonstrate feasibility with the new technology and to establish implementation protocols. The completion of Phase I will result in the identification of facilities/industries currently subject to LDAR programs and identification of those where the new technology is not yet ready to be utilized. Based on the results of Phase I, fugitive VOC rules will be amended as appropriate under the subsequent phase (Phase II) to enhance their applicability and effectiveness, and to further achieve emission reductions.

CTS-01 – FURTHER EMISSION REDUCTIONS FROM COATINGS, SOLVENTS, ADHESIVES, AND SEALANTS: This control measure seeks limited VOC emission reductions by focusing on select coating, adhesive, solvent and sealant categories by further limiting the allowable VOC content in formulations or incentivizing the use of super-compliant technologies. Examples of the categories to be considered include, but are not limited to, coatings used in aerospace applications, adhesives used in a variety of sealing applications, and solvents for graffiti abatement activities. Reductions could be achieved by lowering the VOC content of a few categories within SCAQMD source-specific Rules 1106, 1106.1, 1107,, 1124, 1128, 1136, 1143, 1168, and 1171 where possible, especially where the majority of products already meet lower limits. For Rule 1113, where annual quantity and emissions reporting is required under Rule 314, SIP credit for market-driven reductions could be pursued in categories where many coatings are already formulated below current VOC limits. For solvents, reductions could be achieved by promoting the use of alternative low-VOC products or non-VOC product/equipment at industrial facilities. Particular VOC reductions that lead to the increased use of chemicals that are known or suspected to be toxic should be avoided until it can be demonstrated that these replacement products do not lead to

increased toxic risk for workers or the general public. The tightening of regulatory exemptions can also lead to reduced emissions across multiple use categories.

FLX-02 – STATIONARY SOURCE VOC INCENTIVES: This control measure seeks to incentivize VOC emission reductions from various stationary sources through incentive programs for the use of clean, low VOC emission technologies. Facilities would be able to qualify for incentive funding if they utilize equipment or accept permit conditions which result in cost-effective emission reductions that are beyond existing requirements. The program would establish procedures for quantifying emission benefits from clean technology implementation and develop cost-effectiveness thresholds for funding eligibility. Mechanisms will be explored to incentivize businesses to choose the cleanest technologies as they replace equipment and upgrade facilities, and to provide incentives to encourage businesses to move into these technologies sooner. For stationary sources, the SCAQMD staff has compiled an initial list of potential incentives to encourage businesses to use zero- or near-zero technologies or enhancements to the SCAQMD's existing programs to reduce or eliminate barriers to implement state of the art technologies. Potential incentive concepts include incentive funding, permitting and fee incentives and enhancements, New Source Review (NSR) incentives and enhancements, branding incentives, and recordkeeping and reporting incentives. The SCAQMD staff is committed to further investigating these concepts.

SCAQMD Proposed Mobile Source 8-Hour Ozone Measures

SCAQMD staff analyzed the need to accelerate the penetration of cleaner engine technologies and assist in implementing CARB's proposed State SIP strategy. Specifically, there are several measures under the proposed State SIP strategy that are titled "Further Deployment of Cleaner Technologies" (see Appendix IV-B), which identifies the SCAQMD as an implementing agency along with CARB and U.S. EPA. CARB indicated that the implementation of the "Further Deployment" measures is based on a combination of incentive funding, development of regulations, and quantification of emission reduction benefits from operational efficiency actions and deployment of autonomous vehicles, connected vehicles, and intelligent transportation systems. The SCAQMD has proposed mobile source measures to help implement CARB's "Further Development" measures. In addition, the SCAQMD is implementing several incentives funding programs that have resulted in early emission reductions (e.g., the Carl Moyer Memorial Air Quality Standards Attainment Program, the Surplus Off-Road Opt-In for NOx (SOON) program, and Proposition 1B – Goods Movement Emissions Reduction Program). The emission reduction benefits of the funding programs are quantified and are proposed to be included as part of the overall emission reductions for attainment of the NAAQS.

The proposed SCAQMD mobile source measures are based on a variety of control technologies that are commercially available and/or technologically feasible to implement in the next several years. The focus of these measures includes accelerated retrofits or replacement of existing vehicles or equipment, acceleration of vehicle turnover through voluntary vehicle retirement programs, and greater use of cleaner fuels in the near-term. The measures will encourage greater deployment of zero-emission vehicle and equipment technologies such as plug-in hybrids, battery-electric, and fuel cells to the maximum extent feasible as such technologies are commercialized and near-zero emission technologies everywhere else. In the longer-term, there is a need to significantly increase the penetration and deployment of near-zero and zero-emission vehicles , greater use of cleaner, renewable fuels (either

alternative fuels or new formulations of gasoline and diesel fuels), and additional emission reductions from federal and international sources such as locomotives, ocean-going vessels, and aircraft.

In implementing the SCAQMD mobile source measures, the SCAQMD will focus on collaborative approaches to achieve additional emission reductions to help implement the proposed State SIP Strategy "Further Deployment" measures. During the public process (which is for all intents and purposes, the SCAQMD process used to develop rules to implement the AQMP control measures), SCAQMD staff will assess the progress in identifying actions (voluntary and regulatory) that will result in additional emission reductions. SCAQMD staff will report to the Governing Board on progress on a routine basis, but no later than six months after the adoption of the Final 2016 AQMP. If progress is not made in identifying specific actions within one year of adoption of the Final 2016 AQMP, the SCAQMD staff will recommend to the Governing Board whether to consider proceeding with the development of rules within its existing legal authority or seek additional authority to adopt and implement measures. Such authority includes development of new or expanded clean vehicle fleet rules or indirect source regulations. Table 4-3 provides a schedule for the public process, which includes periodic progress reports to the SCAQMD Mobile Source Committee, convening working groups, and milestones to achieve during the one year period.

TABLE 4-3

Schedule and Milestones for the Mobile Source Measure Public Process

Public Process Activity	Time from Final Approval of the 2016 AQMP
Report to SCAQMD Mobile Source Committee on Process to move forward	• Within One Month
Convene Working Groups for MOB-01 through MOB-05 and EGM-01	• Within One Month
Working Group Meeting • **Define Objectives** • **Seek initial input on the types of actions with potential criteria pollutant reductions** • **Identify existing actions with potential emission reductions** • **Develop model quantification methodologies for emission reductions associated with identified actions** • **Identify future actions with potential emission reductions** • **Quantify potential emission reductions** • **Develop mechanisms to ensure reductions are real, surplus, and enforceable**	• Ongoing on a Monthly Basis
Report to SCAQMD Mobile Source Committee on progress	• Six Months

TABLE 4-3 (concluded)

Schedule and Milestones for the Mobile Source Measure Public Process

Public Process Activity	Time from Final Approval of the 2016 AQMP
Report to SCAQMD Mobile Source Committee/Governing Board on progress and whether to continue with process or recommend formal rule development	• 12 Months

A total of 15 measures are proposed as actions to reduce mobile source emissions. One measure is proposed to identify actions to help mitigate and potentially provide emission reductions due to new development and redevelopment projects. Four measures seek to identify actions that will result in additional emission reductions at commercial marine ports, rail yards and intermodal facilities, warehouse distribution centers, and commercial airports to help meet the emission reductions associated with the State SIP Strategy "Further Deployment" measures for on-road heavy-duty vehicles, off-road equipment, and federal and international sources. Five measures focus on on-road mobile sources and four measures focus on off-road mobile sources. Lastly, one measure seeks to recognize the criteria pollutant emission reduction benefits of existing incentives programs such as the Carl Moyer Memorial Air Quality Standards Attainment Program and Proposition 1B – Goods Movement Emission Reduction Program. The measures call for greater emission reductions through accelerated turnover of older vehicles to the cleanest vehicles and equipment currently available and increased penetration of commercially-available near-zero and zero-emission technologies through incentives programs in the near-term. In the longer-term, CARB will identify potential regulatory actions that will lead to additional emission reductions and greater deployment of zero-emission vehicle technologies everywhere feasible and cost-effective.

Partial-zero and zero-emission technologies are rapidly being introduced into the on-road light- and medium-duty vehicle categories in large part due to the CARB Advanced Clean Car Program, which includes the Low Emission Vehicle (LEV) and the Zero-Emission Vehicle (ZEV) Regulations. In addition, next-generation electric hybrid trucks are being commercialized for light-heavy and medium-heavy heavy-duty on-road vehicles. However, additional research and demonstration are needed to commercialize zero- and near-zero emission technologies for the heavier heavy-duty vehicles (with gross vehicle weight ratings greater than 26,000 pounds).

For many of the off-road mobile sources such as cargo handling equipment, commercial harbor craft, and off-road equipment, some form of "all zero-emission range" or hybridization is being demonstrated and deployment of these technologies is expected to begin over the next few years. For other sectors such as locomotives, marine vessels and aircraft, the development of cleaner combustion technologies beyond existing emission standards will be needed as provided in the State SIP Strategy. The 2016 AQMP White Papers covering Passenger Transportation, Goods Movement, and Off-Road Equipment provide a general discussion on the need for new emission standards and development of cleaner combustion technologies. In addition, CARB's Technology Assessment documents provide in-depth evaluation of current emissions control technologies and the state of development/commercialization of zero- and near-zero advanced technologies. A summary of the 15 measures is provided in Table 4-4.

TABLE 4-4

SCAQMD Proposed Mobile Source 8-Hour Ozone Measures

Number	Title	Adoption	Implementation Period	Implementing Agency	Emission Reductions (tpd) (2023/2031)
Emission Growth Management Measure:					
EGM-01	Emission Reductions from New Development and Redevelopment Projects [All Pollutants]	2018	2019–2031	SCAQMD	TBD [a]
Facility-Based Mobile Source Measures:					
MOB-01	Emission Reductions at Commercial Marine Ports [NOx, SOx, PM]	2018	2019–2031	SCAQMD	TBD [b]
MOB-02	Emission Reductions at Rail Yards and Intermodal Facilities [NOx, PM]	2018	2019–2031	SCAQMD	TBD
MOB-03	Emission Reductions at Warehouse Distribution Centers [All Pollutants]	2018	2019–2031	SCAQMD	TBD
MOB-04	Emission Reductions at Commercial Airports [All Pollutants]	2018	2019–2031	SCAQMD	TBD [b]
On-Road Mobile Source Measures:					
MOB-05	Accelerated Penetration of Partial Zero-Emission and Zero-Emission Vehicles [VOC, NOx, CO]	N/A	Ongoing	CARB, SCAQMD	TBD [a]
MOB-06	Accelerated Retirement of Older Light-Duty and Medium-Duty Vehicles [VOC, NOx, CO]	N/A	Ongoing	CARB, Bureau of Automotive Repair, SCAQMD	TBD [a]
MOB-07	Accelerated Penetration of Partial Zero-Emission and Zero-Emission Light-Heavy- and Medium-Heavy-Duty Vehicles [NOx, PM]	N/A	Ongoing	CARB, SCAQMD	TBD [a]
MOB-08	Accelerated Retirement of Older On-Road Heavy-Duty Vehicles [NOx, PM]	2018	2019–2031	CARB, SCAQMD	TBD [a]
MOB-09	On-Road Mobile Source Emission Reduction Credit Generation Program [NOx, PM]	2018	2019–2027	CARB, SCAQMD	TBD [a]

TABLE 4-4 (CONCLUDED)

SCAQMD Proposed Mobile Source 8-Hour Ozone Measures

Number	Title	Adoption	Implementation Period	Implementing Agency	Emission Reductions (tpd) (2023/2031)
Off-Road Mobile Source Measures:					
MOB-10	Extension of the SOON Provision for Construction/Industrial Equipment [NOx]	N/A	Ongoing	SCAQMD	2.0 / 2.0
MOB-11	Extended Exchange Program [VOC, NOx, CO]	N/A	Ongoing	SCAQMD	2.9 / 1.0 [NOx]
MOB-12	Further Emission Reductions from Passenger Locomotives [NOx, PM]	Ongoing	Beginning 2017–2023	SoCal Regional Rail Authority	TBD [b]
MOB-13	Off-Road Mobile Source Emission Reduction Credit Generation Program [NOx, SOx, PM]	2018	2019–2027	SCAQMD	TBD [a]
Incentive Programs Measure:					
MOB-14	Emission Reductions from Incentive Programs [NOx, PM]	N/A	2016–2024	SCAQMD	11 / 7.8 [NOx]

[a] Emission reductions will be determined after projects are identified and implemented

[b] Submitted into the SIP as part of Rate-of-Progress reporting or in baseline inventories for future AQMP/SIP Revisions

The following text provides a brief description of the SCAQMD staff's proposed mobile source control measures:

Emission Growth Management Measure

There is one proposed control measure within this category. The measure addresses emission reductions from new or redevelopment projects. The SCAQMD will encourage developers and local agencies to identify actions that will result in mitigation of new criteria pollutant emissions and potentially further reduce criteria pollutant emissions from affected projects.

EGM-01 – EMISSION REDUCTIONS FROM NEW OR REDEVELOPMENT PROJECTS: Since San Joaquin Valley Air Pollution Control District Rule 9510 has been approved by U.S. EPA to be included in the SIP for the San Joaquin Valley, the SCAQMD must consider Rule 9510 under the "all feasible measures" requirement of state law. As such, the applicability of Rule 9510 in the South Coast Air Basin and

Coachella Valley will be evaluated. The proposed measure seeks to capture emission reduction opportunities during the project development phase and opportunities to enable greater deployment of zero and near-zero emission technologies. The SCAQMD will reconvene the working group made up of stakeholders from industry, local governments, and community representatives as part of the rulemaking process. The working group will provide input and comments and help identify actions that potentially result in emission reductions to mitigate any new emissions or further reduce emissions. As part of the public process, the SCAQMD staff will evaluate the need to develop a rule or other enforceable mechanisms to ensure that the emission reductions are real, surplus, quantifiable, and enforceable as defined by U.S. EPA if the emission reductions are proposed to be included in the SIP.

Facility-Based Mobile Source Measures

With economic growth projected out to 2040 by SCAG, there may be a potential increase in emissions associated with mobile sources in the goods movement sector even with the deployment of newer, cleaner vehicles and equipment. As such, four facility-based mobile source control measures are proposed. The first measure focuses on commercial marine ports in the Basin. Port-related emission sources include on-road heavy-duty trucks, locomotives, ocean-going vessels, commercial harbor craft, and cargo handling equipment. The Ports of Los Angeles and Long Beach (Ports) have been implementing the San Pedro Bay Ports Clean Air Action Plan (CAAP) since 2006. Implementation of strategies under the CAAP has led to early emission reductions as state, federal, and international regulations are developed. The Ports are in the process of updating the CAAP to implement long-term sustainable strategies that could potentially result in criteria pollutant and greenhouse gas emission reductions, while improving operational efficiencies and reducing dependence on fossil-based fuels. To the extent that criteria pollutant emission reductions associated with such actions can be quantified, a mechanism will be developed that recognizes the actions and credits the associated emission reductions into the SIP.

The second measure focuses on mobile source related vehicles and equipment operating in rail yards and intermodal facilities in the Basin. Such vehicles and equipment include cargo handling equipment, locomotives, on-road heavy-duty trucks, and passenger cars. The third and fourth measures focus on warehouse distribution centers and commercial airports. An approach similar to the marine ports measure will be taken to quantify criteria pollutant emission reductions associated with activities occurring at these facilities.

As part of the public process in implementing the four measures, the SCAQMD staff will be assessing the progress in identifying and quantifying emission reductions that are anticipated to occur at the various facilities. As part of the public process, the SCAQMD staff will evaluate the need for rule development to achieve additional emission reductions and report to the SCAQMD Governing Board six months after the Plan adoption on the progress of implementing the four measures. If after one year (from the date of adoption of the Final 2016 AQMP), voluntary actions or from CARB (since these measures are to help implement CARB's "Further Development" measures) or U.S. EPA are not identified to any significant extent or identified actions do not result in emission reductions in a timely manner to meet federal air quality standards, the SCAQMD staff will recommend that the SCAQMD Governing Board consider regulatory approaches or other enforceable mechanisms to achieve the emission reductions from the mobile source sectors associated with the various facilities.

MOB-01 – EMISSION REDUCTIONS AT COMMERCIAL MARINE PORTS: The Ports have been implementing the CAAP since 2006 and is currently in the process of updating the CAAP. The Ports have been successful for the most part in implementing the CAAP and have exceeded emission reduction goals set in the CAAP. The CAAP update has the potential to assist the region in attaining air quality standards in a timely manner. Many of the actions that have been implemented in the CAAP are voluntary in nature since these reductions are not committed in the SIP. Over time, these actions have been subsumed through regulatory actions by CARB, U.S. EPA, or international entities such as the International Maritime Organization (IMO). Regardless, the actions have led to early emission reductions. The Ports are in a unique position to work with their tenants (terminal and railroad operators) to develop strategies to further reduce emissions. This measure seeks to quantify the emission reductions realized from the CAAP and credit the reductions into the SIP to the extent that these actions are real and surplus to the existing SIP. Emission reductions that occurred through the identified actions as reported by the Ports on an annual basis will be incorporated in the revised baseline emissions as part of the SIP revision process (either as part of the Rate-of-Progress reporting requirements of the CAA or reflected in new baseline emissions inventory for future AQMP/SIP revisions). Since many of these actions are voluntary in nature, any emission reductions credited towards attainment of the federal air quality standards must contain an enforceable commitment that the emission reductions remain real and permanent (as defined by U.S. EPA) if for some reason the emission reductions are not maintained after they are reported into the SIP. As such, the enforceable commitment may be in the form of a regulation by the SCAQMD within its existing legal authority, or by the state or federal government, or other enforceable mechanisms. Regardless, the types of enforceable commitments will be developed through a public process. The proposed measure will replace control measures MOB-03 in the 2007 AQMP and IND-01 in the 2012 AQMP since the emission reductions associated with these measures have been achieved either through regulations adopted by CARB or U.S. EPA. Relative to control measure IND-01 from the 2012 AQMP, the 24-hour PM2.5 air quality standard was not attained in 2014. However, the emission reduction targets provided in IND-01 have already been met.

MOB-02 – EMISSION REDUCTIONS AT RAIL YARD AND INTERMODAL FACILITIES: The goal of this measure is to assess and identify potential actions to further reduce emissions associated with mobile sources operating in and out of rail and intermodal yards. The SCAQMD staff will convene a stakeholder working group to discuss and identify actions or approaches to further reduce emissions at rail yards and intermodal facilities. The identified actions can be voluntary or regulatory or other enforceable mechanisms adopted by local, state, or federal governmental agencies. To the extent that these actions are voluntary in nature and are sustained over a long-term basis and the emission reduction levels are maintained, the emission reductions may be credited as surplus reductions (as defined by the U.S. EPA) into the SIP. If emission reductions are to be included in the SIP, enforceable commitments to ensure that the emissions are permanent will need to be made and may be in the form of a regulation adopted by the SCAQMD within its legal authority or by other enforceable mechanisms.

MOB-03 – EMISSION REDUCTIONS AT WAREHOUSE DISTRIBUTION CENTERS: The goal of this measure is to assess and identify potential actions to further reduce emissions associated with emission sources operating in and out of warehouse distribution centers. The SCAQMD is currently working with industry stakeholders on conducting in-use truck trip studies and obtaining emissions information from various warehouse distribution types. This information along with emissions occurring in and around individual warehouse distribution centers will serve as the basis for seeking opportunities to reduce emissions

beyond existing requirements. A stakeholder working group will be convened to discuss warehouse emissions related issues and provide input and comments on identifying actions that will result in further emission reductions. To the extent that these actions are voluntary in nature and are sustained over a long-term basis and the emission reduction levels are maintained, the emission reductions may be credited as surplus reductions (as defined by the U.S. EPA) into the SIP. If emission reductions are to be included in the SIP, enforceable commitments to ensure that the emissions are permanent will need to be made and may be in the form of a regulation adopted by the SCAQMD within its legal authority or by other enforceable mechanisms.

MOB-04 – EMISSION REDUCTIONS AT COMMERCIAL AIRPORTS: Due to projected increases in airline passenger transportation and expansion of operations at various commercial airports, potential increases in emissions may result unless the increased emissions are fully mitigated. Several airport authorities are implementing emissions mitigation measures, while other airports have initiated actions that can lead to additional emission reductions. This measure seeks to quantify such actions and identify additional actions that can lead to additional emission reductions to assist in attainment of federal air quality standards and reduce local exposure to air toxic emissions. Quantified emission reductions that are real, surplus, permanent, and enforceable will be reflected in future emissions inventories as part of the Rate-of-Progress reporting requirements or in baseline emission inventories as part of future AQMP/SIP development. In addition, such emission reductions can be used for general conformity purposes. A working group will be convened with affected stakeholders to discuss airport emissions related issues and provide input to identify actions and develop mechanisms to implement this measure. To the extent that the identified actions are voluntary in nature and are sustained over a long-term basis and the emission reduction levels are maintained, the emission reductions may be credited as surplus reductions (as defined by the U.S. EPA) into the SIP. If emission reductions are to be included in the SIP, enforceable commitments to ensure that the emissions are permanent will need to be made and may be in the form of a regulation adopted by the SCAQMD within its legal authority or by other enforceable mechanisms. This measure seeks to undertake a stakeholder process and draft for Governing Board consideration an indirect source rule for commercial airports within the South Coast Basin by February 1, 2019 to control emissions of NOx, PM2.5, lead, and diesel particulate matter from non-aircraft sources.

On-Road Mobile Source Measures

Five on-road mobile source control measures are proposed. The first two measures focus on on-road light- and medium-duty vehicles operating in the Basin. It is estimated that around 12 million registered vehicles will be operating in the Basin. The first measure would implement programs to accelerate the penetration and deployment of partial zero-emission and zero-emission vehicles in the light- and medium-duty vehicles categories. The second control measure would seek to accelerate retirement of older gasoline and diesel powered vehicles up to 8,500 pounds gross vehicle weight (GVW). These vehicles include passenger cars, sports utility vehicles, vans, and light-duty pick-up trucks.

The remaining three measures focus on heavy-duty vehicles. The first of these measures seeks additional emission reductions from the early deployment of partial zero-emission and zero-emission light- and medium-heavy-duty vehicles with gross vehicle weights between 8,501 pounds to 26,000 pounds. The second control measure for heavy-duty vehicles seeks additional emission reductions from older, pre-2010 heavy-duty vehicles beyond the emission reductions targeted in CARB's Truck and Bus

Regulation. Additional emission reductions beyond the compliance requirements of the Truck and Bus Regulation could be achieved as affected fleets purchase trucks with engines that meet an optional NOx emissions standard to replace their existing heavy-duty vehicles. In addition, fleets or trucks that are not subject to the Truck and Bus Regulation would be targeted through incentives or through regulatory actions that are within the SCAQMD's legal authority such as the SCAQMD Rule 1190 series of clean fleet vehicle rules, to purchase trucks with engines meeting an optional NOx emissions standard. The third measure will seek to accelerate the introduction of zero- and near-zero emission on-road heavy-duty trucks through mobile source emission reduction credits generating programs. SCAQMD Rules 1612 and 1612.1 have been in place since 1995 and 2001, respectively. However, the current versions of the rules need to be updated to reflect heavy-duty vehicle technologies available today and in the near-future. Mobile source emission reduction credits generated under these rules would only be available to help facilities affected by the facility-based measures (MOB-01 through MOB-04 and EGM-01). The credits are proposed to not be eligible for offset stationary source emissions.

MOB-05 – ACCELERATED PENETRATION OF PARTIAL ZERO-EMISSION AND ZERO-EMISSION VEHICLES: This measure proposes to continue incentives for the purchase of zero-emission vehicles and hybrid vehicles with a portion of their operation in an "all-electric range" mode. The State Clean Vehicle Rebate Pilot (CVRP) program is proposed to continue from 2016 to 2030 with proposed funding up to $5,000 per vehicle and for low-income eligible residents, additional funding of up to $1,500 for a total of $6,500 per vehicle. The California State legislature has appropriated $133 million statewide for the CVRP for Fiscal Year 2016–17. The proposed measure seeks to provide funding rebates for at least 15,000 zero-emission or partial-zero emission vehicles per year.

MOB-06 – ACCELERATED RETIREMENT OF OLDER LIGHT-DUTY AND MEDIUM-DUTY VEHICLES: This proposed measure calls for promoting the permanent retirement of older eligible vehicles through financial incentives currently offered through local funding incentive programs, and AB 118 Enhanced Fleet Modernization Program (EFMP), and the Greenhouse Gas Reduction Fund (EFMP Plus-Up). The proposed measure seeks to retire up to 2,000 older light- and medium-duty vehicles (up to 8,500 pounds GVW) per year. Funding incentives of up to $4,500 per vehicle are available to low- and moderate-income residents for the scrapping of the vehicle, which includes a replacement voucher for a newer cleaner conventional powered vehicle, plug-in hybrid electric or dedicated zero-emission vehicle. For low- and moderate-income residents living in a disadvantaged community, additional funding of up to $5,000 is available for a fuel efficient conventional powered vehicle, plug-in hybrid electric vehicle or dedicated zero-emission vehicle. The proposed measure seeks to provide funding assistance for at least 2,000 replacement vehicles per year.

MOB-07 – ACCELERATED PENETRATION OF PARTIAL ZERO-EMISSION AND ZERO-EMISSION LIGHT-HEAVY- AND MEDIUM-HEAVY-DUTY VEHICLES: The objective of the proposed action is to accelerate the introduction of advanced hybrid and zero-emission technologies for Class 4 through 6 heavy-duty vehicles. The State is currently implementing a Hybrid Vehicle Incentives Project (HVIP) program to promote zero-emission and hybrid heavy-duty vehicles and CARB is proposing to allocate $18 million statewide to the program. The proposed measure seeks to continue the program from 2016 to 2030 to deploy up to 120 zero- and partial-zero emission vehicles per year with up to $50,000 funding assistance per vehicle based on the current allocated funding (funding levels vary depending on technology types). Zero-emission vehicles and hybrid vehicles with a portion of their operation in an "all-electric range" mode

would be given the highest priority. In addition in 2016, the California state legislature appropriated $150 million from the Greenhouse Gas Reduction Fund to invest in zero and near-zero emission on-road heavy-duty vehicles and off-road equipment. The District staff will seek necessary legislative authority to authorize the SCAQMD to require the accelerated purchase and use of near-zero and zero-emission heavy-duty on-road vehicles for public fleets within the South Coast Basin. The District's fleet rules will be amended to require accelerated purchase and use of near-zero and zero-emission heavy-duty on-road public vehicles within the South Coast Basin no later than two years after the SCAQMD obtains any necessary legislative authority to control emissions of NOx, PM2.5, and diesel particulate matter.

MOB-08 – ACCELERATED RETIREMENT OF OLDER ON-ROAD HEAVY-DUTY VEHICLES: This proposed measure seeks to replace up to 2,000 heavy-duty vehicles per year with newer or new vehicles that meet one of the optional NOx standards adopted by CARB. The funding assistance will be prorated to offer the most funding for heavy-duty engines meeting the optional NOx exhaust emissions standard of 0.02 g/bhp-hr or cleaner. Funding assistance of up to $25,000 per vehicle is proposed and the level of funding will depend upon the NOx emissions certification level of the replacement vehicle meeting one of the optional NOx emission standards. In addition, the SCAQMD may to the extent within its authority, adopt a regulation to require purchase of the cleanest commercially available engine, which may include a provision similar to the Surplus Off-Road Opt-In for NOx (SOON) provision of the Statewide In-Use Off-Road Fleet Vehicle Regulation or develop new or expanded clean fleet vehicle rules, to ensure that additional NOx emission reduction benefits are achieved. Other enforceable mechanisms may be considered providing that such mechanisms can be approved into the SIP. The District staff will seek necessary legislative authority to authorize the SCAQMD to require the accelerated purchase and use of near-zero and zero-emission heavy-duty on-road vehicles for public fleets within the South Coast Basin. The District's fleet rules will be amended to require accelerated purchase and use of near-zero and zero-emission heavy-duty on-road public vehicles within the South Coast Basin no later than two years after the SCAQMD obtains any necessary legislative authority to control emissions of NOx, PM2.5, and diesel particulate matter.

MOB-09 – ON-ROAD MOBILE SOURCE EMISSION REDUCTION CREDIT GENERATION PROGRAM: This proposed measure seeks to accelerate deployment of near-zero and zero-emission on-road heavy-duty trucks through the generation of mobile source emission reduction credits (MSERCs) that can be used for purposes of recognizing mobile source emission reductions at facilities affected by proposed AQMP measures MOB-01 through MOB-04, MOB-08, and EGM-01. The SCAQMD staff will develop amendments to SCAQMD Rules 1612 and 1612.1 to reflect the latest advanced near-zero and zero-emission technologies and revise the quantification methodologies in Rules 1612 and 1612.1. MSERCs generated will be discounted to provide additional benefits to the environment and to help meet air quality standards.

Off-Road Mobile Source Measures

Four control measures are proposed to seek further emission reductions from off-road mobile sources and industrial equipment. The first measure calls for the continuation of the SOON provision of the Statewide In-Use Off-Road Diesel Fleet Regulation beyond 2023. The SOON provision implemented to-date has realized additional NOx reductions beyond the Statewide regulation. The second measure seeks to continue the successful lawnmower and leaf blower exchange programs and expand the

programs to include a greater variety of zero-emission equipment into the commercial lawn and garden maintenance activities. A significant portion of the NOx emissions from lawn and garden equipment are attributed to larger lawn and garden equipment operating on diesel fuel. The extended exchange program will focus on replacing these equipment with newer equipment. The third measure calls for additional emission reductions from passenger locomotives. The Southern California Regional Rail Authority (SCRRA or Metrolink), the region's commuter rail service, is in the process of procuring 40 Tier 4 passenger locomotives. This measure will recognize these efforts and continue the purchase of Tier 4 cleaner locomotives. The fourth measure seeks to accelerate the introduction of zero- and near-zero emission off-road equipment through mobile source emission reduction credits generating programs. SCAQMD Rule 1620 has been in place since 1995. However, the current version of the rule needs to be revised to reflect current off-road equipment technologies available today and the near-future. Mobile source emission reduction credits generated under a new amended Rule 1620 or other off-road mobile source emission reduction credit generation rule would only be available to help facilities affected by the facility-based measures (MOB-01 through MOB-04 and EGM-01). The credits are proposed to not be eligible for offset stationary source emissions.

MOB-10 – EXTENSION OF THE SOON PROVISION FOR CONSTRUCTION/INDUSTRIAL EQUIPMENT: To promote turnover (i.e., retire, replace, retrofit, or repower) of older in-use construction and industrial diesel engines, this proposed measure seeks to continue the SOON provision of the Statewide In-Use Off-Road Fleet Vehicle Regulation beyond 2023 through the 2031 timeframe. Historically, the SCAQMD Governing Board has allocated up to $30 million per year for the program. However, more recently, the Governing Board has allocated up to $10 million per year. This measure proposes to extend the current SOON Program beyond 2023 to 2031 with a minimum allocation of $10 million and potentially higher levels upon the Governing Board's approval. In order to implement the SOON program in this timeframe, funding of up to $30 million per year would be sought to help fund the repower or replacement of older Tier 0 and Tier 1 equipment to Tier 4 or cleaner equipment, with approximately 2 tpd of NOx reductions.

MOB-11 – EXTENDED EXCHANGE PROGRAM: This measure seeks to continue the successful lawnmower and leaf blower exchange programs in order to increase the penetration of electric equipment or new low emission gasoline-powered equipment used in the region. The lawnmower exchange program has resulted in over 55,000 gasoline lawnmowers replaced with zero-emission lawnmowers and over 12,000 older, dirtier gasoline-powered commercial leaf blowers replaced with newer, cleaner leaf blowers. The SCAQMD is currently conducting a lawn and garden equipment loan program with various public entities to demonstrate the feasibility of zero-emission lawn and garden equipment in various public and commercial settings. Such demonstrations will provide valuable information to lawn and garden equipment manufacturers to produce zero-emission products for the commercial environment. A segment of the lawn and garden equipment population comprised of diesel powered equipment represents a significant fraction of the total NOx emissions associated with this category. As such, the proposed extended exchange program will focus on incentives to accelerate the replacement of older equipment with new Tier 4 or cleaner equipment or zero-emission equipment where applicable. In addition, other small off-road equipment (SORE) equipment may also be considered for exchange programs for accelerating the turnover of existing engines.

MOB-12 – FURTHER EMISSION REDUCTIONS FROM PASSENGER LOCOMOTIVES: This measure recognizes recent actions by the SCRRA to replace their existing passenger locomotives with Tier 4 locomotives. The SCRRA is in the process of procuring 40 Tier 4 passenger locomotives to replace their older existing Tier 0 and Tier 2 passenger locomotives by 2020. The SCRRA Board has indicated a desire to work with the SCAQMD and other stakeholders to evaluate technologies that will further reduce NOx emissions beyond Tier 4 emissions level.

MOB-13 – OFF-ROAD MOBILE SOURCE EMISSION REDUCTION CREDIT GENERATION PROGRAM: This measure seeks to accelerate the early deployment of near-zero and zero-emission off-road equipment through the generation of MSERCs that can be used for purposes of recognizing mobile source emission reductions at facilities affected by proposed AQMP measures MOB-01 through MOB-04 and EGM-01. The SCAQMD staff will develop amendments to SCAQMD Rule 1620 to reflect the latest advanced near-zero and zero-emission technologies and revise the quantification methodologies in Rule 1620. In addition to Rule 1620, the SCAQMD staff has been working on two additional off-road mobile source emission reduction credit generation rules to incentivize the early deployment of the cleanest ocean-going vessels that are not subject to the State Vessels At-Berth Regulation or vessel calls that are considered surplus to the Statewide regulation and locomotives that have lower NOx emissions than the current Tier 4 locomotive engine standards. The two rules will be further developed under this measure. MSERCs generated may be discounted to provide additional benefits to the environment and to help meet air quality standards.

Incentive Programs Measure

A measure is proposed to recognize the emission benefits resulting from incentive funding programs such as the Carl Moyer Memorial Air Quality Standards Attainment Program and Proposition 1B. The San Joaquin Valley Air Pollution Control District adopted Rule 9610 to recognize the emission reduction benefits of incentive programs in their region. A similar action is proposed under the current measure. The proposed measure describes the six general elements identified by U.S. EPA that will be needed in order for such benefits to be accounted in the SIP.

MOB-14 – EMISSION REDUCTIONS FROM INCENTIVE PROGRAMS: This measure seeks to develop a rule similar to the San Joaquin Valley Air Pollution Control District Rule 9610 to recognize emission reduction benefits associated with incentive programs. The proposed rule would recognize the emission benefits resulting from incentive funding programs such as the Carl Moyer Memorial Air Quality Standards Attainment Program and Proposition 1B such that the emission reductions can be accounted for in the SIP. As previously mentioned, the U.S. EPA indicated that there are six general elements that need to be incorporated in a proposed rule in order for the reductions to be credited in the SIP. The six necessary elements are the minimal amount of information, documentation, or commitment needed for U.S. EPA to consider approval of emission reduction benefits associated with incentives programs. Additional elements may be identified during the implementation of this measure.

State and Federal Control Measures

In addition to SCAQMD and SCAG measures, the Draft 2016 AQMP includes additional control measures to reduce emissions from sources that are primarily under state and federal jurisdiction, including on-road and off-road mobile sources. These reductions are needed to achieve the remaining emission reductions necessary for ozone and PM2.5 attainment. The CARB released the Proposed 2016 State Strategy for the SIP (State SIP Strategy) on May 17, 2016. The new measures contained in the State SIP Strategy commitment reflect a combination of state actions, petitions for federal action, as well as actions that outline a pathway for achieving further deployment of the cleanest technologies in each sector. These measures, in conjunction with the existing control program, identify all of the reductions needed to achieve a 70 percent reduction in NOx emissions from mobile sources in 2023, and an 80 percent reduction in 2031 in the South Coast. Current control programs will reduce NOx emissions from today's levels by 209 tons per day by 2031. As part of the proposed State SIP Strategy, CARB will provide an enforceable commitment to achieve in aggregate an additional 107 tons per day of NOx reductions in 2023, and 97 tons per day in 2031. The State SIP Strategy will also provide 48 and 60 tons per day, respectively, of VOC reductions in 2023 and 2031 which provide supplemental benefits in reducing ozone in some portions of the Basin. Any additional commitments to address PM2.5 attainment needs in 2025 will be identified separately, if needed.

The NOx and VOC emission reductions from the proposed new State SIP Strategy measures in 2023 and 2031 are summarized in Table 4-5. CARB's proposed State SIP Strategy for on-road vehicles, locomotives, ocean going vessels, and off-road equipment are briefly summarized in this section and details of these measures are provided in Appendix IV-B.

TABLE 4-5

South Coast Expected Emission Reductions (tpd) from State SIP Strategy Measures

Proposed Measure	2023		2031	
	NOx	VOC	NOx	VOC
On-Road Light-Duty:				
Advanced Clean Cars 2	—	—	0.6	0.4
Lower In-Use Emission Performance Assessment	NYQ	NYQ	NYQ	NYQ
Further Deployment of Cleaner Technologies*	7	16	5	16
Total On-Road Light-Duty Reductions	**7**	**16**	**6**	**16**
On-Road Heavy-Duty:				
Lower In-Use Emission Performance Level	NYQ	<0.1	NYQ	<0.1
Low-NOx Engine Standard – California Action	—	—	5	—
Low-NOx Engine Standard – Federal Action*	—	—	7	—
Medium and Heavy-Duty GHG Phase 2	NYQ	NYQ	NYQ	NYQ
Innovated Clean Transit	<0.1	<0.1	0.1	<0.1
Last Mile Delivery	<0.1	<0.1	0.4	<0.1
Innovative Technology Certification Flexibility	NYQ	NYQ	NYQ	NYQ
Zero-Emission Airport Shuttle Buses	NYQ	NYQ	NYQ	NYQ
Incentive Funding to Achieve Further Emission Reductions from On-Road Heavy-Duty Vehicles	3	0.4	3	0.4
Further Deployment of Cleaner Technologies*	34	4	11	1
Total On-Road Heavy-Duty Reductions	**37**	**4**	**27**	**2**
Off-Road Federal and International Sources*:				
Aircraft				
Further Deployment of Cleaner Technologies*	9	NYQ	13	NYQ
Locomotives				
More Stringent National Locomotive Emission Standards*	<0.1	<0.1	2	<0.1
Further Deployment of Cleaner Technologies*	7	0.3	3	0.3
Ocean-Going Vessels				
Tier 4 Vessel Standards*	—	—	NYQ	NYQ
Incentivize Low Emission Efficient Ship Visits	NYQ	NYQ	NYQ	NYQ
At-Berth Regulation Amendments	0.3	<0.1	1	<0.1
Further Deployment of Cleaner Technologies*	30	NYQ	38	NYQ
Total Off-Road Federal and International Reductions	**46**	**0.3**	**57**	**0.3**

TABLE 4-5 (CONCLUDED)

South Coast Expected Emission Reductions (tpd) from State SIP Measures

Proposed Measure	2023		2031	
	NOx	VOC	NOx	VOC
Off-Road Equipment:				
Zero-Emission Off-Road Forklift Regulation Phase 1	—	—	1	0.1
Zero-Emission Off-Road Emission Reduction Assessment	NYQ	NYQ	NYQ	NYQ
Zero-Emission Off-Road Worksite Emission Reduction Assessment	NYQ	NYQ	NYQ	NYQ
Zero-Emission Airport Ground Support Equipment	<0.1	<0.1	<0.1	<0.1
Small Off-Road Engines	0.7	7	2	16
Transport Refrigeration Units Used for Cold Storage	NYQ	NYQ	NYQ	NYQ
Low-Emission Diesel Requirement	0.3	NYQ	1	NYQ
Further Deployment of Cleaner Technologies*	21	21	18	20
Total Off-Road Equipment Reductions	**22**	**28**	**22**	**36**
Consumer Products:				
Consumer Products Program	—	1–2	—	4–5
Total Consumer Products Reductions	—	**1–2**	—	**4–5**
Aggregate Emission Reductions	**113**	**50–51**	**111**	**59–60**

* Request U.S. EPA approval under the provisions of Section 182(e)(5) of the Clean Air Act
"NYQ" denotes emission reductions are Not Yet Quantified
"—" denotes no anticipated reductions

On-Road Light-Duty Vehicles

ADVANCED CLEAN CARS 2: This proposed measure is designed to ensure that near-zero and zero-emission technology options continue to be commercially available, with electric driving range improvements to address consumer preferences for greater ease of use, and to maximize electric vehicle miles travelled (eVMT). The regulation may include lowering fleet emissions further beyond the super-ultra-low-emission vehicle standard for the entire light-duty fleet through at least the 2030 model year, and look at ways to improve real world emissions through implementation programs. Additionally, new standards would be considered to further increase the sales of zero-emission vehicles (ZEVs) and plug-in hybrid electric vehicles (PHEVs) in 2026 (and later years) beyond the levels required in 2025.

LOWER IN-USE EMISSION PERFORMANCE ASSESSMENT: This proposed measure is designed to ensure that in-use vehicles continue to operate at their cleanest possible level by evaluating California's in-use performance-focused inspection procedures and, if necessary, make improvements to further the program's effectiveness. Results from the assessment could be used to improve inspection test procedures, address program fraud, improve the effectiveness and durability of emission-related repair work, and to improve the regulations governing the design of in-use performance systems on motor vehicles to the extent necessary.

FURTHER DEPLOYMENT OF CLEANER TECHNOLOGY: ON-ROAD LIGHT-DUTY VEHICLES: This proposed measure is designed to achieve further emission reductions for the Basin's attainment needs through a

suite of additional actions, including greater penetration of near-zero and zero-emission technologies through incentive programs, and emission benefits associated with increased transportation efficiencies, as well as the potential for autonomous vehicles and advanced transportation systems. The emission reductions will be achieved through a combination of actions to be undertaken by both CARB and the SCAQMD.

On-Road Heavy-Duty Vehicles

LOWER IN-USE EMISSION PERFORMANCE LEVEL FOR HEAVY-DUTY VEHICLES: This proposed measure is designed to ensure that heavy-duty vehicles continue to operate at the cleanest possible level. CARB would develop new, supplemental actions, in the form of regulatory amendments or new regulations, to address in-use compliance and to decrease engine deterioration. This suite of actions includes: amendments to CARB's existing roadside and fleet inspection programs to revise the current opacity limit and make other program improvements to better reflect the capability of current technology; amendments to the warranty requirements and useful life provisions to better reflect the operation of these vehicles; amendments to the not to exceed (NTE) supplemental test procedures for heavy-duty diesel engines; amendments to the durability demonstration provisions within the certification requirements for heavy-duty engines; and adoption of a comprehensive inspection and maintenance program for heavy-duty trucks to test for excessive emissions of multiple pollutants.

LOW-NOx ENGINE STANDARD: This proposed measure is designed to introduce near-zero emission engine technologies that will substantially lower NOx emissions from on-road heavy-duty vehicles. CARB began development of new heavy-duty low-NOx emission standards in 2016, with CARB Board action expected in 2019. A California-only low-NOx standard would apply to all vehicles with new heavy-duty engines sold in California starting in 2023. In order to ensure that all trucks traveling within California would eventually be equipped with an engine meeting the lower NOx standard, CARB may also petition U.S. EPA to establish a new federal heavy-duty engine emission standard. If U.S. EPA fails to initiate the rule development process for a federal standard by the end of 2017, CARB would continue with its development and implementation efforts to establish a California-only low-NOx standard. If U.S. EPA begins the regulatory development process for new federal heavy-duty emission standards by 2017, CARB will coordinate its regulatory development efforts with the federal regulation as much as possible.

MEDIUM AND HEAVY-DUTY GHG PHASE 2: This proposed measure is designed to advance fuel efficiency improvements and achieve greater GHG emission reductions through the introduction of the next generation of integrated engine, powertrain, vehicle and trailer technologies designed to reduce climate emissions and fuel use. U.S. EPA finalized new federal Phase 2 standards for medium- and heavy-duty vehicles in August 2016. The new standards build upon the Phase 1 standards and will push technology improvements beyond what is currently in widespread commercial use. CARB staff plans to present a California Phase 2 proposal for the Board's consideration in 2017. In addition to harmonizing with the federal Phase 2 standards where applicable, staff's proposal may include some more stringent, California-only provisions that are necessary to meet California's unique air quality challenges.

INNOVATED CLEAN TRANSIT: This measure is designed to continue the transition to a suite of cleaner transit options to support the goal of a modern, multi-modal, clean transit system. Access to public transit is especially important for people in disadvantaged communities who may have limited mobility

choices. The measure will consider a variety of mechanisms to support access to innovative transit and mobility options that together will achieve emission reduction or other benefits in disadvantaged communities, maintain or expand service, while deploying advanced clean technologies. CARB staff will develop and propose a variety of approaches and mechanisms to support the transition to a suite of innovative clean transit options. CARB staff have convened a technical workgroup and a transit agency subcommittee to inform key data collection and analysis, and to help develop and refine potential approaches, which may include: 1) securing binding commitments from the State's transit providers for a long-term vision for transitioning to zero-emission buses and other technologies; 2) continuing to support to the maximum extent possible the near-term deployment of zero-emission buses into service where transit service can be maintained, expanded, or enhanced; and 3) working with zero-emission first and last-mile solutions .

LAST MILE DELIVERY: This measure is designed to increase the penetration of the first wave of zero-emission heavy-duty technology into applications that are well suited to its use. This proposed measure will result in the use of low-NOx engines and the development of increasing numbers of zero-emission trucks where best suited, primarily for class 3-7 last mile delivery trucks in California starting in 2020, with a small-scale deployment initially, and ramping up to a higher percentage of new vehicle sales. The initial ramp-up of zero-emission trucks will consider the ability of the new technology to meet the operational needs of the users. CARB staff is evaluating options for purchase requirements.

INNOVATIVE TECHNOLOGY CERTIFICATION FLEXIBILITY: This proposed measure is designed to encourage early deployment of the next generation of truck and bus technologies through defined, near-term CARB certification and on-board diagnostic (OBD) compliance flexibility for medium- and heavy-duty vehicles. This regulation is intended to balance the need to provide key, promising technologies with a predictable and practical CARB-certification pathway, while preserving CARB's overarching objective of ensuring that the expected emission benefits of advanced truck and bus technologies are achieved in-use. This regulation would provide the greatest flexibility for potentially transformational engine and vehicle technologies, such as robust hybrids and heavy-duty engines meeting the optional low-NOx standard. In October 2016, CARB adopted the Innovative Technology Regulation (ITR).

ZERO-EMISSION AIRPORT SHUTTLE BUSES: This proposed measure is designed to achieve NOx and GHG emission reductions goals through advanced clean technology, and to increase the penetration of the first wave of zero-emission heavy-duty technology into applications that are well suited to its use. Like transit buses, the inclusion of zero-emission airport shuttles would serve as a stepping stone to encourage broader deployment of zero-emission technologies in the on-road sector. CARB staff would also consider the feasibility of including requirements for other heavy-duty airport vehicles, such as fixed route vehicles entering/exiting the airports and vehicles operating almost exclusively at the airport facility, such as airport owned operational and maintenance vehicles. CARB staff would develop and propose a regulation or other measures to deploy zero-emission airport shuttles in order to further support market development of zero-emission technologies in the heavy-duty sector.

INCENTIVE FUNDING TO ACHIEVE FURTHER EMISSION REDUCTIONS FROM ON-ROAD HEAVY-DUTY VEHICLES: This proposed measure would use existing CARB and SCAQMD incentive and other innovative funding programs for on-road, heavy-duty vehicles to increase the penetration of near-zero and zero-

emission vehicles and engines. Funding mechanisms would target technologies that meet CARB's current optional low-NOx standard through 2023, consistent with the current round of Moyer Program funding.

FURTHER DEPLOYMENT OF CLEANER TECHNOLOGY: ON-ROAD HEAVY-DUTY VEHICLES: This proposed measure is designed to achieve further emission reductions for the Basin's attainment needs through a suite of additional actions, including greater penetration of near-zero and zero-emission technologies through incentive programs, emission benefits associated with increased operational efficiency strategies, and the potential for new driver assist and intelligent transportation systems. The emission reductions will be achieved through a combination of actions to be undertaken by both CARB and the SCAQMD.

Off-Road Federal and International Sources

FURTHER DEPLOYMENT OF CLEANER TECHNOLOGIES: OFF-ROAD FEDERAL AND INTERNATIONAL SOURCES: This measure is designed to achieve further emission reductions for the Basin's attainment needs through a suite of additional actions that would be taken at the State and local level to achieve further reductions among the three categories off-road federal and international sources: ocean-going vessels, aircraft, and locomotives. These actions are designed to increase the penetration of cleaner ocean-going vessels, aircraft, and locomotive technologies, and to promote efficiency improvements at the equipment, sector, and systems levels through: expanding and enhancing existing incentive and innovative funding programs to increase the deployment of cleaner technologies; incentivizing cleaner ships and aircraft to come to California; partnering with engine manufacturers to encourage production of cleaner, more efficient engines; continuing to support demonstration projects; and encouraging efficiency improvements. Achieving the magnitude of emission reductions necessary from this category will require strong action at the federal and international level, coupled with State and local advocacy and action to facilitate these efforts.

MORE STRINGENT NATIONAL LOCOMOTIVE EMISSION STANDARDS: This proposed measure is designed to reduce emissions from new and remanufactured locomotives. CARB would petition U.S. EPA for both new Tier 5 national emission standards for newly manufactured locomotives, and more stringent national requirements for remanufactured locomotives. CARB staff estimates that the U.S. EPA could require manufacturers to implement the new locomotive emission regulations as early as 2023 for remanufactured locomotives, and 2025 for newly manufactured locomotives. A new federal standard could also facilitate development and deployment of zero-emission track mile locomotives and zero-emission locomotives by building incentives for those technologies into the regulatory structure.

TIER 4 VESSEL STANDARDS: This measure is designed to reduce emissions from ocean going vessels. CARB would advocate with U.S. EPA, the U.S. Coast Guard, and international partners for the IMO to adopt more stringent emission standards. Specifically, CARB would advocate for new Tier 4 NOx and PM standards, plus efficiency targets for existing vessels, and new vessel categories not covered by IMO efficiency standards.

INCENTIVIZE LOW EMISSION EFFICIENT SHIP VISITS: This measure is designed to achieve early implementation of clean vessel technologies (e.g., liquefied natural gas, Tier 3 standards or better), and to incentivize vessels with those technologies in California service. CARB staff would work with California seaports, ocean carriers, and other stakeholders to develop the criteria and to identify the best

way to incentivize introduction of Low Emission Efficient Ships into the existing fleet of vessels that visit California seaports.

AT-BERTH REGULATION AMENDMENTS: This measure is designed to further reduce emissions from ships that visit California ports. CARB would investigate expanding the current At-Berth Regulation to include smaller fleets, additional vessel types (including roll-on/roll-off vehicle carriers, bulk cargo carriers, and tankers), and additional operations.

Off-Road Equipment

ZERO-EMISSION OFF-ROAD FORKLIFT REGULATION PHASE 1: This measure is designed to increase penetration of ZEVs in off-road applications, advance ZEV commercialization, and to set a market signal to technology manufacturers and investors. CARB staff would develop and propose a regulation with specific focus on forklifts with lift capacities equal to or less than 8,000 pounds, for which zero-emission technologies have already gained appreciable customer acceptance and market penetration.

ZERO-EMISSION OFF-ROAD EMISSION REDUCTION ASSESSMENT: This measure is designed to expand the use of near-zero and zero-emission technology in non-freight, off-road applications. This assessment would be a follow-up to off-road measures implemented in the 2023+ timeframe, and through it CARB would identify opportunities to transfer near-zero and zero-emission technologies to heavier equipment, such as high lift-capacity forklifts or other equipment in the construction, industrial, and mining sectors with the intent of expanding their application as technology matures and infrastructure grows. Through this assessment, CARB would provide the Board with an informational update regarding the status of ZEVs in off-road applications once the Phase 1 forklift regulation is in place in 2025 or later, which would focus primarily on the scalability and transferability of zero-emission technologies to larger, higher power-demand equipment types, and would be used to inform the development of the Phase 2 regulation.

ZERO-EMISSION OFF-ROAD WORKSITE EMISSION REDUCTION ASSESSMENT: This measure is designed to foster the development of a robust worksite efficiency program and to facilitate the deployment of technologies and/or strategies that increase worksite efficiency, such as connected vehicles, automation, and fleet management technologies in off-road sectors. Through this assessment, CARB would identify opportunities to further expand the use of the aforementioned strategies and/or near-zero and zero-emission technologies, and would provide the Board with an informational update regarding the status of the aforementioned technologies and/or strategies, with a focus on business return on investment, scalability and sustainability of the system, and ancillary benefits such as improved safety and work consistency. There would also be potential testing comparing fuel efficiency, work productivity, and emission reductions. CARB would also encourage deployment via incentives or by providing credit in the off-road rule.

ZERO-EMISSION AIRPORT GROUND SUPPORT EQUIPMENT: This measure is designed to increase the penetration of the first wave of zero-emission heavy-duty technology in applications that are well suited to its use, and to facilitate further technology development and infrastructure expansion. CARB would develop and propose a regulation to accelerate the transition of diesel and large spark ignition airport ground support equipment to zero-emission technology.

SMALL OFF-ROAD ENGINES: This measure is designed to reduce emissions from SORE, and to increase the penetration of zero-emission technology. SORE that are subject to CARB regulations are used in residential and commercial lawn and garden equipment, and other utility applications. CARB will promote increased use of zero-emission equipment, develop and propose tighter exhaust and evaporative emission standards, and enhance enforcement of current emission standards for SORE.

TRANSPORT REFRIGERATION UNITS USED FOR COLD STORAGE: This measure is designed to advance near-zero and zero-emission technology commercialization by increasing the early penetration of hybrid electric and electric standby equipped transport refrigeration units used for cold storage, and supporting the needed infrastructure developments. CARB would develop a regulation to phase-in limits to stationary operating times for internal combustion engines at certain California facilities. Facilities may be required to provide the necessary electric infrastructure to support this action. CARB is currently offering funding through the Proposition 1B Goods Movement Emission Reduction Program to support both purchase of TRUs that can plug in and the stationary electric infrastructure.

LOW-EMISSION DIESEL REQUIREMENT: This measure is designed to reduce emissions from the portion of the heavy-duty fleet that will continue to operate on internal combustion engines. The proposed measure would establish performance requirements for Low Emission Diesel, and would require that diesel fuel providers decrease criteria pollutant emissions from their diesel products until 2031. Due to the magnitude of needed NOx reductions in the Basin and the large volumes of Low-Emission Diesel needed for full statewide implementation, the proposed measure could be phased-in with a gradual implementation strategy that starts in the Basin, and subsequently expands Statewide.

FURTHER DEPLOYMENT OF CLEANER TECHNOLOGIES: OFF-ROAD EQUIPMENT: This measure is designed to achieve further emission reductions for the Basin's attainment needs through a suite of additional actions, including greater penetration of near-zero and zero-emission technologies through incentive programs, and emission benefits associated with the potential for worksite integration and efficiency, as well as connected and autonomous vehicle technologies. These emission reductions will be achieved through a combination of actions to be undertaken by both CARB and the SCAQMD.

SCAG's Regional Transportation Plan/Sustainable Communities Strategy and Transportation Control Measures

The Southern California Association of Governments (SCAG), the Metropolitan Planning Organization (MPO) for Southern California, is mandated to comply with federal and State transportation and air quality regulations. Federal transportation law authorizes federal funding for highway, highway safety, transit, and other surface transportation programs. The federal CAA establishes air quality standards and planning requirements for various criteria air pollutants.

Transportation conformity is required under CAA Section 176(c) to ensure that federally supported highway and transit project activities "conform to" the purpose of the SIP. Conformity currently applies to areas that are designated nonattainment, and those re-designated to attainment after 1990

("maintenance areas" with plans developed under CAA Section 175[A]) for the specific transportation-related criteria pollutants. Conformity for the purpose of the SIP means that transportation activities will not cause new air quality violations, worsen existing violations, or delay timely attainment of the relevant NAAQS. The transportation conformity regulation is found in 40 CFR Part 93.

Pursuant to California Health and Safety Code Section 40460, SCAG has the responsibility of preparing and approving the portions of the AQMP relating to regional demographic projections and integrated regional land use, housing, employment, and transportation programs, measures, and strategies. The SCAQMD combines its portion of the Plan with those prepared by SCAG.

The Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS) and Transportation Control Measures (TCMs), included as Appendix IV-C of the 2016 AQMP/SIP for the Basin, are based on SCAG's Final 2016 RTP/SCS and consist of the following four sections.

Section I. Introduction

As required by federal and state law, SCAG is responsible for ensuring that the regional transportation plan, program, and projects are supportive of the goals and objectives of AQMPs/SIPs. SCAG is also required to develop demographic projections and a regional transportation strategy and control measures for the South Coast AQMP/SIP.

As an MPO, SCAG develops the RTP/SCS every four years. The RTP/SCS is a long-range regional transportation plan that provides for the development and integrated management and operation of transportation systems and facilities that will function as an intermodal transportation network for the SCAG region. The RTP/SCS also outlines certain land use growth strategies that provide for more integrated land use and transportation planning, and maximize transportation investments to achieve regional GHG reduction targets set by CARB pursuant to SB 375.

SCAG also develops the biennial Federal Transportation Improvement Program (FTIP). The FTIP is a multimodal program of capital improvement projects to be implemented over a six year period. The FTIP implements the programs and projects in the RTP/SCS.

Section II. RTP/SCS and TCMs

The SCAG Region faces many critical challenges including demographics, transportation system preservation, transportation funding, goods movement, housing, air quality, climate change, and public health. Under the guidance of the goals and objectives adopted by SCAG's Regional Council, the 2016 RTP/SCS was developed to provide a blueprint to integrate land use and transportation strategies to help achieve a coordinated and balanced regional transportation system. The Final 2016 RTP/SCS represents the culmination of more than three years of work involving dozens of public agencies, 197 local jurisdictions in the SCAG region, hundreds of local, county, regional and state officials, the business community, environmental groups, as well as various nonprofit organizations. The 2016 RTP/SCS was adopted by the SCAG Regional Council on April 7, 2016.

The Final 2016 RTP/SCS makes a concerted effort to integrate the region's transportation network with land uses in order to achieve an even more sustainable region over the coming decades. Accordingly,

the Final 2016 RTP/SCS includes a host of regional strategies for addressing growth, land use and improving the region's transportation system. These are listed below.

Land Use Strategies

- Focus New Growth around Transit/High Quality Transit Areas (HQTAs)
- Plan for Growth around Livable Corridors
- Provide More Options for Short Trips/Neighborhood Mobility Areas
- Support Zero Emission Vehicles & Expand Electric Vehicle Charging Stations
- Support Local Sustainability Planning
- Protect Natural and Farm Lands
- Balance Growth Distribution between 500-Foot Buffer Areas and HQTAs

Transportation Strategies

- Preserve Our Existing System
- Manage Congestion through Transportation Demand Management (TDM) and Transportation System Management (TSM) including advanced ramp metering, and expansion and integration of the traffic signal synchronization network
- Expand Regional Transit System
- Expand Passenger Rail and Maintain High-Speed Rail Commitments
- Promote Active Transportation
- Improve Highway and Arterial Capacity
- Strengthen Regional Transportation Network for Goods Movement
- Improve Airport Ground Access

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

- Transit, intermodal transfer, and active transportation measures;
- High occupancy vehicle (HOV) lanes, high occupancy toll (HOT) lanes, and their pricing alternatives; and
- Information-based transportation strategies.

Attachment A of Appendix IV-C is a list of transportation control measure projects that are specifically identified and committed to in the Draft 2016 AQMP. Per the CAA, these committed TCMs are required to receive funding priority and be implemented timely. In the event that a committed TCM cannot be delivered or will be significantly delayed, the TCM must be substituted for. It is important to note that as the SCAG's FTIP is updated every two years, new committed TCMs are added to the applicable SIP from the previous FTIP.

Section III. Reasonably Available Control Measure Analysis

As required by the CAA, a reasonably available control measure (RACM) analysis must be included as part of the overall control strategy in the AQMP to ensure that all potential control measures are evaluated

for implementation and that justification is provided for those measures that are not implemented. Appendix IV-C contains the RACM TCM component for the Basin's ozone and PM2.5 control strategy. In accordance with U.S. EPA procedures, this analysis considers TCMs in the Final 2016 RTP/SCS, measures identified by the CAA, and relevant measures adopted in other ozone and PM2.5 nonattainment areas of the country. Based on this comprehensive review, it is determined that the TCMs being implemented in the Basin are inclusive of all TCM RACM.

Section IV. TCM Best Available Control Measure (BACM) Analysis for 2006 PM2.5 NAAQS

The Basin has been reclassified as a "serious" nonattainment area under the 2006 PM2.5 NAAQS effective February 12, 2016. As a result, the Basin is required to implement BACMs including TCMs for the control of direct PM2.5 and PM2.5 precursors from on-road mobile sources. This section serves as the TCM BACM component for the new South Coast 2006 PM2.5 standard SIP.

Following the applicable EPA guidance, the TCM BACM analysis consists of a review of on-going implementation of TCMs in the Basin, a review of TCM measures implemented in other "moderate" and "serious" PM2.5 nonattainment areas as well as "serious" PM10 nonattainment areas throughout the country, and a review of TCMs not implemented in the SCAG region. The analysis demonstrates that the TCM projects being implemented in the Basin constitute TCM BACM.

The emission benefits associated with the Final 2016 RTP/SCS are reflected in the 2016 AQMP projected baseline emissions. As shown in Tables 1-1 and 1-2 in Appendix IV-C, the amount of emission reductions from the RTP/SCS are significantly impacted by the change in vehicle fleet mix and vehicle emission factors. For example, assuming that the future EMFAC2014 vehicle fleet mix and emission factors remain the same as in 2012 (the 2016 RTP/SCS and 2016 AQMP base year), the 2016 RTP/SCS would yield a NOx emission reduction of 5.4 tons per day in 2021 and 9.8 tons per day in 2031 compared with the 2016 RTP/SCS baseline. However, if the future improvement in the fleet mix and emission factors as reflected in EFMAC2014 are factored in, the estimated NOx emission reduction from the 2016 RTP/SCS would drop to 2.8 tons per day in 2023 and 4.5 tons per day in 2031.

For a detailed discussion of the integrated regional land use and transportation strategies, the estimated emission reduction benefits, as well as the cost-benefit analysis, refer to Appendix IV-C: Regional Transportation Plan/Sustainable Communities Strategy and Transportation Control Measures.

SCAQMD Proposed PM2.5 Strategy

Despite the attainment demonstration in the 2012 AQMP, the Basin did not meet the 24-hour PM2.5 standard by 2015, mainly due to the drought conditions that persisted for the past several years. The preliminary 2015 data showed that the 24-hour PM2.5 design value was greater than the federal standard of 35 $\mu g/m^3$. U.S. EPA re-designated the Basin from a "moderate" nonattainment to a "serious" nonattainment area, effective February 12, 2016, which set 2019 as the new attainment deadline. The 2016 AQMP demonstrates that the 24-hour standard will be met by 2019 with no additional reductions beyond already adopted and implemented measures (See Chapter 5).

For the annual PM2.5 standard (12 μg/m^3), the attainment target year is 2021 for a "moderate" nonattainment area and 2025 for a "serious" nonattainment are. Modeling projections show that the annual standard will not be met by 2021 if emission reductions beyond the already adopted control measures are not introduced. The aggressive NOx and VOC reductions proposed to meet the 1997 8-hour ozone standard also do not ensure attainment of the annual PM2.5 standard by 2021. An analysis of the feasibility of additional measures focused on direct PM2.5 and its other precursors did not identify a practical path towards annual PM2.5 attainment by 2021. Therefore, the SCAQMD is requesting a reclassification of the Basin as a "serious" nonattainment area with a new attainment deadline as "expeditiously as practicable," but no later than 2025. While CAA Section 182(e)(5) measures cannot be relied on to show future attainment of PM standards, the NOx strategy to meet ozone standards will still ensure achieving the annual standard by 2025.

However, to further ensure attainment of the annual PM2.5 standards, a series of control measures specifically addressing PM2.5 are being proposed. The proposed PM2.5 control measures include 10 stationary source control measures including episodic controls and technology assessments. These PM2.5 control measures are proposed as needed to ensure or advance the attainment of federal PM2.5 NAAQS per the federal CAA requirements. Each PM2.5 control measure was evaluated to determine the potential emission reductions that could be achieved. In some cases, only a range of possible emission reductions could be determined, and for others, the magnitude of potential reductions cannot be determined at this time. As assessments and potential rule development progress, and feasible emission reductions are identified and quantified, the measures will be implemented to advance attainment if practicable

Each type of control measure relies on a number of control methods. Table 4-6 provides an example of the type of proposed PM2.5 control measures and typical corresponding control methods.

TABLE 4-6

SCAQMD Proposed PM2.5 Measure Control Methods

Source Category	Control Method
Best Available Control Measures for PM2.5 and Ammonia Sources	• Add-On Controls • Best Management Practices • Best Available Control Technology • Best Available Retrofit Control Technology • Process Improvement • Targeted Controls • Preventative Measures • Seasonal or Episodic Controls • Market Incentives • Mandatory Curtailments

Table 4-7 provides a list of the proposed SCAQMD stationary source PM2.5 control measures along with the anticipated adoption/implementation period, implementing agency, and projected emission reductions. The measures cover a variety of source types for PM sources (BCM).

TABLE 4-7

SCAQMD Proposed Stationary Source PM2.5 Control Measures

Number	Title	Adoption	Implementation Period	Implementing Agency	Emission Reductions (tpd) (2021/2025)
BCM-01[4]	Further Emission Reductions from Commercial Cooking [PM]	2018	2025	SCAQMD	0 / 3.3*
BCM-02	Emission Reductions from Cooling Towers [PM]	TBD	TBD	SCAQMD	TBD [a]
BCM-03	Further Emission Reductions from Paved Road Dust Sources [PM]	TBD	TBD	SCAQMD	TBD [a]
BCM-04[5]	Emission Reductions from Manure Management Strategies [NH3]	2019	2020	SCAQMD	0.26 / 0.2 [NH3]
BCM-05	Ammonia Emission Reductions from NOx Controls [NH3]	TBD	TBD	SCAQMD	TBD [a]
BCM-06	Emission Reductions from Abrasive Blasting Operations [PM]	TBD	TBD	SCAQMD	TBD [a]
BCM-07	Emission Reductions from Stone Grinding, Cutting and Polishing Operations [PM]	TBD	TBD	SCAQMD	TBD [a]
BCM-08	Further Emission Reductions from Agricultural, Prescribed and Training Burning [PM]	TBD	TBD	SCAQMD	TBD [a]
BCM-09	Further Emission Reductions from Wood-Burning Fireplaces and Wood Stoves [PM]	TBD	TBD	SCAQMD	TBD [a]
BCM-10	Emission Reductions from Greenwaste Composting [VOC, NH3]	2019	2020	SCAQMD	0.1 / 0.1 [NH3]

* Contingency measure

[a] TBD are reductions to be determined once the measure is further evaluated, the technical assessment is complete, and inventory and cost-effective control approach are identified, and are not relied upon for attainment demonstration purposes

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[4] Formerly BCM-03 in the 2012 AQMP and BCM-05 in the 2007 AQMP.

[5] Formerly BCM-04 in the 2012 AQMP.

The following provides a brief description of the SCAQMD proposed PM2.5 control measures. This category includes 10 control measures, including PM2.5 emission reductions from under-fired charbroilers, cooling towers and fugitive dust sources, abrasive blasting, stone cutting and finishing, agricultural and residential burning, composting, and ammonia emission reductions from livestock waste and NOx control equipment.

PM Measures

BCM-01 – FURTHER EMISSION REDUCTIONS FROM COMMERCIAL COOKING: Commercial cooking activities are the largest source of directly emitted PM2.5 emissions in the Basin, and under-fired charbroilers are responsible for the majority of emissions from this source category. To date, a variety of control device technologies have been tested by CE-CERT at the University of California, Riverside, and SCAQMD staff and the inter-agency working group are reviewing draft test results. This control measure is a contingency control measure which would seek additional emission reductions if the annual average PM2.5 standard is not met by 2025. If necessary, the control program would seek to establish a tiered program targeting higher efficiency controls for under-fired charbroilers at large volume restaurants, with more affordable lower efficiency controls at smaller restaurants. As with existing Rule 1138 requirements, a potential future control program for under-fired charbroilers could establish control device efficiency requirements based on restaurant throughput. Efforts could also be taken to develop a control device registration program as an alternative to the SCAQMD permit process. Small business incentive programs funded by mitigation fees or other sources could also be explored to help offset initial purchase and installation costs for restaurants.

BCM-02 – EMISSION REDUCTIONS FROM COOLING TOWERS: This control measure seeks reductions of PM emissions from industrial cooling towers through the use of the latest drift eliminator technologies. This control measure will seek to phase-in the use of drift eliminators with 0.001 percent drift rate for existing cooling towers. This could be achieved by retrofitting older cooling towers with modification to the cooling fans to accompany the drift eliminators, which will also result in water conservation. Newly constructed cooling towers have demonstrated ultra-low drift rates down to 0.0005 percent. This drift rate has been achieved in practice and could be considered a BACT for new construction.

BCM-03 – FURTHER EMISSION REDUCTIONS FROM PAVED ROAD DUST SOURCES: Although fugitive dust emissions from agriculture and construction are primarily in the coarse size fraction (PM10-2.5), entrained road dust is still one of the major direct PM2.5 sources due to the large number of roadways and high traffic volumes in the region. Existing SCAQMD Rules 1157 and 403 requirements to reduce track out from stationary sources are based on a list of options. Further emission reductions could be achieved by specifying the most effective track out prevention measures, such as use of a wheel washing system, for sites with high vehicular activity exiting the site, or those with repeated track-out violations. Existing SCAQMD Rule 1186 requires that certified equipment be used on public roads currently subject to routine street sweeping but does not specify frequency. Further paved road dust PM2.5 emission reductions could be sought through specifying the frequency of street sweeping. Street sweeping as part of routine roadway and highway maintenance may be included in a state, regional and/or local jurisdiction's National Pollutant Discharge Elimination System (NPDES) permits as part of federal Clean Water Act provisions to reduce debris from entering the storm drain system. NPDES permits are governed by the U.S. EPA and issued and maintained by regional water quality control boards. SCAQMD will coordinate with NPDES

permittees and regional water quality control boards to ensure rules of this Plan or future Plans do not conflict with or otherwise compromise NPDES permit requirements. This review is not intended to be a part of the NPDES permit approval process or a reevaluation of existing NPDES permits, but is intended to determine current street sweeping or highway maintenance requirements and practices to ensure that any SCAQMD rulemaking would not be in conflict with existing NPDES permit requirements. As part of efforts to reduce paved road dust silt loadings and the corresponding PM emissions, an evaluation of existing SCAQMD fugitive dust rules will be conducted to determine if additional PM2.5 emissions can be achieved.

BCM-04 – EMISSION REDUCTIONS FROM MANURE MANAGEMENT STRATEGIES: This control measure seeks to use manure management systems to reduce ammonia, a PM precursor, from fresh manure. Examples include acidifier application, dietary manipulation, feed additives, and other manure control strategies which can be applied on a year-around basis. To minimize costs, some control technologies can be seasonally or episodically applied during times when high ambient PM2.5 levels are of concern. Dietary manipulation such as lowering the protein content and including high-fiber ingredients is an effective method to decrease ammonia emission from monogastric animals' and ruminants' manure. Feed additives can be considered as a seasonal or episodic control strategy when ambient PM2.5 concentrations are highest. New approaches to reduce ammonia emissions from manure can be considered that include manure slurry injection, microbial manure additives, manure belt cleaning in laying hen houses, cage-free egg laying manure removal, and poultry manure thermal gasification. Finally, this control measure will implement all feasible control measures and compliance with federal BACM requirements, including lowering the threshold for Large Confined animal facilities under Rule 223 – Emission Reduction Permits for Large Confined Animal Facilities.

BCM-05 – AMMONIA EMISSION REDUCTIONS FROM NOx CONTROLS: This control measure seeks to reduce ammonia from NOx controls such as Selective Catalytic Reduction (SCR) and Selective Non-Catalytic Reduction (SNCR). These systems are capable of reducing NOx emissions from combustion sources very effectively. However, the use of systems also results in potential emissions of ammonia that "slip" past the control equipment and into the atmosphere. Ammonia is a precursor gas for secondary PM formation. Recent advances in catalyst technology have resulted in the development of ammonia slip catalysts that selectively convert ammonia into nitrogen gas. These catalysts could be installed post-SCR and would result in less ammonia slip.

BCM-06 – EMISSION REDUCTIONS FROM ABRASIVE BLASTING OPERATIONS: Existing SCAQMD Rule 1140 regulates opacity requirements for confined and unconfined abrasive blasting operations using various abrasives. The California Health and Safety Code prohibits local districts from requiring emission and performance standards more or less stringent than the State regulation. Rule 1140 has been developed with the ultimate goal of consistency. Rule 1140 establishes the emission and performance standards, including prohibition against visible emissions from confined or unconfined abrasive blasting operations, which is conforming to the California Code of Regulations Title 17, Subchapter 6 – Abrasive Blasting. Current permit conditions for abrasive blasting require venting to a PM air pollution control (APC) equipment when in full use. Baghouses or dry filters are the most frequently used APC equipment. This control measure proposes voluntary applications of a portable blasting enclosure/booth with a dust collection system by providing incentives, primarily focusing on dry abrasive blasting operations conducted in open areas using portable blasting equipment with or without a written SCAQMD permit.

BCM-07 – EMISSION REDUCTIONS FROM STONE GRINDING, CUTTING AND POLISHING OPERATIONS: Stone fabricating operations, including, but not limited to, grinding, cutting, and polishing generate airborne dust emissions containing PM10, some PM2.5, and silica particles that are known to cause lung diseases. Many of these operations are done at confined or unconfined worksites by construction workers, remodeling contractors and individuals, and may not be sufficiently controlled for dust emissions. This control measure seeks both wet and dry methods of control, local exhaust emissions control, no visible emissions requirements, and financial incentives as a regulatory alternative for exchanging existing wet or dry equipment with new equipment that includes integrated add-on controls.

BCM-08 – FURTHER EMISSION REDUCTIONS FROM AGRICULTURAL, PRESCRIBED AND TRAINING BURNING: This control measure proposes to further reduce PM emissions from open burning sources. Further PM emission reductions could be achieved through use of a fee schedule and/or an incentive program to limit agricultural burning and promote burning alternatives (e.g., chipping/grinding or composting). One approach to reduce emissions could involve establishing an administrative fee as part of the burn permit program based on acreage or amount of material burned for the purposes of processing and enforcing. Fees would not be charged to producers using burning alternatives. Another approach could involve providing incentives to agricultural producers, especially in peak PM2.5 areas, to implement alternatives to burning. A demonstration project could also be established where a SCAQMD contractor could conduct chipping/grinding and removal activities in peak PM2.5 areas at no, or reduced, cost to producers.

BCM-09 – FURTHER EMISSION REDUCTIONS FROM WOOD-BURNING FIREPLACES AND WOOD STOVES: This control measure seeks additional emission reductions from residential wood burning activities. Residential wood burning results in directly emitted PM2.5 and curtailment programs and emission reductions can be very cost-effective relative to other source categories. Based on a review of U.S. EPA guidance documents and other air district wood smoke control programs, the existing SCAQMD curtailment program (Rule 445) threshold could be lowered. A lower curtailment criteria (e.g., 20 or 25 $\mu g/m^3$) could be established, which would increase the number of no burn days but not completely prohibit wood burning during the winter. Based on historical data (2013–2015) for the November through February winter season, it is estimated there would be 11 and 28 additional curtailment days, on average, at the 25 and 20 $\mu g/m^3$ thresholds, respectively, above the estimate of 24 days at the current threshold. The Check Before You Burn program could also be extended to include the months of October and/or March as high PM2.5 levels can occur during these periods. All of these potential control options would increase the number of no burn days which could lower the contribution of wood smoke to ambient PM2.5 levels in the winter months. Although these episodic reductions are designed to address 24-hour PM2.5 concentrations, a consistent reduction in wintertime PM2.5 from reduced wood burning could have an impact on annual average PM2.5 concentrations. Further analysis will be conducted to determine the appropriate approach to achieve the emission reductions necessary to demonstrate attainment of both the 24-hour and annual average federal PM2.5 standards. The current SCAQMD program encourages households within high PM2.5 areas to upgrade wood-burning devices through SCAQMD incentives of up to $1,600 to offset purchase and installation costs. Although this program has been effective, additional reductions may be achieved through the use of higher incentives or expansion of the eligible geographic area. Experience has shown that education and outreach to targeted households is vital to ensure program participation,

and an additional element of this control measure would focus on expanding the awareness of the incentive programs.

BCM-10 – EMISSION REDUCTIONS FROM GREENWASTE COMPOSTING: VOCs and ammonia, which are PM precursor gases, are emitted from composting of organic waste materials including greenwaste and foodwaste and are currently regulated by existing SCAQMD Rule 1133.3. Although Rule 1133.3 covers foodwaste composting, the level of emissions from foodwaste composting has not been fully characterized, mainly due to the lack of related emissions test data. This control measure proposes potential emission minimization through emerging organic waste processing technology and potential emission reductions through restrictions on the direct land application of chipped and ground uncomposted greenwaste and through increased diversion to anaerobic digestion. This proposed control measure could seek a 15-day pathogen reduction process of chipped and ground uncomposted greenwaste with composting BMPs to reduce potential VOC and ammonia emissions from land applied greenwaste.

SCAQMD Proposed Contingency Measures

Pursuant to federal CAA Section 172(c)(9), contingency measures are emission reduction measures that are to be automatically triggered and implemented if an area fails to attain the national ambient air quality standard by the applicable attainment date, or fails to make reasonable further progress (RFP) toward attainment.

> *Such plan shall provide for the implementation of specific measures to be undertaken if the area fails to make reasonable further progress, or to attain the national primary ambient air quality standard by the attainment date applicable under this part. Such measures shall be included in the plan revision as contingency measures to take effect in any such case without further action by the State or the Administrator. (CAA Section 172(c)(9))*

U.S. EPA has issued guidance that the contingency measure requirement could be satisfied with already adopted control measures, provided that the controls are above and beyond what is needed to demonstrate attainment with the NAAQS (76 FR 57891).

> *U.S. EPA guidance provides that contingency measures may be implemented early, i.e., prior to the milestone or attainment date. Consistent with this policy, States are allowed to use excess reductions from already adopted measures to meet the CAA Sections 172(c)(9) and 182(c)(9) contingency measures requirement. This is because the purpose of contingency measures is to provide extra reductions that are not relied on for RFP or attainment, and that will provide a cushion while the plan is being revised to fully address the failure to meet the required milestone. Nothing in the CAA precludes a State from implementing such measures before they are triggered.*

In August 2016, U.S. EPA issued the Final Rule of "*Fine Particle Matter National Ambient Air Quality Standards: State Implementation Plan Requirements*" (81 FR 58010) that provides a planning requirement framework for the 2012 and future PM2.5 NAAQS pursuant to Subpart 4. Reasonable Further Progress (RFP) is tracked with milestones and the new rule requires a SIP submittal in nine months after missing a

milestone to show the next milestone will be met along with contingency measures. The compliance with RFP contingency can be found in Appendix VI-C.

The 2012 base year design value for the 24-hour PM2.5 attainment demonstration is 36.6 μg/m^3 and the 2019 attainment year design value must be less than 35.4 μg/m^3 (see Chapter 5). Linear progress towards attainment over the seven year period yields one year's worth of air quality improvements equal to approximately 0.2 μg/m^3. Thus, the contingency measures should provide for approximately 0.2 μg/m^3 of air quality improvements to be automatically implemented in 2020 if the Basin fails to attain the 24-hour PM2.5 in 2019. Because the baseline concentrations in 2019 are anticipated to be 32.1 μg/m^3, there is linear progress of about 0.6 μg/m^3 per year, with a resulting 3.3 μg/m^3 of air quality improvement beyond what is required for attainment. The improvement is occurring due to adopted measures, such as on-road and off-road mobile source regulation, that are being implemented in the future generating these annual reductions. Therefore, excess emission reductions from already adopted measures lead to much more than one year's worth of air quality improvements, and thus the contingency measure requirement for the 24-hour PM2.5 NAAQS is satisfied. In addition, SCAQMD Rule 445 (Wood Burning Devices) imposes a mandatory burning curtailment for a specific source receptor area whenever a PM2.5 level of greater than 30 μg/m^3 is predicted, or for the entire South Coast Air Basin whenever a PM2.5 level of greater than 30 μg/m^3 is predicted for a source receptor area containing a monitoring station that has recorded a violation of the federal 24-hour PM2.5 NAAQS (35 μg/m^3) for either of the two previous three-year periods. By definition, this adopted rule requirement is a contingency measure that is undertaken if the area fails to attain the 24-hour PM2.5 NAAQS (35 μg/m^3) and the timing to implement is immediate.

Similarly, the annual PM2.5 base year design value for the annual PM2.5 attainment demonstration is 14.9 μg/m^3 and the 2025 attainment year design value must be less than 12 μg/m^3 (see Chapter 5). Linear progress towards attainment over the 13 year period yields one year's worth of air quality improvements equal to approximately 0.2 μg/m^3. The NOx strategy will assist in meeting the annual PM2.5 as "expeditiously as practicable" earlier than the attainment year of 2025. Contingency measure BCM-01 will reduce emissions in excess of the equivalent of the one year's worth of reduction (0.2 μg/m^3) (see Appendix VI).

To the extent the 1997 and 2008 8-hour ozone standards will still rely on CAA Section 182(e)(5) flexibility, contingency measures for ozone are not required until three years before the attainment date. Further detailed descriptions of contingency requirements can be found in Chapter 6 – Other Clean Air Act Requirements. As discussed in Chapter 6 and consistent with U.S. EPA guidance, the SCAQMD is proposing to use excess air quality improvements from existing measures supplemented with measures in the proposed control strategy to satisfy contingency measure requirements.

SIP Emission Reduction Commitment

The SIP emission reduction commitment in the 2016 AQMP from adopted rules and proposed measures are divided into commitments for the PM2.5 and ozone SIPs. Taken together, these reductions are relied upon to demonstrate expeditious progress and attainment of the federal air quality standards. The following sections first describe the methodology for SIP emission reduction calculations and the

creditable SIP reductions, then describe what procedures will be followed to ensure fulfillment of the commitment.

SIP Emission Reduction Tracking

For purposes of tracking progress in emission reductions, the baseline emissions for the year 2019 (24-hour average), 2021/2025 (annual average) and 2023/2031 (summer planning inventory) in the 2016 AQMP will be used, regardless of any subsequent new inventory information that reflects more recent knowledge. This is to ensure that the same "currency" is used in measuring progress as was used in designing the Plan. This will provide a fair and equitable measurement of progress. Therefore, it makes no difference whether progress is measured by emission reductions or remaining emissions for a source category. However, the most recent emission inventory information at the time of rule development will continue to be used for calculating reductions, and assessing cost-effectiveness and socioeconomic impacts of the proposed rule. Therefore, for future rulemaking activity, both the most recent and AQMP inventories will be reported.

Any emission reductions achieved beyond the existing SCAQMD regulations are creditable only if they are also SIP-enforceable. Therefore, in certain instances, the SCAQMD may have to adopt regulations to reflect the existing industry practices in order to claim SIP reduction credit, with the understanding that there may not be additional reductions beyond what has already occurred. Exceptions can be made where reductions are real, quantifiable, surplus to the Final 2016 AQMP baseline inventories, and enforceable through other state and/or federal regulations. Also, any emission inventory revisions, which have gone through a peer review and public review process, can also be SIP creditable.

Reductions from Adopted Rules

A number of control measures contained in the 2012 AQMP have been adopted as rules. These adopted rules and their projected emission reductions become assumptions in developing the AQMP future year inventories. Although they are not part of the control strategy in the 2016 AQMP, continued implementation of those rules is essential in achieving clean air goals and maintaining the attainment demonstration. Table 1-2 of Chapter 1 lists the rules adopted by the SCAQMD since the adoption of the 2012 AQMP and their expected emission reductions.

Reductions from SCAQMD Control Measures

For purposes of implementing an approved SIP, the SCAQMD is committed to adopt and implement control measures that will achieve, in aggregate, emission reductions specified in Tables 4-8 through 4-11 to demonstrate expeditious implementation of measures toward meeting the federal 2012 annual PM2.5, the 1979 1-hour ozone, the 1997 8-hour ozone, and the 2008 8-hour ozone standards, respectively. Emission reductions achieved in excess of the amount committed to in a given year can be applied to the emission reduction commitments of subsequent years. The SCAQMD is committed to adopt the control measures in Tables 4-2, 4-4, and 4-7 unless these measures or a portion thereof are found infeasible and other substitute measures that can achieve equivalent reductions in the same adoption or implementation timeframes are adopted. Findings of infeasibility will be made at a regularly scheduled meeting of the SCAQMD Governing Board with proper public notification. For purposes of the SIP commitment, infeasibility means that the proposed control technology is not reasonably likely to be

available by the implementation date in question, or achievement of the emission reductions by that date is not cost-effective. It should be noted that the reductions in Tables 4-8 through 4-11 are committed only to the extent needed to achieve attainment by attainment deadlines (2025 for the 2012 annual PM2.5; 2023, 2024, and 2032 for the 1979 1-hr, 1997 8-hr, and 2008 8-hr ozone, respectively), and if any substitution is needed, the alternative measures will need to achieve the same emission reductions or air quality benefit. It should be also noted that Tables 4-8 through 4-11 not only include the aggregate emission reduction commitments, but also the anticipated specific control measures to meet that reduction commitment with the understanding that if there is a shortfall in the individual measures for a particular year, substitution to achieve the reduction could be generated from other control measures for the same or previous years. The SCAQMD acknowledges that this commitment is enforceable under Section 304(f) of the federal CAA. U.S. EPA will not credit SIP reductions unless the control measures are adopted and approved into the SIP at the time U.S. EPA takes action on the plan, except that U.S. EPA has in the past allowed about 10 percent of required reductions to be in the form of "enforceable commitments."

Adoption and Implementation

As a partial response to concerns raised by the regulated community that costly controls may be required to meet the SIP obligations, previous AQMPs have established cost-effectiveness thresholds for additional tiered levels of analysis. The 2012 AQMP established $16,500 per ton of VOC and $22,500 per ton of NOx as the thresholds. The legal requirements for emission reductions to reach attainment remain, but the cost of achieving those reductions will increases as the most cost-effective controls have already been implemented. To reflect this reality, as well as inflation adjustments since the current thresholds were established, the 2016 AQMP proposes thresholds of $30,000 per ton of VOC and $50,000 per ton of NOx for tiered levels of analysis. Note, however, with the new focus on incentives and public funding, not all of this cost will necessarily be borne by industry. Specifically, proposed rules with an average cost-effectiveness above these threshold will trigger a more rigorous average cost-effectiveness, incremental cost-effectiveness, and socioeconomic impact analysis. A public review and decision-making process will be instituted to seek lower, more cost-effective alternatives. In addition, the SCAQMD staff, with input from stakeholders, will attempt to develop viable control alternatives within the industry source categories that a rule is intended to regulate. If it is determined that control alternatives within the industry source category are not feasible, staff will perform an evaluation of the control measure as described in the next paragraph. Viable alternatives will be reviewed by the SCAQMD Governing Board at a public meeting no less than 90 days prior to rule adoption and direction can be given to staff for further analysis. During this review process, incremental cost-effectiveness scenarios and methodology will be specified, and industry-specific affordability issues will be identified as well as possible alternative control measures. The SCAQMD Governing Board may adopt the original or an alternative that is consistent with state and federal law. In addition, staff will include in all set hearing items a notification whether the proposed rules exceed the cost thresholds.

Alternative/Substitute Measures

Under the 2016 AQMP, the SCAQMD will be allowed to substitute SCAQMD source measures in Tables 4-2, 4-4 and 4-7 with other measures, provided the overall equivalent emission reductions by the adoption and implementation dates in Tables 4-2, 4-4 and 4-7 are maintained and the applicable measure in Tables

4-2, 4-4 and 4-7 is deemed infeasible. In order to provide meaningful public participation, when new control concepts are introduced for rule development, the SCAQMD is committed to provide advanced public notification beyond its regulatory requirements (i.e., through its Rule Forecast Report). The SCAQMD will also report quantitatively on the AQMP's implementation progress annually at its regularly scheduled Governing Board meetings. Included in the reports will be any control measures being proposed or measures, or portions thereof, that have been found to be infeasible and the basis of such findings. In addition, at the beginning of the year, any significant emission reduction related rules to be considered are listed in the Governing Board's Rule Forecast Report. The annual report would also provide any finding of a new feasible control measure to substitute for a measure that has been deemed infeasible. The existing rule development outreach efforts such as public workshops, stakeholder working group meetings or public consultation meetings will continue to solicit public input. In addition, if additional technical analysis, including source testing, indicates that actual emissions are less than previously estimated, the reductions would then be creditable toward SIP commitments. In order for reductions from improved emission calculation methodologies to be SIP creditable, a public process and the Governing Board adoption hearing will also be instituted to solicit comments and make appropriate revisions, if necessary.

Reductions from CARB Control Measures

CARB's overall commitment is to achieve the total emission reductions necessary to attain the federal air quality standards, 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 emission inventory and the 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.

The CARB proposed control measures presented in Table 4-5, combined with ongoing implementation of the current control program, will reduce mobile source NOx emissions 80 percent from the current levels in the Basin by 2031, as well as reduce VOC emissions by 55 percent. The remaining 20 percent will come from additional efforts to enhance the deployment of these cleaner technologies through new incentive funding, efficiency improvements in transportation and freight, and support for the use of advanced transportation technologies, such as intelligent transportation systems and autonomous vehicles. These actions will be implemented through proposed measures for each sector that are designed to provide further emission reductions from the deployment of cleaner technologies necessary to meet the Basin's "extreme" ozone nonattainment area needs. Table 4-12 specifies emission reductions in NOx and VOC emissions committed to be achieved through the CARB regulatory and incentive programs.

TABLE 4-8

Annual PM2.5 (12 µg/m^3) SIP Basin-wide Emission Reduction Commitment
to be Achieved by 2025 through SCAQMD Regulatory Programs
(Annual Average Inventory, tons per day)

YEAR	PM2.5		NOx**	
	Based on Adoption Date	Based on Implementation Date[a]	Based on Adoption Date	Based on Implementation Date[a]
2016				
2017			MOB-10 (1.9) MOB-11 (2.9) MOB-14 (11) **15.8**	
2018	BCM-01 (3.3)		CMB-01 (2.5) CMB-02 (1.1) CMB-03 (1.4) CMB-04 (0.8) ECC-02 (0.3) ECC-03 (1.2) **7.3**	
2019	BCM-04 (0.2)[Δ] BCM-10 (0.1)[Δ]			
2020		BCM-04 (0.2)[Δ] BCM-10 (0.1)[Δ]		CMB-03 (1.4) CMB-02 (1.1) **2.5**
2021				
2022			CMB-05 (5)	CMB-04 (0.8)
2023				ECC-02 (0.3) ECC-03 (1.2) CMB-01 (2.5) MOB-10 (1.9) MOB-11 (2.9) MOB-14 (11) **19.8**
2024				
2025		BCM-01 (3.3)		CMB-05 (5)
TOTAL	**3.3***	**3.3***	**28**	**28**

[a] Represents the final, full implementation date; typically a rule contains multiple implementation dates

[Δ] NH3 measure as PM2.5 precursor

* For contingency measure purposes only

** Summer planning inventory

TABLE 4-9

1979 1-hour Ozone (120 ppb) SIP Emission Reduction Commitment to be Achieved by 2022 through SCAQMD Stationary and Mobile Source Regulatory Programs
(Summer Planning Inventory, tons per day)

YEAR	VOC		NOx	
	Based on Adoption Date	Based on Implementation Date[a]	Based on Adoption Date	Based on Implementation Date[a]
2016				
2017	CTS-01 (1)		MOB-10 (1.9) MOB-11 (2.9) MOB-14 (11) **15.8**	
2018	CMB-01 (1.2) CMB-03 (0.4) ECC-02 (0.07) ECC-03 (0.2) **1.9**		CMB-01 (2.5) CMB-02 (1.1) CMB-03 (1.4) CMB-04 (0.8) ECC-02 (0.3) ECC-03 (1.2) **7.3**	
2019	FUG-01(2) BCM-10 (1.5) **3.5**			
2020		BCM-10 (1.5) CMB-03 (0.4) CTS-01 (1) **2.9**		CMB-02 (1.1) CMB-03 (1.4) **2.5**
2021				
2022		FUG-01 (2) ECC-02 (0.06)^ ECC-03 (0.17)^ CMB-01 (1.0)^ **3.2**		CMB-04 (0.8) MOB-10 (1.9) MOB-11 (2.5) ^ MOB-14 (9.5) ^ ECC-02 (0.26)^ ECC-03 (1.03)^ CMB-01 (2.15)^ **18.1**
TOTAL*	**6.4**	**6.1**	**23**	**21**

[a] Represents the final, full implementation date; typically a rule contains multiple implementation dates

* All ozone strategy reductions are adopted by 2022. However, not all adoptions are implemented by 2022. Therefore, totals are not equal

^ 86 percent of control measures' 2023 reductions

TABLE 4-10

1997 8-hour Ozone (80 ppb) SIP Emission Reduction Commitment to be Achieved by 2023 through SCAQMD Stationary and Mobile Source Regulatory Programs
(Summer Planning Inventory, tons per day)

YEAR	VOC		NOx	
	Based on Adoption Date	Based on Implementation Date[a]	Based on Adoption Date	Based on Implementation Date[a]
2016				
2017	CTS-01 (1) 1.0		MOB-10 (1.9) MOB-11 (2.9) MOB-14(11) 15.8	
2018	CMB-01 (1.2) CMB-03 (0.4) ECC-02 (0.07) ECC-03 (0.2) 1.9		CMB-01 (2.5) CMB-02 (1.1) CMB-03 (1.4) CMB-04 (0.8) ECC-02 (0.3) ECC-03 (1.2) 7.3	
2019	FUG-01 (2) BCM-10 (1.5) 3.5			
2020		BCM-10 (1.5) CMB-03 (0.4) CTS-01 (1) 2.9		CMB-02 (1.1) CBM-03 (1.4) 2.5
2021				
2022		FUG-01 (2)		CMB-04 (0.8)
2023		ECC-02 (0.07) ECC-03 (0.2) CMB-01 (1.2) 1.5		ECC-02 (0.3) ECC-03 (1.2) CMB-01 (2.5) MOB-10 (1.9) MOB-11 (2.9) MOB-14 (11) 19.8
TOTAL	**6.4**	**6.4**	**23**	**23**

[a] Represents the final, full implementation date; typically a rule contains multiple implementation dates

TABLE 4-11

2008 8-hour Ozone (75 ppb) SIP Emission Reduction Commitment to be Achieved by 2031 through SCAQMD Stationary and Mobile Source Regulatory Programs
(Summer Planning Inventory, tons per day)

YEAR	VOC		NOx	
	Based on Adoption Date	Based on Implementation Date[a]	Based on Adoption Date	Based on Implementation Date[a]
2016				
2017			MOB-10 (1.9) MOB-11 (1.0) MOB-14 (7.8) **10.7**	
2018	ECC-02 (0.3) ECC-03 (0.3) CMB-01 (2.8) CMB-03 (0.4) **3.8**		CMB-04 (1.6) ECC-02 (1.1) ECC-03 (2.1) CMB-01 (6.0) CMB-02 (2.8) CMB-03 (1.5) **15.1**	
2019	FUG-01 (2) BCM-10 (1.8) **3.8**			
2020		CMB-03 (0.4)		CMB-03 (1.5)
2021	CTS-01 (2)			
2022		FUG-01 (2)	CMB-05 (5)	CMB-04 (1.6)
2023		ECC-02 (0.3)		ECC-02 (1.1)
2024				
2025				CMB-05 (5)
2026--2030				
2031		ECC-03 (0.3) CMB-01 (2.8) BCM-10 (1.8) CTS-01 (2) **6.9**		ECC-03 (2.1) CMB-01 (6.0) CMB-02 (2.8) MOB-10 (1.9) MOB-11 (1.0) MOB-14 (7.8) **21.6**
TOTAL	**9.6**	**9.6**	**31.0**	**31.0**

[a] Represents the final, full implementation date; typically a rule contains multiple implementation dates

TABLE 4-12

Emission Reduction Commitment to be Achieved by 2031 through CARB Regulatory and Incentive Programs
(Summer Planning Inventory, tons per day)

YEAR	NOx		VOC	
	Based on Adoption Date	Based on Implementation Date[a]	Based on Adoption Date	Based on Implementation Date[a]
2016	5	3	0.5	0.4
2017	0.1		<0.2	
2018	3.4	0.1	16	<0.2
2019	12			
2020	2.6	0.4	0.5	<0.1
2021			4–5	4–5
2022		2		16
2023	88	10	37.3	0.4
2024		7		
2025				
2026		0.6		0.4
2027				
2028				
2029				
2030				
2031		88		37.3
TOTAL	**111**	**111**	**59–60**	**59–60**

[a] Represents the final, full implementation date; typically a rule contains multiple implementation dates

Overall Emission Reductions

A summary of annual average emission inventory and reductions for the proposed control measures for the year 2023 and 2025 is provided in Table 4-13 and Table 4-14, respectively. A summary of summer planning emission inventory and reductions for the years 2023 and 2031 is also provided in Tables 4-15 and 4-16. These reductions reflect the emission reductions associated with implementation of control measures under local, state, and federal jurisdiction. Emission reductions represent the difference

between the projected baseline and the remaining emissions. The federal 2006 24-hr PM2.5 standard will be achieved with baseline emissions by 2019 (see Chapter 5).

Table 4-13 identifies projected reductions based on the annual average inventory for PM2.5 and its precursor gas (NOx) for basin-wide stationary and local mobile control measures to achieve the annual PM2.5 standard as "expeditiously as practicable." These reductions lead to attainment of the federal 2012 annual PM2.5 standard if all reductions from the ozone strategy are creditable towards PM2.5 attainment. However, some measures may only be approvable under CAA Section 182(e)(5), and thus not applicable to PM2.5 attainment demonstrations. SCAQMD will continue to work with U.S. EPA on approvability of measures and reducing reliance on 182(e)(5) measures. Since the creditability of emission reductions and the feasibility of other PM2.5 measures is sufficiently uncertain to advance attainment to 2023, a 2025 attainment date is proposed. Table 4-14 identifies projected reductions based on the annual average inventory for PM2.5 and NOx to achieve the federal 2012 annual PM2.5 standard by 2025 as a "serious" nonattainment area.

Tables 4-15 and 4-16 identify projected reductions based on the summer planning inventory for NOx and VOC emissions to achieve the 1997 8-hour ozone standard by 2023 and 2008 8-hour ozone standard by 2031.

TABLE 4-13

Emission Reductions for 2023 Based on Annual Average Emissions Inventory
(Tons per day)

SOURCES	NOx	PM2.5
Year 2023 Baseline[1]	257	64
Emission Reductions:		
SCAQMD Stationary Sources	7	3[Δ]
SCAQMD Mobile Sources	16	0
CARB Mobile Sources	113	0
TOTAL Reductions (all measures)	136	3[Δ]
2023 Remaining Emissions*	**121**	**61**

[1] Emission assumptions from SCAG's 2016 RTP/SCS are already reflected in the AQMP baseline, including TCMs

[Δ] For contingency measure purposes only

* Numbers may not sum due to rounding

TABLE 4-14

Emission Reductions for 2025 Based on Annual Average Emissions Inventory
(Tons per day)

SOURCES	NOx	PM2.5	VOC
Year 2025 Baseline[1]	241	64	353
Emission Reductions:			
SCAQMD Stationary Sources	12	3[Δ]	6.4
SCAQMD Mobile Sources	16	0	0
CARB Mobile Sources	67	0	50–51*
Federal Measures	46	0	0.3
TOTAL Reductions (all measures)	141	3[Δ]	57–58
2025 Remaining Emissions	**100**	**61**	**295–296**

[1] Emission assumptions from SCAG's 2016 RTP/SCS are already reflected in the AQMP baseline, including TCMs

* Includes Consumer Products

[Δ] For contingency measure purposes only

TABLE 4-15

Emission Reductions for 2023 Based on Summer Planning Inventory
(Tons per day)

SOURCES	VOC	NOx
Year 2023 Baseline[1]	379	255
Emission Reductions:		
SCAQMD Stationary Sources	6.4	7.3
SCAQMD Mobile Sources	0	15.8
CARB Mobile Sources	50–51*	67
Federal Measures	0.3	46
TOTAL Reductions (all measures)	57–58	136
2023 Remaining Emissions	**321–322**	**119**

[1] Emission assumptions from SCAG's 2016 RTP/SCS are already reflected in the AQMP baseline, including TCMs

* Includes Consumer Products

TABLE 4-16

Emission Reductions for 2031 Based on Summer Planning Inventory
(Tons per day)

SOURCES	VOC	NOx
Year 2031 Baseline[1]	362	214
Emission Reductions:		
SCAQMD Stationary Sources	9.6	20
SCAQMD Mobile Sources	0	10.7
CARB Mobile Sources	59–60*	54
Federal Measures	0.3	57
TOTAL Reductions (all measures)	69–70	142
2031 Remaining Emissions	**292–293**	**72**

[1] Emission assumptions from SCAG's 2016 RTP/SCS are already reflected in the AQMP baseline, including TCMs

* Includes Consumer Products

Implementation

Achieving clean air objectives requires the effective and timely implementation of the control measures. Similar to approaches taken by previous AQMPs, the SIP commitment is to bring each control measure for regulatory consideration or program implementation in a specified time frame. The time frame is based on the ability to implement certain control strategies that will result in the reductions necessary to demonstrate attainment by the required attainment date. There is a commitment to achieve a total emission reduction target, with the ability to substitute for control measures deemed technologically, legally, economically, and/or environmentally not feasible, so long as equivalent reductions are met by other means. These measures are also designed to satisfy the federal CAA requirement of RACT [Section 172(c)], BACM, and the California CAA (CCAA) requirement of BARCT [California Health and Safety Code Section 40440(b)(1)].

The adoption and implementation schedule of the control measures proposed in the 2016 AQMP can be found in Tables 4-2, 4-4, and 4-7. Implementation of the mobile source measures in Table 4-4 rely on actions from many agencies. This section describes each agency's area of responsibility.

Incentive Funding

Funding Needs for Mobile Source Emission Reductions

Given the significant NOx emission reductions needed to attain the federal ozone air quality standards by 2023 and 2031, a combination of public funding incentives along with regulatory actions are needed. In the near-term, there is a need to commercialize zero and near-zero on-road trucks and off-road equipment as early as possible. For national and international transportation sources, there is a need to accelerate deployment of the cleanest locomotives, ocean-going vessels, and aircraft as early as possible in the near-term and promulgation of cleaner exhaust emissions standard in the longer term.

The approach that the SCAQMD and CARB are proposing to achieve the emission reductions identified in the State SIP Strategy (Appendix IV-B) "Further Deployment of Cleaner Technologies" measures and the SCAQMD's mobile source measures (Appendix IV-A) is predicated on securing the amount of funding needed to achieve a significant portion of the NOx emission reductions by 2023, followed with regulatory actions that will be implemented in the mid-2020s. A lower level of funding will be needed if significant NOx emission reductions occur by other measures prior to 2023.

To illustrate this approach, an analysis has been conducted to estimate the funding needed to achieve the emission reductions identified in the "Further Deployment of Clean Technologies" measures proposed in the State SIP Strategy (Appendix IV-B, 2016 AQMP). The analysis is not meant to be the only implementation approach to achieve the emission reductions associated with the "Further Deployment" measures, but meant to illustrate an upper limit of the most likely funding necessary if no other actions are taken to achieve the associated emission reductions. As discussed above, CARB described four implementation approaches for the "Further Deployment" measures, which includes incentives programs, regulations to be developed as zero and near-zero emission vehicles and equipment are commercialized, and the quantification of the emission reduction benefits from operational efficiency improvements and deployment of connected vehicles, autonomous vehicles, and intelligent transportation systems.

Five funding scenarios were analyzed to examine the range of funding needed. The five funding scenarios are summarized below.

Funding Scenario Based on Traditional Carl Moyer Cost-Effectiveness Criteria

This scenario assumes that funding on a per vehicle/equipment basis is based on the anticipated future Carl Moyer Memorial Air Quality Standards Attainment (Moyer) Program cost-effectiveness criteria of $30,000/ton and $50,000/ton to account for near-zero and zero emission technologies. The amount of funding is calculated using the formula from the Moyer Guidelines (Moyer Guidelines, Appendix C). The following assumptions were made:

- Capital Recovery Factor: Seven years until 2020 and then three years until 2024. Three years surplus is the Moyer program minimum lead time.

- For 2031, a 10 year project life is assumed for the early years, dropping to seven years in the later years.

- Cost-effectiveness assumption: At the current $18,262/ton cost effectiveness rate the grant amount may not be sufficient to incentivize turnover. CARB is considering increasing the cost-effectiveness criteria as part of the next update of the Guidelines. For the purposes of this analysis a $30,000/ton cost-effectiveness criteria is assumed to estimate funding needs by 2023 and a $50,000/ton criteria is assumed after 2025 to 2031. If a federal ultra-low NOx exhaust emissions standard is established, the funding would be primarily for zero-emission technologies, which may have cost-effectiveness on the order of $50,000/ton or higher.

Based on the above assumptions, two scenarios are developed. The first scenario assumes that funding would be available to attain the 80 ppb federal ozone air quality standard in 2023. Funding at a lower level would continue at the level needed to meet the 75 ppb standard in 2031. Table 4-17 shows the results of this scenario.

TABLE 4-17

Funding Needed for Mobile Source Sector to Attain Ozone NAAQS
(Based on Moyer Cost-Effectiveness and Assuming Funding Needed to Achieve 2023 Attainment, and Continuing to 2031)

Year	Funding/Yr	C-E = $30,000/ton 2023 t/d NOx	C-E = $30,000/ton 2031 t/d NOx	C-E = $50,000/ton 2031 t/d NOx
2017	$100,000,000	1.4		
2018	$150,000,000	2.0		
2019	$500,000,000	6.8		
2020	$800,000,000	10.9		
2021	$900,000,000	27.9		
2022	$900,000,000	27.9		
2023	$900,000,000	27.9		
2024	$250,000,000		2.4	
2025	$250,000,000		2.4	
2026	$250,000,000		2.4	
2027	$250,000,000			2.0
2028	$250,000,000			2.0
2029	$250,000,000			2.0
2030	$250,000,000			2.0
2031	$250,000,000			2.0
Total NOx Reductions (t/d)		**104.8**	**7.2**	**10.0**
Total Funding (by C-E)		**$4,250,000,000**	**$750,000,000**	**$1,250,000,000**
Total Funding		**$4,250,000,000**		**$6,250,000,000**

Under this scenario, funding of up to $4.25 billion will be needed to achieve around 105 tons/day of NOx emission reductions identified in the State Mobile Source Strategy (Appendix IV-B) by 2023. An additional $2 billion will be needed to attain the federal 8-hour ozone air quality standard by 2031.

The second scenario assumes funding is available to attain the 75 ppb ozone air quality standard in 2031, independent of attainment of the ozone air quality standard by 2023. Table 4-18 shows the results of this analysis.

TABLE 4-18

Funding Needed for Mobile Source Sector to Attain Ozone NAAQS
(Based on Moyer Cost-Effectiveness and Assuming 2023 and 2031 Attainment Funding are Independent)

Year	Funding/Yr	(A) C-E = $30,000/ton 2031 t/d NOx	(B) C-E = $50,000/ton 2031 t/d NOx
2017			
2018			
2019			
2020			
2021	$900,000,000	8.7	
2022	$900,000,000	8.7	
2023	$900,000,000	8.7	
2024	$1,000,000,000		8.2
2025	$1,000,000,000		8.2
2026	$1,000,000,000		8.2
2027	$1,000,000,000		8.2
2028	$1,000,000,000		8.2
2029	$1,000,000,000		8.2
2030	$1,000,000,000		8.2
2031	$1,000,000,000		8.2
Total NOx Reductions (t/d)		**26.1**	**65.6**
Total Funding (by C-E)		**$2,700,000,000**	**$8,000,000,000**
Total Funding			**$10,700,000,000**

If funding is secured to achieve solely the federal ozone air quality standard by 2031, the total funding needed is $10.7 billion (Table 4-17, sum of Columns A and B). Based on these analyses, it is less costly to achieve the 80 ppb ozone air quality standard earlier (in 2023) and utilize subsequent funding to achieve the 75 ppb federal ozone air quality standard by 2031.

The two scenarios analyzed in Tables 4-17 and 4-18 provide an approximate range of $4 to $11 billion in funding over a 7 to 15 year period to achieve the projected NOx emissions reductions.

Funding Scenario Based on Per Vehicle Funding Incentive

Historically, funding for clean air projects are based either on a cost-effectiveness criteria or on a per vehicle incentive basis. Funding under the Carl Moyer Memorial Air Quality Standards Attainment Program is based on cost-effectiveness. However, funding under the Proposition 1B Goods Movement Emission Reduction Program is based on per vehicle incentive funding. For example, a typical goods movement heavy-duty truck replacement provides for up to $50,000 per truck for a new or newer replacement truck. At times, the SCAQMD has augmented the Proposition 1B funding with other funding such as the U.S. EPA Diesel Emission Reduction Act (DERA) funding to provide additional financial incentives to purchase alternative fuel trucks.

Two scenarios were analyzed based on "per vehicle" funding incentives. The assumptions for the two scenarios include:

- Funding needed is based on achieving a significant portion of the NOx emissions reduction needed in 2023 (~105 tons/day) and independently in 2031 (~66 tons/day) as provided in the State Mobile Source Strategy.

- Funding needed for NOx emissions reduction from national and international sources is based on Carl Moyer Program cost-effectiveness criteria.

- Funding needed to implement Control Measure MOB-11 – Extended Exchange Program for larger horsepower lawn and garden equipment such as riding lawnmowers.

- Current and projected NOx emissions reduction from existing projects and future anticipated projects as provided in Control Measure MOB-14 (Appendix IV-A) account for the total NOx emissions reduction in 2023 and 2031.

Table 4-19 shows the analysis of the funding needed to achieve the projected NOx emissions reductions identified in the State Mobile Source Strategy (Appendix IV-B), using per vehicle/equipment incentive amounts and populations.

TABLE 4-19

Funding Needed for Mobile Source Sector to Attain Ozone NAAQS
(Based on per vehicle funding)

(a) Funding Needed to Attain in 2023

Vehicle/Equipment Type/Sector	NOx Emission Reduction (tons/day)	Affected Population	Funding per Vehicle/ Equipment	Total Funding
LDV, LDT-1, LDT-2 (pre-1999)	7	356,825	$9,500	$3,389,837,500
Light and Medium Heavy-Duty Trucks (pre-2014)	11.8	118,590	$25,000	$2,964,750,000
Heavy Heavy-Duty Trucks (pre-2014)	14	31,200	$50,000	$1,560,000,000
TRUs, Forklifts, GSE ...	8	61,000	$25,000	$1,525,000,000
Construction & Industrial Equipment	7	6,200	$150,000	$930,000,000
Lawn & Garden	2	2,000,000	$200	$400,000,000
Lawn & Garden - Larger Diesel/Gasoline Equipment	2.9	30,000	$2,000	$60,000,000
Passenger Locomotives	2	12	$2,000,000	$24,000,000
Aircraft, OGV, Freight Locos (assumes federal action)*	40	--	--	$2,940,000,000
Moyer, Prop 1B	9.5	--	--	
Total	**104.2**			**$13,793,587,500**

* Assumes Moyer cost/ton at $30,000/ton + 7 year life. Total funding rounded for discussion purposes

TABLE 4-19 (CONCLUDED)

Funding Needed for Mobile Source Sector to Attain Ozone NAAQS
(Based on per vehicle funding)

(b) Funding Needed to Attain in 2031

Vehicle/Equipment Type/Sector	NOx Emission Reduction (tons/day)	Affected Population	Funding per Vehicle/ Equipment	Total Funding
LDV, LDT-1, LDT-2 (pre-1999)	5	356,825	$9,500	$3,389,837,500
Light and Medium Heavy-Duty Trucks (pre-2013)	5	82,000	$35,000	$2,870,000,000
Heavy Heavy-Duty Trucks (pre-2013)	15	47,700	$50,000	$2,385,000,000
TRUs, Forklifts, GSE...	8	50,000	$25,000	$1,250,000,000
Construction & Industrial Equipment	7	20,000	$100,000	$2,000,000,000
Lawn & Garden	--	--	--	--
Lawn & Garden - Larger Diesel/Gasoline Equipment	1	30,000	$2,000	$60,000,000
Passenger Locomotives	--	--	--	--
Aircraft, OGV, Freight Locos (assumes federal action)*	20	--	--	$1,470,000,000
Moyer, Prop 1B	5.6	--	--	
Total	**66.6**			**$13,424,837,500**

* Assumes Moyer cost/ton at $30,000/ton + 7 year life. Total funding rounded for discussion purposes

Table 4-19 shows the funding needed assuming each mobile source sector achieves the NOx emissions reduction provided in the State Mobile Source Strategy. The total funding needed ranges from $13 to $14 billion to achieve the NOx emission reductions associated with the State Mobile Source Strategy. The analysis assumes every sector reduces its share of the NOx emissions needed for attainment, regardless of cost-effectiveness, and thus includes funding for a larger population of vehicles that individually have smaller emissions.

A more realistic second analysis was conducted with a focus on achieving more emission reductions from heavy-duty vehicles and off-road equipment that would provide a greater cost-effective use of funding. Under this scenario, no significant additional funding is assumed (beyond existing funding) for light-duty vehicles and light-duty trucks. Greater NOx emission reductions would occur from the on-road heavy-duty truck sector. The results of this analysis are shown in Table 4-20. Under this analysis the total funding needed ranges from $9 to $11 billion.

TABLE 4-20

Funding Needed for Mobile Source Sector to Attain Ozone NAAQS
(Based on per vehicle funding and focused on larger vehicles and equipment)

(a) Funding Needed to Attain in 2023

Vehicle/Equipment Type/Sector	NOx Emission Reduction (tons/day)	Affected Population	Funding per Vehicle/ Equipment	Total Funding
Light and Medium Heavy-Duty Trucks (pre-2016)	5.9	68,860	$15,000	$1,032,900,000
Heavy Heavy-Duty Trucks (post-2011 @ near-zero)	25	78,000	$25,000	$1,950,000,000
TRUs, Forklifts, GSE ...	8	61,000	$25,000	$1,525,000,000
Construction & Industrial Equipment	7	6,200	$150,000	$930,000,000
Lawn & Garden	2	2,000,000	$200	$400,000,000
Lawn & Garden - Larger Diesel/Gasoline Equipment	2.9	30,000	$2,000	$60,000,000
Passenger Locomotives	2	12	$2,000,000	$24,000,000
Aircraft, OGV, Freight Locomotives (assumes federal action)*	40	--	--	$2,940,000,000
Moyer, Prop 1B	9.5	--	--	
Total	**102.3**			**$8,861,900,000**

* Assumes Moyer cost/ton @$30,000/ton + 7 year life. Total funding rounded for discussion purposes

TABLE 4-20 (CONCLUDED)

Funding Needed for Mobile Source Sector to Attain Ozone NAAQS
(Based on per vehicle funding and focused on larger vehicles and equipment)

(b) Funding Needed to Attain in 2031

Vehicle/Equipment Type/Sector	NOx Emission Reduction (tons/day)	Affected Population	Funding per Vehicle/ Equipment	Total Funding
Light and Medium Heavy-Duty Trucks (pre-2014)	5	82,000	$35,000	$2,870,000,000
Heavy Heavy-Duty Trucks (post-2021)	15	47,700	$50,000	$2,385,000,000
TRUs, Forklifts, GSE ...	8	50,000	$25,000	$1,250,000,000
Construction & Industrial Equipment	7	20,000	$100,000	$2,000,000,000
Lawn & Garden	--	--	--	--
Lawn & Garden - Larger Diesel/Gasoline Equipment	1	30,000	$2,000	$60,000,000
Passenger Locomotives	--	--	--	--
Aircraft, OGV, Freight Locomotives (assumes federal action)*	25	--	--	$1,840,000,000
Moyer, Prop 1B	5.6			
Total	**66.6**			**$10,405,000,000**

* Assumes Moyer cost/ton @$30,000/ton + 7 year life. Total funding rounded for discussion purposes

For the socioeconomic impact analysis, an additional scenario was developed assuming that funding would be available to achieve a significant amount, but not all of the NOx emission reductions associated with the State SIP Strategy "Further Deployment" measures in 2023 and assuming that the remaining emissions after 2023 will need to be reduced further to achieve the overall 55 percent NOx emission reductions needed for attainment in 2031. The NOx emission reductions would be around 98 tons/day by 2023 and an additional 20.8 tons/day by 2031. The funding needed by emissions source category is provided in Tables 4-21(a) and 4-21(b). The funding needed for this scenario is around $12.7 billion over the period from 2017 to 2031.

TABLE 4-21

Funding Needed for Mobile Source Sector to Attain Ozone NAAQS
(Based on per vehicle funding)

(a) Funding Needed to Attain in 2023

Vehicle/Equipment Type/Sector	NOx Emission Reduction (tons/day)	Affected Population	Funding per Vehicle/ Equipment	Total Funding
Medium Heavy-Duty Trucks (pre-2017)	5.9	68,860	$15,000	$1,032,900,000
Heavy Heavy-Duty Trucks (post-2011 @ near-zero)	27.4	82,300	$25,000	$2,057,500,000
TRUs, Forklifts, GSE ...	9.7	90,000	$25,000	$2,250,000,000
Construction & Industrial Equipment	9.6	10,100	$150,000	$1,515,000,000
Small Off-Road Engines	3.1	270,000	$500	$135,000,000
Passenger Locomotives	2.0	12	$2,000,000	$24,000,000
Aircraft, OGV, Freight Locomotives (assumes federal action)**	40.3	--	--	$2,745,000,000
Total	**98.0**			**$9,759,400,000**

* Note that the total emission reductions under this scenario are not intended to achieve the full emission reductions provided in the State SIP Strategy "Further Deployment of Cleaner Technologies" measures

** Assumes Moyer cost/ton at $30,000/ton + 7 year life. Total funding rounded for discussion purposes

TABLE 4-21 (CONCLUDED)

Funding Needed for Mobile Source Sector to Attain Ozone NAAQS
(Based on per vehicle funding)

(b) Funding Needed to Attain in 2031

Vehicle/Equipment Type/Sector	NOx Emission Reduction (tons/day)	Affected Population	Funding per Vehicle/ Equipment	Total Funding
Medium Heavy-Duty Trucks (pre-2020)	1.7	35,100	$35,000	$1,228,500,000
Heavy Heavy-Duty Trucks (pre-2028)	5.4	18,600	$50,000	$930,000,000
TRUs, Forklifts, GSE...	2.7	42,000	$25,000	$1,050,000,000
Construction & Industrial Equipment	2.3	3,300	$155,000	$511,500,000
Small Off-Road Engines	0.3	36,000	$500	$18,000,000
Aircraft, OGV, Freight Locomotives (assumes federal action)**	8.4	--	--	$618,200,000
Total	**20.8**			**$4,356,200,000**

* Note that the total emission reductions under this scenario are not intended to achieve the full emission reductions provided in the State SIP Strategy "Further Deployment of Cleaner Technologies" measures

** Assumes Moyer cost/ton at $30,000/ton + 7 year life. Total funding rounded for discussion purposes

In summary, the funding needed to achieve the NOx emission reductions identified in the State Mobile Source Strategy ranges from $5 billion to as high as $14 billion depending on the types of funding programs implemented and which mobile source sectors will be more cost effective to reduce emissions. The actual funding levels will most likely be on the order of $10 to $12 billion with a mix of different funding programs and technologies.

Funding Needs for Stationary Source Emission Reductions

It is clear that the majority of NOx emissions reductions needed for attainment of the ozone standards will need to come from mobile sources. However, if equally or more cost-effective incentive funding opportunities are identified in the stationary source sector, funding could be diverted to help local stationary sources reduce their emissions. Several stationary source incentive funding approaches have been developed as part of the 2016 AQMP control strategy (ECC-03, CMB-01, CMB-02, etc.). Details on cost-effectiveness and incentive funding needs for each measure are provided in Appendix IV. A total of $1.1 to $1.6 billion of stationary source incentive funding programs are proposed with projected cost-effectiveness levels in the same range as the mobile source incentives described above.

Future Funding Opportunities

Achieving the emissions reductions from 2016 AQMP incentive-based control measures for both mobile and stationary sources will likely require approximately $11 to 14 billion in total funding. Given this significant funding level needed to attain the federal ozone air quality standards over the next seven to fifteen years, an action plan will be developed as part of the AQMP public adoption process to identify the necessary actions by the District, the region, the state, the federal government, and other partnerships to ensure the requisite levels of funding are secured as early as possible and sustained out to 2031.

The District receives around $56 million per year in incentives funding to accelerate turnover of on- and off-road vehicles and equipment under SB 1107, a portion of the State's Tire Fee, and AB 923. AB 923 will sunset in 2024. In addition, the District has received close to $550 million in Proposition 1B funding. The last round of Proposition 1B will be ending in the next couple of years. The District has also received funding under the DERA program on a competitive basis. Regardless, the amount of funding needed to achieve a significant portion of the NOx emission reductions associated with the "Further Deployment" measures proposed in the State SIP Strategy and the 2016 AQMP will require on the order of $1 billion per year if funding is available beginning in 2017. The proposed actions are discussed below.

Actions at the National Level

- **Creation of a National Clean Air Investment and Cleanup Fund** – This action calls for Congress to create a national fund to assist serious or above nonattainment areas attain federal air quality standards. The concept is similar to the "superfund" programs administered by U.S. EPA to help cleanup soil and water contamination. Congress has appropriated on the order of $500 million to $1 billion per year to help fund programs to address water contamination under the Clean Water Act and clean up contaminated sites. However, a similar concept on this scale has not yet been developed for contaminated air. Such a fund could focus on reducing emissions from national and international sources for which state and local jurisdiction is limited.

- **Develop new partnerships with states and regions currently in nonattainment of existing federal air quality standards or may be in nonattainment of future air quality standards** – Regional partnerships such as the West Coast Collaborative and Northeast Diesel Collaborative provide a valuable means of pooling and coordinating funding resources to help neighboring

states and regions focus on reducing emissions from mobile sources that operate across state boundaries.

Establishing new collaboratives on a national level among nonattainment areas can provide an approach to prioritize funding in a more coordinated manner. As an example, deployment of a greater number of Tier 4 locomotives operating in the Basin is critical for the region to meet air quality standards and reduce air toxic exposure to diesel particulate matter exhaust. The same Tier 4 locomotives haul freight to different parts of the U.S. where air quality may or may not be an issue. Current funding for Tier 4 locomotives can be provided only if there is a commitment that the locomotive operates in California. However, under a collaborative approach, funding for Tier 4 locomotive could be provided on a "national" level. The approach is similar to inter-district funding in the Carl Moyer Program.

This proposed action will be coordinated among regional collaboratives through the National Association of Clean Air Agencies (NACAA). NACAA can provide the forum to initiate discussions on the creation of the Clean Air Investment and Cleanup Fund and other regional clean air projects that may benefit the South Coast Air Basin.

Actions at the State Level

- **Prioritize existing funding programs to maximize the co-benefits of criteria pollutant and GHG emission reductions** – California has several large programs to help fund the deployment of cleaner technologies including the Carl Moyer Program, Proposition 1B, Lower Emission School Bus Program, and the GHG Reduction Funds. As the California State Legislature appropriates funds for these programs, there is a need to recognize projects that provide the maximum benefits in reducing both criteria pollutant and GHG emissions without a greater emphasis on one over the other. This actions calls for greater outreach and education to state legislators and their staff on the benefits of funding for projects that achieve the goals of AB 32 and also maximize criteria pollutant emission reductions. A coordinated effort would be made by the District through CAPCOA (California Air Pollution Control Officers Association) and CARB to provide coordinated outreach and education to state lawmakers on the creation of new funding programs while providing information on the benefits of clean air programs.

- **Initiating new funding programs** – Proposition 1B is a valuable funding program in helping cleanup thousands of on-road heavy-duty trucks and off-road goods movement related equipment. Proposition 1B is in its last year of funding. The District along with interested stakeholders will explore the opportunity to develop a new mechanisms similar to Proposition 1B to improve air quality and transportation infrastructure in the goods movement sector.

Actions at the Regional/Local Level

- **Local Ballot Measures** – Efforts are currently underway in bringing measures to the ballot to provide funding for transportation improvement and air quality improvement. Such measures can provide additional funding resources for the region to help attain federal air quality standards.

- **Identify potential new sources of funding opportunities at all levels of government** – This action entails developing new innovative funding programs at all levels of government. The District working with interested stakeholders from the public and private sector will explore potential new funding opportunities. Identified opportunities may require legislative actions to implement. A working group is proposed to be established to develop ideas for new funding programs that will be provided to the District Governing Board for consideration prior to proceeding.

- **Re-invigorate the District's Strategic Alliance Initiative** – In 2002, the SCAQMD Governing Board adopted the Strategic Alliance Initiative. The initiative contains eight specific actions to help the region address air quality issues. The eight actions have been implemented for the most part. However, two of the initiatives: *Initiative #4. Formation of a Multi-Regional Alliance for Clean Air* and *Initiative #7. Strategic Alliance on Clean Fuel Vehicle Funding* have relevance to the 2016 AQMP. This action is to expand upon the efforts back in 2002 to implement the collaborative efforts identified above under "Actions at the National Level".

  Strategic Alliance Initiative #4 called for major metropolitan nonattainment areas, such as Houston, Texas; Atlanta, Georgia; New York City; and Boston, Massachusetts to work together through sharing of information and pooling technical and political resources to address common air pollution problems. This effort included seeking federal funding for the demonstration of advanced clean air strategies that may ultimately prove applicable to other non-attainment areas.

  Strategic Alliance Initiative #7 proposed that the SCAQMD form new alliances with fleet operators, including local governments, to secure long-term funding for implementation of the District's fleet vehicle program. This effort included seeking federal funding opportunities from Congress, the U.S. Department of Energy, and U.S. Department of Transportation, and other funding opportunities at the federal level.

  Under this proposed action, the SCAQMD would expand Initiatives #4 and #7 to develop the partnerships and collaboratives identified under the "Actions at the Federal Level" discussed above.

Responsible Agencies

Implementation of the control strategies requires a cooperative partnership of governmental agencies at the federal, state, regional and local level.

At the federal level, the U.S. EPA and, sometimes other federal agencies, are charged with reducing emissions from federally controlled sources such as aircraft, trains, marine vessels, and other sources.

At the state level, CARB is primarily responsible for reducing emissions from motor vehicles and consumer products.

At the regional level, SCAG assists sub-regional and local governments in playing a formative role in the air quality elements of transportation planning. In addition, local governments serve an important role in developing and implementing the transportation control measures that are included in the 2016 AQMP. SCAG is responsible for providing the socioeconomic forecast (e.g., population and growth forecasts) upon which the Plan is based. SCAG also provides assessments for conformity of regionally significant transportation projects with the overall Plan and is responsible for the adoption of the RTP and the Regional Transportation Improvement Program (RTIP) which include growth assumptions and transportation improvement projects that could have significant air quality impacts, and transportation control measures as required by the CAA.

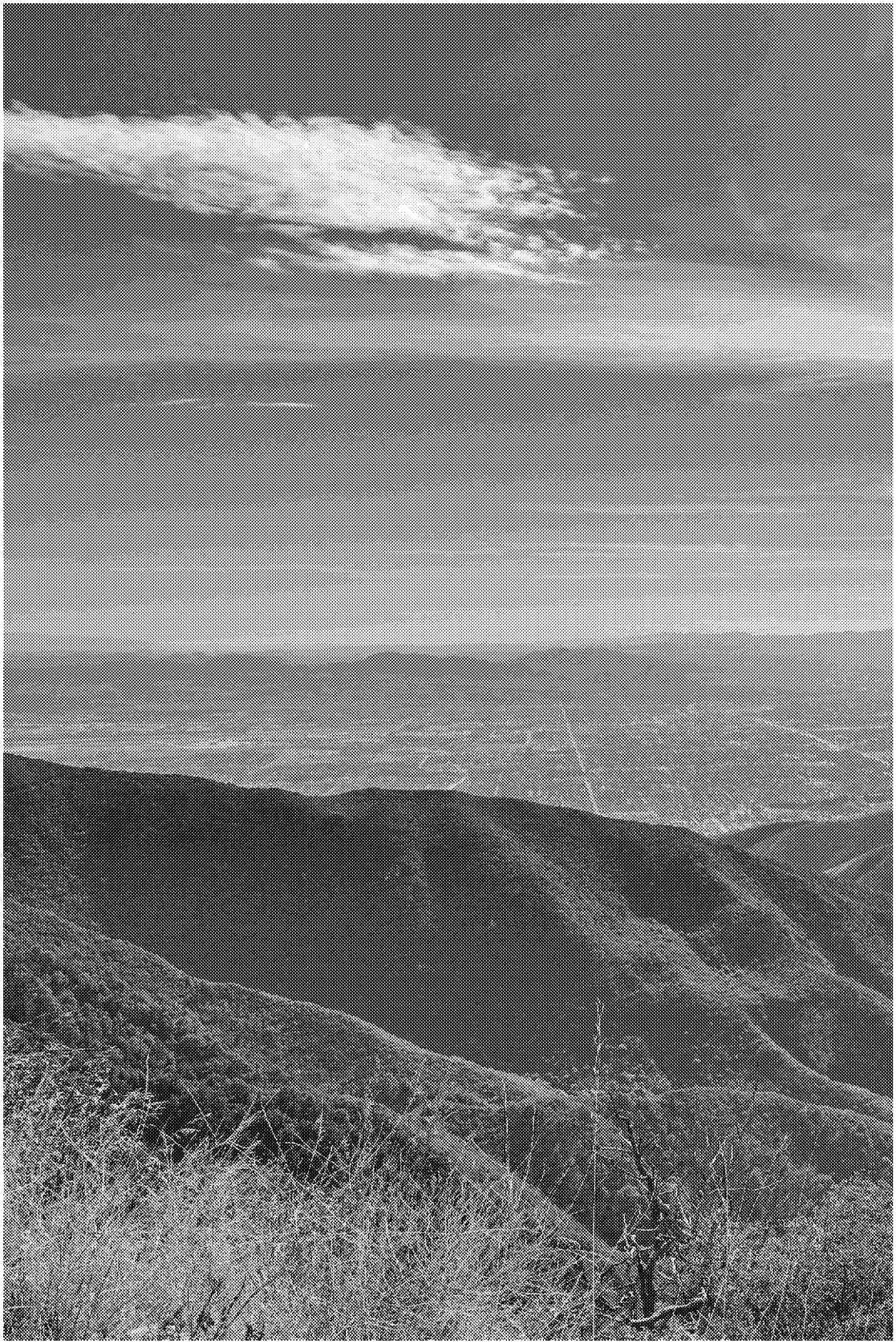
At the regional level, SCAQMD is responsible for the overall development and implementation of the AQMP. SCAQMD is specifically authorized to reduce the emissions from stationary, point, and some area sources such as coatings and industrial solvents. Emission reductions are also sought through funding programs designed to accelerate vehicle turnover and the purchase of cleaner vehicles. In addition, the SCAQMD has authority to regulate indirect sources under the California Health and Safety Code Sections 40716 (a)(1) and 40440(b)(3). As a means of achieving further emission reductions, the SCAQMD may seek additional authority to regulate sources that have not been completely under the SCAQMD's jurisdiction in the past such as marine vessels, consumer products, and other on-road and off-road sources. The SCAQMD implements its responsibilities with participation from the regulated community and other stakeholders through an extensive rule development and implementation program. This approach maximizes the input of those parties affected by the proposed rule through consultation meetings, public workshops, and ongoing working groups.

Table 4-22 list the responsibilities of the key agencies involved in the implementation of the 2016 AQMP.

TABLE 4-22

Agencies Responsible for Implementation
of the 2016 AQMP for the South Coast Air Basin

AGENCY	PRINCIPAL RESPONSIBILITIES
U.S. EPA	• National mobile vehicle emission standards • Airplanes, trains, and ships • New off-road construction & farm equipment below 175 hp
CARB	• On-road/off-road vehicles (emission standards for in-state sales and in-use fleets as authorized under Section 209(e) of the Clean Air Act) • Motor vehicle fuels • Consumer products
SCAG	• Conformity assessments for Regional Transportation Plan and other transportation projects • Regional Transportation Improvement Program • Transportation Control Measures
Local Government	• Transportation and local government actions (i.e., land use approvals & ports) • Transportation facilities
SCAQMD	• Stationary (e.g., industrial/commercial) and area sources • Indirect sources • Certain mobile sources (e.g., fleet regulations, incentives for accelerated vehicle turnover, reduction in average vehicle ridership, etc.)



Chapter 5
Future Air Quality

Air quality modeling is an integral part of demonstrating future attainment of the clean air standards, relating emission reductions to air quality improvements. The 2016 AQMP reflects an updated emission inventory, economic growth projections, enhanced air quality modeling techniques, and the impacts of the proposed control strategies.

In This Chapter

Introduction

Air quality modeling to demonstrate future attainment of air quality standards is an integral part of the planning process to achieve clean air. Modeling provides the means to relate emission reductions from sources of pollution to the resulting air quality improvements. The attainment demonstrations provided in the 2016 AQMP reflect updated emissions estimates, new technical information, enhanced air quality modeling techniques, updated attainment demonstration methodology, and the control strategies provided in Chapter 4. While the primary target of the 2016 AQMP is to demonstrate progress toward the 2008 8-hour ozone standard of 75 ppb by 2031, efforts to meet other air quality standards and the corresponding analyses are included in the 2016 AQMP and presented in this chapter. Both the revoked 1997 8-hour standard (80 ppb) and the revoked 1979 1-hour standard (120 ppb) are included in the analysis with attainment years of 2023 and 2022, respectively. This chapter also demonstrates future attainment of the annual and 24-hour PM2.5 standards (12 and 35 $\mu g/m^3$).

The District's goal is to develop an attainment demonstration that: 1) ensures that ambient air quality standards for all criteria pollutants are met by the established deadlines in the federal CAA and 2) achieves an expeditious rate of progress towards attaining the air quality standards. The overall control strategy is designed such that efforts to achieve the standard for one criteria pollutant complements efforts to meet the standards for other pollutants.

Background

The South Coast Air Basin is classified as an "extreme" nonattainment area for ozone. The 2016 AQMP addresses three ozone standards: the 2008 8-hour standard of 75 ppb, the revoked 1997 8-hour standard of 80 ppb, and the revoked 1-hour standard of 120 ppb. The attainment deadline years are 2031, 2023 and 2022, respectively. The emissions inventory and meteorological conditions were developed for a 2012 base year.

The Basin is currently a "serious" nonattainment area for 24-hour PM2.5 and "moderate" nonattainment for annual PM2.5. The 2012 AQMP addressed attainment of the 2006 24-hour standard of 35 $\mu g/m^3$ by 2014; however, the unforeseen drought that occurred in the 2011–2014 time period inhibited the projected progress towards attainment. The District requested a voluntary bump-up from "moderate" status to "serious" nonattainment status in the "Supplement to the 24-Hour PM2.5 State Implementation Plan for the South Coast Air Basin" submitted to U.S. EPA in 2015 and subsequently approved in 2016. For "moderate" nonattainment areas, the attainment deadline was 2015 based on CAA *Title 1, Part D, Subpart 4, Section 188(c)(l),* which establishes that attainment must be reached by the end of the 6th calendar year after the effective date of designation. The year 2019 is the new attainment deadline for "serious" nonattainment areas for the 24-hour PM2.5 standard.

The Basin was designated a "moderate" nonattainment area for the 2012 annual PM2.5 standard of 12 $\mu g/m^3$ on April 15, 2015. This designation sets an attainment deadline of December 31, 2021. Despite the recent drought, the Basin shows continued improvement in annual PM2.5 design values. The base

year annual PM2.5 design values at Mira Loma are lower than the previous 1997 standard of 15 μg/m^3, but do not yet meet the new 2012 standard of 12 μg/m^3 (Figure 5-11), indicating that additional reductions may be needed to meet the more stringent standard. Acknowledging the challenges in meeting the standard, including the feasibility of proposed measures, uncertainties in drought conditions, and the potential inability to credit all ozone strategy reductions towards PM2.5 attainment if approved under CAA Section 182(e)(5), SCAQMD will request a voluntary bump-up to the "serious" classification, with a new attainment date of 2025. Future year attainment was analyzed for 2021, the original target for "moderate" nonattainment, and 2025, the revised attainment date for the requested "serious" status. This AQMP includes all the milestone years significant to future PM2.5 attainment status: 2019 (24-hour PM2.5 attainment date), 2021 (annual PM2.5 attainment date for "moderate" nonattainment status) and 2025 (annual PM2.5 attainment date for "serious" nonattainment status). In addition, 2023 was included in the analysis to evaluate co-benefits of the ozone strategy on PM attainment and to assess the practicability of an earlier PM2.5 attainment date.

During the development of the 2012 AQMP, the District implemented an air quality modeling platform that integrates meteorological modeling, emissions inventories and atmospheric chemistry simulations into a physically and chemically consistent framework. In the 2007 and earlier AQMPs, the modeling platforms for meteorology and chemical-transport were developed separately. In addition, ozone and PM2.5 used separate modeling approaches due to the limitations of computational capacity. Recent advancements in computational technology enabled the transition to a state-of-science one-atmosphere, multi-pollutant modeling platform.

For the 2016 AQMP, the updated modeling platform has continued to serve as the primary tool to demonstrate attainment after incorporating the latest datasets and chemical mechanisms. Since completion of the 2012 AQMP, the modeling platform has been updated with satellite-based input data, improved chemical gaseous and particulate mechanisms, improved computational resources and post-processing utilities, enhanced spatial and temporal allocations of the emissions inventory, and a revised attainment demonstration methodology. Several other additional updates were also included.

The 2016 AQMP ozone and PM2.5 attainment demonstration has been developed using the U.S. EPA-supported Community Multiscale Air Quality (CMAQ) (version 5.0.2) modeling platform with Statewide Air Pollution Research Center (SAPRC) 07 chemistry, and the Weather Research and Forecasting Model (WRF) (version 3.6.1) meteorological fields. PM2.5 and ozone were modeled simultaneously using the one-atmosphere modeling platform. Ozone attainment demonstrations focused on the period from May through September, while PM2.5 was analyzed for the entire year. The simulations were conducted over an area with a western boundary over 100 miles west of the Ports of Los Angeles and Long Beach. The eastern boundary extends slightly beyond the Colorado River while the northern and southern boundaries of the domain extend to the San Joaquin Valley and the Northern portions of Mexico, respectively. CMAQ was simulated with a 4-kilometer grid resolution.

For the 2016 AQMP, WRF was updated with the most recent version (version 3.6.1) available at the time of protocol preparation and was evaluated with a set of input data, which includes land-use classification and sea-surface temperature initialization fields. The WRF simulations were initialized from National Centers for Environmental Prediction (NCEP) analyses and run for three-day increments with four-dimensional data assimilation (FDDA).

Day-specific point source emissions were extracted from the District's stationary source and RECLAIM inventories. Mobile source emissions included day and hour real-time profiles based on the CALTRANS Performance Measurement System and weight-in-motion profiles, CARB's EMFAC2014 emissions model, and vehicle population data and transportation analysis zone (TAZ) data provided by SCAG. The mobile source data and selected area source data were subjected to daily WRF-derived temperature corrections to account for enhanced evaporative emissions on warmer days. Gridded daily biogenic VOC emissions were provided by CARB using the MEGAN biogenic emissions model. The simulations benefited from enhancements made to the emissions inventory, such as day-specific adjustments in traffic volumes when generating on-road emissions and improvements in gridding surrogates for spatial allocations of area and off-road emissions.

Detailed information on the modeling approach, data retrieval, model development and enhancement, model application, emissions inventory development, and interpretation of results is presented in Appendix V. The following sections summarize the results of the 8-hour/1-hour ozone and annual/24-hour PM2.5 attainment demonstration modeling efforts and provide an update to the future projected ozone and PM2.5 levels given new emissions estimates, the latest air quality measurements, and modeling tools.

Ozone Modeling Approach

Design Values and Relative Response Factors (RRF)

To bridge the gap between air quality model predictions and measurements, U.S. EPA guidance has recommended the use of relative response factors (RRFs). In this approach, future year concentration predictions require two elements: base year design values and RRFs. The RRF is simply a ratio of the future year predicted air quality to the simulated air quality in the base year, representing the model-predicted change in air quality in response to predicted emissions changes. The attainment demonstrations are pollutant and averaging period specific. Base-year design values for 2012 were obtained from measurements and correspond to the form of the NAAQS. Eight-hour design values are calculated from the 3-year average of the fourth highest daily ozone 8-hour average concentration in each year. The 1-hour ozone design value represents the fourth highest 1-hour ozone value in a three-year period. Base year design values for the attainment demonstration are calculated as a five-year weighted average (average of the three, 3-year design values centered at the base year, 2012). Future year concentrations are estimated by multiplying the non-dimensional RRF by the base year design value, thus applying the model-predicted change in air quality directly to the actual measured concentrations in the base year. Assuming any potential modeling biases are similar in the base and future years, the RRF approach acts to minimize their impact on predictions.

Design Value Selection

U.S. EPA guidance recommends the use of multiple year averages of design values, where appropriate, to dampen the effects of single year anomalies in the air quality trend due to factors such as adverse or favorable meteorology or radical changes in the local emissions profile. The trend of Basin ozone design values is presented in Figure 5-1. Both 8-hour and 1-hour ozone design values have decreased over the

14-year period. The most recent 8-hour design value (102 ppb) continues to exceed the 1997 8-hour ozone standard (80 ppb) by 28 percent and the 2008 ozone standard (75 ppb) by 36 percent. In addition, the most recent 1-hour design value of 135 ppb exceeds the 1979 1-hour ozone standard (120 ppb) by 13 percent.

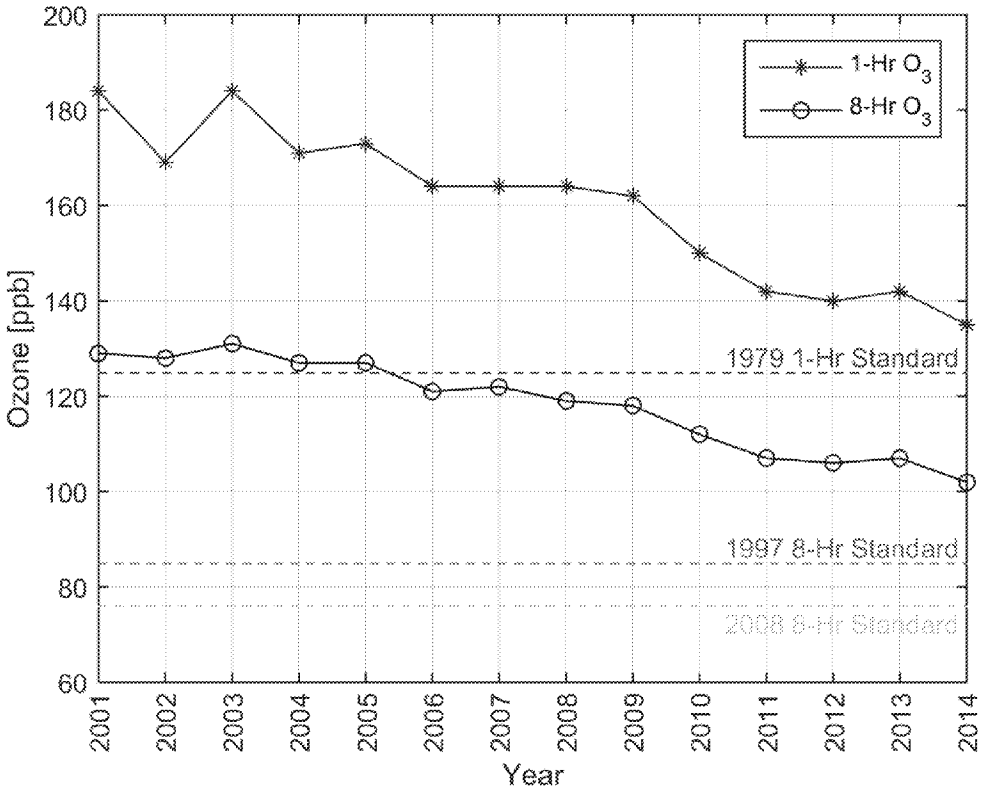


FIGURE 5-1

SOUTH COAST AIR BASIN OZONE DESIGN VALUES. EACH 8-HOUR VALUE REPRESENTS THE 3-YEAR AVERAGE OF THE YEARLY FOURTH HIGHEST 8-HOUR AVERAGE OZONE CONCENTRATION. THE 1-HOUR VALUES REPRESENT THE FOURTH HIGHEST 1-HOUR OZONE OVER A 3-YEAR PERIOD

The 2016 AQMP attainment demonstrations rely on air quality measurements collected during the five-year period centered on 2012, which is the base year selected for the emissions inventory development, the WRF meteorological simulation, and the anchor year for the future year ozone and PM2.5 projections.

Ozone Representativeness

Past ozone attainment demonstrations, up to and including the 2007 AQMP, evaluated a set of meteorological conditions conducive for air pollutant build-up or evaluated episodes occurring during concurrent intensive field monitoring programs. These episodic periods were rated based on how representative they were in reference to the ozone standard being evaluated. The 2007 AQMP was the first plan to address the 8-hour ozone standard and use RRFs in the future year ozone projections. To

provide a robust characterization of the RRFs for use in the attainment demonstration, the analysis simulated a total of 36 days. The ozone modeling guidance used for the 2007 AQMP recommended that a minimum of five days of simulations meeting modeling acceptance criteria be used in a future year RRF calculation, but recommended incorporating as many days as possible to fully capture both the meteorological variations in the ozone season and the response of ozone formation for different daily emissions profiles.

The 2012 AQMP used a different approach. Instead of the episode-based simulation days, it included season-long (June through August) comprehensive CMAQ simulations. It analyzed 92 simulation days and chose the days that met the following selection criteria: the predicted daily max is within 20 percent of the site-specific design value, the unpaired daily maximum prediction error is less than 20 percent, and the prediction is higher than the federal standard of 75 ppb. The maximum modelled grid cell in the 3 by 3 grid centered at each station was retrieved from the base and future year simulations. The number of days used in the RRF calculation differed from station to station. Approximately 50 days met the criteria at Crestline, more than half of the entire simulation period.

The approach used in the current AQMP is similar to the approach used in the 2012 AQMP with the following changes per recent U.S. EPA guidance (U.S. EPA, 2014).[1] The ozone season was expanded from May to September (153 simulation days) in order to capture exceedances that occurred in early and late summer. Only the top 10 days are used to calculate the RRF. Some stations have fewer than 10 days meeting the specified criteria with daily maximum 8-hr values exceeding 60 ppb and the unpaired daily-max prediction error less than 20 percent. These stations are included in the analysis as long as five or more days meet the selection criteria. The maximum modeled value in the 3 by 3 grid surrounding each station is compared to the corresponding grid position in the future year. A similar approach was implemented for the 1-hour ozone future year projections; details of the 1-hour ozone and 8-hour ozone analysis are presented in Appendix 5.

Basin-wide ozone air quality simulations were conducted for each hour in the 2012 ozone season (May 1st to September 30th). Figure 5-2 depicts the observed daily maximum 8-hour ozone levels Basin-wide and at Crestline and Redlands during the 2012 ozone season. Crestline was the design value site in the past, but Redlands showed the highest design value for the five-year period in the current analysis. During this period, several well-defined multi-day ozone episodes occurred in the Basin, with 107 total days having daily maximum concentrations of 75 ppb or higher. Stations located in San Bernardino and Riverside counties show similar levels of elevated ozone as Crestline and Redlands, exhibiting the influences of similar transport and chemistry patterns.

[1] https://www3.epa.gov/ttn/scram/guidance/guide/Draft_O3-PM-RH_Modeling_Guidance-2014.pdf

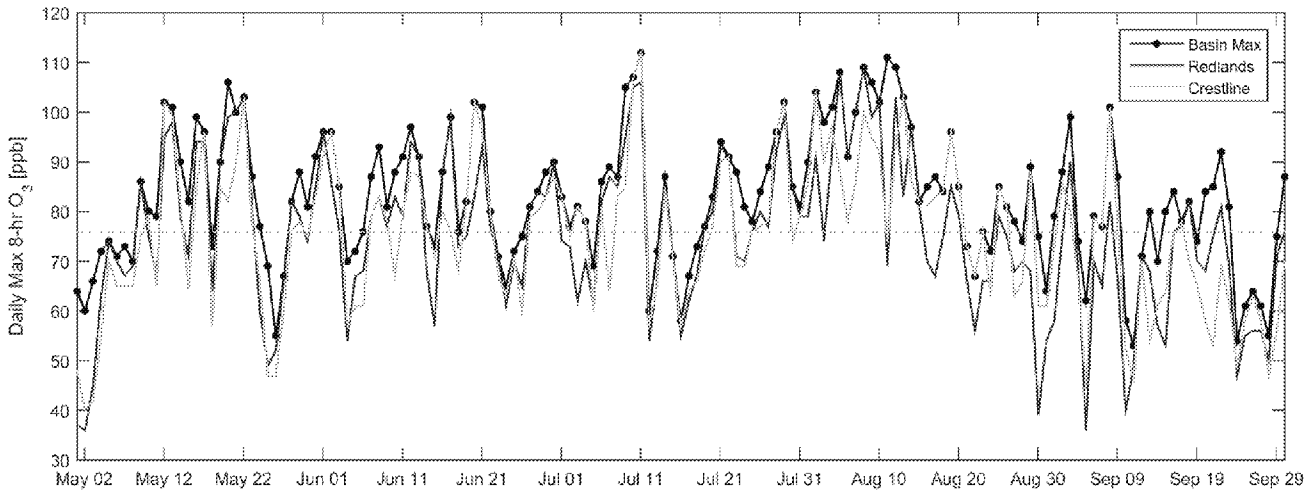


FIGURE 5-2

OBSERVED BASIN, REDLANDS, AND CRESTLINE DAILY MAXIMUM 8-HOUR AVERAGE OZONE CONCENTRATIONS: MAY 1 THROUGH SEPT 30, 2012.

Table 5-1 lists the number of weekend and weekday days exceeding the 8-hour ozone standard during the 2012 ozone season for stations that meet the U.S. EPA's data completeness requirement and have design values greater than 75 ppb. A "weekend effect," typically experienced in urban areas, results from reduced NOx emissions on weekends leading to higher ozone and consequently more weekend days exceeding the standard. This indicates a benefit of VOC reductions from concurrent reductions from the NOx control strategy or stand-alone VOC controls such as the consumer products program—to minimize inadvertent ozone increases during the course of NOx reduction.

TABLE 5-1

Five-year Weighted Design Values and Number of Days Daily Maximum Concentrations Exceeded 75 ppb in 2012

Station*	2012 5-Year Weighted Design Value (ppb)	Number Of Weekend Days In 2012 With Observed daily max 8-hour Ozone > 75 ppb	Number Of Weekday Days In 2012 With Observed daily max 8-hour Ozone > 75 ppb
Azusa	79.3	9	2
Banning	95.3	21	45
Crestline	103.0	30	59
Fontana	101.0	35	30
Glendora	92.7	29	18
Lake Elsinore	85.3	6	11
Mira Loma	92.7	24	29
Perris	91.0	17	32
Pomona	84.3	12	5
Redlands	104.7	35	50
Reseda	89.0	11	17
Rubidoux	96.3	24	29
San Bernardino	98.0	29	28
Santa Clarita	97.3	30	32
Upland	96.7	25	24

**Stations having design values greater than 75 ppb and meeting data completeness criteria*

Ozone Modeling Approach

The set of 153 days from May 1st through September 30th, 2012 were analyzed to determine the 8-hour maximum ozone for the base (2012) and future attainment years 2023 and 2031—the attainment years for the 1997 standard of 80 ppb and the 2008 standard of 75 ppb, respectively. Both baseline and controlled cases were simulated. The former represents the level of emissions with no additional reductions beyond existing measures, and the latter contains additional emission reductions proposed in the 2016 AQMP to reach attainment.

Finally, a set of simulations with incremental VOC and NOx emission reductions from 2023 and 2031 baseline emissions were generated to create ozone isopleths for each station in the Basin. The ozone isopleths provide guidance in developing control strategies by depicting ozone concentrations as a

function of both NOx and VOC reductions. They provide the basis for estimating the Basin carrying capacity, the maximum allowable emissions of NOx and VOC to reach attainment.

Future Ozone Air Quality

The 2016 AQMP baseline ozone simulations reflect the changes made to the 2023 and 2031 baseline inventories. The 2016 AQMP summer planning inventory for 2023 has a similar VOC/NOx emissions ratio (1.35 vs. 1.37) as the 2012 AQMP, although total tonnages of both precursor emissions are lower than those presented in the 2012 AQMP. Lower 2023 baseline VOC and NOx emissions in the 2016 AQMP relative to the 2012 AQMP reflect the impact of rules and regulations implemented after the 2012 AQMP as well as the recession occurring between 2008 and 2010. The 2012 AQMP relied on the 2012 Regional Transportation Plan (RTP) to forecast future growth. To a certain degree, the 2012 RTP incorporated the impact of the economic recession that occurred during the 2008–2010 period. But, it is unlikely that this growth forecast reflected the full intensity of the recession. For example, the consumption of taxable gasoline consumption reached its minimum level in 2012, which is after the RTP was finalized in April 2012. Therefore, some discrepancies are expected between the projected emissions inventory for 2012 and the 2012 actual emissions data. The new 2016 AQMP inventory is revised to properly account for this impact.

8-Hour Ozone Attainment

The 2016 AQMP addresses both the revoked 1997 8-hour ozone standard of 80 ppb and the 2008 8-hour ozone standard of 75 ppb, for which attainment dates are 2023 and 2031, respectively. Table 5-2 summarizes the results of the updated ozone simulations. The 2023 ozone baseline and 2023 controlled ozone projections from the 2012 AQMP are included in the table for comparison. The 2012 AQMP concluded that NOx emissions must be reduced by 65 percent of baseline emissions to meet the 80 ppb standard by 2023.

TABLE 5-2

Model-Predicted 8-Hour Ozone Concentrations (ppb)

Station	Final 2012 AQMP		2016 AQMP			
	2023 Baseline	2023 Controlled	2023 Baseline	2023 Controlled	2031 Baseline	2031 Controlled
Azusa	95	77	77	70	75	62
Banning	94	73	89	78	85	71
Crestline	107	81	93	81	89	72
Fontana	104	81	96	84	92	75
Glendora	107	84	93	83	90	74
Lake Elsinore	85	66	74	65	70	58
Perris	88	66	80	70	76	62
Pomona	100	80	83	75	81	67
Redlands	103	77	95	82	90	73
Reseda	90	73	79	71	75	64
Riverside	100	77	89	78	86	69
San Bernardino	108	83	90	78	86	70
Santa Clarita	94	73	84	76	80	68
Upland	106	83	92	82	89	73

Both 2023 and 2031 baseline scenarios that do not contain additional reductions beyond already adopted measures do not lead to attainment, indicating additional emission reductions are necessary to meet the standards. The carrying capacities, the maximum allowable NOx emissions to meet ozone standards, are estimated to be 141 TPD NOx in 2023, and 96 TPD NOx in 2031. These are equivalent to an additional 45 percent and 55 percent of NOx reductions, respectively, from the 2023 and 2031 baseline emission levels. These reductions will ensure attainment of the federal 8-hour standard by 2023 and the 2008 standard by 2031 at all stations.

The proposed needed reductions are significantly less than the estimates presented in the 2007 and 2012 AQMPs. Several factors contributed to this change. First, the 2012 base year design values are lower than the 2005 and 2008 base year design values used in the 2007 AQMP and the 2012 AQMP, respectively, due to the improvements in air quality with time, indicating greater than expected efficacy of control strategies implemented in the Basin. Secondly, improvements introduced to the emissions inventory led to better estimates of 2023 emissions. 2023 baseline emissions were revised significantly in the 2012 AQMP from the 2007 AQMP due to emission changes in the on-road truck and off-road equipment categories resulting from CARB rulemaking. The 2023 baseline emission projections were further revised in the 2016 AQMP. The revised 2023 baseline shows 255 TPD of total NOx emissions compared to the 319 TPD projected in the 2012 AQMP and the 506 TPD projected in the 2007 AQMP. The lower baseline emissions reflect the impact of rules and regulations implemented after the release of the previous AQMPs. Also, while the recession that occurred during the 2008 to 2010 period was incorporated in the 2012 AQMP inventory, its impact was further refined in the 2016 AQMP, resulting in lower 2023 emissions than what was originally predicted in the 2012 AQMP. Methodological updates to emissions estimates contributed to the changes as well. For example, the allocation of LPG consumption data for the Basin compared to the State was reduced by approximately 50 percent based on the most recent data from the State's GHG reporting system. The lower NOx emissions baseline leads to a lower percentage of needed reductions. Thirdly, the new attainment demonstration focuses only on top 10 concentration days, as discussed previously. The RRF approach used in the 2012 AQMP, based on U.S. EPA guidance available at the time, included more than 60 days, approximately two thirds of the total simulation days. According to U.S. EPA, the approach using the top 10 days yields a slightly better estimate of the actual observed ozone change than the previous approach of focusing on the days most likely to exceed the standard.

Spatial Projections of 8-Hour Ozone Design Values

The spatial distribution of ozone design values for the 2012 base year is shown in Figure 5-3. Projected 8-hour ozone design values for 2023 and 2031 with and without implementation of all proposed control measures are presented in Figures 5-4 through 5-7. The predicted ozone concentrations will be significantly reduced in future years in all parts of the Basin with the control measures proposed in the 2016 AQMP. Future design values are predicted from modeled RRFs and base-year design values. Future design values are then interpolated to cover the areas between monitoring stations using a natural neighbor interpolation, the interpolation scheme that best represents the Basin. Refer to Appendix V for details.

Appendix V also provides base year model performance statistics and grid-level CMAQ predictions for the base and future milestone years as well as a weight of evidence discussion to support the modeling attainment demonstration.

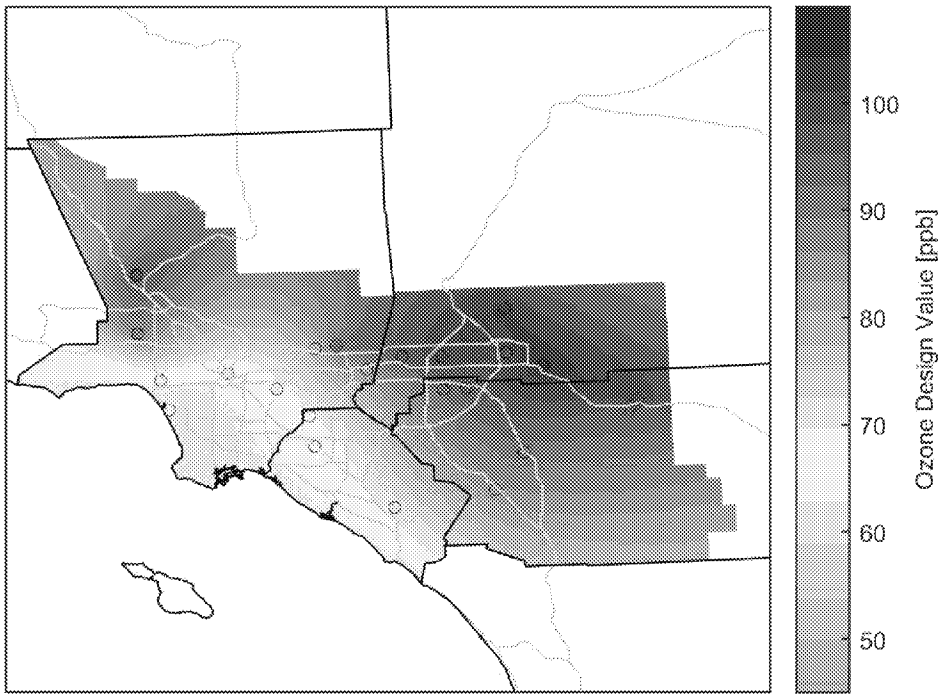


FIGURE 5-3

INTERPOLATED 5-YEAR WEIGHTED 8-HOUR OZONE DESIGN VALUES (ppb) FOR 2012. VALUES ARE COLOR-CODED TO CORRESPOND TO THE 2008 75 ppb AIR QUALITY INDEX

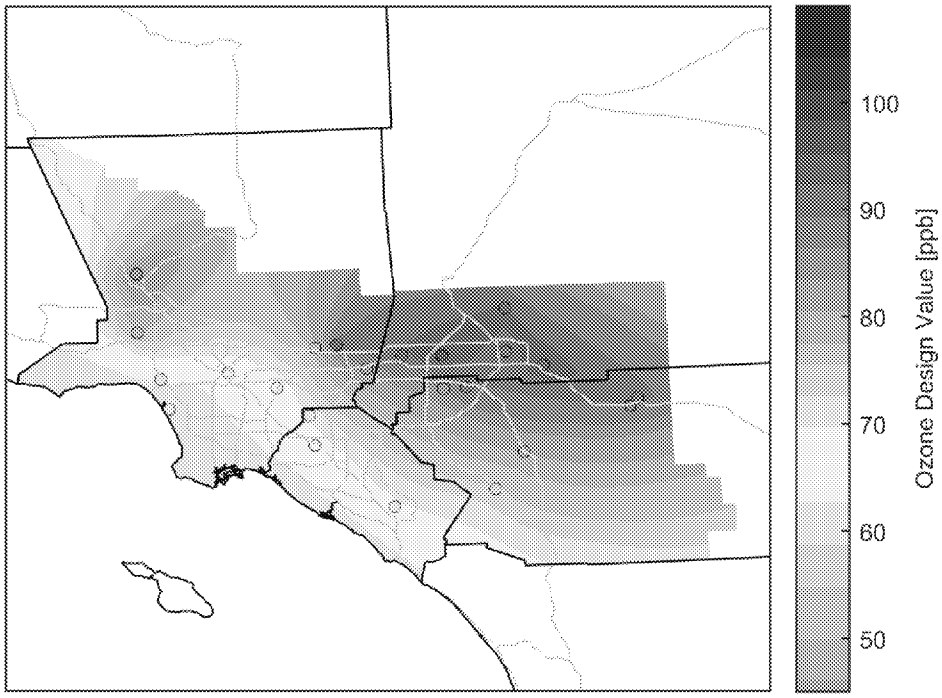


FIGURE 5-4

INTERPOLATED 2023 BASELINE 8-HOUR OZONE CONCENTRATIONS (ppb). VALUES ARE COLOR-CODED TO CORRESPOND TO THE 2008 75 ppb AIR QUALITY INDEX

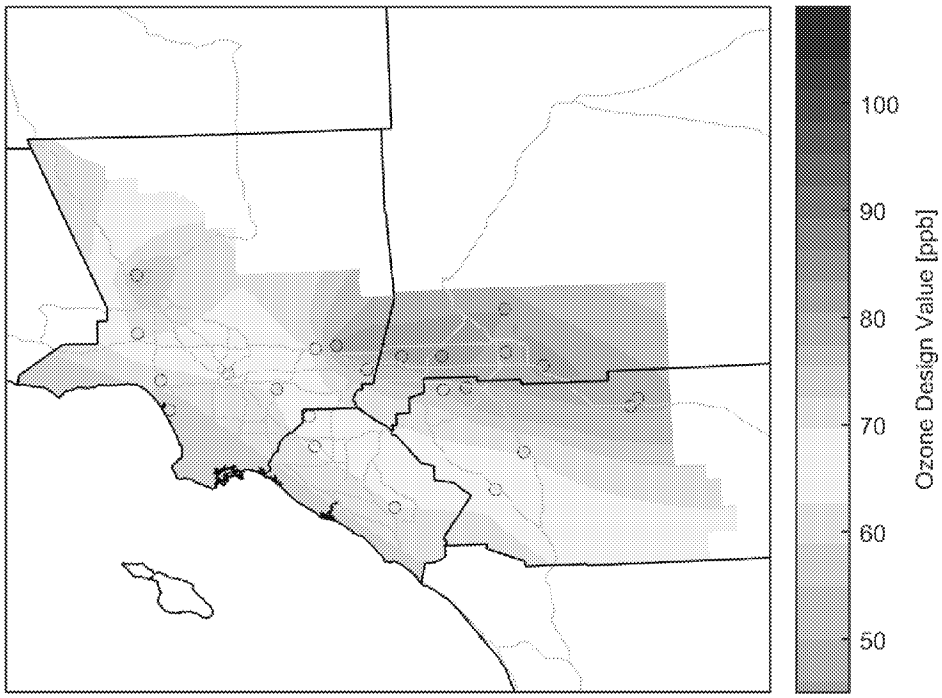


FIGURE 5-5

INTERPOLATED 2023 CONTROLLED 8-HOUR OZONE CONCENTRATIONS (ppb). VALUES ARE COLOR-CODED TO CORRESPOND TO THE 2008 75 ppb AIR QUALITY INDEX

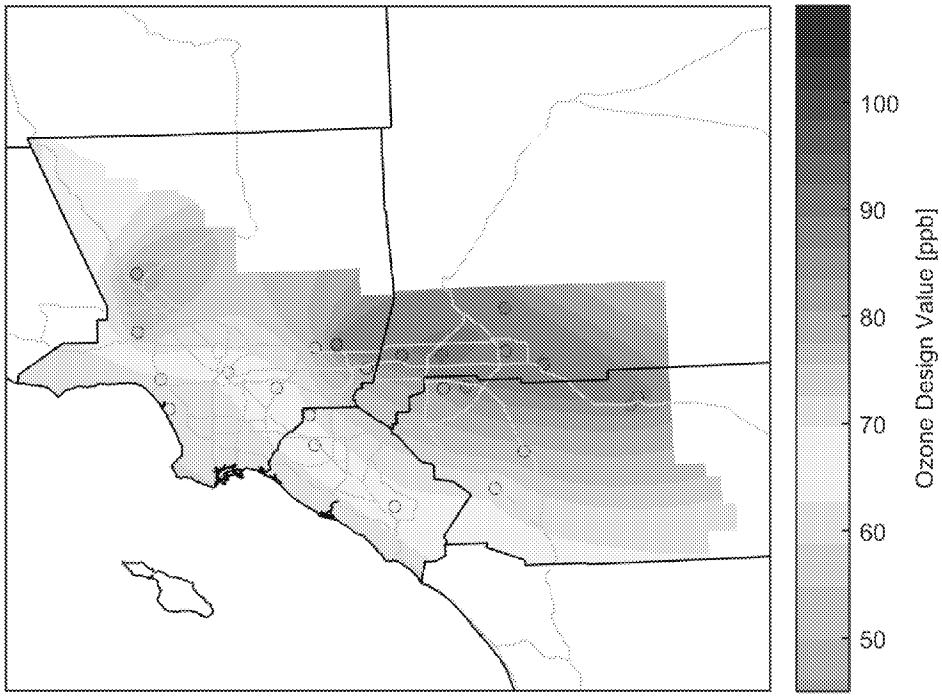


FIGURE 5-6

INTERPOLATED 2031 BASELINE 8-HOUR OZONE CONCENTRATIONS (ppb). VALUES ARE COLOR-CODED TO CORRESPOND TO THE 2008 75 ppb AIR QUALITY INDEX

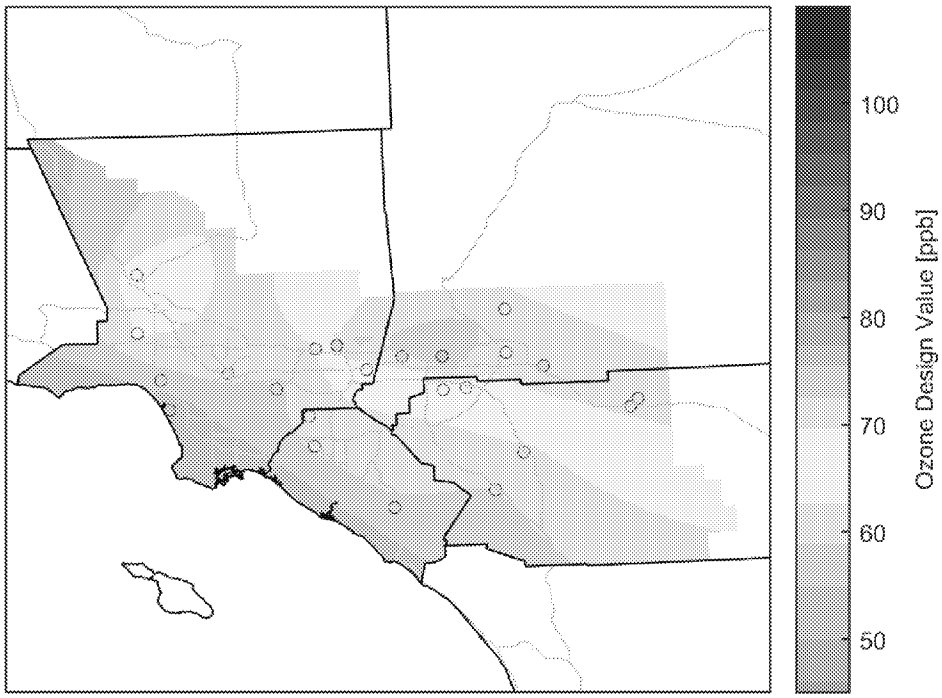


FIGURE 5-7

INTERPOLATED 2031 CONTROLLED 8-HOUR OZONE CONCENTRATIONS (ppb). VALUES ARE COLOR-CODED TO CORRESPOND TO THE 2008 75 ppb AIR QUALITY INDEX

1-Hour Ozone Attainment

The 2016 AQMP also addresses the 1979 1-hour ozone standard of 120 ppb with an attainment date of 2022. Table 5-3 summarizes the results of the updated ozone simulations. The 2012 AQMP projected baseline and controlled design values using a RRF analysis are also included for comparison. The 2022 baseline scenario with no additional reductions beyond already adopted measures does not lead to attainment, indicating that additional emission reductions are necessary to meet the standards. The carrying capacity to attain the 1-hour standard is approximately 245 TPD of NOx, indicating the need to reduce NOx emission by approximately 50 TPD. However, unlike 8-hour ozone which responds to NOx reductions much more than VOC reductions, 1-hour ozone responds to VOC reductions as sensitively as NOx reductions. Therefore, VOC reductions are as effective as NOx reduction in attaining the 1-hour standard. Consequently, the 1-hour ozone standard can be attained with a combined approximate 50 TPD reduction of either NOx or VOC emissions. The attainment scenario presented in the following table and figures were conducted with 33 TPD of NOx emissions reduction and 16 TPD of concurrent VOC reductions that are expected to occur from the NOx strategy. Note that the emission reductions for the 1-hour ozone strategy are a part of the 8-hour ozone strategy, but were identified to be feasible for early implementation. The control strategies to meet the 80 ppb 8-hour standard in 2023 are expected to achieve reductions necessary to meet the 1-hour standard in 2022.

TABLE 5-3

Base-year Design Values and Model-Predicted 1-Hour Ozone Design Values (ppb)

Station	2012 5-Year Weighted Design Value	Final 2012 AQMP		2016 AQMP	
		2022 Baseline	2022 Controlled	2022 Baseline	2022 Controlled
Azusa	112	139	131	104	101
Banning	-	119	102	--	--
Burbank	-	123	111	--	--
Crestline	132	134	116	120	118
Fontana	138	128	110	125	122
Glendora	132	143	133	121	119
Lake Elsinore	108	108	90	93	91
Pasadena	-	141	134	--	--
Perris	114	111	94	108	106
Pomona	117	124	108	103	101
Redlands	133	127	109	120	118
Reseda	125	112	101	105	103
Riverside	124	116	103	109	106
San Bernardino	123	127	110	107	104
Santa Clarita	132	119	105	110	108
Upland	135	135	121	122	119

NOTE: Burbank, Pasadena, and Banning do not have 5-year weighted 2012 base-year design values due to incomplete measurement data, and therefore, it was not possible to calculate 2022 design values at these stations. Burbank does not meet U.S. EPA data completeness requirements in 2014, Pasadena does not meet U.S. EPA data completeness requirements in 2013, and Banning does not meet U.S. EPA data completeness requirements in 2013.

With proposed controls in place, the analysis demonstrates that all stations in the Basin will meet the 1979 federal 1-hour ozone standard by 2022. The proposed reduction percentage and the carrying

capacity are lower than the estimates presented in the 2012 AQMP due to the same reasons discussed previously for the 8-hour ozone modeling.

Spatial Projections of 1-Hour Ozone Design Values

The spatial distribution of 1-Hour ozone design values for the 2012 base year is shown in Figure 5-8. Future year ozone air quality projections for 2022 with and without implementation of all proposed control measures are presented in Figures 5-9 through 5-10. The predicted ozone concentrations will be significantly reduced in the future years in all parts of the Basin with the control measures proposed in the 2016 AQMP. Future design values are predicted from modeled RRFs and measured base-year design values. Future design values are then interpolated using a natural neighbor interpolation to generate the interpolated fields.

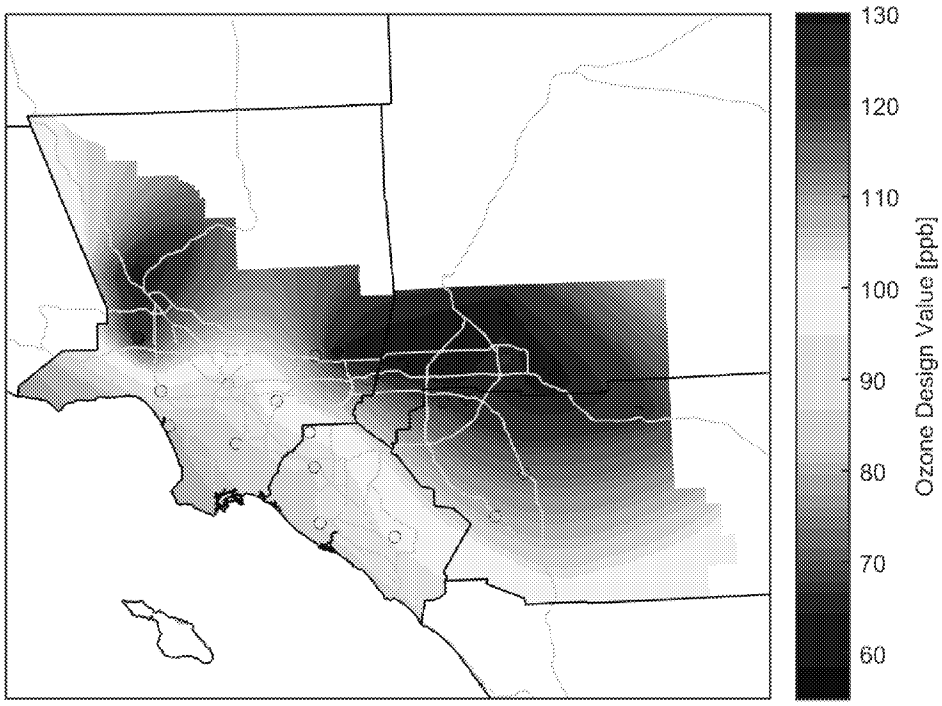


FIGURE 5-8
2012 OBSERVED 5-YEAR WEIGHTED 1-HOUR OZONE DESIGN VALUES (ppb)

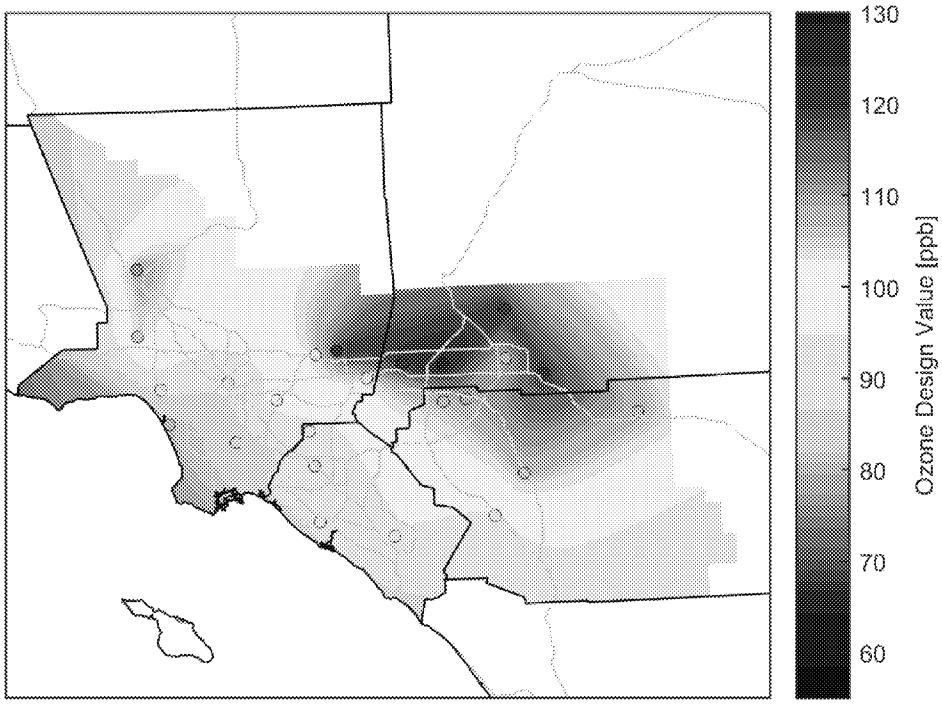


FIGURE 5-9
MODEL-PREDICTED 2022 BASELINE 1-HOUR OZONE CONCENTRATIONS (ppb)

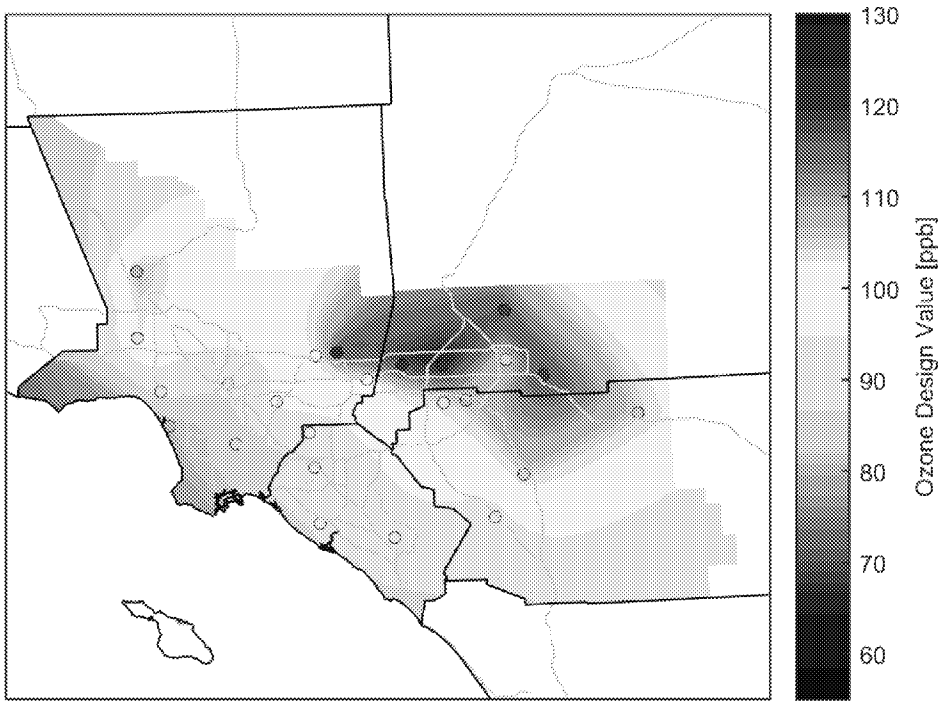


FIGURE 5-10
MODEL-PREDICTED 2022 CONTROLLED 1-HOUR OZONE CONCENTRATIONS (ppb)

Weight of Evidence

Ozone modeling guidance strongly recommends the use of corroborating evidence to support the future year attainment demonstration. The weight of evidence demonstration for the 2016 AQMP includes a model performance evaluation on the temporal profile of on-road mobile source emissions and spatial surrogate profiles of area source emissions. Detailed discussions of all model results and the weight of evidence discussion are provided in Appendix V.

PM2.5 Modeling Approach

Simulations for the PM2.5 concentrations were conducted for 2012 (base year), 2019 (24-hour PM2.5 attainment date), and 2025 (annual PM2.5 attainment date for "serious" nonattainment status). In addition, 2023 was included in the analysis to evaluate the co-benefits from the ozone control strategy.

Design Values and Relative Response Factors (RRF)

The 24-hour PM2.5 design value is determined from the three-year average of the 98th percentile of all 24-hour concentrations sampled at a monitoring site. The annual PM2.5 design value is based on the four quarterly average PM2.5 concentrations, averaged by year, for a three-year period.

Design Value Selection

U.S. EPA guidance recommends the use of multiple year averages of design values, where appropriate, to dampen the effects of single year anomalies to the air quality trend due to factors such as adverse or favorable meteorology or radical changes in the local emissions profile. The trend in the Basin 24-hour PM2.5 design values, determined from routine Federal Reference Method (FRM) samples from 1999 through 2014 (Figure 5-11), depicts large reductions in concentrations over the period. However, the rate of decrease in both annual and 24-hour design values has slowed or reversed in recent years. The 24-hour PM2.5 design value for 2001 was 76 $\mu g/m^3$ while the 2014 design value (based on data from 2012, 2013 and 2014) was 38 $\mu g/m^3$. The annual PM2.5 design value has demonstrated a reduction of 15.2 $\mu g/m^3$ over the period from 2001 through 2014. The slowing or reversal in the rate of PM2.5 reduction in recent years is largely due to the reduced atmospheric cleansing and mixing from the multi-year drought affecting the region. In the absence of this severe drought, it is anticipated that the Basin would be even closer to attaining both the annual and 24-hour PM2.5 standards, as projected in the previous AQMPs.

Consistent with U.S. EPA guidance, the 2016 AQMP relies on a five-year weighted annual average centered on 2012, the base year selected for the emissions inventory development, WRF simulations and the anchor year for the future year ozone and PM2.5 projections.

Table 5-4 provides the five-year weighted 2012 annual and 24-hour average PM2.5 design values for four Speciation Air Sampling System (SASS) sites – Anaheim, Fontana, Los Angeles and Riverside, as well as Mira Loma, the station with the highest PM2.5 design value in the Basin and the only station currently exceeding the 24-hour PM2.5 standard.

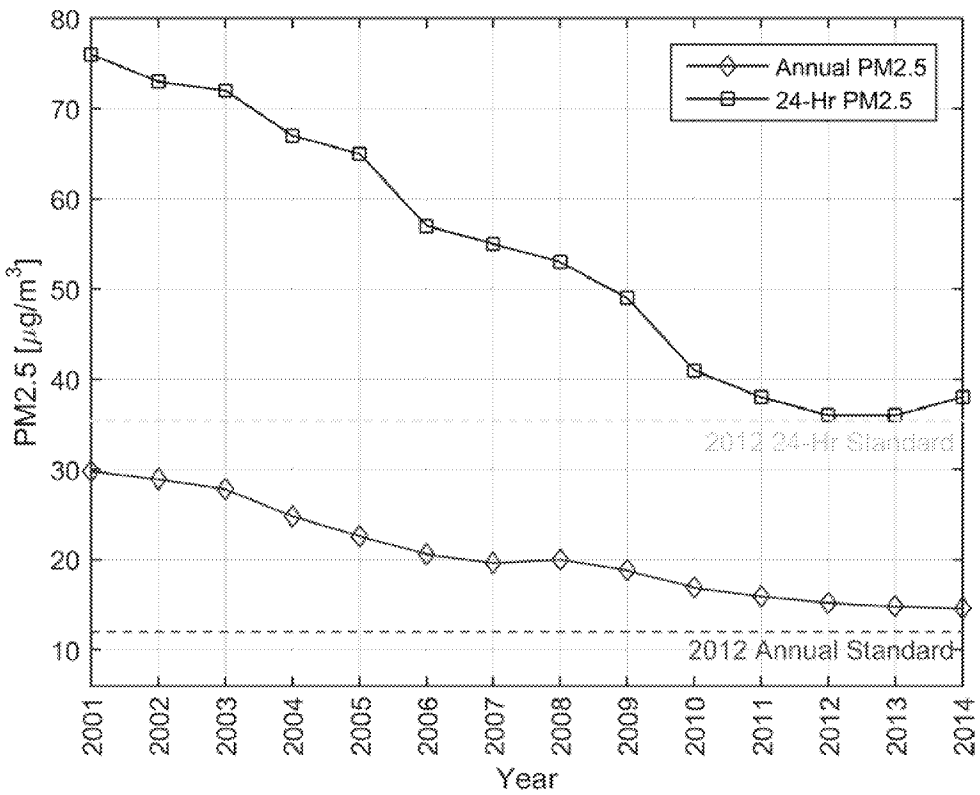


FIGURE 5-11

SOUTH COAST AIR BASIN ANNUAL PM2.5 AND 24-HOUR AVERAGE DESIGN VALUES.

TABLE 5-4

2012 Five-year Weighted PM2.5 Design Values (DV) (μg/m^3)

Monitoring Site	Annual DV	24-Hour DV
Anaheim	10.57	26.0
Fontana	12.60	32.7
Los Angeles	12.43	31.0
Mira Loma	14.87	36.7
Riverside Rubidoux	13.13	33.0

Calculated based on quarterly observed data between 2010 and 2014

PM2.5 Modeling

PM2.5 is either directly emitted into the atmosphere (primary particles), or formed through atmospheric chemical reactions from precursor gases (secondary particles). Primary PM2.5 includes road dust, diesel

soot, combustion products, and other sources of fine particles. Secondary products, such as sulfates, nitrates, and complex organic carbon compounds are formed from reactions with oxides of sulfur, oxides of nitrogen, VOCs, and ammonia.

PM2.5 speciation data measured at four SASS sites during 2012 provided the chemical characterization for evaluation and validation of the CMAQ model predictions. With one site in each county, the four SASS sites are strategically located to represent aerosol characteristics in the four counties in the Basin. Riverside-Rubidoux was traditionally the Basin maximum location. Fontana and Anaheim experience high concentrations within their respective counties, and the Central Los Angeles site was intended to capture the characteristics of an emission source area. The close proximity of Mira Loma to Rubidoux and the common in-Basin air flow and transport patterns enable the use of the Rubidoux speciated data as representative of the particulate speciation at Mira Loma. Both sites are directly downwind of the dairy production areas in Chino and the warehouse distribution centers located in the northwestern corner of Riverside County. Speciated data monitored at the selected sites for MATES IV, which were conducted for the period of June 2012 to June 2013, were analyzed to corroborate the applicability of using the 2012 chemical profiles.

Model performance was evaluated against concentrations of ammonium, nitrates, sulfates, secondary organic matter, elemental carbon, primary and total mass of PM2.5 measured at the four monitoring sites (Rubidoux, Central Los Angeles, Anaheim, and Fontana).

The following section summarizes the PM2.5 modeling approach conducted in preparation for this Plan. Details of the PM2.5 modeling are presented in Appendix V.

Annual PM2.5 Modeling Approach

The 2016 AQMP annual PM2.5 modeling employs the same approach in estimating the future year annual PM2.5 levels as was described in the 2012 AQMP attainment demonstrations except for updates in the modeling platform, input databases and emissions inventory. Future year PM2.5 annual average air quality is determined using site- and species-specific quarterly-averaged RRFs applied to the weighted quarterly average 2012 PM2.5 design values per U.S. EPA guidance (U.S. EPA, 2014[2]).

CMAQ simulations were conducted for 366 days from January 1 to December 31 of 2012. The simulations included 8,784 consecutive hours from which daily 24-hour average PM2.5 concentrations were calculated. A set of RRFs were generated for each future year simulation. RRFs were generated for ammonium (NH4), nitrate (NO3), sulfate (SO4), organic carbon (OC), elemental carbon (EC), sea salts (Salt) and a combined grouping of crustal compounds and metals (Others). For each species, a total of 16 RRFs were generated for each future year simulation (four seasons and four monitoring sites). Future year design values were calculated by multiplying the species- and site-specific RRFs by the corresponding quarterly mean component concentration. The quarterly mean components were summed to get

[2] https://www3.epa.gov/ttn/scram/guidance/guide/Draft_O3-PM-RH_Modeling_Guidance-2014.pdf

quarterly mean PM2.5 levels, which were then averaged to determine the annual design values (Table 5-5).

24-Hour PM2.5 Modeling Approach

The RRF approach requires two components: base year design values from measurement data and RRFs from model predictions per U.S. EPA guidance. The base year design value is established using the top 8 days in each quarter per year for the five-year period used in the weighted average (2010–2014). Details on the RRF approach for the 24-hour PM2.5 attainment demonstration are provided in Appendix V. Future year PM2.5 24-hour average concentrations are presented for the 2019 24-hour PM2.5 attainment deadline. The projection suggests that the 2019 baseline with no further controls will attain the standard, which is consistent with the results presented in the 2012 AQMP. In addition, Appendix V includes discussions for chemical speciation, an unmonitored area analysis, and an analyses of the potential impact of future drought conditions.

Future PM2.5 Air Quality

Annual PM2.5

Annual PM2.5 concentrations were simulated for the base year (2012) and future milestone years (2021 and 2025). For the future years, both baseline and control scenarios were included in the analysis. The results are presented in Table 5-5 and Figure 5-12. Mira Loma, the design site for the base year, has a five-year weighted design value of 14.9 $\mu g/m^3$ in 2012, in attainment of the previous 1997 standard (15 $\mu g/m^3$), but not the 2008 standard. Mira Loma is projected to remain as the highest PM2.5 site in 2025. The baseline cases, which do not include additional controls beyond already adopted measures, project future design values close to 12.3 $\mu g/m^3$ but are not low enough to meet the standard. Still, the future year concentrations are expected to be well below the previous 1997 standard. The control scenarios capturing SCAQMD stationary source PM2.5 measures in the 2016 AQMP were evaluated as well. However, it is practically challenging to implement the directly emitted PM reductions from the SCAQMD PM control measures by 2021 and, even if so, the emission reductions from those measures are not enough to achieve attainment in 2021.

Annual PM2.5 concentrations were further evaluated using emission reduction co-benefits from the ozone strategy for 2023. When all the NOx and VOC reductions proposed to attain the 80 ppb ozone standard are implemented in 2023, the PM2.5 annual design value for 2023 is expected to be 11.1 $\mu g/m^3$, demonstrating attainment of the annual standard two years in advance of the 2025 "serious" area deadline. However, the ozone strategy may include CAA Section 182(e)(5) measures that are allowed in the SIP for ozone "extreme" nonattainment areas, but not for PM2.5. Therefore, an attainment scenario using only the control measures anticipated to be approved without 182(e)(5) flexibility was developed for 2025. This scenario showed an annual PM2.5 design value of 12.0 $\mu g/m^3$ at the Mira Loma site, indicating that the annual PM2.5 standard is expected to be met by 2025 without additional measures directed specifically at PM reductions.

TABLE 5-5

Annual Average PM2.5 Design Concentrations (μg/m^3)

Station	2012	2025 Baseline	2025 Control	2023 O3 Attainment Scenario
Anaheim	10.6	9.3	9.1	8.7
Fontana	12.6	10.5	10.3	9.7
Los Angeles	12.4	10.8	10.4	9.7
Mira Loma	14.9	12.3	11.8	11.1
Rubidoux	13.2	10.9	10.6	9.9

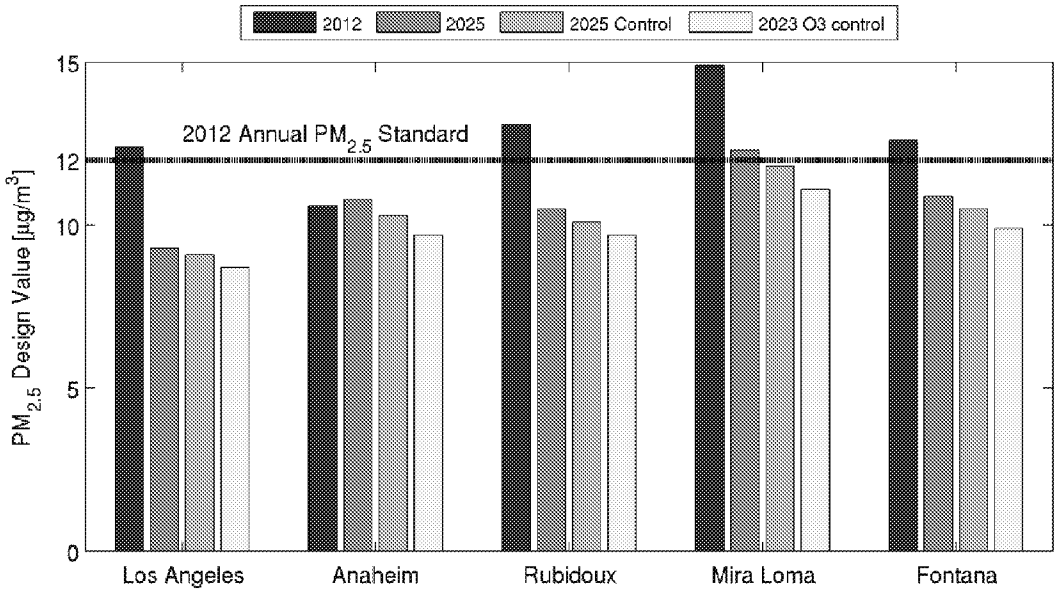


FIGURE 5-12

ANNUAL AVERAGE PM2.5 CONCENTRATIONS. FEDERAL STANDARD IS DENOTED WITH A HORIZONTAL GREY LINE

Spatial Projections of Annual PM2.5 Design Values

Figure 5-13 provides a perspective of the Basin-wide spatial extent of annual PM2.5 design values in the base year, 2012. Figure 5-14 shows the projected PM2.5 concentrations in 2023 with the full implementation of the ozone control strategy, but no additional control on directly emitted PM. The 2025 baseline case does not lead to attainment of the standard (Figure 5-15), but NOx and VOC reductions from non-182(e)(5) control measures are expected to lead to attainment as all the monitoring stations within the Basin exhibit annual PM2.5 levels below the federal standard of 12 µg/m^3 (Figure 5-16).

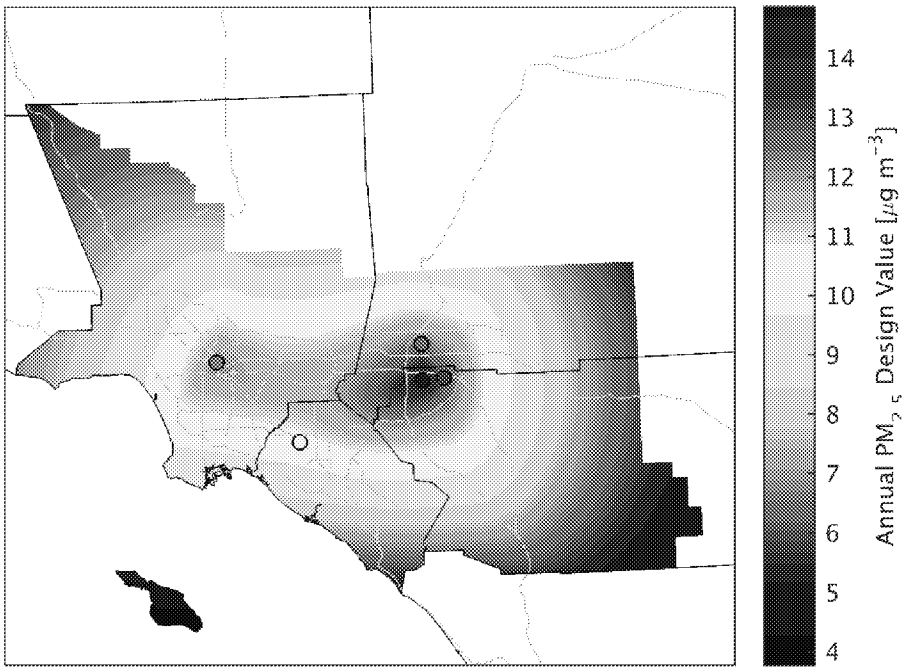


FIGURE 5-13
5-YEAR WEIGHTED ANNUAL PM2.5 DESIGN VALUES (µg/m^3) for 2012

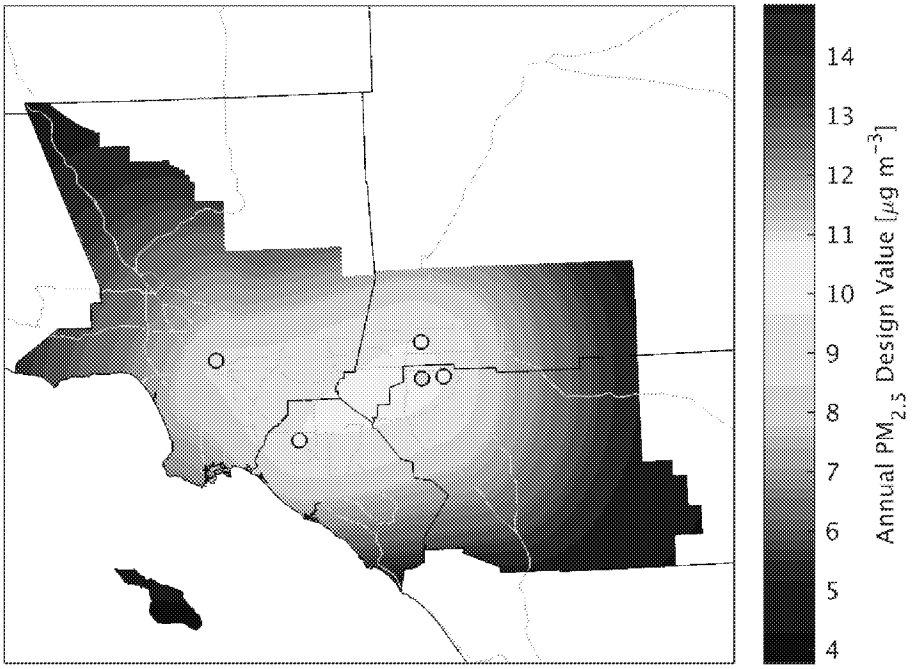


FIGURE 5-14

ANNUAL PM2.5 CONCENTRATIONS (μg/m^3) WITH 2023 8-HOUR OZONE ATTAINMENT SCENARIO

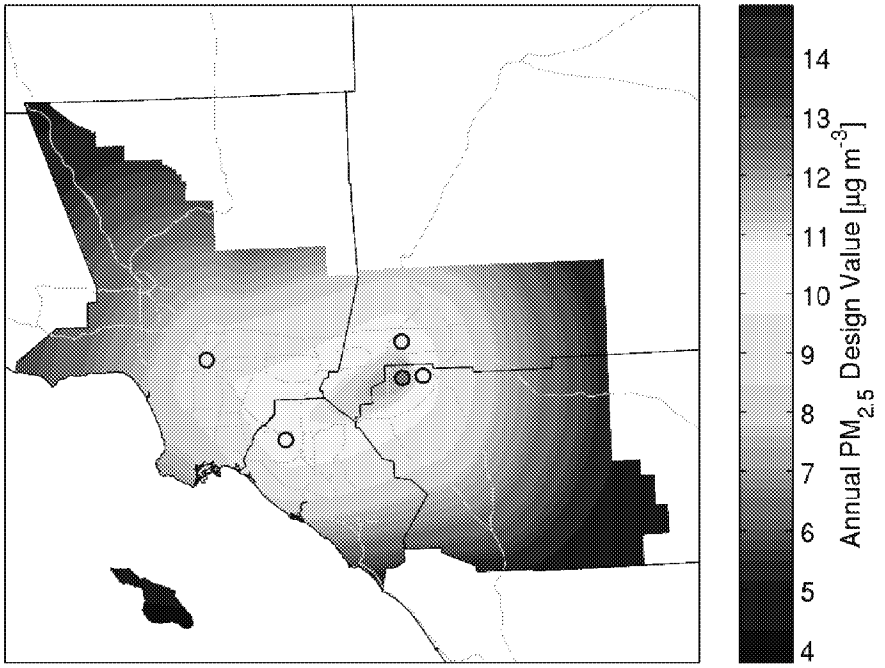


FIGURE 5-15

ANNUAL PM2.5 CONCENTRATIONS (μg/m^3) WITH 2025 BASELINE EMISSIONS

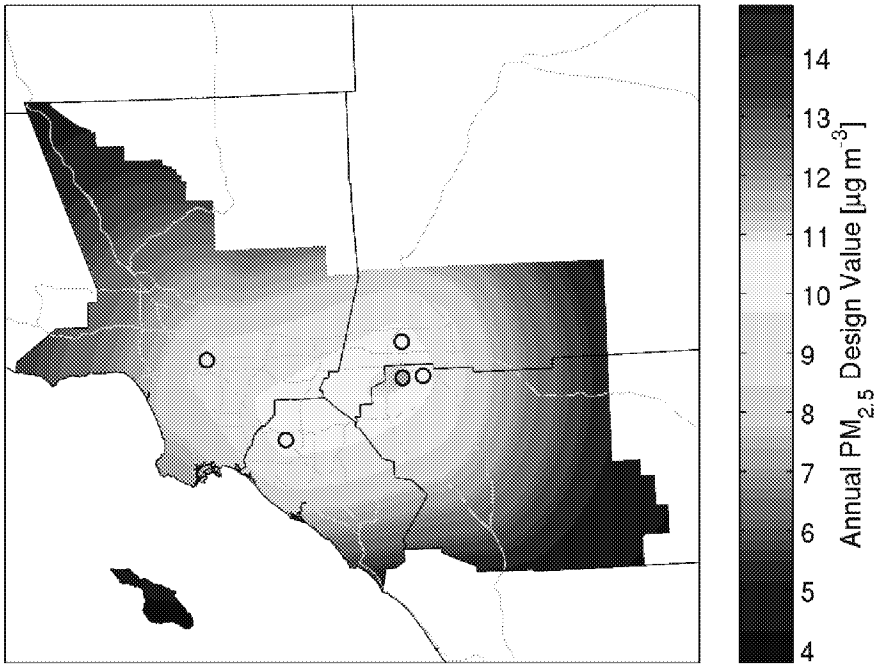


FIGURE 5-16
ANNUAL PM2.5 CONCENTRATIONS (µg/m^3) for 2025 ATTAINMENT SCENARIO

24-Hour PM2.5

A numerical simulation with 2019 baseline emissions was conducted to assess 24-hour PM2.5 attainment status in the Basin. Simulation of the 2019 baseline emissions indicates that the Basin will attain the federal 24-hour PM2.5 standard in 2019 without additional controls (See Table 5-6 and Figure 5-17). This is consistent with the findings of the 2012 AQMP, which demonstrated attainment in 2019 without any additional controls. The projected 2019 design value is 32.1 µg/m^3 at Mira Loma.

The level of 24-hour PM2.5 concentrations projected for 2019 is significantly lower than the standard (35 µg/m^3). While the District is committed to attain as expeditiously as practicable, unforeseen meteorological conditions such as drought or severe wild fire events would hinder the projected attainment. For example, the severe drought that prevailed from 2011 to 2015 delayed the attainment projected in the 2012 AQMP and the subsequent Supplement to the 2012 AQMP. However, the lower projected design value will help to ensure attainment even in the presence of unforeseen meteorological events. Detailed discussions of the impacts of the drought on PM2.5 are included in Appendix V.

TABLE 5-6

24-Hour Average 5-Year Weighted PM2.5 Concentrations (μg/m^3)

Station	2012 Base Year	2019 Baseline
Anaheim	25.8	23.5
Fontana	32.7	28.0
Los Angeles	30.5	27.6
Mira Loma	36.5	31.4
Rubidoux	33.2	28.3

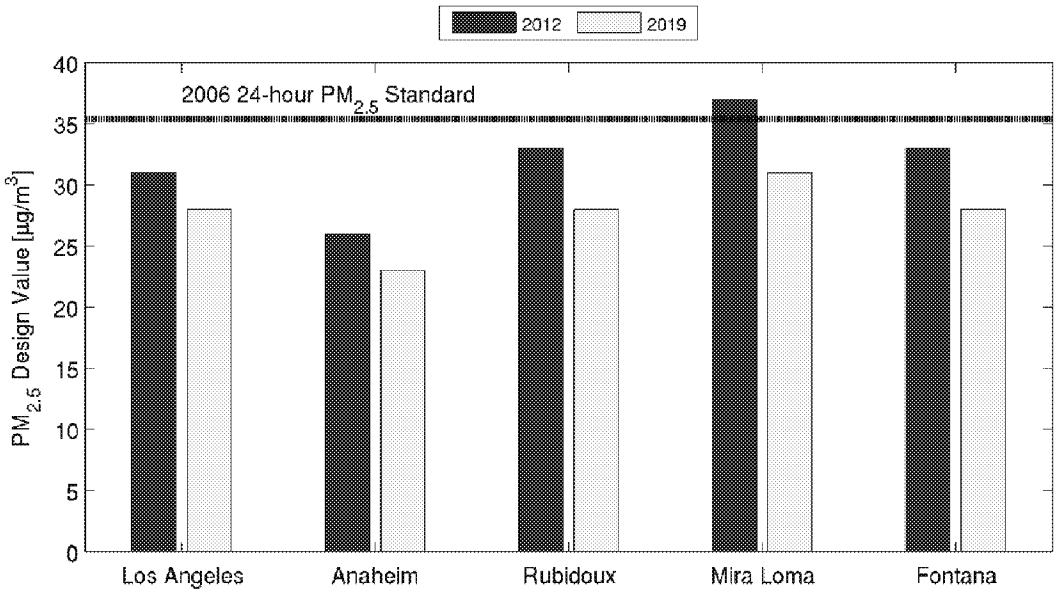


FIGURE 5-17

MAXIMUM 24-HOUR AVERAGE PM2.5 DESIGN CONCENTRATIONS: 2012 BASELINE AND 2019 BASELINE (NO ADDITIONAL CONTROLS).

Spatial Projections of 24-Hour PM2.5 Design Values

Figure 5-18 provides the Basin-wide spatial extent of 24-hour PM2.5 levels in the base year resulting from the interpolation of design values at the four speciation stations and Mira Loma. Several areas around the northwestern portion of Riverside and southwestern portion of San Bernardino Counties depict grid cells with weighted PM2.5 24-hour design values exceeding 35 µg/m^3 in 2012. Figure 5-19 shows an interpolated spatial representation of future model-predicted 24-hour design values in 2019. By 2019, Mira Loma, the PM2.5 24-hour design station, will attain the federal standard. The design values in other areas, determined by interpolation of the five stations, will also attain the federal standard.

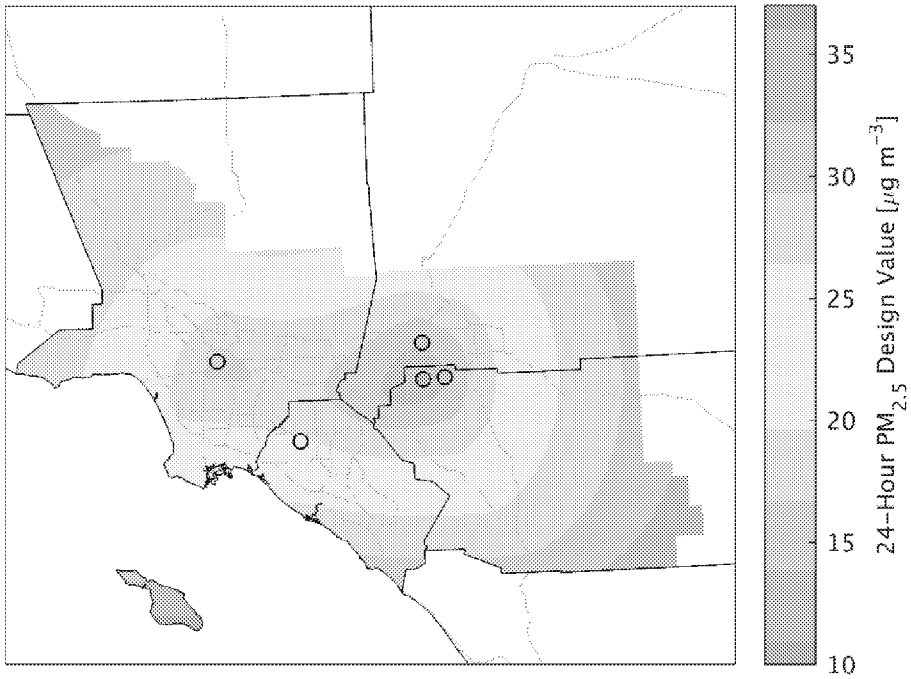


FIGURE 5-18

2012 BASELINE 24-HOUR PM2.5 CONCENTRATIONS (µg/m^3). COLORS CORRESPOND TO THE AIR QUALITY INDEX

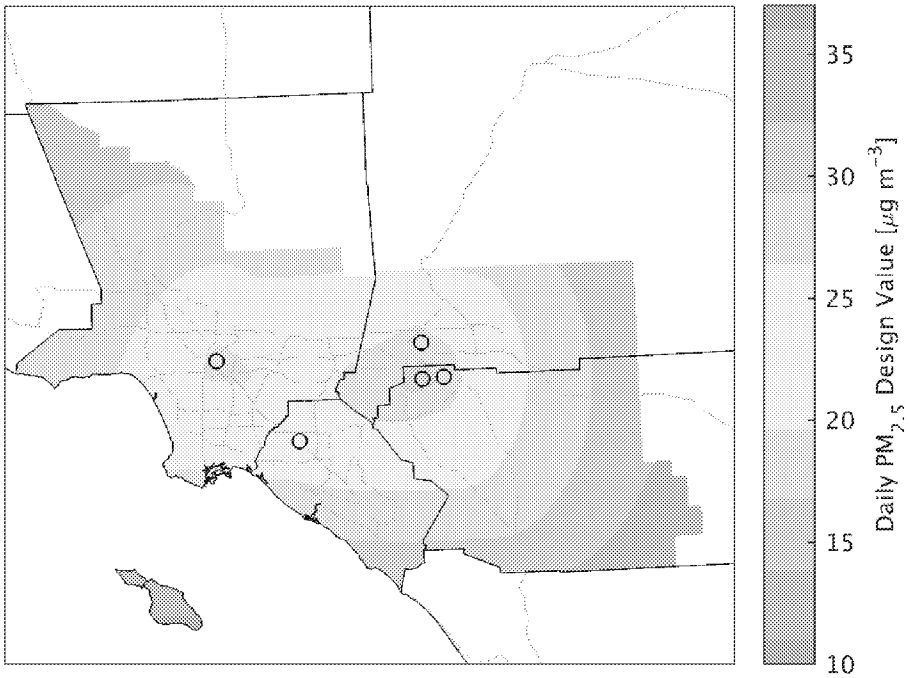


FIGURE 5-19
2019 24-HOUR PM2.5 CONCENTRATIONS (μg/m^3). COLORS CORRESPOND TO THE AIR QUALITY INDEX

Additional Modeling Analyses

A First Look at Attaining the 2015 8-Hour Ozone Standard

In 2015, the U.S. EPA lowered the federal 8-hour ozone standard to 70 ppb. Recent 8-hour ozone rule implementation guidance requires that a SIP revision with an updated attainment demonstration and control strategy be submitted to U.S. EPA no later than four years after designation. The Basin will likely be designated as an "extreme" nonattainment area for the new standard in 2017, consistent with the classification of the 75 ppb standard. Thus, the deadline for attainment of the 70 ppb standard is 20 years after designation (likely 2037), six years after the attainment deadline for the 75 ppb federal standard. It is critical to conduct preliminary analyses to assess the need for potential adjustments to the overall control strategy when considering this new standard and deadline.

The preliminary projections, based upon ozone "isopleths" developed for the 2031 emission scenarios indicate that 2037 Basin NOx carrying capacity to meet the 70 ppb standard could be as low as 75 TPD. This is additional 62 percent NOx reduction beyond the projected 2037 baseline and 25 TPD of additional NOx emission reductions between 2031 and 2037. Further discussion of the Basin's status relative to the new 2015 8-hour ozone standard is presented in Chapter 8.

Summary and Conclusions

Figure 5-20 shows the Basin-wide maximum 8-hour ozone concentrations in the base year (2012) along with projected design values for the attainment deadline of the 1997 standard of 80 ppb (2023) and for the 2008 standard of 75 ppb (2031). Figure 5-21 shows the same projected design values relative to the California standards. With the controls proposed in the 2016 AQMP, the future year ozone concentrations are expected to meet the federal standards. NOx reductions of approximately 45 percent and 55 percent from the baseline levels are needed in 2023 and 2031, respectively (Figure 5-22). Approximately 50 TPD of NOx and VOC combined reductions from the 2022 baseline are needed to meet the 1-hour ozone standard in 2022, confirming that the 8-hour standard is a more stringent form than the 1-hour standard. The strategies developed for attainment of the 2023 and 2031 8-hour standards will ensure attainment of the 1-hour standard in 2022 (Table 5-7).

The California standard for 8-hour ozone is 70 ppb, the same level as the 2015 revised federal standard. This state standard will not be achieved by 2031. Preliminary analysis suggests additional emission reductions beyond the level required in 2031 are needed to meet the 70 ppb standard. Challenges in achieving the 70 ppb standard are discussed in Chapter 8.

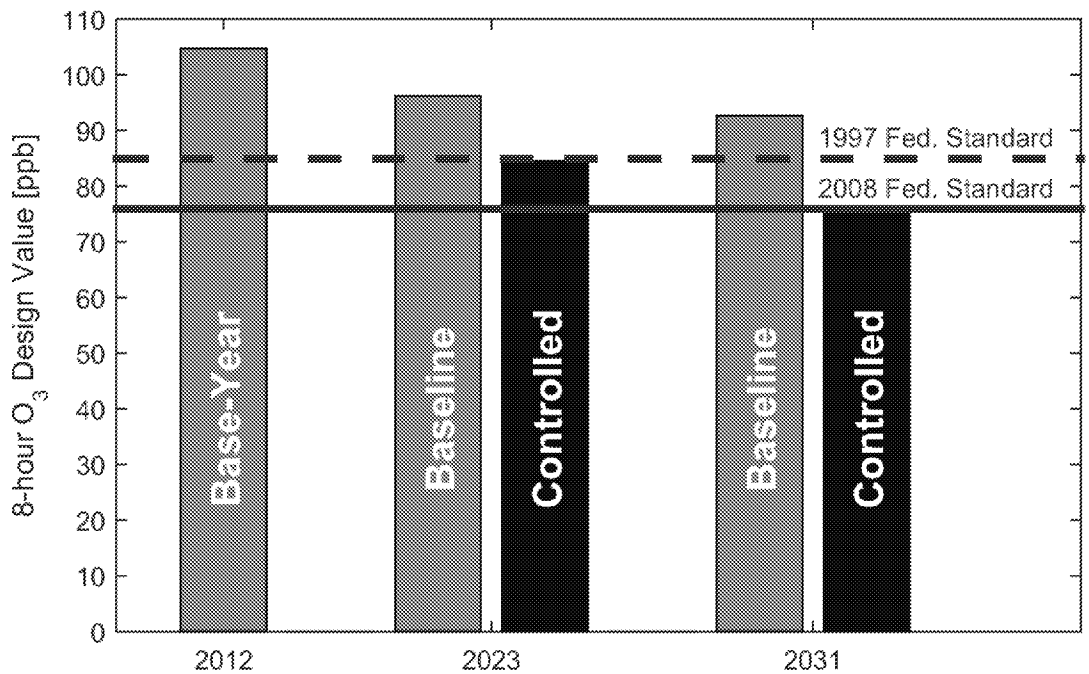


FIGURE 5-20

PROJECTION OF FUTURE 8-HOUR OZONE AIR QUALITY IN THE BASIN IN COMPARISON TO FEDERAL STANDARDS

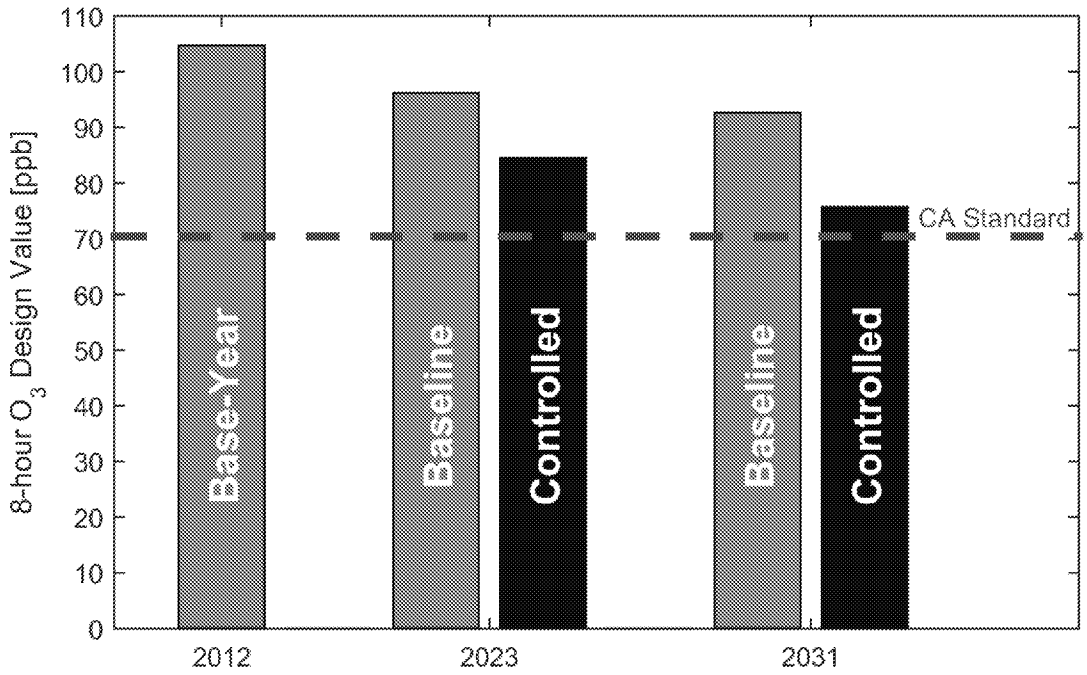


FIGURE 5-21

PROJECTION OF FUTURE 8-HOUR OZONE AIR QUALITY IN THE BASIN IN COMPARISON TO CALIFORNIA STANDARDS

TABLE 5-7

Basin NOx Carrying Capacity for Ozone Attainment

Attainment Year	2022	2023	2031
Federal Standard	1-hr Ozone (120 ppb)	8-hr Ozone (80 ppb)	8-hr Ozone (75 ppb)
NOx Carrying Capacity (TPD)	245*	141	96

*The reductions needed to attain the 1-hour standard can be achieved from either NOx or VOC emissions.

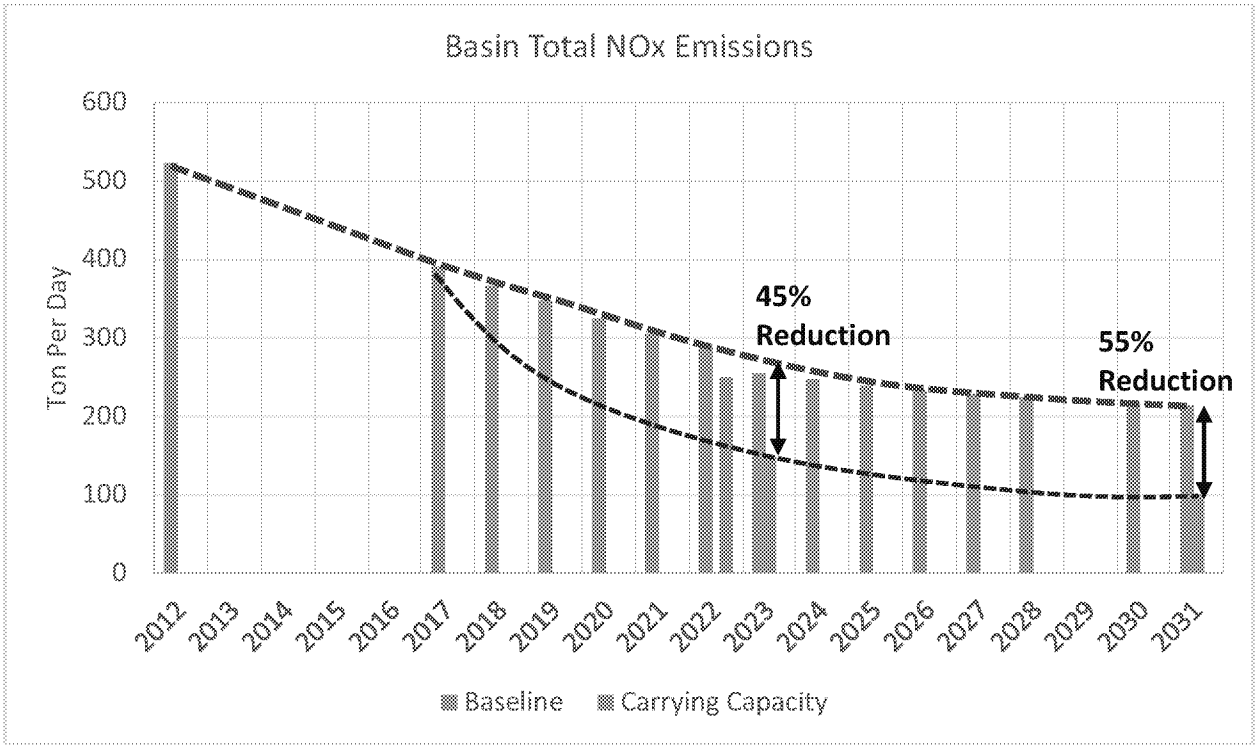


FIGURE 5-22
SUMMER PLANNING BASELINE EMISSIONS AND OZONE CARRYING CAPACITY

Figure 5-23 shows the 2012 observed base-year design value along with the2023 and 2025 model-predicted future design values of annual PM2.5. The federal annual PM2.5 standards are predicted to be achieved in 2023 with implementation of the proposed ozone strategy. However, the federal CAA does not allow 182(e)(5) measures in the attainment demonstration of PM2.5; therefore, an additional scenario using only non-182(e)(5) measures was developed for 2025 to comply with the CAA requirements. With only the non-182(e)(5) measure reductions, the annual PM2.5 standard is expected to be met in 2025.

Table 5-8 presents the future Basin annual PM2.5 design values under each control scenario. Table 5-8 also contains the predicted 2025 design value resulting from the ozone control strategy in the absence of 182(e)(5) measures. Attainment is achieved in 2025 under this scenario.

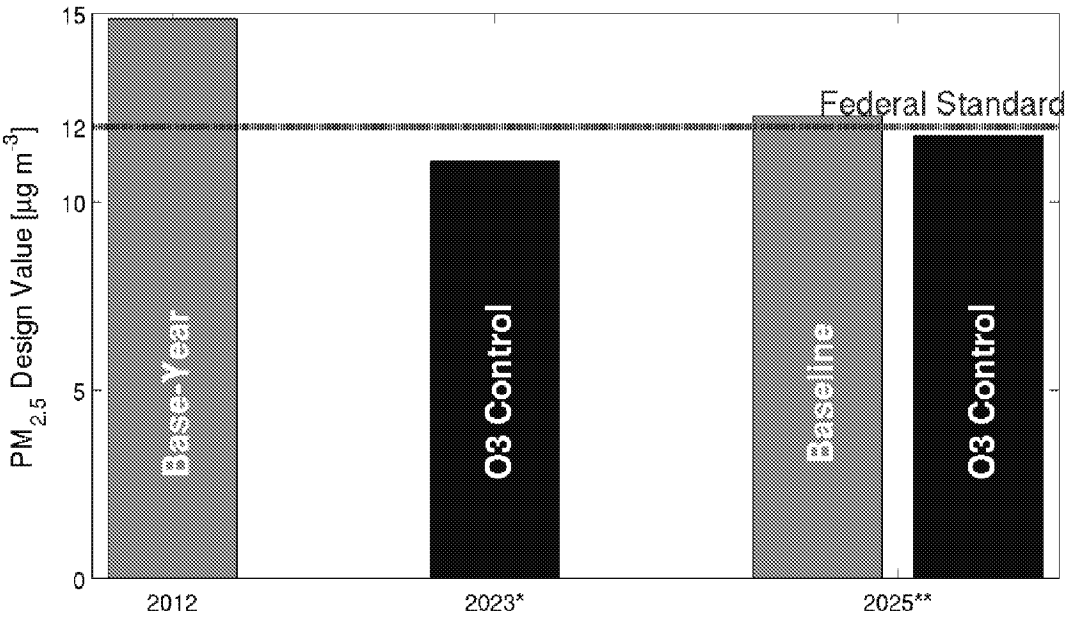


FIGURE 5-23

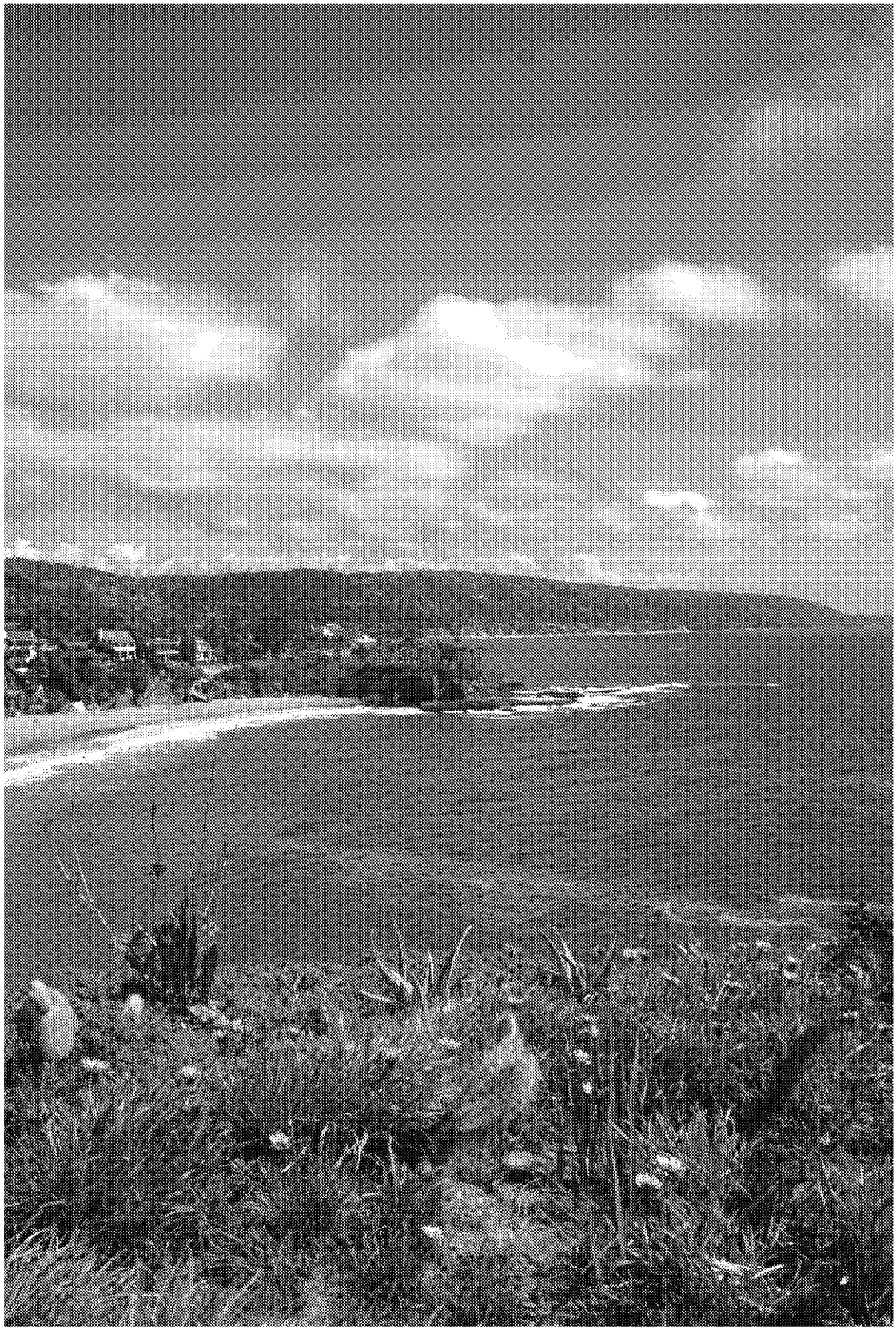
PROJECTION OF FUTURE ANNUAL PM2.5 AIR QUALITY IN THE BASIN IN COMPARISON WITH FEDERAL STANDARDS

*INCLUDES 182(E)(5) MEASURES
**DOES NOT INCLUDE 182(E)(5) MEASURES

TABLE 5-8

Future Design Values of Annual Average PM2.5 at Mira Loma in µg/m^3

Station	Baseline	Controlled	Control Strategy
2023	12.1	11.1	Ozone co-benefit including 182(e)(5) measures
2025	12.3	11.8	Ozone co-benefit without 182(e)(5) measures



Chapter 6
Federal and State Clean Air Act Requirements

The environmentally historic federal Clean Air Act (CAA) was amended in 1990 to require planning provisions for those areas in the nation not currently meeting the national ambient air quality standards. As such, the AQMP is required to include a series of elements and demonstrations to comply with federal CAA requirements.

In This Chapter

Introduction

The 2016 AQMP is designed to satisfy the SIP submittal requirements of the federal CAA to demonstrate attainment of the 2006 24-hour and 2012 annual PM2.5, and the 2008 8-hour ozone ambient air quality standards, the CCAA triennial update requirements, and the SCAQMD's requirement to update transportation emissions budgets based on the latest approved motor vehicle emissions model and planning assumptions. Specific information related to the air quality and planning requirements for portions of the SSAB under the SCAQMD's jurisdiction are included in Chapter 7. The Final 2016 AQMP will be submitted to U.S. EPA as a SIP revision upon approval by the SCAQMD Governing Board and CARB.

In November 1990, Congress enacted a series of amendments to the CAA intended to intensify air pollution control efforts across the nation. One of the primary goals of the 1990 CAA amendments was to overhaul the planning provisions for those areas not currently meeting the NAAQS. The CAA identifies specific emission reduction goals, requires both a demonstration of reasonable further progress and attainment, and incorporates more stringent sanctions for failure to attain or to meet interim milestones. Title I (*Air Pollution Prevention and Control*) of the CAA contains four parts (Part A through Part D) that provide provisions for air pollution prevention and control. Specifically, Part D describes the Plan requirements for nonattainment areas within six subparts as outlined in Figure 6-1. Subpart 1 describes the general provisions that apply to all applicable criteria pollutants unless superseded by pollutant-specific requirements in Subparts 2 through 5.

There are several sets of general planning requirements in the CAA, both for nonattainment areas [Section 172(c)] and for SIPs in general [Section 110(a)(2)]. These requirements are listed and briefly described in Chapter 1. This chapter presents the CAA requirements for the PM2.5 and ozone NAAQS, and demonstrates how the 2016 AQMP satisfies these requirements.

There are both primary and secondary air quality standards. Primary standards are designed to protect public health including the health of "sensitive" populations including asthmatics, children, and the elderly. Secondary standards protect public welfare and includes the protection against decreased visibility and damage to animals, crops, vegetation, and buildings.

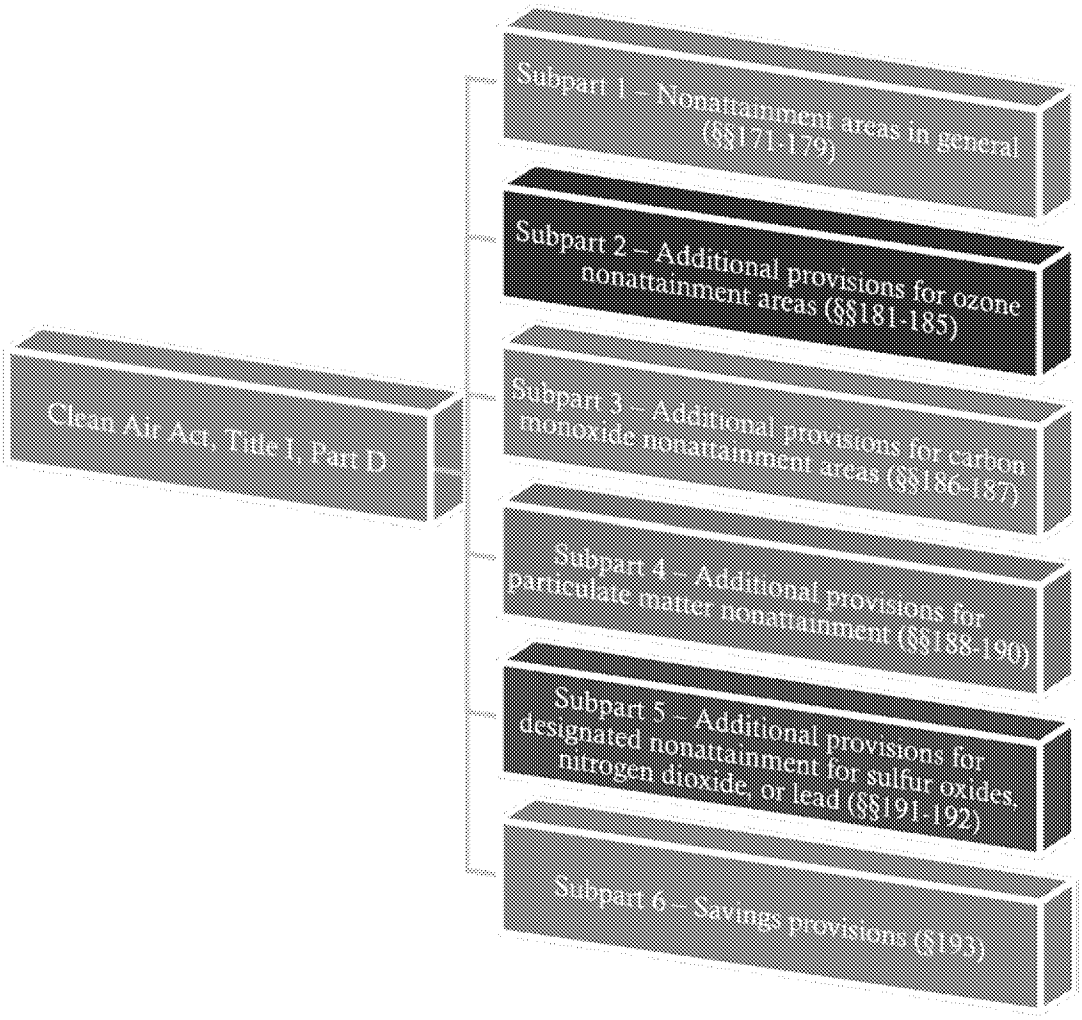


FIGURE 6-1
CLEAN AIR ACT, TITLE I, PART D – PLAN REQUIREMENTS FOR NONATTAINMENT AREAS

Federal Air Quality Standards for Fine Particulates

The U.S. EPA first promulgated the NAAQS for Fine Particles (PM2.5) in July 1997. Following legal challenges, the standards were eventually upheld in March 2002. The annual standard was set at a level of 15 micrograms per cubic meter (µg/m^3), based on the three-year average of annual mean PM2.5 concentrations. The 24-hour standard was set at a level of 65 µg/m^3 based on the three-year average of the 98th percentile of 24-hour concentrations. The U.S. EPA issued nonattainment designations in December 2004, which became effective on April 5, 2005.

In January 2006, the U.S. EPA proposed a more stringent 24-hour PM2.5 standard. Before promulgating new standards, the U.S. EPA follows an extensive review process. That process led U.S. EPA to the conclusion that the existing standards for particulates were not adequate to protect public health. The studies indicated that short-term exposures at levels below the 24-hour standard of 65 µg/m^3 caused acute health

effects, including asthma attacks and respiratory problems. As a result, in 2006 the U.S. EPA established a new, lower 24-hour average standard for PM2.5 at 35 μg/m^3. No changes were made to the annual PM2.5 standard which remained at 15 μg/m^3 at that time. For the 2006 24-hour PM2.5 standard, the form of the standard continues to be based on the 98th percentile of 24-hour PM2.5 concentrations measured in a year (averaged over three years) at the monitoring site with the highest measured values in an area. This form of the standard was determined to be health protective while providing a more stable metric (percentile form) to facilitate effective control programs. Effective December 14, 2009, the U.S. EPA designated the Basin as nonattainment for the 2006 24-hour PM2.5 NAAQS.

On June 14, 2012, the U.S. EPA proposed revisions to strengthen the primary annual PM2.5 NAAQS. The annual component of the standard provides protection against typical day-to-day exposures as well as longer-term exposures, while the daily standard protects against higher short-term events. On December 14, 2012, U.S. EPA strengthened the primary annual PM2.5 standard to 12 μg/m^3 and issued final designations on December 18, 2014, designating the Basin as nonattainment. U.S. EPA retained the secondary annual PM2.5 standard of 15 μg/m^3 and the 24-hour PM2.5 standard of 35 μg/m^3. Monitoring data indicates that the former 1997 primary annual PM2.5 standard of 15 μg/m^3 was attained in the Basin in 2015, but U.S. EPA has not yet formally acted on this finding. Figure 6-2 summarizes the U.S. EPA's PM2.5 standards to date.

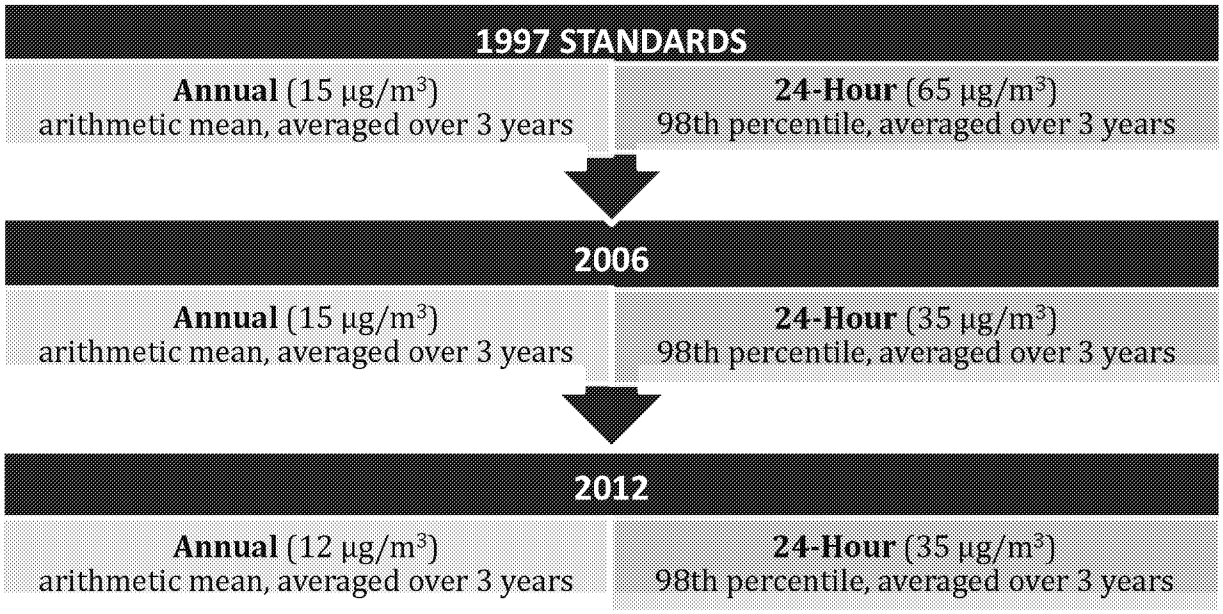


FIGURE 6-2
U.S. EPA'S PM2.5 STANDARDS

For the 2006 24-hour standards, the U.S. EPA required the SIP to be submitted no later than three years after the designation, hence December 14, 2012. The 2012 AQMP projected attainment of the 2006 24-hour PM2.5 NAAQS by 2014; however, due to the effects of the region's several-year drought on air quality, attainment by 2014 was deemed not possible.

In January 2013, the U.S. Court of Appeals, D.C. Circuit, ruled that the U.S. EPA erred in implementing the 1997 PM2.5 NAAQS pursuant solely to the general implementation provisions of Subpart 1, without considering the particulate matter specific provisions of Subpart 4. Although Subpart 4 relates to PM10, the Court reasoned that the plain meaning of the CAA requires implementation of the 1997 PM2.5 standards under Subpart 4 because PM2.5 particles fall within the statutory definition of PM10 and are thus subject to the same statutory requirements as PM10. Subpart 4 is more specific about what states must do to bring areas into attainment through the establishment of a two-tier classification system for nonattainment areas ("moderate" or "serious"). Subpart 4 also has specific provisions regarding regulation of precursors of PM emissions that are not present in Subpart 1. On June 2, 2014, U.S. EPA classified the Basin as "moderate" nonattainment under Subpart 4. In March 2015, U.S. EPA issued *"Proposed Rule for Implementing the National Air Quality Standards for Fine Particles"* that provides the proposed planning requirements framework for the 2012 and future PM2.5 NAAQS pursuant to Subpart 4, in addition to the Subpart 1 provisions. On August 24, 2016, the implementation rule was finalized (81 FR 58010), establishing nonattainment SIP requirements for areas that do not meet the NAAQS for fine particle pollution.

Consistent with Subpart 4, states have until 2021 to meet the 2012 annual PM2.5 standard for "moderate" nonattainment areas, and if necessary, up to four additional years (2025) if the area is re-classified as "serious" nonattainment. Annual PM2.5 emissions in the Basin have experienced a steady decline over the last decade with monitoring data showing attainment of the previous annual PM2.5 standard (15.0 $\mu g/m^3$). The 2016 AQMP demonstrates how the region will achieve the 2012 annual PM2.5 standard (12.0 $\mu g/m^3$) as expeditiously as practicable, but no later than the statutory attainment deadline.

Under Subpart 4, the attainment date for a "moderate" nonattainment area is the end of the 6th calendar year after the effective date of designation, and for a "serious" area, the attainment date is the end of the 10th calendar year after effective date of designation. Therefore, the "moderate" area attainment dates for the Basin are December 31, 2021 for the 2012 annual PM2.5 standard and December 31, 2015 for the 2006 24-hour PM2.5 standard. In July 2015, SCAQMD submitted a formal request to the U.S. EPA to reclassify the Basin as a "serious" nonattainment area for the 24-hour PM2.5 NAAQS based on the monitoring data, which indicated that attainment is not practicable by December 31, 2015.

On October 20, 2015, U.S. EPA issued a proposed rule to partially approve the PM2.5 portion of the 2012 AQMP and the 2015 AQMP Supplement for the 2006 24-hour PM2.5 NAAQS. Approved commitments in the Plan and Supplement included carrying out technology assessments on under-fired charbroilers (by 2017) and livestock waste (by 2016), and NOx RECLAIM reductions by 2015. The attainment demonstration was not approved as it was deemed impractical to attain by 2015 and the region was reclassified as "serious" nonattainment for 24-hour PM2.5, consistent with Subpart 4.

As a result, the 2006 24-hour standard has an attainment date as expeditiously as practicable, but no later than December 31, 2019. A "serious" area attainment plan needs to be submitted no later than 18 months after the effective date, hence, by August 12, 2017. More stringent "serious" nonattainment area requirements apply including implementation of Best Available Control Measures / Best Available Control

Technology (BACM/BACT), a lower major source emissions threshold (from 100 tons per year to 70 tons per year), and an update to the reasonable further progress (RFP) analysis given the longer attainment time frame. Figure 6-3 provides a general timeline for the implementation of the PM2.5 standards in the Basin.

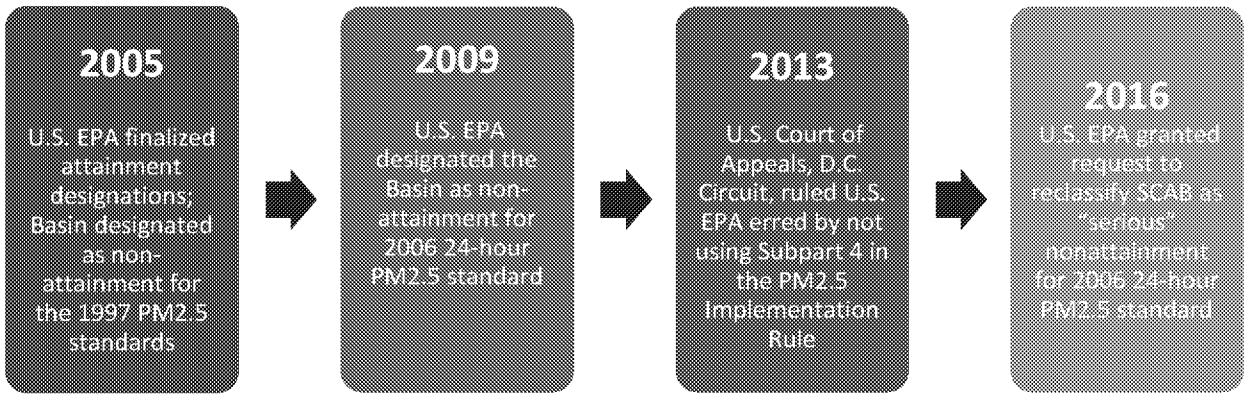


FIGURE 6-3
TIMELINE FOR THE IMPLEMENTATION OF PM2.5 NAAQS IN THE BASIN

Federal Air Quality Standards for Ozone

Background

In 1979, U.S. EPA established a primary health-based NAAQS for ozone at 120 ppb averaged over a 1-hour period. Pursuant to the 1990 CAA amendments, U.S. EPA later classified nonattainment areas on a scale from "marginal" to "extreme," based on the severity of the ozone problem. "Extreme" areas were provided the most time to attain the standard, until November 15, 2010, but with more stringent requirements. The Basin was classified as "extreme" nonattainment on November 6, 1991 and a 1-hour ozone SIP was submitted in 1994 by the SCAQMD and CARB. U.S. EPA approved the 1-hour ozone SIP for the South Coast in 1997 as well as the CARB revisions to the SIP in 2000. Subsequently, revisions to the 1-hour ozone SIP in 2003 included updated emissions inventories along with new commitments to achieve VOC and NOx reductions. In 2009, U.S. EPA approved certain elements of the 2003 SIP but disapproved the attainment demonstration, largely because CARB withdrew emission reduction commitments in 2008 rendering the plan insufficient to demonstrate attainment. U.S. EPA concluded that consequences[1] for a disapproved plan were initially not triggered because U.S. EPA determined that the approved SIP already contained an approved 1-hour attainment demonstration meeting CAA requirements, which was all that was necessary regarding the now revoked 1-hour standard.[2] Litigation on this issue resulted in the Court stating

[1] Consequences include highways sanctions, increased offset ratio (NSR), and a Federal Implementation Plan (FIP) (CAA, Title I, Part D, Subpart 1, Section 179).

[2] In 1997, U.S. EPA promulgated a new more stringent 8-hour ozone standard of 80 ppb to replace the 1-hour standard. *62 Fed. Reg. 38856 (July 18, 1997).*

in 2012 that "U.S. EPA should have ordered California to submit a revised attainment plan for the South Coast after it disapproved the 2003 Attainment Plan."

In response to a U.S. EPA "SIP call" that same year, a plan containing a demonstration of attainment of the 1-hour ozone NAAQS was included as part of the 2012 AQMP and approved by U.S. EPA effective October 3, 2014. U.S. EPA's approval of this plan is in litigation. The Basin has not achieved the current or previous 8-hour or 1-hour NAAQS to date. The 2016 AQMP provides an updated attainment demonstration with the latest NOx and VOC reduction commitments to ensure the 1-hour ozone NAAQS is met by December 31, 2022.

In July 1997, U.S. EPA replaced the 1-hour ozone standard with an 8-hour standard. The 8-hour ozone standard established by U.S. EPA was challenged, and eventually upheld in March 2002. The 1997 8-hour ozone standard was set at 0.08 ppm, calculated as the annual fourth-highest daily maximum 8-hr concentration, averaged over three years. The U.S. EPA finalized Phase 1 of the ozone implementation rule in April 2004. This rule set forth the classifications for nonattainment areas and continued obligations with respect to the existing 1-hour ozone requirements. As described by the Phase 1 rule, the Basin was classified as "severe-17" with an attainment date of June 2021, while the portion of the SSAB under the District's jurisdiction (Coachella Valley Planning Area) was classified as "serious", with an attainment date of June 2013. In May 2010, the U.S. EPA granted the State's request to (1) reclassify the Basin as an "extreme" nonattainment area with an attainment date of 2024 for ozone and (2) designate the Coachella Valley as "severe-15" with an attainment date of 2019. The federal 1-hour ozone standard was revoked, effective June 15, 2005, but "anti-backsliding" measures, including implementation of an approved attainment plan, remain in effect for areas that have not yet attained these standards.

On March 12, 2008, U.S. EPA lowered the NAAQS for ground-level ozone to a level of 75 ppb from the previous standard of 80 ppb, set in 1997. U.S. EPA designated the Basin as "extreme" nonattainment effective July 20, 2012, and pursuant to the CAA Section 181(a)(1), the U.S. EPA requires that all areas with an "extreme" classification meet the 2008 8-hour ozone standard as expeditiously as practicable but no later than 20 years from the effective date of designation, or July 20, 2032. It should be noted that since the attainment deadline falls mid-year, emission reductions need to be in place by January 1, 2031, so that they are realized in the full previous calendar of 2031. The 1997 ozone standard was subsequently revoked effective July 20, 2013, but areas are still subject to anti-backsliding provisions.

In March 2015, U.S. EPA finalized the "Implementation of the 2008 National Ambient Air Quality Standards for Ozone: State Implementation Plan Requirements." This final rule addresses a range of nonattainment area SIP requirements for the 2008 ozone NAAQS, and serves as a guideline for the development of the 2016 AQMP. In addition, the new 2015 8-hour ozone NAAQS highlights the continuing work needed to meet the new standard. Figure 6-4 summarizes the U.S. EPA's ozone standards to date. Figure 6-5 provides a timeline for the implementation of the ozone standards.

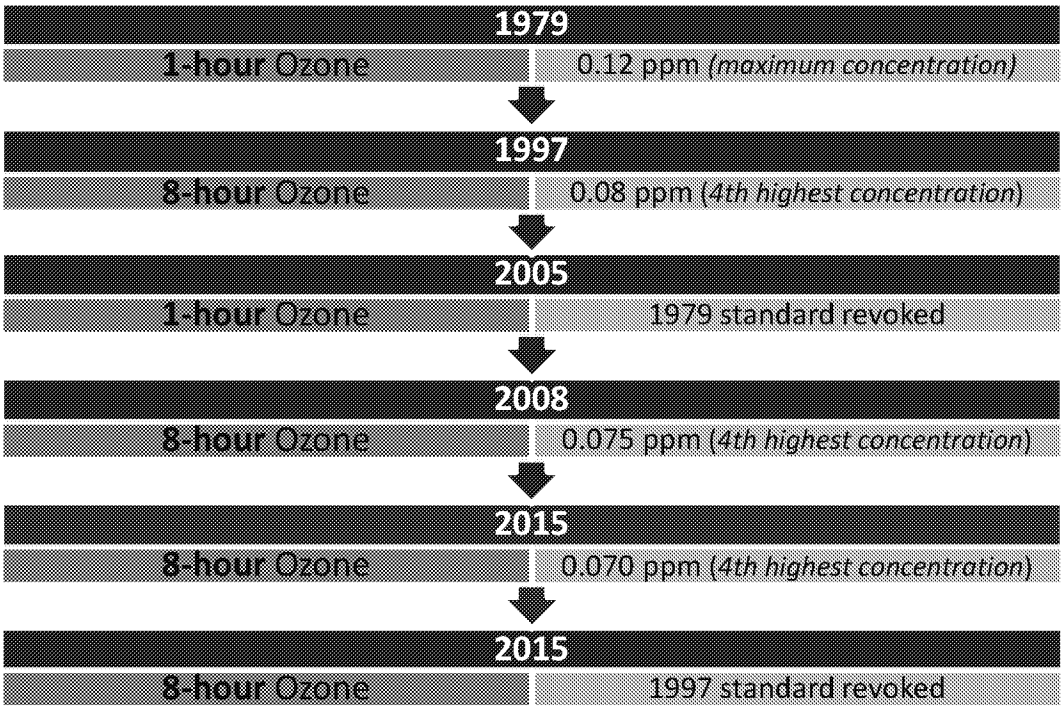


FIGURE 6-4
U.S. EPA'S OZONE STANDARDS

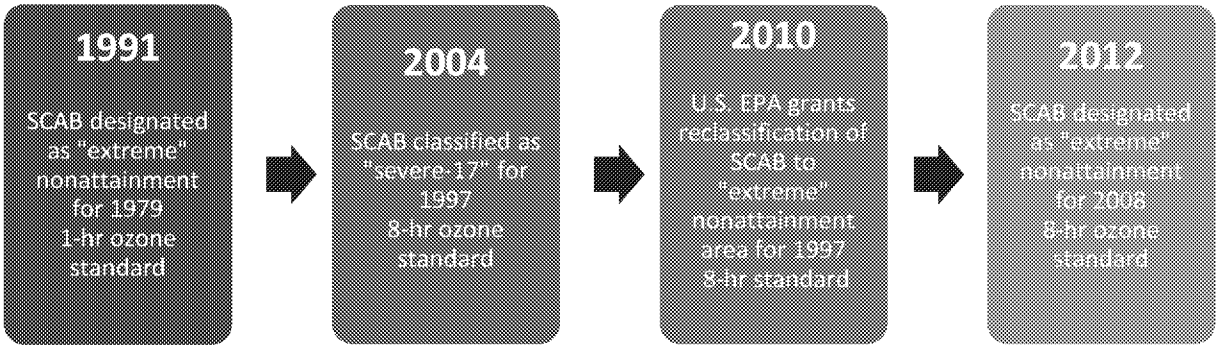


FIGURE 6-5
TIMELINE FOR THE IMPLEMENTATION OF OZONE NAAQS IN THE BASIN

Federal Clean Air Act Requirements for Nonattainment Areas

For areas such as the Basin that are classified nonattainment for the PM2.5 and ozone NAAQS, Section 172 of Subpart 1 of the CAA applies. Section 172(c)(1) of the CAA requires nonattainment areas to provide for implementation of all Reasonably Available Control Measures (RACM) as expeditiously as possible, including the adoption of reasonably available control technology (RACT). Section 172(c)(2) requires that nonattainment areas demonstrate RFP. A comprehensive emission inventory is required under Section 172(c)(3). Nonattainment area SIPs must include control strategies (Section 172(c)(6)), contingency measures (Section 172(c)(9)), and provisions for making demonstrations of conformity (Section 176(c)). However, U.S. EPA's March 2015 ozone implementation rule provides that "extreme" areas with approved Section 182(e)(5) commitments only had to submit contingency measures under three years before the attainment date, and not the general CAA contingency measures. Section 172(c)(5) requires the implementation of a new source review program including the use of "lowest achievable emission rate" for major sources referred to under state law as "Best Available Control Technology" (BACT) for contributors to PM2.5 and precursor emissions (i.e., precursors of secondary particulates).

Subpart 2

Subpart 2 provides additional provisions for ozone nonattainment areas. An attainment demonstration is required under Section 182(c)(2)(A) for areas classified as "serious" or above. Areas classified as "severe" or "extreme" nonattainment are required to demonstrate that sufficient transportation control strategies and transportation control measures have been identified to offset growth in emissions due to growth in vehicle miles traveled (VMT) under Section 182(d)(1)(A). Section 182(g) requires that each nonattainment area (other than an area classified as "marginal" or "moderate") achieve specific emission reduction targets in the applicable milestone years.

Emissions Statements

Subpart 2 Section 182(a)(3)(B)(i) requires "the SIP to require that the owner or operator of each stationary source of oxides of nitrogen or volatile organic compounds provide the State with a statement for classes or categories of sources, showing the actual emissions of oxides of nitrogen and volatile organic compounds from that source." Section 182(a)(3)(B)(ii) waives the requirement if the stationary source emits less than 25 tons per year of VOC or NOx. SCAQMD satisfies this requirement through the approved SCAQMD Rule 301[3] paragraph (e)(2) that requires emission reporting from all sources emitting 4 tons per year or more of VOC/NOx and paying a fee "for all actual source emissions including but not limited to permitted, unpermitted, unregulated and fugitive emissions." Each facility with total emissions greater than or equal to 4 tons per year from each air contaminant (e.g., specific organic gases, oxides of nitrogen, total particulate matter) shall report all emissions and incur emission fees. Thus, Rule 301 requires more stringent reporting

[3] http://www.aqmd.gov/docs/default-source/rule-book/reg-iii/rule-301.pdf?sfvrsn=4.

from VOC and NOx stationary source emissions than is required under the CAA Section 182(a)(3)(B), thus satisfying the Emissions Statements clause.

Subpart 4

Additional provisions for PM nonattainment areas are listed in Subpart 4. Section 189 requires states with nonattainment areas to submit an attainment demonstration. Section 189(c) requires the submission of quantitative milestones every three years until the attainment date. Under Section 189(e), control requirements that apply to PM2.5 are also applicable to the precursors of PM, namely NOx, SO_2, VOC and ammonia. Best Available Control Measures (BACM) are required for "serious" nonattainment areas under Section 189(b)(1)(B).

Table 6-1 summarizes the federal CAA requirements for the 2006 and 2012 PM NAAQS and the 2008 Ozone NAAQS, and outlines the 2016 AQMP chapters and appendices that fulfill the statutory requirements; for Coachella Valley, part of these plan provisions, such as attachment status, RFP and milestones, and VMT offset, are presented in Chapter 7.

While U.S. EPA revoked the 1979 1-hour ozone standard in 2005, the U.S. EPA's published "SIP call" proposal on September 19, 2012 found the then-approved 1-hour ozone SIP substantially inadequate to provide for attainment of the revoked 1-hour ozone standard by the applicable attainment date of November 15, 2010. U.S. EPA's proposed SIP call was in response to the decision of the Ninth Circuit Court of Appeals in *Association of Irritated Residents v. United States Environmental Protection Agency,* 686 F. 3d 668 (Amended January 12, 2012). As a result, the 2012 AQMP included an attainment demonstration for the 1-hour ozone standard and included demonstrations to address the VMT emissions offset requirements of CAA Section 182(d)(1)(A). Approval of this plan is under litigation. As U.S. EPA replaced the 1997 8-hour ozone standard with a more health-protective 2008 8-hour ozone standard, the 1997 ozone standard was revoked in April 2015. With respect to the 1997 8-hour ozone standard, the SCAQMD indicated that, while the 2012 AQMP updated the approved 1997 8-hour ozone control strategy with new measures for VOC and NOx reductions, it was not intended as an update to other elements of the approved 8-hour ozone control plan. In August 2014, U.S. EPA approved *"South Coast Extreme 1-Hour Ozone Attainment Demonstration and 1-Hour and 8-Hour VMT Offset Demonstrations"* of the 2012 AQMP.

TABLE 6-1

Federal Clean Air Act Requirements

Requirement	Federal CAA Section	Applicability				2016 AQMP
		2008 8-hr Ozone (Extreme)	2012 Annual PM2.5 (Moderate)	2012 Annual PM2.5 (Serious)	2006 24-hr PM2.5 (Serious)	
Emission Inventory	Subpart 1 §172(c)(3) Ozone - Subpart 2 182(a)(1)	✓	✓	✓	✓	Chapter 3 & Appendix III
Reasonably Available Control Measures (RACM)	Subpart 1 §172(c)(1) Ozone – Subpart 2 182(b)(2)	✓	✓			Appendix VI-A
Best Available Control Measures (BACM)	Subpart 4 §189(b)(1)(B)			✓	✓	Appendix VI-A
Control Strategy & Other Measures	Subpart 1 §172(c)(6)	✓	✓	✓	✓	Chapter 4, Appendix IV & Appendix VI-C
Attainment Demonstration	Ozone - Subpart 2 §182(c)(2)(A) & 182(e) PM - Subpart 4 §189(a)(1)(B) & §189(b)(1)(A)	✓		✓	✓	Chapter 5, Chapter 7 & Appendix V
Impracticability Demonstration	PM - Subpart 4 §189(a)(1)(B)		✓			Appendix VI-B
Reasonable Further Progress (RFP) & Milestones	Subpart 1 §172(c)(2) Ozone - Subpart 2 §182(c)(2)(B) & §182(g) PM - Subpart 4 §189(c)	✓	✓	✓	✓	Appendix VI-C
Contingency Measures	Subpart 1 §172(c)(9)	✓		✓	✓	Chapter 4 & Appendix IV
General Conformity	Subpart 1 §176(c)	✓	✓	✓	✓	Appendix VI-D
Transportation Conformity	Subpart 1 §176(c)	✓	✓	✓	✓	Appendix VI-D
Vehicle Miles Traveled (VMT) Offset	Subpart 2 §182(d)(1)(A)	✓	n/a*			Appendix VI-E
PM Precursors	Subpart 4 §189(e)		✓	✓	✓	Appendix VI-F
New Source Review (NSR)	Subpart 1 §172(c)(5) & §173; §182(e)(1&2) PM - Subpart 4 §189(b)(3)	✓	✓	✓	✓	Appendix VI-G

TABLE 6-1 (CONCLUDED)

Federal Clean Air Act Requirements

Requirement	Federal CAA Section	Applicability				2016 AQMP
		2008 8-hr Ozone (Extreme)	2012 Annual PM2.5 (Moderate)	2012 Annual PM2.5 (Serious)	2006 24-hr PM2.5 (Serious)	
Emissions Statements	Subpart 2 §182(a)(3)(B)	✓	n/a*			Chapter 6
Vehicle Inspection/Maintenance (I/M) Programs	Subpart 2 §182(b)(4) & Subpart 2 §182(c)(3)	✓	n/a*			Appendix IV-B
Clean Fuels Fleet Program	Subpart 2 §182(c)(4)	✓	n/a*			CARB motor vehicle program from prior SIP submittals
Clean Fuels for Boilers	Subpart 2 §182(e)(3)	✓	n/a*			SCAQMD Rule 2002 and Rule 1146
Transportation Control Measures during Heavy Traffic Hours	Subpart 2 §182(e)(4)	✓	n/a*			Appendix IV-C
Enhanced (Ambient) Monitoring	Subpart 2 §182(c)(1)	✓	n/a*			2016 Annual Air Quality Monitoring Network Plan, Chapter 2 & Appendix II
Transportation Controls	Subpart 2 §182(c)(5)	✓	n/a*			Appendix IV-B, Appendix IV-C & Appendix VI
NOx Requirements	Subpart 2 §182(f)	✓	n/a*			Appendix III, Appendix IV & Appendix VI
Penalty Fee Program Requirements	Subpart 2 §185	TBD	n/a*			-
Contingency Measures Associated with Areas Utilizing CAA §182(e)(5)	Subpart 2 §182(e)(5)	✓	n/a*			Chapter 4 and Appendix VI-C

* §182 or §185 requirements not applicable to PM

Table 6-2 provides the explanation of the different requirements and conclusions as to how the requirements are satisfied.

TABLE 6-2

Requirements and Compliance Conclusions

Requirement	Clean Air Act Title I Part D Definition	Analysis
Emission Inventory	A comprehensive, accurate, current inventory of actual emissions from all sources of the relevant pollutants in such area.	Annual average and summer planning emissions from all criteria pollutants from point, area, and mobile sources are provided in Chapter 3 and Appendix III for base year (2012) and attainment years for the ozone and PM standards.
Reasonably Available Control Measures (RACM)	Lowest emissions met with reasonably available (technical and economic feasibility) technology for mobile, area, and point sources, that can collectively advance the attainment date by at least one year. Does not include unenforceable or impractical measures.	Appendix VI-A contains analyses of all potential control measures for emission reduction opportunities, as well as economic and technological feasibility. The analyses concluded that the SCAQMD's rules and regulations were in general equivalent to, or more stringent than other districts' rules and regulations. For areas where improvements are possible, they are included as plan commitments or have been targeted for further evaluation.

TABLE 6-2 (CONTINUED)

Requirements and Compliance Conclusions

Requirement	Clean Air Act Title I Part D Definition	Analysis
Best Available Control Measures (BACM)	The maximum degree of emission reductions achievable from a source or source category, considering energy, economic, and environmental impacts. They also need to advance the attainment date by at least one year. BACM is more stringent than RACM.	Appendix VI-A contains analyses of all potential control measures for emission reduction opportunities, as well as economic and technological feasibility. The analyses concluded that the SCAQMD's rules and regulations were in general equivalent to, or more stringent than other districts' rules and regulations. For areas where improvements are possible, they are included as plan commitments or have been targeted for further evaluation.
Control Strategy & Other Measures	Further emission reductions achieved from actions such as requiring air pollution control technologies and emission reduction programs.	Chapter 4 and Appendix IV provide the comprehensive control strategy that includes SCAQMD stationary and mobile measures, CARB mobile source and consumer product emission reductions, and federal actions.
Attainment Demonstration	Apply the proposed control strategy implemented as "expeditiously as practicable" to demonstrate attainment of standards based on photochemical grid modeling pursuant to U.S. EPA guidance.	Chapter 5 and Appendix V provide the attainment demonstration of the ozone standards by the statutory deadlines with the implementation of the control strategy. 24-hr PM2.5 levels will attain the standard with baseline emissions, and annual PM2.5 levels will meet the "serious" nonattainment deadline with implementation of the ozone control strategy

TABLE 6-2 (CONTINUED)

Requirements and Compliance Conclusions

Requirement	Clean Air Act Title I Part D Definition	Analysis
Impracticability Demonstration	If "moderate" area PM attainment is demonstrated as impracticable, an area can request a reclassification to "serious" nonattainment, thus providing more time to comply, along with stricter requirements such as a BACM.	Appendix VI-B determines it is impracticable for the region meet the annual PM2.5 by the "moderate" nonattainment area deadline of 2021, even after implementing all feasible measures as expeditiously as practicable.
Reasonable Further Progress (RFP) & Milestones	Annual incremental reductions in emissions of relevant air pollutant(s) generally linear to the attainment year.	As shown in Appendix VI-C, baseline VOC emissions result in a shortfall of RFP, but substitution of baseline NOx reductions make up the shortfall. Baseline PM2.5 emissions project no shortfall for PM2.5 or precursors for each milestone year through the attainment year.
Contingency Measures	Additional measure to be implemented if area fails to meet RFP milestones or attainment date based on one-year's worth of reductions. Must be fully adopted and ready to implement.	Adequate contingency measures have been provided and are discussed in Chapter 4 and Appendix IV-A.
General Conformity	SIP must account for any federal action to determine if emissions increases are less than the de minimis thresholds for the relevant pollutants or precursors. If greater, then a positive conformity determination is needed.	General conformity budgets have been established in a set-aside account, along with a tracking system for federal actions to ensure conformity is being met. More details can be found in Appendix VI-D.
Transportation Conformity	Transportation plans and programs should not cause or contribute to any new violation of a standard, increase the frequency or severity of any existing violation, or delay the timely attainment of the air quality standards.	Motor vehicle emissions budgets have been established for the purpose of ensuring the conformity of transportation plans and programs. The budgets can be found in Appendix VI-D.

TABLE 6-2 (CONTINUED)

Requirements and Compliance Conclusions

Requirement	Clean Air Act Title I Part D Definition	Analysis
Vehicle Miles Traveled (VMT) Offset	Requires offset of emission increases due to VMT. U.S. EPA allows vehicle technology improvements, motor vehicle fuels, and other transportation- related strategies to offset VMT.	Appendix VI-E demonstrates that emission increases from VMT growth is adequately offset by technology improvements and transportation strategies.
PM Precursors	Subpart 4 states control requirements for major stationary sources of PM also apply to major stationary sources of the precursors of PM unless the precursors do not significantly contribute to PM levels (CAA §189(e)).	As presented in Appendix VI-F, all four PM2.5 precursors, namely ammonia, NOx, SOx, and VOC, are considered in the evaluation of control measures. Data and analyses of the four PM2.5 precursors are included in various elements of the 2016 AQMP.
New Source Review (NSR)	A permitting requirement for new and modified major stationary sources.	SCAQMD's NSR program complies with ozone non-attainment requirements. Rule 1325 is currently being amended to include VOC and ammonia as PM2.5 precursors and to incorporate changes to the major source threshold for "serious" non-attainment areas.
Emissions Statements	Owner or operator of each stationary source of NOx or VOC provides statement for classes or categories of sources, showing the actual emissions of NOx and VOC from that source.	The SCAQMD satisfies this requirement through the approved SCAQMD Rule 301 paragraph (e)(2) that requires emission reporting from all major stationary sources of NOx and VOC greater than or equal to four tons per year.

TABLE 6-2 (CONTINUED)

Requirements and Compliance Conclusions

Requirement	Clean Air Act Title I Part D Definition	Analysis
Vehicle I/M Program	The I/M regulations establish minimum performance standards for "basic" and "enhanced" I/M programs as well as various testing requirements.	Under California law, the Bureau of Automotive Repair (BAR) is responsible for developing and implementing the smog check program. On July 1, 2010, EPA approved California's inspection and maintenance program as meeting the requirements of the CAA (75 FR 38023). Details about proposed control measure of the smog check program can be found in Appendix IV-B.
Clean Fuels Fleet Program	Under Clean-Fuel Fleet (CFF) program, a specified percentage of vehicles purchased by fleet operators for covered fleets shall be clean-fuel vehicles and shall use clean alternative fuels when operating in the covered area.	CARB submitted its Low Emission Vehicle (LEV) program with enhancements as part of its 1994 ozone SIP on November 15, 1994. EPA approved the substitution of the LEV program for a Clean Fuel Fleet program into the California SIP on August 27, 1999 (64 FR 46849).
Clean Fuels for Boilers	Each new, modified, and existing electric utility and industrial and commercial boiler that emits more than 25 tons per year (tpy) of NOX to either burn as its primary fuel natural gas, methanol, or ethanol (or a comparably low polluting fuel), or use advanced control technology (such as catalytic control technology or other comparably effective control methods).	SCAQMD Rule 1146 and SCAQMD NOx RECLAIM program (Rule 2002) satisfy the requirements of CAA section 182(e)(3). Under SCAQMD Rule 1303, new or modified boiler emitting at least 10 tpy of NOx or VOC is required to employ Best Available Control Technology, which must be at least as stringent as the Lowest Achievable Emissions Rate (LAER) as defined in CAA section 171(3).
Transportation Control Measures during Heavy Traffic Hours	Provisions establishing traffic control measures applicable during heavy traffic hours to reduce the use of high polluting vehicles or heavy-duty vehicles	This is an optional requirement. Control measures regarding transportation control measure can be found in Appendix IV-C

TABLE 6-2 (CONCLUDED)

Requirements and Compliance Conclusions

Requirement	Clean Air Act Title I Part D Definition	Analysis
Transportation Controls	Submit a demonstration as to whether current aggregate vehicle mileage, aggregate vehicle emissions, congestion levels, and other relevant parameters are consistent with those used for the area's demonstration of attainment	Transportation controls for this AQMP can be found in Appendix IV-B and Appendix IV-C. Transportation conformity and VMT offset analysis can be found in Appendix VI-D and Appendix VI-E, respectively.
Enhanced (Ambient) Monitoring	Enhanced monitoring of ozone, oxides of nitrogen, and volatile organic compounds.	The SCAQMD's 2016 Annual Air Quality Monitoring Network Plan describes the steps taken to address the requirements of section 182(c)(1). It includes descriptions of the Photochemical Assessment Monitoring stations (PAMS) program. Monitoring data used for attainment demonstration and air quality modeling can be found in Chapter 2 and Appendix II.
NOx Requirements	Major stationary sources of NOx are subject to the provisions in Subpart 2 §182 (c), (d) & (e).	Emission inventory and control strategy for major stationary sources of NOx can be found in Appendix III and Appendix IV, respectively. Other requirements such as RACM/BACM demonstration and NSR can be found in Appendix VI.
Penalty Fee Program Requirements	Section 185 requires each major stationary source of VOC and NOx to pay an annual fee for emissions in excess of 80 percent of the emissions baseline if an area fails to attain the ozone standards by its applicable attainment date.	TBD
Contingency Measures Associated with Areas Utilizing CAA §182(e)(5)	Commitments to develop and adopt contingency measures to be implemented if the anticipated technologies as described in §182(e)(5) do not achieve planned reductions.	Contingency measures can be found in Chapter 4. Appendix VI-C describes the 3% emission reduction for contingency for the 2008 8-hour ozone standard.

As measures from the more recent ozone and PM standards continue to be implemented, the District anticipates that the revoked 1979 and 1997 ozone standards will be attained. While the 2016 AQMP strengthens its control strategies to address the 2008 8-hr ozone NAAQS, it also provides updated control strategies with new measures for NOx and VOC reductions, and attainment demonstrations for the revoked ozone standards. Chapter 5 demonstrates that the District will attain the revoked 1-hour ozone standard in 2022, and the revoked 1997 8-hour ozone standard in 2023, with implementation of the already adopted and proposed measures. More details on the attainment demonstration for the revoked 1979 1-hr ozone standard and the revoked 1997 8-hr ozone standard can be found in Appendix V. Table 6-3 summarizes the anti-backsliding provisions for the revoked ozone standards and the applicable documents that demonstrate that the District fulfilled such requirements.

TABLE 6-3

Anti-backsliding Requirements for Revoked Ozone Standards

	Compliance Demonstration	
Applicable Requirements (40 CFR, Subpart X, §51.1100)	**1-hour Standard**	**1997 8-hour Standard**
1) Reasonably Available Control Technology (RACT) (CAA §172(c)(1), §182(b)(2))	Appendix VII, 2012 AQMP	Appendix VI, 2007 AQMP
2) Vehicle Inspection/Maintenance (I/M) programs (CAA §182(b)(4), §182(c)(3))	Appendix VII, 2012 AQMP	Chapter 4/ Appendix IV-B, 2007 AQMP
3) Major source applicability cutoffs for purpose of RACT (CAA §172(c)(2), §182(b)(2), §182(b)(1)(A)(ii), §182(c), §182(d), §182(e), §182(f))	RACT Rules go below Major Source thresholds	
4) Reasonable Further Progress (RFP)/ Rate of Progress (ROP) reductions (CAA §172(c)(2), §182(b)(1)(A), §182(c)(2)(B))	2003 AQMP	Chapter 6, 2007 AQMP
5) Stage II vapor recovery[4]	2003 AQMP	n/a
6) Clean fuels fleet program (CAA §182(c)(4))	2003 AQMP	2007 AQMP
7) Clean fuels for boilers (CAA §182(e)(3))	2003 AQMP	2007 AQMP
8) Transportation control measures (TCMs) during heavy traffic hours (CAA §182(e)(4))	Appendix VII, 2012 AQMP	Chapter 4/ Appendix IV-C, 2007 AQMP
9) Enhanced (ambient) monitoring (CAA §182(c)(1))	Appendix VII, 2012 AQMP	Appendix V, 2007 AQMP
10) Transportation controls (CAA §182(c)(5))	Appendix VII, 2012 AQMP	Chapter 4/ Appendix IV-C, 2007 AQMP
11) Vehicle miles traveled provisions (CAA §182(d)(1)(A))	Appendix VIII, 2012 AQMP	Appendix VIII, 2012 AQMP
12) NOx requirements (CAA §182(f))	2003 AQMP	2007 AQMP

[4] Listed in 40 CFR, Subpart X, §51.900 but not in §51.1100.

TABLE 6-3 (CONCLUDED)

Anti-backsliding Requirements for Revoked Ozone Standards

	Compliance Demonstration	
Applicable Requirements (40 CFR, Subpart X, §51.1100)	**1-hour Standard**	**1997 8-hour Standard**
13) Attainment demonstrations (CAA §182(c)(2)(A), §189(a)(1)(B), §189(b)(1)(A))	Appendix VII, 2012 AQMP	Chapter 5/ Appendix V, 2007 AQMP
14) Nonattainment contingency measures (CAA §172(c)(9); §182(e)(5)) for failure to attain NAAQS or make RFP toward attainment	Appendix VII, 2012 AQMP	Chapter 9, 2007 AQMP
15) Nonattainment new source review (NSR) major source threshold and offset ratios (CAA §172(c)(5), §182(e)(3), §189(b)(3)) ("serious" PM)	SCAQMD Reg. XIII Rule 1325	SCAQMD Reg. XIII Rule 1325
16) Penalty fee program requirements for "severe" and "extreme" areas (CAA §185)	SCAQMD Rule 317	TBD
17) Contingency measures associated with areas utilizing CAA §182(e)(5)	Appendix VII, 2012 AQMP	Chapter 9, 2007 AQMP
18) Reasonably Available Control Measures (RACM) (CAA §172(c)(1), 189(a)(1)(C))[1]	Appendix VII, 2012 AQMP	Appendix VI, 2007 AQMP

California Clean Air Act Requirements

The Basin is designated as nonattainment with the state ambient air quality standards for PM10, PM2.5 and ozone. The CCAA requires that a plan for attaining the ozone standard be reviewed, and revised as necessary, every three years (Health & Safety Code § 40925). The Final 2016 AQMP satisfies this triennial update requirement. The CCAA established a number of legal mandates to facilitate achieving health-based state air quality standards at the earliest practicable date. The following CCAA requirements do not directly apply to particulate matter plans but are directed at ozone as described in the remainder of this chapter:

(1) Demonstrate attainment by the earliest practicable date (Health & Safety Code § 40913);

(2) Reduce nonattainment pollutants at a rate of 5 percent per year, or include all feasible measures and an expeditious adoption schedule (Health & Safety Code § 40914);

(3) Reduce population exposure to "severe" nonattainment pollutants according to a prescribed schedule (Health & Safety Code § 40920(c)); and

(4) Rank control measures by cost-effectiveness (Health & Safety Code § 40922).

Plan Effectiveness

The CCAA requires, beginning on December 31, 1994 and every three years thereafter, that the District assess its progress toward attainment of the State ambient air quality standards [Health & Safety Code § 40924(b)] and that this assessment be incorporated into the District's triennial plan revision. To demonstrate the effectiveness of the District's program, air quality trends since 1990 depicting maximum pollutant concentrations are provided in Figure 6-6. While this statute does not apply to particulate matter, it is useful to discuss progress towards attainment of the PM10 and PM2.5 standards. Basin annual average PM10 concentrations have decreased continuously since 1990 from a high of nearly 80 $\mu g/m^3$ to a 2015 level of 48.8 $\mu g/m^3$. PM2.5 annual concentrations have decreased by more than 50 percent since 1999 to a 2015 level of 13.3 $\mu g/m^3$. The State annual standards are 20 $\mu g/m^3$ and 12 $\mu g/m^3$ for PM10 and PM2.5, respectively.

One-hour ozone concentrations have decreased by more than 50 percent since 1990 to a 2015 level of 0.144 ppm. Eight-hour ozone concentrations have also decreased continuously from 1990 levels of 0.194 ppm to 2015 levels of 0.127 ppm. The State annual standards are 0.09 ppm and 0.07 ppm for 1-hour ozone and 8-hour ozone, respectively.

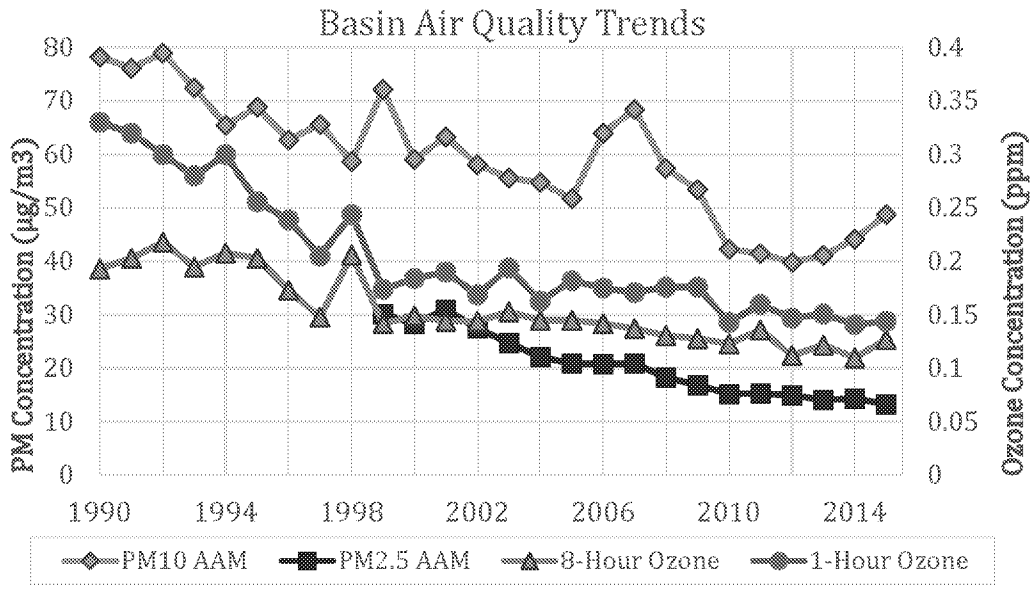


FIGURE 6-6

OZONE, PM10, AND PM2.5 TRENDS SINCE 1990

NO_2 and CO air quality have also improved substantially since 1990. NO_2 and CO metrics are not shown here since the Basin currently meets all State and federal NO_2 and CO standards. A comprehensive discussion of air quality trends was discussed in Chapter 2 and also can be found in Appendix II – Current Air Quality.

Emission Reductions

The CCAA requires that each district plan be designed to achieve a reduction in district-wide emissions of 5 percent or more per year for each covered nonattainment pollutant or its precursors, averaged every consecutive three-year period (Health & Safety Code § 40914). This requirement does not apply to PM. If this cannot be achieved, a plan may instead show that it has implemented all feasible measures as expeditiously as possible (Health & Safety Code § 40914(b)). Nevertheless, all feasible measures should be implemented for particulate matter in order to assure attainment as expeditiously as practicable.

The baseline NOx emissions meet the five percent averaged every consecutive three-year average reductions up to 2026 (see Appendix III for emission inventory values). As the NOx reduction strategy is being implemented, corresponding VOC and PM2.5 emissions are also expected to be reduced. As discussed in the RACM / RACT and BACM / BACT analysis in Appendix VI, this Plan implements all available feasible measures as expeditiously as possible.

Population Exposure

The CCAA also requires a reduction in overall population exposure to criteria pollutants. Reductions are to be calculated based on per-capita exposure and the severity of the exceedances. For the Basin, this provision is applicable to ozone [Health & Safety Code § 40920(c)]. The definition of exposure is the number of persons exposed to a specific pollutant concentration level above the State standard times the number of hours exposed. The per-capita exposure is the population exposure (units of parts per hundred million (pphm)-person-hours) divided by the total population. This requirement for the specific milestone years listed in the CCAA has been shown to have already been satisfied in previous AQMPs.

Cost-Effectiveness Ranking

The CCAA requires that each plan revision include an assessment of the cost-effectiveness of available and proposed control measures and contain a list which ranks the control measures from the most cost-effective to the least cost-effective (Health & Safety Code § 40922). Table 6-4 provides a list of stationary source control measures for the annual PM2.5 standard ranked by cost-effectiveness. Tables 6-5 and 6-6 provide lists of SCAQMD stationary and mobile source control measures, respectively, for ozone ranked by cost-effectiveness, and Table 6-7 ranks the CARB strategy measures.

In developing an adoption and implementation schedule for a specific control measure, a district shall consider the relative cost-effectiveness of the measure as well as other factors including, but not limited to, technological feasibility, total emission reduction potential, the rate of reduction, public acceptability, and enforceability (Health & Safety Code § 40922). These requirements do not apply to particulate matter, but provide a useful framework for evaluation. The PM2.5/ozone control strategy and implementation schedule is provided in Chapter 4.

TABLE 6-4

Cost-Effectiveness Ranking of District's Stationary Source Control Measures for PM2.5 [a,b]

MEASURE NUMBER	DESCRIPTION	DOLLARS/TON[c]	RANKING BY COST-EFFECTIVENESS
BCM-01	Further Emission Reductions from Commercial Cooking [PM]	$15,000–$18,000/ton	1
BCM-04	Emission Reductions from Manure Management Strategies [NH3]	$15,000/ton	2
BCM-10	Emission Reductions from Greenwaste Composting [VOC, NH3]	$61,500/ton	3
BCM-08	Further Emission Reductions from Agricultural, Prescribed, and Training Burning [PM]	TBD - Minimal	4
BCM-09	Further Emission Reductions from Wood-Burning Fireplaces and Wood Stoves [PM]	TBD - Minimal	4
BCM-02	Emission Reductions from Cooling Towers [PM]	TBD[d]	6
BCM-03	Further Emission Reductions from Paved Road Dust Sources [PM]	TBD[d]	6
BCM-05	Ammonia Emission Reductions from NOx Controls [NH3]	TBD[d]	6
BCM-06	Emission Reductions from Abrasive Blasting Operations [PM]	TBD[d]	6
BCM-07	Emission Reductions from Stone Grinding, Cutting and Polishing Operations [PM]	TBD[d]	6

[a] The cost-effectiveness values of these measures are based on the Discount Cash Flow methodology and 4 percent real interest rate

[b] Where a range exists, the ranking was done based on the low end of the range

[c] Preliminary estimate, actual cost-effectiveness will be determined by the Phase I technology assessment

[d] TBD – emission reductions and costs to be determined once the inventory and control approach are identified

TABLE 6-5

Cost-Effectiveness Ranking of Stationary Source Control Measures for Ozone [a,b]

MEASURE NUMBER	DESCRIPTION	DOLLARS/TON[c]	RANKING BY COST-EFFECTIVENESS
ECC-01	Co-Benefit Emission Reductions from GHG Programs, Policies, and Incentives [All Pollutants]	Marginal	1
ECC-02	Co-Benefits from Existing Residential and Commercial Building Energy Efficiency Measures [NOx, VOC]	Marginal; short payback period	1
BCM-10	Emission Reductions from Greenwaste Composting [VOC, NH3]	$3,400/ton	3
FUG-01	Improved Leak Detection and Repair [VOC]	$4,000–$5,000/ton	4
CTS-01	Further Emission Reductions from Coating, Solvents, Adhesives, and Sealants [VOC]	$8,000–$12,000/ton	5
CMB-05	Further NOx Reductions from RECLAIM Assessment [NOx]	$13,500–$21,000/ton	6
CMB-04	Emission Reductions from Restaurant Burners and Residential Cooking [NOx]	$15,000–$30,000/ton	7
CMB-02	Emission Reductions from Replacement with Zero or Near-Zero NOx Applications in Commercial and Residential Applications [NOx]	$15,000–$30,000/ton	7
CMB-03	Emission Reductions from Non-Refinery Flares [NOx, VOC]	< $20,000/ton	9
ECC-03	Additional Enhancements in Reducing Existing Residential Building Energy Use [NOx, VOC]	$45,000–$50,000/ton	10
CMB-01	Transition to Zero and Near-Zero Emission Technologies for Stationary Sources [NOx, VOC]	$53,000/ton	11
ECC-04	Reduced Ozone Formation and Emission Reductions from Cool Roof Technology [All Pollutants]	TBD[c] - Marginal	12
MCS-02	Application of All Feasible Measures [All Pollutants]	TBD[c]	13
FLX-01	Improved Education and Public Outreach [All Pollutants]	N/A[d]	14
FLX-02	Stationary Source VOC Incentives [VOC]	N/A[d]	14
MCS-01	Improved Breakdown Procedures and Process Re-Design [All Pollutants]	N/A[d]	14

[a] The cost-effectiveness values of these measures are based on the Discount Cash Flow methodology and 4 percent real interest rate

[b] Where a range exists, the ranking was done based on the low end of the range

[c] TBD – emission reductions and costs to be determined once the inventory and control approach are identified

[d] N/A – emission reductions and costs cannot be quantified due to the nature of the measure (e.g., outreach) or the early stage in development

TABLE 6-6
Cost-Effectiveness Ranking of Mobile Source Control Measures for Ozone

MEASURE NUMBER	DESCRIPTION	DOLLARS/TON[a]	RANKING BY COST-EFFECTIVENESS
MOB-11	Extended Exchange Program [VOC, NOx, CO]	$800–$10,000/ton	1
MOB-10	Extension of the SOON Provision for Construction/Industrial Equipment [NOx]	$11,300/ton	2
MOB-12	Further Emission Reductions from Passenger Locomotives [NOx, PM]	$15,000/ton	3
MOB-14	Emission Reductions from Incentive Programs [NOx, PM]	$18,262/ton	4
EGM-01	Emission Reductions from New Development and Redevelopment Projects [All Pollutants]	TBD[a]	5
MOB-01	Emission Reductions at Commercial Marine Ports [NOx, SOx, PM]	TBD[a]	5
MOB-02	Emission Reductions at Rail Yards and Intermodal Facilities [NOx, PM]	TBD[a]	5
MOB-03	Emission Reductions at Warehouse Distribution Centers [All Pollutants]	TBD[a]	5
MOB-04	Emission Reductions at Commercial Airports [All Pollutants]	TBD[a]	5
MOB-05	Accelerated Penetration of Partial Zero-Emission and Zero-Emission Vehicles [VOC, NOx, CO]	TBD[a]	5
MOB-06	Accelerated Retirement of Older Light-Duty and Medium-Duty Vehicles [VOC, NOx, CO]	TBD[a]	5
MOB-07	Accelerated Penetration of Partial Zero-Mission and Zero-Emission Light-Heavy- and Medium-Heavy-Duty Vehicles [NOx, PM]	TBD[a]	5
MOB-08	Accelerated Retirement of Older On-Road Heavy-Duty Vehicles [NOx, PM]	TBD[a]	5
MOB-09	On-Road Mobile Source Emission Reduction Credit Generation Program [NOx, PM]	TBD[a]	5
MOB-13	Off-Road Mobile Source Emission Reduction Credit Generation Program [NOx, SOx, PM]	TBD[a]	5

[a] Emission reductions and costs will be determined after projects are identified and implemented. See Appendix IV-A for cost information for specific measures

TABLE 6-7

Cost-Effectiveness Ranking of CARB Mobile Source Control Measures for Ozone [a]

CARB's MEASURE DESCRIPTION	DOLLARS/TON[a,b]	RANKING BY COST-EFFECTIVENESS
Advanced Clean Cars 2	TBD[a]	N/A
Lower In-Use Emission Performance Assessment	TBD[a]	N/A
Further Deployment of Cleaner Technologies	TBD[a]	N/A
Lower In-Use Emission Performance Level	TBD[a]	N/A
Low-NOx Engine Standard – California Action	TBD[a]	N/A
Low-NOx Engine Standard – Federal Action	TBD[a]	N/A
Medium and Heavy-Duty GHG Phase 2	TBD[a]	N/A
Innovative Clean Transit	TBD[a]	N/A
Last Mile Delivery	TBD[a]	N/A
Lower In-Use Emission Performance Level	TBD[a]	N/A
Low-NOx Engine Standard – California Action	TBD[a]	N/A
Low-NOx Engine Standard – Federal Action	TBD[a]	N/A
Medium and Heavy-Duty GHG Phase 2	TBD[a]	N/A
Further Deployment of Cleaner Technologies	TBD[a]	N/A
More Stringent National Locomotive Emission Standards	TBD[a]	N/A
Further Deployment of Cleaner Technologies	TBD[a]	N/A
Tier 4 Vessel Standards	TBD[a]	N/A
Incentivize Low Emission Efficient Ship Visits	TBD[a]	N/A
At-Berth Regulation Amendments	TBD[a]	N/A
Further Deployment of Cleaner Technologies	TBD[a]	N/A
Zero-Emission Off-Road Forklift Regulation Phase 1	TBD[a]	N/A
Zero-Emission Off-Road Emission Reduction Assessment	TBD[a]	N/A
Zero-Emission Off-Road Worksite Emission Reduction Assessment	TBD[a]	N/A
Zero-Emission Airport Ground Support Equipment	TBD[a]	N/A
Small Off-Road Engines	TBD[a]	N/A
Transport Refrigeration Units Used for Cold Storage	TBD[a]	N/A
Low-Emission Diesel Requirement	TBD[a]	N/A
Further Deployment of Cleaner Technologies	TBD[a]	N/A
Consumer Products Program	TBD[a]	N/A

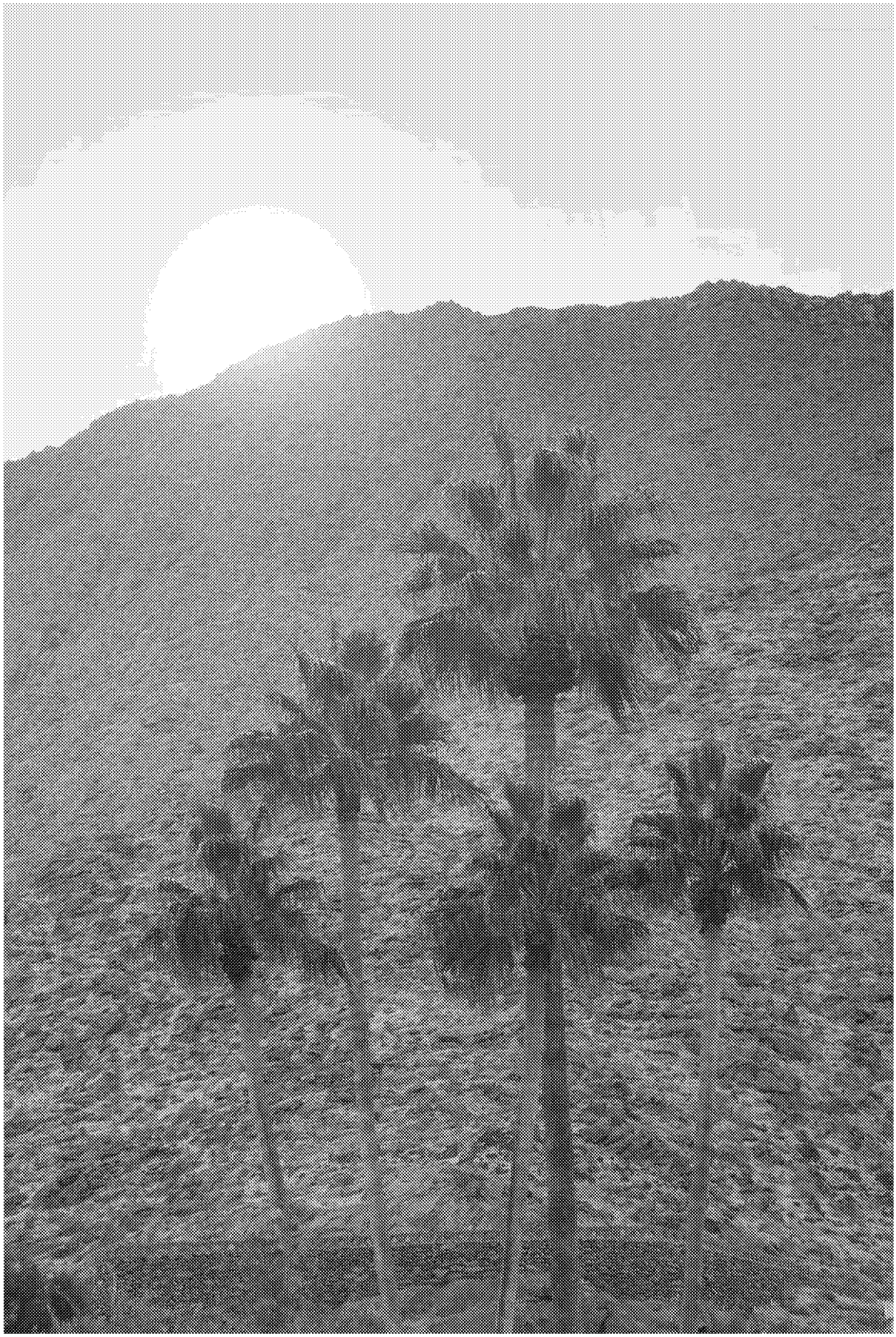
[a] Emission reductions and costs will be determined after projects are identified and implemented

[b] Where a range exists, the ranking was done based on the low end of the range

Conclusion

As provided in Table 6-2, all federal CAA requirements are satisfied and demonstrated in the 2016 AQMP. Many of the details showing compliance are provided in Appendix VI of this Plan and are listed in both Tables 6-1 and 6-2. Compliance with anti-backsliding requirements for the revoked standards are listed in Table 6-3. While the requirements have been satisfied in existing rules, regulations and previous AQMPs, some analyses have been updated in the 2016 AQMP. For example, a new attainment demonstration performed for the revoked 1-hour ozone standard was adopted in 2012 to respond to a U.S. EPA SIP call and is being updated in the 2016 AQMP to reflect new information and the new control strategy developed to meet the 8-hour ozone standards.

Chapter 7
Current and Future Air Quality – Desert Nonattainment Areas SIP



The Coachella Valley is under the SCAQMD's jurisdiction, however it is located in another air basin where the air quality challenges differ. The 2016 AQMP addresses the Clean Air Act requirements for the 2008 8-hour ozone federal standard in the SCAQMD desert region.

In This Chapter

Introduction

The Coachella Valley Planning Area is defined, for the purposes of this discussion, as the desert portion of Riverside County in the SSAB, and is part of the SCAQMD, which also includes the Basin. The Coachella Valley is the most populated area in this desert region, which encompasses several communities, including Palm Springs, Desert Hot Springs, Cathedral City, Rancho Mirage, Palm Desert, Indian Wells, La Quinta, Indio, Coachella, Thermal, and Mecca. Figure 7-1 provides a map of the area and the surrounding topography.

The Coachella Valley is designated by U.S. EPA as a nonattainment area for the 2008 8-hour ozone NAAQS of 0.075 ppm, and for the former 1997 8-hour ozone NAAQS of 0.08 ppm. For both 8-hour ozone federal standards, the Coachella Valley is classified as a "severe-15" ozone nonattainment area, indicating that the area has 15 years from the nonattainment designation date to attain the NAAQS. The Coachella Valley is also still designated as a nonattainment area for PM10, due to windblown dust events that recur in the area, with a classification of "serious." The Coachella Valley is in attainment of the current federal standards for NO_2, CO, lead, and SO_2.

On October 1, 2015, U.S. EPA finalized the new 2015 8-hour ozone NAAQS at 0.070 ppm, retaining the same form as the previous 8-hour standards. This standard became effective on December 28, 2015. Attainment/nonattainment designations will be finalized for the new standard by October 1, 2017, likely based upon 2014–2016 air quality data. It is expected that the Basin and the Coachella Valley, as well as a significant portion of California, will be designated nonattainment. SIP submittals to demonstrate attainment of the 2015 ozone NAAQS will likely be due in the 2020–2021 time frame, with attainment dates between 2020 and 2037, depending on the severity of the ozone problem.

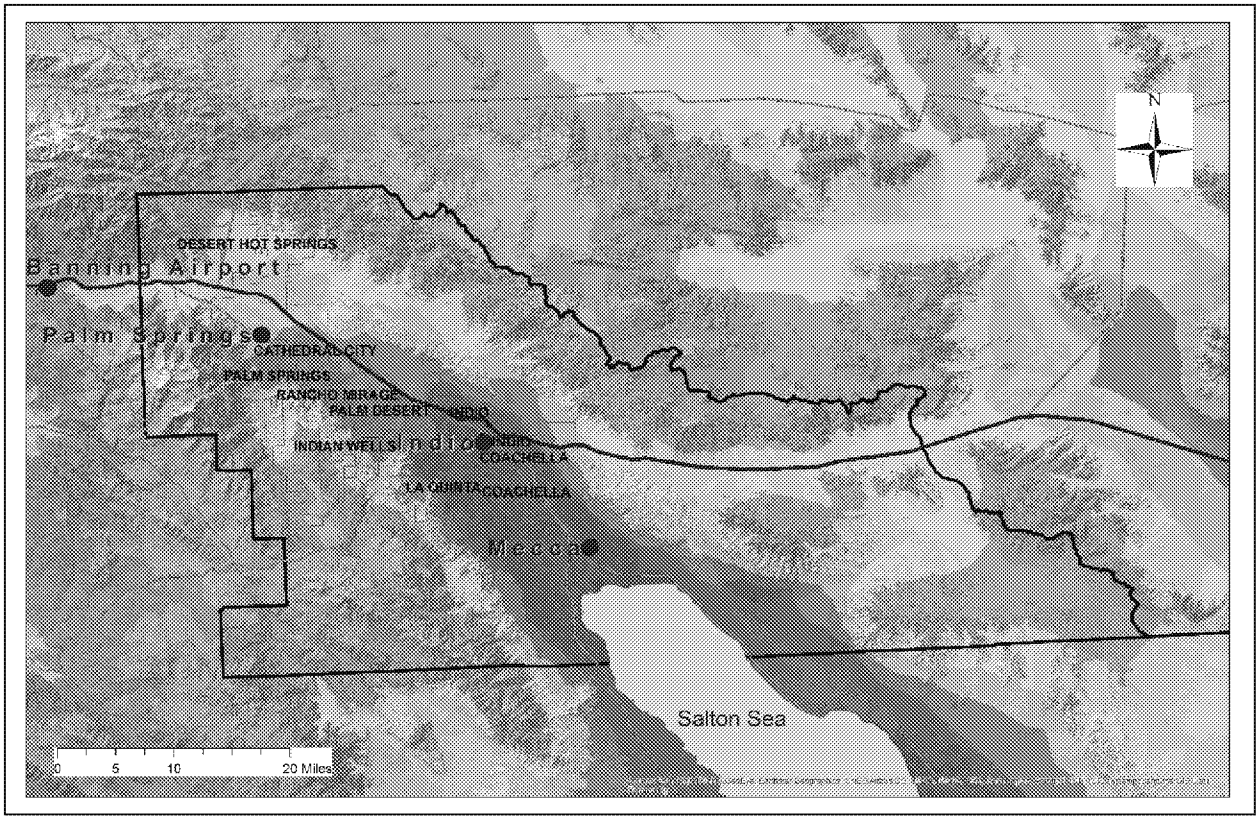


FIGURE 7-1

LOCATION AND TOPOGRAPHY OF THE COACHELLA VALLEY PLANNING AREA

[THE SAN GORGONIO PASS (AKA BANNING PASS) IS THE WEST-EAST PASS BETWEEN THE MOUNTAINS NEAR THE BANNING AIRPORT AIR MONITORING STATION THAT LEADS FROM THE SOUTH COAST AIR BASIN INTO THE COACHELLA VALLEY; SCAQMD AIR MONITORING STATIONS AT PALM SPRINGS, INDIO, AND MECCA ARE SHOWN WITHIN THE COACHELLA VALLEY BOUNDARIES]

While the 2007 AQMP adequately addressed and satisfied the CAA planning requirements for the Coachella Valley regarding the 1997 8-hour ozone NAAQS, the 2016 AQMP specifically addresses CAA planning requirements for 2008 ozone NAAQS. This chapter and associated appendices constitute the ozone SIP for the 2008 8-hour ozone NAAQS, which addresses the current status of ozone air quality and provides the strategy toward future attainment of the federal 8-hour ozone standards in the Coachella Valley, presenting the projections of future ozone levels based on the base year 2012 emissions inventories, growth projections, and control strategies within and outside the Coachella Valley.

Effective May 15, 2015, U.S. EPA finalized a clean data determination (indicating measurements in the area have reached attainment levels) for the revoked 1-hour ozone NAAQS (0.12 ppm) for the former Southeast Desert Modified Air Quality Management Area nonattainment area, including the Coachella Valley. This action was based on 2011–2013 final data and preliminary 2014 data.

On April 18, 2003, U.S. EPA approved the Coachella Valley State Implementation Plan (2003 CVSIP), which addressed future-year attainment of the annual average PM10 NAAQS with a 2006 attainment deadline. This federal standard was revoked, effective December 15, 2006. Since 2007, annual average PM10

concentrations have met the revoked federal annual standard (50 μg/m^3). The 2003 CVSIP also addressed continued attainment of the 24-hour PM10 federal standard, except for uncontrollable natural events. The 2016 AQMP does not include new modeling efforts for PM10. Since the mid-1990s, peak 24-hour average PM10 concentrations have not exceeded the current federal standard (150 μg/m^3) other than on days with windblown dust from natural events, which can be excluded upon U.S. EPA concurrence consistent with the Exceptional Event Rules and prior policies. The PM10 data from the Coachella Valley monitors shows attainment of the PM10 24-hour NAAQS after the removal of the flagged high-wind exceptional events, for which SCAQMD supporting documentation will be submitted and subsequent U.S. EPA approval will be required. However, U.S. EPA has requested that SCAQMD conduct additional ambient monitoring in the southeastern portion of the Coachella Valley before the re-designation can be considered. This new station has been in operation since 2013 in the community of Mecca, and re-designation will be revisited upon analysis of the required three full years of data.

Like the Basin, the Coachella Valley is a growing area, as shown by the historic and projected populations presented in Table 7-1. By 2030, the population in the Coachella Valley is projected to increase by 39 percent over the 2010 level. On a percentage basis, the Coachella Valley growth is expected to exceed that of the Basin for that time period. This population growth is taken into account in the emission projections for future years, which are used to demonstrate attainment of the air quality standards.

TABLE 7-1

Historic and Projected Population for Basin and Coachella Valley

AREA	Historic Population				Projected Population		
	1980	1990	2000	2010	2020	2031	2040
South Coast Air Basin	10,500,000	13,083,594	14,640,692	15,735,186	16,764,932	17,940,418	18,822,083
Coachella Valley	139,000	244,070	325,937	425,404	497,257	596,386	673,425

Source: Historic populations from Southern California Association of Governments, January 2016 CARB 2013 Almanac of Emissions and Air Quality, 2013 Edition, Appendix C [http://www.arb.ca.gov/aqd/almanac/almanac13/almanac13.htm]; Population projections from Southern California Association of Governments (SCAG) [January 2016 update]

Air Quality Setting

Air Quality Summary

In 2015, the SCAQMD monitored air quality at four permanent locations in the Coachella Valley, including the two long-term stations at Indio and Palms Springs and recently added stations at Mecca and the north shore of the Salton Sea. The Palm Springs air monitoring station is located closer to the San Gorgonio Pass (also known as the Banning Pass), predominantly downwind of the densely populated Basin. The Indio station is located further east in the Coachella Valley, on the predominant downwind side of the

main population areas of the Coachella Valley. Both of these sites routinely measure ozone, PM10, PM2.5 and sulfates (from PM10). The Palm Springs station also measures CO, and NO_2.

A new station was established in 2013 in the community of Mecca, closer to the Salton Sea in the southeastern portion of the Coachella Valley. It is measuring PM10 continuously, as well as hydrogen sulfide (H_2S), a gas emitted naturally from the Salton Sea that can occasionally cause strong odors. An additional station was also established in 2013 near the shore of the Salton Sea, measuring only H_2S.

Recent and historic air pollution data collected in the Coachella Valley is summarized in this chapter, and is also presented in Chapter 2: Air Quality and Health Effects, along with that of the Basin. Additional details can be found in Appendix II – Current Air Quality. Information on the health effects associated with criteria air pollutants are summarized in Chapter 2 and detailed in Appendix I – Health Effects.

Attainment Status

The Coachella Valley remains a nonattainment area for the revoked 1997 and revised 2008 8-hour ozone NAAQS, as well as for the new 2015 ozone NAAQS. The Coachella Valley is now in attainment of the former (1979) 1-hour ozone NAAQS. The Coachella Valley is also a nonattainment area for the state 1-hour and 8-hour ozone standards.

Since the mid-1990s, the days that have exceeded the 24-hour PM10 federal standard at the SCAQMD Coachella Valley monitoring stations at Indio and Palm Springs have been associated with high-wind natural events. Much of this data has been flagged in the U.S. EPA Air Quality System (AQS) database to be excluded for comparison to the NAAQS, as allowed by the U.S. EPA Exceptional Events Rule and its predecessor, the Natural Events Policy. As a result, the District will continue to seek a re-designation by U.S. EPA for the Coachella Valley to attainment for the PM10 NAAQS, once sufficient data from PM10 monitors in Palm Springs, Indio, and the new Mecca station can be finalized and fully evaluated for exceptional events, contingent upon U.S. EPA concurrence. The Coachella Valley remains a nonattainment area for the PM10 CAAQS.

The current federal NAAQS attainment designations for the Coachella Valley are presented in Table 7-2. The state CAAQS attainment designations are presented in Table 7-3.

TABLE 7-2

National Ambient Air Quality Standards (NAAQS) Attainment Status
Coachella Valley Portion of the Salton Sea Air Basin

Criteria Pollutant	Averaging Time	Designation[a]	Attainment Date[b]
Ozone (O_3)	(1979) **1-Hour** (0.12 ppm)[c]	Attainment	11/15/2007 (attained 12/31/2013)
	(2015) **8-Hour** (0.070 ppm)[d]	Pending – Expect Nonattainment (Severe)	Pending
	(2008) **8-Hour** (0.075 ppm)[d]	Nonattainment (Severe-15)	7/20/2027
	(1997) **8-Hour** (0.08 ppm)[d]	Nonattainment (Severe-15)	6/15/2019
PM2.5[e]	(2006) **24-Hour** (35 µg/m^3)	Unclassifiable/Attainment	N/A (attained)
	(2012) **Annual** (12.0 µg/m^3)	Unclassifiable/Attainment	N/A (attained)
	(1997) **Annual** (15.0 µg/m^3)	Unclassifiable/Attainment	N/A (attained)
PM10[f]	(1987) **24-hour** (150 µg/m^3)	Nonattainment (Serious)	12/31/2006
Lead (Pb)	(2008) **3-Months Rolling** (0.15 µg/m^3)	Unclassifiable/Attainment	Unclassifiable/ Attainment
CO	(1971) **1-Hour** (35 ppm)	Unclassifiable/Attainment	N/A (attained)
	(1971) **8-Hour** (9 ppm)	Unclassifiable/Attainment	N/A (attained)
NO_2[g]	(2010) **1-Hour** (100 ppb)	Unclassifiable/Attainment	N/A (attained)
	(1971) **Annual** (0.053 ppm)	Unclassifiable/Attainment	N/A (attained)
SO_2[h]	(2010) **1-Hour** (75 ppb)	Designations Pending	N/A
	(1971) **24-Hour** (0.14 ppm) (1971) **Annual** (0.03 ppm)	Unclassifiable/Attainment	Unclassifiable/ Attainment

a) U.S. EPA often only declares Nonattainment areas; everywhere else is listed as Unclassifiable/Attainment or Unclassifiable
b) A design value below the NAAQS for data through the full year or smog season prior to the attainment date is typically required for an attainment demonstration
c) The 1979 1-hour ozone NAAQS (0.12 ppm) was revoked, effective 6/15/05; the Southeast Desert Modified Air Quality Management Area, including the Coachella Valley, had not timely attained this standard by the 11/15/07 "severe-17" deadline, based on 2005-2007 data; on 8/25/14, U.S. EPA proposed a clean data finding based on 2011-2013 data and a determination of attainment for the former 1-hour ozone NAAQS for the Southeast Desert nonattainment area; this rule was finalized by U.S. EPA on 4/15/15, effective 5/15/15, and included preliminary 2014 data
d) The 2008 8-hour ozone NAAQS (0.075 ppm) was revised to 0.070 ppm, effective 12/28/15 with classifications and implementation goals to be finalized by 10/1/17; the 1997 8-hour ozone NAAQS (0.08 ppm) was revoked in the 2008 ozone NAAQS implementation rule, effective 4/6/15; there are continuing obligations under the 1997 and 2008 ozone NAAQS until they are attained
e) The annual PM2.5 standard was revised on 1/15/13, effective 3/18/13, from 15 to 12 µg/m^3
f) The annual PM10 standard was revoked, effective 12/18/06; the 24-hour PM10 NAAQS attainment deadline was 12/31/2006; the Coachella Valley Attainment Re-designation Request and PM10 Maintenance Plan was postponed by U.S. EPA pending additional monitoring and analysis in the southeastern Coachella Valley
g) New 1-hour NO_2 NAAQS became effective 8/2/10; attainment designations 1/20/12; annual NO_2 NAAQS retained
h) The 1971 Annual and 24-hour SO_2 NAAQS were revoked, effective 8/23/10; however, these 1971 standards will remain in effect until one year after U.S. EPA promulgates area designations for the 2010 SO_2 1-hour standard; final area designations expected by 12/31/2020 with SSAB expected to be designated Unclassifiable/Attainment

TABLE 7-3

California Ambient Air Quality Standards (CAAQS) Attainment Status

Coachella Valley portion of Salton Sea Air Basin

Pollutant	Averaging Time and Level[b]	Designation[a]
		Coachella Valley
Ozone (O_3)	**1-Hour** (0.09 ppm)[c]	Nonattainment
	8-Hour (0.070 ppm)[d]	Nonattainment
PM2.5	**Annual** (12.0 µg/m^3)	Attainment
PM10	**24-Hour** (50 µg/m^3)	Nonattainment
	Annual (20 µg/m^3)	Nonattainment
Lead (Pb)	**30-Day Average** (1.5 µg/m^3)	Attainment
CO	**1-Hour** (20 ppm)	Attainment
	8-Hour (9.0 ppm)	Attainment
NO_2	**1-Hour** (0.18 ppm)	Attainment
	Annual (0.030 ppm)	Attainment
SO_2	**1-Hour** (0.25 ppm)	Attainment
	24-Hour (0.04 ppm)	Attainment
Sulfates	**24-Hour** (25 µg/m^3)	Attainment
H_2S[c]	**1-Hour** (0.03 ppm)	Unclassified[c]

a) State designations shown were updated by CARB on January 5, 2016, based on the 2012-2014 3-year period; stated designations are based on a 3-year data period after consideration of outliers and exceptional events
Source: http://www.arb.ca.gov/desig/statedesig.htm#current

b) State standards, or CAAQS, for ozone, CO, SO_2, NO_2, PM10 and PM2.5 are values not to be exceeded; lead, sulfates, and H_2S standards are values not to be equaled or exceeded; CAAQS are listed in the Table of Standards in Section 70200 of Title 17 of the California Code of Regulations

c) SCAQMD began monitoring H_2S in the southeastern Coachella Valley in November 2013 due to odor events related to the Salton Sea; three full years of data are not yet available for a designation, but nonattainment is anticipated for the H_2S CAAQS in at least part of the Coachella Valley

The maximum concentrations of ozone, PM2.5, PM10, NO_2, and CO recorded at the Coachella Valley monitoring locations in 2015 are shown in Figure 7-2, as percentages of the state and federal standards. The federal standard levels shown are only exceeded for 8-hour ozone. While PM10 concentrations also exceed the federal standards, the PM10 data flagged for exclusion due to high-wind exceptional events have been excluded from the figure although supporting documentation submittal and U.S. EPA concurrence will still be required. The stricter state standard levels are exceeded for both 1-hour and 8-hour ozone and also for PM10. While the maximum concentrations do not necessarily indicate a violation of the federal design value or state designation value form of the standards, they are a useful metric for progress toward attaining those standards.

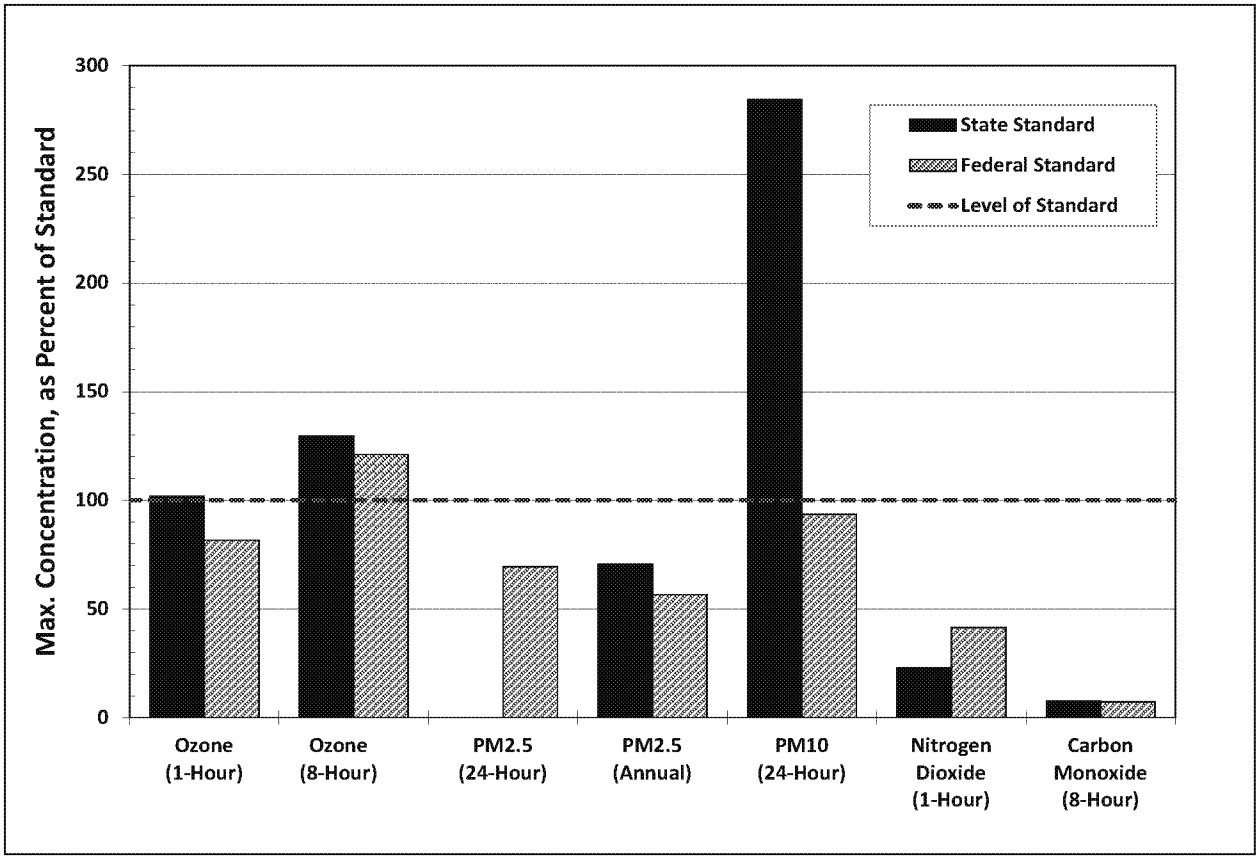


FIGURE 7-2

COACHELLA VALLEY 2015 MAXIMUM POLLUTANT CONCENTRATIONS AS PERCENT OF STATE AND FEDERAL STANDARDS

(THE 2008 8-HOUR FEDERAL OZONE STANDARD IS SHOWN – NOTE THAT THE BAR FOR THE STATE 8-HOUR OZONE STANDARD IS THE NEARLY THE SAME AS FOR THE NEW 2015 8-HOUR FEDERAL OZONE STANDARD, WHICH IS NOT SHOWN; FOR PM10, FLAGGED EXCEPTIONAL EVENTS ARE EXCLUDED, PENDING EVENT DOCUMENTATION REQUIREMENTS AND U.S. EPA APPROVAL)

Figure 7-3 shows the Coachella Valley design values[1] for ozone, PM2.5, and PM10, for the three-year period 2013–2015, as percentages of the current and revoked federal standards, as compared to the Basin. The Basin is predominantly upwind of the Coachella Valley and is the main source area for transported ozone and ozone precursor emissions.

[1] A design value is a statistic that describes the air quality status of a given area relative to the level and form of the NAAQS. For most criteria pollutants, the design value is a 3-year average and takes into account the form of the short-term standard (e.g., 98th percentile, fourth highest value, etc.). Design values can also be calculated for standards that are exceedance-based (e.g., 1-hour ozone and 24-hour PM10) so that they can be expressed as a concentration instead of an exceedance count, in order to allow a direct comparison to the level of the standard. Note that the modeling design values used for the AQMP attainment demonstration are based on a 5-year period, weighted toward the center year, as specified in U.S. EPA modeling guidelines.

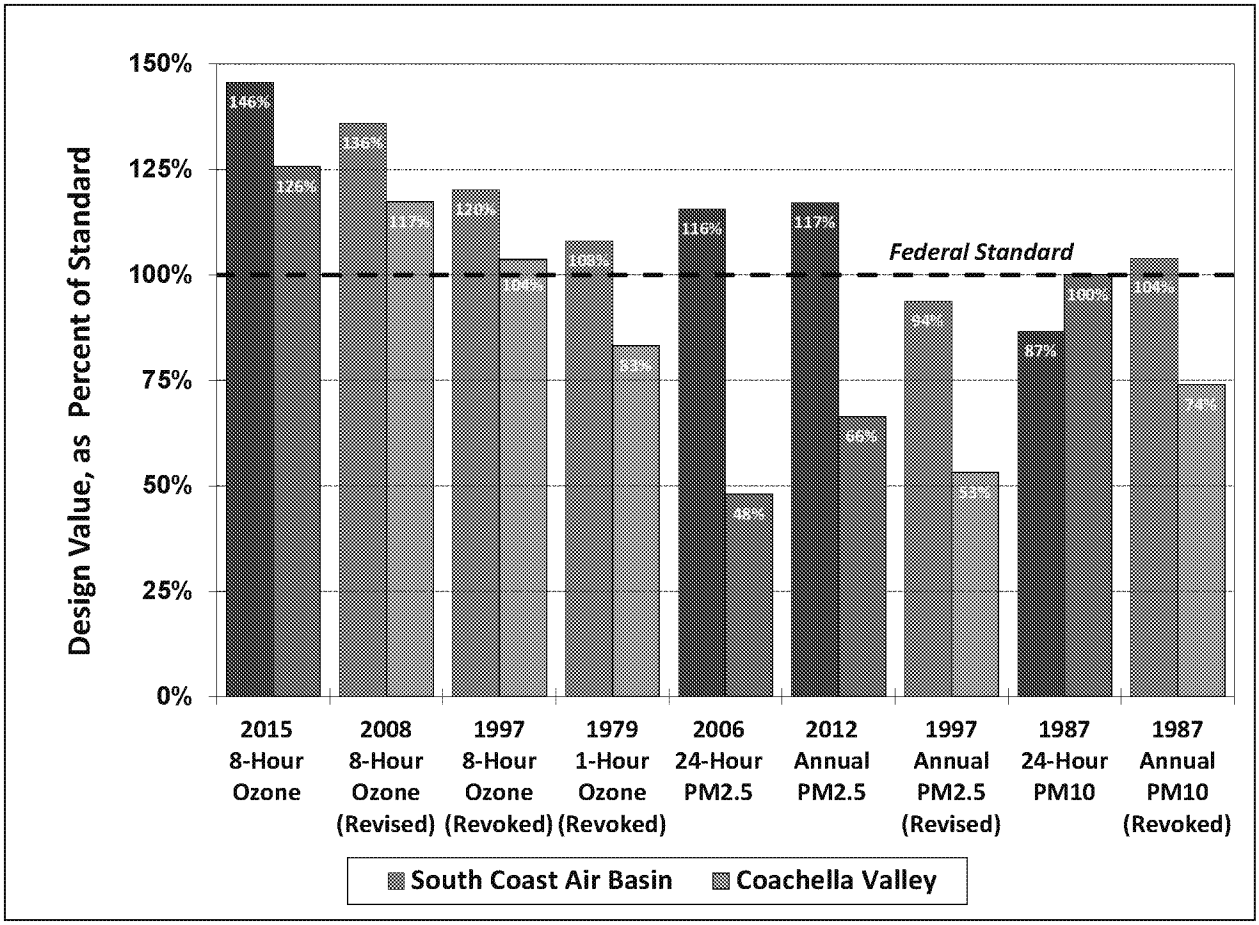


FIGURE 7-3

SOUTH COAST AIR BASIN AND COACHELLA VALLEY 2013–2015 3-YEAR DESIGN VALUES

(PERCENTAGE OF FEDERAL STANDARDS, BY CRITERIA POLLUTANT; FLAGGED PM10 EXCEPTIONAL EVENTS ARE EXCLUDED BUT SUPPORTING DOCUMENTATION AND U.S EPA CONCURRENCE IS STILL NEEDED; NOTE THAT 100 PERCENT OF THE FEDERAL STANDARD IS NOT VIOLATING THAT STANDARD; DARKER COLORS INDICATE THE CURRENT, MOST STRINGENT STANDARD)

Figure 7-4 shows the trend of 3-year design values in the Coachella Valley since 1990, including 1-hour and 8-hour ozone and 24-hour and annual PM2.5, as a percentage of the federal standards (including the former 1979 1-hour ozone NAAQS, the 1997, 2008 and 2015 8-hour ozone NAAQS, the 2006 24-hour PM2.5 NAAQS, and the 2012 annual PM2.5 NAAQS). While recent 8-hour ozone concentrations remain above the NAAQS, the trend shows continued improvement. The PM2.5 design values have remained below the federal standards since the start of these measurements in the Coachella Valley.

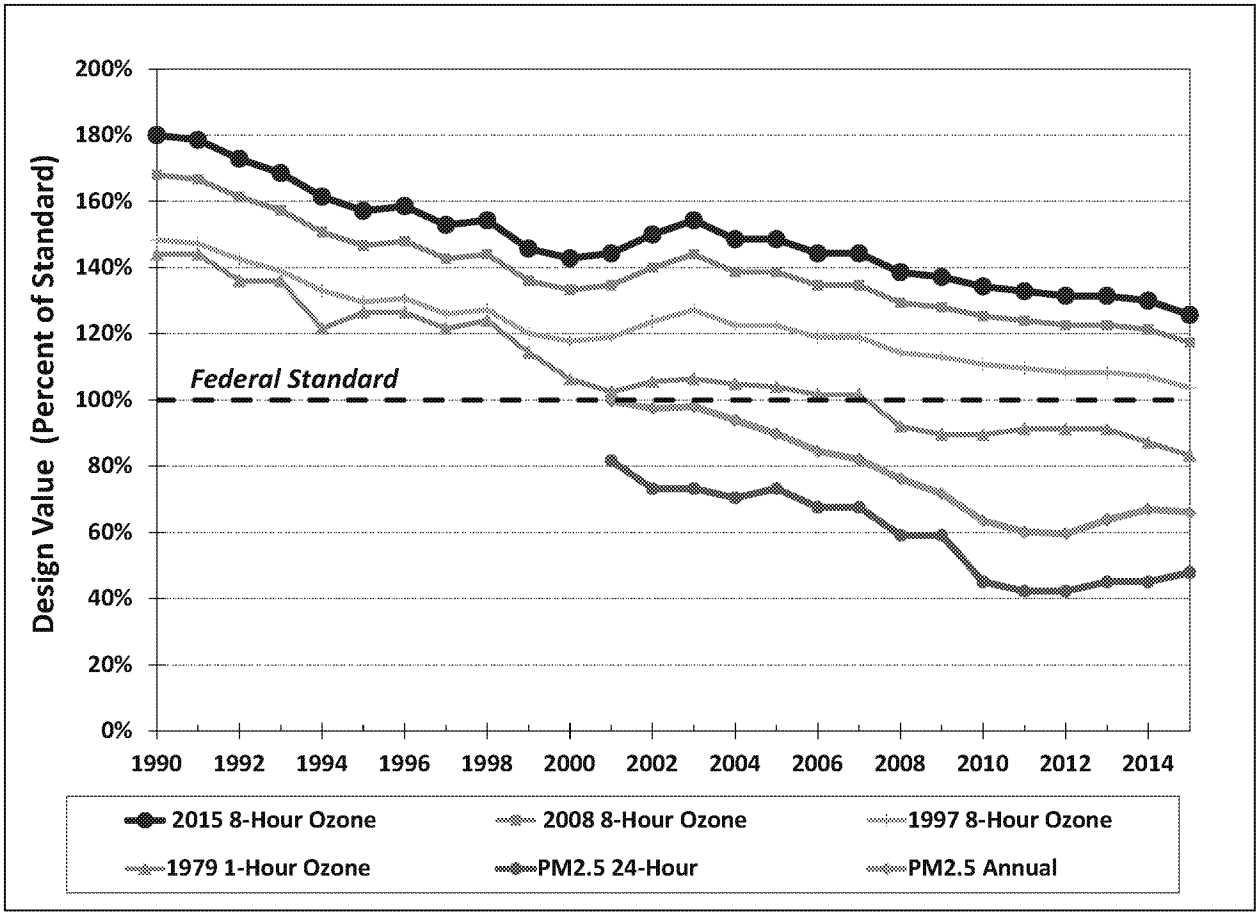


FIGURE 7-4

COACHELLA VALLEY 3-YEAR DESIGN VALUE TRENDS OF OZONE AND PM2.5 AS PERCENT OF THE MOST RECENT FEDERAL STANDARDS, 1990–2015

(PM2.5 MONITORING STARTED IN 1999; THE YEAR PLOTTED IS THE END YEAR OF THE 3-YEAR DESIGN VALUE)

Ozone (O_3)

Atmospheric ozone in the Riverside county portion of the SSAB is both directly transported from the Basin and formed photochemically from precursors emitted upwind. The precursors are emitted in greatest quantity in the coastal and central Los Angeles County areas of the Basin. The Basin's prevailing sea breeze causes polluted air to be transported inland. As the air is being transported inland, ozone is formed, with peak concentrations occurring in the inland valleys of the Basin, extending from eastern San Fernando Valley through the San Gabriel Valley into the Riverside-San Bernardino area and the adjacent mountains. As the air is transported still further inland into the Coachella Valley through the San Gorgonio Pass, ozone concentrations typically decrease due to dilution, although ozone standards can still be exceeded.

Ozone is measured continuously at two locations in the Coachella Valley at the Palm Springs and Indio air monitoring stations. In 2015, the new 8-hour ozone federal standard (0.070 ppm) was exceeded in the Coachella Valley on 47 days (13 percent of the year), while the previous 2008 (0.075 ppm) and 1997 (0.08

ppm) 8-hour standards were exceeded on 26 and 5 days, respectively. The maximum 8-hour ozone concentration was 0.092 ppm (131, 123 and 109 percent of the level of the 2015, 2008 and 1997 ozone standards, respectively). The former 1979 1-hour federal ozone standard level (0.12 ppm) was not exceeded in the Coachella Valley in 2014, with a maximum 1-hour concentration of 0.102 ppm. Ozone concentrations in the Coachella Valley, and the number of days exceeding the federal ozone standards, are greatest in the late spring and summer months, with no exceedances during the winter.

The 8-hour ozone design value for the Coachella Valley for the three-year 2013–2015 period was 0.088 ppm (126, 117, and 104 percent of the 2015, 2008 and 1997 ozone NAAQS, respectively). The 1-hour ozone design value was 0.104 ppm, which is 83 percent of the former 1979 1-hour ozone NAAQS. While the Coachella Valley remains in attainment of the former 1-hour federal standard, the 8-hour NAAQS are still exceeded. The Palm Springs station had higher ozone design values and significantly more days above the standards than the Indio station.

The 1-hour and 8-hour state ozone standards were exceeded on three days and 51 days, respectively, in the Coachella Valley in 2015. The 1-hour ozone health advisory level (≥ 0.15 ppm) has not been reached in the Coachella Valley area since 1998. No 1-hour Stage 1 episode levels (≥ 0.20 ppm) have been recorded in the Coachella Valley area since 1988.

Figure 7-5 shows the trend of the annual peak ozone concentrations (1-hour and 8-hour averages) measured in the Coachella Valley between 1990 and 2015. Figure 7-6 shows the trend of the annual number of days exceeding federal and state ozone standards at Coachella Valley monitoring sites for the years 1990–2015. Figure 7-7 shows the 3-year ozone design value trends from 1990 through 2015 (labeled as the end year of each 3-year design value period). As is illustrated, the Coachella Valley has experienced a trend of steady ozone improvements over the years. However, additional gains are needed to achieve the new and previous 8-hour ozone standards.

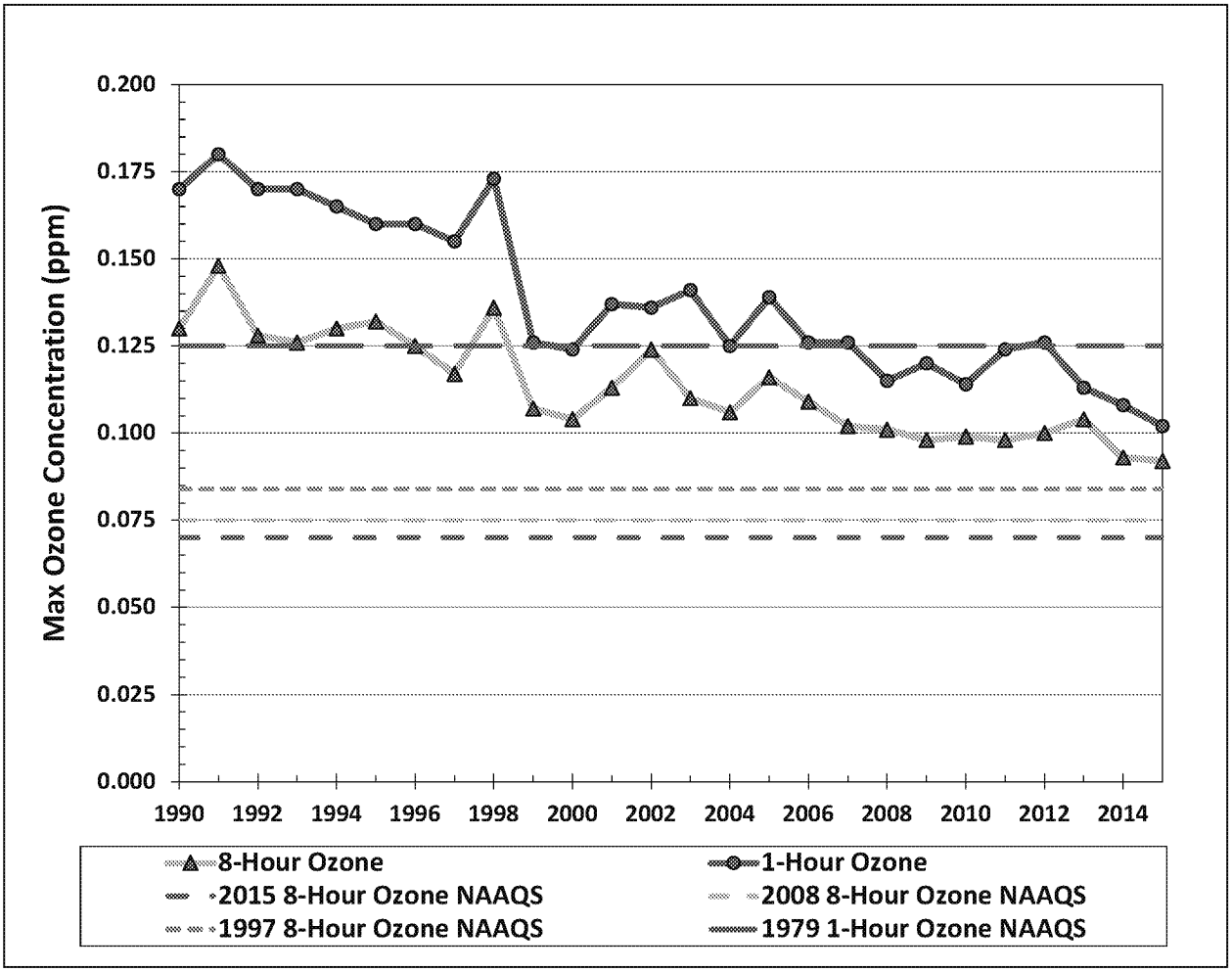


FIGURE 7-5

TRENDS OF COACHELLA VALLEY MAXIMUM 1-HOUR AND 8-HOUR OZONE CONCENTRATIONS, 1990–2015

(DASHED LINES DEPICT THE NEW 2015 8-HOUR AND THE PREVIOUS 2008 AND 1997 8-HOUR AND 1979 1-HOUR FEDERAL OZONE STANDARDS)

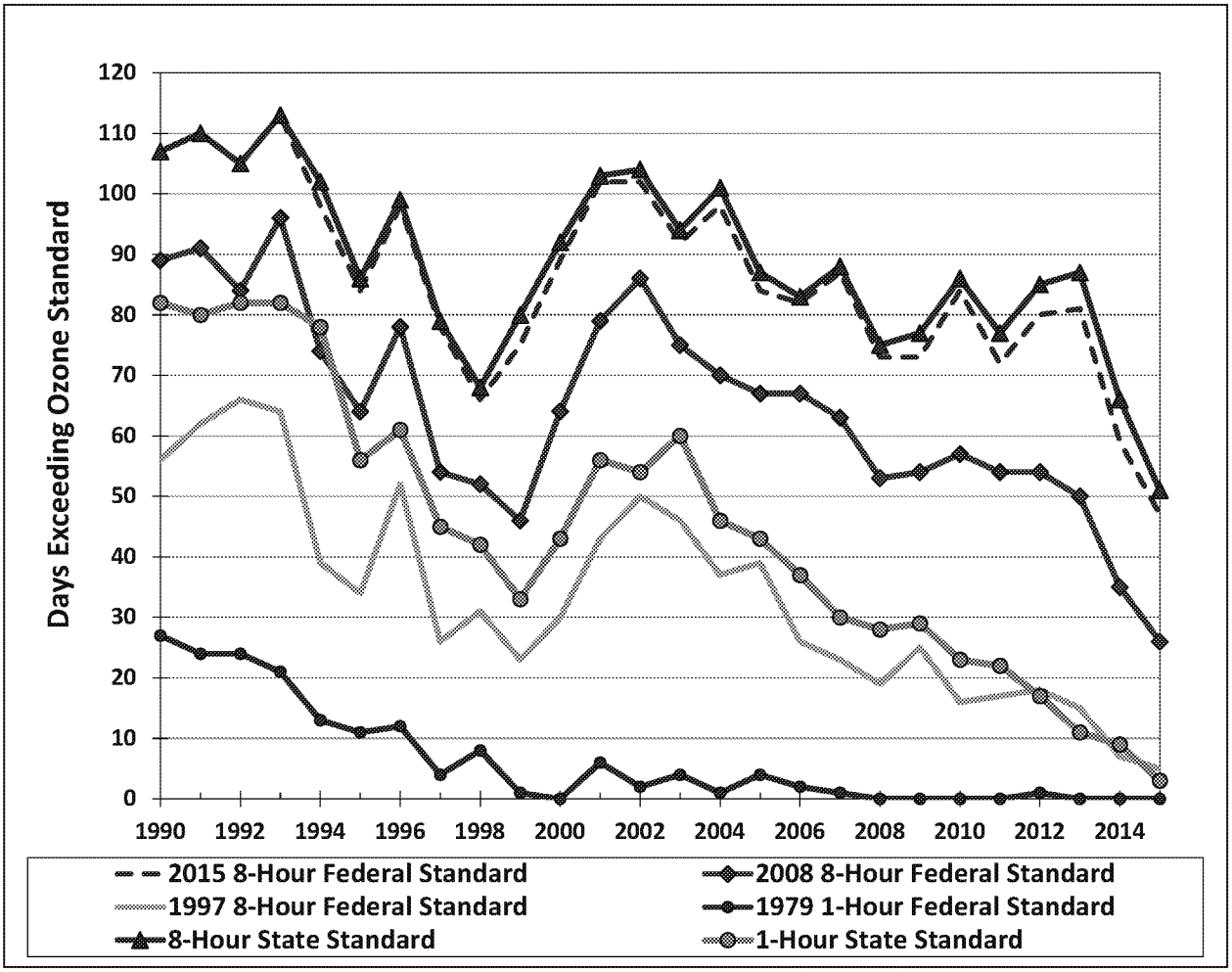


FIGURE 7-6

COACHELLA VALLEY NUMBER OF DAYS EXCEEDING FEDERAL AND STATE OZONE STANDARDS, 1990–2015

(THE NEW 2015 AND 2008 8-HOUR FEDERAL STANDARDS ARE NOW THE CURRENT OZONE NAAQS, BUT COMMITMENTS REMAIN TOWARD TIMELY ATTAINMENT OF THE FORMER FEDERAL STANDARDS; THE COACHELLA VALLEY HAS ATTAINED THE FORMER 1979 FEDERAL 1-HOUR OZONE STANDARD)

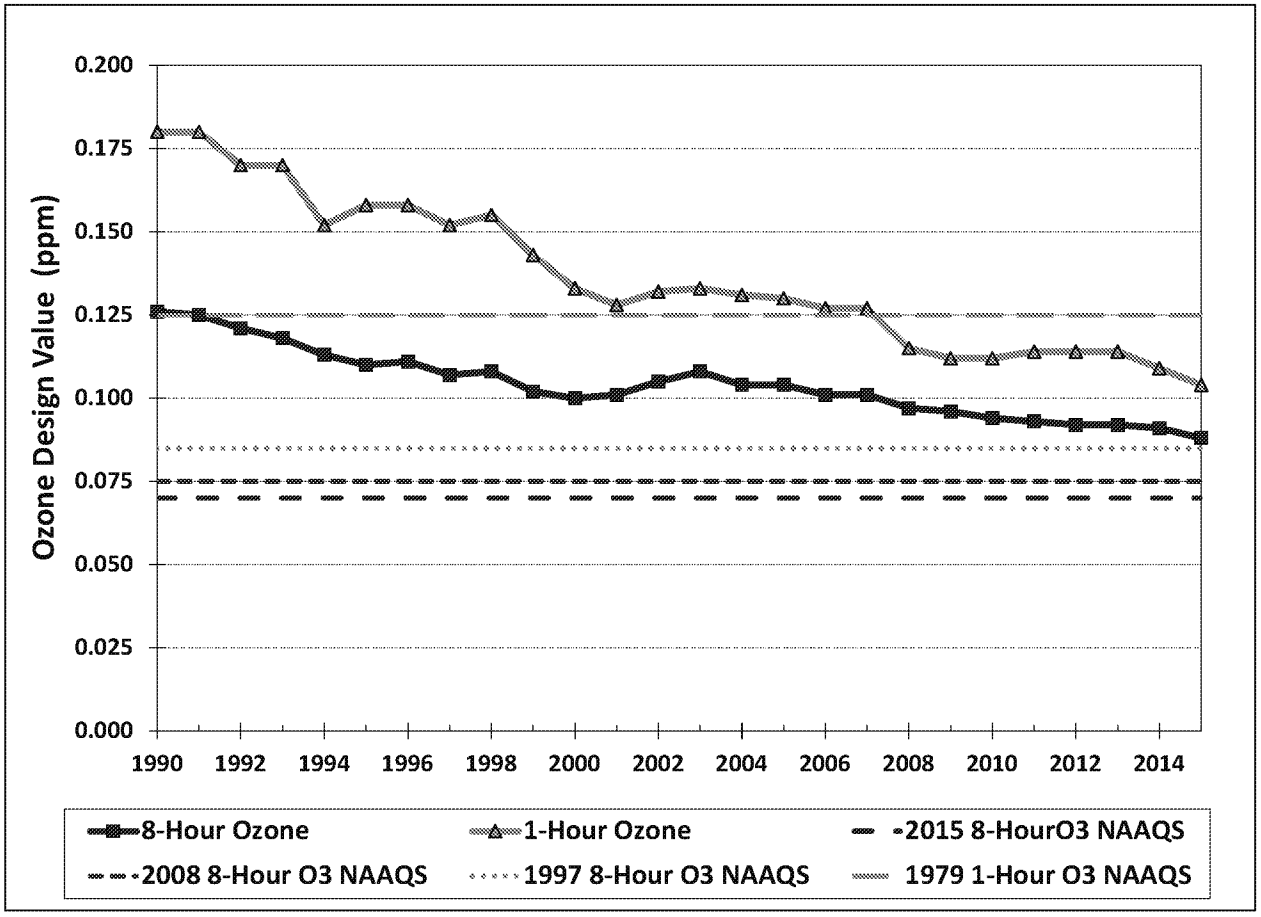


FIGURE 7-7

COACHELLA VALLEY FEDERAL 8-HOUR AND 1-HOUR OZONE 3-YEAR DESIGN VALUE TRENDS, 1990–2015

[DASHED LINES INDICATE THE CURRENT 2015 (NEW), 2008 AND REVOKED 1997 8-HOUR FEDERAL OZONE STANDARDS AND THE REVOKED 1979 1-HOUR OZONE STANDARD (ATTAINED); YEAR PLOTTED IS THE END YEAR OF THE 3-YEAR DESIGN VALUE PERIOD]

PM10

PM10 is measured daily at both Indio and Palm Springs by supplementing the (primary) 1-in-3-day Federal Reference Method (FRM) filter sampling at Indio and the 1-in-6-day FRM sampling at Palm Springs with (secondary) continuous hourly FEM measurements at both stations. In addition, a third station has been operational in the community of Mecca in the southeastern Coachella Valley since 2013, measuring PM10 with a real-time FEM sampler. This monitoring was started at the request of U.S. EPA Region IX to help evaluate windblown dust in that portion of the Coachella Valley, which is potentially impacted by high-wind natural events, agricultural activities, and fugitive dust from the exposed shoreline of the receding Salton Sea.

Although exceedances of the ozone standard in the Coachella Valley area are primarily due to the transport of ozone and its precursors from the densely populated areas of the upwind Basin to the west, PM10 in the Coachella Valley is largely due to locally generated sources of fugitive dust (e.g., construction

activities, re-entrained dust from paved and unpaved road travel, and natural wind-blown sources). The Coachella Valley is subject to frequent high winds that generate wind-blown sand and dust, leading to high episodic PM10 concentrations, especially from disturbed soil and natural desert blow sand areas. PM10 is the only pollutant which often reaches higher concentrations in the SSAB than in the Basin. On some of the high days, long-range transport of wind-generated dust and sand occurs with relatively light winds in the Coachella Valley, when entrained dust from desert thunderstorm outflows travels to the Coachella Valley from the desert areas of southeastern California, Arizona, Nevada or northern Mexico. All days in recent years that exceeded the 24-hour federal PM10 NAAQS at Indio, Palm Springs, and Mecca would not have exceeded that standard except for the contribution of windblown dust and sand due to strong winds in the upwind source area (high-wind natural events).

In 2014, high-wind natural events occurred on eight days that caused high 24-hour PM10 concentrations over the federal standard at the monitors at Indio, Palm Springs, or Mecca.[2] An additional eight days with high PM10 concentrations in 2015 were also flagged as exceptional events due to high winds. These days are summarized in Table 7-4. For 2014, the initial analysis shows that seven of the high-wind events were associated with strong onshore winds from the Basin through the San Gorgonio Pass and down the Coachella Valley. Two days in 2014 had high PM10 due to strong outflows from thunderstorms over Arizona and northern Mexico that entrained dust and sand that was transported into the Coachella Valley by southeasterly monsoonal flows. In 2015, four of the high-wind events were associated with strong winds through the San Gorgonio Pass and the remaining four were associated with summertime thunderstorm activity over the deserts of the southwestern U.S. and northern Mexico. One of the 2014 monsoonal flow days, July 17, 2015, had the highest PM10 concentration measured in the Coachella Valley in 2014 or 2015 – 337 $\mu g/m^3$ at Indio. As was done for similar high-wind events in prior years, the 2014 and 2015 events have been flagged upon submittal to the U.S. EPA AQS database as high-wind exceptional events, in accordance with the U.S. EPA Exceptional Events Rule, with further documentation and U.S. EPA concurrence pending.

[2] The FEM PM10 sampler in Mecca was treated as a special purpose monitor for evaluation purposes through 2014; the 2015 data has been submitted to the U.S. EPA AQS database along with flagging for exceptional events.

TABLE 7-4

High-Wind Exceptional Event Days in the Coachella Valley in 2014 and 2015

Date	Palm Springs PM10 (µg/m³)	Indio PM10 (µg/m³)	Mecca PM10 (µg/m³)#	Event Description
03/26/2014	113*	**168**	123*	high winds
04/12/2014	57*	**243**	**183***	high winds
04/13/2014	32*	**168**	132*	high winds
04/25/2014	49*	52	**183***	high winds
05/10/2014	73*	**215**	**226***	high winds
06/13/2014	29*	101	**183***	high winds
06/27/2014	38*	**165**	130*	high winds
07/27/2014**	106*	152	152*	high winds – monsoonal thunderstorms
08/18/2014	**313***	**298**	**237***	high winds – monsoonal thunderstorms
05/07/2015	15*	ND	**209***	high winds
07/08/2015	23*	**174**	**180***	high winds – monsoonal thunderstorms
07/17/2015	**161**	**337**	**306***	high winds – monsoonal thunderstorms
08/19/2015	48*	**181**	147*	high winds – monsoonal thunderstorms
09/09/2015	**187**	**176**	128*	high winds – monsoonal thunderstorms
11/02/2015	ND	**182**	87*	high winds
12/14/2015	11*	55	**203***	high winds
12/26/2015	13*	100	**300***	high winds

ND = No Data

Bold text indicates concentrations in excess of the PM10 NAAQS

2014 Mecca PM10 data is considered preliminary, subject to change in validation (not submitted or flagged in U.S. EPA AQS database)

* Indicates measurement with continuous FEM (TEOM) instrument; FRM filter is primary measurement when available

** Peak measured concentrations on 7/27/14 did not technically exceed the federal PM10 standard, which requires a 24-hour average of 155 µg/m³, or above, to exceed

After excluding days flagged due to high-wind natural events, the federal 24-hour PM10 standard and the revoked federal annual PM10 standard, were not exceeded at these stations in either 2014 or 2015. Therefore, the maximum 2015 24-hour PM10 concentration (152 µg/m³) and annual average (38.6 µg/m³)

were 98 and 71 percent of the current 24-hour federal PM10 standard and the revoked annual federal standard (50 μg/m^3), respectively.[3]

When considering the form of the federal PM10 standards, after excluding the flagged high-wind exceptional events, the 3-year (2013–2015) design values for the Coachella Valley are 152 μg/m^3 for the 24-hour average and 38 μg/m^3 for the annual average (former standard). These are 98 and 70 percent of the 24-hour and former annual PM10 federal standards, respectively, and 304 and 190 percent of the state 24-hour (50 μg/m^3) and annual average (20 μg/m^3) PM10 standards. Figure 7-8 shows the trend of the annual average PM10 concentrations in the Coachella Valley for the station showing the highest PM10 measurements from 1990 through 2015, along with the annual PM2.5 trend.

[3] Technically, a 24-hour PM10 concentration ≥ 155 μg/m^3 is required to exceed the federal standard, due to rounding requirements and the form of the standard. While Coachella Valley concentrations near, but below 155 μg/m^3, are also influenced by high winds, exceptional event flagging only applies to data that violates a NAAQS. The revoked federal annual PM10 standard required an annual PM10 concentration ≥ 50.05 μg/m^3 to exceed that standard, which rounds to 50.1 μg/m^3.

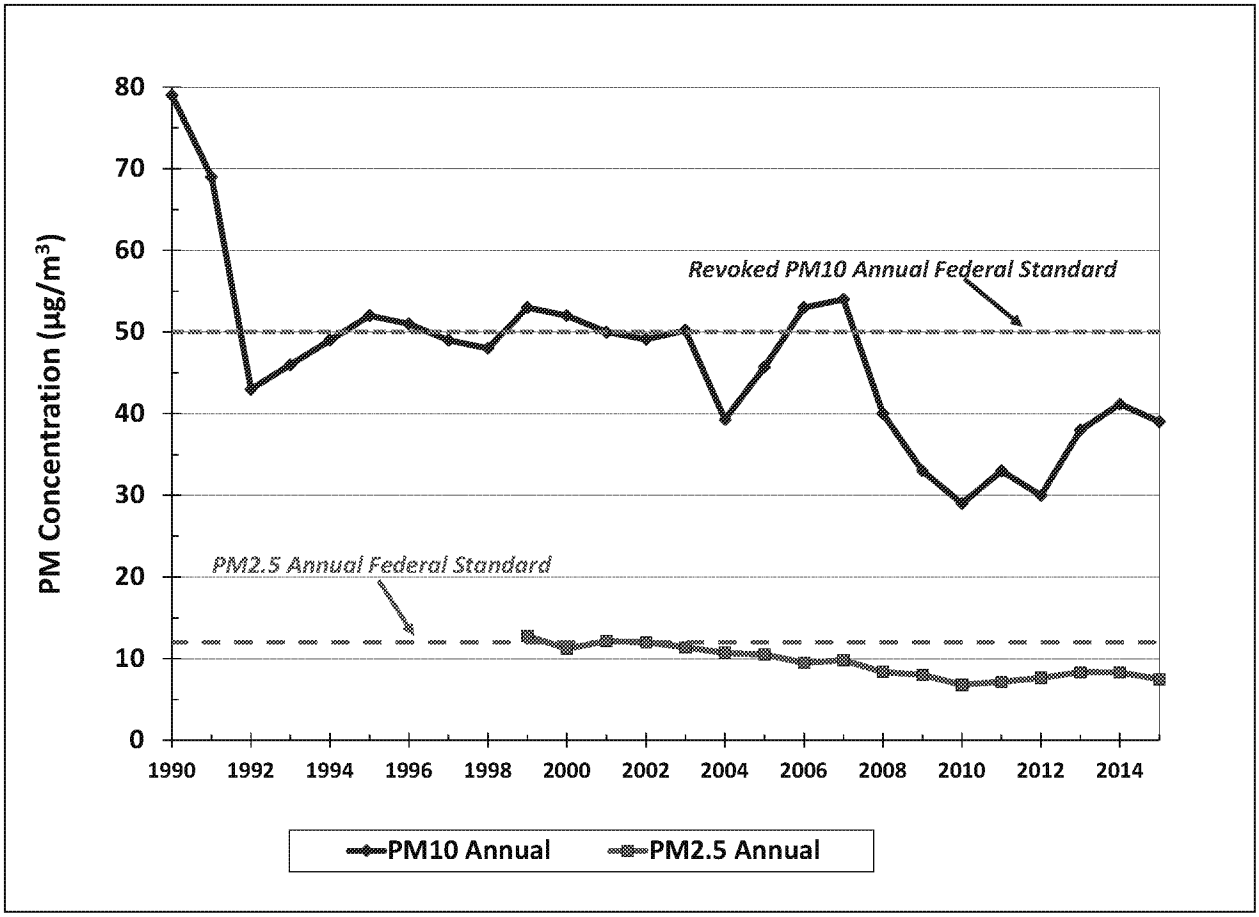


FIGURE 7-8
COACHELLA VALLEY TREND OF ANNUAL AVERAGE PM10 AND PM2.5, 1990–2015

PM2.5

SCAQMD began PM2.5 monitoring in both the Coachella Valley and the Basin in 1999. Two routine stations (Palm Springs and Indio) measure PM2.5 every third day with 24-hour filter-based FRM measurements, as required by U.S. EPA monitoring regulations. PM2.5 has remained relatively low, especially when compared to the Basin, due to fewer combustion-related emissions sources and less secondary aerosol formation in the atmosphere. There is also typically increased vertical mixing and horizontal dispersion in the desert areas. When looking at the 3-year design value for the 2013–2015 period, the Coachella Valley PM2.5 24-hour design value (17 µg/m^3) is 48 percent of the 24-hour NAAQS (35 µg/m^3) and the annual average design value (8.0 µg/m^3) is 66 percent of the current 2012 annual NAAQS (12.0 µg/m^3).

Figure 7-9 shows the trend of 3-year design values for annual average and 24-hour PM2.5 from 2001 through 2015. The stations in the Coachella Valley have not exceeded the 3-year design value form of the current standards since monitoring began. The annual average for the first year of measurements (1999) was just slightly above the level of the standard as can be seen in the trend of the annual average PM2.5 concentrations, shown in Figure 7-8 (above). As was seen elsewhere in California, the slight

increasing trend in the 24-hour design values in the Coachella Valley after 2012 is likely due, at least in part, to the ongoing drought conditions (see the PM2.5 section in Chapter 2 for additional drought discussion).

There are occasionally some individual days that exceeded the level of the 24-hour PM2.5 standard in the Coachella Valley, due to the PM2.5 fine particulate portion of windblown dust during very high PM10 events caused by high winds. Even though the PM2.5 standard can be exceeded during these exceptional events, the PM2.5 mass is a very small fraction of the total PM10 mass. These events are "extreme" and can be flagged as exceptional events, but they have not occurred frequently enough to exceed the 98th percentile form of the 24-hour PM2.5 standard.

The 2015 Coachella Valley maximum 24-hour average and the highest annual average concentrations (24.6 µg/m^3 and 7.5 µg/m^3, respectively, both at Indio) were 69 percent and 62 percent of the current federal 24-hour and annual standards. The annual PM2.5 state standard (12.0 µg/m^3), which is the same level as the federal annual standard, but with different rounding requirements, is also not exceeded in the Coachella Valley.

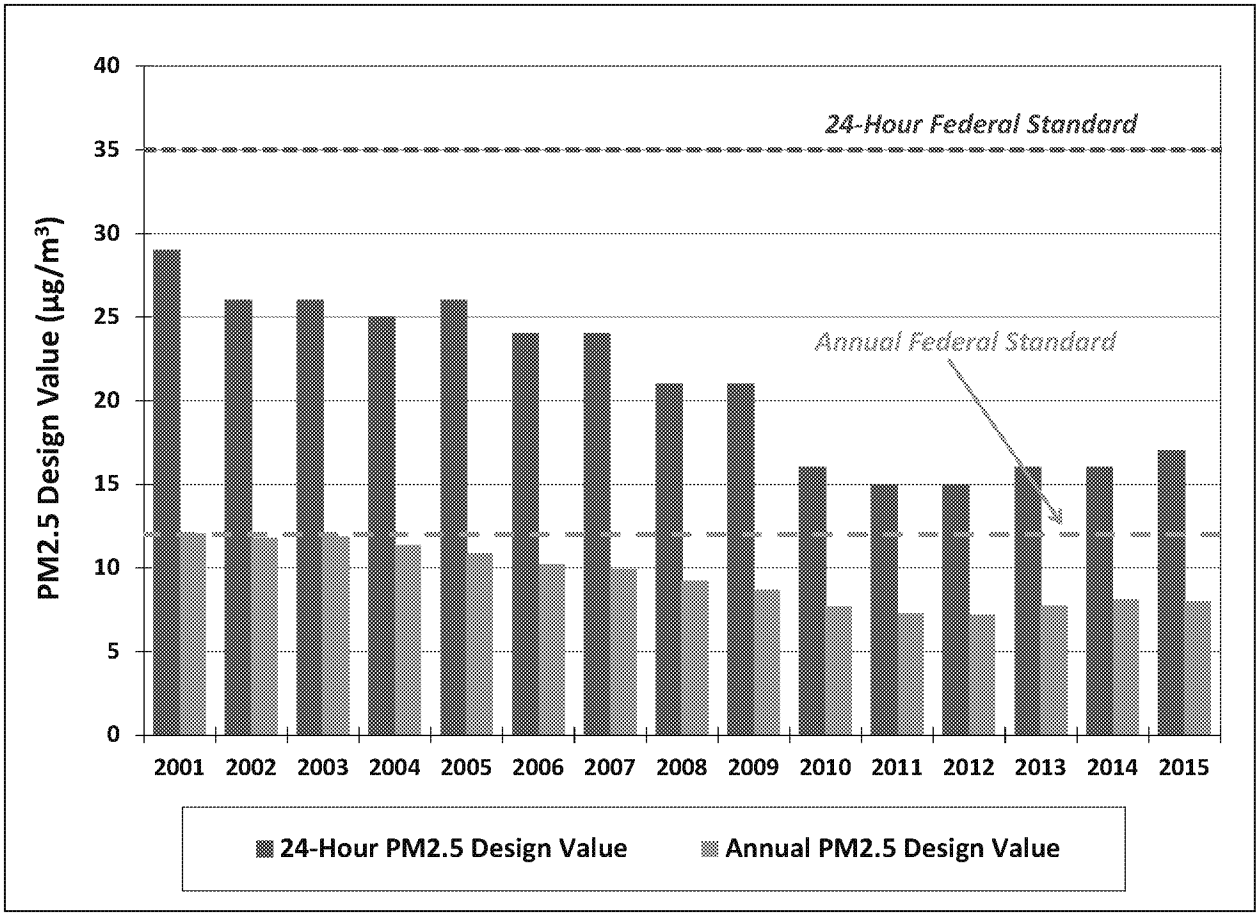


FIGURE 7-9
COACHELLA VALLEY TREND OF 24-HOUR AND ANNUAL AVERAGE PM2.5 3-YEAR DESIGN VALUES, 2001–2015

Desert Hot Springs PM2.5 Monitoring

In addition to the routine PM2.5 measurements, SCAQMD has been measuring PM2.5 since May 2014 with a continuous FEM instrument in Desert Hot Springs. This station is in the predominantly downwind direction of the 800 megawatt CPV Sentinel natural gas-powered electric generation facility.[4] Through the end of 2015, only a single day, June 19, 2015, exceeded the level of the 24-hour federal standard, with a concentration of 52.3 µg/m^3. That high day was associated with a strong windblown dust event that also had very high PM10 concentrations, due to outflows from thunderstorm activity over the desert southwest. Therefore, this day would qualify for flagging as a high-wind exceptional event and the high PM2.5 concentration was not correlated to power plant activity. In addition, such occasional single high

[4] Current and historic preliminary data from the Desert Hot Springs temporary special purpose monitor near CPV Sentinel can be found on the SCAQMD website at: http://www.aqmd.gov/home/library/air-quality-data-studies/special-monitoring/cpv-sentinel-monitoring.

values over the level of the standard have not caused a violation of the 98th percentile, 3-year design value form of the PM2.5 NAAQS.

The preliminary Desert Hot Springs PM2.5 annual average for 2015, the first full year of measurements, was 6.66 μg/m^3, well below the 12.0 μg/m^3 annual federal standard in this northern Coachella Valley location. While the concentrations from the continuous PM2.5 instruments, such as that used at the Desert Hot Springs station, are typically biased higher than the filter-based FRM PM2.5 measurements, the annual average concentration of 6.7 μg/m^3 is close to the 2014 FRM PM2.5 annual average measured at Palm Springs (6.4 μg/m^3) and below that measured at Indio (8.3 μg/m^3).

Other Criteria Pollutants

Carbon Monoxide (CO)

CO was measured at one Coachella Valley air monitoring station (Palm Springs) in 2015. Neither the federal nor state standards were exceeded. The maximum 8-hour average CO concentration recorded in 2015 (0.7 ppm) was less than 8 percent of both the federal (9 ppm) and state (9.0 ppm) 8-hour standards. The maximum 1-hour CO concentration (2.0 ppm) was 6 percent of the federal (35 ppm) and 10 percent of the State (20 ppm) 1-hour CO standards. Historical carbon monoxide air quality data show that the Coachella Valley area has not exceeded the federal CO standards in nearly three decades.

Nitrogen Dioxide (NO_2)

NO_2 was measured at one station (Palm Springs) in the Coachella Valley in 2015. The maximum annual average NO_2 concentration of 0.0062 ppm was approximately 12 percent of the federal annual standard (0.0534 ppm) and 21 percent of the state annual standard (0.030 ppm). The maximum 1-hour average concentration of 41.5 ppb was 42 percent of the 2010 federal (100 ppb) and 23 percent of the state 1-hour standard (180 ppb).

Sulfur Dioxide (SO_2)

SO_2 concentrations were not measured in the Coachella Valley in 2015. Historic analyses have shown SO_2 concentrations to be well below the state and federal standards and there are no significant emissions sources in the Coachella Valley.

Sulfates (SO_4^{2-})

Sulfate, from FRM PM10 filters, was measured at two stations (Palm Springs and Indio) in the Coachella Valley in 2015. The 2015 maximum 24-hour average sulfate concentration was 4.6 μg/m^3 (18 percent of the 25 μg/m^3 State sulfate standard) and the 3-year maximum State designation value was 2.6 μg/m^3 (10 percent of the 25 μg/m^3 State sulfate standard). While still well below the State standard, the 4.6 μg/m^3 peak value may not be the State designation value, since it was associated with a high-wind exceptional event that caused exceedances of the PM10 NAAQS at Indio at both the Palm Springs and Indio air monitoring stations. There is no federal sulfate standard.

Lead (Pb)

Lead was not measured in the Coachella Valley in 2015. Historic analyses have shown concentrations to be less than the state and federal standards as no significant sources of lead emissions are located in the Coachella Valley.

Hydrogen Sulfide (H_2S)

SCAQMD started measuring H_2S near the Salton Sea at two locations in November 2013 in order to better understand odor events related to the Salton Sea and to better communicate these events to the community. One of the H_2S monitoring stations is located on Torres-Martinez tribal land that is close to the shore, in a sparsely populated area. The second monitor is located at the SCAQMD Mecca air monitoring station site (Saul Martinez Elementary School), a more populated community approximately four miles north of the Salton Sea.

A significant H_2S odor event occurred in September 2012, bringing sulfur or rotten-egg odors and widespread attention to the issue of H_2S odors from the Salton Sea. This event affected people in communities throughout the Coachella Valley, across many areas of the Basin, and into portions of the Mojave Desert Air Basin to the north. Over 235 odor complaints were registered with SCAQMD during this event, from as far west as the San Fernando Valley in Los Angeles County.

H_2S is a product of anaerobic organic decay in the Salton Sea that is particularly active in the summer months, especially at the bottom of the shallow Sea with the abundant desert sunlight and heat. The 2012 event occurred during a period of moist southeasterly "monsoonal" flows in desert areas of southeastern California, along with desert thunderstorms. Strong outflow winds from thunderstorms to the south crossed the Salton Sea, causing mixing in the water layers that released and transported significant amounts of H_2S gas and the associated odors.

While strong events like that of September 2012 are uncommon, less extreme releases of H_2S can cause odors in areas close to the Salton Sea relatively frequently. These events are more prevalent during the hot summer months, especially when the southeasterly "monsoonal" flow events occur, but they sometimes occur at other times of the year. Elevated H_2S is typically measured in the Coachella Valley during wind shifts that bring flows from the south or east directions. These shifts occur most often in the early morning or the late afternoon/early evening hours in this area. The Salton Sea's receding shorelines and shallower waters may affect the number or severity of these odor events in the future.

While there is no federal standard for H_2S, California has set a standard of 30 parts per billion (ppb), averaged over one hour as a level not to be reached or exceeded. The state standard was adopted in 1969, based on the thresholds for annoyance and unpleasant odors, with the purpose of decreasing odor annoyances.[5] Humans can detect H_2S odors at extremely low concentrations, down to a few ppb. Above the state standard, most individuals can smell the offensive odor and many may experience temporary symptoms such as headaches and nausea due to unpleasant odors. The CAAQS for H_2S was reviewed in 1984 and retained.

In 2014 and 2015, 24 and 27 days, respectively, had exceedances of the 1-hour state H_2S standard at the sparsely populated Torres-Martinez monitoring site at the Salton Sea. Of these, five days in 2014 and 12 12 days in 2015 had H_2S exceedances that lasted longer than one hour. The highest number of hourly exceedances in a day was 20, on September 9, 2015, while the next highest number of hours exceeding in a single day was six. The exceedances at this station occurred between the beginning of April and the

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[5] Collins, J., and D. Lewis. (2000). Hydrogen Sulfide: Evaluation of Current California Air Quality Standards with Respect to Children. California Office of Environmental Health Hazard Assessment document prepared for CARB. http://www.arb.ca.gov/ch/ceh/001207/h2s_oehha.PDF.

end of October, with most occurring in August and September. The highest 1-hour concentration measured at the Torres-Martinez station in 2014 and 2015 was 183 ppb, on September 9, 2015.

Further north from the Salton Sea in Mecca, the state H_2S standard was exceeded on three days in 2014 and six days in 2015, with a peak concentration of 129 ppb on September 3, 2015. The most hours in a day to exceed the standard at Mecca was six, on September 9, 2014. Most of the daily exceedances only lasted one or two hours. All the 2014 and 2015 Mecca exceedances occurred in the months of August and September. Figure 7-10 shows the 2014 and 2015 monthly number of days by station exceeding the state H_2S standard in the Coachella Valley.

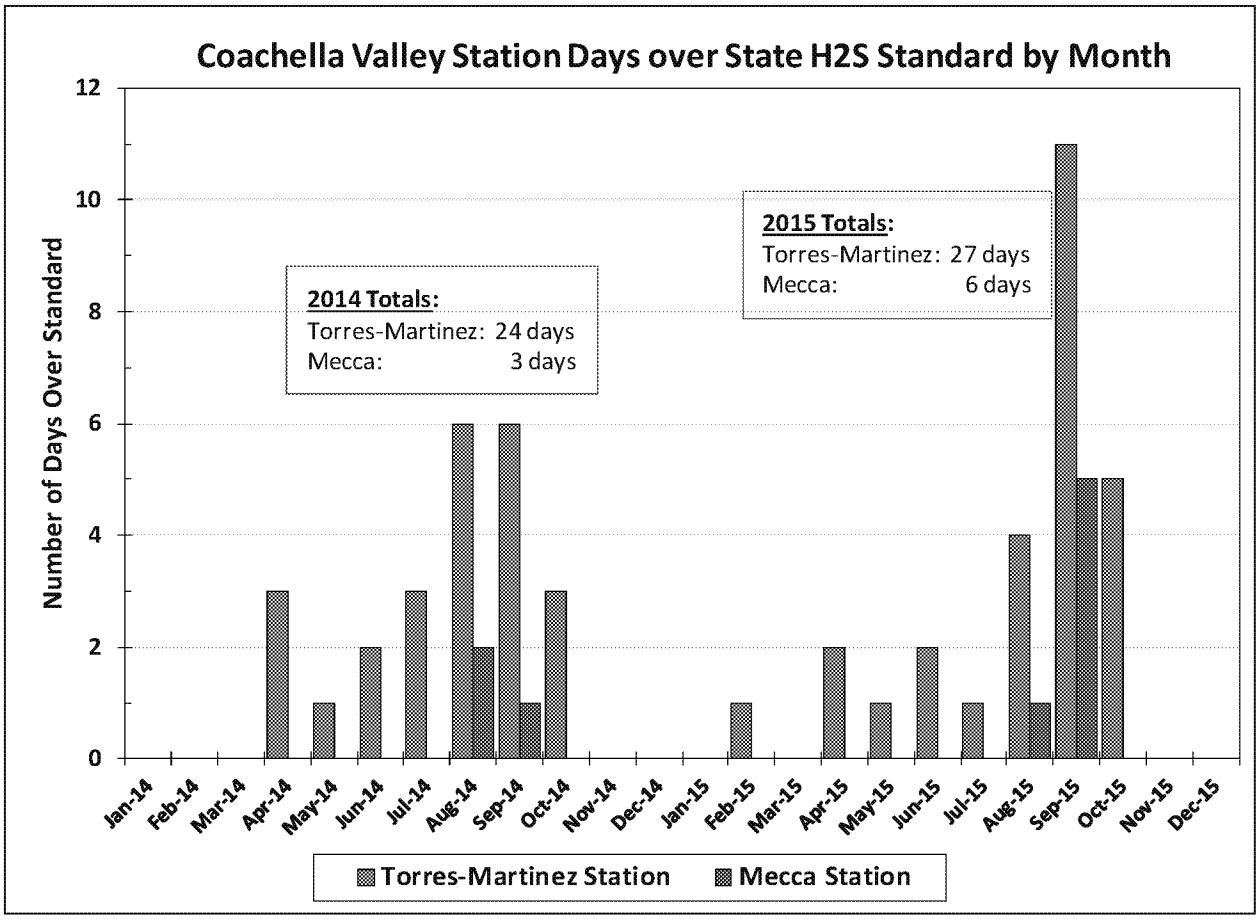

FIGURE 7-10

NUMBER OF DAYS IN EACH MONTH WITH 1-HOUR HYDROGEN SULFIDE (H_2S) OVER THE STATE STANDARD IN 2014 AND 2015 FOR COACHELLA VALLEY MONITORING STATIONS

Pollutant Transport

Pollutant transport from the Basin to the SSAB occurs through the San Gorgonio Pass (sometimes referred to as the Banning Pass) to the Coachella Valley.[6] The transport pathway to the Coachella Valley has been well documented and studied in the past. An experiment in the early 1970s concluded that the South Coast Air Basin was the source of the observed high ozone levels in the Coachella Valley.[7] Transport from Anaheim to Palm Springs was directly identified with an inert sulfur hexafluoride tracer release.[8] A comprehensive study of transport from the Basin to the SSAB also confirmed the ozone transport pathway to the Coachella Valley.[9]

Ozone pollutant transport to the Coachella Valley can be demonstrated by examining averaged ozone concentrations by time of day for various stations along the transport corridor from Los Angeles County into Riverside County and into the Coachella Valley. Figure 7-11 shows the diurnal distribution of averaged 1-hour ozone concentrations for the May–October smog season, by hour, for the 2012–2014 period. The Coachella Valley transport route is represented, starting at Central Los Angeles as the main emissions source region and passing through Riverside-Rubidoux and Banning and finally through the San Gorgonio Pass to Palm Springs in the Coachella Valley. Near the source regions, ozone peaks occur just after mid-day (1 to 2 p.m. Pacific Standard Time (PST)), on average, during the peak of incoming solar radiation and therefore the peak of ozone production. Ozone peaks near the emissions source region are not as high as those further downwind, due to the photochemical reaction time needed for ozone to form from precursor gases. Downwind of the source region, ozone peaks occur later in the day and at generally higher concentrations as ozone and ozone precursors are transported downwind and photochemical reactions continue. At Palm Springs, ozone concentration peaks occur between 4 and 6 p.m. PST. If this peak were locally generated, it would be occurring closer to near mid-day, as is seen in the major source areas of the Basin, and not in the late afternoon or early evening, as is seen at Palm Springs.

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[6] Keith, R.W. (1980). A Climatological Air Quality Profile: California's South Coast Air Basin. Staff Report, South Coast Air Quality Management District.

[7] Kauper, E.K. (1971). Coachella Valley Air Quality Study. Final Report, Pollution Res. & Control Corp., Riverside County Contract & U.S. Public Health Service Grant No. 69-A-0610 RI.

[8] Drivas, P.J., and F.H. Shair. (1974). A Tracer Study of Pollutant Transport in the Los Angeles Area. *Atmos. Environ.* 8, 1155-1163.

[9] Smith, T.B., et al. (1983). The Impact of Transport from the South Coast Air Basin on Ozone Levels in the Southeast Desert Air Basin. CARB Research Library Report No. ARB-R-83-183. CARB Contract to MRI/Caltech. http://www.arb.ca.gov/research/single-project.php?row_id=64953.

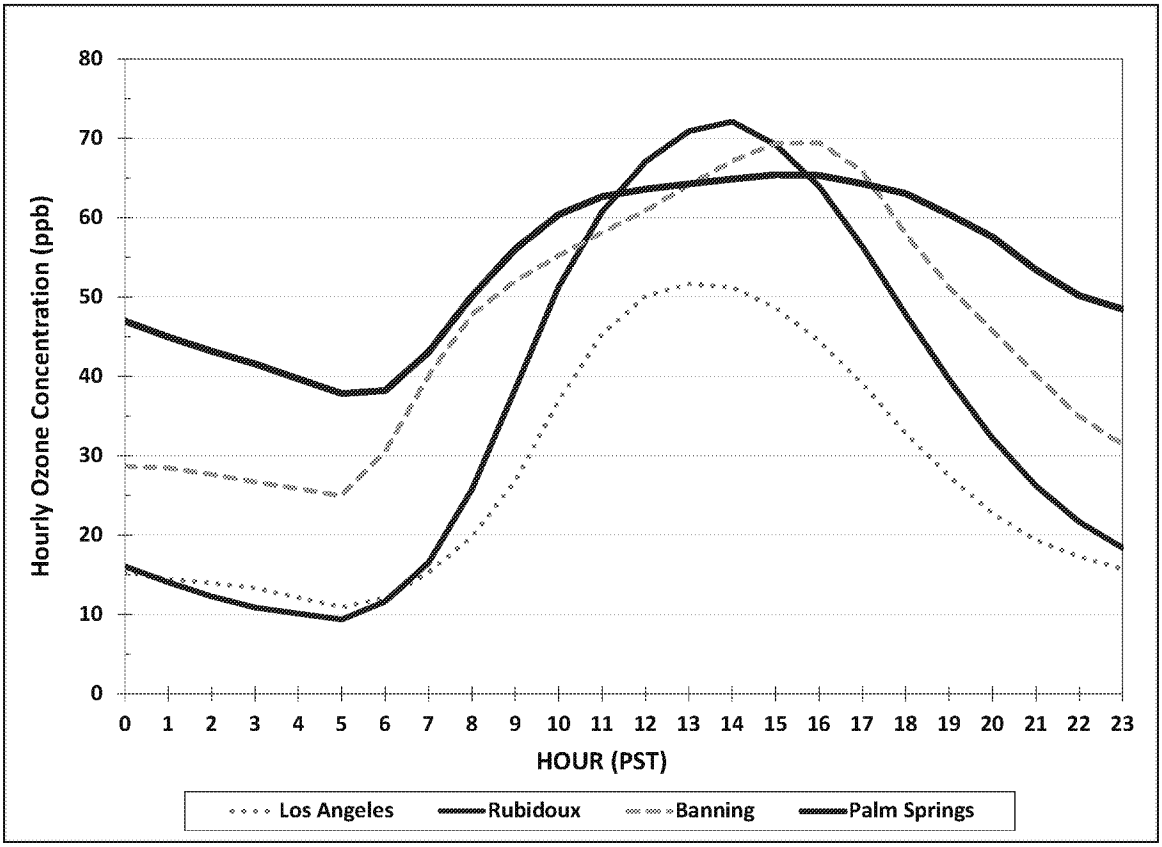

FIGURE 7-11

DIURNAL PROFILE OF 3-YEAR (2012–2014) HOURLY OZONE CONCENTRATIONS ALONG THE TRANSPORT ROUTE INTO THE COACHELLA VALLEY

(HOURS IN PACIFIC STANDARD TIME (PST), AVERAGED FOR THE MAY–OCTOBER OZONE SEASON BY HOUR)

Palm Springs also exhibits higher morning ozone concentrations, when compared to the concentrations in the morning in the Basin closer to the main emissions source areas (i.e., Los Angeles and Rubidoux). The stations in the Basin have more local NOx emissions (mostly from mobile sources) that help scavenge[10] the ozone after dark when ozone photochemistry ceases. The Coachella Valley has limited local NOx emissions to help scavenge the ozone at night. This elevated overnight ozone contributes to an early morning start to the daily ozone increase in Coachella Valley, starting after sunrise (5–6 a.m. PST), with the ample sunlight and strong overnight temperature inversions in the desert. Ozone concentrations observed on high ozone days in the Coachella Valley can reach an initial peak before noon and then drop slightly with increased mixing in the early afternoon, before climbing to the daily peak, typically between 4 and 6 p.m., as the typical onshore flow reaches the Coachella Valley through the San Gorgonio Pass, transporting new ozone from the Basin.

[10] Freshly emitted NOx includes NO, which destroys ozone through a fast reaction colloquially termed 'scavenging.'

Future Air Quality

Emissions Inventories

For illustrative purposes, Table 7-5 shows base year (2012) and future-year emission inventories for the Coachella Valley, based on the AQMP inventory methodology as described in Appendix III – Base and Future Year Emission Inventory. Emissions, in tons per day, of VOC, NOx, CO, SOx, PM10, PM2.5, and NH_3 are shown. The corresponding inventories for the Basin are shown for comparison in Table 7-6. The Basin emissions, typically upwind of the Coachella Valley, overwhelm the locally-generated emissions. Depending on the pollutant, emissions in the Basin are 10 to over 350 times greater than emissions in the Coachella Valley. Future increases in some of the pollutant emissions within the Coachella Valley are largely due to projected increases in population, VMT, and construction activity. It is clear that improved air quality in the Coachella Valley depends on reduced emissions in the Basin. This is further illustrated by the positive trends in ozone air quality in both areas, as described earlier.

TABLE 7-5

Coachella Valley Annual Average Emissions for Base Year (2012) and Future Years, without Further Controls

COACHELLA VALLEY EMISSIONS (Tons/Day)							
YEAR	**VOC**	**NOx**	**CO**	**SOx**	**PM10**	**PM2.5**	**NH_3**
2012	14.1	27.1	59.7	0.2	15.2	3.4	2.4
2019	12.6	16.8	45.3	0.2	21.7	3.7	2.3
2021	12.6	14.7	43.6	0.2	23.3	3.9	2.3
2022	12.6	13.7	43.2	0.2	23.7	3.9	2.3
2023	12.6	11.2	43.0	0.2	24.3	4.0	2.3
2025	12.7	10.5	42.8	0.2	25.3	4.1	2.4
2026	12.8	10.3	43.1	0.2	25.8	4.2	2.4
2031	13.5	9.4	45.7	0.2	28.6	4.6	2.5

TABLE 7-6

South Coast Air Basin Annual Average Emissions for Base Year (2012) and Future Years, without Further Controls

SOUTH COAST AIR BASIN EMISSIONS (Tons/Day)							
Year	VOC	NOx	CO	SOx	PM10	PM2.5	NH_3
2012	470.1	539.9	2123.1	18.4	152.5	66.4	81.1
2019	375.6	353.1	1447.3	16.6	158.8	63.9	74.0
2021	365.4	309.1	1357.3	16.8	160.7	63.8	72.9
2022	362.3	290.5	1324.7	17.0	161.9	64.1	72.6
2023	358.8	256.7	1298.1	17.1	162.7	64.2	72.3
2025	353.5	240.6	1246.8	17.4	163.8	64.3	72.3
2026	351.8	234.2	1231.8	17.5	164.4	64.4	72.4
2031	345.0	213.8	1187.8	18.2	167.9	65.3	73.1

Reasonable Further Progress

The federal CAA requires SIPs for most nonattainment areas to demonstrate RFP toward attainment through emission reductions phased in from the time of the SIP submission until the attainment date time frame. The RFP requirements in the CAA are intended to ensure that ozone nonattainment areas provide for sufficient progress towards ozone precursor emission reductions to attain the ozone NAAQS.

Per CAA Section 171(1), RFP is defined as "such annual incremental reductions in emissions of the relevant air pollutant as are required by this part or may reasonably be required by the Administrator for the purpose of ensuring attainment of the applicable national ambient air quality standard by the applicable date." As stated in subsequent federal regulation, the goal of the RFP requirements is for areas to achieve generally linear progress toward attainment. To determine RFP for the attainment date, U.S. EPA has determined that the plan should rely only on emission reductions achieved from sources within the nonattainment area.

Subpart 2 sections 182(b)(1) and 182(c)(2)(B) contain specific emission reduction targets to ensure that ozone nonattainment areas provide for sufficient precursor emission reductions to attain the ozone national ambient air quality standard. Section 182(b)(1)(A) requires that "moderate" or above areas provide for VOC reductions of at least 15 percent from baseline emissions within six years after November 15, 1990. The U.S. EPA final rule of "*Implementation of the 2008 National Ambient Air Quality Standards for Ozone: State Implementation Plan Requirements*" (80 FR 12263) states that if an area has already met the 15 percent requirement for VOC under either the 1-hour ozone NAAQS or the 1997 8-hour ozone

NAAQS, such requirement under 182(b)(1) would not have to be fulfilled again. Instead, such areas would need to meet the CAA requirements under Section 182(c)(2)(B), which requires that "serious" and above areas provide VOC and/or NOx reductions (CAA, Section 182(c)(2)(C)) of 18 percent over the first six years after the baseline year for the 2008 8-hour ozone NAAQS, and an additional 3 percent per year averaged over each consecutive three-year period until the attainment date.

As mentioned a number of times in this chapter, poor ozone air quality in the Coachella Valley is primarily due to transport of ozone and its precursors from the upwind source region of the Basin and attainment in Coachella Valley is only possible with substantial emission reductions in the Basin. With this in mind, the proposed control strategy consists of two components: 1) an aggressive control strategy for NOx emission sources in the Basin; and 2) control of locally generated emissions via proposed state-wide or nationally applied control measures implemented by state and federal actions.

Tables 7-7 and 7-8 summarize the RFP calculations. Figure 7-12 depicts the target level and projected baseline RFP demonstration for VOC. For each of the milestone years, the District is able to show that the required progress is met on the basis of reductions from the existing control program using a combination of VOC and NOx reductions within the Coachella Valley portion of the SSAB alone. No additional reductions from the proposed control measures in the Plan are needed for progress purposes. Projected VOC baseline emissions are not sufficient to meet the CAA requirements as the baseline VOC emission levels are above the target levels of each milestone year. Therefore, projected NOx baseline emission reductions are needed to show compliance with the targeted RFP levels. The CAA Section 182(c)(2)(C) provides for NOx reductions to substitute for RFP reductions not achieved for VOC emissions. The demonstration in Tables 7-7 and 7-8 show compliance with RFP requirements as well as CAA contingency requirements. Contingency measures for attainment in Coachella Valley will be specified in CARB's staff report on the South Coast Plan.

TABLE 7-7

Summary of Reasonable Further Progress Calculations – VOC

ROW	CALCULATION STEP [a]	2012[b]	2018	2021	2024	2026
1	Baseline VOC Emissions (tpd)	16.50	14.89	14.61	14.88	15.10
2	Required Percent Change Since Previous Milestone Year (%)		18.0	9.0	9.0	6.0
3	Target VOC Level (tpd)		13.53	12.31	11.20	10.53
4	Cumulative Milestone Year Shortfall (tpd)		1.36	2.30	3.68	4.57
5	Cumulative Shortfall in VOC (%)		8.2	13.9	22.3	27.7
6	Incremental Milestone Year Shortfall (%)		8.2	5.7	8.4	5.4

[a] Units are in tons per day (tpd), based on the summer planning inventory unless otherwise noted
[b] Base Year (2012)

Row Description:

ROW 1: Projected baseline emissions from Appendix III – Baseline and Future Emission Inventory taking into account existing rules and projected growth

ROW 2: Required 18% reduction 6 years after Base Year; future milestone years are every 3 years until attainment year; and required reductions are 3% per year for each milestone year (e.g., for every 3 years, required 9% reduction)

ROW 3: [(1-Row 2/100) x Row 1 or Row 3] – Base Year Row 1 for first milestone year, and previous milestone year's target level (Row 3) for remaining milestone years

ROW 4: [(Row 1) – (Row 3)] or (Baseline – Target) – negative number meets target level and positive number is shortfall of target level

ROW 5: [(Row 4) / (Base Year Row 1) x 100]

ROW 6: Negative (Row 5) is zero shortfall; positive number is a shortfall. Incremental milestone year shortfall is determined by subtracting the previous year's shortfall from the cumulative (e.g., for 2024, cumulative shortfall of 22.3% – previous 2021 shortfall of 13.9% = 8.4%)

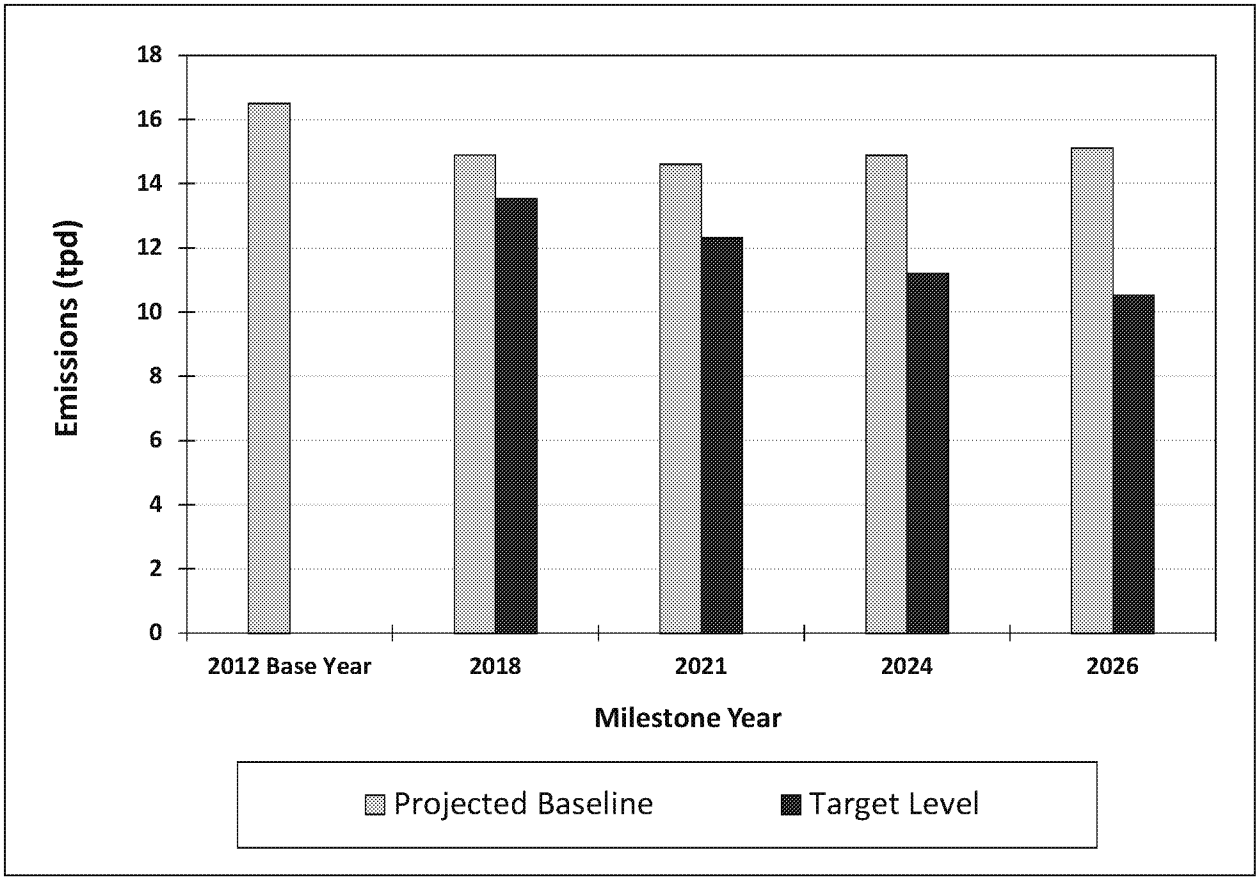

FIGURE 7-12

REASONABLE FURTHER PROGRESS – VOC

TABLE 7-8

Summary of Reasonable Further Progress Calculations – NOx

ROW	CALCULATION STEP [a]	2012[b]	2018	2021	2024	2026
1	Baseline NOx Emissions (tpd)	26.53	16.60	13.44	9.65	8.92
2	Reductions in NOx Emissions since Base Year (tpd)		9.93	13.09	16.88	17.61
3	Percent Reductions in NOx Emissions since Base Year (%)		37.4	49.3	63.6	66.4
4	Contingency plus VOC Shortfall (%)		3.0	11.2	16.9	25.3
5	Percent Available for NOx Substitution (%)		34.4	38.1	46.7	41.1
6	Incremental Milestone Year VOC Shortfall (%)		8.2	5.7	8.4	5.4
7	Percent Surplus Reduction (%)		26.2	32.4	38.3	35.7
8	RFP Compliance		Yes	Yes	Yes	Yes
9	Contingency Compliance		Yes	Yes	Yes	Yes

[a] Units are in tons per day (tpd), based on the summer planning inventory unless otherwise noted
[b] Base Year (2012)

Row Description:

ROW 1: Projected baseline emissions from Appendix III – Baseline and Future Emission Inventory taking into account existing rules and projected growth

ROW 2: Reductions achieved in Baseline: [(Row 1 Base Year) – (Row 1 Milestone Year)]; e.g., for 2018: 26.53 tpd – 16.60 tpd = 9.93 tpd

ROW 3: % Reductions achieved since Base Year: [(Row 2) / (Row 1 Base Year)] x 100; e.g., for 2018: (9.63/26.53) x 100 = 37.4%

ROW 4: Reserves 3% (1 year worth of CAA RFP reductions) for contingency measure implementation plus the previous year(s)'s incremental milestone year VOC shortfall from Table 7-7

ROW 5: [(Row 3) – (Row 4)]

ROW 6: Incremental milestone year VOC shortfall from Table 7-7

ROW 7: Surplus reductions achieved [(Row 5) – (Row 6)]

ROW 8: Positive number in Row 7 is percent surplus for each milestone year, thus meeting RFP target levels

ROW 9: Surplus includes 3% contingency carryover and VOC shortfall, and still meets RFP target levels

VMT Offset Demonstration for the 2008 Ozone Standard

In 1979, U.S. EPA established a primary health-based NAAQS for ozone at 0.12 ppm averaged over a 1-hour period [See 44 Fed. Reg. 8220 (February 9, 1979)]. The CAA, as amended in 1990, classified areas that had not yet attained that standard based on the severity of their ozone problem, ranging from "marginal" to "extreme." "Extreme" areas were provided the most time to attain, until November 15, 2010, but were also subject to the most stringent requirements. In particular, "severe" and "extreme" areas were subject to CAA Section 182(d)(1)(A), which requires SIPs to adopt "specific enforceable transportation control strategies and transportation control measures to offset any growth in vehicle miles traveled or numbers of vehicle trips in such area...." U.S. EPA designated the Coachella Valley, then as part of the Southeast Desert Modified Air Quality Management area, as "Severe-17" on November 6, 1991 (56 Fed. Reg. 56694), and thus the Coachella Valley was subject to this requirement. The U.S. EPA has historically interpreted this provision of the CAA (now called "VMT emissions offset requirement") to allow areas to meet the requirement by demonstrating that emissions from motor vehicles decline each year through the attainment year [see 57 Fed. Reg. 13498, at 13521–13523 (April 16, 1992)].

In 1997, U.S. EPA replaced the 1-hour ozone standard with an 8-hour standard of 0.08 ppm [62 Fed. Reg. 38856 (July 18, 1997)]. The U.S. EPA promulgated rules implementing this standard with the "Phase 1" rule issued on April 30, 2004 (69 Fed. Reg. 23951), and the Phase 2 rule issued on November 29, 2005 (70 Fed. Reg. 71612). These implementation rules required that areas classified as "severe" or "extreme" under the 1997 8-hour standard would also be subject to the VMT offset requirement.

In 2008, U.S. EPA revised the 8-hour ozone NAAQS to a level of 0.075 ppm (73 Fed. Reg. 16436, March 27, 2008). The Coachella Valley was subsequently designated nonattainment for the 2008 standard on May 21, 2012 and classified as a "severe-15" nonattainment area (77 Fed. Reg. 30087), making the Coachella Valley subject to the requirements of CAA Section 182(d)(1)(A) for the 2008 8-hour ozone NAAQS.

In August 2012, U.S. EPA issued guidance titled "Implementing Clean Air Act Section 182(d)(1)(A): Transportation Control Measures and Transportation Control Strategies to Offset Growth in Emissions Due to Growth in Vehicle Miles Traveled". Among other things, U.S. EPA's guidance points out that subsequent court decisions regarding previous VMT offset demonstrations omitted any reference to "transportation control strategies" (TCS). TCSs, which are not defined in the CAA or U.S. EPA regulation, are eligible to offset growth in emissions due to growth in VMT. The U.S. EPA's new guidance indicates that technology improvements such as vehicle technology improvements, motor vehicle fuels, and other control strategies that are transportation-related could be used to offset increases in emissions due to VMT growth. U.S. EPA's revised guidance sets forth a method of calculating the actual growth in emissions due to growth in VMT. Essentially, the area compares projected attainment year emissions assuming no new control measures and no VMT growth with projected actual attainment year emissions (including new control measures and VMT growth). If the latter number is smaller than the former, no additional transportation control measures or strategies would be required. If additional transportation control measures and transportation control strategies are required, they should be clearly identified and distinguished from the measures included in the initial calculations for the base year and the three scenarios identified for the attainment year.

In addition, the guidance recommends that the base year used in the demonstration be the base year used in the attainment demonstration for the ozone standard. To address U.S. EPA's guidance, 2012 is

used in this demonstration as the base year for the 2008 8-hour standard. Consistent with U.S. EPA guidance, emissions of VOC are used to determine compliance with the VMT offset requirement.

Transportation Control Strategies and Transportation Control Measures

By listing them separately, the Clean Air Act [CAA §182(d)(1)(A)] differentiates between TCS and transportation control measures (TCM), and thus provides for a wide range of strategies and measures as options to offset growth in emissions from vehicle miles traveled (VMT) growth. In addition, the example TCMs listed in Section 108(f)(1)(A) of the CAA include measures that reduce emissions by reducing VMT, reducing tailpipe emissions, and removing dirtier vehicles from the fleet. California's motor vehicle control program includes a variety of strategies and measures including new engine standards and in-use programs (e.g., smog check, vehicle scrap, fleet rules, and idling restrictions). TCMs developed by SCAG provide additional reductions. In addition, SCAG prepares a report every two years that reports on the status of implementation of TCMs.

Based on the provisions in Section 182(d)(1)(A) and the clarifications provided in the U.S. EPA guidance, any combination of TCSs and TCMs may be used to meet the requirement to offset growth in emissions resulting from VMT growth. Since 1990 when this requirement was established, California has adopted more than sufficient enforceable transportation control strategies and measures to meet the requirement to offset the growth in emissions from VMT growth.

Emissions Due to VMT Growth

The U.S. EPA guidance provides a recommended calculation methodology to determine if sufficient transportation control strategies and TCMs have been adopted and implemented to offset the growth in emissions due solely to growth in VMT. As such, any increase in emissions solely from VMT increases in the future attainment year from the base year (assuming that there are no further motor vehicle control programs implemented after the base year) would need to be offset. In addition, a calculation is needed to show the emissions levels if VMT had remained constant from the base year to the future attainment year. A comparison of the projected attainment year emissions assuming no new control measures and no VMT growth with projected actual attainment year emissions (including new control measures and VMT growth) can be made. If the latter number is smaller than the former, no additional transportation control measures or strategies would be required.

VMT Offset Demonstration Summary

For the 2008 8-hour ozone NAAQS offset demonstration, 2012 controls are used as the base case control level since 2012 is the base year of the SIP. 2026 is the Coachella Valley's attainment demonstration attainment year for the 2008 ozone NAAQS. The following calculations are based on the recommended calculation methodology provided in U.S. EPA guidance. Additional details on the analysis methodology is provided in Appendix VI-E – Compliance with other Clean Air Act Requirements.

Table 7-9 summarizes the vehicle miles traveled (VMT), vehicle starts, vehicle population, and VOC emissions for the Coachella Valley in the 2012 base year from the EMFAC2014 model. Table 7-10 summarizes the vehicle parameter and VOC emissions as projected for the Coachella Valley in the attainment year (2026), as calculated with three emissions scenarios:

1. 2026 VOC emissions calculated with the motor vehicle control program frozen at 2012 levels and with projected VMT, starts, and vehicle population for the attainment year. This represents what the emissions in the attainment year would have been if transportation control strategies and transportation control measures had not been implemented after 2012. To perform this calculation, California Air Resources Board (CARB) staff identified the on-road motor vehicle control programs adopted since 2012 and adjusted EMFAC2014 to reflect the VOC emissions levels in 2026 without the benefits of the post-2012 control programs. The projected VOC emissions are 3.1 tons/day.
2. 2026 VOC emissions calculated with the motor vehicle control program frozen at 2012 levels and assuming VMT, starts, and vehicle population do not increase from 2012 levels. In this calculation, the VOC emission levels in calendar year 2026 without benefit of the post 2012 control program are calculated. EMFAC2014 allows a user to input different VMT, starts, and vehicle population than default. For this calculation, EMFAC2014 was run without the benefit of the post 2012 control program for calendar year 2026 with the 2012 level of VMT of 11,402,997 miles per day, the 2012 level of starts at 2,006,983 per day, and the 2012 level of population at 319,781 vehicles. The VOC emissions associated with 2012 VMT, starts, and vehicle population in calendar year 2026 are 2.5 tons/day.
3. 2016 VOC emissions that represent emissions with full implementation of all transportation control strategies and transportation control measures since 2012 and which represents the projected future year baseline emissions inventory using the VMT, starts, and vehicle population for the attainment year. The VOC emission levels for 2026 assuming the benefits of the post-2012 motor vehicle control program and the projected VMT, starts, and vehicle population in 2026 are calculated using EMFAC2014. The projected VOC emissions level is 2.0 tons/day.

TABLE 7-9

Summary of 2012 Coachella Valley Base Year VMT Factors and VOC Emissions

	VMT (thousand miles/day)	Starts (thousands/day)	Vehicle Population (thousands)	VOC Emissions* (tons/day)
2012 Base Year	11,403	2,007	320	4.8

* Does not include diurnal or resting loss emissions

TABLE 7-10

Summary of 2026 Coachella 2026 Attainment Demonstration Year VMT Factors and VOC Emissions

	Description	VMT* (miles/day, thousands)	Starts (thousands/day)	Vehicle Population (thousands)	VOC Emissions** (tons/day)
(1)	**Emissions with Motor Vehicle Control Program Frozen at 2012 Levels** (VMT, starts and vehicle population at 2026 levels.)	14,977	2,738	446	3.1
(2)	**Emissions with Motor Vehicle Control Program Frozen at 2012 Levels** (VMT, starts, and vehicle population at 2012 levels)	11,403	2,007	320	2.5
(3)	**Emissions with Full Motor Vehicle Control Program in Place** (VMT, starts and vehicle population at 2026 levels)	14,977	2,738	446	2.0

* CY 2026 VMT based on the SCAG 2016 RTP
** Does not include diurnal or resting loss emissions

As provided in the U.S. EPA guidance, to determine compliance with the provisions of Section 182(d)(1)(A) of the CAA, the emissions levels calculated in Calculation 3 should be less than the emissions levels in Calculation 2 in Table 7-10. The 2026 VOC emissions with full motor vehicle control program are 2.0 tons/day, which is less than 2.5 tons/day and, therefore, this requirement is met. Figure 7-13 shows graphically that the VMT offset requirement is met due to the emissions benefits of the motor vehicle control programs in offsetting VOC emissions due to increased VMT, starts, and vehicle population in the Coachella Valley for the 2008 8-hour ozone standard with the 2012 base year. The left bar (in purple) shows the emissions in the base year with base year controls. The three bars on the right in each figure show the emissions levels in the attainment year for the three calculations identified above: (1) the red bar shows attainment year emissions with base year controls and attainment year VMT, starts, and vehicle population; (2) the green bar shows attainment year emissions with base year controls, VMT, starts, and vehicle population; and (3) the blue bar shows attainment year emissions with attainment year controls, VMT, starts, and vehicle population. Based on the U.S. EPA guidance, since the blue bar is lower than the green bar, the identified transportation control strategies and TCMs are sufficient to offset the growth in emissions.

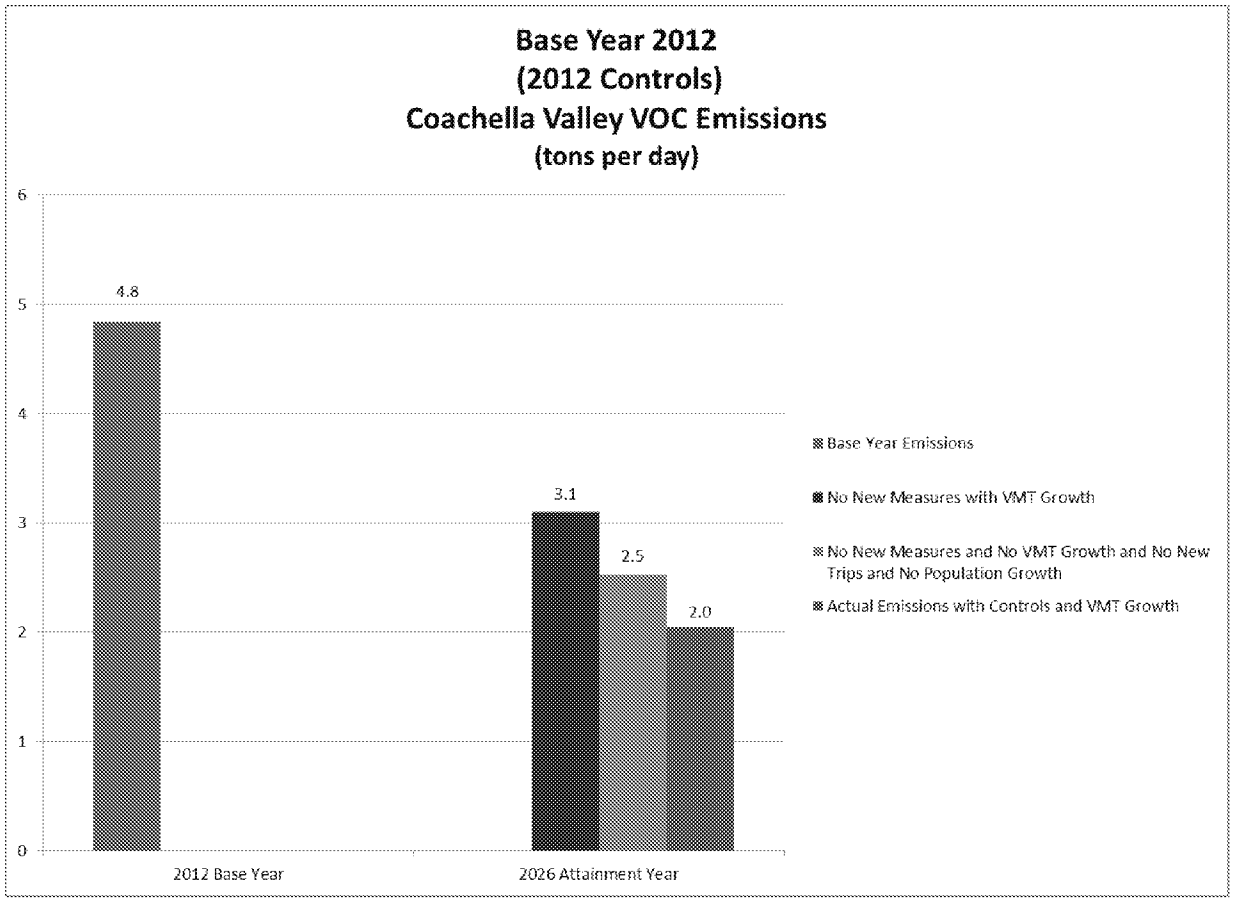

FIGURE 7-13

REASONABLE FURTHER PROGRESS – VOC

(VOC EMISSIONS FROM ON-ROAD MOBILE SOURCES IN THE COACHELLA VALLEY; 2012 BASE YEAR AND 2026 ATTAINMENT YEAR; DOES NOT INCLUDE RESTING OR DIURNAL LOSS EMISSIONS)

Ozone Attainment Demonstration and Projections

This section presents an overview of the new ozone SIP attainment demonstration for the 2008 8-hour ozone NAAQS for the Coachella Valley. It also evaluates the progress toward attainment of the 1997 8-hour ozone NAAQS, although it is not an update to the previously submitted ozone SIP attainment demonstration for that revoked standard. In addition, this section provides an initial look at future attainment of the 2015 8-hour ozone NAAQS (0.070 ppm), which is also not part of this SIP.

2008 8-Hour Ozone NAAQS Attainment Demonstration

In the 2007 AQMP and the subsequent SIP submittal, SCAQMD requested that U.S. EPA reclassify the Riverside County portion of the Salton Sea Air Basin from "serious" nonattainment to "severe-15" and extend the attainment date for the 1997 8-hour ozone NAAQS (0.08 ppm) to June 15, 2019. This voluntary nonattainment reclassification was approved by U.S. EPA on May 5, 2010. The "severe-15"

nonattainment designation was subsequently applied to the 2008 8-hour ozone NAAQS (0.075 ppm) in the Coachella Valley, for a new attainment date of July 20, 2027 for that revised standard.

The CAA requires that ozone nonattainment areas designated as "serious" and above use a regional photochemical model to demonstrate attainment. To meet this requirement, the CMAQ modeling system is used in this analysis for the Coachella Valley, as well as the Basin. The complete SCAQMD modeling system and its application is described in Chapter 5 and Appendix V – Modeling and Attainment Demonstration, along with base and future year results, sensitivity analyses and performance evaluations.

Future projected air quality for the Coachella Valley was developed using CMAQ simulations and relative response factors (RRFs, ratios of CMAQ predictions for future year over base year predictions), focusing on the 10 highest ozone episode days for the Coachella Valley stations during the five-month period encompassing the peak of the ozone season (May through September of 2012; 153 days). Of the five-month period in 2012, the 2008 8-hour federal ozone standard (0.075 ppm) was exceeded on 83 days in the Basin and 31 days in the Coachella Valley. The 1997 8-hour federal standard (0.08 ppm) was exceeded on 51 days in the Basin and 7 days in the Coachella Valley during the five-month period. For reference, the new 2015 8-hour federal ozone standard (0.070 ppm) was exceeded on 113 days in the Basin and 50 days in the Coachella Valley from May through September of 2012.

The Coachella Valley is currently a nonattainment area for the 2008 8-hour ozone NAAQS (0.075 ppm). With an attainment due date of July 20, 2027, emission reductions required to meet the standard need to be in place by the end of 2026 and the modeling demonstration must show attainment in 2026. Therefore, air quality in 2026 was simulated using CMAQ to evaluate future attainment in the Coachella Valley. The 2026 baseline future projection design values, with no additional emissions controls beyond rules and regulations already adopted, still exceed the 2008 standard at Palm Springs (0.079 ppm), but not at Indio (0.075 ppm). However, further control measures applied to upwind Basin emission reductions will be in place by 2023, as described in Chapter 4, in order for the Basin to meet the 1997 ozone NAAQS (0.08 ppm). With successful implementation of these additional Basin reductions including benefits from deployment of new cleaner technologies, the Coachella Valley is projected to no longer exceed the 2008 NAAQS as early as 2023, but no later than the 2026 attainment deadline with the Coachella Valley design value predicted to be 0.075 ppm at Palm Springs and 0.073 ppm at Indio in 2023. Thus, attainment of the 2008 8-hour ozone NAAQS in the Coachella Valley is ensured by the anticipated NOx reductions from the Basin's control strategy designed to meet the 1997 ozone standard in the Basin by the 2026 statutory attainment deadline. As can be seen, progress toward ozone NAAQS attainment in the Basin is crucial for timely attainment in the Coachella Valley.

1997 8-Hour Ozone NAAQS Attainment Progress

Attainment of the 1997 8-hour ozone NAAQS (0.08 ppm) was demonstrated in the 2007 AQMP that was submitted to U.S. EPA as a SIP revision on November 28, 2007. U.S.EPA approved the reclassification of the Coachella Valley to "severe-15," as requested in the 2007 AQMP. A subsequent SIP update for the Coachella Valley and the Western Mojave Desert 8-hour ozone nonattainment areas was prepared and

submitted to U.S EPA by CARB on November 6, 2014.[11] The 2014 Update provided additional information to support the 2007 Coachella Valley Plan, including updates to the emission inventory, the attainment demonstration, the reasonable further progress demonstration, and the transportation conformity budget; along with an ozone vehicle miles traveled offset demonstration.

While no further submittals for the 1997 8-hour ozone NAAQS are required at this time, the Coachella Valley has seen significant progress toward attainment in recent years. The trends of both 8-hour ozone design values and the number of days exceeding the level of the 1997 8-hour ozone standards show significant improvement. The 8-hour ozone standards are based on the annual fourth highest measured 8-hour average concentration at each station. For NAAQS attainment determinations, the 3-year average of the annual fourth highest 8-hour average concentrations cannot exceed the 0.08 ppm (due to rounding it must be less than 0.085 ppm or 85 ppb). This means that exceeding the 8-hour ozone concentration does not necessarily result in nonattainment status, since the standard could be exceeded three times at any individual station, on average over the 3-year design value period.

Figure 7-13 shows the trend of annual number of days exceeding the 1997 8-hour ozone standard at the highest Coachella Valley station (Palm Springs) for 1990 through 2015. The number of days exceeding the 1997 standard shows a progressive improvement, from 18 days in the 2012 base year to only five days in 2015. Figure 7-14 shows the trend of the annual 8-hour ozone 3-year design values, showing continuing gradual improvement. These historical observations provide evidence that Coachella Valley is still expected to be in attainment of the 1997 ozone NAAQS by the end of 2018, corroborating the ozone SIP attainment modeling demonstration in the 2007 AQMP and the CARB 2014 Update.

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[11] December 12, 2014 letter from Jonathan P. Taylor, California Air Resources Board, to Matt Lakin, U.S. EPA Region IX: http://www.arb.ca.gov/planning/sip/planarea/updatessubltr.pdf, with CARB Staff Report, *Proposed Updates to the 1997 8-hour Ozone Standard State Implementation Plans: Coachella Valley and Western Mojave Desert 8-hour Ozone Nonattainment Areas*: http://www.arb.ca.gov/planning/sip/planarea/antaqmp/2014update0922.pdf.

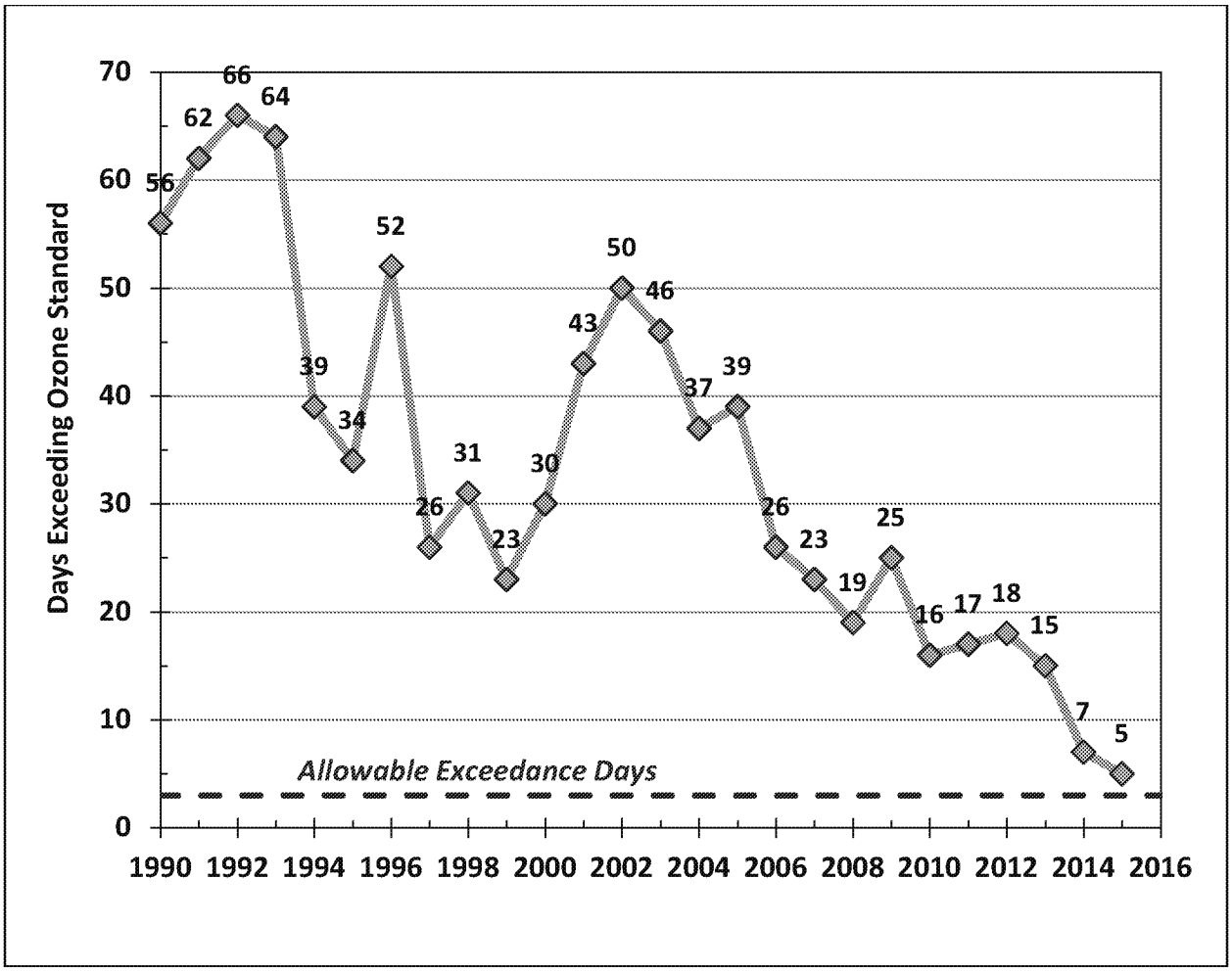


FIGURE 7-13

TREND OF ANNUAL COACHELLA VALLEY NUMBER OF DAYS EXCEEDING THE 1997 8-HOUR OZONE STANDARD, 1990–2015

(THE 8-HOUR OZONE NAAQS IS BASED ON THE FOURTH HIGHEST CONCENTRATION IN EACH YEAR, ALLOWING THREE DAYS TO EXCEED THE STANDARD)

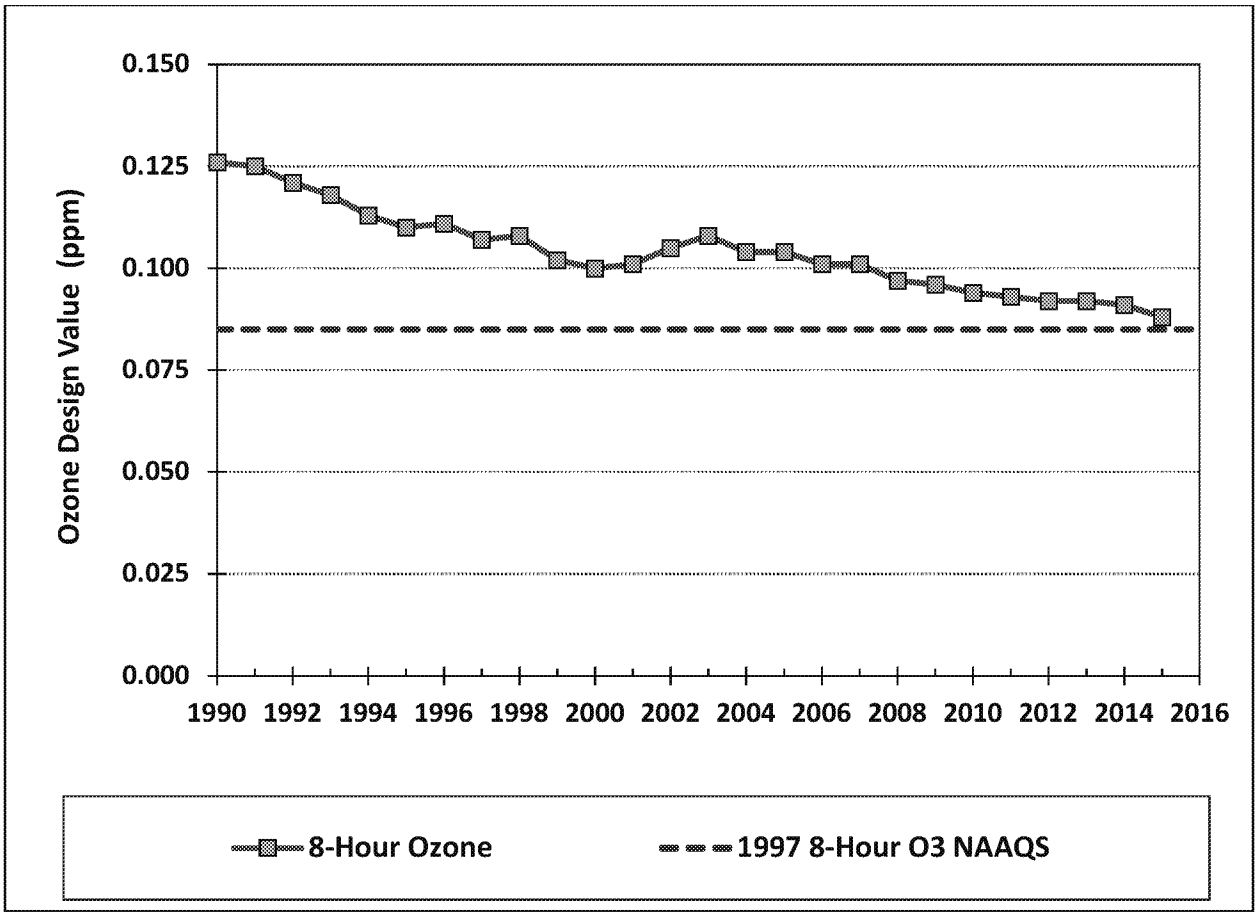


FIGURE 7-14

TREND OF COACHELLA VALLEY 8-HOUR OZONE 3-YEAR DESIGN VALUES, 1990–2015

(UPPER DOTTED LINE IS THE 1997 8-HOUR FEDERAL STANDARD AS REQUIRED TO BE ATTAINED IN 2018)

2015 8-Hour Ozone NAAQS Attainment Projection

Although it is not being addressed as part of this SIP submittal, the AQMP modeling effort provides an initial look at the potential for future attainment of the new 2015 8-hour ozone NAAQS (0.070 ppm). The designations for the new standard are anticipated by October 1, 2017. If the new attainment designation for the Coachella Valley continues to have a "severe-15" classification, the new attainment date will likely be 2032 with all control measures required to be in place for a 2031 model year demonstration date. This date would be five years later (2037) with an "extreme" nonattainment classification, which may be need to be considered due to the reliance of Coachella Valley ozone improvement on the Basin's progress in achieving emission reductions. CMAQ simulations of the future year ozone levels using the baseline (no additional controls) regional emissions indicate that the new standard will not be attained in the Coachella Valley by the "severe-15" attainment deadline of 2031, with a predicted design value over the 2015 ozone NAAQS. This scenario does not include control measures proposed in the 2016 AQMP. The emission reductions that will be in place by 2031 for the Basin to attain the 2008 NAAQS (0.075 ppm) are predicted to bring the Coachella Valley to attainment of the 2015 ozone

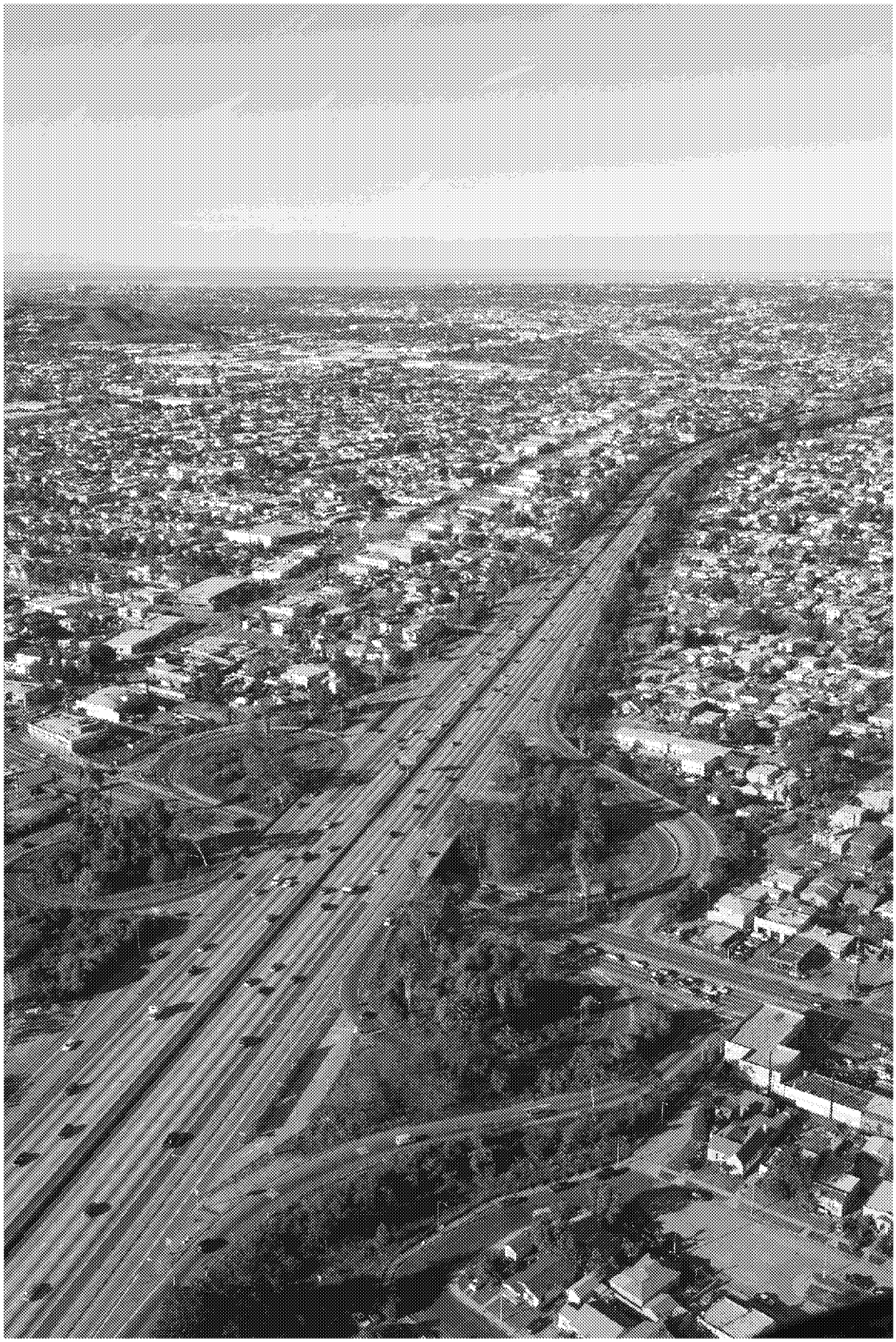
standard in 2031, with a peak predicted design value of 0.070 ppm. The additional emission reductions that will likely be required to attain the 2015 ozone NAAQS in the Basin by 2037 will also ensure attainment of the new standard in the Coachella Valley. A full attainment and control strategy analysis of the new 0.070 ppm ozone standard for both the Basin and Coachella Valley, including the potential need for reclassification, will be the subject of the next AQMP due in the 2020–2021 time frame. Further details of all the future-year air quality projections for the Basin and the Coachella Valley are presented in Chapter 5 and Appendix V – Modeling and Attainment Demonstrations.

Conclusions

The "severe-15" attainment date for the 2008 8-hour ozone NAAQS of 2027 is the primary focus of the 2016 AQMP modeling demonstration for the Coachella Valley. With the future emission controls in place in the Basin by 2023 in order for the Basin to meet the 1997 8-hour ozone NAAQS, the 2008 ozone NAAQS will be met in the Coachella Valley in 2023. This is three years in advance of the 2026 attainment year for the 2008 NAAQS in the Coachella Valley "severe-15" nonattainment area.

With the "severe-15" ozone nonattainment designation, the Coachella Valley attainment demonstration year for the 1997 8-hour ozone NAAQS is 2018. Based on the improving trends of both the 8-hour ozone design values and the number of exceedance days, it appears that the 1997 ozone standard will be attained in the Coachella Valley by the end of 2018 with no additional emission controls needed beyond already adopted rules and regulations. This evidence supports for the modeling simulations for Coachella Valley in the 2007 AQMP.

The future emission reductions implemented in the Basin will not only ensure timely attainment of the 1997 and 2008 8-hour ozone standards in Coachella Valley, they will also help ensure progress towards the more stringent 2015 8-hour ozone standard. The classification, and thus the attainment deadlines, for this new ozone standard are pending from U.S. EPA. The full strategy for attainment of the 2015 NAAQS in the Coachella Valley will be determined based on the analysis in the next AQMP.



Chapter 8
Looking Beyond Current Requirements

U.S. EPA periodically reviews existing air quality standards in light of emerging epidemiological and toxicology studies. More stringent standards with new attainment deadlines present additional challenges for the Basin that need to be considered in the planning process.

In This Chapter

Introduction

This chapter presents additional analyses which are not legally required, but are presented here for informational purposes to initiate stakeholder discussion on future air quality planning. The content will also help place the 2016 AQMP in context with the long-range transformation needed for this region to meet more recently promulgated health-based air quality standards.

Criteria Pollutant NAAQS Review

CAA Section 109(d) requires U.S. EPA to periodically review the existing air quality standards in light of findings of new and emerging epidemiological and health studies. If appropriate, such review may consider revision of existing air quality standards to reflect advances in scientific knowledge on the effects of the pollutant on public health and welfare. U.S. EPA reviews the scientific basis for these standards by preparing an Integrated Science Assessment (ISA), formerly called an Air Quality Criteria Document (AQCD). The evidence and conclusions presented in the ISA directly inform the technical and policy assessments conducted by the Office of Air Quality Planning and Standards (OAQPS). Collectively, these documents form the scientific and technical bases for the U.S. EPA's decisions on the adequacy of existing NAAQS and the appropriateness of new or revised standards. This process is a five-year review cycle that considers the following:

Established in 1977 under the CAA Amendments of 1977 *(42 U.S.C. § 7409(d)(2))* and part of U.S. EPA's Science Advisory Board (SAB), the Clean Air Scientific Advisory Committee (CASAC) provides independent advice to the U.S. EPA Administrator on the technical basis for the NAAQS, as well as addresses research related to air quality, sources of air pollution, the strategies to attain and maintain air quality standards, and to prevent significant deterioration of air quality. More specifically, CASAC is charged with independent expert scientific review of U.S. EPA's draft ISAs and other technical and policy assessments. CASAC provides advice to the U.S. EPA Administrator on the technical foundation for the NAAQS based on a peer review of extensive scientific information. The advice provided by CASAC assists the U.S. EPA in deciding whether the existing primary standard[1] is "requisite to protect public health with adequate margin of safety." A secondary standard[2] must "specify a level of air quality the attainment and maintenance of which is requisite to protect the public welfare from any known or anticipated adverse effects associated with the presence of such air pollutant in the ambient air." Primary standards are designed to protect public health, such as the health of "sensitive" populations, including persons with asthma, children, and the elderly. Secondary standards protect public welfare, such as protection against decreased visibility and damage to animals, crops, vegetation, and buildings. Figure 8-1 provides an overview of the U.S. EPA process in establishing, approving, and re-evaluating a NAAQS for a particular pollutant.

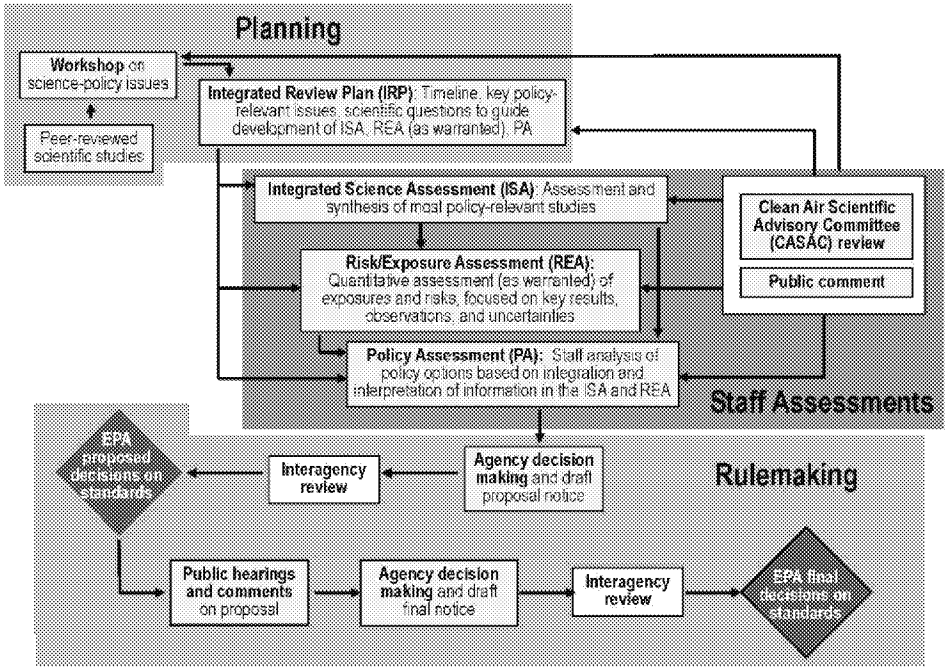


FIGURE 8-1 OVERVIEW OF THE U.S. EPA NAAQS REVIEW PROCESS

[1] CAA § 109 (b)(1), 42 U.S.C. 7409.

[2] CAA § 109 (b)(2), 42 U.S.C. 7409.

Changes in the Federal Ozone Standard

Background

Since the adoption of the 2008 8-hour ozone NAAQS of 0.075 ppm, the U.S. EPA carefully evaluated the latest available scientific literature on the health and welfare effects (primary and secondary standards, respectively) of ozone, focusing particularly on the new literature available since the conclusion of the previous review in 2008. In January 2010, U.S. EPA proposed to revise the 8-hr ozone NAAQS in the range of 0.060 ppm to 0.070 ppm. In September 2011, consistent with the direction of President Obama, the Administrator of the Office of Information and Regulatory Affairs (OIRA), Office of Management and Budget (OMB), returned the draft final rule to U.S. EPA for further consideration. Between 2008 and 2014, U.S. EPA prepared draft and final versions of the Integrated Review Plan (IRP), Integrated Science Assessment (ISA, the Health and Welfare Risk and Exposure Assessment (REA), and the Policy Assessment (PA). Multiple drafts of these documents were available for public review and comment and were peer-reviewed by CASAC. The final documents reflect U.S. EPA staff's consideration of the comments and recommendations made by CASAC and the public on draft versions of these documents.

In April 2014, the U.S. Court of Appeals for the District of Columbia issued a ruling ordering U.S. EPA to propose a rule based on latest ozone NAAQS review by December 1, 2014 and finalize by October 1, 2015. Figure 8-2 displays the timeline involved in the recent development and approval of the 8-hour ozone standard.

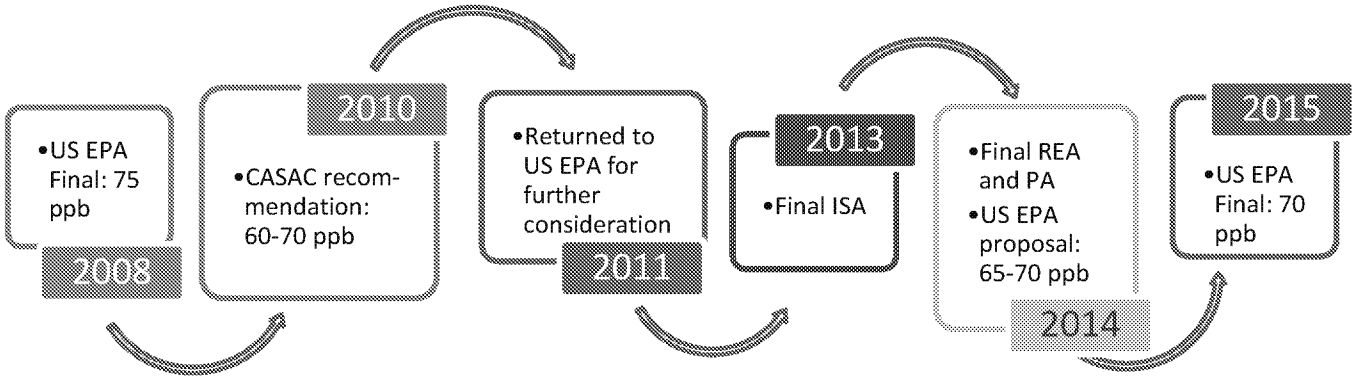


FIGURE 8-2

RECENT DEVELOPMENT AND APPROVAL OF 8-HOUR OZONE STANDARD

On December 17, 2014, U.S. EPA concluded that the primary ozone standard of 0.075 ppm is not requisite to protect public health with an adequate margin of safety, and that it should be revised to provide increased public health protection. Specifically, U.S. EPA proposed to retain the indicator, averaging time (8-hour) and form (annual fourth-highest daily maximum, averaged over three years) of the existing primary ozone standard and proposed to revise the level of that standard to within a range of 0.065 ppm to 0.070 ppm. U.S. EPA proposed this revision to increase public health protection, including for "at-risk" populations such as children, older adults, and people with asthma or other lung diseases, against an array of ozone-related adverse health effects. For short-term ozone exposures, these effects include decreased lung function, increased respiratory symptoms and pulmonary inflammation, effects that result in serious indicators of respiratory morbidity such as emergency department visits and hospital admissions, and all-cause (total non-accidental) mortality. For long-term ozone exposures, these health effects include a variety of respiratory morbidity effects and respiratory mortality.

Recognizing that CASAC recommended a range of levels from 0.060 ppm to 0.070 ppm in 2010, and that levels as low as 0.060 ppm could potentially be supported, the U.S. EPA Administrator solicited comments on alternative standard levels below 0.065 ppm, and as low as 0.060 ppm. However, the U.S. EPA Administrator noted that setting a standard below 0.065 ppm, down to 0.060 ppm, would inappropriately place very little weight on the uncertainties in the health effects evidence and exposure/risk information. The secondary standard was also proposed to be revised within the range of 0.065 to 0.070 ppm.

On October 26, 2015, U.S. EPA revised the primary and secondary ozone NAAQS (effective December 28, 2015) to a level of 0.070 ppm (or 70 ppb) retaining their indicators, forms, and averaging times. U.S. EPA also made corresponding revisions in data handling conventions for ozone and changes to the Air Quality Index (AQI), revised regulations for the PSD program to add a transition provision for certain applications, established exceptional events schedules, and provided information related to implementing the revised standards. Figure 8-3 displays the anticipated milestones for the 2015 8-hour ozone NAAQS.

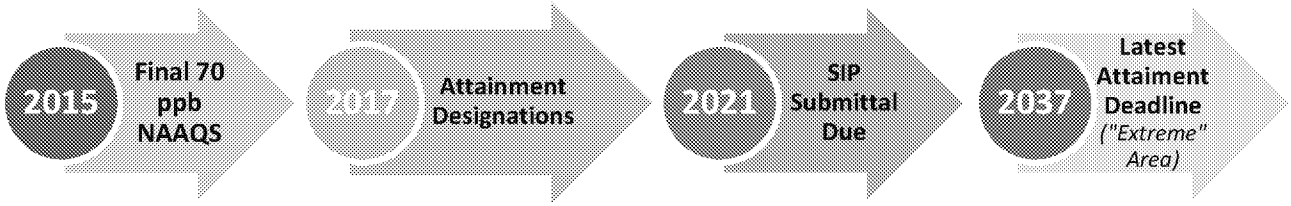


FIGURE 8-3
ANTICIPATED MILESTONES FOR 2015 8-HOUR OZONE NAAQS

Next Steps

After U.S. EPA establishes new or revised NAAQS, the CAA directs U.S. EPA and states to ensure the new or revised NAAQS are met. Areas of the country are identified as either in attainment of the new or revised NAAQS or not in attainment. Upon designation of nonattainment areas, certain states are required to develop SIPs taking into account projected emission reductions from existing federal, state, and local regulations already adopted at the time of the SIP submittal as well as additional measures as may be needed to attain the standards, including specific CAA requirements. Nonattainment designations for the 2015 ozone standard are expected to be identified in 2017 triggering the four-year deadline[3] to submit a Plan by 2021. If the region is determined to be in "extreme" nonattainment, the latest statutory deadline to demonstrate attainment would be approximately 2037 (20 years from the effective date of designation).

Implications of a New Ozone Standard for the Basin

Based on the modeling results presented in Chapter 5 and Appendix V (Modeling and Attainment Demonstration), the Basin can demonstrate attainment with the existing federal 8-hour ozone standards by the corresponding attainment deadlines (2023 and 2032). In order to meet the 80 ppb ozone level in 2023 and 75 ppb in 2031, an approximate additional 45 percent and 55 percent reduction, respectively, in NOx emissions will be necessary beyond already adopted measures. In some areas, VOC reductions are not as effective as NOx reductions, but certain concurrent VOC reductions would reduce some of the needed NOx reductions. A full discussion of the emission reductions needed to meet current ozone standards is included in Chapter 5 and Appendix V.

As stated above, the 8-hour ozone standard has been lowered to a level of 70 ppb in 2015. Therefore, in order to demonstrate attainment in the 2037 time frame, an additional 62 percent NOx emission reduction is anticipated to be needed from the 2037 baseline. Assuming the 75 ppb standard is met in 2031 with a 96 TPD NOx carrying capacity helps to illustrate the significant reductions needed to meet a new 70 ppb 8-hour ozone standard. A 70 ppb standard represents an approximately 25 TPD additional NOx reduction between 2031 and 2037. NOx emission reductions continue to be the most effective strategy to lower ozone levels.

[3] Based on CAA, Title I, Part D, Subpart 2, §182 and Final Ozone Implementation Rule (March 2015) for ozone attainment demonstration four years after effective date of designation.

Review of Federal PM Standards

On December 3, 2014, the U.S. EPA's Office of Research and Development's National Center for Environmental Assessment (NCEA) announced that it is preparing an ISA as part of the review of the primary and secondary NAAQS for PM. This ISA is intended to update the scientific assessment presented in the "ISA for Particulate Matter" published in December 2009. The public and interested parties were invited to assist U.S. EPA in developing and refining the scientific information base for the review of the PM NAAQS by submitting research studies that have been published, accepted for publication, or presented at a public scientific meeting. Figure 8-5 provides some of the studies that U.S. EPA is seeking to acquire during the process in considering the PM NAAQS.

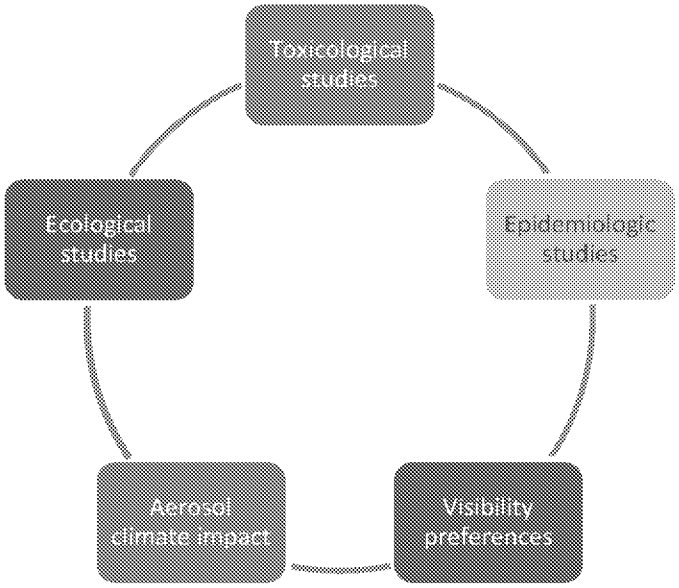


FIGURE 8-5
INFORMATION U.S. EPA IS SEEKING IN THE REVIEW OF THE PM NAAQS

For the review of the PM NAAQS, U.S. EPA is interested in obtaining additional new information concerning:

(a) toxicological studies of effects of controlled exposure to PM on laboratory animals and humans;
(b) epidemiologic (observational) studies of health effects associated with ambient exposures of human populations to PM;
(c) quantification of light extinction (loss of visibility) in urban and non-urban areas, such as new studies regarding visibility preferences, including studies in additional urban and non-urban areas that disentangle visibility preferences from health preferences, the sensitivity of visibility preferences to survey methods, and/or preferences regarding intensity versus frequency of visibility impairment;
(d) climate impacts from PM-related aerosols, particularly regarding the quantification of anthropogenic aerosol effects on radiative forcing; and

(e) ecological studies that examine the effects on agricultural crops and natural terrestrial and/or aquatic ecosystems from ambient exposures to PM, including information regarding interactions with other ecosystem stressors and co-occurring pollutants.

U.S. EPA is also seeking recent information in other areas of PM research such as chemistry and physics, sources and emissions, analytical methodology, transport and transformation in the environment, and ambient concentrations. Selected literature relevant to a review of the NAAQS for PM will be assessed in the forthcoming PM ISA. U.S. EPA has also held recent workshops on ultrafine particles and has indicated that a review of the relevant scientific information could be addressed in this review. The evaluation of PM and ecological effects will not include studies that examine effects due to the deposition of NOx or SOx in the particulate form (e.g., ammonium sulfate), that will be covered in the ongoing review of the NOx/SOx secondary standard.

The review and research process will provide an opportunity for experts to highlight significant new and emerging PM research, and to make recommendations to U.S. EPA regarding the design and scope of the review for the primary (health-based) and secondary (welfare-based) PM standards. This will ensure that the review addresses key policy-relevant issues, and considers the new and emerging science that is relevant to informing U.S. EPA's understanding of these issues.

As a result of this process, U.S. EPA developed a draft Integrated Review Plan (IRP) for the PM NAAQS that was released for public review and comments on April 19, 2016. The draft IRP outlines the schedule, process, and approaches for evaluating the relevant scientific information and addresses the key policy-relevant issues to be considered in this review. CASAC is reviewing the draft IRP and held a teleconference on May 23, 2016. The public had the opportunity to comment on the draft IRP until June 23, 2016. The final IRP, prepared in consideration of CASAC and public comments, will outline the process and schedule for conducting the review and the planned scope of the assessment documents (e.g., an ISA, an REA, and a PA) as well as the key relevant policy issues/questions that will guide the review.

The federal PM standards were reviewed in 2006 when U.S. EPA proposed to revise the level of the primary 24-hour PM2.5 standard from 65 to 35 $\mu g/m^3$ and retain the primary ("health-based") annual PM2.5 standard. The primary 24-hour PM10 standard would also be retained but the annual PM10 standard would be revoked. Finally, the secondary ("welfare-based") standards would be identical to the primary standards. Subsequent litigation concluded that U.S. EPA needed to explain why the secondary standard, identical to the primary standard, would provide the required protection from PM-related visibility impairment. This review took place between 2007 and 2011 with the preparation of the ISA, REA and PA documents that were peer reviewed by CASAC. In December 2012, U.S. EPA proposed to revise the annual PM2.5 standard by lowering the level from 15 $\mu g/m^3$ to 12 $\mu g/m^3$. With regard to the secondary standards, U.S. EPA proposed to retain the secondary standard because the visibility analysis conducted concluded that protection from visibility would not change with the adoption of a distinct visibility index. The final rule became effective on March 18, 2013.

The current review of the PM air quality criteria and standards is anticipated to involve finalizing the draft IRP by the end of 2016, the release and review of the ISA and REA from 2017 to 2019, the PA release and review taking place from 2018 to 2019, initial rulemaking in 2020, and finalizing a standard in 2021.

World Health Organization Air Quality Standards

The World Health Organization (WHO) is a specialized agency of the United Nations (UN) that is tasked with addressing international public health by mitigating communicable and non-communicable diseases, establishing policies to enhance health equity, promoting a healthier environment, and educating the public on nutrition, occupational health, and substance abuse. In reference to air quality, the WHO recognizes that "lower levels of air pollution generate better cardiovascular and respiratory health of the population long- and short-term.[4]" The WHO published air quality guidelines offering global guidance on thresholds and limits for key air pollutants that pose health risks. The WHO guidelines are not regulatory limits but provide a basis for protecting public health from adverse effects of air pollutants (outdoor and indoor), to eliminate or reduce exposure to hazardous air pollutants, and to guide national and local authorities in their risk management decisions.

There are a number of considerations when establishing outdoor air quality guidelines, such as background levels of pollution, mainly of anthropogenic origin, the location of the pollution (urban vs. rural, developed vs. developing countries), effects on children and the elderly compared to healthy adults. For example, WHO's Air Quality Guidelines for Europe[5] recommend a level for ambient ozone of 100 $\mu g/m^3$ (50 ppb) for a daily maximum 8-hour average that "will provide adequate protection of public health," which is lower than the recently U.S. EPA-approved 2015 8-hour ozone NAAQS at 70 ppb. It should be noted the same guidelines provide an interim target level at 160 $\mu g/m^3$ (80 ppb) for 8-hour ozone, at which "measurable (though transient) changes in lung function and lung inflammation among healthy young adults have been demonstrated during intermittent exercise in controlled chamber tests."

Health effects from PM2.5 concentrations are measured, similar to the U.S. EPA NAAQS, on a short-term (24-hour) and long-term (annual) basis. The WHO guidelines[6] recommend 10 $\mu g/m^3$ for PM2.5 on an annual basis, which is lower than the current U.S. EPA annual PM2.5 NAAQS of 12 $\mu g/m^3$. However, the WHO guidelines suggest interim targets higher than the U.S. EPA annual PM2.5 NAAQS ranging from 35 $\mu g/m^3$ to 15 $\mu g/m^3$ lower the risk of premature mortality as the target concentrations are decreased. For 24-hour PM2.5 concentration, the WHO guidelines recommend a daily level of 25 $\mu g/m^3$, which is lower than the current 24-hour PM2.5 NAAQS of 35 $\mu g/m^3$, but suggests interim targets that are higher than the 24-hour PM2.5 NAAQS ranging from 75 $\mu g/m^3$ to 37.5 $\mu g/m^3$ lower the short-term mortality as the target concentrations are decreased. See Table 8-1 for a comparison of the air quality standards.

Protecting public health is based on a number of public policies and scientific documentation supporting those policies and decisions. Both U.S. EPA and WHO have set out to establish an effective public health policy with air quality standards that evolve over time as new scientific studies are conducted and new information is discovered. While the current U.S. EPA NAAQS seek to protect the nation from harmful

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[4] http://www.who.int/mediacentre/factsheets/fs313/en/.

[5] World Health Organization, Air Quality Guidelines (2005) pp. 324-326 http://www.who.int/phe/health_topics/outdoorair/outdoorair_aqg/en/.

[6] World Health Organization, Air Quality Guidelines (2005) pp. 278-279 http://www.who.int/phe/health_topics/outdoorair/outdoorair_aqg/en/.

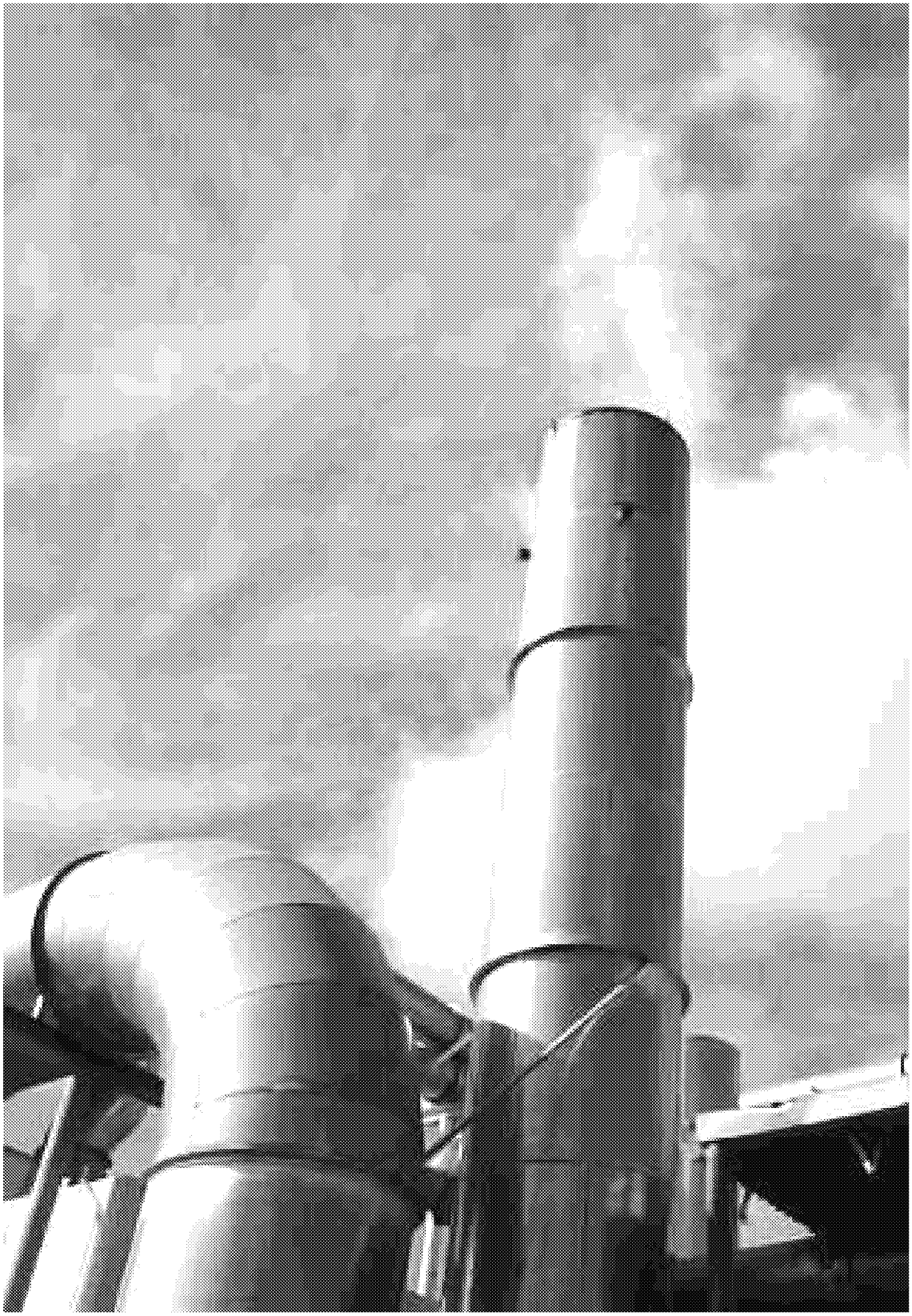
adverse air pollution levels, other global health organizations working in parallel may provide additional insight on how to move forward and make progress in achieving public health goals.

TABLE 8-1

WHO Guidelines Standards Compared to U.S. EPA Standards

Pollutant	WHO Recommendation	Latest U.S. EPA-Approved NAAQS
8-hour Ozone	50 ppb	70 ppb
8-hour Ozone Interim Target	80 ppb	n/a
Annual PM2.5	10 $\mu g/m^3$	12 $\mu g/m^3$
Annual PM2.5 Interim Targets	15–35 $\mu g/m^3$	n/a
24-hour PM2.5	25 $\mu g/m^3$	35 $\mu g/m^3$
24-hour PM2.5 Interim Targets	37.5–75 $\mu g/m^3$	n/a

n/a = not applicable



Chapter 9
Air Toxics Control Strategy

There has been substantial progress in reducing air toxic exposure in the Basin. However, risks are still unacceptably high and risk reduction efforts continue. This chapter discusses the future SCAQMD control strategy for air toxic emissions.

In This Chapter

Background

Since 2000, the SCAQMD has prepared Air Toxics Control Plans to outline the overall strategy for the SCAQMD's air toxics control program. The first Air Toxics Control Plan was approved by the SCAQMD Governing Board in 2000 with an Addendum in 2004. The 2000 Air Toxics Control Plan was an outgrowth of Environmental Justice Initiatives (Initiatives) adopted by the SCAQMD Governing Board in October 1997. The Initiatives included a call to conduct enhanced air toxics monitoring and analysis, and to commence air toxics rulemaking for new and existing sources. These efforts highlighted the need for a more systematic approach to reducing airborne toxics emissions, culminating in the 2000 plan – the first local district air toxics control plan in the nation. As a continued outgrowth of the Initiatives, the SCAQMD Governing Board directed staff to report back on the feasibility of rulemaking to address the cumulative impacts of air toxics. In September 2003, the SCAQMD Governing Board approved a *White Paper on Potential Control Strategies to Address Cumulative Impacts from Air Pollution*. The white paper included 25 cumulative impact reduction strategies including rules, policies, funding, education, and coordination with other agencies.

In 2010, the SCAQMD staff expanded the existing Air Toxics Control Plan into a "Clean Communities Plan" (CCP), which put greater emphasis on the cumulative effects of air toxics on neighborhoods and communities, and included 23 measures that utilized traditional source-specific measures and a variety of different implementation approaches such as community participation, increased outreach and communication, additional agency coordination, and enhanced monitoring and compliance programs. The CCP is the continuing effort and update to both the Air Toxics Control Plan and its Addendum. Figure 9-1 is a timeline of the agency's evolving policy and scientific efforts to date in addressing air toxics, including the umbrella rules and the Multiple Air Toxics Exposure Studies (MATES) discussed later in this chapter.

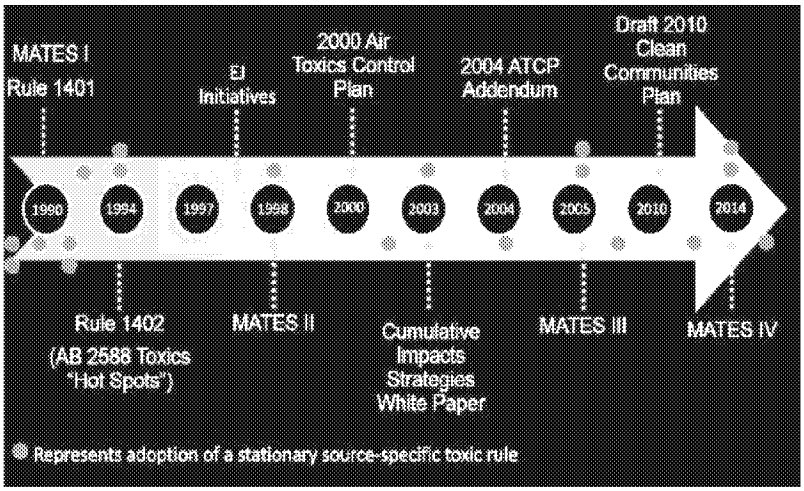


FIGURE 9-1
SCAQMD'S AIR TOXICS PROGRAM TIMELINE

Previous Air Toxic Control Plans, including the CCP, focused on developing a broad policy document for reducing air toxics. This consisted of developing potential control concepts and programs that went beyond current ongoing programs and efforts to implement the existing AQMP. This chapter presents areas of focus for the SCAQMD's air toxics control strategy over the next several years and its relationship to the 2016 AQMP.

Current Air Toxics Regulatory Program for Stationary Sources

The SCAQMD has a robust, multifaceted, and comprehensive air toxics regulatory program consisting of rules to address new and modified toxic sources through permitting, the AB2588 program (existing toxic sources), and source-specific toxics rules. The SCAQMD has three air toxics "umbrella" rules addressing new and modified, and existing sources with air toxic emissions. Rule 1401 sets health risk thresholds for air toxic emissions from new, modified, and relocated sources. Rule 1401 lists toxic air contaminants (TACs) that are evaluated during the SCAQMD's permitting process for new, modified or relocated sources. Rule 1401.1 sets more stringent risk thresholds than Rule 1401 for new and relocated facilities that are located near schools. The requirements are more stringent than Rule 1401 in order to provide additional protection to school children. The third umbrella rule is Rule 1402 which implements the Air Toxics Hot Spots (AB2588) program and establishes health risk thresholds for existing facilities. These umbrella rules include evaluation of nearly 300 TACs for existing, new, modified, or relocated sources. During the past decade, more than 80 TACs have been added or had risk values amended.

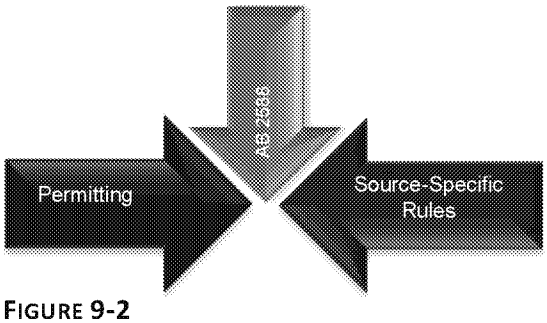


FIGURE 9-2
SCAQMD'S AIR TOXICS PROGRAM IS MULTI-

In addition to the above described umbrella toxics rules, the SCAQMD's regulatory program includes over fifteen source-specific toxics rules regulating specific equipment or industry categories such as chrome plating, asbestos remediation, lead-acid battery recycling, perchloroethylene dry cleaners, metal melting facilities, and diesel internal combustion engines. The SCAQMD's air toxics regulatory program for source-specific categories is as stringent as, or more stringent than, state Air Toxic Control Measures (ATCMs) and federal National Emission Standards for Hazardous Air Pollutants (NESHAPs). Many of the SCAQMD toxics rules incorporate requirements from state ATCMs and federal NESHAPs, and in some cases the state and federal programs have incorporated the more stringent requirements already established in SCAQMD toxic rules. Table 9-1 lists source-specific toxic rules that have been adopted or amended in the last several years, the number of affected sources, and emission reductions, if quantified.

TABLE 9-1

SCAQMD Air Toxic Rules Recently Amended or Adopted

Rule	Source Category	Key Adoption/ Amendment Dates	TAC	Number of Facilities	Estimated Emission Reductions	Final Emission Limit	Final Ambient Limit
1156	Cement Manufacturing	3/6/2009 *(amended)* 11/6/2015 *(amended)*	Hexavalent Chromium	2	32 lbs/yr (Cr^{+6})	N/A	0.2 ng/m^3 (Cr^{+6})
1401	New Source Review of Toxic Air Contaminants	6/5/2015 *(amended)*	Multiple TACs	All permitted facilities	N/A	N/A	N/A
1401.1	Requirements for New and Relocated Facilities Near Schools	6/5/2015 *(amended)*	Multiple TACs	All permitted facilities	N/A	N/A	N/A
1402	Control of Toxic Air Contaminants from Existing Sources	6/5/2015 *(amended)*	Multiple TACs	All permitted facilities	N/A	N/A	N/A
1420.1	Lead-acid Battery Recycling	11/5/2010 *(adopted)* 1/10/2014 *(amended)* 3/6/2015 *(amended)* 9/4/2015 *(amended)*	Lead Arsenic Benzene 1,3-Butadiene	2	31 lbs/yr (Arsenic) 3,673 lbs/yr (Benzene) 485 lbs/yr (1,3-Butadiene)	0.00114 lb/hr (Arsenic) 0.003 lb/hr (Lead)	10.0 ng/m^3 (Arsenic) 0.100 µg/m^3 (Lead)
1420.2	Metal Melting Facilities	10/2/2015 *(adopted)*	Lead	13	N/A	99% control efficiency or 0.0003 lb/hr (Lead)	0.100 µg/m^3 (Lead)
1470*	Stationary Diesel-Fueled Engines*	5/4/2012 *(amended)*	Diesel PM	~4900	N/A	0.01 to 0.15 g/bhp-hr for new engines near a sensitive receptor	N/A

*Implements ATCM for Stationary Compression Ignition Engines

Current Air Toxics Regulatory Approach for Mobile Sources

Mobile sources include both on- and off-road sources such as passenger cars, motorcycles, trucks, busses, heavy-duty construction equipment, recreational vehicles, marine vessels, lawn and garden equipment, and small utility engines. The existing control program for mobile sources is primarily under the jurisdiction of CARB. CARB's current mobile source control program consists of new on-road and off-

road vehicle and equipment emission standards, in-use fleet wide emission reduction regulations, and mobile source incentive programs.

The on-road new vehicle emission standards began in 1970 when CARB required new light-duty vehicles to meet NOx and reactive organic gases (ROG) standards to reduce ozone. CARB gradually lowered the standards over the years such that new light-duty vehicles are now over 90 percent cleaner than vehicles produced in the 1970's. For the on-road heavy-duty sector, CARB has adopted increasingly tighter new engine emission standards affecting NOx, non-methane hydrocarbon (NMHC), and, most relevant to air toxic risk, PM emission reductions. These standards and their accompanying inspection, monitoring , and low sulfur fuel program effectively reduce NOx, PM, and sulfur emissions, including diesel particulate matter (DPM) which is responsible for over 70 percent of the associated air emission cancer risk in the Basin.

The very first emission standards for new off-road diesel engines were adopted for 1995 and later small off-road engines less than 19 kW. In 1992, CARB approved standards for off-road diesel engines 130 kW and greater. These standards, which were implemented beginning in 1996, targeted NOx emission reductions without an increase in NMHC or PM emissions. More stringent Tier 4 emission standards were added to the existing regulation in 2004 while also being harmonized with the new non-road federal emission standards. These engine standards for off-road diesel engines had toxic pollutant co-benefits in further reducing DPM emissions in the Basin.

Beginning in 2007, CARB also developed in-use fleet regulations for compression ignited engines powering on-road and off-road vehicles, and portable and mobile equipment that reduce DPM and NOx emissions. These off-road in-use fleet regulations require existing fleets to reduce their emissions by retiring, replacing, or repowering older engines. The off-road categories subject to in-use fleet regulations include off-road construction vehicles, portable equipment and engines, cargo handling equipment, commercial harbor craft, and fishing vessels. In addition to the off-road fleet regulations, regulations targeting at-berth emissions from marine vessels, truck and off-road and marine low-sulfur fuel, and off-road vehicle idling were also adopted.

The SCAQMD also has a mobile source program that is designed to reduce both toxic and smog-forming air pollutants. Beginning in 2000, the SCAQMD adopted seven rules that gradually shifted public agencies and certain private entities under contract or exclusive franchise to public entities to use lower emitting and alternative fuel vehicles whenever a fleet operator with 15 or more vehicles replaced or purchased new vehicles. All seven fleet rules are now in effect and include fleet rules for sweepers, light and medium-duty public fleet vehicles, transit buses, refuse vehicles, airport ground access vehicles, school buses, and heavy-duty public fleet vehicles. Together, they have helped reduce the impacts to local communities from DPM and other air toxic emissions from motor vehicles.

The existing mobile source control strategy also includes a number of incentive programs which are designed to incentivize the turnover of equipment and fleets to cleaner technologies either through the introduction of compliant vehicles and equipment earlier than would be required by regulation or through the introduction of zero-, near- zero, or ultra-low emission technologies that go beyond the existing regulatory control programs. Incentive programs include such statewide programs as the Carl Moyer Memorial Air Quality Standards Attainment Program, Goods Movement Emission Reduction Program (Prop 1B), and On-Road Voucher Incentive Program (VIP), which are funded through the State of California

and SCAQMD programs such as, the Mobile Source Air Pollution Reduction Review Committee (MSRC) and special SCAQMD grant funding initiatives.

2015 OEHHA Revised Health Risk Assessment Guidelines

The SCAQMD relies on the Health Risk Assessment Guidelines developed by the Office of Environmental Health Hazard Assessment (OEHHA) in various aspects of its toxics regulatory program including the permitting program, the AB2588 Hot Spots Program as required by statute, and existing regulatory programs. In 2003, OEHHA developed and approved its Health Risk Assessment Guidance document (2003 OEHHA Guidelines) and prepared a series of Technical Support Documents, reviewed and approved by the Scientific Review Panel (SRP), that provided new scientific information showing that early-life exposures to air toxics contribute to an increased estimated lifetime risk of developing cancer and other adverse health effects, compared to exposures that occur in adulthood. As a result, OEHHA developed the Revised OEHHA Guidelines in March 2015 which incorporated this new scientific information. The new method utilizes higher estimates of cancer potency during early life exposures. There are also differences in the assumptions on breathing rates and length of residential exposures. When these revisions are combined, estimated cancer risks for the same inhalation exposure level are about 2.3 times higher using the proposed updated methods, and approximately up to six times higher for toxic air contaminants with multi-pathway exposures.

Since some source-specific toxics rules are based on health risk estimates, the SCAQMD has and will continue to re-evaluate these rules to determine whether amendments are necessary to provide consistency with the Revised OEHHA Guidelines and/or if new requirements are needed to provide adequate protection to public health in light of the higher health risk estimates. In addition, during amendments to Rule 1402 to incorporate the Revised OEHHA Guidelines in 2015, some industry representatives had requested that the SCAQMD incorporate a program to allow early risk reductions in lieu of traditional public noticing. SCAQMD staff is working on proposed amendments to Rule 1402 to incorporate a Voluntary Early Risk Reduction Program and streamline Rule 1402.

Multiple Air Toxics Exposure Study (MATES)

In 1986, the SCAQMD conducted the first Multiple Air Toxics Exposure Studies (MATES) study to determine the Basin-wide risks associated with major airborne carcinogens. Since then, the SCAQMD has conducted three further MATES studies, each of enhanced scope. Results of the MATES studies have helped guide the SCAQMD's air toxics regulatory program. In 1998, MATES II was conducted and represented one of the most comprehensive air toxics measurement programs conducted in an urban environment. MATES II included a monitoring program of 40 known air toxic compounds, an updated emissions inventory of toxic air contaminants, and a modeling effort to characterize health risks from hazardous air pollutants. MATES III was conducted between 2004 and 2006 and consisted of a two-year monitoring program as well as updates to the air toxics emissions inventory and a regional modeling analysis of exposures to air toxics in the Basin. In May 2015, the SCAQMD released the final report for MATES IV which was conducted as a one-year study between June 2012 and June 2013. This study consisted of a monitoring program at 10 fixed sites, an updated emissions inventory of TACs, and a modeling effort to characterize risk across the Basin.

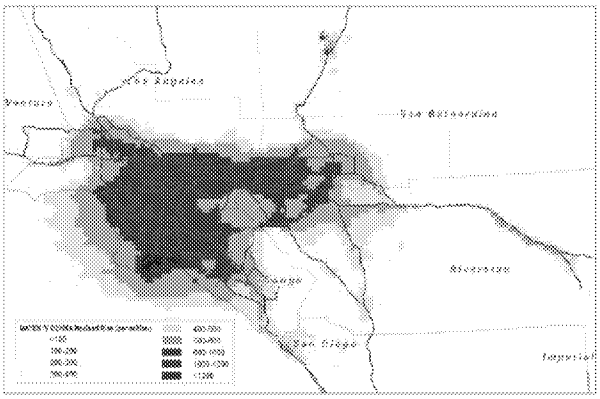


FIGURE 9-4
MATES IV MODELED AIR TOXICS RISKS ESTIMATES USING REVISED OEHHA HEALTH RISK GUIDELINES

Results of MATES IV showed a dramatic 70 percent reduction in the average level of diesel particulate emissions compared to MATES III. Additionally, the population weighted carcinogenic risk from air toxics in the Basin, based on the average concentrations monitored, was nearly 60 percent lower as compared to carcinogenic risk determined in MATES III. It should be noted that a majority of the risk was attributed to emissions associated with mobile sources, with the remainder attributed to toxics emitted from stationary sources, which include large industrial operations such as refineries and metal processing facilities, as well as smaller businesses such as gas stations and chrome platers. Although the Revised OEHHA Guidelines change the estimated cancer risk values in Figure 9-4, this does not change the fact that estimated cancer risks have been significantly reduced, between 75 to 86 percent over the last couple decades, depending on the location within the Basin.

Although the results of MATES IV have shown a significant regional reduction in exposure to key TACs and reduced cancer risk throughout the Basin, more needs to be done to reduce cancer risk levels regionally. Applying the revised OEHHA methodology to the modeled air toxics levels, the MATES IV estimated population weighted cancer risk is 897 per million. Additional toxics measures are necessary in order to further reduce toxic emissions and associated regional health risk levels.

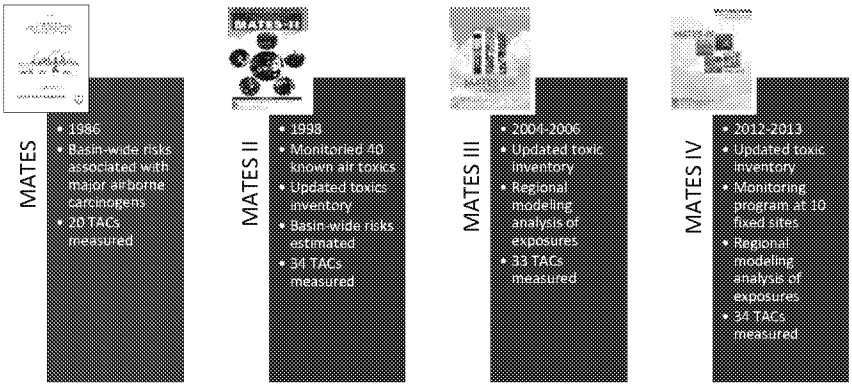


FIGURE 9-5
SUMMARY MATES STUDIES

Localized Air Toxics (Hot Spots)

Even with regional reductions in air toxics, there are areas throughout the Basin where communities are in close proximity to toxic emitting sources, resulting in an elevated health risk. Air toxics are often referred to as having "localized impacts," as the health risk is highest where the toxic emitting source is close to those communities and decreases substantially further out from the facility. Modeling data has shown that health risks generally decrease about 90 percent at 1,500 feet from the source. As such, the calculated local health risks at a residences in close proximity to a toxic emitting facility is expected to be elevated compared to the overall health risk for an entire community. The SCAQMD's regulatory program relies on source-specific rules to reduce localized health risks from toxic emitting stationary source facilities combined with facility-specific requirements to reduce facility-wide toxic emissions that are required through implementation of the Hot Spots Act and Rule 1402.

Within the past five years, the SCAQMD staff has become more aware of stationary source facilities that have posed elevated health risks to neighboring communities, highlighting the importance of rules and regulations that can address these elevated health risks. Additionally, recent ambient air monitoring in communities surrounding air toxic sources indicate that toxic emissions in the form of fugitive emissions have the potential to migrate out of some facilities and into nearby neighborhoods (see section below – *Recent Air Toxic Findings*). Any health risk impacts resulting from these types of fugitive emission issues will be localized and are unlikely to be revealed by regional modeling or monitoring.

Environmental Justice

The 2016 AQMP has identified the need for nitrogen oxide (NOx) emission reductions as the most significant air quality challenge in meeting the upcoming ozone standard deadlines. Total Basin emissions of NOx must be reduced an additional 45 percent by 2023, and an additional 55 percent by 2031. While the Basin's challenges for criteria pollutant reductions such as NOx emission reductions are significant, the Basin also contains numerous communities experiencing disproportionate environmental impacts from toxic air contaminants.

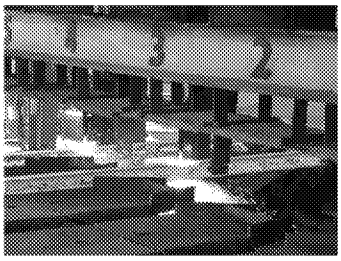
Since 1997, the SCAQMD has focused on Environmental Justice and methods to improve the air quality in specific communities. The purpose of SCAQMD's Environmental Justice program is to ensure that everyone has the right to equal protection from air pollution and fair access to the decision-making process that works to improve the quality of air within their communities. Environmental Justice, has been defined by SCAQMD as: "equitable environmental policymaking and enforcement to protect the health of all residents, regardless of age, culture, ethnicity, gender, race, socioeconomic status, or geographic location, from the health effects of air pollution." SCAQMD's Environmental Justice program began in 1997. The programs and initiatives have been continually reviewed to keep the Environmental Justice programs current and moving forward. One important component of that review process is the Environmental Justice Advisory Group (EJAG), which serves as an advisory group to the SCAQMD Governing Board. The mission of EJAG is to advise and assist SCAQMD in protecting and improving public health in SCAQMD's most impacted communities through the reduction and prevention of air pollution. It is anticipated that the EJAG will continue to provide input prioritizing strategies, regulations, and investments during the implementation period of the 2016 AQMP.

The 2016 AQMP control measures, including mobile source measures to reduce emissions from goods-movement vehicles and facilities, as well as the defined air toxic control measures described in this chapter, will help these communities by accelerating clean air efforts in Environmental Justice areas because many of the facilities targeted by the proposed control measures are located in disproportionately impacted communities. In addition to the toxic control measure defined in this chapter, the 2016 AQMP contains many incentive measures which will also help residences and organizations that may be more economically challenged by offsetting some of the costs of pollution reduction strategies while also promoting more livable neighborhoods and helping local businesses incorporate newer equipment and technologies.

In addition, the 2016 AQMP Socioeconomic Report will contain an enhanced impact analyses on Environmental Justice communities as a way to determine the impacts of the 2016 AQMP control strategy on Environmental Justice communities.

Recent Air Toxics Findings

Since the adoption of the 2010 CCP, more information has become available regarding fugitive toxic particulate emissions, indicating that more controls are needed for certain source categories. Ambient monitoring at a chrome plating facility, a metal forging facility with a metal grinding operation, a steel mini mill, and at two large lead-acid battery recycling facilities have shown that additional controls are needed to address fugitive toxic particulate emissions, particularly metal particulates. Heavy metals, such as arsenic, nickel, cadmium, and hexavalent chrome have high relative risks compared to other toxics. In addition to risks from inhalation, toxic metals can create health problems from ingestion, dermal exposure, and through consumption of breast-milk.



Traditionally, source-specific control strategies have focused on reducing stack emissions. Many of the SCAQMD source-specific rules reduce stack emissions by over 98 percent. In addition, some existing rules include housekeeping provisions to minimize fugitive toxic emissions. However, staff has become increasingly aware based on data from ambient monitors that certain operations with fugitive toxic dust may require an enclosure and more robust housekeeping provisions to contain fugitive emissions and minimize the release of metal particulate emissions into the air.

Fugitive metal particulate emissions can be difficult to quantify. The primary method to quantify fugitive metal particulate is using ambient monitors, which can measure both fugitive and point (or stack) emissions from a facility. The SCAQMD currently has very few rules that require ambient monitoring. Recent ambient monitoring in communities surrounding metal melting and metal finishing facilities indicate that fugitive toxic metals have the potential to migrate out of the facilities and into neighborhoods. At one large lead-acid battery recycling facility, nearly 98 percent of emissions found on ambient monitors were attributable to fugitive emissions rather than stack emissions. Air monitoring conducted by the SCAQMD staff at a chrome plating facility has shown high levels of hexavalent chromium in the ambient air due to cross-draft conditions affecting the emission collection potential of control equipment. Results of sampling data collected by SCAQMD staff at multiple forging facilities have shown that fugitive metallic dust generated from grinding activities includes TACs such as cadmium, chromium, cobalt, and nickel. The health impacts of many of these toxic metal particulate emissions warrant developing control measures to minimize exposure. Better control of fugitive emissions and improvements to housekeeping and maintenance are necessary to reduce potential impacts in surrounding communities.

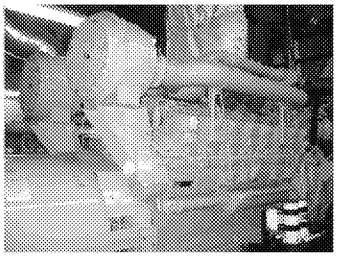
Relationship of Air Toxics Control Strategy to the 2016 AQMP

Reducing air toxics in the region has been a long-term goal of the SCAQMD and has resulted in significant reduction of local risk from toxic air pollutants throughout the Basin. To the extent feasible, the 2016 AQMP is capturing co-benefit opportunities in achieving multi-pollutant reductions to meet ambient air quality standards having multiple deadlines. Some criteria pollutant control measures will concurrently reduce air toxics and some air toxics control measures will reduce criteria pollutants. The following

sections discuss the emission reductions targeted from air toxic control strategies and concurrent criteria pollutant emission reductions.

Concurrent PM Reductions

Efforts to reduce PM2.5 and its precursors will reduce particulate emissions that are toxic air contaminants, such as DPM, in the region. There have been significant decreases in air toxics exposure over the past couple of decades, primarily due to the reduction in DPM from mobile sources and stationary sources. Concurrent reductions in particulate emissions (the majority of which is DPM) have occurred from implementation of Rule 1470 – Requirements for Stationary Diesel-Fueled Internal Combustion and Other Compression Ignition Engines, and Rule 1472 – Requirements for Facilities with Multiple Stationary Emergency Standby Diesel-Fueled Internal Combustion Engines. As a result of CARB's Diesel Risk Reduction Plan, a significant number of mobile source regulations were adopted for a variety of diesel sources including: Cargo Handling Equipment; Commercial and Charter Fishing Vessels; Commercial Harbor Craft; School Buses; Port (Drayage) Trucks; Stationary Engines and Portable Equipment; Transport Refrigeration Units (TRU) and TRU Generators. Reduction in PM emissions and DPM will continue with the turnover of existing stationary diesel engines and mobile sources.



As warranted by data and analysis, SCAQMD staff will add and strengthen requirements to reduce toxic metal emissions and exposure from various metal industry sources. These measures, although not developed for SIP attainment purposes, will achieve concurrent reductions in directly emitted PM2.5 and may be quantified and credited toward needed SIP reductions. A control strategy that reduces particulate emissions from metal grinding operations, for example, provides a means of achieving concurrent particulate and air toxic emission reductions.

Concurrent VOC Reductions

Additional VOC controls are helpful for attainment of air quality standards and one 2016 AQMP approach is to prioritize controls that will focus on VOC that are most reactive in ozone and/or PM2.5 formation. In addition to contributing to the formation of PM2.5 and ozone, many VOCs, such as benzene, are also considered air toxics.

In the past, the SCAQMD has developed source-specific controls under Regulation XI – Source Specific Rules, to reduce or eliminate the use of coatings and solvents that contain air toxics. This includes rules that require the phase-out of air toxics where alternatives exist, such as Rule 1168 – Adhesive and Sealant Applications, which required the elimination of emissions of methylene chloride, perchloroethylene, ethylene dichloride, and trichloroethylene from the application of adhesives, adhesive bonding primers, sealants, sealant primers, or any other primers. Another example is Rule 1124 - Aerospace Assembly and Component Manufacturing Operations where facilities decreased toxicity-weighted emissions of methylene chloride, perchloroethylene, and trichloroethylene when Rule 1402 levels were exceeded. A third example is the prohibition of the use of perchloroethylene in operations subject to Rule 1171 - Solvent Cleaning Operations.

Potential Tradeoffs

Unlike with PM, reducing organic air toxic emissions will not necessarily result in concurrent VOC emission reductions. A tradeoff can occur when the resulting alternative to the toxic solvent or coating is replaced with a VOC-containing compound. An example of this is Rule 1421 – Control of Perchloroethylene Emissions from Dry Cleaning Systems. The goal of Rule 1421 was to reduce perchloroethylene, a carcinogen, from dry cleaning operations through a gradual transition to non-perchloroethylene alternatives. One of the primary non-perchloroethylene alternatives included the use of halogenated solvents, some of which are classified as VOCs.

In addition, in an effort to meet more stringent federal ozone standards, the SCAQMD continues to seek further VOC emission reductions from stationary and area sources in the Basin. Manufacturers of coatings, solvents, adhesives, sealants, lubricants, ink, and other VOC-containing products often respond by reformulating their products using solvents that are exempt from the definition of VOC. Exemptions are based primarily on evidence that the solvent negligibly contributes to ozone formation, but may also consider other factors such as toxicity. Exempting VOCs has the potential to create unforeseen health impacts by increasing the use of the exempt substances that may have toxic characteristics. The SCAQMD staff is continually encouraging the use of materials that are low in reactivity (and not considered a VOC) and not considered toxic.

Air Toxics Control Strategy

The 2016 AQMP air toxics control strategy is composed of two components. The first consists of the mobile source control strategies that are designed to reduce NOx, ROG, and PM emissions in order to meet the SIP commitments in the 2016 AQMP, while also producing co-benefits for a variety of TACs. The second component includes those stationary source control strategies that are implemented by the SCAQMD in order to primarily reduce TACs that can create localized impacts to nearby communities. The second component will not be submitted as part of the SIP.

Table 9-2 shows the baseline and projected key TAC emissions from the 2016 mobile source control strategies and estimated baseline and projected TAC emissions with the control strategies in place. In addition to reductions in criteria pollutant emissions, implementation of mobile source strategies will result in significant reductions in TACs. From the 2012 baseline, implementation of mobile source control strategies is expected to reduce seven key mobile source related TACs by more than 70 percent by 2031.

TABLE 9-2

Key Toxic Air Contaminant Emissions from 2016 AQMP Mobile Source Control Measures; Baseline and Projected Annual Average Day Emissions (pounds/day)

Toxic Air Contaminant	2012 Baseline	2023 Baseline	2023 Controlled	2031 Baseline	2031 Controlled
Naphthalene	547	305	167	264	131
Benzene	13,403	6,995	3,994	5,792	3,130
1,3-Butadiene	2,122	1,209	588	1,081	508
MTBE	311	126	102	80	62
Formaldehyde	16,120	9,315	4090	8,793	3,640
Acetaldehyde	7,113	3,969	1747	3722	1,532
Diesel particulate	20,750	6,864	6,428	5,873	5,708

Mobile Source Control Strategies

Mobile sources are responsible for approximately 90 percent of DPM emissions in the Basin, as well as other toxic air contaminants related to fuel combustion and evaporation. The 2016 AQMP mobile source component contains strategies which will reduce DPM and other TACs by deploying both zero-emission and cleaner combustion technologies. Zero-emission technologies are critical to reducing near-source exposure to air toxics, especially around freight hubs and networks such as ports, rail yards, and distribution centers. The 2016 AQMP mobile source control strategies include actions to deploy zero-emission technologies across a broad spectrum of sources, including passenger vehicles, truck and bus applications, forklifts, transport refrigeration units, and airport ground support equipment. The mobile source control strategies call for internal combustion engine technology that is effectively 90 percent cleaner than today's current standards. The introduction of zero-emission technologies in heavy-duty applications will be critical to the overall effort. Actions to promote ZEVs in these heavy-duty applications are underway and are important to further reduce regional and near-source toxics exposure, especially as it relates to reducing risk from DPM. In the off-road sector, the 2016 AQMP mobile source control strategies stress the need to reflect this same type of transformation to a mix of zero and near-zero technologies operating on renewable fuels. A summary list of CARB mobile source strategies is shown in Table 9-3.

TABLE 9-3

2016 AQMP CARB Mobile Source Control Measures
and Concurrent Key Toxic Air Contaminants (TACs) Reduced

On-Road Light-Duty	Key TACs Reduced
More stringent engine performance standards and increased fuel efficiency	Naphthalene, Benzene, 1,3-Butadiene, MTBE, Formaldehyde, Acetaldehyde
Requirements to ensure durability of passenger vehicle technologies	
Incentive funding to achieve further ZEV deployment beyond vehicle regulations	
Electricity grid representing 50 percent renewable energy generation	
Increased use of renewable fuels	
Reductions from passenger vehicle miles traveled and intelligent transportation systems	
On-Road Heavy-Duty	**Key TACs Reduced**
More stringent engine performance standards reflecting technology that is 90 percent cleaner than today's standards and increased fuel efficiency	Benzene, Formaldehyde, Acetaldehyde, Diesel Particulate Matter
Deployment of near-zero and zero-emission technologies into focused heavy-duty applications such as transit buses and last mile delivery	
Requirements to ensure durability of heavy-duty vehicle technologies	
Incentive funding to achieve further deployment of cleanest engine technologies	
Increased freight transport system efficiencies and use of intelligent transportation systems	
Increased use of renewable fuels	
Off-Road Federal and Intermodal Sources	
Call for federal and international action to set more stringent standards for ocean going vessels, locomotives, and aircraft, as well as cleaner technologies for older locomotives	Naphthalene, Benzene, Formaldehyde, Acetaldehyde, 1,3-Butadiene, Diesel Particulate Matter
Decreased emissions from ocean going vessels at berth	
Increased freight transport system efficiencies	
Incentive funding to achieve further deployment of cleanest engine technologies	
Increased use of renewable fuels	
Off-Road Equipment Sources	
Deployment of ZEV technologies into targeted equipment categories such as forklifts and airport ground support equipment	Naphthalene, Benzene, Formaldehyde, Acetaldehyde, 1,3-Butadiene, Diesel Particulate Matter
Cleaner engine technology transfer from on-road to off-road applications	
Incentive funding to achieve further deployment of cleanest engine technologies	
Increased worksite efficiencies	
Increased use of renewable fuels	

Stationary Source Toxics PM Control Strategies

The 2016 stationary source air toxic control strategy represents the overarching direction for the SCAQMD's air toxics control program. The stationary source air toxic control strategy is not required by state or federal law, and thus will not represent a commitment under the SIP. However, the stationary source air toxic control strategy are considered strategies for future agency action. As with all of SCAQMD's pollution control efforts, development and implementation of air toxics control strategies

involve partnerships with other agencies, the regulated community, environmental groups, and the public, along with the systematic assessment of potential socioeconomic impacts.

Control strategies include the reduction of air toxic metal emissions from a variety of sources including metal grinding and metal melting operations; chrome plating and spraying; nickel, cadmium and other metal plating operations; lead facilities (other than facilities subject to Rules 1420.1 and 1420.2); soil containing toxic metal that is undergoing remediation; DPM from stationary engines, and non-vehicular lead sources (Rule 1420). Table 9-4 summarizes the control measures targeting stationary source TACs.

TABLE 9-4
Summary of Stationary Source Measures to Reduce Toxic Air Contaminants

Source	Objective	Potential Toxic Air Contaminants and Co-Benefits	Control Approaches
Control of Metal Particulate from Metal Grinding Operations (TXM-01)	Reduce metal particulate emissions from metal grinding activities at forging facilities, metal foundries, and plating operations	• Cadmium • Hexavalent Chromium • Cobalt • Nickel • Particulate (metal)	• Enclosures • Pollution controls • Housekeeping measures
Control of Toxic Metal Particulate Emissions from Plating and Anodizing Operations (TXM-02)	Further reduce fugitive metal particulate emissions from electroplating and chromic acid anodizing processes	• Hexavalent Chromium • Nickel • Cadmium • Copper • Arsenic • Lead • Particulate (metal)	• Enclosures • Pollution controls • Enhanced housekeeping measures • Physical modifications to increase capture efficiency and reduce fugitive emissions
Control of Hexavalent Chromium from Chrome Spraying Operations (TXM-03)	Further control hexavalent chromium emissions from spraying of paints and coatings containing hexavalent chromium	• Hexavalent chromium • Particulate (metal)	• Increased housekeeping and best management practices
Control of Toxic Metal Particulate Emissions from Contaminated Soil (TXM-04)	Control toxic metal particulates during soil cleanup/remediation activities	• Lead • Hexavalent chromium • Cadmium • Nickel • Arsenic • Possibly other metal TACs • Particulate (metal)	• Soil covering • Chemical treatment • Barriers • Wheel knockout and cleaning stations • Other dust suppression techniques
Control of Toxic Metal Particulate Emissions from Laser and Plasma Cutting (TXM-05)	Control toxic metal particulates from Laser and Plasma Cutting	• Nickel • Cadmium • Hexavalent chromium, and possibly other metal TACs	• Filter technology including HEPA filters • Alternative technologies such as flame and water jet cutting
Control of Toxic Emissions from Metal Melting Facilities (TXM-06)	Further reduce metal toxic emissions from melting, pouring, casting, degating, heat treating, surface cleaning, and finishing operations at foundries	• Arsenic • Cadmium • Nickel • Other toxic metals • Particulate (metal)	• Particulate filter technologies for furnaces • Enclosures • Increased housekeeping and best management practices • Possibly ambient air monitoring

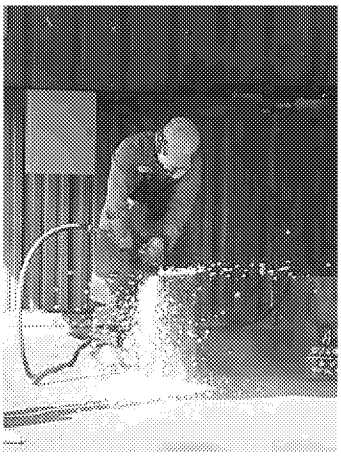
TABLE 9-4 (CONCLUDED)
Summary of Stationary Source Measures to Reduce Toxic Air Contaminants

Source	Objective	Potential Toxic Air Contaminants and Co-Benefits	Control Approaches
Control of Lead Emissions from Stationary Sources (TXM-07)	Further control lead emissions from non-vehicular sources	• Lead • Particulate (Metal)	• Reduce ambient lead concentration • Increased housekeeping and best management practices
Control of Emissions from Chemical Stripping of Cured Coatings (TXM-08)	Reduce methylene chloride emissions from chemical stripping operations	• Methylene Chloride	• Reformulation • Activated carbon • Point of sale restrictions
Control of Emissions from Oil and Gas Well Activities (TXM-09)	Reduce toxic emissions during well drilling, maintenance, and stimulation activities at oil and gas production sites	• Benzene • Toluene • Ethylbenzene • Xylene • Diesel Particulate Matter • Particulate Matter	• Pollution control and best management practices to minimize BTEX emissions from portable storage tanks, circulation tanks, and portable totes with particulates • Use of the cleanest diesel equipment available for off-road engines • Housekeeping provisions

The following sections provide additional detail on the individual control strategies that are planned to be developed to reduce exposure and impacts from air toxics. Each individual section includes a:

- General background and description of the source;
- Control objective and specifics about the source category's potential air toxic emissions;
- General control approach; and
- Implementation approach

Control of Metal Particulate from Metal Grinding Operations (TXM-01)



Background: The objective of this control measure is to control fugitive toxic metal particulate emissions at forging facilities, metal foundries, and plating operations. In general, there are no current SCAQMD regulatory requirements for metal grinding operations, and this activity is exempt from permitting. Metal grinding is a material removal and surface preparation process used to shape and finish metal parts. Grinding employs an abrasive product, usually a rotating wheel brought into controlled contact with the metal surface that removes tiny pieces of metal from the part generating metallic chips and dust. This activity is common in both heavy and light industrial processes such as metal foundries and forging and plating operations that commonly produce parts for the aerospace, automotive, and oil and gas industry.

Potential TACs: Results of sampling data collected by SCAQMD staff at multiple forging facilities have shown that fugitive metallic dust generated from metal grinding activities include TACs such as cadmium, hexavalent chromium, cobalt, and nickel. Additionally, extensive ambient air monitoring conducted at one forging facility has confirmed elevated concentrations of nickel in the ambient air due to metal grinding activities.

Affected Facilities: The SCAQMD has identified at least 24 forging facilities in the Basin that conduct metal grinding operations. SCAQMD staff is assessing metal grinding operations and foundries and other metal working facilities to identify the need for pollution controls and other requirements to contain metal TACs from those operations.

Control Approach: Potential metal particulate emission control approaches include conducting grinding within permanent enclosures, capture and control through add-on controls, and housekeeping measures. Examples of add-on controls include, cyclones, baghouses, scrubbers, and HEPA filters. Effective housekeeping measures may include routine wet washing or vacuuming, proper material storage and disposal, and routine maintenance of emission control devices.

Control of Metal Particulate from Metal Grinding Operations (TXM-01)

Objective:
Reduce metal particulate emissions from metal grinding activities at forging facilities, metal foundries, and plating operations

Potential TACs:
- Cadmium
- Hexavalent Chromium
- Cobalt
- Nickel
- Particulate (Metal)

Control Approaches:
- Enclosures
- Pollution controls

Implementation Approach: This measure will be implemented as individual source-specific rules are adopted or amended. SCAQMD staff is working on a proposed metal grinding rule for forging facilities. Staff will be also be developing a proposed source-specific rule for foundries and amending existing rules for plating operations. During those rule development efforts, staff will establish requirements to address metal particulates from grinding operations, if needed.

Control of Toxic Metal Particulate Emissions from Plating and Anodizing Operations (TXM-02)

Background: The purpose of this control measure is to further control metal (hexavalent chrome, nickel, cadmium, copper, arsenic, and lead) emissions from plating operations. Hexavalent chromium electroplating and chromic acid anodizing are processes currently regulated under Rule 1469 – Hexavalent Chromium Emissions from Chromium Electroplating and Chromic Acid and Anodizing Operations. Other non-hexavalent chromium plating operations are regulated under Rule 1426 – Emissions from Metal Finishing Operations. Electroplating processes involve the creation of desired metal surfaces or substrates. Both nickel and copper plating are commonly performed prior to chrome plating in order to provide a substrate for the chrome to adhere to or to add additional properties such as strength. In many cases, nickel plating is performed as the only or final stage of plating where appearance is the primary desired quality of the end product. Other sources of fugitives can come from air sparging, openings or cross-draft conditions within buildings or enclosures, poor housekeeping, improper handling of waste, and improper handling of raw products.

Potential TACs: Point and fugitive source emissions of hexavalent chromium, nickel, cadmium, copper, arsenic, and lead can be generated from electroplating or anodizing processes.

Affected Facilities: Hexavalent chromium electroplating and chromic acid anodizing processes are used in various industries including aerospace, automotive, computer electronics, machinery, and industrial equipment. There are 34 hard chrome plating facilities, 50 decorative chrome plating facilities, and 32 anodizing facilities for a total of 116 facilities in the Basin. These facilities may also do non-hexavalent chromium metal plating. Additionally, there are approximately 200 more facilities in the Basin that do metal plating other types of metal plating or anodizing.

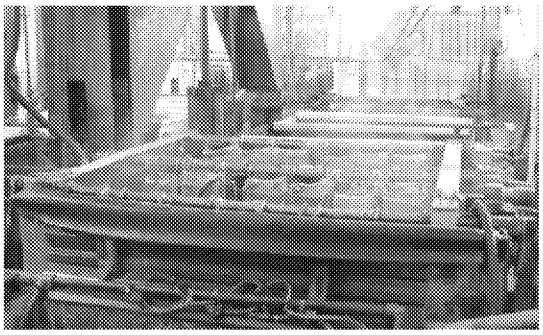
Control Approach: Current point source control approaches include chemical or mechanical methods to control surface tension of the baths in the tank, or capture of emissions using add-on air pollution controls such as scrubbers, mesh pads, and HEPA filters. Fume suppressants are extremely effective at minimizing process fugitive emissions from the tank, especially in situations where facilities have cross draft conditions in buildings where tanks are located, or conduct operations around tanks that may affect the release or behavior of the emissions. When used in combination with add-on air pollution control equipment, fume suppressants serve as the primary control of both point source and fugitive emissions prior to collection by the control device, and optimizes the overall emission reduction potential of the system. Facilities also can utilize best housekeeping and best management practices to mitigate fugitive emissions. In some cases, facilities may use alternative materials or plating processes. Additionally, alternative methods of applying a metal coating may be used such as aluminum ion vapor deposition, physical vapor deposition, or metal spray coating.

Control of Toxic Metal Particulate Emissions from Plating and Anodizing Operations (TXM-02)

Objective:
Further reduce fugitive metal particulate emissions from electroplating and acid anodizing processes

Potential TACs:
Hexavalent Chromium, Nickel, Cadmium, Copper, Arsenic, Lead

Control Approaches:
- Enclosures
- Pollution controls
- Enhanced housekeeping measures
- Physical modifications to increase capture efficiency and reduce fugitive emissions



Implementation Approach: This measure would be implemented through amendments to Rules 1426 and 1469.

Control of Hexavalent Chromium from Chrome Spraying Operations (TXM-03)

Background: The objective of this control measure is to further control hexavalent chromium emissions from spraying of paints and coatings. Spraying of paints and coatings containing chromium or hexavalent chromium is currently regulated under Rule 1469.1 – Spraying Operations Using Coatings Containing Chromium. During the uncontrolled application of coatings, hexavalent chromium emissions

are generated by the inefficient transfer of paint to the part or from overspray. Emissions from spraying operations are typically conducted within a paint spray booth and exhaust through a wall of filter media or stack, assuming the facility has a properly designed booth and ventilation system. However, there is also a potential for fugitive emissions to occur from an open booth face, if capture into the ventilation system is not complete. Additionally, fugitive hexavalent chromium emissions can be generated by poor housekeeping, improper use of control equipment, and improper handling of waste or painted products. Rule 1469.1 currently includes requirements for spray enclosures, transfer efficiency, and housekeeping practices within spray enclosures.

Control of Hexavalent Chromium from Chrome Spraying Operations (TXM-03)

Objective:
Further control hexavalent chromium emissions from spraying of paints and coatings

Potential TACs:
Hexavalent chromium

Control Approaches:
- Increased housekeeping and best management practices

Potential TACs: The source of air toxics from these facilities is hexavalent chromium, which is present in paint particles.

Affected Facilities: Paints and coatings containing hexavalent chromium occurs in a variety of industries including aerospace, electroplating, and coating facilities. There are approximately 70 facilities identified in the Basin that perform chrome spraying operations.

Control Approach: Current housekeeping requirements of Rule 1469.1 include general measures and best management practices for the clean-up, handling, storage, and disposal of waste generated within spray booth enclosures. The existing provisions for enclosures can be enhanced by requiring routine and periodic housekeeping inspections, in addition to new housekeeping and work practice requirements outside of spray enclosures in order to comprehensively reduce fugitive emissions from the facility.

Implementation Approach: This measure would be implemented through amendments to Rule 1469.1.

Control of Toxic Metal Particulate Emissions from Contaminated Soil (TXM-04)

Background: Currently the SCAQMD has a rule regulating VOC emissions from contaminated soil that establishes requirements to ensure the release of VOC emissions are minimized. There is currently no rule to address metal particulate emissions that can become airborne during the handling and disturbance of soils contaminated with toxic metals. Examples of metal toxic air contaminants that can be in contaminated soil include, but are not limited to, hexavalent chromium, lead, nickel, cadmium, and arsenic. This control strategy would establish specific requirements to ensure that fugitive toxic air contaminant emissions from soils contaminated with toxic metals are minimized during the excavation, storage, and/or transportation.

Potential TACs: Potential fugitive toxic metals include, but are not limited, to hexavalent chromium, lead, nickel, cadmium, and arsenic.

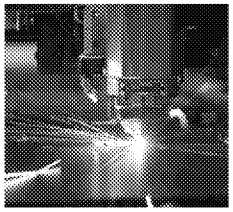
Affected Facilities: Currently, the number of expected sources cannot be estimated since the activities are intermittent in nature.

Control Approach: Possible control approaches include soil covering, watering, chemical treatment, barriers, tire and wheel knockout and cleaning stations, and other dust suppression techniques. Air monitoring of the site may also be a part of the control strategy.

Implementation Approach: This measure will be implemented through a new SCAQMD rule.

Control of Toxic Metal Particulate Emissions from Laser and Plasma Cutting (TXM-05)

Background: The control measure would control metal particulate emissions from laser and plasma cutting operations. New or modified laser plasma cutting operations are currently permitted by the SCAQMD and are subject to Rule 1401 which establishes risk thresholds for permitted sources. Laser and plasma cutting technologies are used for cutting and fabricating large sheets of metal goods. Laser cutting directs a laser onto most metals (except reflective metals including aluminum, brass and copper) which melts or vaporizes the metal. Plasma cutting uses electrically conductive gas to transfer energy from an electrical power source through the plasma to the metal being cut. The high temperature of the plasma melts the metal. The intense energy of both the laser and plasma cutting process creates fumes and smoke from vaporizing the molten material from the bottom of the cut (kerf). Uncontrolled vaporized metals such as cadmium and nickel present environmental and health concerns. Additionally, high energy processes, such as laser and plasma cutting, can oxidize the elemental chrome in stainless steel into hexavalent chrome.



Potential TACS: Potential TACs from laser and plasma cutting include nickel, cadmium, hexavalent chromium, and possibly other metals.

Affected Facilities: Approximately 150 to 200 facilities utilize laser or plasma cutting equipment on metal substrates.

Control of Toxic Metal Particulate Emissions from Contaminated Soil (TXM-04)

Objective:
Reduce fugitive emissions from soils contaminated with toxic metals

Potential TACs:
Lead, hexavalent chromium, cadmium, nickel, arsenic, and possibly other metal TACs

Control Approaches:
- Soil covering
- Chemical treatment
- Barriers
- Wheel knockout and cleaning stations
- Other dust suppression techniques

Control of Toxic Metal Particulate Emissions from Laser and Plasma Cutting (TXM-05)

Objective:
Control toxic metal particulates from laser and plasma cutting operations

Potential TACs:
Nickel, cadmium, hexavalent chromium, and possibly other metal TACs

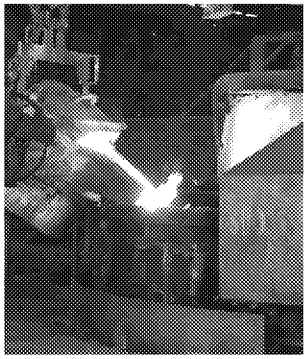
Control Approaches:
- Filter technologies such as HEPA filters
- Alternative processes

Control Approaches: Filter technologies such as high efficiency particulate arrestors (HEPA) filters or possibly other pollution controls could be used to reduce emissions. Staff will investigate alternative approaches that may result in less fugitive metal particulate emissions. Some alternative approaches include: flame cutting, water jet cutting, welding, and conventional machining.

Implementation Approach: Implementation would be through development of a proposed source-specific rule for laser and plasma cutting operations to control fugitive toxic metal emissions.

Control of Toxic Emissions from Metal Melting Facilities (TXM-06)

Background: This control measure seeks to further reduce metal toxic emissions such as arsenic, cadmium, and nickel from foundries and other metal melting facilities. Other metal melting operations include smelting, tinning, galvanizing, and other miscellaneous processes where metals are processed in molten form. Metal foundries are facilities which produce metal castings. The process involves melting metal into a liquid, pouring the liquid metal into a mold or casting, allowing the metal to cool and solidify, removing the mold or casting, degating, heat treating, surface cleaning, and finishing. Possible emission sources from such operations include, but are not limited to, fume, particulate, or dust from the melting, pouring, casting, degating, heat treating, coating, brazing, finishing, or surface cleaning processes, leftover metal or slag, and poor housekeeping.



Control of Toxic Emissions from Metal Melting Facilities (TXM-06)

Objective:
Further reductions of toxic emissions from foundries and other metal melting facilities

Potential TACs:
Arsenic, cadmium, nickel, cadmium, and possibly other toxic metals

Control Approaches:
- Filter technologies such as HEPA filters
- Increased housekeeping and best management practices
- Ambient air monitoring

Potential TACs: The proposal is anticipated to further reduce toxic and particulate emissions from metal melting facilities.

Affected Sources: Within the Basin, there are approximately 200 foundries serving industries such as aerospace, aircraft, automotive, industrial gas turbine, medical, and military. There are approximately another 50 other metal melting facilities that would be subject to this control measure.

Control Approaches: Emissions can potentially be reduced through venting operations to an emission collection system or improvements to existing collection systems, such as the addition of high efficiency filters. Fugitive emissions can be reduced through housekeeping measures which may include, but are not limited to, sweeping, mopping or filtered vacuuming, and enclosed material storage. Equipment may require new or updated source testing and potentially new or updated permits. Additionally, an ambient air monitoring requirement is under consideration.

Implementation Approach: This measure would be implemented through amendments to Rule 1407 and possibly through a new SCAQMD rule.

Control of Lead Emissions from Stationary Sources (TXM-07)

Background: The objective of this control measure is to further control lead emissions from non-vehicular sources. Lead and arsenic emissions from large lead-acid battery recycling facilities are regulated by Rule 1420.1. Emissions of lead from large (>100 ton per year) metal melting facilities are regulated by Rule 1420.2. All other non-vehicular sources of lead are regulated by Rule 1420. Lead is found in metals and aggregate processed either as an alloy or as a contaminant. Facilities process lead in aggregate processing, metal melting, metal finishing, metal machining operations, and also use lead solder for electronic circuit boards. Possible emission sources from such operations include, but are not limited to, fume, particulate, or dust from the mining, melting, finishing, or surface cleaning processes, leftover metal or slag, and poor housekeeping. Control of lead emissions often occurs concurrently with the control of other toxic metals.

Control of Lead Emissions from Stationary Sources (TXM-07)

Objective:
Further control lead emissions from non-vehicular sources

Potential TACs:
Lead

Control Approaches:
- Reduce ambient lead concentration
- Increased housekeeping and best management practices

Potential TACs: Lead is the primary metal of concern. Other toxic metals can be concurrently reduced such as hexavalent chromium, nickel, cadmium, and arsenic.

Affected Facilities: Within the Basin, there are approximately 500 stationary sources such as aerospace, computer, metal melting, mining, and roofing that process lead-containing materials.

Control Approach: Reduce the ambient lead concentration limit to be consistent with the federal lead NAAQS. Further reductions in the ambient lead concentration limit will also be considered. In addition, improved housekeeping requirements and best management practices similar to those included in Rule 1420.1, including provisions for general cleaning, rooftop cleaning, and handling, storage, and disposal of waste generated to comprehensively reduce fugitive lead emissions.

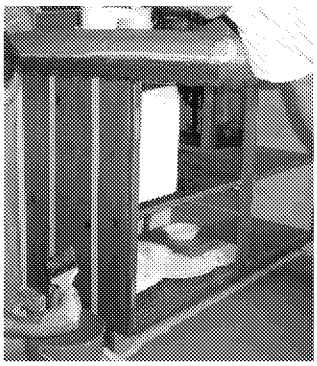
Implementation Approach: This measure would be implemented through amendments to Rule 1420.

Toxic VOCs

Control strategies focusing on VOCs will include the reduction of air toxic VOC emissions from a variety of sources including furniture stripping, oil and gas well maintenance and stimulation activities, and solvent and coating sources using recently delisted non-VOC containing materials. Each source and control strategy is discussed in the following sections.

Control of Emissions from Chemical Stripping of Cured Coatings (TXM-08)

Background: The proposed control measure would restrict the use of methylene chloride during chemical stripping operations. Methylene chloride is a suspected carcinogen and is classified as a Hazardous Air Pollutant by U.S. EPA and as a Toxic Air Contaminant by the State of California. A typical chemical stripping product contains between 70 and 85 percent methylene chloride by weight. Methylene chloride is the active ingredient that penetrates the coating film and lifts the coating off the surface. Most chemical stripper usage is done without any equipment or controls. The chemical stripper is applied by brush and then rinsed off afterwards. Larger users of chemical strippers are usually furniture stripping shops which sometimes utilize tanks and flow trays to use the chemical stripper. Other uses include automobile rim coating operations and residential furniture restoration.



Control of Emissions from Chemical Stripping of Cured Coatings (TXM-08)

Objective:
Restrict uncontrolled methylene chloride usage in chemical stripping operations

Potential TACs:
Methylene chloride

Control Approaches:
- Reformulation
- Air pollution control equipment (i.e., carbon Adsorbers)
- Point of sale restrictions

Potential TACs: The proposal would reduce methylene chloride emissions from chemical stripping operations.

Affected Sources: There are approximately 40 facilities in the Basin that would be considered larger users.

Control Approaches: Reformulation is the preferred method for reducing methylene chloride emissions. The use of control equipment may also be a consideration. The control measure would potentially address both the commercial users of chemical strippers and the methylene chloride strippers sold at retail stores for home restoration projects.

Implementation Approach: This measure will be implemented through a new SCAQMD rule restricting the uncontrolled use of methylene chloride in commercial and residential chemical stripping applications.

Control of Emissions from Oil and Gas Well Activities (TXM-09)

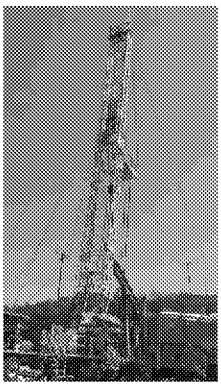
Background: Existing oil and gas field production facilities are required to notify the SCAQMD of a planned well maintenance or stimulation event under Rule 1148.2 – Notification and Reporting Requirements for Oil and Gas wells and Chemical Suppliers. In addition to the notification requirements, Rule 1148.2 also requires operators to report chemical usage during each operation, although trade secret chemicals are not revealed to the public. Oil and gas field production well maintenance and stimulation activities release emissions such as DPM, fugitive dust, and other air toxic emissions such as BTEX

compounds. This control measure seeks to develop a series of Best Management Practices (BMP) to reduce the emission impact from the well maintenance and stimulation activities. The implementation of the BMPs specified may be contingent upon the proximity to sensitive receptors.

Potential TACs: The proposal would reduce DPM and benzene, toluene, ethylbenzene, and xylene emissions from well maintenance and stimulation activities such as well drilling, redrilling, maintenance acidizing, matrix acidizing, gravel packing, and hydraulic fracturing.

Affected Sources: There are 242 facilities operating approximately 4,320 onshore oil and gas wells in the District. An analysis of data collected in 2015 under Rule 1148.2, showed that there were 275 unique well events occurring in 2015.

Control Approaches: This control measure seeks to develop a series of BMPs to reduce the emission impact from the well maintenance and stimulation activities. The BMPs may include: (1) reduction of BTEX compounds from return fluids during gravel packing and hydraulic fracturing events by using carbon absorbers to control emissions venting from portable storage tanks, covering circulation tanks, and closing access hatches on portable storage tanks; (2) reduction of BTEX compounds from drilling mud return processing equipment by covering areas open to atmosphere; (3) reduction of fugitive silica dust from the use of portable plastic totes (known as Rigid Intermediate Bulk Containers (RIBC)) in lieu of canvas or cloth bags (known as Flexible Intermediate Bulk Containers (FIBC)); (4) reduction of DPM from the use of Tier 3 and 4 off-road engines, or engines equipped with a CARB certified Level 3 diesel particulate filter (DPF); and (5) work area plastic ground coverings to collect spills and reduce fugitive dust.



Control of Emissions from Oil and Gas Well Activities (TXM-09)

Objective:
Reduce emission impacts from well maintenance and stimulation activities

Potential TACs:
Diesel particulate matter, benzene, toluene, ethylbenzene and xylene compounds

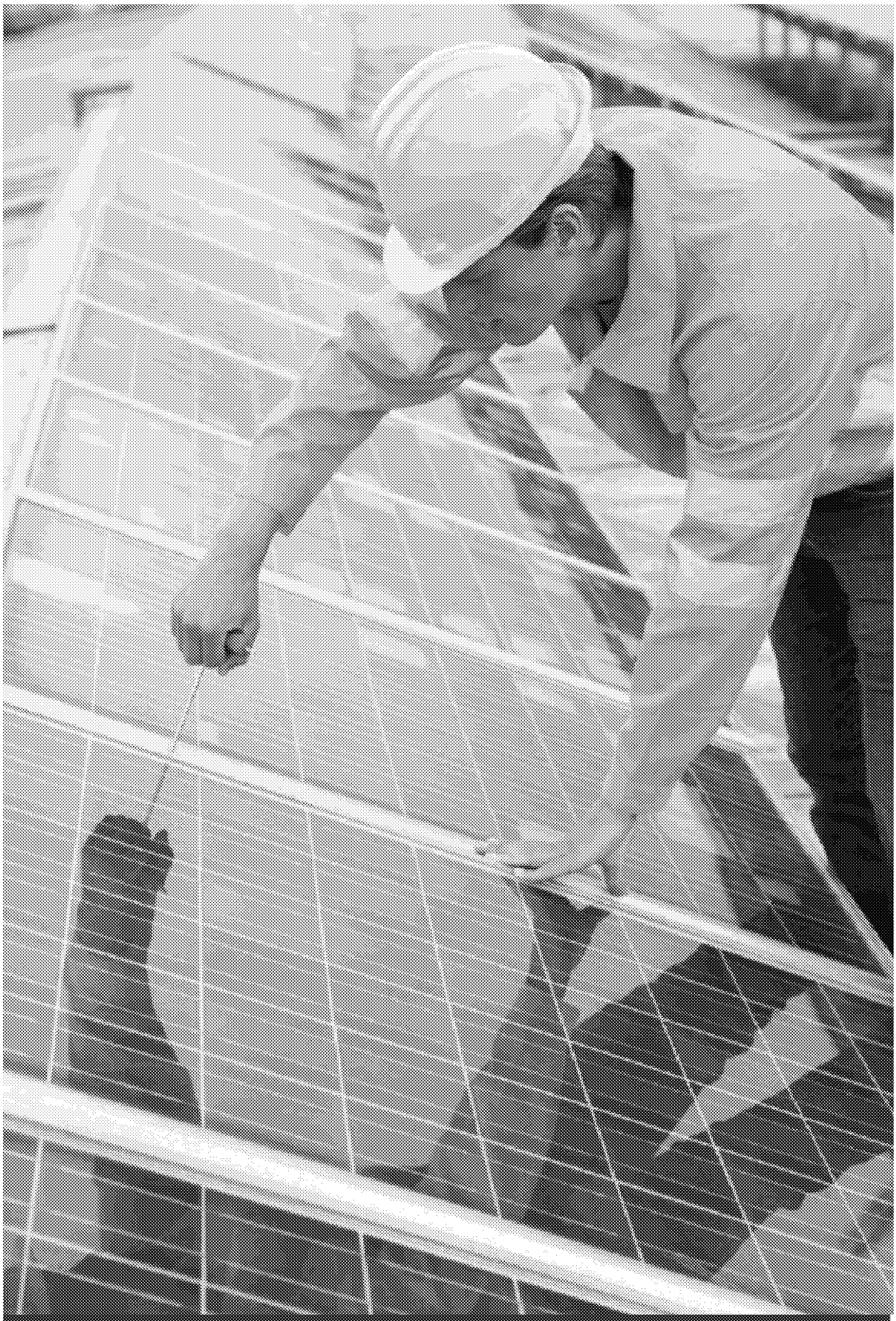
Control Approaches:
- Best Management Practices
- Minimize fugitive dust
- Use of cleaner diesel engine

Implementation Approach: This measure will be implemented through a rule making process in one of the Rule 1148-series rules.

Conclusion

Implementation of the 2016 AQMP Mobile Source strategies is expected to concurrently reduce air toxics by more than 70 percent depending on the toxic air contaminant. Over the next five years, the SCAQMD is planning to propose a suite of air toxics rules that will specifically address fugitive metal particulates that will also concurrently reduce particulate emissions. Implementation of these measures will help the Basin achieve and maintain regional air quality goals while also having significant benefits to local communities that live and work near these sources.

Chapter 10
Climate and Energy



Significant reductions in greenhouse gases are needed to achieve California's climate targets, presenting challenges for the State's energy and transportation infrastructure. Climate, energy, and transportation strategies have direct impacts on air quality, and the 2016 AQMP control strategy will affect these other objectives. Therefore, understanding the connections and coordination with other agencies is essential. A large majority of criteria pollutant and greenhouse gas emissions result from our transportation and energy choices.

In This Chapter

Introduction

In September 2011, the SCAQMD Governing Board adopted the SCAQMD Air Quality-Related Energy Policy. This policy integrates energy, air quality, and climate change by explaining how our dependence upon fossil fuels for energy generation and consumption within the Basin results in the emission of criteria pollutants, toxic pollutants, and greenhouse gases. The Air Quality-Related Energy Policy also articulates ten Policies and ten Actions to ensure clean air by promoting the development of reliable, safe, cost effective, and clean energy. For example, Policy 1 asserts the promotion of zero and near-zero emission technologies through ultra clean energy strategies to meet air quality, energy security and climate change objectives. Action 10 requires that an update of energy usage within the District is provided in each AQMP (SCAQMD, 2011). In addition, during the December 4, 2015 Governing Board hearing, the SCAQMD Governing Board requested a review of technologies and programs that can help reduce energy use, increase availability of renewable energy sources, reduce the need for new fossil fuel-based power generation in the Basin, and incorporate alternatively powered transportation.

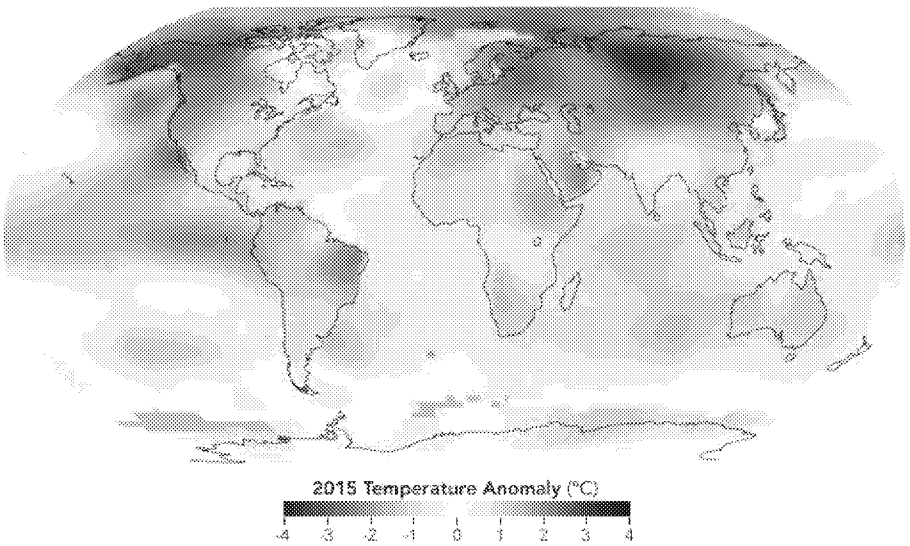


FIGURE 10-1
GLOBAL TEMPERATURE ANOMALIES IN 2015 ***(NOAA, 2016)***

The energy projections, technologies, and programs presented here reflect existing District policies and planning efforts. However, many newly adopted programs, as well as those under development and within the proposed 2016 AQMP control measures, will have impacts on future energy usage in California that are not yet fully accounted for in future energy use projections. In addition, ten white papers that preceded the development of the 2016 AQMP, covered an array of sectors and topics, including a survey of technologies and policies that can help achieve a zero and near-zero emission future, were integral to the development of this chapter as well as the 2016 AQMP (SCAQMD Energy Outlook White Paper). Two of the white papers were focused on energy usage in the Basin and highlighted the importance of energy and climate change objectives from other agencies in helping reduce air pollution, showing the importance of collaborative planning efforts. The Residential and Commercial Energy white paper provided an assessment of the energy usage, age of buildings, review of existing efficiency programs, and future energy usage scenarios within the Basin's commercial and residential sectors. The Energy Outlook white paper reviewed the types of energy use, focused on different end use sectors, reviewed

new technologies and the changing energy environment, and provided future emissions scenario analysis as future energy and climate change targets are achieved.

In the U.S., "criteria air pollutants," are those with health based air quality standards that set allowable concentrations of six substances in ambient air, and are regulated under the federal Clean Air Act as well as California State law. They include ozone, particulate matter (PM), carbon monoxide (CO), lead, nitrogen dioxide (NOx), and sulfur dioxide (SOx). Volatile organic compounds (VOCs), ammonia, and NOx are also regulated as ozone and PM precursors. Control strategies in this AQMP rely on a combination of available and advanced technologies along with efficiency improvements to attain the ambient air quality standards. Additionally, many of the control measures combine planning efforts for climate change, transportation, and the energy sector to achieve multiple co-benefits. As later shown, the primary sources of criteria and greenhouse gas emissions are direct and indirect energy use within the Basin.

Criteria pollutants and greenhouse gases (GHGs) are often treated separately by different regulations. However, certain air pollutants are both climate forcers and criteria pollutants. Additionally, there are interactions between climate and criteria pollutants within the atmosphere. These interactions often worsen the impacts from greenhouse gases and increase background levels of criteria pollutants. An example of this interaction is the atmospheric fate of the GHG methane. While methane persists in the atmosphere for 10 to 14 years, its atmospheric lifetime is impacted by criteria pollutants (Prather, 2007). As methane reacts within the atmosphere, it acts like a VOC and increases background tropospheric ozone levels. Over the past 12 years, global methane emissions have increased over 30 percent, which also increased background levels of tropospheric ozone (Turner, 2016). Increasing background tropospheric ozone makes achieving air quality standards more difficult. Lastly, tropospheric ozone is also one of the strongest and significant short lived climate pollutants (Intergovernmenal Panel on Climate Change [IPCC] AR5, 2013).

Climate Change

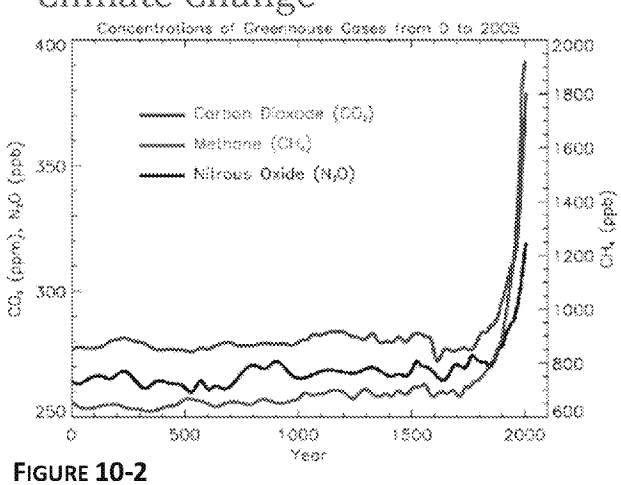


FIGURE 10-2
ICE CORE RECORD ALONG WITH ATMOSPHERIC MEASUREMENTS OF METHANE, CARBON DIOXIDE, AND NITROUS OXIDE
(Thomas Karl, 2009)

The earth's atmospheric greenhouse effect is essential for life on this planet. Greenhouse gases in the earth's atmosphere absorb outgoing infrared radiation, keeping us at a comfortable average global temperature of 60 °F. An absence of GHGs in earth's atmosphere would result in an average surface temperature of 0 °F. The earth's natural carbon cycle balances GHGs in the atmosphere to stable concentrations over thousands of years. However, this balance has been disrupted over the past 150 years due to mankind's rapid increase in consumption of fossil fuels for energy, as well as a decline in natural carbon sinks due to human land-use Revolution, fossil fuels previously

sequestered underground have been extracted and burned largely for their energy content, releasing greenhouse gases such as carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) into the atmosphere at an escalating rate. During the same period, synthetic gases with extremely high global warming potentials, such as chlorofluorocarbon and hydrofluorocarbon refrigerants, were developed and released into the atmosphere. In addition, human activity has led to a decline in natural carbon sinks such as forests and wetlands, which have been removed so the land could be used for agriculture, mining and, and the growth of cities and towns.

The rapid expansion of fossil fuel-based energy, the emission of synthetic gases, and the depletion of our natural carbon sinks have drastically increased the level of GHGs in the earth's atmosphere and depleted stratospheric ozone. This results in changing global weather patterns, such as more extreme storms, higher average temperatures, and more prolonged periods of drought. In addition, half of the additional CO_2 emitted into the atmosphere over this time was absorbed by the earth's oceans, leading to an increase in ocean acidity. These changes, along with other human-caused environmental impacts, have some ecologists and geologists terming the geologic epoch in which we live, "the Anthropocene Period", in which human activities have started to significantly impact global ecology and ecosystems (University of California, 2015).

Since the beginning of the Industrial Revolution, GHG concentrations in the atmosphere have increased exponentially (see Figure 10-2). As shown in Figure 10-3, average global temperatures have been increasing with some variation since the 1950's. The highest yearly average global temperature, since instrumental temperature record keeping began in 1880, was observed in 2015 (NOAA, 2016). The 2015 record average temperature broke the previous average record temperature by 0.23 °F, the widest margin documented. NOAA's recent temperature data also confirmed that July 2016 was not only the record warmest July ever, but the hottest month ever on record, in agreement with NASA data (NASA Earth Observatory, 2016).

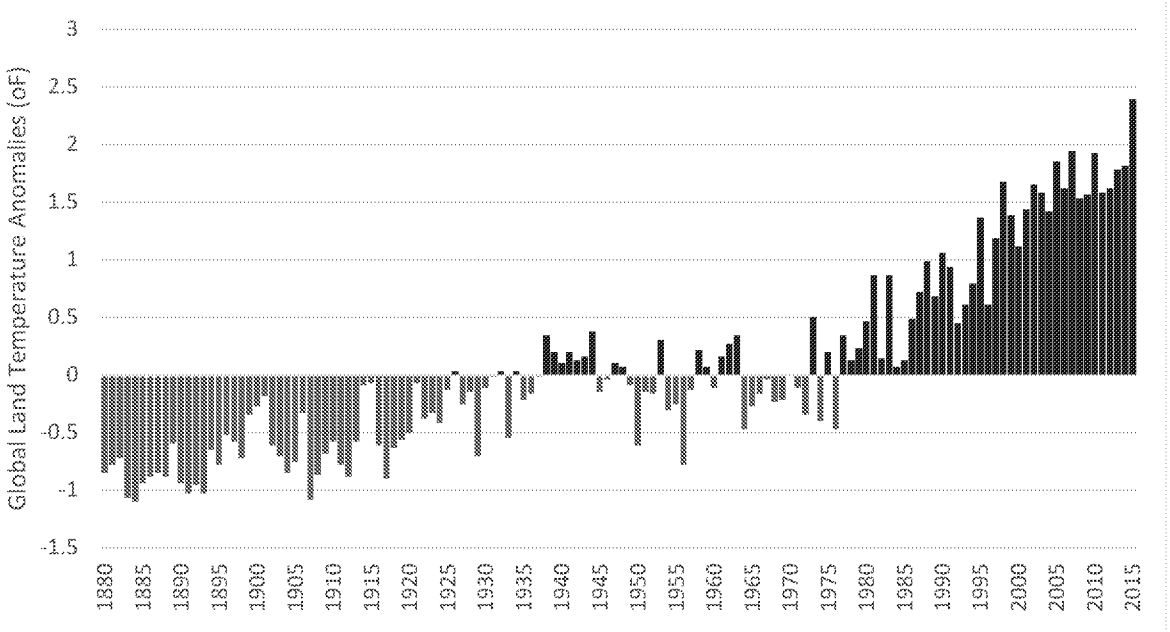


FIGURE 10-3
GLOBAL TEMPERATURE ANOMALIES (I.E. DEPARTURE FROM REFERENCE VALUE OR LONG-TERM AVERAGE) FOR LAND WITH RESPECT TO 20TH CENTURY TEMPERATURE AVERAGE ***(NOAA, n.d.)***

Even if GHG emissions were significantly curtailed today, there would continue to be climate change impacts for decades to come due to the past accumulation and slow removal processes of greenhouse gases in the earth's atmosphere. The projected impacts include extreme weather variability, rising ground-level temperatures, sea level rise, and depleted water resources. In addition, future projections of increased extreme heat events in Southern California could result in more days exceeding the ground-level ozone standard. Ground-level ozone in the Basin forms through a chemical reaction between NOx and VOCs in the presence of sunlight. The correlation of the peak hourly temperature and peak hourly ozone measurements is shown in Figure 10-4 for the SCAQMD San Bernardino monitoring station. This increase of ozone with temperature is often referred to as the "climate penalty." Additionally, increased emissions of criteria pollutants from developing countries along with higher atmospheric levels of methane have resulted in increasing levels of global background ozone, which makes it more difficult to achieve ozone standards in urban areas (Cooper, 2011) (IPCC, 2013).

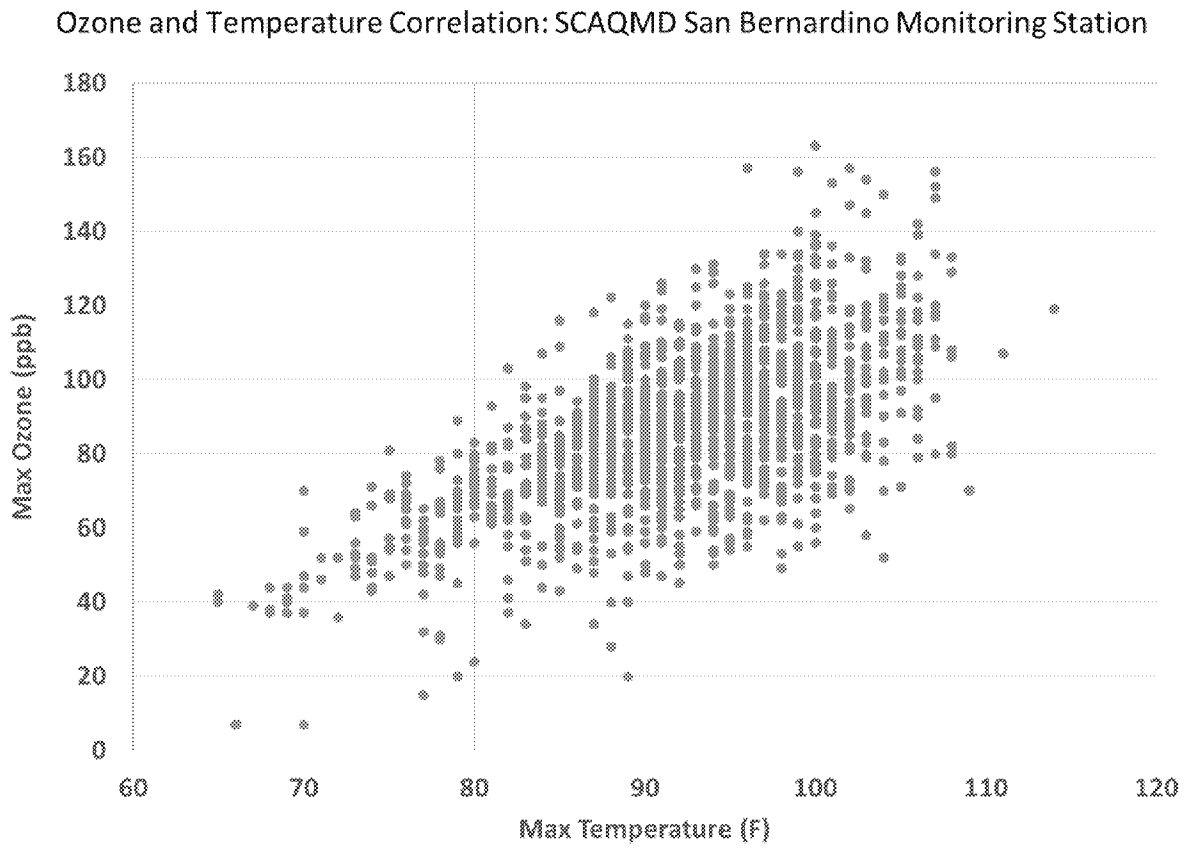


FIGURE 10-4
CORRELATION OF ONE-HOUR OZONE MAXIMUM CONCENTRATION WITH ONE-HOUR MAXIMUM TEMPERATURE DURING SUMMER MONTHS FROM YEARS 2004 TO 2015 MEASURED AT SCAQMD SAN BERNARDINO MONITORING SITE

Many GHGs undergo slow atmospheric reactions and/or uptake through biological processes or other removal mechanisms. To minimize these predicted greater future impacts of climate change and associated catastrophic weather events, the world must quickly limit its collective GHG emissions. Following a "business as usual" path without future GHG mitigation efforts could lead to increased average warming that ranges from 2.5 °C to 7.8 °C (4.5 °F to 14 °F) by the end of the century (University of California, 2015). The range of projected temperatures reflects the significant uncertainties associated with predicting future global temperatures, impacts from climate feedback mechanisms, and varying global emission levels. The consequences for each degree of increased temperature include: significant public health impacts, ecological disturbances, and sea level rise, coupled with a declining ability to adapt to these changes. In addition, as temperatures increase so does the intensity of positive feedback mechanisms, such as decreasing surface albedo from melting ice, and increased methane emissions from the thawing of permafrost. If higher levels of warming continue to occur, areas of the earth will become uninhabitable due to heat stress, lack of potable water, vector-borne transmission of disease, and sea level rise inundating coastal lands (Sherwood, 2010) (Pal, 2015). Many ecological consequences are already occurring, such as ocean acidification, species migration, and sea level rise due to ocean warming and associated thermal expansion.

The California Global Warming Solutions Act (AB 32 and SB 32), and related Executive Orders mandate that California reduce emissions to 1990 levels by 2020, 40 percent below 1990 levels by 2030, and 80 percent below 1990 levels by the year 2050. The 2050 target was based on the need to limit global warming to below 2 °C. The 2 °C limit was formally codified in the Copenhagen Accord in 2009 as a global benchmark by which nations have agreed to measure collective success in limiting global warming. The recent 21st Council of Parties (COP-21) in Paris retained the commitment of the world's nations to reduce GHG emissions to the 2 °C threshold, while also recognizing the desirability of pursuing an even lower target. As GHGs accumulate in the atmosphere, climate change impacts become more acute and mitigation of these impacts becomes more intractable, complex, and expensive. For example, future economic costs arising from the impacts of climate change are non-linear with increasing temperatures because these costs recur year-after-year (White House, 2014). Therefore, it is critical that decisions are made expeditiously to develop and implement technologies to reduce GHG emissions alongside reductions of criteria and toxic pollutants. Every year of delay allows increased accumulation of GHGs in the atmosphere, negative health impacts, and, consequently, the need for more aggressive reductions in the future. Within the Basin, use of fossil fuel based energy resources contribute the majority of criteria pollutants, air toxics, and GHG emissions. Efforts to clean the air and meet mandated air quality standards, focused on the adoption of cleaner energy sources, also achieve the co-benefit of reducing GHG emissions, thus helping to meet State and global climate goals. These efforts also provide economic benefits from the new technologies and markets associated with clean low emission technologies.

Energy

The use of energy is a necessity of modern life in Southern California. It powers our economy, our mobility, and our personal comfort, and well-being. In 2012, total energy costs in the Basin were estimated to be over $57 billion. Currently, energy use for both in-Basin mobile sources and electricity generation for stationary sources is dominated by the combustion of fossil fuels. The combustion of fossil fuels results in the emission of criteria pollutants, air toxics, and greenhouse gases. This results in short-term air quality impacts on health and longer-term climate change impacts from the accumulation of greenhouse gases in the earth's atmosphere.

FIGURE 10-5
(Bloomberg New Energy Finance , 2016)

Beginning in late 2014, global fossil fuel based energy prices dropped sharply and continued to fall. In the past, declining fossil fuel prices have hindered the growth of renewable energy resources. However, over the past two years, renewable energy technologies have also significantly declined in price, making them increasingly cost competitive with traditional fossil fuel-based energy resources (Bloomberg New Energy Finance , 2016).

The declining costs of renewable energy technologies are opening pathways for decarbonizing multiple energy sectors, thus reducing criteria and air toxic pollutants and greenhouse gas emissions, and helping achieve cleaner air and climate stability. However, at this time, most renewable energy technologies are not a direct replacement for traditional fossil fuel based resources for power generation. This is due to the intermittency of many renewable energy resources, outdated regulations and policies governing

energy generation, and necessary upgrades to grid and transmission infrastructure. A key to overcoming these roadblocks is the adoption of integrated energy strategies that achieve GHG emission reductions and commensurate reductions of criteria pollutants and toxic air emissions.

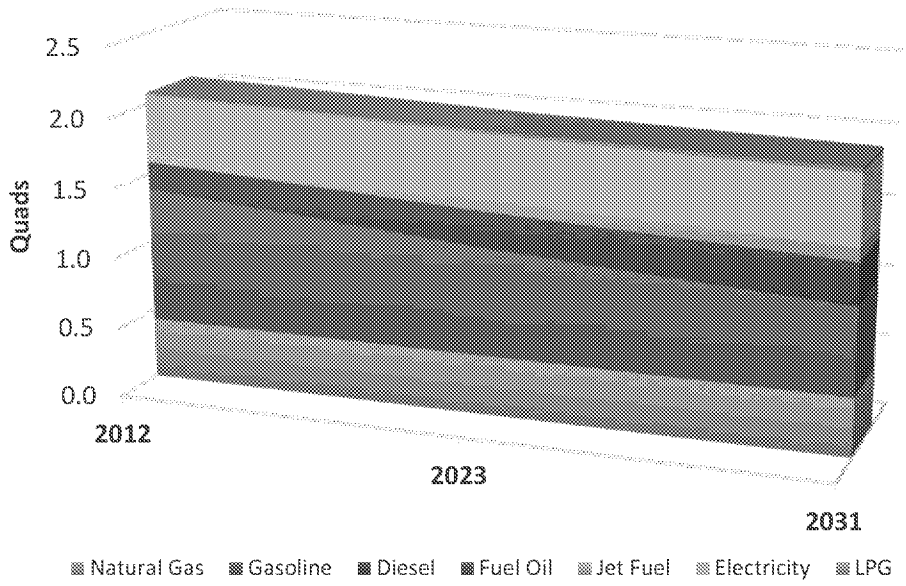
California is already transitioning towards generating power from a higher percentage of cleaner renewable energy sources as later shown in Figures 10-14 and 10-15. This is resulting in improved air and water quality, as well as greater resilience to large price fluctuations of traditional fossil fuel-based energy resources. The emission reduction efforts in California and the Basin have charted a path for the nation and other countries to follow as they also begin to develop new technologies and programs to tackle air pollution and curb GHG emissions while growing a vibrant and resilient economy.

South Coast Basin Energy Consumption, Emissions, and Projections

Energy projections, technologies, and programs presented in this section reflect information derived from many existing policies and other agencies' planning documents. However, many newly adopted programs and those still in development will also have impacts on future energy usage in California and are not yet fully represented in the future energy use projections below.

Energy Consumption Inventory and Projections

In 2012, the end use energy needs of the Basin were 2.1 quads (1 quad = one quadrillion [10^{15}] British Thermal Units). This is equivalent to over 2 percent of the energy consumption within the United States (U.S.) for approximately 5 percent of the U.S. population (EIA Consumption & Efficiency, n.d.). As shown in Figure 10-6, in 2012, the Basin consumed 0.96 quads of gasoline, over 45 percent of the total Basin energy consumed. End-use electricity and natural gas consumption account for the second and third largest categories of energy consumption in the Basin, principally the result of commercial and residential building usage.



Note: Does not include consumption of natural gas for electricity generation to avoid double counting with electricity end use. Does not include fuel oil and diesel past the 24 nautical mile buffer zone.

FIGURE 10-6
TOTAL END USE ENERGY CONSUMPTION IN QUADS FOR THE BASIN BY FUEL TYPE IN 2012 AND FORECASTED GROWTH

The largest share of energy use in the Basin is devoted to transportation purposes as shown in Figure 10-7. This is the result of several factors related to the region's dense urban population, development structure, and economy. Southern California has two of the largest maritime ports in the nation. Together, the San Pedro Bay ports of Los Angeles and Long Beach account for nearly 40 percent of all U.S. container imports (on a per twenty-foot equivalent unit (TEU) basis) (U.S. Maritime Administration, 2016). The in-Basin goods movement system includes local distribution networks based on extensive fleets of diesel powered trucks and trains transporting many millions of shipping containers to and through the area. The Basin also has three large airports that include both air and ground transportation. Most importantly, the Basin is home to more than 16 million residents who primarily rely on freeway and road infrastructure for mobility. As a result, the largest end energy use is vehicular gasoline consumption.

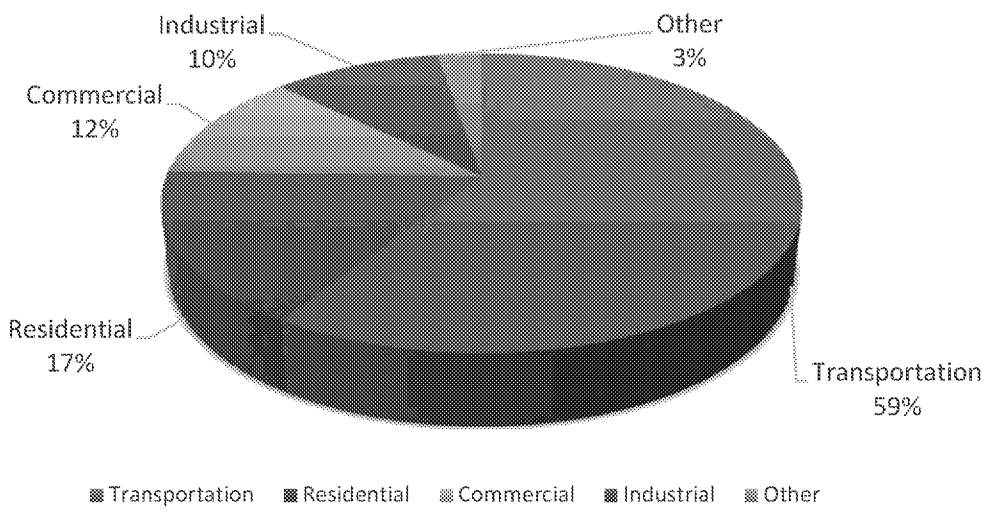
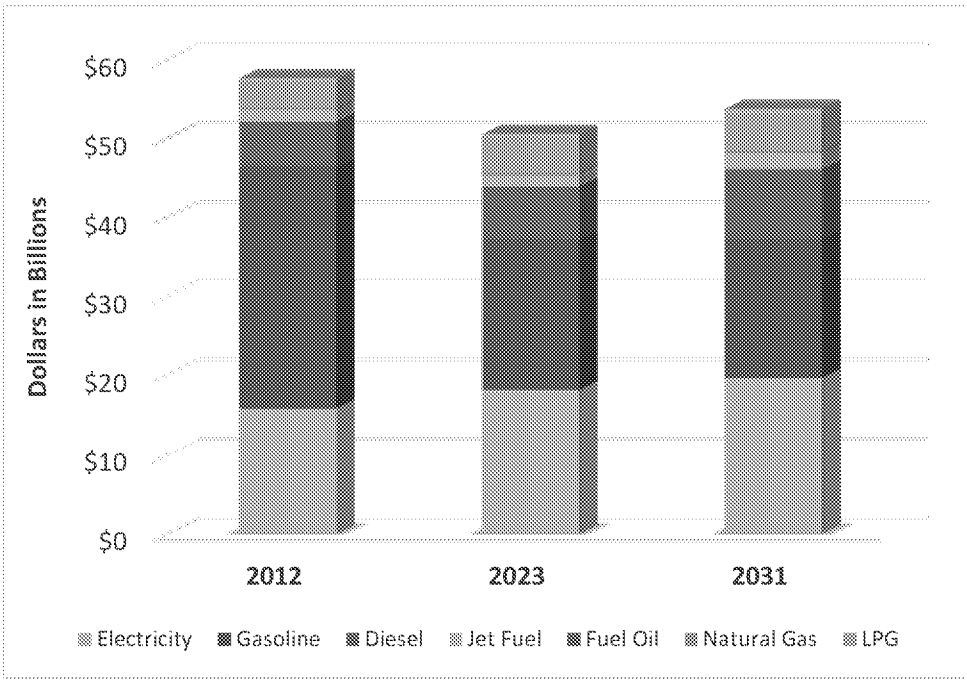


FIGURE 10-7
SHARE OF ENERGY USE IN THE BASIN

In 2012 over $57 billion was spent on energy costs within the Basin. As shown in Figure 10-8, the cost of energy is expected to decrease in 2023 to $50 billion and then increase slightly in 2031 to $53 billion. This trend is consistent with the projected energy prices of the EIA Annual Energy Outlook. As shown in Figure 10-6, the Basin energy usage is projected to decrease slowly from 2.1 to 1.9 quads largely because of improved efficiency in 2031 (i.e., a 0.2 quad decrease between 2012 and 2031) within mobile and stationary sources. Similar to the energy consumption pattern, associated GHG emissions decrease from 127 MMT (million metric tons) CO_2 in 2012 to 105 MMT CO_2 in 2031. This projected decline of GHG emissions by 2030 currently falls short of the statewide target of reducing GHG emissions 40 percent below 1990 levels by 2030. State, federal, and local mandates regarding energy efficiency standards, renewable energy portfolio standards, and the cap-and-trade program will all help to reduce both energy consumption and emissions.

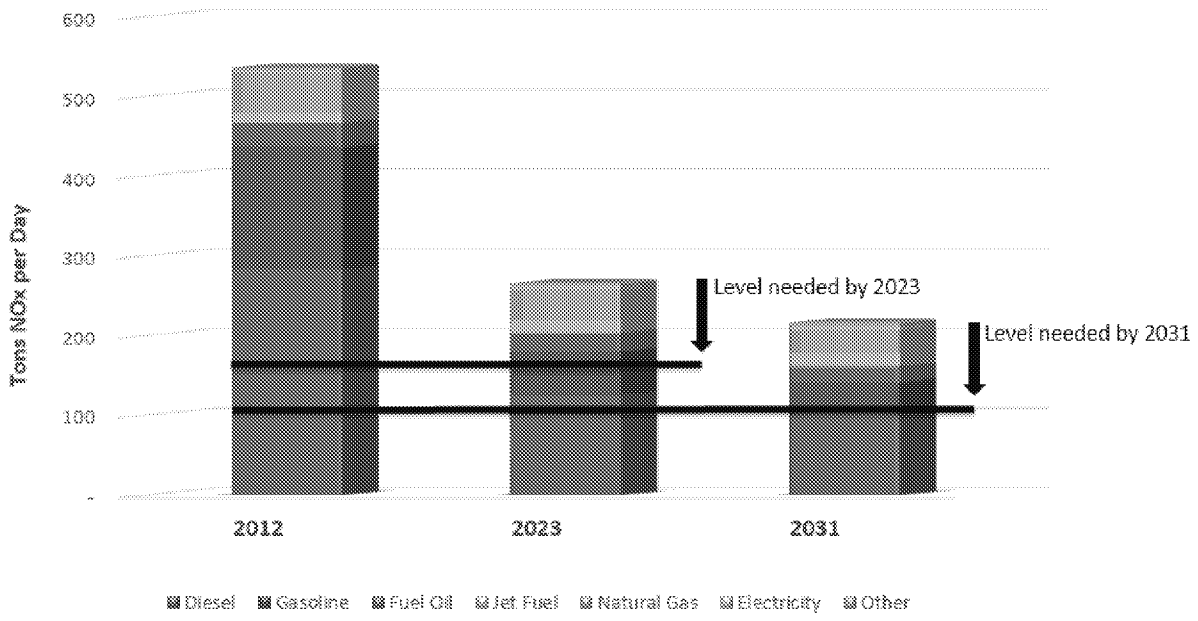


Note: Does not include cost of natural gas for electricity generation to avoid double counting with electricity end use. Prices based on EIA Energy Outlook 2011 reference case for the Pacific except electricity (EIA AEO, 2015).

FIGURE 10-8
DOLLARS SPENT AND PROJECTED ON ENERGY END USE IN 2012 AND FUTURE YEARS IN THE BASIN

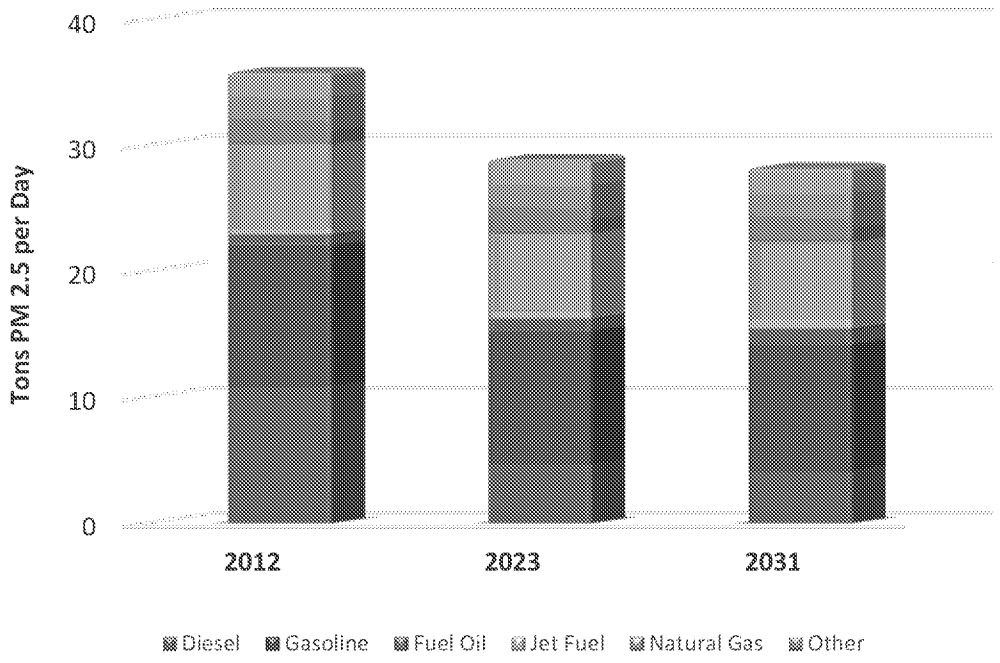
Emissions

Transportation sources account for over 50 percent of in-Basin energy use. These sources are also the main contributor to NOx emissions (Figure 10-9). Within the transportation sector, diesel-powered sources emit the majority of NOx. This is largely the outcome of years of effective stationary source and light-duty vehicle controls, the large numbers of diesel vehicles, and the slow rate of fleet turnover for diesel-powered vehicles. Increased fleet turnover, fuel economy standards, diesel repowering and other State regulations are projected to lower NOx emissions. However, these reductions are not sufficient to achieve the National Ambient Air Quality Standards (NAAQS) ozone standards. Figure 10-10 provides the corresponding data for direct PM2.5 emissions by fuel type. Similarly, the majority of PM2.5 emissions are attributable to transportation sources.



Note: Other includes Biomass, Landfill Gas, Incinerators, LPG and RECLAIM Other.

FIGURE 10-9
NOX EMISSIONS IN TONS PER DAY BY FUEL TYPE



Note: Other includes Biomass, LPG, Incinerator and Landfill Gas

FIGURE 10-10
PM 2.5 EMISSIONS IN TONS PER DAY BY FUEL TYPE

In 2012, the CO_2 emissions from direct fuel use in the Basin were 127 MMT (see Figure 10-9). These emissions account for 28 percent of the total 459 MMT CO_2 released in California in 2013 (California Greenhouse Gas Emission Inventory - 2015 Edition, n.d.). Transportation fuels dominate the CO_2 emissions in Southern California. CO_2 emissions, shown in Figure 10-9, were developed from recent fuel consumption data and future projections.

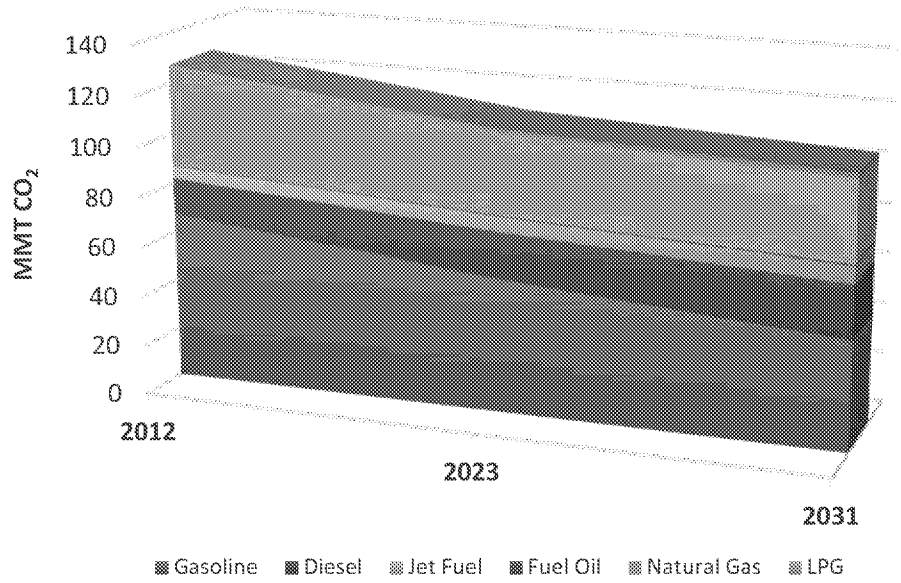


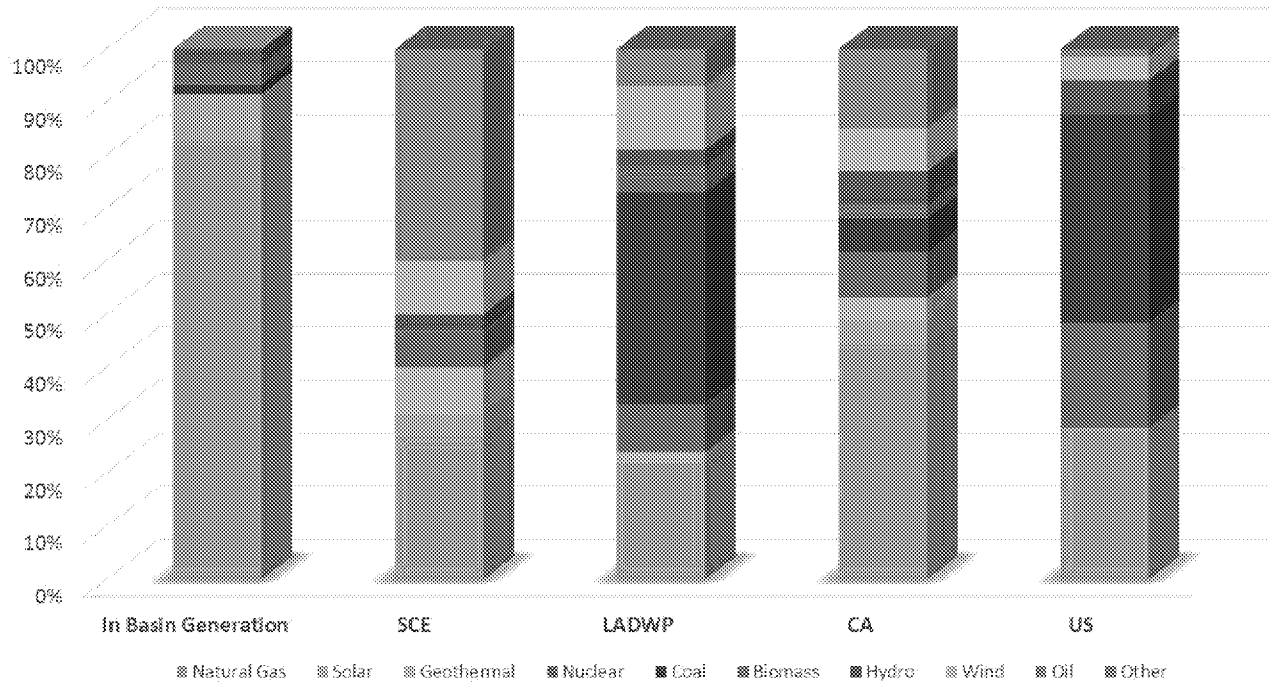
FIGURE 10-11
CARBON DIOXIDE EMISSIONS BY FUEL TYPE

Electricity Sources

In 2012, electricity end use in the Basin accounted for 120,210 gigawatt hours (GWh) of energy usage and 37 percent of the energy end use costs. Electricity generated within the Basin accounted for 45,000 GWh or 37 percent of the total electricity consumed in the Basin (CEC Energy Almanac - QFER and SB 1305 Reporting, n.d.). As of 2012, natural gas-fueled power plants produced the majority of the electricity in the Basin (Figure 10-12) as is the case for most of California; in contrast, the majority of electricity produced in the U.S. is from coal-fired power plants. Figure 10-12 also shows the percentage breakdown of the generation mix for electricity supplied to the Basin from Southern California Edison (SCE) and the Los Angeles Department of Water and Power (LADWP). From 2010 to 2014, the percentage of power used by SCE from coal has been reduced from 7 percent to 0 percent (CEC Utility Annual Power Content Labels for 2014, n.d.). LADWP energy supply from coal has recently reduced from 40 percent to between 28 and 30 percent since the start of divestiture of the Navajo Generating Station in July 2016 (LADWP Comments on Draft 2016 AQMP, 2016).

SB 1368 (CEC SB 1368 Emission Performance Standards, n.d.), and its implementing regulations promulgated by the California Energy Commission (CEC) and the California Public Utilities Commission (CPUC), have explicit constraints on utilities regarding the development of new coal-powered facilities or contracts for coal-powered generation. Due to this legislation, and as the State's renewable portfolio

standard and cap-and-trade program are implemented, power procurement from coal resources will continue to decline over time.



Note: The SCE and LADWP generation do not represent the total Basin generation and generation outside of the Basin is not subject to SCAQMD regulatory authority. These figures represent purchases of electricity products by California retail suppliers and do not correspond to utility requirements under the California Renewables Portfolio Standard. The "Other" category accounts for unspecified electricity sources.

FIGURE 10-12
ELECTRICITY GENERATING MIX BY TYPE IN 2012

In-Basin Electricity Consumption

As stated above, total electricity end use consumption within the Basin was 120,210 GWh in 2012 and expected to grow to an estimated 144,369 GWh by 2031. This is derived from the net energy loads for L.A. Basin, SCE and LADWP service territories within the CEC California Energy Demand Forecast 2010–2020, and retail supplier power content percentages (QFER CEC-1304 Reporting Database, n.d.) (CEC Utility Annual Power Content Labels, n.d.). The CEC-1304 reporting form collects data from power plants with a total nameplate capacity of 1 megawatt (MW) or more. Electricity consumption is continuing to recover from a decline experienced during the last economic recession. The projected electricity use within the Basin is estimated to grow approximately 20 percent from 2012 to 2031 (an average of 1.1 percent per year). In 2012, an estimated $15.8 billion was spent on end-use electricity deliveries within the Basin. Based on EIA Annual Energy Outlook 2015 projections, an estimated $19.7 billion is projected to be spent on electricity in the Basin in 2031.

Challenges and Opportunities in Moving Towards 100 Percent Renewable Power

Worldwide energy consumption accounts for two-thirds of global GHG emissions (International Energy Agency, 2015). Additionally, as shown previously in Figure 10-9, energy consumption accounts for all in-Basin NOx emissions, along with the majority of VOC and air toxics emissions (SCAQMD, 2015). Over the past century, the energy used by different sectors in the Basin primarily stems from specific fossil fuels: e.g., liquid fuels gasoline and diesel are used in the transportation sector, and natural gas is primarily used for electrical power generation and heating (SCAQMD Energy Outlook White Paper). Currently, California is undergoing a widespread shift in power generation and electrical infrastructure with the advent and adoption of renewable energy technologies. Renewable generation technologies such as solar photovoltaics, wind turbines, and hydrogen fuel cells are becoming more efficient and declining in cost. Solar photovoltaic technologies using crystalline silicon and other established renewable energy technologies do not need significant technological advances to achieve terawatt-scale deployment by 2050 (MIT, 2015). It is also feasible with new technology development, continued price declines, and widespread implementation to have renewable energy sources provide the majority of transportation and stationary energy needs (Jacobson, 2014). Installed costs for solar panels have been declining rapidly as shown in Figure 10-13, and wind energy capacity costs have decreased 75 percent in the past three decades (Trancik, 2015). Renewable energy generation technologies have thus become cost competitive with fossil fuel generation technologies in most locations. However, as discussed above, the renewable generation technologies, must currently still be supplemented by fossil fuel generation due to intermittency, periods of over-generation, along with lack of manageable loads and energy storage (MacDonald, 2016) (Trancik, 2015). The reliance on fossil generation to support renewables is expected to decline as more auxiliary resources are integrated onto the grid.

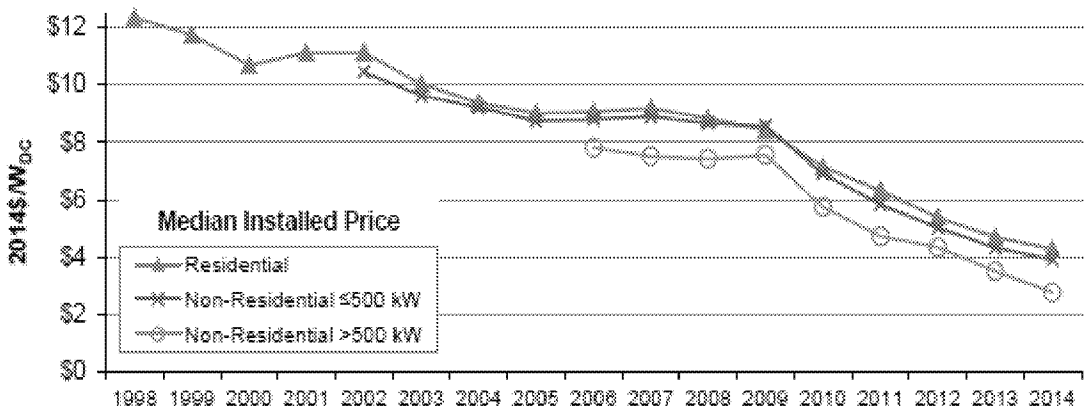


FIGURE 10-13
MEDIAN INSTALLED SOLAR PHOTOVOLTAIC PRICES ***(DOE and LBNL, 2015)***

Declining costs in solar and wind resources have made them attractive technologies to increase the amount of renewable power generation globally (Bloomberg, 2016). In California, the majority of new renewable generation has been from solar and wind resources, as shown in Figure 10-14.

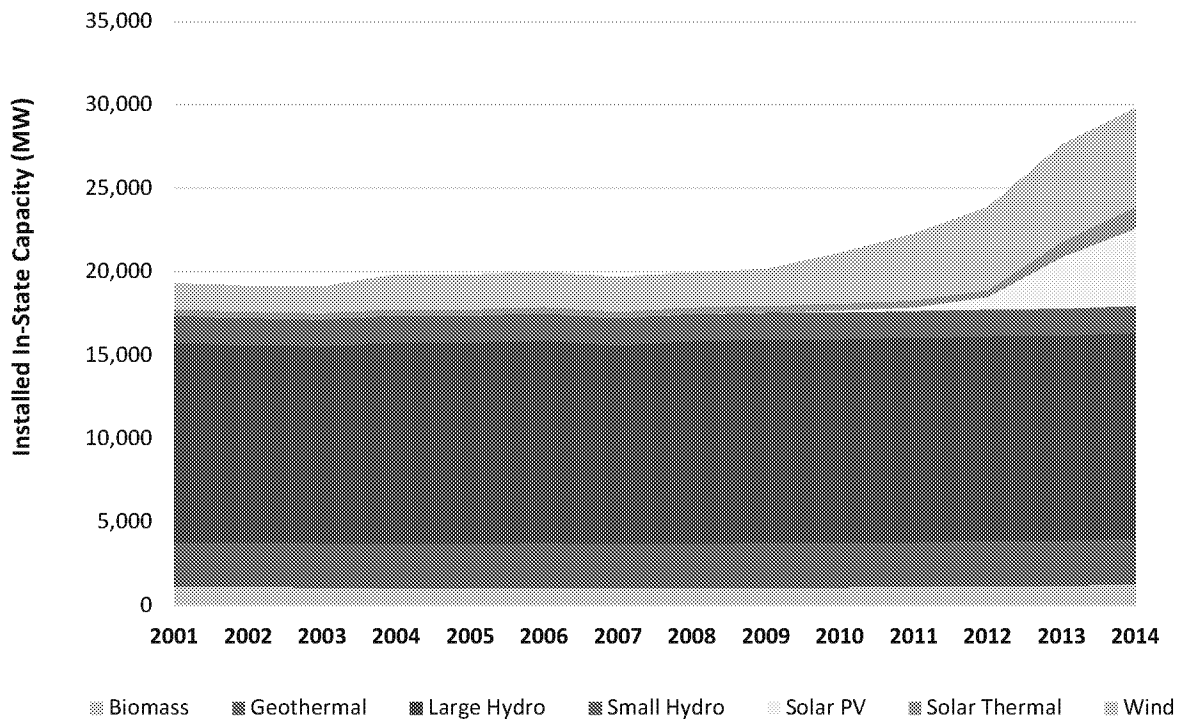


FIGURE 10-14
IN STATE RENEWABLE ELECTRICITY GENERATION BY FUEL TYPE

This shift has been in response to regulatory and policy mandates, as well as technology advancement in energy efficiency and renewable energy. The consumption of electricity is expected to increase through mid-century as alternatively powered vehicles become more reliant upon the electrical grid.

The increase in electricity consumption coincides with increasing requirements to power the grid with renewable power. As the grid shifts to operating with a higher percentage of renewable power, matching generation with demand on short-time scales becomes more complex as a result of intermittency from the renewable resources. Grid balance has historically been maintained by controllable conventional power generating resources. Currently, fossil fuel energy resources such as natural gas are able to ramp quickly to meet spikes in demand and support renewable power intermittency. With the move towards 50 percent of grid power coming from renewable energy resources, the reliance on conventional generating resources will decrease. However, intermittency and demand spikes will need to be met through additional resources that include enhanced regional grid collaboration, a diverse mix of renewable power resources, adjusting electricity loads through demand-side management, stored power, and grid integration of alternatively powered transportation. This will require policy and regulation changes to allow for new power markets, the expansion of efficiency programs and requirements to reduce the need for generation, the development of new energy storage technologies, and utilization of alternatively powered transportation for grid stability.

Increasing Grid Flexibility through Enhanced Regional Grid Collaboration and Increasing Renewable Generation Resource Diversity

California was one of the first states to implement a renewable portfolio standard (RPS) that required investor owned utilities (IOUs) to procure 20 percent of their electricity from renewable resources by 2010. In 2011, Governor Brown mandated a new RPS requiring that 33 percent of the State's electricity come from renewable resources by 2020. In the summer of 2015, the passage of SB 350 put in place a new RPS mandate to achieve 50 percent renewable energy generation by 2030, with a requirement for longer-term discussions regarding the potential for 100 percent renewable power generation (Crawford, 2015). While these California targets are ambitious, Hawaii is the first state to adopt a 100 percent renewable power target by 2045.

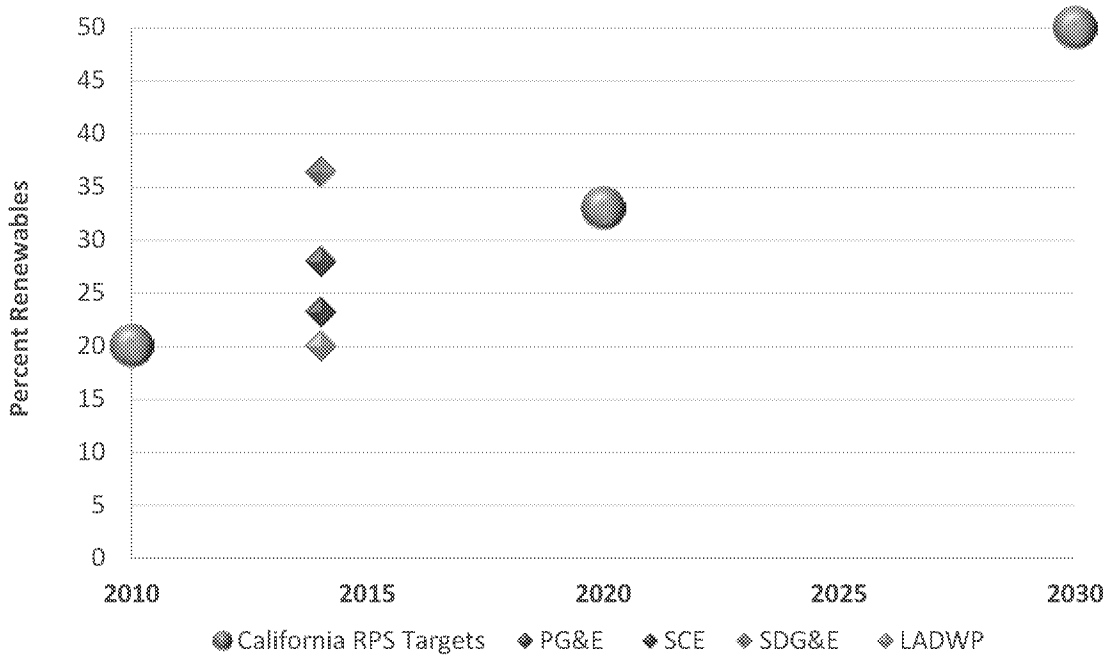


FIGURE 10-15
INCREASINGLY STRINGENT RENEWABLE PORTFOLIO MANDATES FOR CALIFORNIA AND THE LATEST PERCENTAGE OF RENEWABLES AT THE THREE LARGEST INVESTOR OWNED UTILITIES AND ONE PUBLICLY OWNED UTILITY PROCURED TO MEET THE RENEWABLE MANDATES (SOURCE: CPUC BIENNIAL RPS UPDATE JAN. 2016) (SOURCE: *CEC UTILITY ANNUAL POWER CONTENT LABELS*)

As higher levels of renewable resources power the electrical grid, flexible grid resources, such as energy storage, must be integrated to accommodate the inherent intermittency and over-generation issues. It is anticipated that California will meet the majority of its 33 percent and 50 percent RPS requirements with additional solar and wind resources. The addition of large amounts of solar is predicted to result in over-generation during periods of peak sunlight, as shown in Figure 10-16, primarily in the fall and spring.

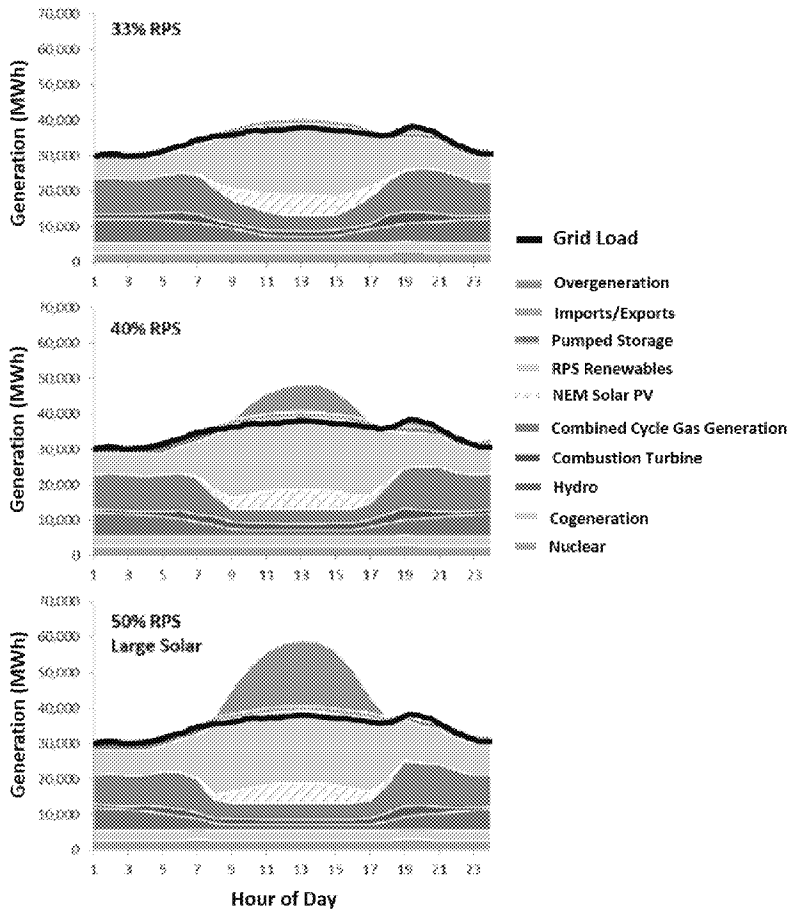


FIGURE 10-16
GRID LOAD RELATIVE TO GENERATION RESOURCES. POWER OVERGENERATION OCCURS WITH HIGHER PERCENTAGES OF RENEWABLES FROM SOLAR AND WIND. THE 50% RPS LEVEL ASSUMES 25% SOLAR AND 15% WIND. ***(Energy and Environmental Economics, 2015)***

A reliable grid must match load demand with generation supply on a second-by-second basis. Over-generation and the intermittency of renewable power resources create challenges for maintaining this stability. Therefore, the California Independent Operator (CAISO) is initiating procedures to accommodate increasing amounts of solar generation and other renewable power. Figure 10-17 shows the net load profile (net load = total grid load – renewable generation) that traditional generation resources must provide in future years as more solar and wind energy resources are added. Referred to as the "Duck Curve" due to its shape, this illustration of net load shows that adding more solar generation to the grid requires generation from other energy sources to significantly decline or idle during peak daylight hours. However, these conventional generating resources must be able to quickly ramp up to balance renewable power generation intermittency and provide power demand ramping rates as solar resources decline at day's end. Currently, gas turbine power plants and synchronous condensers are used to meet the supply interruptions associated with renewable power generation. The reliance on these fossil fuel resources to bridge these interruptions negates some of the GHG and criteria emissions benefits achieved from using clean renewable power resources.

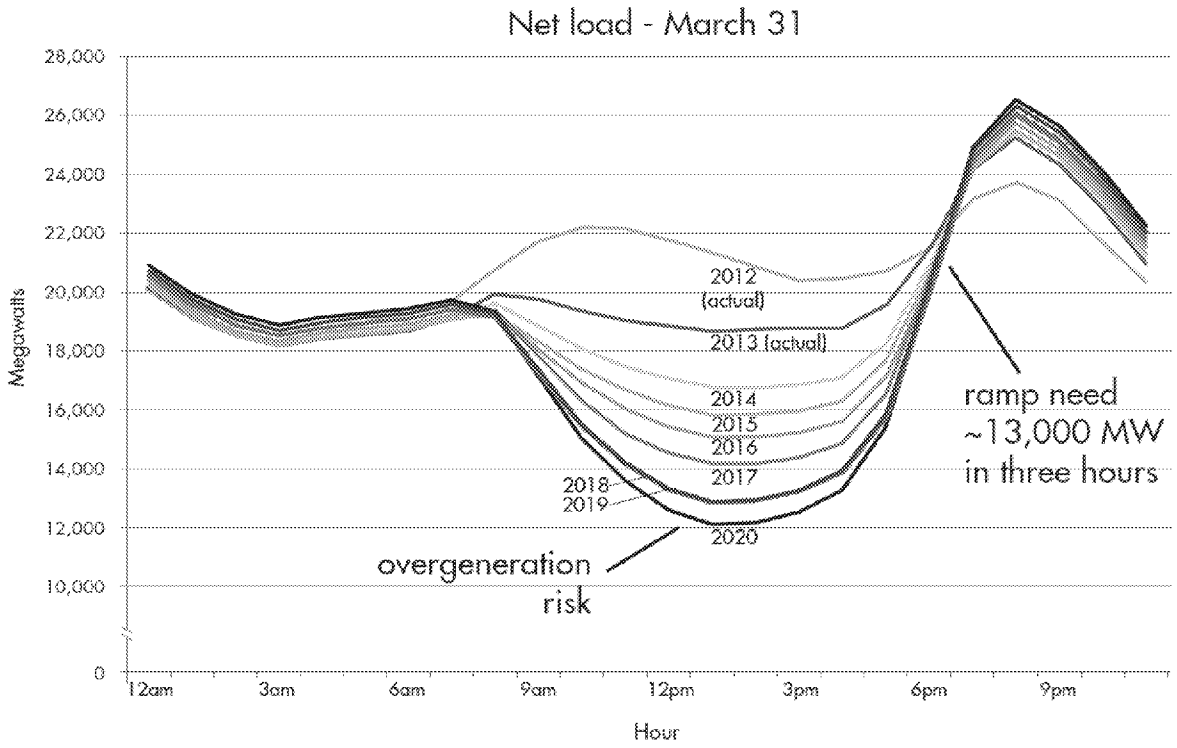


FIGURE 10-17
"DUCK CURVE" REPRESENTS THE NET LOAD FROM FLEXIBLE GENERATION SOURCES THAT CAISO MUST BALANCE ON A TYPICAL SPRING DAY. THE NET LOAD SUBTRACTS THE VARIABLE RENEWABLE GENERATION FROM THE END USER DEMAND. ***(CAISO, 2016)***

Enhanced Regional Collaboration

Linking the electrical grids operated by CAISO with the electrical grids managed by neighboring states' grid balancing authorities can utilize larger amounts of renewable resources while providing greater reliability and lower energy costs (Energy and Environmental Economics, 2015).

In 2014, CAISO developed a platform for an Energy Imbalance Market (EIM). Initially, the EIM was a collaboration with CAISO and grid operator PacifiCorp. The EIM was developed to increase grid operational efficiencies by (1) providing coordinated planning efforts and renewable resource development; and (2) providing a mechanism to export excess renewable power and import renewable power during periods of over-generation or high load needs. However, CAISO was not allowed to fully participate in the EIM until the passage of SB 350, which permitted CAISO to operate as a regional organization with authority outside of California.

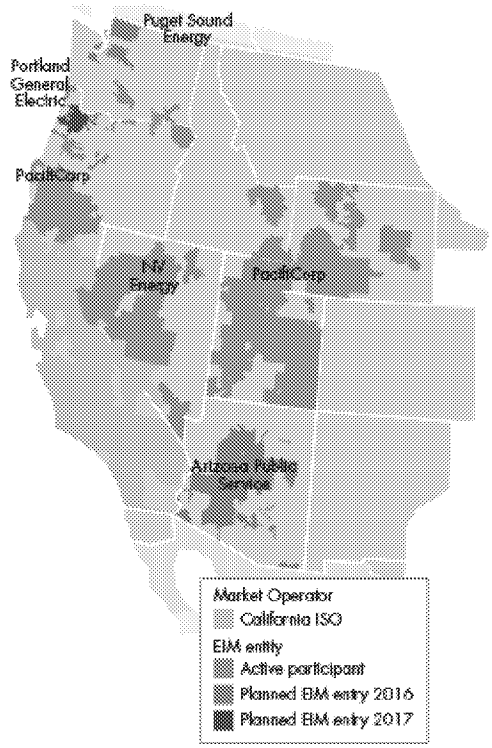


FIGURE 10-18
ENERGY IMBALANCE MARKET (EIM) PARTICIPATION ***(CAISO, 2016)***

The EIM is facilitating the utilization of renewable resources available in each territory by the other territories. Because these renewable resources vary based on local and sub-regional weather patterns and generation technologies, the over-generation from these resources in their "home territory" can be used to supplement and balance electrical loads in the other territories (see Figure 10-18). For example, the Pacific Northwest has large amounts of wind and hydropower resources. These resources can be used to balance the intermittency of solar power generation in California along with providing renewable resources for peak evening electrical loads. Because grid load profiles vary throughout the day and the grid operators are located in different time zones, the exchange of power resources within the EIM helps to accommodate these load profile variations. Finally, the ability to tap into the more abundant EIM system resources can support the high ramp rates shown in Figure 10-17 and Figure 10-19. Other grid balancing authorities in the western United States have joined the EIM and more are planning to join (Energy and Environmental Economics, 2015). While the EIM market is still relatively new, CAISO will need to avoid the import of coal and other fossil fuel energy resources

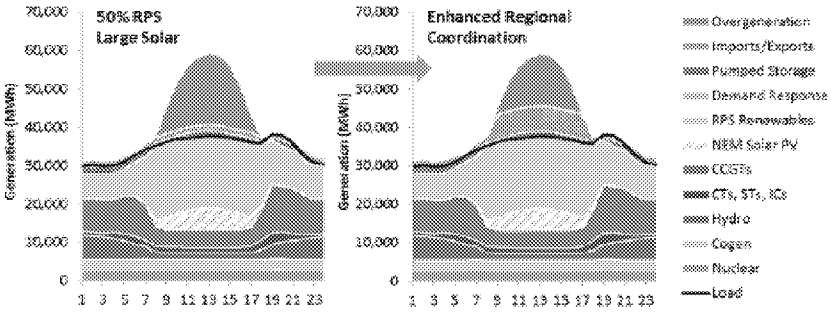


FIGURE 10-19
GRID LOAD WITH AND WITHOUT ENHANCED REGIONAL COORDINATION (*ENERGY AND ENVIRONMENTAL ECONOMICS, INC, 2014*)

utilized by some participating authorities in order to avoid jeopardizing the RPS targets for California.

Increasing Grid Flexibility through Advanced Demand Response and Energy Efficiency Measures

The two most cost-effective ways to avoid the expense of adding power generation and new infrastructure are to increase energy efficiency and to improve grid load management (Rosenfeld, 2009). The avoided use of energy through efficiency measures has been termed "negawatts" by Amory Lovins of the Rocky Mountain Institute (Economist, 2014).

Two of the greatest advantages of implementing energy efficiency measures are that benefits are cumulative and long-lasting.

The California Public Utilities Commission (CPUC) and the California Energy Commission (CEC) have established building efficiency and appliance efficiency standards that became progressively more stringent. California Code of Regulations, Title 24 building efficiency standards, have increasingly strengthened efficiency requirements for new buildings since their adoption in the late 1970's. The target for new Title 24 standards is zero net energy consumption for new residential construction by 2020 and zero net energy consumption for newly constructed commercial buildings by 2030. The Title 24 building energy standards coupled with State and national appliance energy standards have helped keep per capita energy consumption in California stable and well below national levels since the late 1970's, (shown in Figure 10-20) along with reducing the need for 12,000 MW of new power generation (Rosenfeld, 2009).

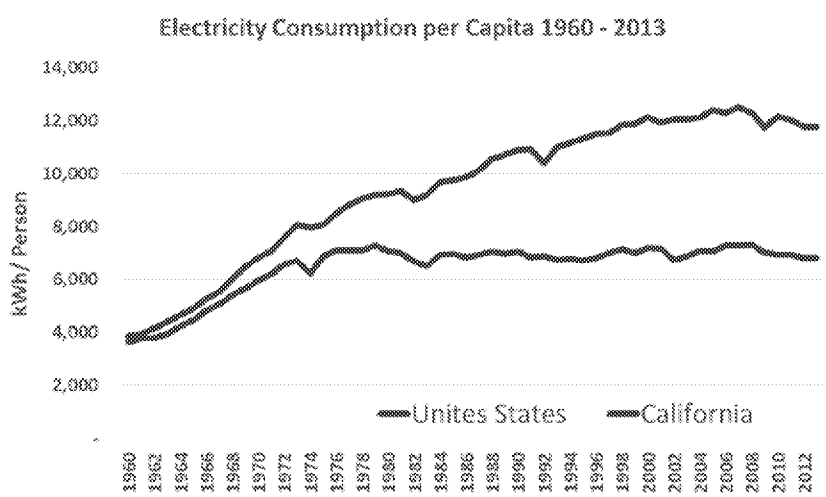


FIGURE 10-20
PER CAPITA ELECTRICITY CONSUMPTION OVER TIME FOR CALIFORNIA AND THE UNITED STATES

Improving the energy efficiency of existing buildings is a huge opportunity to realize additional energy reductions. In Southern California, 64 percent of residential homes were built prior to the adoption of the first Title 24 energy standards (SCAQMD, 2015). Ratepayer programs administered through the CPUC provide rebates for efficiency improvements in existing buildings. While these improvements drive down energy demand, the incentives to perform these retrofits are often not utilized. This is due to barriers to performing efficiency retrofits such as expensive upfront capital costs; lack of awareness of the incentives; the complexity of the retrofit projects; and, the split incentive issue associated with rented buildings whereby retrofit costs are borne by building owners but the benefit of lower energy bills is realized by tenants. The U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, has compiled key resources to help overcome some of these obstacles. In addition, California established a target to double the energy efficiency of existing buildings by 2030 with the adoption of the Clean Energy and Pollution Act of 2015 (SB 350) targets. This will help spur energy efficiency retrofits, as well.

The highest electrical loads generally occur during hot summer days when air conditioner usage spikes. The additional demand is largely met with the power produced by peaking fossil fuel generation units ("peaker plants"). These generation units typically operate with 10 percent utilization rates; therefore, have lower generation efficiencies to help lower capital costs. Since peaker plants operate infrequently, these generating resources often do not utilize the most fuel efficient generating technologies such as incorporating heat recovery steam generators.

To help limit the use and need for additional peaker plants, electrical utility pricing structures help reduce usage during peak periods by employing time-of-use rates. Time-of-use rates increase during peak demand periods, and thus act as a monetary incentive to curtail demand during peak periods. Rather than match grid load demand with additional generation, decreasing end use demand through demand response programs can help change load profiles. Demand response programs incentivize end-use customers to reduce or shift their electricity usage during peak usage demand periods. New technologies such as Wi-Fi enabled thermostats, controllable electric water heaters which can also pull power from the grid to be used as energy storage, and smart phone app-based products, are making load management easier to implement for both utilities and consumers.

As electric vehicles (EVs) become more prevalent, vehicle charging will become an important grid management tool. Intelligently integrating electric transportation charging technologies with the electrical grid is an effective way to provide grid resources. Many EV charging site hosts already have the ability to manage power flows based, in part, on electricity pricing and demand response, allowing the utility to send a signal to customers to cut back on loads during high peak grid demand. Future grid services tied to EV charging are anticipated to include bi-directional power flows, frequency response, and voltage support to enhance grid stability and storage capacity.

Increasing Grid Flexibility through Energy Storage Technologies

The energy landscape is rapidly evolving due to declining costs for generation equipment and the development of new technologies that provide grid and behind-the-meter support services, including energy storage systems.

As discussed above, renewable generation technologies are now well established and cost-effective; however, the technologies that provide ancillary services and grid support to fully integrate renewable power into the grid are still evolving. Renewable power resources are variable. This means that renewable resources may generate more power than is immediately necessary to meet demand, resulting in the need to block and thus lose the excess power from reaching the electrical grid. Another option is to store the additional energy supply. Energy storage technologies help to balance over-generation by storing excess power for later use (Figure 10-21), and by storing energy generated during weak demand periods so that it can be used during peak periods (Figure 10-22). Using energy storage technologies in large grid-scale applications along with smaller behind-the-meter energy storage systems provide flexible resources that reduce reliance on fossil-based generation plants.

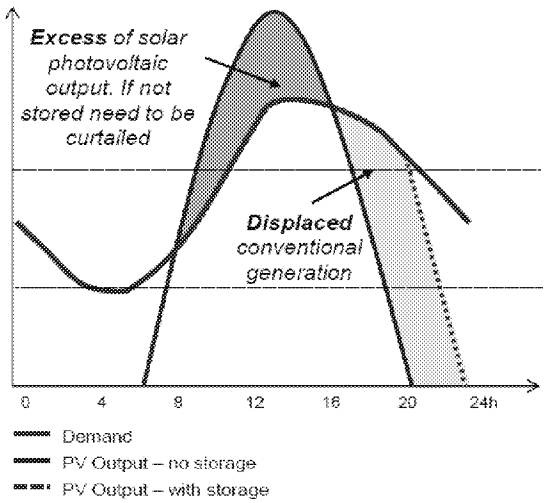


FIGURE 10-21
USE OF STORAGE TO MATCH TO RENEWABLE GENERATION AND STORE THE EXCESS SOLAR POWER FOR LATER PERIODS ***(SBC Energy Institute, 2013)***

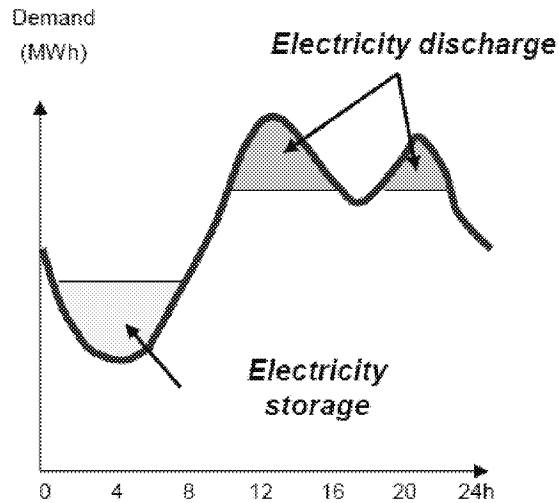


FIGURE 10-22
EXAMPLE USING STORAGE TO HELP BALANCE ELECTRICAL LOADS FOR END USE ELECTRICITY CUSTOMERS. ELECTRICITY IS STORED DURING LOWER DEMAND PERIODS AND DISCHARGED DURING PEAK USAGE PERIODS. USING STORAGE IN THIS MANNER TAKES ADVANTAGE OF LOWER ELECTRICITY RATES TO PROVIDE POWER AT HIGHER RATE PERIODS. ***(SBC Energy Institute, 2013)***

Energy storage systems can utilize different physical processes including thermal, mechanical, electrochemical, and chemical technologies, as shown in Table 10-1. Each storage technology has properties that can provide different types of support services based on their energy storage capacities, discharge rates, and ability to perform other ancillary services such as frequency regulation and voltage support.

TABLE 10-1

STORAGE TECHNOLOGIES GROUPED BY PHYSICAL PRINCIPLES

Mechanical Storage	Thermal Storage	Electrical Storage	Chemical Storage "Power to Gas"
-Pumped hydro	-Hot-water storage	-Supercapacitors	-Hydrogen
-Compressed air	- Molten salt	-Sodium-sulfur batteries	-Synthetic natural gas
-Flywheel	-Ice and chilled water	-Lithium ion batteries	-Methanol
			-Synthetic diesel
		-Vanadium redox-flow batteries	

Each storage technology has advantages and disadvantages with applications for transmission, distribution, and behind-the-meter power needs. Disadvantages of different storage technologies include costs, discharge rates, ease of installation, and maturity of the technology. Different storage types provide options for different applications, such as long term storage, reactive power, and peak shaving.

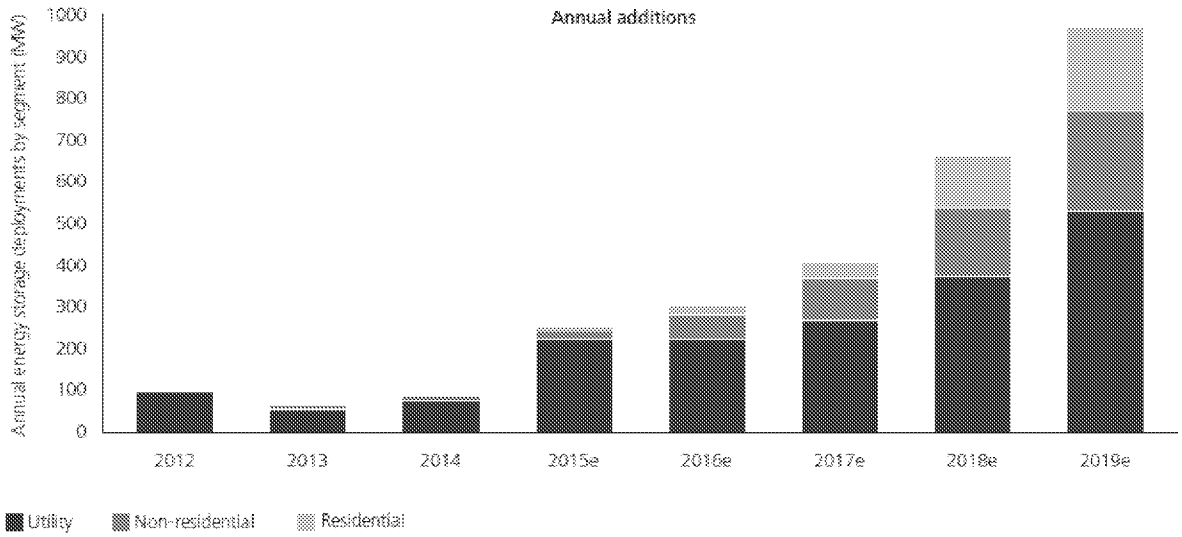


FIGURE 10-23
PAST ENERGY STORAGE DEPLOYMENTS IN U.S BY SECTOR UP TO 2014 AND FUTURE MARKET ESTIMATES TO 2019. FROM 2014 TO 2015 THE MARKET IS ESTIMATED TO HAVE INCREASED BY 185 PERCENT. (SOURCE GREEN TECH MEDIA RESEARCH)

Electricity pricing structures that promote load balancing and State mandates to increase the amount of renewable energy generation are driving the market for energy storage systems, a market that is projected to grow to $50 billion by 2020. Many energy storage technologies, such as compressed air and power-to-gas technologies, are still under development. However, other energy storage systems, such as lithium batteries, are currently being marketed for behind-the-meter commercial and residential applications as well as large grid applications. Energy storage can be used to lower peak consumption, which reduces load demand charges. Currently the North America cost break-even point for adding battery storage systems for customers paying demand charges is around $9 per kilowatt and is expected to drop to $4–5 per kilowatt by 2020 as battery prices continue to drop (McKinsey&Company, 2016).

Grid-level Energy Storage

Grid-level storage systems are the largest energy storage systems. They typically must be at least 1 MW in order to provide useful service at a grid scale, as shown in Figure 10-22. These systems can replace certain peak generating resources (Figure 10-23). This is important from an efficiency standpoint; peak generating resources typically have low utilization rates with flexible generating ranges that are less than total capacity due to idling requirements. In addition, peaker plants are only brought online to meet high peak demand; they sit dormant for most of the year. Battery storage systems would provide numerous valuable grid resources beyond periods of peak demand.

Cost has been a limiting factor in considering a grid storage system over natural gas peaking generation; however, prices for battery storage systems are dropping rapidly with declining battery prices (GTM Research, 2016). In addition, the system controls for grid energy storage are more dynamic than for peak generating resources. In order to ensure the energy stored can meet anticipated demand, the amount of energy storage within the system, discharge rates, and length of discharge, requires a different level of monitoring than peak generating resources. However, more widespread utilization of grid

energy storage systems will soon take place because of new regulations. Under the AB 2514 energy storage mandate, utilities are required to install 1.3 GW of storage within their electrical grids in California. Many of the large power generating companies have already embraced grid-level storage systems, and thus are beginning to help local utilities meet their AB 2514 requirement.

FIGURE 10-24
5 MW GRID LEVEL BATTERY STORAGE USED ON UC SAN DIEGO MICROGRID

Grid storage technologies include molten salt thermal storage coupled with large solar thermal generating plants and large lithium battery container installations, as shown in Figure 10-22. An emerging grid storage technology is vanadium-redox-flow batteries; this system has large storage capacities, a long lifetime, and lower costs but must operate at high temperatures.

Another emerging technology for longer-term storage is "power-to-gas" which consists of energy storage by converting electrical energy to chemical energy in the form of hydrogen. As previously mentioned, the integration of increasingly higher percentages of solar renewable energy into the grid will result in periods of electricity over-generation. Hydrogen gas can be generated during those periods of excess power through electrolysis of water, addressing renewable intermittency and excess electricity generation. This hydrogen can be used to produce natural gas and liquid fuels, can be converted back to electricity through clean combustion and fuel cells, or used for transportation by vehicles and by fossil fuel-powered electrical generation plants. Additionally, the hydrogen produced renewably through this process may eventually be blended with natural gas and added into the existing distribution pipeline infrastructure. Today, within California, hydrogen is mainly produced through steam reformation of hydrocarbons, primarily methane. However, the reformation process emits CO_2 as a byproduct. The use of electrolysis coupled with solar renewable energy provides a zero-emission hydrogen production solution. Other renewable sources would include steam-reformed biogas and biomass. Together with avoiding renewable energy curtailment, power-to-gas systems can help provide grid stabilization with renewable resources along with long term energy storage.

Hydrogen can be converted back to electricity using stationary fuel cells which have different characteristics compared to conventional power plants, allowing them to better complement the integration of renewable resources and the need to balance variability. The efficiency of conventional thermal power plants decreases when plants are operated at less than design output, thus increasing emissions. In contrast, stationary fuel cells can be operated at lower generation outputs with further increases in efficiency. Moreover, stationary fuel cells, contrary to conventional fossil based plants, have high efficiencies even at small scales. This characteristic makes for a more interesting option to support distributed power generation.

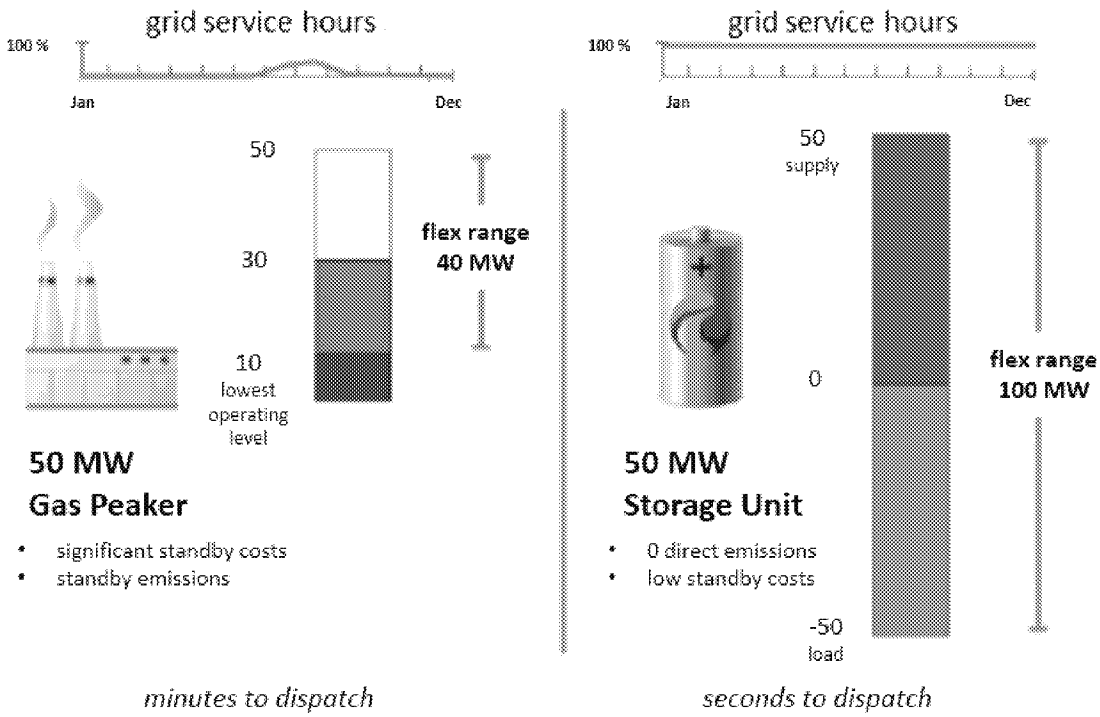


FIGURE 10-25
COMPARISON OF USING GRID STORAGE IN PLACE OF PEAKING GENERATION UNITS ***(Adapted from Greentech Media, 2016)***

Residential and Commercial Storage

Residential and commercial energy storage systems installed "behind the meter" (i.e., on the building owner's side of the meter) are becoming popular because they can decrease peak demand electrical utility costs, provide backup power, and be used as off-grid systems.

A portion of the utility rates for large commercial sites are typically set during the highest 15-minute peak power consumption during a billing cycle. In addition, many utility charges are adjusted seasonally during peak electrical demand periods. These so-called "high demand charges" have prompted the use of energy storage systems to reduce the highest peak power loads. This is known as "peak shaving" (see Figure 10-20). Under this application, electricity is pulled from the grid during low demand periods, when rates are also typically lower. The energy is stored so that it can later be used during the highest rate periods. Many commercial energy storage companies are installing systems at no cost to facilities that are subject to high demand rates. Under these installations, the electrical cost savings are shared with the storage owner/installer and the site. These arrangements are often referred to as Power Efficiency Agreements (PEAs), and are similar to the Power Purchase Agreements (PPAs) offered by many solar installers. Residential energy storage systems are being used in a similar manner because many California residences are subject to time-of-use rates that vary with peak electrical loads.

Although the market for residential and commercial energy storage systems is still in its infancy, as shown in Figure 10-21, the development of storage technologies for residential and commercial applications is beginning to grow quickly. Increases in electricity rates, coupled with declines in energy storage and

solar power prices, are creating an economic driver for new energy storage system installations. Another reason is the ease with which residential storage systems can be installed, e.g., by simply plugging into an existing wall outlet.

To meet this nascent demand, both established companies and startups are starting to offer energy storage products. Many of the startup companies are focusing on how these storage systems, when coupled with distributed power generation from solar, give the consumer the ability to manage their own energy system. In the near future, combining an energy storage system with on-site solar generation could make tying in to the electrical grid optional for some consumers (Rocky Mountain Institute, 2014). Whether many residences and commercial sites decide to unplug from traditional utility service will likely depend on how the utilities rates are structured and the cost to keep grid connections for unforeseen circumstances.

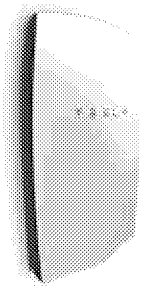


FIGURE 10-26
TESLA 'POWERWALL' HOME BATTERY

Biogas

As long as traditional power generation plants remain operational and utilize fossil fuels as source energy, the natural gas they use should come from renewable resources, when possible. In the Basin, the waste streams from wastewater treatment plants, dairies, and landfills can be utilized to generate renewable biogas. Generating biogas from these waste streams can, in some instances, reduce emissions from these facilities. Additionally, the biogas can be used by conventional power generating plants, by the transportation sector, and by commercial and residential end users while counting toward renewable mandates. Sourcing biogas from within the Basin can provide new fuel supplies that decrease reliance on existing infrastructure. There is a high potential for biogas production in the Basin, with the four county region representing slightly over 50 percent of the State's biogas availability from landfill gas and waste water treatment plants (CEC PIER Program, UC Davis, 2015). If the energy potential from biogas is developed the resulting natural gas could supply an estimated 7 percent of the Basin's natural gas consumption in 2012 and 8.5 percent of the consumption in 2023.

Policy and Regulation Changes Along with Developing New Power Markets

The electrical power industry is undergoing the most rapid change in a century since the invention and development of electrical utility grids by Thomas Edison and Nicola Tesla. As shown previously in Figure 10-11, the price of solar panels has dropped significantly over time and is expected to continue. As distributed renewable energy becomes more widely available and less costly, the electrical utilities, CAISO, and regulatory agencies will need to develop regulatory mechanisms to incentivize and integrate these resources into the grid and allow the delivery of multiple grid services, such as energy generation, energy storage and voltage support (Solar City Grid Engineering, 2016). To accommodate larger amounts of distributed renewable energy on the grid, many of the rules governing utility markets will need to be amended to allow for additional storage, EV integration, and other flexible resources. Using distributed renewable energy as an infrastructure resource by the utilities will enable a more dynamic and flexible power system than the traditional centralized energy generation system of the past.

To allow for the participation of distributed renewable energy resources in the wholesale energy market, CAISO is developing the Distributed Energy Resource Provider (DERP) market. The DERP market would allow multiple smaller energy resources to be aggregated, and then participate as a single entity in the wholesale power market. The DERP market could provide opportunities for large microgrids, such as those run by universities, to sell power back to an investor-owned utility (IOU). In addition, large buildings such as warehouses could be aggregated together, thus becoming a significant source of power generation.

As a larger percentage of distributed renewable resources power the grid, the need increases for ancillary services such as energy storage and voltage support. For example, the shutdown of the San Onofre Nuclear Generating Station (SONGS) created a significant need for voltage support and reactive power (VAR) in South Orange County. Renewable energy resources typically have smart inverters giving them the ability to provide ancillary services. However, these ancillary services are currently prohibited under CPUC Rule 21. Amending Rule 21 to allow smart inverters to provide ancillary services is currently under review. This opens up the possibility of additional grid ancillary service markets for energy storage; EV charging and storage; and distributed generation.

These changes in energy management could allow further penetration of distributed renewable resources into the energy market without the need for large centralized generation facilities. Some utilities are looking to utilize distributed renewable energy as infrastructure resources in their infrastructure planning needs assessments. For example, SCE perceives distributed renewable resources as large-scale infrastructure solutions within their Preferred Pilot Resources program (Southern California Edison, n.d.).

Southern California's Energy and Air Quality Future

Southern California's energy market has undergone three transformative events within the last two decades: the California Energy Crisis in 2000; the shutdown of the SONGS in 2012; and, the Aliso Canyon natural gas storage leak in 2015 and 2016. While the energy infrastructure in the Basin has proven resilient enough to continue providing power to millions of end-users, these unplanned events have demonstrated the vulnerabilities of traditional centralized generation in an urban region. Encouraged by technical innovation and the declining costs of renewable resources, current planning efforts are now putting a greater focus on the development of distributed renewable energy resources and their essential supporting technologies, along with the continued implementation of efficiency measures.

The development and implementation of distributed energy resources and new technologies, along with heightened energy-efficiency efforts, provide multiple benefits in the Basin. These benefits include criteria and toxic emission reductions, GHG reductions, a resilient energy infrastructure, and significant economic benefits. These economic benefits are achieved, in part, through increased energy diversity; reduced energy costs; jobs for system installation and retrofits; and the creation of new businesses focused on clean technology innovation and production.

In addition to developing a more resilient energy infrastructure and becoming increasingly reliant on renewable resources to power the electrical grid, the transportation sector must also be transformed in order to attain healthful air quality levels standards in the Basin. Transportation and goods movement are the largest energy-consuming sectors in the Basin and employ many of the oldest technologies. Internal combustion engines utilize only 20 percent to 30 percent of the energy content in gasoline or

diesel for mobility; the remaining energy is lost primarily to waste heat. Increased efficiency within the transportation sector would provide a multitude of benefits.

The light-duty transportation sector is subject to several efficiency regulations that dictate fleet fuel efficiency requirements. These regulations include federal fuel-efficiency mandates, Pavley standards, and a State of California Executive Order target to have 1.5 million electric cars on the road by 2025. The technology transition to efficient light-duty vehicles such as hybrids, plug in hybrids, EVs, and fuel cell vehicles is well underway. Incentives available from California and the federal government have resulted in the purchase of 196,500 plug-in hybrids, 106,000 EVs and 635 fuel cell vehicles in the State since 2011 (Plug-in Electric Vehicle Collaborative, n.d.) (Hybrid Cars, n.d.) (California Air Resources Board, 2016); one of the top selling vehicles in California is the Toyota Prius hybrid. While these numbers are relatively small compared to overall vehicle sales, some industry analysts are predicting that the adoption of these vehicles may follow an "S" curve adoption rate much like cell phones and computers, as illustrated in Figure 10-29. Supporting these sales projections are declining battery prices, increased range, and less frequent maintenance requirements (Randall, 2016). An indication that EVs may start to show significant sales volumes and follow the "S" curve adoption rate is the 400,000+ (as of April 28, 2016) reservations for the Tesla Model 3 immediately following its recent announcement on March 31, 2016. If sales are completed, this model alone would quadruple the number of pure EVs on the road in the next 18 months.

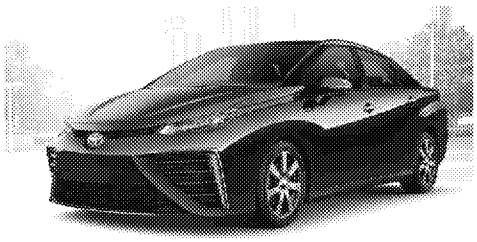


FIGURE 10-27
TOYOTA MIRAI ***(Toyota, 2016)***

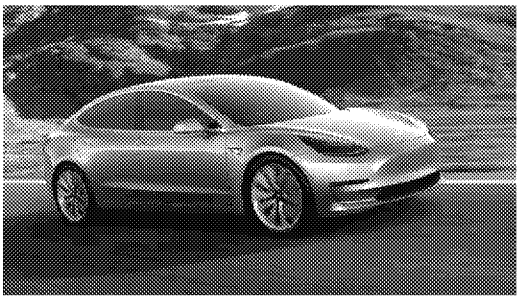


FIGURE 10-28
TESLA MODEL 3 ***(Tesla Motors, 2016)***

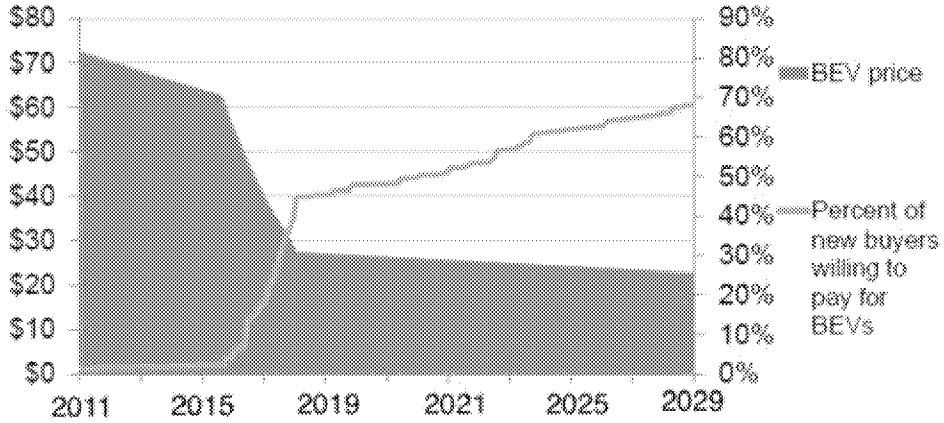


FIGURE 10-29
FORECASTED ADDRESSABLE (AVAILABLE) MARKET FOR BATTERY EV'S WITH 200-MILE RANGE IN RELATION TO BATTERY EV PRICE DECLINES (BATTERY EV PRICES IN THOUSANDS $) (SOURCE: BLOOMBERG NEW ENERGY FINANCE)

The source energy used by the transportation sector (e.g. gasoline, diesel) has historically differed from the source energy used by stationary sources (e.g. natural gas, electricity). Therefore, the transportation

fueling infrastructure has operated largely independent of the electrical grid. With anticipated widespread adoption of EVs, a large part of the transportation sector will tap into the electrical grid to supply its energy needs. In order to accommodate the acceleration of EV sales and the resultant vehicle charging requirements, the electrical grid must become more dynamic. As the grid adapts to accommodate additional power needs, there is an opportunity to strengthen its resiliency by utilizing EV battery storage. As discussed above, EVs can help control grid loads with strategic charging. When renewable resource over-generation occurs, EVs can pull power from the grid and store this energy in their batteries. Using EV charging as a grid service could be more widely implemented to take advantage of the many potential benefits.

As of July 2016 California had 20 retail hydrogen fueling stations with 14 of those stations located in the Basin, including one at the SCAQMD headquarters in Diamond Bar. Additional infrastructure will have to become available to keep up with anticipated demand and to have a robust network of fueling stations. A complete network of fueling stations will boost vehicle manufacturing, reduce industry risk while lowering cost with economies of scale, and encourage the commercialization of fuel cell vehicles such as the Toyota Mirai, Honda Clarity, and the Hyundai Tucson. The emissions associated with the production of hydrogen for transportation could be mitigated by using renewables such as solar or even steam-reformed biogas instead of the currently used steam reformation of hydrocarbons. SB 1505 (Lowenthal, 2006) mandates that once annual throughput reaches 3,500 metric tons, no less than 33.3 percent of the hydrogen produced or dispensed in California must be from renewable energy resources. Compliance with this mandate will enhance the emissions benefits of fuel cell vehicles. The National Renewable Energy Laboratory 2014 study identified both Los Angeles and Orange Counties as some of the top 5 areas in the U.S. with net availability and potential for hydrogen from waste water treatment plants and landfills.

Transformation of the Energy Sector

The path forward to achieving cleaner air and mitigating climate change requires the continued transformation of the energy sector. The past model of simply adding centralized power generation to accommodate electrical loads is becoming less cost-effective and potentially obsolete. This transformation will include integrating additional renewable resources into the electrical grid; the widespread adoption of zero emission vehicle technologies; the development and implementation of energy storage technologies; increased energy efficiency measures; the use of alternative low-emission fuels; and, the launch of new energy markets to ensure these new technologies flourish. To encourage this transformation and maximize its co-benefits, SCAQMD will engage in the following activities:

- *Coordinate planning, technology demonstration, and incentive program efforts* – Agencies such as CEC, CPUC, U.S. EPA, CARB, SCAG, SCAQMD, CAISO, and local agencies leverage their efforts by working together on planning and regulatory efforts. Regulation and action by one agency can potentially conflict with the planning, regulatory and incentive efforts of other agencies. In addition, agencies working in collaboration with the local ports, utilities, and Original Equipment Manufacturers (OEMs) can identify and undertake technology demonstration projects prior to widespread implementation. Working together can better identify and implement incentive-funding programs that help the transition to newer technologies.

- *Establish Workgroup to Assess Life-Cycle Emissions* – In assessing technologies for stationary sources, the SCAQMD will convene a workgroup to assess the in-basin life-cycle criteria pollutant emissions related to energy use from technologies and/or other activities such as efficiency improvements. This assessment, in part, will include future energy scenarios that are anticipated as more renewable resources are incorporated into the energy usage within the Basin. The assessments will consider emissions associated with energy time-of-use, impact of higher efficiencies, fuel switching, and future energy and regulatory markets. In addition, the assessments will consider life-cycle GHG emissions, potential toxic impacts or benefits, and utilize experts and materials from other government agencies and universities.
- *Provide technical and project assistance* – The SCAQMD in collaboration with other agencies, utilities, OEMs, and stakeholders are able to provide technical assistance to those wishing to implement distributed energy resources, efficiency measures, or new transportation technologies and infrastructure. In addition to providing technical assistance, SCAQMD can help make available incentive programs, tax credits, rebates, credit markets and other financial tools to help project managers leverage funds from multiple sources to assist with infrastructure costs.

- *Schedule for infrastructure and technology needs* – Implementing more efficient mobile source technologies will require that the supporting energy infrastructure can accommodate their use. SCAQMD must continue to coordinate with other agencies and utilities on the implementation of transportation infrastructure that accommodates mobile source technologies.

- *Collaborate and participate in national and international partnerships* – Working collaboratively with other state, national, and international entities on air pollution reduction efforts, including the development of new technologies to assist in this effort, will leverage information and programs, and transfer knowledge on successes and lessons learned.

- *Evaluate biogas* – The technologies to produce biogas from waste streams within the Basin should continue to be further reviewed and coordinated with State agencies that are implementing measures to achieve renewable and waste stream diversion mandates.

- *Study the "climate penalty"* – Future climate impacts on air quality must be further studied, taking into account scenarios regarding future projected temperatures, local and global emissions, and weather extremes. The SCAQMD should continue to work with other agencies and researchers to further understand and monitor climate change impacts on air quality.

- *Integrate a variety of implementation approaches in collaboration with other agencies with focus on the air quality benefits from GHG reduction measures such as renewable energy, smart grid technologies, and efficiency* – This AQMP is incorporating several control measures to account for criteria pollutant co-benefits from federal, State and local mandates and programs to reduce GHG emissions, increase energy efficiency, along with renewable power sources. These control measures include ECC-01 and ECC-02 which account for co-benefits of greenhouse gas, efficiency, and renewable energy mandates such as AB 32, SB 32, SB 350 and Title 24. Furthermore, control measure ECC-03 will pursue incentive programs to accelerate the

implementation of onsite renewable energy, solar thermal, efficiency measures, along with smart grid applications.

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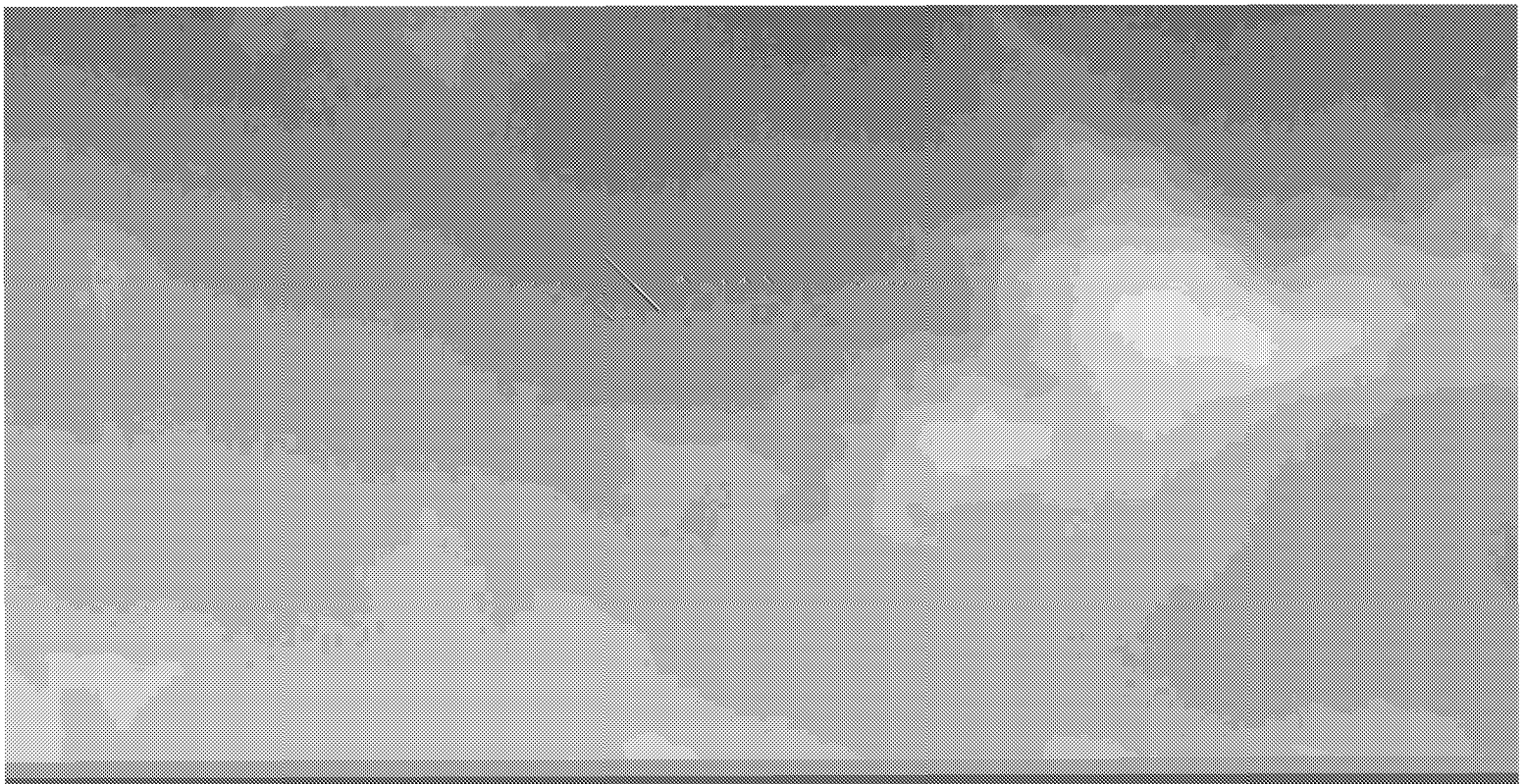
Chapter 11
Public Process and Participation

The participation of stakeholders and the general public during the development of the 2016 AQMP provided critical feedback and guidance in the development of the control strategy.

In This Chapter



Introduction

The development of the 2016 AQMP has been a regional multi-agency effort including the SCAQMD, CARB, SCAG, U.S. EPA, and other entities. The Plan includes control strategies to demonstrate attainment with various ozone and PM2.5 NAAQS by specified deadlines; it incorporates the latest scientific and technological information and planning assumptions, including SCAG's 2016 Regional Transportation Plan/Sustainable Communities Strategy and updated emission inventories and modeling methods.

A 2016 AQMP Advisory Group was formed to provide feedback and recommendations on the development of the plan, including development of policy and control strategies. The Advisory Group represents a diverse cross section of stakeholders, such as large and small businesses, government agencies, environmental and community groups, and academia. In addition, a Scientific, Technical, and Modeling Peer Review (STMPR) Advisory Group convened to make recommendations on air quality modeling, emissions inventory, and socioeconomic modeling and analysis. Both Advisory Groups met periodically, sometimes monthly, throughout the AQMP development process and those meetings have been open to the public. There has also been ongoing close coordination between U.S. EPA, CARB, SCAG and SCAQMD staff on all elements of AQMP development.

Leading up to the development of the 2016 AQMP, SCAQMD staff in conjunction with stakeholders prepared 10 white papers on key topics to provide technical background, a policy framework for the AQMP, and better integration of major planning issues such as air quality, transportation, climate, energy, and business considerations.

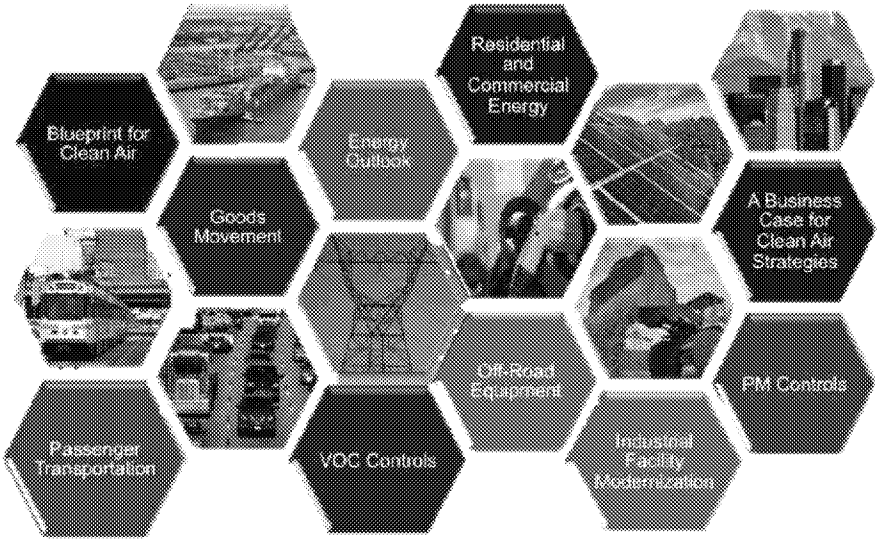


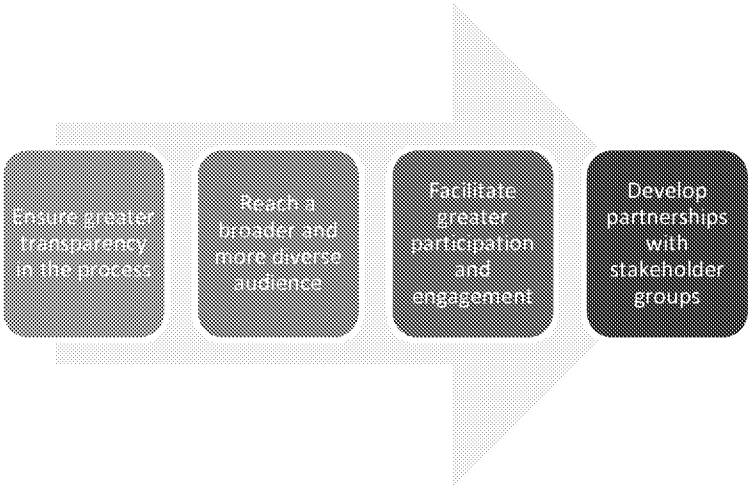
FIGURE 11-1
2016 AQMP WHITE PAPERS

These white papers were intended to assist the public, stakeholders and the SCAQMD staff to better understand key facts and policy issues related to the development of the 2016 AQMP. Each White Paper had an associated Working Group that generally met monthly until the White Paper was completed. All working group meetings were open to the public. The 2016 AQMP Advisory Group members and recommended technical experts voluntarily participated in White Paper Working Group meetings. Many of the findings, recommendations, and conclusions in the white papers have been integrated into the 2016 AQMP. Final versions of all 10 white papers are available online at

http://www.aqmd.gov/home/about/groups-committees/aqmp-advisory-group/2016-aqmp-white-papers.

Outreach Program

The 2016 AQMP Outreach Program is designed to go beyond traditional Advisory Group meetings, public workshop, and public hearing opportunities in order to more broadly disseminate information and engage a wider range of stakeholders. The approach aims to achieve multiple goals including ensuring greater transparency in the process, reaching a broader and more diverse audience, facilitating greater participation and engagement, and developing partnerships with stakeholder groups.



The outreach approach has been designed to inform the policy discussion by helping to ensure that all stakeholders have access to a common set of facts, are aware of the State and federal requirements, and have appropriate background information to engage in meaningful dialogue on the AQMP.

The clean air goals in the 2016 AQMP will not be achieved solely by the actions of the SCAQMD. The proposed control strategy will require participation from affected businesses, local communities, and multiple government agencies. Achieving the mutual goals of protecting public health, providing environmental equity and promoting robust and sustainable economic development can only be accomplished through strong partnerships. Thus, it is critical to inform and engage a wide range of stakeholders on the goals, requirements, approach, and potential impacts of the 2016 AQMP.

Stakeholders for the 2016 AQMP include community members, businesses, trade associations, environmental organizations, health advocates, academia and local, regional, state and federal government entities. Table 11-1 lists specific stakeholder groups participating in the AQMP process. The stakeholders were notified of all Advisory Group meetings, working group meetings, workshops and hearings, and were invited to participate in various activities designed to assist in enhancing communication and development of the 2016 AQMP.

A variety of formats and communication outreach methods were utilized as part of the Outreach Program. The formats used for specific activities were tailored to the particular audience or venue where information was being presented and discussed. Figure 11-2 provides an overview the variety of formats and outreach methods used by the SCAQMD during the development of the 2016 AQMP including Advisory Group and Committee meetings, working groups, printed material, conference calls, stakeholder meetings, and social media.

TABLE 11-1

Stakeholders Participating in Outreach Efforts

Stakeholder Category	Stakeholders
Public Agencies	• CARB • California Energy Commission • California Public Utilities Commission • California ISO • CalRecycle • U.S. EPA • U.S. Department of Transportation • U.S. Department of Energy
Local/Regional Government	• Councils of Governments/Associated Governments • SCAG • Transportation Commissions • Local Planning Departments • Building and Fire Departments • Tribal Governments
Special Districts	• School Districts • Sanitation Districts • Water/Power Districts
Health Advocates	• Medical Practitioners • Health Researchers • Health Providers
Community/Health/ Environmental Groups	• Public Health Departments/Associations • Environmental Justice Organizations • Environmental Advocacy Groups • Faith-based Organizations • Labor Organizations
Academia	• Universities • National Laboratories
General Public	• Residents • Students • Interested Parties

TABLE 11-1 (CONCLUDED)

Stakeholders Participating in Outreach Efforts

Stakeholder Category	Stakeholders
Business	• Energy Industry (Electricity, Petroleum Production and Refining, Natural Gas, Biofuels, Renewables, etc.) • Green Technologies • Goods Movement and Logistics (Warehousing, Trucking, Railroads, Ports/Shipping/Freight) • Dairy Operations • Printing/Coating Industry • Airport/Airline Operations • Engine Manufacturers • After-treatment Technologies • Building and Construction Industry/Realtors • Chambers of Commerce/ Business Councils • Trade Associations • Small Businesses

FIGURE 11-2

FORMATS AND COMMUNICATION OUTREACH METHODS USED FOR THE 2016 AQMP

Public Workshops

As in previous AQMPs, multiple public workshops are being held throughout the SCAQMD jurisdiction. Public hearings will also be held, in fulfillment of legal requirements. Regular informational updates to the SCAQMD Governing Board and its Committees and Advisory Groups provide another forum for public input. In addition to these hearings and workshops, the following describes specific activities designed to fulfill the goals of the Outreach Program. Stakeholders and interested parties were encouraged to participate and meet with SCAQMD staff to discuss emission reductions ideas, constituent concerns, and implementation suggestions.

Key Agency Coordination Meetings

Throughout the 2016 AQMP development process, staff has and continues to hold frequent coordination meetings with the key AQMP partner agencies (CARB, U.S. EPA and SCAG). Meetings occur several times per month to discuss technical, legal, policy, and control strategy topics.

Stakeholder Meetings, Topical Workshops, and Focus Groups

Meetings with specific stakeholder groups have been and will continue to be held to communicate the purpose and scope of the 2016 AQMP, discuss the concerns of the representatives, solicit recommendations for inclusion in the Plan, and gather further outreach suggestions. Stakeholders include all those listed in Table 11-1, such as regional councils of government (COGs); transportation commissions; Chambers of Commerce; business councils; trade groups and associations; environmental and health advocates; and community groups. Outreach methods include agendized SCAQMD presentations at COGs, participation at conferences and seminars, and face-to-face meetings as requested. In addition to meetings with specific stakeholders, topical workshops and focus groups on specific topics have been and will be held to focus on specific AQMP-related topics such as economics, incentives, white papers, energy, employment impacts, health benefits, modeling issues, climate/energy, transportation, environmental justice, specific control measures, and goods movement. For the preparation of the 10 2016 AQMP White Papers, working groups were formed to address specific topics addressed in each of the policy documents. The focus groups were comprised of experts for the particular subject, the inventory, the trends and/or control technology being evaluated, including equipment manufacturers and suppliers. The focus groups met as often as necessary to provide recommendations. These meetings provided a forum where different opinions on specific topics could be shared and discussed.

Peer Review

In addition to the feedback provided by the 2016 AQMP Advisory Group and the STMPR Advisory Group, additional expert peer review of specific 2016 AQMP components was sought. One specific example is a focused peer review of the socioeconomic/health impacts and a cost-benefit analysis of the 2016 AQMP and associated control strategy. Another review is focused on modeling methods and assumptions, including growth and emissions projections. Expert reviewers were from a diverse range of institutions and perspectives. All results of the peer reviews have been, and will be made public to ensure full transparency and open discussion of any issues raised. One such example of peer review is Appendix I (Health Effects) of the 2016 AQMP in accordance with California Health and Safety Code Section 40471(b) that requires the SCAQMD to prepare a report on health impacts of particulate matter air pollution in the Basin in conjunction with public health agencies. An advisory council appointed by the SCAQMD Governing Board and Board Advisory Groups has been formed to undertake peer review of the report prior to its final inclusion in the Plan.

General Public Outreach

The 2016 AQMP was included in the SCAQMD's extensive community outreach activities – including, but not limited to, events, community forums, and other meetings – to promote greater public awareness of its purpose and significance. Non-technical brochures were created and distributed at public events. Web-based and social media communication tools have been utilized to distribute AQMP information and provide an opportunity for interactive feedback.

Outreach Activities

Table 11-2 provides the specific efforts conducted to implement the Outreach Program for the 2016 AQMP since the Advisory Group convened in 2014 until the release of the Draft Plan. The table provides the date the activity took place, with what organization(s), and the audience (particular stakeholders or open to the public). In addition, over one hundred meetings and teleconferences with key agencies were conducted with SCAG, CARB, and/or U.S. EPA.

In addition to meeting and providing invited presentations, SCAQMD staff also attended a number of meetings conducted by other organizations (e.g., cities, councils of government, chambers, etc.) which included a brief announcement regarding the 2016 AQMP. These types of announcements identified the date, time and location of AQMP Advisory meetings, white paper working group meetings, or the latest status in the development and release of the 2016 AQMP.

TABLE 11-2

Outreach Activities for the 2016 AQMP

DATE	ORGANIZATION	AUDIENCE
4/10/2014	SCAQMD AQMP Advisory Group Meeting	Open to Public
4/29/2014	Southern California Alliance of Publicly-Owned (SCAP) Treatment Works	Public Agencies
5/9/2014	SCAQMD Local Government and Small Business Assistance Advisory Group	Open to Public
5/29/2014	SCAQMD AQMP Advisory Group Meeting	Open to Public
6/11/2014	SCAQMD Student Interns	Government/Education
6/24/2014	Blueprint for Clean Air White Paper Working Group	Open to Public
6/25/2014	VOC Controls White Paper Working Group	Open to Public
6/25/2014	SCAQMD Student Interns	Government/Education
6/26/2014	Residential and Commercial Energy White Paper Working Group	Open to Public
6/26/2014	A Business Case for Clean Air Strategies White Paper Working Group	Open to Public
7/8/2014	Passenger Transportation White Paper Working Group	Open to Public
7/8/2014	Goods Movement White Paper Working Group	Open to Public
7/18/2014	PM Controls White Paper Working Group	Open to Public
7/23/2014	Energy Outlook White Paper Working Group	Open to Public
8/5/2014	Passenger Transportation White Paper Working Group	Open to Public
8/5/2014	Goods Movement White Paper Working Group	Open to Public

TABLE 11-2 (CONTINUED)

Outreach Activities for the 2016 AQMP

DATE	ORGANIZATION	AUDIENCE
8/13/2014	Blueprint for Clean Air White Paper Working Group	Open to Public
8/13/2014	Industrial Facility Modernization White Paper Working Group	Open to Public
8/13/2014	A Business Case for Clean Air Strategies White Paper Working Group	Open to Public
8/19/2014	VOC Controls White Paper Working Group	Open to Public
9/4/2014	Valley Industry & Commerce Association (VICA)	Environment, Energy & Utilities Committee
9/4/2014	Passenger Transportation White Paper Working Group	Open to Public
9/4/2014	Goods Movement White Paper Working Group	Open to Public
9/10/2014	Residential and Commercial Energy White Paper Working Group	Open to Public
9/24/2014	PM Controls White Paper Working Group	Open to Public
9/30/2014	A Business Case for Clean Air Strategies White Paper Working Group	Open to Public
10/15/2014	VOC Controls White Paper Working Group	Open to Public
10/28/2014	SCAQMD AQMP Advisory Group Meeting	Open to Public
10/31/2014	A Business Case for Clean Air Strategies White Paper Working Group	Open to Public
1/13/2015	L.A. County Bar Association	Environmental Lawyers
1/23/2015	SCAQMD Mobile Source Committee	Open to Public
2/4/2015	Passenger Transportation White Paper Working Group	Open to Public

TABLE 11-2 (CONTINUED)

Outreach Activities for the 2016 AQMP

DATE	ORGANIZATION	AUDIENCE
2/4/2015	Goods Movement White Paper Working Group	Open to Public
2/20/2015	SCAQMD Mobile Source Committee	Open to Public
2/24/2015	Off-Road Equipment White Paper Working Group	Open to Public
3/11/2015	A Business Case for Clean Air Strategies White Paper Working Group	Open to Public
3/19/2015	SCAQMD AQMP Advisory Group Meeting	Open to Public
4/1/2015	Off-Road Equipment White Paper Working Group	Open to Public
4/14/2015	VOC Controls White Paper Working Group	Open to Public
4/15/2015	Blueprint for Clean Air White Paper Working Group	Open to Public
4/15/2015	Energy Outlook White Paper Working Group	Open to Public
4/16/2015	PM Controls White Paper Working Group	Open to Public
4/17/2015	SCAQMD Mobile Source Committee	Open to Public
4/29/2015	Off-Road Equipment White Paper Working Group	Open to Public
5/20/2015	SCAQMD AQMP Advisory Group Meeting	Open to Public
6/4/2015	SCAG Energy and Environment Committee	Open to Public
6/5/2015	SCAQMD Governing Board Meeting	Open to Public
6/9/2015	SCAQMD Student Interns	Government/Education
6/10–6/11/ 2015	2016 AQMP Control Strategy Symposium	Open to Public
6/23/2015	A Business Case for Clean Air Strategies White Paper Working Group	Open to Public

TABLE 11-2 (CONTINUED)

Outreach Activities for the 2016 AQMP

DATE	ORGANIZATION	AUDIENCE
6/23/2015	SCAQMD Student Interns	Government/Education
6/25/2015	Residential and Commercial Energy White Paper Working Group	Open to Public
6/26/2015	Off-Road Equipment White Paper Working Group	Open to Public
6/26/2015	L.A. Chamber of Commerce (*Energy, Water & Environmental Sustainability; Transportation & Goods Movement Councils*)	Joint Council meeting
7/1/2015	Goods Movement White Paper Working Group	Open to Public
7/1/2015	Gateway Cities Council of Governments	Board of Directors
7/10/2015	SCAQMD Governing Board Meeting	Open to Public
7/13/2015	California Council for Environmental & Economic Balance (CCEEB)	Business Representatives
7/21/2015	SCAQMD AQMP Advisory Group Meeting	Open to Public
7/24/2015	SCAQMD Mobile Source Committee	Open to Public
8/21/2015	China EPA	Public Agency
8/26/2015	SCAQMD AQMP Advisory Group Meeting	Open to Public
8/27/2015	SCAQMD Board Assistant Briefing	Open to Public
8/28/2015	China EPA	Public Agency
9/4/2015	SCAQMD Governing Board Meeting	Open to Public
9/9/2015	BizFed	Business Representatives
9/11/2015	Local Government & Small Business Assistance Advisory Group	Open to Public

TABLE 11-2 (CONTINUED)

Outreach Activities for the 2016 AQMP

DATE	ORGANIZATION	AUDIENCE
9/15/2015	Energy Outlook White Paper Working Group	Open to Public
9/18/2015	SCAQMD Mobile Source Committee	Open to Public
9/23/2015	Industrial Facility Modernization White Paper Working Group	Open to Public
9/30/2015	A Business Case for Clean Air Strategies White Paper Working Group	Open to Public
10/2/2015	SCAQMD Governing Board Meeting	Open to Public
10/7/2015	San Bernardino Association of Government	Board of Directors
10/9/2015	SoCal Gas	Business
10/12/2015	Future Ports	Open to Public
10/13/2015	L.A. Chamber of Commerce (*Transportation & Goods Movement Council*)	Business Representatives
10/15/2015	Air & Waste Management Association	Annual Meeting
10/15/2015	San Gabriel Valley Council of Government	Governing Board
10/16/2015	SCAQMD Stationary Source Committee	Open to Public
10/22/2015	Orange County Council of Government	Executive Council
10/28/2015	Enviros Conference Call Meeting	Environmental
10/28/2015	SCAQMD AQMP Advisory Group Meeting	Open to Public
11/6/2015	SCAQMD Governing Board Meeting	Open to Public
11/20/2015	SCAQMD Mobile Source Committee	Open to Public
12/2/2015	Beijing Environmental Protection Bureau	Public Agency

TABLE 11-2 (CONTINUED)

Outreach Activities for the 2016 AQMP

DATE	ORGANIZATION	AUDIENCE
12/17/2015	SCAG Technical Working Group	Open to Public
1/20/2016	Mayor Garcetti's Office of Sustainability, City of Los Angeles	Government
1/21/2016	Industrial Environmental Coalition of Orange County	Business Representatives County Program
1/22/2016	SCAQMD Mobile Source Committee	Open to Public
1/27/2016	Enviros Conference Call Meeting	Environmental Groups
1/29/2016	SCAQMD Environmental Justice Advisory Group (EJAG)	Open to Public
2/24/2016	Enviros Conference Call Meeting	Environmental Groups
2/10/2016	The Inland Empire Air Quality Committee (American Lung Association)	Air Quality Committee
3/9/2016	Beijing Environmental Protection Bureau	Public Agency
3/18/2016	SCAQMD Mobile Source Committee	Open to Public
3/23/2016	Enviros Conference Call Meeting	Environmental Groups
3/25/2016	SoCal Gas	Business
4/1/2016	SCAQMD Governing Board Meeting	Open to Public
4/8/2016	UCLA Law School	Academia
4/13/2016	SCAQMD AQMP Advisory Group Meeting	Open to Public
4/13/2016	Physicians for Social Responsibility - LA	Environmental Group
4/15/2016	SCAQMD Mobile Source Committee	Open to Public

TABLE 11-2 (CONTINUED)

Outreach Activities for the 2016 AQMP

DATE	ORGANIZATION	AUDIENCE
4/15/2016	SCAQMD Stationary Source Committee	Open to Public
4/26/2016	Southern California Alliance of Publicly Owned (SCAP) Treatment	Public Agency
4/27/2016	Enviros Conference Call Meeting	Environmental Groups
5/3/2016	SoCal Gas Company	Business
5/12/2016	SoCal Gas Company	Business
5/13/2016	Local Government & Small Business Assistance Advisory Group	Open to Public
5/17/2016	Building Industry Association of Southern California	Business Representatives
5/18/2016	Western States Petroleum Association	Business Representatives
5/20/2016	SCAQMD Mobile Source Committee	Open to Public
5/25/2016	Enviros Conference Call Meeting	Environmental Groups
6/1/2016	SoCal Gas Company - Downey	Business
6/7/2016	SoCal Gas Company	Business
6/9/2016	Building Industry Association of Southern California	Business Representatives
6/15/2016	SCAQMD AQMP Advisory Group Meeting	Open to Public
6/17/2016	SCAQMD Mobile Source Committee	Open to Public
6/17/2016	Goods Movement Industry	Business/Port Representatives
6/22/16	Enviros Conference Call Meeting	Environmental Groups
6/23/2016	Orange County Council of Governments	Open to Public

TABLE 11-2 (CONTINUED)

Outreach Activities for the 2016 AQMP

DATE	ORGANIZATION	AUDIENCE
6/27/2016	Realtors Committee on Air Quality	Business Representatives
7/7/2016	SCAG Energy and Environment Committee	Open to Public
7/7/2016	Architectural Coatings Association	Business Representatives
7/12/2016	Diesel 2 Gas	Business Representatives
7/14/2016	Public Workshop (Coachella Valley)	Open to Public
7/14/2016	Public Workshop (SCAQMD, Diamond Bar)	Open to Public
7/19/2016	BizFed	Business Representatives
7/20/2016	Public Workshop (Buena Park, Orange County)	Open to Public
7/20/2016	Public Workshop (Carson, Los Angeles County)	Open to Public
7/20/2016	Home Rule Advisory Group Meeting	Open to Public
7/21/2016	Public Workshop (San Bernardino County)	Open to Public
7/21/2016	Public Workshop (Riverside County)	Open to Public
7/22/2016	SCAQMD Mobile Source Committee	Open to Public
7/26/2016	University of Southern California	Academia
7/27/2016	Clean Cities Coalition - Western Riverside Council of Governments	Open to Public
7/29/2016	SCAQMD Environmental Justice Advisory Group	Open to Public
8/2/2016	Los Angeles County Board of Supervisors	Open to Public
8/3/2016	Pasadena Sierra Club	Environmental Interest

TABLE 11-2 (CONTINUED)

Outreach Activities for the 2016 AQMP

DATE	ORGANIZATION	AUDIENCE
8/4/2016	SoCal Gas/Cooking Industry	Business Representatives
8/4/2016	ClearSign Low NOx Burner Technologies	Business Interest
8/16/2016	SCAQMD AQMP Advisory Group Meeting	Open to Public
8/31/2016	Association of Environmental Professionals	Environmental Consultants
9/1/2016	Valley Industry and Commerce Association - Energy, Environment & Utilities Committee	Business Representatives
9/6/2016	SoCal Gas Company	Business Representatives
9/7/2016	San Bernardino Associated Governments – Board Meeting	Open to Public
9/9/2016	SoCal Gas Company	Business Representatives
9/13/2016	Sanitation Districts of Los Angeles County - Industry Advisory Council	Business Representatives
9/16/2016	SCAQMD Mobile Source Committee Meeting	Open to Public
9/22/2016	South Bay Cities Council of Governments	Open to Public
9/27/2015	Inland Action - Board of Directors	Business Representatives
9/28/2016	SCAQMD AQMP Advisory Group Meeting	Open to Public
9/29/2016	SCAG Regional Council	Open to Public
10/3/2016	Western Riverside Council of Governments	Open to Public
10/5/2016	Industrial Environmental Association /CMTA Symposium and Conference	Open to Participants

TABLE 11-2 (CONTINUED)

Outreach Activities for the 2016 AQMP

DATE	ORGANIZATION	AUDIENCE
10/12/2016	U.S. Environmental Protection Agency	Environmental Policy
10/13/2016	American Automobile Association	Business Interest
10/14/2016	SCAQMD Local Government and Small Business Assistance Advisory Group Meeting	Open to Public
10/21/2016	SCAQMD Mobile Source Committee	Open to Public
10/21/2016	Japan Automakers Association (JAMA)	Business Interest
10/25/2016	Inland Empire Economic Partnership – Logistical Council	Business Representatives
10/25/2016	City of Los Angeles	Environmental Policy
10/27/2016	SCAQMD AQMP Advisory Group Meeting	Open to Public
10/28/2016	SCAQMD Environmental Justice Advisory Group	Open to Public
11/2/2016	Air & Waste Management Association	Environmental Consultants
11/15/2016	Public Hearing – Buena Park (Orange County)	Open to Public
11/15/2016	Public Hearing – Carson (Los Angeles County)	Open to Public
11/17/2016	Public Hearing – San Bernardino (San Bernardino County)	Open to Public
11/17/2016	Public Hearing – Riverside (Riverside County)	Open to Public
12/2/2016	SCAQMD Governing Board Meeting – Set Hearing	Open to Public

TABLE 11-2 (CONCLUDED)

Outreach Activities for the 2016 AQMP

DATE	ORGANIZATION	AUDIENCE
1/9/2017	SCAG's Global Land Use & Economic (GLUE) Council	Business Representatives
1/18/2017	Southern California Gas Company	Business Representatives
1/18/2017	Sierra Club, EARTHJUSTICE, Center for Community Action and Environmental Justice	Environmental Interest
1/19/2017	Industrial Environmental Coalition of Orange County	Environmental Interest
1/19/2017	Realtors Committee on Air Quality	Business Representatives
1/19/2017	Public Solar Power Coalition	Environmental Interest
1/20/2017	SCAQMD Mobile Source Committee	Open to Public
1/20/2017	Public Solar Power Coalition	Environmental Interest
1/26/2017	Orange County Council of Governments	Open to Public
1/26/2017	Watts & South L.A. Clean Air Community Forum	Open to Public
2/3/2017	SCAQMD Governing Board Meeting – Public Hearing	Open to Public
3/3/2017	SCAQMD Governing Board Meeting – Public Hearing	Open to Public

Glossary

AAQS (Ambient Air Quality Standards): Health and welfare based standards for clean outdoor air that identify the maximum acceptable average concentrations of air pollutants during a specified period of time. (See NAAQS.)

Acute Health Effect: An adverse health effect that occurs over a relatively short period of time (e.g., minutes or hours).

Aerosol: Particles of solid or liquid matter that can remain suspended in air for long periods of time because of their small size and light weight.

Air Pollutants: Amounts of foreign and/or natural substances occurring in the atmosphere that may result in adverse effects on humans, animals, vegetation, and/or materials.

Air Quality Simulation Model: A computer program that simulates the transport, dispersion, and transformation of compounds emitted into the air and can project the relationship between emissions and air quality.

Air Toxics: A generic term referring to a harmful chemical or group of chemicals in the air. Typically, substances that are especially harmful to health, such as those considered under U.S. EPA's hazardous air pollutant program or California's AB 1807 toxic air contaminant program, are considered to be air toxics. Technically, any compound that is in the air and has the potential to produce adverse health effects is an air toxic.

ATCM (Airborne Toxic Control Measure): A type of control measure, adopted by the CARB (Health and Safety Code Section 39666 et seq.), which reduces emissions of toxic air contaminants from nonvehicular sources.

Alternative Fuels: Fuels such as methanol, ethanol, hydrogen, natural gas, and liquid propane gas that are cleaner burning and help to meet mobile and stationary emission standards.

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

APCD (Air Pollution Control District): A county agency with authority to regulate stationary, indirect, and area sources of air pollution (e.g., power plants, highway construction, and housing developments) within a given county, and governed by a district air pollution control board composed of the elected county supervisors and in most cases, representatives of cities within the district.

AQMD (Air Quality Management District): A group or portions of counties, or an individual county specified in law with authority to regulate stationary, indirect, and area sources of air pollution within the region and governed by a regional air pollution control board comprised mostly of elected officials from within the region.

AQMP (Air Quality Management Plan): A Plan prepared by an APCD/AQMD, for a county or region designated as a nonattainment area, for the purpose of bringing the area into compliance with the requirements of the national and/or California Ambient Air Quality Standards. AQMPs designed to attain national ambient air quality standards are incorporated into the SIP.

Area-wide Sources (also known as "area" sources): Smaller sources of pollution, including permitted sources smaller than the districts's emission reporting threshold and those that do not receive permits (e.g., water heaters, gas furnace, fireplaces, woodstoves, architectural coatings) that often are typically associated with homes and non-industrial sources. The California Clean Air Act requires districts to include area sources in the development and implementation of the AQMPs.

Atmosphere: The gaseous mass or envelope surrounding the earth.

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

Attainment Plan: In general, a plan that details the emission reducing control measures and their implementation schedule necessary to attain air quality standards. In particular, the federal Clean Air Act requires attainment plans for nonattainment areas; these plans must meet several requirements, including requirements related to enforceability and adoption deadlines.

BACT (Best Available Control Technology): The most up-to-date methods, systems, techniques, and production processes available to achieve the greatest feasible emission reductions for given regulated air pollutants and processes. BACT is a requirement of NSR (New Source Review) and PSD (Prevention of Significant Deterioration). BACT as used in federal law under PSD applies to permits for sources of attainment pollutants and other regulated pollutants is defined as an emission limitation based on the maximum degree of emissions reductions allowable taking into account energy, environmental & economic impacts and other costs. [(CAA Section 169(3)]. The term BACT as used in state law means an emission limitation that will achieve the lowest achievable emission rates, which means the most stringent of either the most stringent emission limits contained in the SIP for the class or category of source, (unless it is demonstrated that the limitation is not achievable) or the most stringent emission limit achieved in practice by that class in category of source. "BACT" under state law is more stringent than federal BACT and is equivalent to federal LAER (lowest achievable emission rate) which applies to nonattainment NSR permit actions.

BAR (Bureau of Automotive Repair): An agency of the California Department of Consumer Affairs that manages the implementation of the motor vehicle Inspection and Maintenance Program.

Basin (South Coast Air Basin): Area bounded by the Pacific Ocean to the west and the San Gabriel, San Bernardino, and San Jacinto Mountains to the north and east. It includes all of Orange County and the non-desert portions of Los Angeles, Riverside, and San Bernardino Counties.

Carrying Capacity: Amount of allowable regional emissions that would still meet health-based air quality standards.

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

CAAQS (California Ambient Air Quality Standards): Standards set by the State of California for the maximum levels of air pollutants which can exist in the outdoor air without unacceptable effects on human health or the public welfare. These are more stringent than NAAQS.

CARB (California Air Resources Board): The State's lead air quality agency, consisting of a nine-member Governor-appointed board. It is responsible for attainment and maintenance of the State and federal air quality standards, and is primarily responsible for motor vehicle pollution control. It oversees county and regional air pollution management programs.

CCAA (California Clean Air Act): A California law passed in 1988 which provides the basis for air quality planning and regulation independent of federal regulations. A major element of the Act is the requirement that local APCDs/AQMDs in violation of state ambient air quality standards must prepare attainment plans which identify air quality problems, causes, trends, and actions to be taken to attain and maintain California's air quality standards by the earliest practicable date.

CEQA (California Environmental Quality Act): A California law which sets forth a process for public agencies to make informed decisions on discretionary project approvals. The process aids decision makers to determine whether any environmental impacts are associated with a proposed project. It requires significant environmental impacts associated with a proposed project to be identified, disclosed, and mitigated to the maximum extent feasible.

CFCs (Chlorofluorocarbons): Any of a number of substances consisting of chlorine, fluorine, and carbon. CFCs are used for refrigeration, foam packaging, solvents, and propellants. They have been found to cause depletion of the atmosphere's ozone layer.

Chronic Health Effect: An adverse health effect which occurs over a relatively long period of time (e.g., months or years).

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

CMAQ (Community Multiscale Air Quality Model): A computer modeling system designed to address air quality as a whole by including state-of-the-science capabilities for modeling multiple air quality issues, including tropospheric ozone, fine particles, toxics, acid deposition, and visibility degradation.

CAMx (Comprehensive Air Quality Model with Extensions): An open-source modeling system for multi-scale integrated assessment of gaseous and particulate air pollution.

Conformity: Conformity is a process mandated in the federal Clean Air Act to insure that federal actions do not impede attainment of the federal health standards. General conformity sets out a process that requires federal agencies to demonstrate that their actions are air quality neutral or beneficial. Transportation conformity sets out a process that requires transportation projects that receive federal funding, approvals or permits to demonstrate that their actions are air quality neutral or beneficial and meet specified emissions budgets in the SIP.

Congestion Management Program: A state mandated program (Government Code Section 65089a) that requires each county to prepare a plan to relieve congestion and reduce air pollution.

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

Contingency Measure: Contingency measures are statute-required back-up control measures to be implemented in the event of specific conditions. These conditions can include failure to meet interim milestone emission reduction targets or failure to attain the standard by the statutory attainment date. Both State and federal Clean Air Acts require that District plans include contingency measures.

Electric Vehicle: A motor vehicle which uses a battery-powered electric motor as the basis of its operation. Such vehicles emit virtually no air pollutants. Hybrid electric motor vehicles may operate using both electric and gasoline powered motors. Emissions from hybrid electric motor vehicles are also substantially lower than conventionally powered motor vehicles.

EMFAC: The EMission FACtor model used by CARB to calculate on-road mobile vehicle emissions. The 2016 AQMP is based on the latest version, EMFAC2014.

Emission Inventory: An estimate of the amount of pollutants emitted from mobile and stationary sources into the atmosphere over a specific period such as a day or a year.

Emission Offset (also known as an emission trade-off): A regulatory requirement whereby approval of a new or modified stationary source of air pollution is conditional on the reduction of emissions from other existing stationary sources of air pollution or banked reductions. These reductions are required in addition to reductions required by BACT.

Emission Standard: The maximum amount of a pollutant that is allowed to be discharged from a polluting source such as an automobile or smoke stack.

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

Fugitive Dust: Dust particles which are introduced into the air through certain activities such as soil cultivation, off-road vehicles, or any vehicles operating on open fields or dirt roadways.

Goods Movement: An event that causes movement of commercial materials or stock typically at ports, airports, railways, highways, including dedicated truck lanes and logistics centers.

GHGs (Greenhouse Gases): A gas in an atmosphere that absorbs long-wave radiant energy reflected by the earth, which warms the atmosphere. GHGs also radiate long-wave radiation both upward to space and back down toward the surface of the earth. The downward part of this long-wave radiation absorbed by the atmosphere is known as the "greenhouse effect."

Growth Management Plan: A plan for a given geographical region containing demographic projections (i.e., housing units, employment, and population) through some specified point in time, and which provides recommendations for local governments to better manage growth and reduce projected environmental impacts.

HEV (Hybrid Electric Vehicles): Hybrids commercially available today combine an internal combustion engine with a battery and electric motor.

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

HFCV (Hydrogen Fuel Cell Vehicles): Vehicles that produce zero tailpipe emissions and run on compressed hydrogen fed into a fuel cell "stack" that produces electricity to power the vehicle.

Incentives: Tax credits, financial rebates/discounts, or non-monetary conveniences offered to encourage further use of advanced technology and alternative fuels for stationary and mobile sources.

Indirect Source: Any facility, building, structure, or installation, or combination thereof, which generates or attracts mobile source activity that results in emissions of any pollutant (or precursor). Examples of indirect sources include employment sites, shopping centers, sports facilities, housing developments, airports, commercial and industrial development, and parking lots and garages.

Indirect Source Control Program: Rules, regulations, local ordinances and land use controls, and other regulatory strategies of air pollution control districts or local governments used to control or reduce emissions associated with new and existing indirect sources.

Inspection and Maintenance Program: A motor vehicle inspection program implemented by the BAR. It is designed to identify vehicles in need of maintenance and to assure the effectiveness of their emission control systems on a biennial basis. Enacted in 1979 and strengthened in 1990. (Also known as the "Smog Check" program.)

LEV (Low Emission Vehicle): A vehicle which is certified to meet the CARB 1994 emission standards for low emission vehicles.

Maintenance Plan: In general, a plan that details the actions necessary to maintain air quality standards. In particular, the federal Clean Air Act requires maintenance plans for areas that have been redesignated as attainment areas.

Mobile Sources: Moving sources of air pollution such as automobiles, motorcycles, trucks, off-road vehicles, boats and airplanes.

Model Year: Model year refers to the actual annual production period (year) as determined by the manufacturer.

NAAQS (National Ambient Air Quality Standards): Standards set by the federal U.S. EPA for the maximum levels of air pollutants which can exist in the outdoor air without unacceptable effects on human health or the public welfare.

Near-Zero Emission Technologies: Refers to emissions approaching zero and will be delineated for individual source categories through the process of developing the Air Quality Management Plan/State Implementation Plan and subsequent control measures.

NOx (Nitrogen Oxides, Oxides of Nitrogen): A general term pertaining to compounds of nitric acid (NO), nitrogen dioxide (NO_2), and other oxides of nitrogen. Nitrogen oxides are typically created during combustion processes, and are major contributors to smog formation and acid

deposition. NO_2 is a criteria air pollutant, and may result in numerous adverse health effects; it absorbs blue light, resulting in a brownish-red cast to the atmosphere and reduced visibility.

Nonattainment Area: A geographic area identified by the U.S. EPA and/or CARB as not meeting either NAAQS or CAAQS standards for a given pollutant.

NSR (New Source Review): A program used in development of permits for new or modified industrial facilities which are in a nonattainment area, and which emit nonattainment criteria air pollutants. The two major requirements of NSR are Best Available Control Technology and Emission Offsets.

Ozone: A strong smelling reactive toxic chemical gas consisting of three oxygen atoms. It is a product of the photochemical process involving the sun's energy. Ozone exists in the upper atmosphere ozone layer as well as at the earth's surface. Ozone at the earth's surface causes numerous adverse health effects and is a criteria air pollutant. It is a major component of smog.

Ozone Precursors: Chemicals such as hydrocarbons and oxides of nitrogen, occurring either naturally or as a result of human activities, which contribute to the formation of ozone, a major component of smog.

PZEV (Partial Zero Emission Vehicle): A vehicle emissions rating within California's exhaust emission standards. Cars that are certified as PZEVs meets the Super Ultra Low Emission Vehicle exhaust emission standard and has zero evaporative emissions from its fuel system.

Permit: Written authorization from a government agency (e.g., an air quality management district) that allows for the construction and/or operation of an emissions generating facility or its equipment within certain specified limits.

PIC (Particle-in-Cell) Model: An air quality simulation model that is used to apportion sulfate and nitrate PM10 concentrations to their precursor emissions sources. The PIC model uses spatially and temporally resolved sources of NOx and SOx emissions, with meteorological, physical, and simplified chemical processes, to calculate the contributions from various emission source categories.

PEV (Plug-in Electric Vehicle): Vehicles that can be recharged from any external source of electricity and the electricity is stored in a rechargeable battery pack to drive or contribute to drive the wheels.

PHEV (Plug-in Hybrid Electric Vehicle): Vehicles similar to traditional hybrids but are also equipped with a larger, more advanced battery that allows the vehicle to be plugged in and recharged in addition to refueling with gasoline. This larger battery allows the car to drive on battery alone, gasoline alone, or a combination of electric and gasoline fuels.

PM (Particulate Matter): Solid or liquid particles of soot, dust, smoke, fumes, and aerosols.

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

PM2.5 (Particulate Matter less than 2.5 microns): A major air pollutant consisting of tiny solid or liquid particles, generally soot and aerosols. The size of the particles (2.5 microns or smaller, about 0.0001 inches or less) allows them to easily enter the air sacs deep in the lungs where they may cause adverse health effects, as noted in several recent studies. PM2.5 also causes visibility reduction and is a criteria air pollutant.

PSD (Prevention of Significant Deterioration): A program used in development of permits for new or modified industrial facilities in an area that is already in attainment. The intent is to prevent an attainment area from becoming a non-attainment area. This program, like require BACT as defined in the Clean Air Act and, if an AAQS is projected to be exceeded, Emission Offsets.

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

RTP (Regional Transportation Plan): The long-range transportation plan developed by the Southern California Association of Governments that provides a vision for transportation investments throughout the South Coast region. The RTP considers the role of transportation in the broader context of economic, mobility, environmental, and quality-of-life goals for the future, identifying regional transportation strategies to address regional mobility needs.

ROG (Reactive Organic Gas): A reactive chemical gas, composed of hydrocarbons, that may contribute to the formation of smog. Also sometimes referred to as Non-Methane Organic Compounds (NMOCs). (Also see VOC.)

SSAB (Salton Sea Air Basin): Area comprised of a central portion of Riverside County (the Coachella Valley) and Imperial County. The Riverside county portion of the SSAB is bounded by the San Jacinto Mountains in the west and spans eastward up to the Palo Verde Valley.

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

Smog: A combination of smoke, ozone, hydrocarbons, nitrogen oxides, and other chemically reactive compounds which, under certain conditions of weather and sunlight, may result in a murky brown haze that causes adverse health effects. The primary source of smog in California is motor vehicles. (See Inspection and Maintenance Program.)

Smoke: A form of air pollution consisting primarily of particulate matter (i.e., particles). Other components of smoke include gaseous air pollutants such as hydrocarbons, oxides of nitrogen, and carbon monoxide. Sources of smoke may include fossil fuel combustion, agricultural burning, and other combustion processes.

SO_2 (Sulfur Dioxide): A strong smelling, colorless gas that is formed by the combustion of fossil fuels. Ocean-going vessels, which may use oil high in sulfur content, can be major sources of SO_2. SO_2 and other sulfur oxides contribute to ambient PM2.5. SO_2 is also a criteria pollutant.

Stationary Sources: Non-mobile sources such as power plants, refineries, and manufacturing facilities which emit air pollutants; can include area sources depending on context.

SULEV (Super Ultra Low Emission Vehicle): A vehicle emissions rating within California's LEV 1 and LEV 2 exhaust emission standards.

SCS (Sustainable Communities Strategy): Planning element in the RTP that integrates land use and transportation strategies that will achieve CARB's GHG emissions reduction targets.

TAC (Toxic Air Contaminant): An air pollutant, identified in regulation by the CARB, which may cause or contribute to an increase in deaths or in serious illness, or which may pose a present or potential hazard to human health. TACs are considered under a different regulatory process (California Health and Safety Code Section 39650 et seq.) than pollutants subject to CAAQS. Health effects due to TACs may occur at extremely low levels, and it is typically difficult to identify levels of exposure which do not produce adverse health effects.

TCM (Transportation Control Measure): Under Health & Safety Code Section 40717, any control measure to reduce vehicle trips, vehicle use, vehicle miles traveled, vehicle idling, or traffic congestion for the purpose of reducing motor vehicle emissions. TCMs can include encouraging the use of carpools and mass transit. Under federal law, includes, but is not limted to those measures listed in CAA Section 108(f).

UFP (Ultrafine Particles): Particles with a diameter less than 0.1 μm (or 100 nm).

ULEV (Ultra Low Emission Vehicle): Vehicles with low emission ratings within California's LEV 1 or LEV 2 exhaust emission standards. The LEV 1 emission standards typically apply to cars from 1994–2003. The LEV 2 emission standards were adopted in 1998 and typically apply to cars from 2004–2010.

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

VMT (Vehicle Miles Traveled): Total vehicle miles traveled by all or a subset of mobile sources.

Visibility: The distance that atmospheric conditions allow a person to see at a given time and location. Visibility reduction from air pollution is often due to the presence of sulfur and nitrogen oxides, as well as particulate matter.

VOCs (Volatile Organic Compounds): Hydrocarbon compounds that exist in the ambient air. VOCs contribute to the formation of smog and/or may themselves be toxic. VOCs often have an odor, and some examples include gasoline, alcohol, and the solvents used in paints.

Zero-Emission Technologies: Advanced technology or control equipment that generates zero end-use emissions from stationary or mobile source applications.

ZEV (Zero Emission Vehicle): A vehicle that produces no emissions from the on-board source of power.