

# SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

---

## Draft CAA Section 182(e)(5) Contingency Measure Plan

### Planning for Attainment of the 1997 80 ppb 8-Hour Ozone Standard in the South Coast Air Basin

#### October 2019

##### Deputy Executive Officer

Planning, Rule Development, and Area Sources  
Philip M. Fine, Ph.D.

##### Assistant Deputy Executive Officer

Planning, Rule Development, and Area Sources  
Sarah L. Rees, Ph.D.

##### Planning and Rules Manager

Planning, Rule Development, and Area Sources  
Zorik Pirveysian

---

Authors: Kalam Cheung, Ph.D. – Program Supervisor – South Coast AQMD  
Sang-Mi Lee, Ph.D. – Program Supervisor – South Coast AQMD  
Brian Choe – Program Supervisor – South Coast AQMD  
Britney Gallivan – AQ Specialist – South Coast AQMD  
Kelly Trainor Gamino – AQ Specialist – South Coast AQMD  
Philip Crabbe III, Public Affairs Manager  
Carol Sutkus – Air Quality Planning Manager - CARB  
Scott King, Ph.D. – Air Quality Pollution Specialist – CARB

Contributors: Ian McMillan, Planning and Rules Manager  
Shah Dabirian, Ph.D., Program Supervisor  
Ryan Finseth, Ph.D., Air Quality Specialist  
Paul Stroik, Ph.D., Air Quality Specialist

Reviewed by: Barbara Baird, Esq. – Chief Deputy Counsel – South Coast AQMD  
Megan Lorenz – Principal Deputy District Counsel – South Coast AQMD  
Sylvia Vanderspek – Air Quality Planning Branch Chief – CARB  
Kurt Karperos – Deputy Executive Officer – CARB

**SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT**

**GOVERNING BOARD**

Chairman: DR. WILLIAM A. BURKE  
Speaker of the Assembly Appointee

Vice Chairman: BEN BENOIT  
Council Member, Wildomar  
Cities of Riverside County

**MEMBERS:**

LISA BARTLETT  
Supervisor, Fifth District  
County of Orange

JOE BUSCAINO  
Council Member, 15<sup>th</sup> District  
City of Los Angeles Representative

MICHAEL A. CACCIOTTI  
Council Member, South Pasadena  
Cities of Los Angeles County/Eastern Region

VANESSA DELGADO  
Senator (Ret.)  
Senate Rules Committee Appointee

JANICE HAHN  
Supervisor, Fourth District  
County of Los Angeles

LARRY MCCALLON  
Mayor Pro Tem, Highland  
Cities of San Bernardino County

JUDITH MITCHELL  
Mayor, Rolling Hills Estates  
Cities of Los Angeles County/Western Region

V. MANUEL PEREZ  
Supervisor, Fourth District  
County of Riverside

DWIGHT ROBINSON  
Council Member, Lake Forest  
Cities of Orange County

JANICE RUTHERFORD  
Supervisor, Second District  
County of San Bernardino

VACANT  
Governor's Appointee

EXECUTIVE OFFICER:  
WAYNE NASTRI

## TABLE OF CONTENTS

<b>EXECUTIVE SUMMARY .....</b>	<b>1</b>
<b>1. BACKGROUND AND ACHIEVING ATTAINMENT OF THE 80 PPB .....</b>	<b>7</b>
<b>STANDARD .....</b>	<b>7</b>
<b>1. a. Progress toward Attainment of the 1997 8-Hour Ozone Standard .....</b>	<b>7</b>
<b>1. b. History of Air Quality Planning in the South Coast AQMD .....</b>	<b>10</b>
<b>1. c. Emission Benefits from the Existing Programs .....</b>	<b>20</b>
<b>1. d. Clean Air Act Section 182(e)(5) Contingency Measure Requirements.....</b>	<b>31</b>
<b>1. e. Total Reductions Needed to Attain.....</b>	<b>32</b>
<b>1. f. 182(e)(5) Commitments in the 2016 AQMP .....</b>	<b>32</b>
<b>2. CONTINGENCY MEASURE PLAN .....</b>	<b>36</b>
<b>3 IDENTIFIED MEASURES THAT CAN ACHIEVE REDUCTIONS BY 2023.....</b>	<b>37</b>
<b>3. a. CARB Regulations Providing NOx Reductions Not Included in the 2016 .....</b>	<b>37</b>
<b>3. b. CARB Innovative New Measures.....</b>	<b>39</b>
<b>3. c. South Coast AQMD Measures Providing NOx Reductions Not Included in the 2016 AQMP .....</b>	<b>41</b>
<b>4. ADDITIONAL INCENTIVE FUNDING THROUGH SOUTH COAST AQMD’S STATE LEGISLATIVE EFFORTS .....</b>	<b>49</b>
<b>5. FEDERAL MEASURES AND FEDERAL RESPONSIBILITY .....</b>	<b>51</b>
<b>5. a. NOx Emissions from Sources Under Federal Responsibility are an Increasing Portion of the Inventory .....</b>	<b>51</b>
<b>5. b. California Lacks Direct Regulatory Authority Over Significant Sources .....</b>	<b>51</b>
<b>5. c. Defined Measures to Reduce NOx from Federal and International Sources .....</b>	<b>52</b>
<b>6. PUBLIC PROCESS .....</b>	<b>59</b>

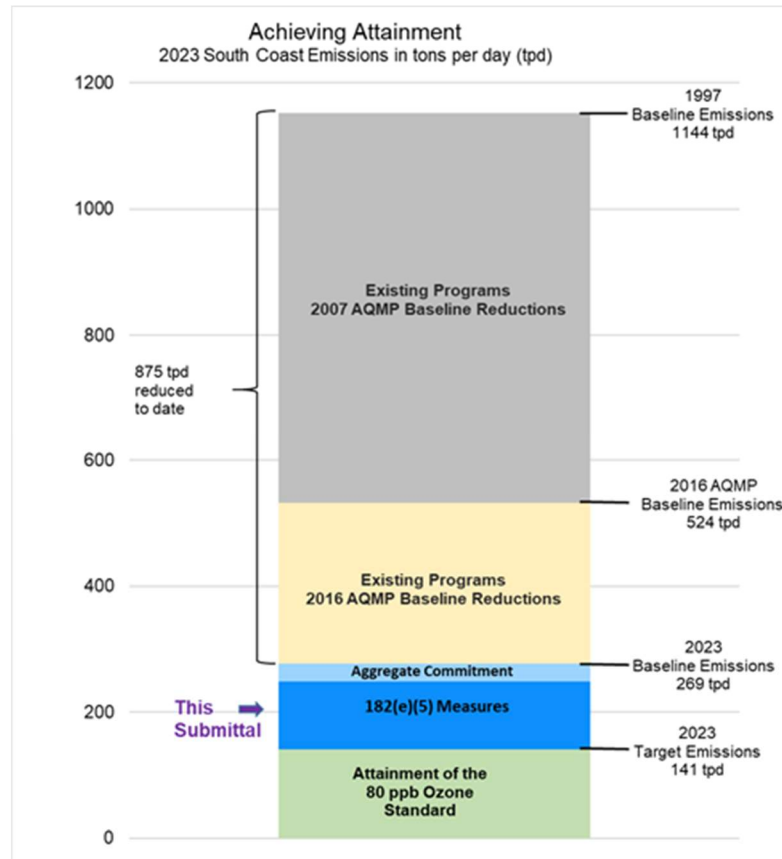
## EXECUTIVE SUMMARY

The South Coast Air Basin (Basin) has faced poor air quality dating back over eight decades. The first recognized episodes of photochemical smog (ozone) occurred in Los Angeles in the summer of 1943 with visibility reduced to only three blocks. With a booming industry and growing economy, the region continued to experience significant levels of air pollution. Increasing awareness of the impacts of air pollution on human health and the environment led to the development of air pollution control laws in California and at the federal level, culminating in the federal Clean Air Act (Act or CAA). As a result of California and federal requirements, aggressive air pollution control programs have been put in place which have drastically improved the air quality in the Basin despite significant increases in population and vehicles. Since the 1950s, the maximum levels of ozone have decreased by 75% while the population and number of vehicles have increased by three and four fold, respectively. Incidents of Stage I smog alerts, which used to occur 100-120 times a year, have been eliminated. Ozone levels sufficient to trigger Stage II smog alerts levels have not occurred since the 1980s. Also, the National Ambient Air Quality Standards (NAAQS) for Carbon Monoxide (CO), Nitrogen Dioxide (NO<sub>2</sub>) and Particulate matter less than 10 microns (PM<sub>10</sub>) have all been achieved in the Basin.

Since the mid-20th century, the greater Los Angeles region has been at the forefront of air pollution science and research, low- and zero-emissions technology development, and innovative air quality regulations and programs. Significant advancements have been achieved in both stationary and mobile source control technologies for reducing emissions. Despite these efforts and the corresponding substantial improvements in air quality that we have achieved, the health of our residents continues to be seriously affected by the poor air quality that confronts the region. The region's unique topography and meteorology coupled with emissions from millions of vehicles, and a thriving economy including the 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 ozone standards which present a significant challenge for the region to attain.

In 1997, U.S. EPA set a new health protective 8-hour ozone standard (standard) at 80 parts per billion (ppb), replacing the previous 1-hour ozone standard. U.S. EPA designated the Basin as Extreme nonattainment for this standard. In 2007, the South Coast AQMD's 2007 Air Quality Management Plan (AQMP) outlined a detailed path for the area to attain this standard by the CAA deadline of 2024 (emission reductions to occur in 2023). As part of this attainment strategy, the 2007 AQMP relied on a provision in the Act, section 182(e)(5), that allows areas classified as Extreme nonattainment to include emissions reductions from measures that anticipate reductions from future advanced technologies. When this provision is relied upon to demonstrate attainment, the area must make an enforceable commitment to submit contingency measures to U.S. EPA three years before the reductions are needed to attain the standard. In this submittal, the State must demonstrate that the assumed reductions from section 182(e)(5)'s future technology were already achieved, or if not, the State must submit contingency measures capable of achieving the remaining emission reductions. This Contingency Measure Plan is intended to meet that requirement.

While ozone forms in the atmosphere from a photochemical reaction of NO<sub>x</sub> and VOCs, NO<sub>x</sub> is the key pollutant that must be controlled to reduce ozone in our region. NO<sub>x</sub> is typically formed as a byproduct of combustion processes – such as those in power plants, boilers, and engines. As we have implemented increasingly more stringent requirements on stationary sources to control NO<sub>x</sub> emissions, emissions from mobile sources – such as trucks, locomotives, ships and planes – have grown to dominate NO<sub>x</sub> emissions. Today, over 80% of the NO<sub>x</sub> emissions in our region are from mobile sources. Figure ES-1 illustrates the great progress that California Air Resource Board (CARB) and South Coast AQMD have made in reducing NO<sub>x</sub> emissions since the standard was set in 1997. Since that time, NO<sub>x</sub> emissions have been reduced by 76% through CARB and South Coast AQMD’s regulations and programs.



**Figure ES-1:** NO<sub>x</sub> Emission Reductions, Commitments and Requirements in the South Coast Air Basin

In the 2016 AQMP, the South Coast AQMD updated its attainment demonstration to achieve the 1997 standard in 2023. While this new attainment demonstration still relies on the section 182(e)(5)’s future technology provision, the reductions needed from this provision are dramatically reduced – from 241 tons per day (tpd) NO<sub>x</sub> in the 2007 AQMP, to 108 tpd of NO<sub>x</sub> in the 2016 AQMP. The 2007 AQMP’s reliance on section 182(e)(5) was necessary as new technologies were at that time in their earliest stages of development, and some technologies were not yet foreseen. However, in the 2016 AQMP, the types of advanced technologies needed to achieve attainment were identified and were either

already commercially available or were to be available by 2023. The main challenge was to rapidly turn over to these new technologies. An additional obstacle for California exists since many of the older vehicles and engines that need to be replaced with new technologies are not under the States' regulatory authority but rather are under federal authority and therefore require federal action to provide these reductions. In Figure ES-1, the 108 tpd NO<sub>x</sub> emissions reductions that are remaining for section 182(e)(5) provisions and which are addressed in this draft Contingency Measure Plan are represented by the darker blue section.

This draft Contingency Measure Plan represents a joint strategy by South Coast AQMD and CARB for achieving the 108 tons per day of NO<sub>x</sub> reductions allocated to section 182(e)(5) measures needed to attain the 1997 8-hour ozone standard in 2023. Achieving the standard in this short timeframe represents a tremendous challenge for the South Coast region - especially given the meteorological factors in the region conducive to poor air quality - and will require significant deployment of near-zero and zero-emission technologies and substantial levels of incentive funding to accelerate turnover to these cleaner technologies. While California and South Coast AQMD continue to implement their ongoing efforts, federal actions and measures are absolutely critical for meeting this standard. Without significant reductions from federal sources, we will be unable to attain the 1997 ozone standard in 2023.

The draft Contingency Measure Plan includes: 1) newly identified emission reduction strategies and innovative new measures; 2) additional incentive funding to transition to the cleanest available technologies; and 3) significant federal action and/or funding to achieve the required reductions from sources under federal responsibility.

### *South Coast AQMD and CARB have Identified New Strategies*

To develop this plan, CARB and the South Coast AQMD have re-evaluated the sources of emissions in the Basin and developed further strategies to reduce emissions. Those strategies are reflected in this document as newly identified strategies. These strategies fall into two categories: Identified Emission Reduction Strategies shown in Table ES-1, and Innovative New Measures listed in Table ES-2.

The Identified Emission Reductions Strategies represent a next round of regulations and programs that both agencies are working toward in implementing the 2016 AQMP. These are efforts that have been adopted or are soon-to-be-adopted since adoption of the 2016 AQMP, but for which emission reductions were not included in the 2016 AQMP. The Innovative New Measures represent the next step of pushing the envelope to achieve more reductions at the State level. CARB continues to seek out new and innovative opportunities for emission reductions.

**Table ES-1: Identified Emission Reduction Strategies**

Measures Description	Agency	NOx Reductions (tpd)
RECLAIM Transition Rules	South Coast AQMD	2
Ports MOU	South Coast AQMD	3-5
Airports MOU	South Coast AQMD	0.5
Metrolink Locomotives	South Coast AQMD	3
OGV Vessel Speed Reduction	South Coast AQMD	0.2
Funding Incentives (Expected Future Funding)	South Coast AQMD	1.5
Low Carbon Fuel Standard and Alternative Diesel Fuels Regulation	South Coast AQMD	1.7
ATCM for Portable Engines, and the Statewide Portable Equipment Registration Program	CARB	0.25
HD Inspection and Maintenance (I/M) Program	CARB	4.2
Innovative New Measures	CARB	3.0
<b>Total Reductions Towards 182(e)(5) Commitment*</b>		<b>24-26 tpd</b>

\* Preliminary estimates; also includes 4.2 tons per day of reductions associated with updated OGV emissions inventory and CARB’s SIP Strategy for OGV.

**Table ES-2: CARB’s Innovative New Measures**

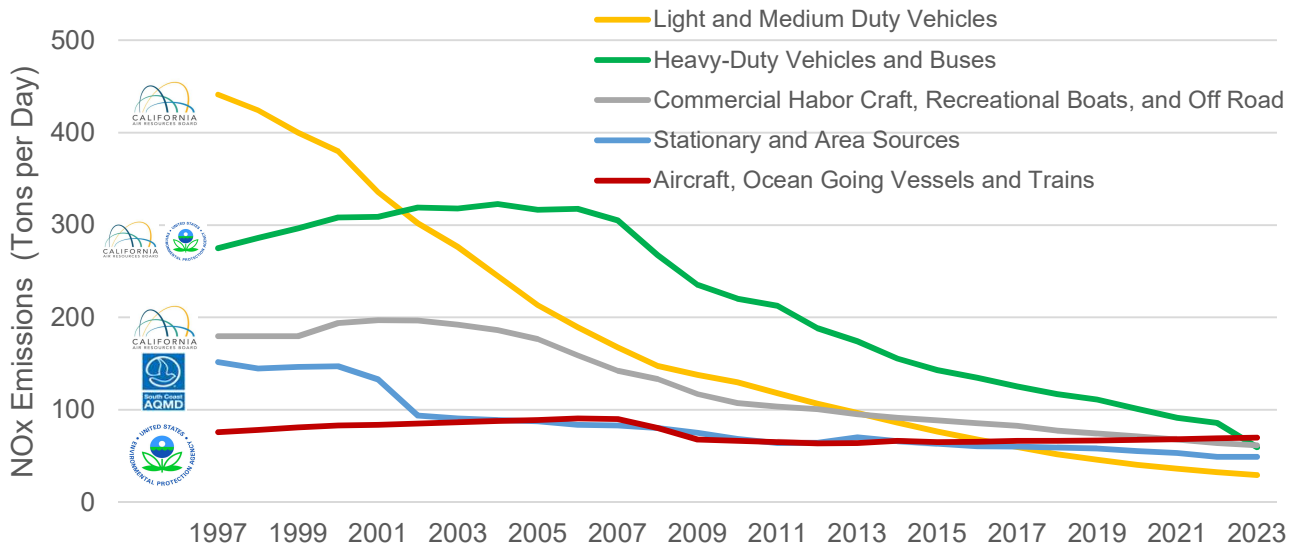
Measures
Tier 5 Off-Road Diesel Engine Standard
State Green Contracting
Reduction in Growth of Single-Occupancy Vehicle Travel
Locomotive Emission Reduction Measure
VMT and Land Conservation
Regional VMT Reductions
Co-benefits from Electrification of Buildings due to 2017 Climate Change Scoping Plan

*Additional Sources of Funding*

Since the inception of the Carl Moyer Program over 20 years ago, over \$2 billion of incentive funding has been spent in the South Coast region to accelerate the introduction of cleaner mobile and stationary source technologies. The role of incentive funding has been critical to provide the appropriate market signals to advance the development of these cleaner technologies into full commercialization. Based on the analysis in the 2016 AQMP, over \$1 billion of additional incentive funding is required per year over 14 years to achieve the needed reductions to meet the ozone standards in the Basin in 2023 and 2031. Since the adoption of the 2016 AQMP, South Coast AQMD has been aggressively pursuing new sources of funding. These efforts have led to an approximate doubling of incentive funding, now roughly between \$200-300 million per year. However, this has not been enough to meet the 2016 AQMP funding goals, and several years have been lost. Based on South Coast AQMD’s preliminary analysis, an additional 15 tons per day of NOx reductions could be achieved in 2023 from continuing efforts to secure additional funding.

*A Call for Action*

California and South Coast AQMD have pushed advances in clean technology, innovative regulations, and incentive programs to adopt the most comprehensive, aggressive, and successful strategy to reduce emissions from mobile sources in the nation. As a direct result of California’s programs, NOx emissions from those mobile sources under California’s authority have decreased by approximately 83 percent since 2000, as shown in Figure ES-2. California will be able to achieve a significant amount of the last portion of reductions needed to reach attainment in 2023. However, to achieve all of the reductions necessary to reach attainment, the State, South Coast AQMD and the federal government will need to work together with all stakeholders to drastically lower emissions to achieve the needed reductions.

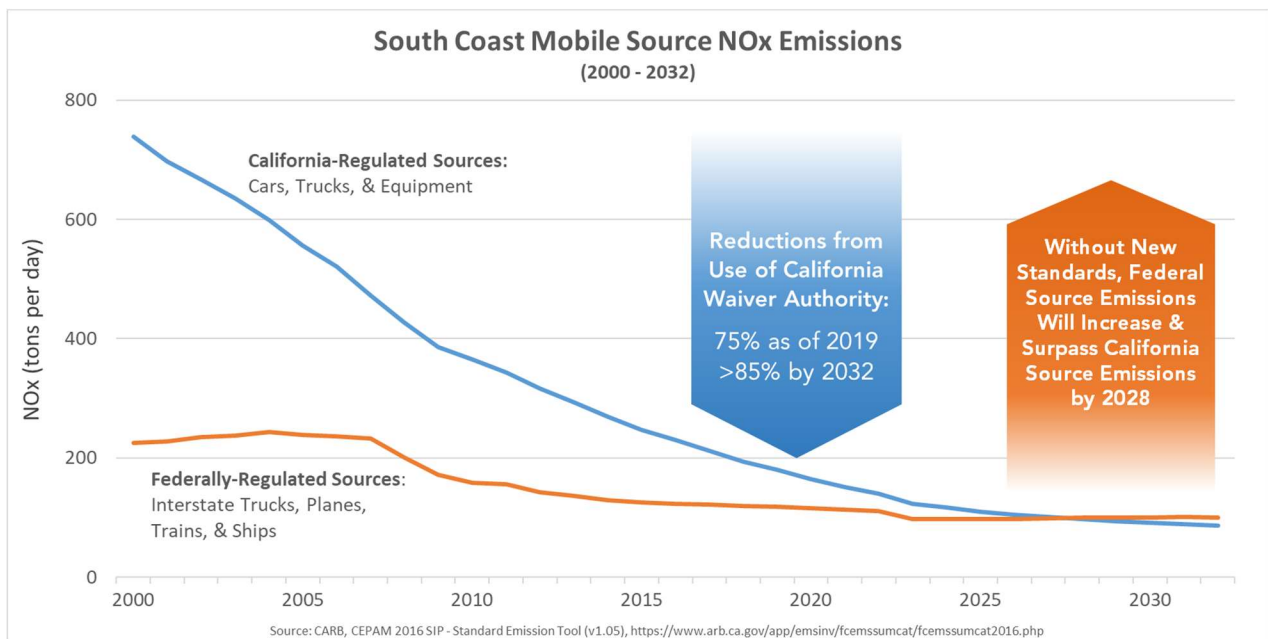


**Figure ES-2: Progress in Reducing South Coast NOx Emissions by Agency**



California relies on U.S. EPA to lower emissions from sources that the federal government alone has the authority to regulate. Historically, NOx emissions from federally regulated sources were a relatively small portion of the total NOx inventory. In 2000, emissions from aircraft, trains, and ocean-going vessels together made up approximately 7 percent of California’s total NOx inventory. While California adopted programs to lower NOx emissions from the mobile sources under California’s control, U.S. EPA has not kept pace in reducing NOx emissions from sources under federal control. As a result, those same federal sources are today responsible for over 19 percent of NOx emissions in the South Coast, and that percentage is projected to continue to rise. While total NOx emissions have decreased in South Coast by nearly 70 percent from 1997, NOx emissions from federal sources outside of California’s control have only decreased by 15 percent since 1997, and are projected to increase in the future without federal action.

As California and the South Coast AQMD continue to pursue the cleanest technologies and adopt the most stringent regulations and programs in the nation, federal action is critical for meeting this standard. As Figure ES-2 shows, aircraft, ocean going vessels, and trains’ total emissions have been almost flat and will be slightly increase in the future. Absent federal action, these emissions will continue to increase, as shown in Figure ES-3. To the extent that U.S. EPA fails to act on federal sources that are beyond California’s regulatory control, California would need to achieve reductions from these sources through voluntary incentive programs. The funding to achieve the necessary reductions dramatically exceeds current resources. Given that these sources are under federal authority and thus, responsibility, significant levels of federal incentive funding to reduce emissions from federal sources, and/or federal regulatory actions to achieve the remaining level of reductions is necessary for attainment in 2023.



**Figure ES-3: Federal Sources Overtake State Sources in the Future**

## 1. BACKGROUND AND ACHIEVING ATTAINMENT OF THE 80 PPB STANDARD

### 1. a. Progress toward Attainment of the 1997 8-Hour Ozone Standard

In 1979, the U.S. EPA established primary and secondary national ambient air quality standards (NAAQS or standards) for ozone at 0.12 parts per million (ppm) averaged over a 1-hour period. The South Coast Air Basin was classified as an "extreme" nonattainment area<sup>1</sup> and, in 1990, was given an attainment deadline of November 15, 2010.

On July 18, 1997, the U.S. EPA revised the primary and secondary standards for ozone to 0.08 ppm, averaged over an 8-hour period ("1997 8-hour ozone standards"), and revoked the one-hour ozone standard. U.S. EPA guidance on the revoked one-hour ozone standard indicated that although the standard was revoked, certain planning requirements, known as anti-backsliding requirements, remained in effect. The Basin was classified as Severe 17 for the new eight-hour standard with an attainment date of June 2021. Due to challenges in attaining the 8-hour ozone standard, as permitted by the Clean Air Act, South Coast AQMD requested a voluntary re-designation of the Basin to "Extreme," with a new attainment date of June 15, 2024.

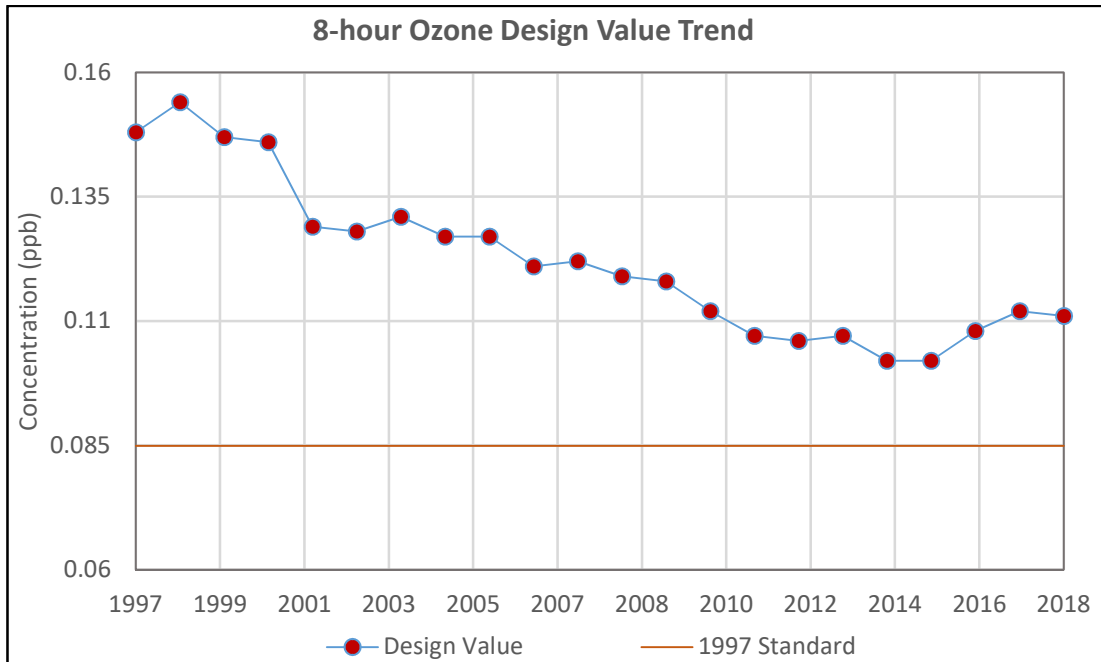
U.S. EPA revoked the 1997 8-hour ozone standard (0.08 ppm) in the 2008, and promulgated the 2008 8-hour ozone NAAQS (0.075 ppm). Then in 2015, EPA revised the 8-hour standard to 0.070 ppm, effective December 2015. The South Coast Air Basin is classified as an Extreme nonattainment area for all three 8-hour ozone standards and has 20 years to attain each standard from the effective date of the final designation. Table 1-1 summarizes the attainment date and the attainment status for each of the federal ozone air quality standards for South Coast Air Basin.

**Table 1-1**  
Attainment Status of the Federal Ozone Air Quality Standards of the South Coast Air Basin

Criteria Pollutant	Averaging Time	Designation	Attainment Date
Ozone (O <sub>3</sub> )	(1979) 1-Hour (0.12 ppm)	Nonattainment (Extreme)	2/6/2023
	(1997) 8-Hour (0.08 ppm)	Nonattainment (Extreme)	6/15/2024
	(2008) 8-Hour (0.075 ppm)	Nonattainment (Extreme)	7/20/2032
	(2015) 8-Hour (0.070 ppm)	Nonattainment (Extreme)	8/3/2038

<sup>1</sup> U.S. EPA classifies ozone nonattainment areas in one of five different categories (marginal, moderate, serious, severe, and extreme) depending on how much the levels of ozone in the area exceed the standard. The "extreme" category is for the worst levels of ozone pollution.

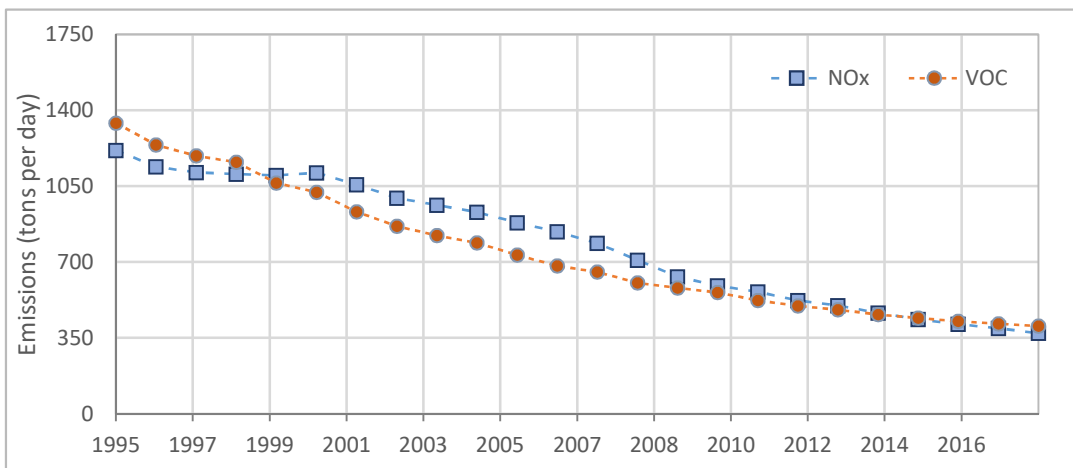
Air quality in the South Coast Air Basin has improved significantly over many decades. Figure 1-1 shows the trend of the 8-hour ozone design value in the Basin from 1997 to 2018.<sup>2</sup> Consistent with the individual National Ambient Air Quality Standard, design values are typically used to designate and classify nonattainment areas, as well as to assess progress towards meeting the NAAQS. The 8-hour ozone design value is a three-year average of the 99th percentile highest value (4th highest daily maximum of 8-hour-average concentrations). While the ozone concentration in the Basin shows a steadily decreasing trend, year-to-year fluctuations are noticeable. This is mostly due to meteorological conditions, such as temperature, precipitation, and humidity, which affect the chemistry, mixing and transport of ozone and its chemical precursors. Global scale atmospheric dynamics such as El Nino or La Nina affect the Basin level air quality as well, since the global scale circulation patterns bring anomalous weather patterns such as above-average precipitation, stagnant conditions, or stronger subsidence that can either improve air quality or enhance pollution. The unusually high ozone concentrations observed in the 2016 to 2018 period were likely attributable to meteorological abnormalities that triggered excessive photochemical production of ozone and prolonged stagnation of air pollution. South Coast AQMD is currently conducting a study to analyze meteorological factors and trends to explain the poor air quality observed in the recent years despite continuing and demonstrable reductions in emissions.



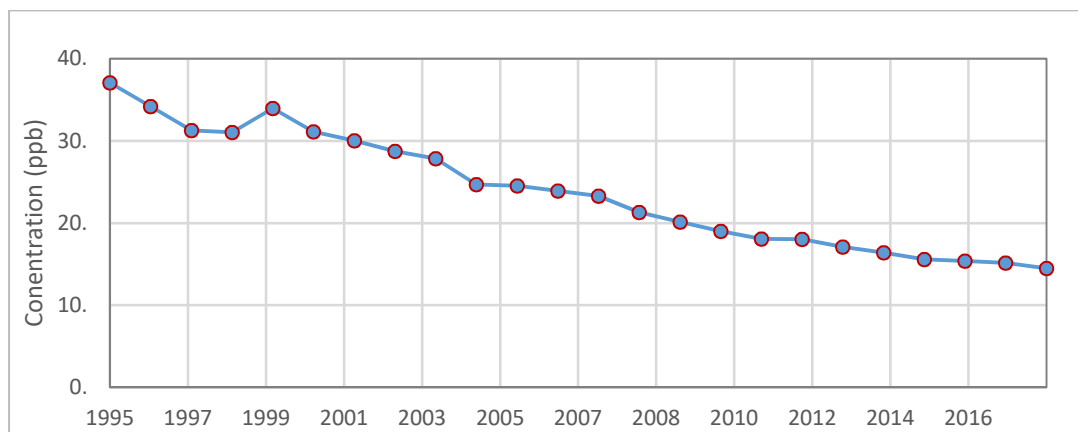
**Figure 1-1**  
The 8-hour ozone design value in the South Coast Air Basin

<sup>2</sup> A design value is a statistic that describes the air quality status of a given location relative to the level of the NAAQS.

The progress in reducing ambient ozone concentrations is due to the reduction of ozone precursor pollutants in the past several decades. Ozone is a secondary air pollutant; ozone is not emitted directly from human activities or natural sources, but is chemically produced in the atmosphere. Emissions of NO<sub>x</sub> and VOC react in the presence of ultraviolet light to form ozone. Figure 1-2 illustrates the Basin’s total emissions of NO<sub>x</sub> and VOC from anthropogenic sources. NO<sub>x</sub> and VOC emissions have decreased by 70% and 75%, respectively, from 1995 to 2018 and are expected to continue the trend in the future years due to continuing implementation of existing and upcoming regulations. Measured ambient nitrogen dioxide (NO<sub>2</sub>) concentrations provide further evidence regarding the decrease in NO<sub>x</sub> emissions. An analysis of monitoring data between 1995 and 2018 indicates that ambient NO<sub>2</sub> levels have been reduced by over 60%, similar to the emission reductions indicated in Figure 1-3.



**Figure 1-2**  
Basin Total NO<sub>x</sub> and VOC emissions



**Figure 1-3**  
Annual average NO<sub>2</sub> concentrations in the South Coast Air Basin<sup>3</sup>

<sup>3</sup> Seventy-five percent data completeness criteria was applied.

## **1. b. History of Air Quality Planning in the South Coast AQMD**

The federal Clean Air Act (CAA) requires areas that are not in attainment of the NAAQS to develop and implement emission reduction strategies that will bring the area into attainment by the required attainment dates. The Air Quality Management Plan (AQMP) is the regional blueprint for achieving air quality standards, and is designed to meet both federal and state CAA planning requirements. The AQMP is jointly developed by South Coast AQMD, CARB and Southern California Association of Governments (SCAG), and is submitted as part of the State Implementation Plan (SIP) to the U.S. EPA for evaluation and approval. The South Coast AQMD addressed attainment of the 1997 8-hour ozone standard of 80 ppb beginning in the 2007 AQMP, with updates provided subsequently in the 2012 and 2016 AQMPs.

### **1. b. i. Air Quality Management Plans**

#### ***2007 AQMP***

The CAA required that areas designated as nonattainment for the 1997 8-hour ozone standard submit a SIP to the U.S. EPA by June 15, 2007. The 2007 AQMP<sup>4</sup> was developed in adherence with this provision and was the first South Coast SIP to address this standard. The 2007 AQMP control strategy consisted of four components: 1) the South Coast AQMD's Stationary and Mobile Source Control Measures, 2) CARB's Proposed Revised Draft State Strategy, 3) South Coast AQMD Policy Options to Supplement CARB's Control Strategy, and 4) Regional Transportation Strategy and Transportation Control Measures provided by SCAG. The magnitude of the NO<sub>x</sub> emission reductions needed for attainment of the 1997 ozone NAAQS posed a significant challenge requiring 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. Overall, the 2007 AQMP included 31 stationary and 30 mobile source measures. Based on the emission inventory and modeling analysis, the overall projected emission reductions needed to meet the 1997 8-hour ozone standard were 116 tons per day of VOC and 383 tons per day of NO<sub>x</sub> in 2023. A summary of the 2007 AQMP summer planning emission inventory and reductions is provided in Table 1-2.

The South Coast AQMD's short-term and mid-term control strategies for stationary and mobile sources were based on the following approaches: 1) facility modernization; 2) energy efficiency and conservation; 3) good management practices; 4) market incentives/compliance flexibility; 5) area source programs; 6) emission growth management; and 7) mobile source programs. The 2007 AQMP's long-term strategy built upon the long-term reductions associated with the implementation of short- and mid-term control measures or actions proposed by the South Coast AQMD, SCAG, and CARB. For achieving the remainder of the reductions needed for attainment, the long-term strategy primarily relied on long-term control measures based on new advanced technologies and control techniques or

---

<sup>4</sup> <http://www.aqmd.gov/home/air-quality/clean-air-plans/air-quality-mgt-plan/2007-air-quality-management-plan>

significant improvement of existing technologies which could not be specifically defined at the time. CAA section 182(e)(5) specifically authorizes the inclusion of such long-term measures, often referred to as the “black box,” for extreme ozone nonattainment areas. After implementation of the South Coast AQMD’s proposed measures and CARB’s State Strategy, the size of the black box was estimated to be 27 tons per day of VOC and 190 tons per day of NOx, representing 43% of the overall combined VOC and NOx reductions needed for ozone attainment in 2023. The following table provides a list of some of the advanced technologies and innovative control approaches presented in the 2007 AQMP to achieve the long-term reductions needed for ozone attainment.

**Table 1-2**  
2007 AQMP Emission Reductions for 2023 Based on  
Summer Planning Inventory (tons per day)

Sources	VOC	NOx
<b>Year 2023 Baseline<sup>1</sup></b>	<b>536</b>	<b>506</b>
Baseline Adjustment <sup>2</sup>	(0.2)	9
Emission Reductions:		
South Coast AQMD’s Short-Term and Mid-Term Control Stationary Source Control Measures	19	9
South Coast AQMD Additional Mobile Source Control Measures	16	43
CARB’s Revised Draft Proposed State Strategy	54	141
Long-Term Measures <sup>3</sup>	27	190
<b>Total Emission Reductions (All Measures):</b>	<b>116</b>	<b>383</b>
<b>2023 Remaining Emissions</b>	<b>420</b>	<b>114</b>

<sup>1</sup> Emission assumptions from SCAG’s 2004 Regional Transportation Plan are already reflected in the AQMP baseline.

<sup>2</sup> Reflects baseline inventory adjustments for CARB’s adopted rules in 2006 for large spark-ignited engines (1.9 tpd NOx) and consumer products (4.8 tpd VOC), emissions for the purpose of set-aside tracking (5 tpd VOC increase) and emission benefits from Carl Moyer Program (6.2 tpd NOx) and NSR Program benefits (1.2 tpd NOx). Emission benefits from the Carl Moyer Program presented in this table reflect the additional reductions not included in the baseline. () denotes emission increases. See Appendix III of 2007 AQMP.

<sup>3</sup> Includes long-term reductions from SCLTM-01A, SCLTM-01B, SCLTM-02 and SCLTM-03. Refer to Appendix IV-B-2 of 2007 AQMP.

**Table 1-3**  
2007 AQMP Possible Approaches for Long-Term Control Measures

Emission Category	Strategies
<b>Light Duty Vehicles</b>	<ul style="list-style-type: none"> <li>▪ Extensive retirement of high-emitting vehicles and accelerated penetration of PZEVs and ZEVs</li> </ul>
<b>On-Road Heavy Duty Vehicles</b>	<ul style="list-style-type: none"> <li>▪ Expanded modernization and retrofit of heavy-duty trucks and buses</li> <li>▪ Expanded inspection and maintenance program</li> <li>▪ Advanced near-zero and zero-emitting cargo transportation technologies</li> </ul>
<b>Off-Road Vehicles</b>	<ul style="list-style-type: none"> <li>▪ Expanded modernization and retrofit of off-road equipment</li> </ul>
<b>Fuels</b>	<ul style="list-style-type: none"> <li>▪ More stringent gasoline and diesel specifications; Extensive use of diesel alternatives</li> </ul>
<b>Marine Vessels</b>	<ul style="list-style-type: none"> <li>▪ More stringent emission standards and programs for new and existing ocean-going vessels and harbor craft</li> </ul>
<b>Locomotives</b>	<ul style="list-style-type: none"> <li>▪ Advanced near-zero and zero emitting cargo transportation technologies</li> </ul>
<b>Pleasure Craft</b>	<ul style="list-style-type: none"> <li>▪ Accelerated replacement and retrofit of high-emitting engines</li> </ul>
<b>Aircraft</b>	<ul style="list-style-type: none"> <li>▪ More stringent emission standards for jet aircraft (engine standards, clean fuels, retrofit controls); Airport Bubble</li> </ul>
<b>Consumer Products</b>	<ul style="list-style-type: none"> <li>▪ Ultra Low-VOC formulations; Reactivity-based controls</li> </ul>
<b>Renewable Energy</b>	<ul style="list-style-type: none"> <li>▪ Accelerated use of renewable energy and development of hydrogen technology and infrastructure</li> </ul>
<b>AB32 Implementation</b>	<ul style="list-style-type: none"> <li>▪ Concurrent criteria pollutant reduction technologies</li> </ul>

### *2012 AQMP*

The 2012 AQMP was primarily developed to address the planning requirements of the 2006 24-hour PM<sub>2.5</sub> standard, while providing some updates to the South Coast AQMD's commitments towards meeting the 1997 8-hour ozone NAAQS. The 2012 AQMP measures aimed at addressing ozone

included a number of stationary source control measures covering coatings and solvents, combustion sources, petroleum operations, fugitive VOC emissions, multiple component sources, incentive programs, and educational programs; on-road mobile source measures focusing on light-, medium-, and heavy-duty vehicles; and measures to achieve further emission reductions from off-road mobile sources and off-road industrial equipment. Overall, the 2012 AQMP included 21 stationary and 17 mobile source ozone reduction measures. Based on the emissions inventory and modeling analysis in the 2012 AQMP, the overall projected emission reductions needed to meet the 8-hour ozone standard were 239 tons per day of NO<sub>x</sub> in 2023, compared to the total NO<sub>x</sub> reductions of 383 tons per day identified in the 2007 AQMP. The lower overall emission reductions requirements in 2012 AQMP were primarily due to lower ozone levels in the base year, as well as an updated emissions inventory and modeling analysis.

Since the 2012 AQMP was developed primarily to address 24-hour PM<sub>2.5</sub> and the federal PM nonattainment area provisions of CAA section 189 do not allow for long-term measures, this plan did not provide any additional updates to the long-term measures of the 2007 AQMP that were provided in accordance with the federal ozone nonattainment area provisions of CAA section 182(e)(5). The 2012 AQMP did, however, indicate that since some of the major emission sources are already controlled by over 90%, attainment of the ozone standards would require broad deployment of zero- and near-zero emission technologies. The 2012 AQMP highlighted the significant amount of reductions needed to attain the federal ozone and PM standards and the urgent need to engage in interagency coordinated planning to identify additional strategies, especially in the area of mobile sources, to meet all federal criteria pollutant standards within the timeframes allowed under the federal CAA.

### *2016 AQMP*

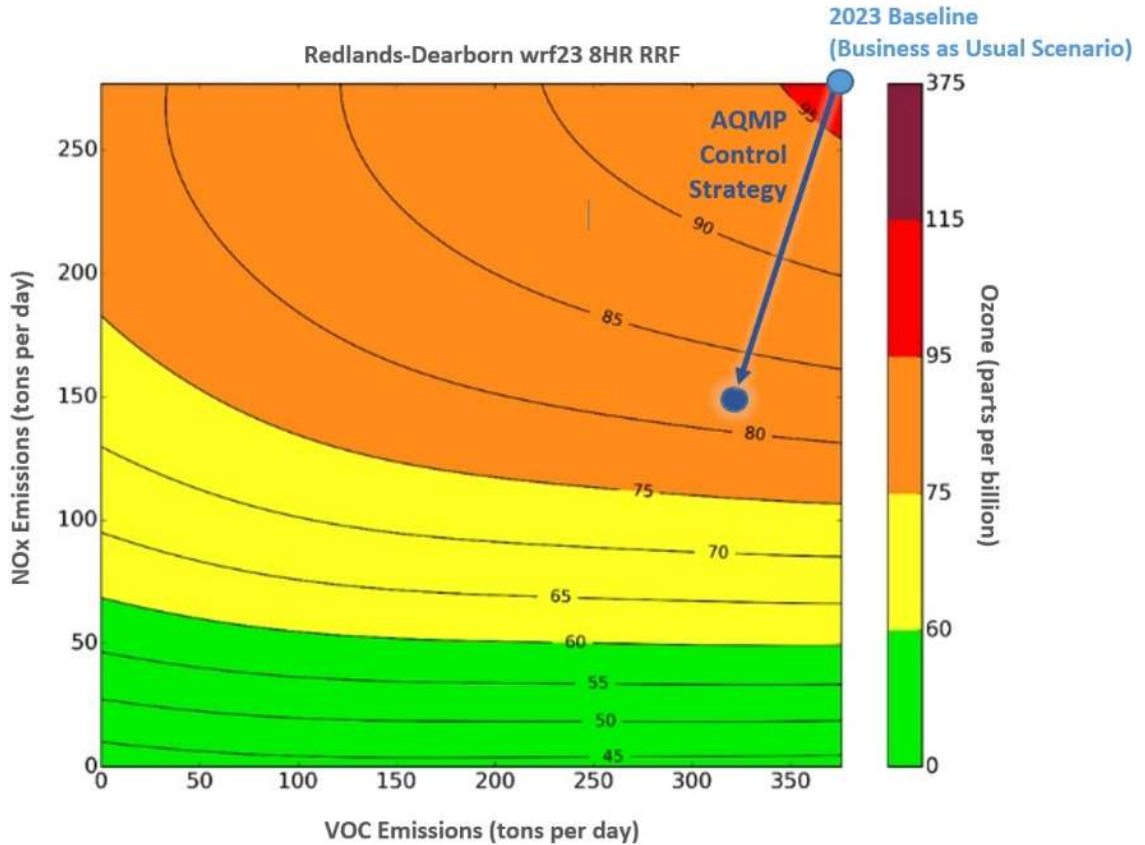
The 2016 AQMP outlines the control strategies needed to attain the 2008 8-hour ozone standard (75 ppb) in 2031, the 2012 annual PM<sub>2.5</sub> standard (12 µg/m<sup>3</sup>) in 2025, and the 2006 24-hour PM<sub>2.5</sub> standard (35 µg/m<sup>3</sup>) in 2019, as well as providing an update on meeting the 1997 8-hour ozone standard (80 ppb) in 2023 and the 1979 1-hour ozone standard (120 ppb) in 2022. The 2016 AQMP's control strategy for attaining the 1997 and 2008 ozone standards in 2023 and 2031, respectively, included defined stationary and mobile source measures proposed by South Coast AQMD as well as CARB state strategies including defined measures and "Further Deployment of Cleaner Technologies" measures, as allowed under CAA section 182(e)(5). South Coast AQMD's defined stationary source measures included 15 measures targeting stationary combustion sources, petroleum operations and fugitive VOC emissions, coatings and solvents, multiple component sources, best available control measures, and co-benefits from energy and climate change programs. South Coast AQMD's defined 15 mobile source measures included South Coast AQMD's proposed facility-based mobile source measures (FBMSMs) and a number of incentive-based programs. The FBMSMs cover marine ports, commercial airports, railyards, warehouses and distribution centers, and new developments and redevelopments, and are intended to reduce mobile source emissions associated with these types of



facilities to help achieve the reductions attributed to CARB's Further Deployment measures. South Coast AQMD's proposed incentive measures cover both on-road vehicles and off-road equipment 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 South Coast AQMD's mobile source 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. In addition, the South Coast AQMD has been implementing several incentive 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 NO<sub>x</sub> (SOON) program, and Proposition 1B – Goods Movement Emissions Reduction Program). The continued implementation of these programs is expected to provide additional reductions toward attainment of the 1997 8-hour ozone standard in 2023.

The 2016 State SIP Strategy for the State Implementation Plan (State SIP Strategy) describes CARB's commitment to achieve the mobile source and consumer products reductions needed in the Basin. The State SIP Strategy identified the regulatory and programmatic approaches necessary to deploy cleaner technologies and fuels, and ensure sufficient penetration to meet air quality standards by deadlines established in the CAA. A majority of the reductions needed to meet the ozone standard in the Basin in 2023 will come from existing or proposed regulatory actions. This includes ongoing implementation of the existing control program, combined with new regulatory measures identified in the State SIP Strategy. New reductions were identified through two types of measures – defined measures that comprise an aggregate commitment for the State of five tons per day and measures to achieve further deployment of new technologies. The further deployment measures represent the remainder of the reductions needed, 108 tons per day, and include incentive programs to further accelerate technology penetration in time to meet the standard, and further federal actions, including support for demonstration programs and supporting policies to achieve reductions from sources under federal and international regulatory authority. Because these further deployment measures do not fit the definition of a defined SIP measure for U.S. EPA's approval purposes and because actions and resources from other agencies are required, these measures were envisioned to be approved under the provisions of section 182(e)(5).

Based on the modeling analysis conducted in the 2016 AQMP, NO<sub>x</sub> reductions were determined to be the most effective control path for achieving the 1997 8-hour ozone standard in 2023, as illustrated in Figure 1-4.



**Figure 1-4**  
2016 AQMP NOx Reductions, Most Efficient Control Path for Ozone Attainment

The magnitude of NOx emission reductions needed for attainment of the ozone NAAQS in 2023 represents a significant challenge for the whole region given the short remaining timeline. As most sources are already subject to the most stringent emissions controls in the world, attainment of the ozone standard will require broad deployment of zero and near-zero NOx emission technologies in the 2023 timeframe. Based on the emission inventory and modeling analysis, the carrying capacity - the maximum amount of emissions allowable in the region that would still meet the standard - is 141 tons per day of NOx in 2023.<sup>5</sup> A summary of the 2016 AQMP summer planning NOx emission inventory and reductions is provided in Table 1-4.

<sup>5</sup> The carrying capacity is higher than the one predicted in the 2007 AQMP due to several factors including lower ozone levels in the base year of the 2016 AQMP, updated emission and modeling systems as well as EPA’s updated modeling guidance and methodology.

**Table 1-4**  
2016 AQMP NO<sub>x</sub> Emission Reductions for 2023 Based on  
Summer Planning Inventory (tons per day)

Sources	NO <sub>x</sub>
<b>Year 2023 Baseline<sup>1</sup></b>	<b>269</b>
<b>Carrying Capacity</b>	<b>141</b>
<b>Total Emission Reductions (All Measures):</b>	<b>135</b>
Defined Measures:	27
South Coast AQMD's Stationary Source Control Measures	7
South Cost AQMD Additional Mobile Source Control Measures	16
CARB's Defined Measures	4
Further Deployment of Cleaner Technologies	108
Set Aside Budget <sup>2</sup>	3
<b>2023 Remaining Emissions</b>	<b>137<sup>3</sup></b>

<sup>1</sup> Reflects CARB's 2018 Updates to the California State Implementation Plan (<https://ww3.arb.ca.gov/planning/sip/2018sipupdate/2018sipupdate.htm>).

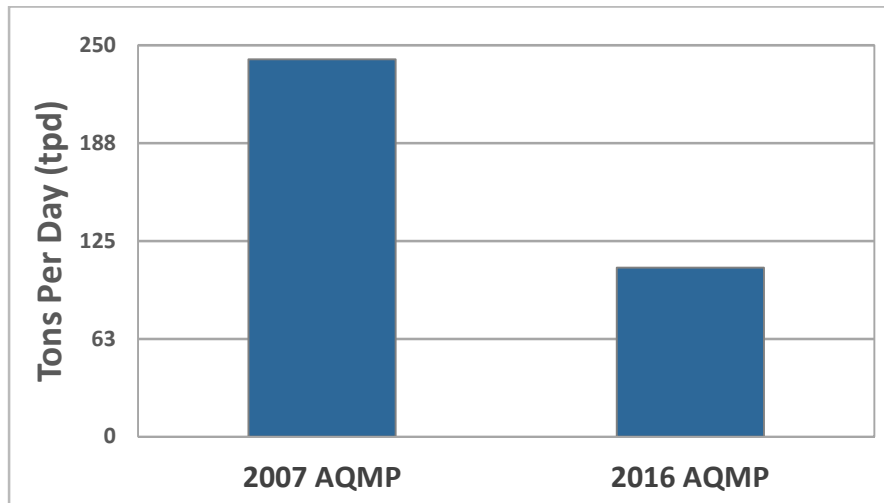
<sup>2</sup> As SIP reserve for potential technology assessment and for general conformity purposes

<sup>3</sup> Reflects an additional 4.2 tpd of NO<sub>x</sub> emission reductions beyond the projected carrying capacity of 141 tpd to accommodate changes in ocean-going vessel (OGV) emission inventory and CARB's SIP strategy for OGV.

In 2023, mobile sources, which are under the state and federal jurisdiction, are responsible for the 80% of NO<sub>x</sub> emissions while stationary sources, which are already subject to most stringent requirements, account for the remaining 20% of NO<sub>x</sub> emissions. Therefore, the vast majority of NO<sub>x</sub> reductions needed for attainment have to come from mobile sources. As illustrated in Table 1-4, after implementation of the defined control measures by South Coast AQMD and CARB, an additional 108 tons per day of NO<sub>x</sub> reductions are still needed to attain the 1997 ozone standard in 2023. These remaining reductions are expected to be achieved through Further Deployment of Cleaner Technologies measures for on-road heavy-duty vehicles, off-road equipment, and federal and international sources. The "Further Deployment" measures include incentive programs, regulations to be developed as zero and near-zero emission vehicles and equipment are commercialized, South Coast AQMD's FBMSMs, and the quantification of the emission reduction benefits from operational efficiency improvements and deployment of connected vehicles, autonomous vehicles, and intelligent transportation systems.

As indicated in the 2016 AQMP, significant amounts of incentive funding, in combination with regulatory actions, are needed to achieve the ozone standard in the Basin. Based on the 2016 AQMP’s analysis, the amount of funding needed to achieve the NO<sub>x</sub> emission reductions associated with the “Further Deployment” measures proposed in the State Mobile Source Strategy and the 2016 AQMP is \$1 billion per year beginning in 2017 over the next 14 years.

It is important to highlight the reduced reliance on control strategies approved under the provisions of CAA section 182(e)(5) for attainment of the 1997 8-hour ozone standard in 2016 AQMP compared to the 2007 AQMP (Figure 1-5). In the 2007 AQMP, 241 tpd of NO<sub>x</sub> reductions were associated with measures approved by the U.S. EPA under section 182(e)(5). By the time the 2016 AQMP was adopted, the majority of the zero and near-zero technologies needed for attainment were already, or would soon be, commercially available. However, reliance on section 182(e)(5) in the 2016 AQMP was necessary, not because the technology was not yet identified, as was the case in the 2007 AQMP, but because of the difficulty in quickly turning the fleet over to this new technology given that many mobile source categories are under federal jurisdiction. Nevertheless, achieving the remaining 108 tons per day of NO<sub>x</sub> by 2023 represents a very difficult challenge requiring new regulatory programs and a significant level of funding.



**FIGURE 1-5**  
2007 AQMP vs. 2016 AQMP Reduced Reliance on Section 182(e)(5) Measures

Attainment of the 1997 8-hour ozone standard will require aggressive mobile source control strategies and incentive programs, supplemented by focused and strategic stationary source control measures, and expedited action by federal, state, and regional governments, businesses, and the public. Significant challenges remain in meeting the federal ozone standard. Ozone reduction strategies and programs need to be accelerated to ensure that the air basin will meet the 8-hour ozone standard by 2024.

## **1. b. ii. Evolution of the Mobile Source Program**

Since the U.S. EPA set the 8-hour ozone standard in 1997, total NO<sub>x</sub> emissions in the South Coast have been reduced by 76 percent. A significant portion of these reductions came from mobile source programs. California's strategies to procure reductions from mobile sources have matured over the past decades as technology and science have progressed.

California's first vehicle exhaust standards were set in 1963, and vapor recovery from vehicle fueling stations followed soon after. Efforts in the 1980's focused on reducing emissions from passenger vehicles, as that represented a substantial portion of the ozone precursor emissions in the State's nonattainment areas. Light-duty vehicle programs such as the Smog Check and on-board diagnostics programs ensured that the control technology remained functional. The first Low-Emission Vehicle (LEV) regulations were adopted in 1990, requiring automobile manufacturers to introduce progressively cleaner light- and medium-duty vehicles with more durable emission controls and extended warranties for those controls from the 1994 through 2003 model years. By adopting these regulations, CARB established the most stringent criteria pollutant exhaust regulations ever for light- and medium-duty vehicles. Subsequent generations of the LEV regulations continued to reduce criteria pollutant emissions from new light- and medium-duty vehicles. In 2012, CARB adopted the LEV III regulations as part of the Advanced Clean Cars rulemaking package. The LEV III regulations included increasingly stringent emission standards for criteria pollutants and greenhouse gases for new passenger vehicles through the 2025 model year.

In the 1990s, emissions from trucks and other heavy-duty vehicles were increasing. At the same time, air quality modeling showed that strategies to reduce ozone should be targeting reductions in NO<sub>x</sub> emissions. In an effort to address this, California focused on pollution control technology in heavy-duty vehicles by setting emission standards for new trucks and requiring cleaner burning diesel fuel. Small off-road equipment standards were also adopted. Cleaner generations of those new equipment standards were adopted over the next two decades. California also continued to regulate VOC emissions during the 1990s, adopting regulations to reduce VOCs from consumer products.

With California's actions to establish stringent emissions standards for new light and heavy-duty vehicles, cleaner vehicles entering the fleet were replacing older, dirtier ones. California also created programs to ensure that pollution controls remain functional and that cars with excessive emissions were repaired or removed from the road. The Smog Check program required vehicle emissions to be tested regularly and the On-Board Diagnostic system required light-duty vehicles to monitor components that affect the performance of the vehicle emission controls.

To speed the transition to cleaner vehicles, the Carl Moyer incentive program was developed. This program focused on reducing NO<sub>x</sub> emissions by accelerating the turnover of older heavy-duty diesel vehicles and equipment to technologies that are cleaner than required by current regulations. Since its inception, the Carl Moyer Program has provided funding to incentivize the turnover of heavy-duty

diesel engines and vehicles including on-road trucks, marine vessels, irrigation pumps, forklifts, and other off-road equipment. The table below highlights this and the other significant California regulations and programs adopted in the 1980s and 1990s.

**Table 1-5**  
Major State Regulations Adopted Between 1980 and 1999

Major Regulations Adopted Between 1980 and 1999	Implementation	Source
Vehicle Inspection and Maintenance program (Smog Check)	1984	Light-Duty Vehicles
On-Board Diagnostic	1988	Light-Duty Vehicles
Heavy-Duty Diesel NOx Standards	1990/96/98	Heavy-Duty Vehicles
Reformulated Gasoline	1992	Gasoline
Clean Diesel Fuel	1992	Diesel
Low-Emission Vehicle	1994	Light-Duty Vehicles
On-Board Diagnostic II	1996	Light-Duty Vehicles
Zero-Emission Vehicle program	1998	Light-Duty Vehicles
Carl Moyer Program	1998	Vehicles

In the 2000's and 2010's, California's efforts focused on specific fleets that tended to remain in service longer and contained higher emitting vehicles compared to newer vehicles. The 2010 Truck and Bus Regulation requires that all trucks in California meet 2010 Heavy-Duty Engine Standards by 2023. This all-encompassing regulation was preceded by regulations targeting drayage trucks and solid waste collection vehicles that sped the turnover of those fleets.

Given the need to turn over the on-road fleets to cleaner vehicles faster than natural turnover would dictate, new incentive programs were created, such as the light-duty Clean Vehicle Rebate Program and the Heavy-Duty Proposition 1B Freight Program. In addition, the Carl Moyer Program was expanded in 2004 to fund a wider range of equipment, while maintaining the mandate that the funded vehicles and equipment must go beyond current regulatory requirements.

**Table 1-6**  
Major State Regulations Adopted Since 2000

Major Regulations Adopted Since 2000	Implementation Begins	Source
School Zone idling	2003	Heavy-Duty Vehicles
Heavy-Duty Diesel NOx Standards	2004/2007/2010	Heavy-Duty Vehicles
Commercial Vehicle Idling	2005	Heavy-Duty Vehicles
Public Agencies and Utilities Fleet	2006	Heavy-Duty Vehicles
Proposition 1B incentive program	2007	Heavy-Duty Vehicles
Solid Waste Collection Vehicles	2008	Heavy-Duty Vehicles
Clean Vehicle Rebate Project	2010	Light-Duty Vehicles
Drayage Truck Regulation	2010	Heavy-Duty Vehicles
Truck and Bus Regulation	2012	Heavy-Duty Vehicles
Enhanced Fleet Modernization Plus Up	2015	Light-Duty Vehicles
LEV III/ Alternative Clean Cars	2015	Light-Duty Vehicles

## 1. c. Emission Benefits from the Existing Programs

### 1. c. i. Stationary Sources

South Coast AQMD first addressed the attainment of the 8-hour ozone standard of 80 ppb in the 2007 AQMP, with updates provided subsequently in the 2012 and 2016 AQMPs. Over the past fifteen years, ozone levels in the South Coast Air Basin have steadily decreased largely due to the implementation of emission control measures by the South Coast AQMD and CARB. The 2007 AQMP included 2023 baseline emissions of 506 tpd NOx and 536 tpd VOC, based on the summer planning inventory. With the implementation of the 2007 AQMP and 2012 AQMP control measures and the State SIP Strategy, the 2023 baseline emissions decreased to 269 tpd NOx in the 2016 AQMP. In other words, the 2023 projected emissions have been cut by almost half by the rules and regulations implemented in the last decade. This section summarizes the progress made in obtaining emission reductions from control measures from the 2007, 2012, and 2016 AQMPs, and describes how these existing programs assist in attaining the 1997 8-hour ozone standard.

#### *Summary of the 2007 AQMP Implementation*

The 2007 AQMP was developed to address the CAA planning requirements for attaining the 1997 8-hour ozone standard and the 1997 annual PM2.5 standard. The 8-hour ozone control strategy built upon the PM2.5 strategy, augmented with additional NOx and VOC reductions to meet the standard by the deadline in 2024 (emission reductions to occur in 2023). The ozone portion of the 2007 AQMP was

approved by U.S. EPA into the SIP on March 1, 2012<sup>6</sup>. The 2012 AQMP provided an update on the progress in implementing the 2007 AQMP. This progress can be measured by the number of control measures that have been adopted as rules and the resulting emission reductions. Between 2008 and 2011, twelve control measures or rules were adopted or amended by the South Coast AQMD. Table 1-7 lists the South Coast AQMD's 2007 AQMP commitments and the control measures or rules that were adopted through 2011. The emission reductions that were achieved in 2014 and will be achieved in 2023 through already adopted measures are based on the emissions inventories from the 2007 AQMP. As shown in Table 1-7, for the control measures adopted by the South Coast AQMD over this period, 22.5 tons per day of VOC reductions and 7.6 tons per day of NO<sub>x</sub> reductions had been achieved by 2014. The 2023 projected emissions reductions associated with implementation of these measures are 26.4 tons per day of VOC emissions and 10.3 tons per day of NO<sub>x</sub> emissions.

**TABLE 1-7**  
2007 AQMP Measures' Emission Reductions  
for VOC and NO<sub>x</sub> (tons per day)

Control Measure #	Control Measure Title	Adoption Date	COMMITMENT (tpd)		ACHIEVED (tpd)	
			2014	2023	2014	2023
<b>VOC EMISSIONS</b>						
MOB-05	AB923 Light-Duty Vehicle High-Emitter Identification Program [NO <sub>x</sub> , VOC]	On-going	0.8	0.7	--	--
MOB-06	AB923 Medium-Duty Vehicle High-Emitter Identification Program [NO <sub>x</sub> , VOC]	On-going	0.5	0.6	--	--
FUG-04	Pipeline and Storage Tank Degassing[VOC]-R1149	2008	NA	NA	0.04	0.04
BCM-03	Emission Reductions from Wood Burning Fireplaces and Wood Stoves [All]	2008	NA	NA	0.44	0.70
MCS-01	Facility Modernization [NO <sub>x</sub> , VOC, PM] - R1110.2	2008+	2.0	9.2	0.3	0.3
CTS-01	Emission Reductions from Lubricants [VOC][R1144]	2009	1.9	2.0	3.9	3.2

<sup>6</sup> <https://www.federalregister.gov/documents/2012/03/01/2012-4673/approval-of-air-quality-implementation-plans-california-south-coast-attainment-plan-for-1997-8-hour>



CTS-04	Emission Reductions from the Reduction of VOC Content of Consumer Products Not Regulated by the State Board [VOC][R1143]	2009	NA	NA	9.7	10.1
MCS-04	Further Emission Reductions from Greenwaste Composting Operations [VOC][R1133.3]	2011	NA	NA	0.88	0.88
MCS-07	Application of All Feasible Measures [VOC][R1113, R1177]	2011	NA	NA	7.2	11.1
FLX-02	Petroleum Refinery Pilot Program [VOC and PM2.5]	(b)	0.7	1.6	0	0
FUG-02	Emission Reductions from Gasoline Transfer and Dispensing Facilities [VOC]	(b)	3.7	4.0	0	0
MCS-05	Emission Reductions from Livestock Waste [VOC]	(b)	0.8	0.6	0	0
EGM-01	Emission Reductions from New or Redevelopment Projects [NOx, VOC, PM2.5]	(c)	NA	0.5	NA	--
<b>TOTAL VOC REDUCTIONS</b>			<b>10.4</b>	<b>19.2</b>	<b>22.5</b>	<b>26.4</b>
<b>NOx EMISSIONS</b>						
MOB-05	AB923 Light-Duty Vehicle High-Emitter Identification Program [NOx, VOC]	On-going	0.4	0.4	--	--
MOB-06	AB923 Medium-Duty Vehicle High-Emitter Identification Program [NOx, VOC]	On-going	0.5	0.6	--	--
CMB-01	NOx Reduction from Non RECLAIM Ovens, Dryers and Furnaces [NOx][R1147]	2008	3.5	4.1	3.5	4.1
BCM-03	Emission Reductions from Wood	2008	NA	NA	0.06	0.10
MCS-01	Facility Modernization [NOx, VOC, PM] - R1110.2, PR1146, PR1146.1	2008+	1.6	2.2	2.17	3.15
CMB-03	Further NOx Reductions from Space Heaters [NOx]	2009	0.8	1.1	0.1	3.0
EGM-01	Emission Reductions from New or Redevelopment Projects [NOx, VOC, PM2.5]	(c)	0	0.8	--	--
<b>TOTAL NOx REDUCTIONS</b>			<b>6.8</b>	<b>9.2</b>	<b>5.83</b>	<b>10.35</b>

### *Summary of 2012 AQMP Implementation*

The 2012 AQMP was developed to set forth a comprehensive and integrated program that would lead the Basin into attainment of the federal 24-hour PM<sub>2.5</sub> air quality standard, and to provide an update to the Basin's commitments towards meeting the federal 8-hour ozone standards. The Plan included updated and new control measures and commitments for emissions reductions for the 8-hour ozone attainment strategy and helped reduce reliance on the section 182(e)(5) long-term measures. The 2012 AQMP received a limited approval and limited disapproval by U.S. EPA on April 14, 2016<sup>7,8</sup>. Table 1-8 lists the South Coast AQMD's 2012 AQMP commitments and the control measures or rules that were adopted through 2015. The emission reductions that 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. As shown in Table 1-8, for the control measures adopted by the South Coast AQMD over this period, 2.4 tpd of VOC reductions and 19.5 tpd of NO<sub>x</sub> reductions, will be achieved by 2023.

**Table 1-8**  
2012 AQMP Measures' Emission Reductions  
for NO<sub>x</sub> and VOC (tons per day)

Control Measure #	Control Measure Title	Adoption Date	COMMITMENT		ACHIEVED	
			2014	2023	2014	2023
<b>NO<sub>x</sub> EMISSIONS</b>						
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	NO <sub>x</sub> Reduction from Biogas Flares	Rulemaking Underway	--	TBD	--	TBD
CMB-03	Reductions from Commercial Space Heating	2016	--	0.18	--	TBD
<b>TOTAL NO<sub>x</sub> REDUCTIONS</b>			<b>2</b>	<b>10.7</b>	<b>0</b>	<b>19.5</b>
<b>VOC EMISSIONS</b>						

<sup>7</sup> <https://www.federalregister.gov/documents/2016/04/14/2016-08039/partial-approval-and-partial-disapproval-of-air-quality-state-implementation-plans-california-south>

<sup>8</sup> The limited disapproval was based on the concerns that the 2010 RECLAIM program did not meet the Reasonably Available Control Measure, Reasonably Available Control Technology (RACM/RACT) requirement for certain sources of emissions, which was subsequently resolved in 2018. <https://www.federalregister.gov/documents/2018/02/12/2018-02677/air-quality-state-implementation-plans-approvals-and-promulgations-california-south-coast-moderate>

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
<b>TOTAL VOC REDUCTIONS</b>			<b>0</b>	<b>5.8</b>	<b>0.4</b>	<b>2.4</b>

### *Summary of 2016 AQMP Implementation*

The 2016 AQMP is an integrated Plan designed to primarily address the 8-hour ozone NAAQS established in 2008, the annual PM<sub>2.5</sub> NAAQS established in 2012, and the 24-hour PM<sub>2.5</sub> NAAQS established in 2006 (2006 24-hour PM<sub>2.5</sub>). Given the overlap in emissions and control strategies for other yet-to-be-attained NAAQS, the 2016 AQMP also provides an update on the control strategy for two other standards: the 1997 8-hour ozone NAAQS and the 1979 1-hour ozone NAAQS. Ozone measures include actions to reduce NO<sub>x</sub> and VOC emissions from both stationary (point and area) and mobile sources. The mobile source measures include actions to be taken by the South Coast AQMD, CARB and the U.S. EPA.

Since the adoption of the 2016 AQMP, several rules have been developed and adopted as part of the implementation of the Plan. As noted in Table 1-9, one control measure commitment, CTS-01, was fulfilled with the October 2017 amendment to Rule 1168 – Adhesive and Sealant Applications, resulting in a VOC reduction of 1.4 tpd by 2023, exceeding the commitment of 1.0 tpd in the 2016 AQMP. Rule 1118.1 – Non-Refinery Flares, seeks to fulfill the purpose of CMB-03 and was adopted by the Governing Board in January 2019. Recently approved amendments to Rules 1134, 1135 and 1146 series have assisted in achieving the goals of control measure CMB-05 to transition RECLAIM facilities into command and control. There are also a number of 2016 AQMP control measures for which development is currently under way, including Rules 1109.1, 1110.2, 1117, 1147 series, 1150.3, and 1179.1, and continuing implementation of ongoing mobile source programs such as Surplus Off-

Road Opt-In for NO<sub>x</sub> (SOON), the extended exchange program, and incentive programs (e.g., Carl Moyer), for which reductions have not yet been completely quantified.

Three mobile source incentive measures with quantifiable NO<sub>x</sub> emission reductions were included in the 2016 AQMP. They are MOB-10 (Extension of the SOON Provision for Construction/Industrial Equipment), MOB-11 (Extended Exchange Program), and MOB-14 (Emission Reductions from Incentive Programs), each with 2, 2.9 and 11 tpd of committed NO<sub>x</sub> reductions, respectively, by 2023. MOB-14 recognizes the emission benefits from incentive funding programs such as the Carl Moyer Memorial Air Quality Standards Attainment Program and Proposition 1B such that the emission reductions from these programs can be accounted for in the SIP. To track the implementation of MOB-14, the emission reduction benefits for the incentive projects funded under Carl Moyer Program and Proposition 1B were quantified between 2013 and 2019 and were estimated to be 5.9 tpd in 2023. Given that the emission reductions from secured or reasonably anticipated funding for future Moyer projects are likely to continue to generate surplus emissions in 2023, it is anticipated that the aggregate commitments of 11 tpd under MOB-14 will be fulfilled.

**TABLE 1-9**  
2016 AQMP Measures' Emission Reductions  
for VOC and NO<sub>x</sub> (tons per day)

Control Measure #	Control Measure Title	Adoption Date	COMMITMENT		ADOPTED TO BE ACHIEVED	
			2023	2031	2023	2031
<b>VOC EMISSIONS</b>						
CTS-01	Further Emission Reductions from Coatings, Solvents, Adhesives, and Sealants [R1168]	2017/2021	1.0	2.0	1.4	--
FUG-01	Improved Leak Detection and Repair	2019	2.0	2.0	--	--
CMB-01	Transition to Zero and Near-Zero Emission Technologies for Stationary Sources	2018	1.2	2.8	--	--
CMB-03	Emission Reductions from Non-Refinery Flares [R1118.1]	2018	0.4	0.4	0.014	--
ECC-02	Co-Benefits from Existing Residential and Commercial Building Energy Efficiency Measures	2018	0.07	0.3	--	--
ECC-03	Additional Enhancements in Reducing Existing Residential Building Energy Use	2018	0.2	0.3	--	--
BCM-10	Emission Reductions from Greenwaste Composting	2019	1.5	1.8	--	--

<b>TOTAL VOC REDUCTIONS</b>		<b>6.4</b>	<b>9.6</b>	<b>1.4</b>	<b>--</b>	
<b>NOx EMISSIONS</b>						
CMB-01	Transition to Zero and Near-Zero Emission Technologies for Stationary Sources	2018	2.5	6.0	--	--
CMB-02	Emission Reductions from Replacement with Zero or Near-Zero NOx Appliances in Commercial and Residential Applications	2018	1.1	2.8		--
CMB-03	Emission Reductions from Non-Refinery Flares [R1118.1]	2018	1.4	1.5	0.2	--
CMB-04	Emission Reductions from Restaurant Burners and Residential Cooking	2018	0.8	1.6	--	--
CMB-05	Further NOx Reductions from RECLAIM Assessment [R1134, 1135, R1146 series]	2022	0.0	5.0	TBD*	--
ECC-02	Co-Benefits from Existing Residential and Commercial Building Energy Efficiency Measures	2018	0.3	1.1	0.3**	--
ECC-03	Additional Enhancements in Reducing Existing Residential Building Energy Use	2018	1.2	2.1	--	--
MOB-10	Extension of the SOON Provision for Construction/Industrial Equipment	Ongoing	1.9	1.9	*	TBD
MOB-11	Extended Exchange Program	Ongoing	2.9	1.0	TBD	TBD
MOB-14	Emission Reductions from Incentive Programs	Ongoing	11	7.8	5.9***	TBD
<b>TOTAL NOx REDUCTIONS</b>			<b>23.1</b>	<b>31.0</b>	<b>6.4</b>	<b>TBD</b>

\*Emission reductions from Rules 1134, 1135 and 1146 series are used to account for the RECLAIM shave as amended in 2015. Part of these emission reductions resulting from non-RECLAIM facilities could be used to fulfill CMB-01 and CMB-02.

\*\* A linear extrapolation was used to estimate emission reductions from ECC-02 which are co-benefits from the adoption of State policies, such as SB350 and Title 24.

\*\*\* Estimated reductions through 2020.

### **RECLAIM**

The Regional Clean Air Incentives Market (RECLAIM) program, under South Coast AQMD's Regulation XX, was adopted in October 1993 and is a market-based emissions trading program designed to reduce NOx and SOx emissions. RECLAIM was designed to provide equivalent emission reductions in the aggregate for the facilities in the program compared to what would occur under a command-and-control approach, with flexibility for each facility to find the most cost-effective strategy

to meet their emission reduction targets. The California Health and Safety Code requires the South Coast AQMD to implement Best Available Retrofit Control Technology (BARCT) in the RECLAIM program, as well as for other stationary sources, and if BARCT advances, the South Coast AQMD is required to periodically re-assess the overall program caps (i.e. overall allocation), and reduce the RECLAIM Trading Credit (RTC) holdings to a level equivalent to command-and-control BARCT levels. In December 2015, the South Coast AQMD Governing Board adopted a reduction of 12 tpd of RTCs over a seven-year period, from 2016 to 2022. With an allocation of 26.5 tpd of RTCs in 2015, the remaining allocation would be 14.5 tpd in 2023. Further, on March 3, 2017, the South Coast AQMD Governing Board adopted a 2016 AQMP NO<sub>x</sub> RECLAIM measure (CMB-05) to achieve 5 tpd of NO<sub>x</sub> emission reductions 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.

As specified in the staff report of the 2015 December RECLAIM amendment, a reduction of 12 tpd of RTCs is calculated based on the actual emissions reported by the RECLAIM facilities in 2011/2012, with adjustments to account for uncertainties that arose in the BARCT analysis and for additional 2011 activity level adjustments. The 2011/2012 baseline emissions for the NO<sub>x</sub> RECLAIM universe were 20.7 tpd. With the implementation the 2015 RECLAIM amendment, the RTCs remaining in 2023 will be 14.5 tpd. Therefore, to account for the RECLAIM shave in the SIP, an emission reduction of 6.2 tpd of actual emissions (the difference between the actual emissions in 2011/2012 and the 2023 remaining potential emissions in the SIP emission inventory) was included in the baseline emissions for the 8-hour ozone attainment demonstration in the 2016 AQMP.

In order to accurately report on progress made toward achieving emission reduction commitments, reductions from adopted rules are first allocated to account for the reduction specified under RECLAIM Rule 2002. Since the adoption of the 2016 AQMP, five rules (Rules 1134, 1135, 1146, 1146.1, and 1146.2) have been adopted or amended by the South Coast AQMD as part of the RECLAIM transition, and one additional rule is scheduled to be heard by the Governing Board in November 2019. The total emission reductions resulting from these six rules is 5.2 tpd. Furthermore, five additional rules (Rules 1117, 1147, 1147.1, 1147.2 and 1147.3) are currently under development and are scheduled for adoption in calendar year 2020. The emission reductions anticipated from these rule amendments /adoptions are estimated to be at least in the range of 0.5 tpd to 1 tpd, which will likely satisfy the baseline NO<sub>x</sub> emission reductions commitments specified under RECLAIM Rule 2002.. As the RECLAIM program transitions into a regulatory approach, the actual emissions from the RECLAIM universe will be tracked for emission reconciliation with the commitments in the SIP inventory. Additional reductions beyond this commitment due to these and other rulemaking activities (e.g., 1109.1) are discussed later.

**TABLE 1-10**  
South Coast AQMD Emission Reduction Allocation

	Rule	Adoption Date	NOx Reduction (tpd)
Adopted Rules in 2018 - 2019	Rule 1134 – Stationary Gas Turbines	4/5/2019	2.8
	Rule 1135 – Electricity Generating Facilities	11/2/2018	1.8
	Rule 1146, Rule 1146.1, Rule 1146.2 – Non-Refinery Boilers and Heaters	12/7/2018	0.3
	Rule 1110.2 – Emissions from Gaseous- and Liquid-Fueled Engines	Scheduled to be heard in Nov 2019	0.3
Rules to be Adopted in 2020	Rule 1117 – Emissions of Oxides of Nitrogen from Glass Melting Furnaces	n/a	0.5 to 1
	Rule 1147 – Series NOx Reductions from Miscellaneous Sources		
	Rule 1147.1 – NOx Reductions from Large Miscellaneous Combustion		
	Rule 1147.2 – NOx Reductions from Metal Processing Equipment		
	Rule 1147.3 - NOx Reductions for Equipment at Aggregate Facilities		

The 2016 AQMP included new and innovative means to continue to make progress toward attaining the ozone standard. These included incentive programs, efficiency improvements, recognizing co-benefits from other programs, regulatory measures, and other voluntary actions. A key element of the 2016 AQMP is to make available private and public funding to help further the development and deployment of the advanced cleaner technologies such as zero emission and near-zero emission technologies, and co-benefits from existing programs (e.g., climate and energy efficiency). On January 4, 2019, the South Coast AQMD Governing Board awarded 27 emission reduction incentive projects, totaling over \$47 million from several South Coast AQMD's mitigation and penalty funds, to support the 2016 AQMP's goals. Of the 27 projects, 16 are selected to implement commercially available zero or near-zero control technology as well as to support infrastructure for implementation of cleaner fuels. These projects are anticipated to result in approximately 88 tons per year of NOx and 2 tons per year of PM2.5 emissions reductions in the Basin, with the majority of projects in environmental justice communities. Additionally, 11 stationary and mobile source technology demonstration projects were funded. Upon successful demonstration and deployment, these projects have the potential to provide additional long term NOx and VOC emission reductions. The awarded projects are consistent with the commitments in various 2016 AQMP control measures including MOB-14, CMB-02, CMB-04, and ECC-03.

## 1. c. ii. Mobile Sources

### *On-Going Mobile Source Regulations and Programs*

The California Air Resources Board (CARB) is implementing numerous regulations aimed at reducing NO<sub>x</sub> from light-duty on-road vehicles such as cars, heavy-duty on-road vehicles such as diesel trucks, and off-road sources like ocean-going vessels and large construction equipment. Phased implementation of these regulations continue to lower emissions from mobile sources and off-road equipment through 2023 and beyond, as newer vehicles and equipment are introduced with cleaner technologies, and replace the older and dirtier vehicles and equipment. In addition to regulations targeting vehicles and other combustion sources, as mentioned above, CARB is requiring cleaner fuels that provide for additional emission reductions in vehicles and equipment. NO<sub>x</sub> emissions from light-duty vehicles in the Basin have been reduced significantly over the past several decades and will continue to go down after 2023 due to the benefits of CARB's longstanding light-duty mobile source program. Between 1997 and 2023, NO<sub>x</sub> emission from light-duty sources have decreased by over 90 percent. Key light-duty programs include:

- Zero Emission Vehicle (ZEV) program that requires auto manufacturers to offer for sale specific numbers of the cleanest cars available;
- Reformulated Gasoline program that requires gasoline in California meet specifications for clean burning fuel;
- Smog Check Program that requires periodic inspections of the vehicle's emission controls, and repairs to controls that are not functioning properly;
- Low Emission Vehicle (LEV) and LEV II regulations that set engine standards for cars, sport utility vehicles, pick-up trucks and mini-vans;
- On-Board Diagnostics (OBD) and OBD II regulations requiring passenger cars, light-duty trucks, and medium-duty vehicles to be equipped with emission control diagnostic systems; and
- Advanced Clean Cars program that sets comprehensive standards for new vehicles in California through model year 2025.

NO<sub>x</sub> emissions from heavy-duty vehicles in the Basin have been reduced significantly and will continue to be reduced beyond 2023 due to the benefits of CARB's heavy-duty mobile source program. Between 1997 and 2023, NO<sub>x</sub> emission from heavy-duty sources have decreased by 80 percent. Key heavy-duty programs for this source include:

- Stringent heavy-duty engine standards;
- CARB Clean and Cleaner Diesel programs that reduce emissions from all diesel vehicles and equipment;
- Regulations to limit idling in school buses and commercial vehicles;



- In-use moderation regulations on specific fleets such as solid waste collection vehicles and drayage trucks; and
- Truck and Bus Regulation that requires all older trucks and buses to meet the 2010 engine emissions standards in 2023.

Off-road sources encompass equipment powered by an engine that does not operate on the road. Sources vary from ocean-going vessels to lawn and garden equipment and include locomotives, aircraft, tractors, harbor craft, off-road recreational vehicles, construction equipment, forklifts, and cargo handling equipment. NOx emissions from off-road sources in the Basin have been reduced significantly and will continue to go down through 2023 due to the benefits of CARB and U.S. EPA programs. Between 1997 and 2023, NOx emission from off-road sources have decreased by over 50 percent. Key off-road programs for these off-road sources include:

- Large Spark-Ignition (LSI) Engine Fleet Requirements Regulation that requires operators of in-use fleets achieve tightening specific fleet emission standards;
- Small Off-Road Engines (SORE) program setting emissions standards for spark ignition engines rated at or below 19 kilowatts; and
- Regulations limiting emissions from specific off-road equipment such as cargo handling equipment and transportation refrigeration units.

To speed the delivery of the cleanest vehicles to the Basin, CARB and the South Coast AQMD have worked on identifying and distributing incentive funds needed to accelerate the cleanup of older vehicles. There are a number of incentive programs that have speed the early turnover to clean vehicles and produced emission reductions beyond what could be achieved by new engine standards and natural turnover. Key incentive programs for mobile sources include:

- Clean Vehicle Rebate Project and Enhanced Fleet Modernization Program for light-duty vehicles;
- Carl Moyer Incentive Program and the Proposition 1B Incentive Program for on-road and off-road heavy-duty vehicles;
- Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project for on-road heavy-duty trucks and buses; and
- Funding Agricultural Replacement Measures for Emission Reductions (FARMER) Program for agricultural equipment.

### *State SIP Strategy Implementation*

Since adopting the State SIP Strategy, CARB has been hard at work to implement the measures that were defined in the Strategy according to the schedule set forth in the aggregate commitment. Several

of these measures have been adopted by CARB and are detailed in the table below. Other measures are in the development stage, either undergoing public workshops or being developed by CARB staff.

**Table 1-11**  
2016 State SIP Strategy Aggregate Commitment Measures

Measure Title	Board date Adopting the Subsequent Rule
South Coast On-Road Heavy Duty Vehicle Incentive Measure	March 22, 2018
Heavy-Duty Diesel Vehicle Emission Control System Warranty Regulation Amendments	June, 2018
Zero-emission Airport Shuttle Regulation	June 1, 2019
Zero-Emission Powertrain Certification Regulation	June 1, 2019
Electric Vehicle Supply Equipment Standards	June 1, 2019
Ocean-Going Vessel At Berth And At Anchor Regulation	Scheduled December, 2019

#### **1. d. Clean Air Act Section 182(e)(5) Contingency Measure Requirements**

Section 182(e)(5) of the Act allows Extreme ozone nonattainment areas to include emission reductions in their attainment strategy from the anticipated development of new control techniques or improvement of existing control technologies. These advanced technology measures are generally undefined at the time the SIP is adopted and submitted to U.S. EPA. Areas with SIPs that rely on such provisions must submit a SIP revision three years prior to the attainment year to demonstrate that the area will achieve the reductions assigned to the new technology by the attainment date, or include contingency measures to be implemented if the anticipated technologies do not achieve the planned reductions.

These contingency measures must be adequate to produce emission reductions sufficient, in conjunction with other plan provisions, to demonstrate reasonable further progress and attainment by the applicable dates. If the area fails to achieve the emission reductions due to an inability to fully implement the advanced technology provisions, U.S. EPA shall require the State to implement the contingency measures to the extent necessary.

While most of the reductions needed for attainment will come from existing control programs, California relied on these advanced technology provisions to achieve the additional increment of reductions needed to demonstrate attainment of the standard. In its 2016 State Strategy for the State Implementation Plan (State SIP Strategy) CARB outlined those measures proposed for approval under section 182(e)(5). The advanced technology measures required this future flexibility in the approval process because some of the measures relied on the expenditure of future funding to achieve the pace of clean technology deployment needed. While the vehicle fleet would naturally turn over to zero- and near zero-emission technologies, the pace at which natural turnover takes place is not sufficient to meet

California's emission reduction needs. In addition, flexibility was needed because significant actions by federal and international agencies are needed to reduce those emissions subject to federal regulatory authority that California lacks the authority to regulate.

Whereas 66 percent of the emissions reductions needed for attainment will be achieved from baseline measures that were adopted prior to adoption of the 2016 AQMP, the remaining emissions reductions will be achieved through two types of measures, as listed below.

1. Aggregate commitment for defined measures - Enforceable commitments to take specific regulatory and programmatic actions according to a specific schedule to achieve an aggregate amount of emissions reductions by specific years, often referred to as the "aggregate commitment."
2. Section 182(e)(5) commitment for Future Deployment Measures - A commitment to achieve emissions reductions that were approved under the section 182(e)(5) provisions. These measures are the subject of this report.

#### **1. e. Total Reductions Needed to Attain**

Based on the 2016 AQMP modeling analysis, an additional 45 percent NO<sub>x</sub> emission reductions is needed in 2023 to attain the 1997 8-hour ozone NAAQS. This percentage is based on meeting the "carrying capacity" of 141 tons per day of NO<sub>x</sub> in 2023. To demonstrate attainment, the 2016 AQMP identified the total NO<sub>x</sub> reductions to come from: 1) defined measures by South Coast AQMD and CARB totaling 27 tons per day (aggregate commitments); and 2) CARB's "Further Deployment of Cleaner Technologies" under CAA Section 182(e)(5) totaling 108 tons per day. This report addresses how the 108 tons per day of NO<sub>x</sub> reductions can be achieved.

#### **1. f. 182(e)(5) Commitments in the 2016 AQMP**

##### *Define the Challenge – emission reductions are getting harder to achieve*

Existing CARB and South Coast AQMD control programs have achieved substantial reductions in precursor emissions of ozone and will continue to do so into the future through turnover of older vehicles, engines and equipment to cleaner vehicles, engines and equipment. Through regulations adopted and implemented to date, CARB and the air districts have controlled many of the sources that had previously contributed the largest amounts of emissions. Additionally, the 2016 State SIP Strategy included commitments for cleaner heavy-duty truck standards set at the State and federal level. Therefore, regulating the remaining sources subject to State and local authority achieves incrementally smaller amounts of emissions reductions. State and local agencies continue to look to the categories and sources with the largest shares of remaining emissions for further reductions, but it has become increasingly difficult to get the levels of reductions needed from sources within state and local agencies' authority to achieve further air quality progress.

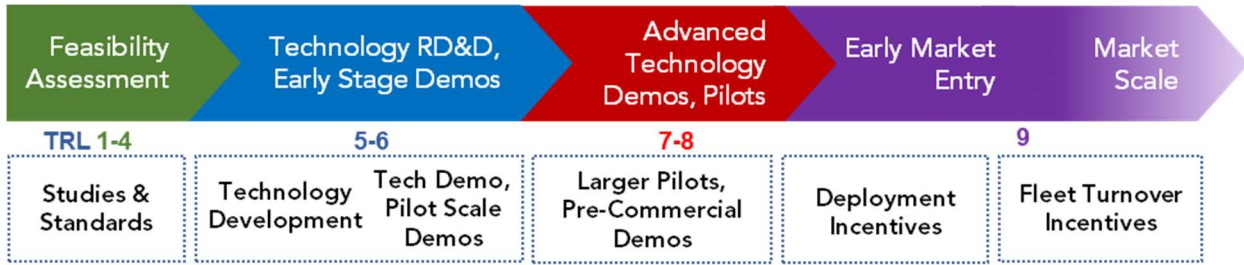
Furthermore, the deadlines for attainment of the 80 ppb ozone and other federal standards are fast approaching, and development and full implementation of regulatory measures is not always possible within the timeframes needed. As these deadlines approach and the amount of emissions reductions possible from new regulations decreases, reductions from voluntary incentive programs become more important in the overall strategy to achieve our attainment goals. In addition, while regulatory programs drive the introduction of cleaner technologies, fuels, and fueling infrastructure, the natural fleet turnover rate and the current pace of market development for the cleanest technologies will not be sufficient to meet California's needs. Clearly signaled, adequately funded, multiple-year incentives will be critical to drive the rapid transformation of the transportation sector to zero-emission technologies wherever feasible and near zero-emission technologies with the cleanest, lowest carbon fuels everywhere else.

In California, there are a variety of voluntary, publically funded programs in place to encourage the development of, and incentivize the purchase of, cleaner vehicles and engines and these programs have been tremendously successful in reducing emissions. However, additional funding mechanisms, international partnering with shipping lines, research and demonstration projects, and other innovative strategies will be needed to accelerate deployment of these technologies and their related infrastructure to meet our short- and long-term goals. CARB's 2016 State SIP Strategy and related planning documents include a combination of proposed regulations and incentives designed to help shift California from a reliance on petroleum fueled vehicles and off-road equipment to zero- and near zero-emission vehicles and fuels.

### *Expectation for Development and Deployment of New Technologies*

While advanced technologies require time to develop and commercialize, public investment through incentive programs can greatly accelerate this timeline. In addition to directly funding research, development and deployment, significant public funding can also induce increased levels of private investment as manufacturers become more willing to increase production capacity and provide additional support, training, and infrastructure for clean technologies.

Just as there are a range of regulations, there are a range of incentives at the local, State, and federal levels that support technology advancement at the demonstration, pilot, and commercial deployment stages, or across all technology readiness levels (TRL). The figure below shows the evolution of mobile source technology in California. Public agencies provide key incentives at each level.



**Figure 1-6**  
Evolution of Mobile Source Technology in California

As the above figure shows, California, through many state and local agencies, invests public funds throughout the stages of technology evolution. This approach is critical because it signals the importance that the local air districts and CARB place on the development and deployment of these advanced technologies, attracting innovators and green businesses to the state. CARB has programs in its incentive portfolio that span from pre-commercial demonstration, pilot, early commercial, and commercial phases of technology and market development.

The continued application of incentive funding throughout all stages accelerates the movement of the market toward market viability and financial stability. Especially for the heavy-duty sectors, increased incentive funding is needed well into the future to ensure that market successes are solidified and continue to make progress towards reaching California and South Coast AQMD’s air quality goals. However, the ultimate goal for each technology application is to reach a point of financial sustainability where incentives can be phased out for that specific technology.

*Without Federal Efforts, the Basin Cannot Attain the Standard*

Despite the many actions being taken by the South Coast AQMD and CARB, the contribution of emissions from interstate and international sources coupled with limitations on regulatory authority mean that achieving the magnitude of emission reductions necessary to meet federal standards will also require strong action at the federal level. CARB and the South Coast AQMD continue to work with federal and international agencies to advocate for more stringent emission standards for sources that are not under California and local regulatory purview, but federal action has not been sufficient to meet federally mandated air quality objectives.

Achieving the emission reductions necessary from these source categories will require prompt action at the federal and international level, coupled with State and local advocacy and action to facilitate these efforts. Without considerable emission reductions from sources under federal control, the South Coast Air Basin will not be able to reach attainment in 2023 or the subsequent attainment dates for other air quality standards.

*Four Years until the Attainment Date*

Given that significant levels of NO<sub>x</sub> reductions are still needed for attainment of the 1997 8-hour ozone standard in only four years, an aggressive control strategy needs to be developed and additional emission reductions actions are required. Although the magnitude of the required reductions represents a daunting challenge, every feasible action must be considered and implemented to achieve as much reductions as possible to provide healthy air for the region.

## 2. CONTINGENCY MEASURE PLAN

The proposed Contingency Measure Plan (CMP) outlined in this report lays out an aggressive approach for achieving the 108 tons per day of NO<sub>x</sub> reductions allocated to “Further Deployment of Cleaner Technologies” under section 182(e)(5) necessary to attain the 1997 8-hour ozone standard by 2023. The CMP is comprised of three specific strategies, as described below:

1. **Identified Emission Reduction Strategies** – Since the adoption of the 2016 AQMP, CARB and South Coast AQMD have identified additional emission reductions that can be credited toward the section 182(e)(5) reduction commitments in 2023. These reductions are based on: a) adopted regulations, b) new regulations or programs to be adopted by 2020, c) clean mobile source technologies being implemented which were not reflected in the 2023 emissions inventory, and d) a series of innovative new measures designed to achieve further reductions. Chapter 3 provides a brief description for each of these measures.
2. **Additional Incentive Funding** – Additional emission reductions are expected from both the existing and new sources of incentive funding by accelerating the turn-over of existing mobile sources to cleaner technologies. Chapter 4 discusses the potential future funding sources.
3. **Federal sources and federal measures** – Without further reductions from federal sources (i.e., OGV, aircraft, locomotives, out-of-state trucks), which account for 32% of NO<sub>x</sub> emissions, attainment of the 1997 8-hour standard is not possible by 2023. Therefore, to achieve the balance of the section 182(e)(5) commitment, additional reductions are needed from federal sources through federal regulatory programs and/or federal incentive funding. Chapter 5 provides a list of possible federal measures and actions for reducing emissions from sources under federal jurisdiction.

Table 2.1 presents the anticipated emissions reductions for the CMP for addressing the section 182(e)(5) commitment in 2023.

**Table 2-1**  
Contingency Measure Plan Strategies

CMP Strategy	2023 Reductions (tpd)
Identified Emissions Reduction Strategies	24-26
Additional Incentive Funding	15
Federal Measures and/or Funding	67-69
<b>Total</b>	<b>108</b>

### 3 IDENTIFIED MEASURES THAT CAN ACHIEVE REDUCTIONS BY 2023

As previously described, Section 182(e)(5) of the Clean Air Act allows for Extreme nonattainment areas’ attainment demonstrations to be based in part on the anticipated development of new technologies or improvement of existing control technologies. These long-term control measures are often referred to as “black box” measures and go beyond the short-term control measures that are based on known and demonstrated technologies. The 2016 State SIP Strategy includes both defined regulatory/incentive measures as well as measures identified as “Further Deployment of Cleaner Technologies” measures that do not yet have fully-defined implementation strategies (i.e., proposed under section 182(e)(5)). This section describes the identified measures, beyond the emission reductions quantified in the 2016 AQMP and the State SIP Strategy, to be used as contingency measures for the reductions specified under “Further Deployment of Cleaner Technologies” in the State SIP Strategy.

#### 3. a. CARB Regulations Providing NOx Reductions Not Included in the 2016 AQMP

In addition to those measures that were defined in the State SIP Strategy, CARB is implementing new measures that will achieve reductions toward California’s section 182(e)(5) commitment. These measures are listed in the Table 3-1 with descriptions following.

**Table 3-1**  
CARB New Mobile Source Measures toward Section 182(e)(5) Commitment

Measure	Date of Adoption (Expected)	Achieved NOx Emissions Reductions in 2023 (tpd)
Low Carbon Fuel Standard and Alternative Diesel Fuels Regulation	April, 2018	1.7
ATCM for Portable Engines, and the Statewide Portable Equipment Registration Program Regulation	November 16, 2017	0.25
HD Inspection and Maintenance (I/M) program	(Early 2020)	4.2
<b>Total Mobile Source Reductions Towards 182(e)(5) Commitment</b>		<b>6.15</b>

#### *Low Carbon Fuels Standard Amendment*

On September 27, 2018, the CARB Board approved amendments to the Low Carbon Fuel Standard (LCFS), which strengths and smooths the Carbon Intensity (CI) benchmarks through 2030 in-line with California’s 2030 GHG target enacted through SB32. The LCFS transforms and diversifies the fuel pool in California to reduce petroleum dependency and achieve air quality benefits. The LCFS is a key



part of a comprehensive set of programs in California to reduce emissions from the transportation sector.

The LCFS sets annual CI standards, or benchmarks, which reduce over time, for gasoline, diesel, and the fuels that replace them. The new fuels will not only lower GHGs but also improve California's air quality relative to current (2016) conditions and to the business-as-usual scenario. The total statewide NOx and PM2.5 emissions are estimated to be lower in each year from 2019 through 2030.

***ATCM for Diesel Particulate Matter from Portable Engines Rated At 50 Horsepower and Greater, And the Statewide Portable Equipment Registration Program Regulation***

On November 16, 2017, CARB approved amendments to the Portable Equipment ATCM and PERP Regulation (PERP Regulation). The PERP Regulation requires operators to upgrade their equipment by 2020 to meet emissions requirements. The PERP Regulation was designed to force the development of retrofit emissions control technologies and new engine technologies to meet regulatory requirements. Some of these technologies materialized and some did not. Because technologies did not develop as anticipated, the current PERP Regulation requirements are financially and, in some cases, technologically infeasible. The new PERP Regulation restructures the emissions requirements so that implementation and enforcement of the regulation is feasible, the regulated fleets can comply, and emissions reductions are achieved.

***Heavy Duty Truck Inspection and Maintenance Program***

Scheduled for consideration by CARB in early 2020, the Heavy-Duty Truck Inspection and Maintenance Program (HD I/M program) will be designed to incentivize vehicle owner and driver behavior to ensure that heavy-duty vehicles are well maintained and properly repaired.

In California, heavy-duty diesel vehicles with a gross vehicle weight rating over 14,000 pounds represent one of the largest sources of mobile air pollution. 2019 estimates indicate that these vehicles contribute approximately 58 percent of the statewide on-road mobile source NOx emissions. Some of these emissions are attributed to broken or failing emissions-related equipment.

CARB's existing heavy-duty inspection programs rely on random field inspections by CARB staff and annual self-inspections by truck owners to test for smoke opacity levels. However, these programs do not ensure that vehicle owners are regularly inspecting and repairing their vehicles' broken emissions controls. The HD I/M program will ensure that vehicles' emissions control systems are operating as designed to reduce emissions, and also remove gross polluting HD vehicles from the roads.

### 3. b. CARB Innovative New Measures

California has identified additional, innovative measures beyond those regulations identified above that were not identified in the 2016 AQMP and State SIP Strategy, but have been adopted, or are soon to be adopted by CARB. These actions are more innovative in nature and represent a next-level effort to continue to reduce emissions in the Basin. In some cases, these measures go beyond the historical model of programs and regulations and represent the level of transformation needed of every sector to achieve clean air. These measures are described below.

#### *Tier 5 Off-Road Diesel Engine Standard*

CARB has adopted four increasingly stringent tiers of regulations to reduce emissions from off-road diesel engines since 1995 to minimize the adverse health effects of diesel emissions. However, it has been almost 14 years since the off-road diesel standards were last updated (Tier 4 in 2005), which now lag behind the European Stage V nonroad diesel standards in stringency. As a result, the emissions contribution from off-road diesel engines continues to increase and will exceed the contribution from on-road diesel engines by 2025, making off-road diesel the single largest source of mobile NO<sub>x</sub> emissions in California. This measure would include adopting more-stringent standards that reduce NO<sub>x</sub> and PM emissions by up to 90% below the current Tier 4 standards, as well as potential requirements to offer off-road vehicles with zero-emission technology for sale.

#### *State Green Contracting*

California's State Transportation Agency spends approximately \$5 billion annually on building and maintaining California roads. In addition, State government purchases new vehicles and equipment each year. This measure would consider requiring that contractors use the cleanest equipment available in order to be considered for these contracts and that State agencies purchase the cleanest vehicles and equipment that are available. This measure builds on Governor Newsom's recent directive for State government to immediately redouble efforts to reduce greenhouse gas emissions and mitigate the impacts of climate change while building a sustainable, inclusive economy.

#### *Reduction in Growth of Single-Occupancy Vehicle Travel*

This measure would consider applying a regional transportation system pricing program in conjunction with requirements to use funding generated to encourage people to take public transit, carpool, bike, walk, and/or adjust trip times at congested times of day. The regional pricing program would implement a suite of regional and locally focused pricing strategies for use of certain lanes, driving into certain areas, parking in prime locations, driving at peak times, and/or utilizing non-pooled ridehailing services. Funds generated from the program must be used to either encourage use of existing identified clean transportation options or to provide additional clean transportation options. Some examples include, but are not limited to: reducing the cost of transit via transit passes, providing rebates for e-bikes, providing lower cost or reserved parking spaces for carpools, educating the public about the

availability of per-mile car insurance pricing options, and provide traveler incentives to encourage travel at times when roads are less congested.

### *Locomotive Emission Reduction Measure*

CARB is evaluating concepts for a potential regulation to reduce criteria, toxics, and greenhouse gas emissions. These concepts address in-use locomotive emissions, idling, and maintenance activities. The potential regulation includes elements that could be implemented at the state and/or district level. Previously, state action to limit rail emissions has been through enforceable agreements. Although a regulation will take more time to implement than an agreement, it will not sunset like previous MOUs, it will be more transparent in its development, it will be enforceable, and it will achieve additional emissions reductions.

Specifically, one of CARB's concepts, called the Locomotive Emissions Reduction Spending Account requires that the Class 1 railroads set aside funds each year to purchase Tier 4 or cleaner locomotives. The amount to be set aside is based on the usage of Tier 3 and lower (dirtier) locomotives in California. The charge increases with the emissions level of the locomotive used, which should encourage cleaner locomotive operation within the state. The Account could begin implementation by the end of 2022, with potential PM and NOx reductions by the end of 2023. Note, CARB staff will coordinate with the District to ensure this measure does not duplicate the railyard indirect source rule.

### *VMT and Land Conservation*

Integrating land and transportation strategies can have synergistic effects and help the state further reduce both criteria and greenhouse gas emissions by protecting land-based carbon while providing simultaneous reductions in emissions from transportation. Protection of lands that are at risk of conversion to urban or rural development through use of conservation easements or the implementation of local and regional planning policies that protect land from development result in the extinguishment of development rights, thereby avoiding increases in VMT by limiting opportunities for expansive, vehicle-dependent forms of development. Currently, only some sustainable community strategies in regional transportation plans explicitly include conservation and management of natural and working lands. While cities and counties across California have developed local and county climate action plans to reduce GHG emissions and increase climate resilience, few capture the potential GHG reductions from conserving, restoring, and managing NWL. Although limited research is available on the direct effect of land conservation on VMT, the State is expanding efforts to understand the relationship and synergies of taking an integrated cross-sector approach.

### *Regional VMT Reductions*

Today's California is shaped by historic patterns of growth in transportation and housing. While we have grown to be the fifth largest economy in the world, our residents, in search of an affordable place to live, and with insufficient transportation options, are too often left with little choice but to spend

significant time and money driving from place to place. Where we put transportation and housing also imposes and often reinforces long-standing racial and economic injustices by placing a disproportionate burden on low-income residents, who end up paying the highest proportion of their wages for housing and commuting. Staff and elected officials of local, sub-regional, regional, and state government bodies all have critical authorities and roles to contribute and could take steps to improve these outcomes, but so far, all – acting rationally within the state’s current structure of incentives, political forces, and policy restrictions – have not been able to enact the magnitude of change needed. There are unique opportunities for elected officials to improve the transportation sector to reduce emissions and help with attainment of health-based air quality standards in the South Coast.

### *Co-Benefits from Electrification of Buildings due to 2017 Climate Change Scoping Plan*

Buildings contribute directly to emissions when fuel (primarily natural gas) is combusted on-site for space and water heating. As grid electricity in California transitions to 100 percent clean energy, building electrification can reduce fuel combustion emissions in buildings. The framework for this measure is contained in Alternative 1 of the 2017 Climate Change Scoping Plan, and includes measures pertaining to appliance technology substitution; demand reduction; and electrical efficiency in industry, agriculture, residential, and commercial lighting; and residential air conditioning, freezing, and refrigeration. An implementation framework for building electrification would consider mechanisms to require and incentivize early retirement/replacement and new installations of residential and commercial water heating, space heating, and air conditioning appliances with zero or near-zero emission technologies such as high efficiency electric heat pumps.

### **3. c. South Coast AQMD Measures Providing NO<sub>x</sub> Reductions Not Included in the 2016 AQMP**

The 2016 AQMP was adopted in March 2017 and approved by CARB the same month. Among the 27 control measures targeting NO<sub>x</sub>, ten have quantifiable NO<sub>x</sub> emission reductions while the reductions from the remaining control measures were left to be determined (TBD) in the AQMP. The “TBD” measures require further technical and feasibility evaluations to determine the emission reduction potential and thus, the attainment demonstration is not dependent on these measures. Emissions reductions achieved and quantified by these measures can be applied towards contingency requirements.

Table 3-2 provides a list of the South Coast AQMD’s identified emissions reduction strategies with reduction benefits that were not specifically identified in the 2016 AQMP. Since the adoption of the 2016 AQMP, South Coast AQMD has taken several actions to develop rules and programs to further reduce NO<sub>x</sub> emissions. On May 4, 2018, the South Coast AQMD Governing Board directed staff to pursue a voluntary Memorandum of Understanding (MOU) approach with marine ports and commercial airports and pursue regulatory approaches for warehouses/distribution centers, railyards and new and re-development. The MOUs with the marine ports and commercial airports will implement the facility-based mobile source measures (FBMSMs) MOB-01 and MOB-04 in the 2016

AQMP, with quantifiable emissions reductions. In addition, pursuant to directives listed in control measure CMB-05 of the 2016 AQMP and in recently adopted state statute (AB 617), RECLAIM facilities are subject to an expedited implementation schedule to install additional BARCT no later than December 31, 2023, which accelerated the implementation schedule of CMB-05, thereby providing additional emission reduction benefits in 2023. Additional NOx emission reductions anticipated from continued implementation of existing incentive programs with future funding will also generate reductions that are surplus to South Coast AQMD’s 2023 commitments. Also, reductions are anticipated from deployment of Metrolink’s Tier 4 locomotives and improved OGV vessel speed reduction programs implemented by the Ports, which were not included in the 2016 AQMP inventory. Finally, because of the updated OGV inventory and CARB’s SIP strategy for OGVs, there are surplus reductions that can be allocated toward the section 182(e)(5) reduction commitments. Details of each identified measure are provided in subsequent sections.

**Table 3-2**  
South Coast AQMD’s Identified Measures Providing Additional NOx Reductions toward CAA 182 (e)(5) Commitments

Measure/Program	Date of Adoption/ Implementation	Emissions Reductions (tpd in 2023)
RECLAIM Transition Rules	2020	2
Facility-Based Mobile Source Measure for Commercial Airports	December 2018	0.5
Facility-Based Mobile Source Measure for Marine Ports	Early 2020	3-5
Incentive Funding (Expected Future Funding)	2020-2023	1.5
Metrolink Tier 4 Locomotives Conversion	Full Implementation Before 2023	3.0
OGV Vessel Speed Reduction	2017+	0.2
<b>Total Reductions Towards 182(e)(5) Commitment *</b>		14 - 16

\* Preliminary estimates; also includes 4.2 tons per day of reductions associated with updated OGV emissions inventory and CARB’s SIP Strategy for OGV.

***RECLAIM Transition Rules***

As described in more detail under Section 3a, for SIP accounting purposes, reductions from adopted rules are first allocated to account for the reduction commitments specified under RECLAIM Rule 2002 that were part of the 2016 AQMP baseline emissions inventory. Only surplus emission reductions beyond the baseline can be credited towards the CAA section 182(e)(5) commitment. Table 3-3 lists the anticipated rules to be adopted in 2020 that go beyond the reductions specified under RECLAIM Rule 2002. These anticipated rules include Rule 1109.1 for refinery equipment, Rule 1150.3 for landfills,

Rule 1179.1 for combustion equipment and publicly owned treatment work facilities, and Rule 1146.2 for large water heaters and small boilers and process heaters. It should be noted that for the anticipated rules, the final emission reduction amounts are still being determined and will be finalized during the rulemaking process. The approximately 2 tpd of additional emission reductions from these anticipated rules will be surplus for 2023 (the 2016 AQMP CMB-05 commitment of 5 tpd is for 2025 with no credit taken for 2023) and can be credited to the section 182(e)(5) commitments.

**Table 3-3**  
Surplus Emission Reduction Allocation for RECLAIM Transition

	Rule	Reduction NOx in 2023 (tpd)
Rules to be Adopted in 2020	Rule 1109.1 – Refinery Equipment	2
	Rule 1150.3 – Emissions of Oxides of Nitrogen from Combustion Equipment at Landfills	
	Rule 1179.1 – NOx Emission Reduction from Combustion Equipment and Publicly Owned Treatment Work Facilities	
Rules beyond 2020	Rule 1146.2 – Emissions of Oxides of Nitrogen from Large Water Heaters and Small Boilers and Process Heaters	

***Facility-Based Mobile Source Measure (FBMSM) for Commercial Airports***

The 2016 AQMP includes South Coast AQMD’s proposed Facility-Based Mobile Source Measures (FBMSMs) to help reduce emissions from indirect sources. Indirect sources are facilities that have limited direct emissions, but attract significant mobile emissions, such as airports, ports, and warehouses. Control Measure MOB-04: Emission Reductions at Commercial Airports covers emissions from non-aircraft airport-related mobile sources, including ground support equipment, shuttle buses, trucks, and on-road and off-road vehicles. In May 2018, the South Coast AQMD Governing Board directed staff to pursue a voluntary Memorandum of Understanding (MOU) approach for the non-aircraft sources at five commercial airports in the Basin - Los Angeles International Airport, John Wayne Airport, Burbank Airport, Long Beach Airport, and Ontario Airport. Following the Board’s direction, South Coast AQMD established an Airport MOU working group for the development and implementation of the MOUs with the airports. The draft MOUs are developed based on the Air Quality Improvement Plans/Measures (AQIP/AQIM) that the airports have prepared, which include specific airport measures and initiatives for reducing emissions from non-aircraft sources. Under the MOUs, the airports will commit to implement specified AQIP/AQIM measures that are potentially eligible for SIP credit and provide annual reports to South Coast AQMD on the implementation of

these measures. South Coast AQMD will be responsible for quantifying the emissions benefits for these potential SIP creditable measures and making up any emission reduction shortfall.

The FBMSM for commercial airports is expected to achieve 0.5 tpd of NO<sub>x</sub> emission reductions in 2023 based on the implementation of SIP creditable AQIP/AQIM measures, which primarily focus on ground support equipment with additional measures for shuttle buses and vehicles/trucks. For ground support equipment, the airports are establishing airport-specific emissions performance targets (i.e., grams of NO<sub>x</sub>/HC per horsepower hour) in 2023 and 2031, which would require transitioning to cleaner or zero-emission equipment. For shuttle buses and vehicles, zero-emission or near-zero-emission vehicles are being proposed.

### *Facility-Based Mobile Source Measure for Marine Ports*

The 2016 AQMP also includes Control Measure MOB-01: Emission Reductions at Commercial Marine Ports. This measure covers emissions from port-related mobile sources, including drayage trucks and cargo handling equipment. In May 2018, the South Coast AQMD Governing Board directed staff to pursue a voluntary Memorandum of Understanding (MOU) approach for the Ports of Los Angeles and Long Beach. The MOU will include specific measures from the Ports' 2017 Clean Air Action Plan (CAAP) update, with the goal of obtaining SIP creditable emission reductions from those measures. Following the Board's direction, South Coast AQMD established a Technical Working Group (TWG) to develop methodologies and quantify emissions benefits associated with the implementation of CAAP measures. The TWG is comprised of representatives from South Coast AQMD, CARB, U.S. EPA, Ports of Los Angeles and Long Beach, Coalition for Clean Air, Sierra Club, Pacific Merchant Shipping Association, and California Trucking Association. In addition, a Ports MOU working group has been established to track the development and implementation of the MOU. Under the MOU, the Ports will commit to implement specified CAAP measures with South Coast AQMD committing to quantify the emission benefits and make up any emissions reduction shortfall.

The Ports MOU is estimated to achieve 3 to 5 tpd of NO<sub>x</sub> emission reductions in 2023 based on the implementation of proposed SIP creditable CAAP measures, primarily focusing on drayage trucks and potentially on cargo handling equipment. Under the proposed updates to Clean Truck Program, a rate will be charged to the beneficial cargo owners for heavy-duty trucks with loaded containers entering or exiting the Ports' terminals, with possible exemptions provided for zero and near-zero emission trucks. The revenues to be collected through the assessment of the rate will be used as incentives for fleets to replace their existing trucks with zero and near-zero emission trucks. As for cargo handling equipment, the emission reductions are largely associated with electrifying terminal equipment, including on-going modernization projects at several terminals. The estimated reductions from cargo handling equipment are yet to be quantified.

*Additional Emission Reductions from Incentive Funding (existing funding sources)*

The 2016 AQMP highlighted the need for a significant level of incentive funding to achieve additional reductions in a timely manner. The 2016 AQMP provides an analysis of the incentive funding levels that will be needed to achieve the emission reductions associated with the State SIP Strategy “Further Deployment of Cleaner Technologies” measures if no other actions occur. The total amount of funding needed to achieve the 2023 NO<sub>x</sub> emission reductions identified in the State Mobile Source Strategy ranges from \$4.3 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. California and the South Coast AQMD have a long history of successful implementation of incentive programs that help fund the accelerated deployment of cleaner engines and after-treatment technologies in on-road heavy-duty vehicles and off-road mobile equipment. Such accelerated deployment not only result in early emission reductions, but also provides a signal to technology providers, engine and automobile manufacturers, and academic researchers to develop and commercialize the cleanest combustion engines possible and further the efforts to commercialize zero-emission technologies into a wider market. Some of the major incentive sources include:

- Carl Moyer Memorial Air Quality Standards Attainment Program (SB1107 and AB 923)
- AB 118 – California Alternative and Renewable Fuel, Vehicle Technology, Clean Air, and Carbon Reduction Act of 2007
- Proposition 1B – Highway Safety, Traffic Reduction, Air Quality, and Port Security Bond Act of 2006
- Low Carbon Transportation Funding (Greenhouse Gas Reduction Fund)
- AB 2766 – Motor Vehicle Fee Program
- South Coast AQMD Clean Fuels Program
- South Coast AQMD Rule 2202 – On-Road Motor Vehicle Mitigation Options
- AB 617 and AB 134

Since the adoption of the 2016 AQMP, the South Coast AQMD has implemented a range of incentive funds available to local fleets to accelerate implementation of lower emitting technologies, and provides outreach to support cleaner technologies. Table 3-4 lists the number of affected mobile source equipment and emission reductions in tons per year (tpy) for projects approved in 2018. This serves to demonstrate South Coast AQMD’s ability to implement incentive programs in the region, and that incentive programs are an effective means to generate emission reductions.



**Table 3-4**  
Summary of South Coast AQMD's Board Approved  
Incentive Programs in 2018

Program	Funding Amount	No. of Equipment	NOx (tpy)	PM2.5 (tpy)
<b>Carl Moyer &amp; SOON</b>	\$35,559,645	558	415	7.8
<b>AB 134</b>	\$49,060,072			
<b>Near-Zero Trucks with CEC Grant, Ports, and AB</b>	\$14,000,000	140	63.2	–
<b>Near-Zero Emission School Buses</b>	\$35,638,000	206	27.1	1.5
<b>EFMP</b>	\$8,257,730	1,023	14.4	--
<b>Voucher Incentive (VIP)</b>	\$2,745,000	65	44.2	0.12
<b>TOTAL</b>	<b>\$ 145,260,447</b>	<b>1,992</b>	<b>563.9</b>	<b>9.42</b>

In the last few years, the South Coast AQMD and its State and regional partners implemented around \$100 to \$200 million per year in incentives funding. Since the 2016 AQMP, actions have been undertaken to secure a significant sustainable level of funding revenue. Table 3-5 provides a summary of reasonably expected future funding for the major incentive programs in the Basin that are estimated to be about \$800 million of funding over the next 3-4 years.

**Table 3-5**  
Summary of Reasonably Expected Future Funding

Funding Source	Expected Funding
<b>Carl Moyer</b>	\$40-\$50 million per year
<b>AB 617-related Incentives</b>	\$80-\$90 million per year
<b>AB 2766</b>	\$22 million per year
<b>Mobile Source Air Pollution Reduction Review Committee</b>	\$17 million per year
<b>Volkswagen Settlement</b>	\$67 million (total)
<b>Prop 1B</b>	\$30 million (total)

Based on the expected future funding of approximately \$800 million over the next 4 years, about 12 tpd of NO<sub>x</sub> reductions are expected to be achieved by 2023. After fulfilling South Coast AQMD's aggregate commitments for 2016 AQMP control measures MOB-10, MOB-11 and MOB-14, the remaining surplus reduction is estimated at approximately 1.5 tpd of NO<sub>x</sub> emissions in 2023 that can be used for the South Coast AQMD's section 182(e)(5) commitments.

#### *Metrolink Tier 4 Locomotives Conversions*

The South Coast AQMD Governing Board has awarded Metrolink a total of \$92.85 million since February 2013 for the replacement of 37 older locomotives (Tier 0 & Tier 2) with Tier 4 locomotives and the new purchase of three Tier 4 locomotives. As of September 2019, 27 Tier 4 locomotives have been delivered to Metrolink with 23 units deployed in revenue service or undergoing shakedown testing. Metrolink anticipates all 40 Tier 4 locomotives will be deployed in service by the end of 2020. Upon full deployment, Metrolink will operate 40 train sets with Tier 4 locomotives. Metrolink will retain several Tier 2 locomotives as spare or standby units to fill in during scheduled and unscheduled maintenances for the Tier 4 locomotives. Based on the preventive maintenance schedule, Metrolink anticipates at least three Tier 4 units will be out of service at a time, with the normal operation cycle including 37 Tier 4s and 3 Tier 2s in service on a daily basis. The emission reductions from Tier 4 conversions, which are surplus to the 2016 AQMP inventory, are estimated to be 3 tpd in 2023.

#### *OGV Vessel Speed Reduction*

The Ports of Los Angeles and Long Beach have been implementing a voluntary incentive-based Vessel Speed Reduction (VSR) Program and Green Flag Incentive Program, respectively, over the last several years. Under these programs, the Ports offer monetary incentives to shipping lines that reduce their transiting speeds to 12 knots within 20 nautical miles and 40 nautical miles of Point Fermin. The benefits of the Ports' VSR programs, included in the 2016 AQMP inventory, were based on the Ports implementation of the VSR programs in 2014. However, with continued improvements in the VSR Program, the Ports have reported higher compliance rates in 2017. Based on the 2017 VSR compliance rates reported by the Ports, the surplus NO<sub>x</sub> reductions is estimated to be 0.2 tpd in 2023.

#### *Updated OGV Inventory and SIP Strategy*

During the development of the 2016 AQMP, the emissions inventory was frequently updated to incorporate the latest available information and methodologies. The Draft 2016 AQMP was first released to the public for review and comments in June 2016, and a Revised Draft 2016 AQMP was subsequently released in October 2016. Both of these documents incorporated the best available emission inventory at the time of their development. In the last quarter of 2016, the emissions for OGV were updated with significant increases of NO<sub>x</sub> emissions in future years, primarily due to the delayed introduction of Tier 3 engines in California waters. However, there was not enough time to incorporate the emissions inventory update in the attainment demonstration for the various federal standards addressed in the 2016 AQMP. To ensure that attainment could still be achieved, the State SIP Strategy

was revised with increased emission reductions commitments in the OGV category to accommodate the changes in OGV emission inventory that were not been reflected in the 2016 AQMP SIP submittal.

In 2018, CARB adopted the 2018 Updates to the California State Implementation Plan (2018 SIP Update) in response to recent court decisions related to ozone reasonable further progress baseline inventory years and contingency measures. The 2018 SIP Update includes an updated emission inventory incorporating the changes in the OGV category. As a result, the 2023 baseline emissions for OGV has been increased from 23 tpd to 37 tpd in the South Coast Air Basin. After incorporating the OGV inventory updates into the attainment demonstration, we discovered that the emission reductions commitment for the OGV category in the 2016 AQMP and State SIP Strategy was higher than needed, with an additional 4.2 tons per day of NO<sub>x</sub> emission reductions beyond the projected carrying capacity of 141 tons per day. Therefore, to reflect the most up-to-date emissions inventory and control strategy, a 4.2 tpd of NO<sub>x</sub> reductions is realized from the over-commitment in the 2016 AQMP and State SIP Strategy.

#### **4. ADDITIONAL INCENTIVE FUNDING THROUGH SOUTH COAST AQMD'S STATE LEGISLATIVE EFFORTS**

South Coast AQMD has been making sustained efforts locally and with the state legislature to seek funding to implement the 2016 AQMP for the South Coast region and will continue to do so going forward. The 2016 AQMP calls for over \$1 billion per year in incentive funding for clean vehicles, infrastructure and equipment.

In 2017, the South Coast AQMD sponsored AB 1274 (O'Donnell), which was signed into law. Beginning in 2019, this bill creates annual smog abatement fees that are transferred to the Carl Moyer Program for more effective reductions in diesel particulate matter and nitrogen oxide emissions. This bill is anticipated to create a sustainable funding source of about \$25-30 million annually for the South Coast region. Also, through budget trailer bill AB 134, South Coast AQMD received a one-time allocation of \$107.5 million in Greenhouse Gas Reduction Fund (GGRF) monies for increased Carl Moyer Program funding for incentives to accelerate turnover to cleaner vehicles and equipment and reduce criteria air pollutant and toxic air contaminant emissions in the South Coast region. In 2018, as a result of budget trailer bill SB 856, South Coast AQMD ultimately received a one-time allocation of about \$86 million in GGRF funding for AB 617 incentives to accelerate turnover to cleaner vehicles and equipment and reduce criteria air pollutant and toxic air contaminant emissions that will benefit disadvantaged communities within the South Coast region that are in the AB 617 program or are being considered for that program in future years. In 2019, as a result of budget bill AB 74 (Ting), South Coast AQMD is expected to again receive a one-time allocation of about \$86 million in GGRF funding that shall be available for financial incentives to reduce mobile and stationary sources of criteria air pollutants or toxic air contaminants within the South Coast region consistent with community emissions reduction programs developed pursuant to the AB 617 program and its statutory requirements (Section 44391.2 of the Health and Safety Code).

Moving forward, through 2023, several funding sources will be advocated for including: (1) Greenhouse Gas Reduction Funds (GGRF), (2) Statewide Bond Funding, and (3) Voting District Authorization for Clean Air Legislation, SB 732 (Allen).

1. GGRF - Given that the South Coast region already has three approved communities in the AB 617 program and is likely to add 2 more in 2020, South Coast AQMD will be advocating for at least \$150 to \$200 million in sustainable annual GGRF monies for incentive funding going forward, to benefit disadvantaged communities within the South Coast region that are in the AB 617 program or are being considered for that program in future years.
2. Statewide Bond Funding – Currently, there are multiple pieces of state legislation that would result in bond measures for the statewide ballot (e.g. AB 352 (E. Garcia); AB 1298 (Mullin); and SB 45 (Allen)), that include funding at around the \$4 billion level, for purposes that include the funding of zero-and near-zero-emission vehicle technologies and infrastructure. These bills are expected to be consolidated into one primary bond bill in 2020 and represent a substantial

potential source of incentive funding to benefit air quality within the South Coast region. South Coast AQMD staff will be working with the California Air Pollution Control Officers Association (CAPCOA) to secure a portion of these bond monies for incentive funding for local air districts, including in the South Coast region, to reduce air pollution and facilitate attainment of federal air quality standards.

3. Voting District Authorization for Clean Air Legislation, SB 732 (Allen):

- South Coast AQMD is currently sponsoring state legislation, SB 732 (Allen), which seeks authorization from the Legislature to create a voting district in the South Coast region to allow local funding measures to be placed on the ballot. The bill allows the people of the South Coast region to decide for themselves whether they want to invest in clean air and address climate change. Once the bill passes the state legislature and is signed into law, it would allow a sales tax measure to be put on a ballot within the South Coast region, either by voter initiative or by South Coast AQMD Board action.
- This bill could result in the South Coast region receiving a sustainable source of funding in the amount of about \$1.4 billion dollars per year, to be used primarily for incentive funding for clean vehicles, infrastructure and equipment to facilitate implementation of the 2016 AQMP and future AQMPs within the South Coast region.

Further, South Coast AQMD will continue working hard to explore all additional options, as needed, to help secure sufficient funding to implement the AQMP and attain federal air quality standards in the South Coast region.

The anticipated future funding of \$1.4 billion is expected to generate 15 tpd of NO<sub>x</sub> reductions in 2023. Using detailed on-road and off-road vehicle populations (including by horsepower bin and model years), vehicle utilization (e.g., miles/year or horsepower-hours/year), and emissions data from CARB's EMFAC and ORION databases, staff calculated the potential emission reductions from future incentive funding programs. Incentive funding levels per vehicle/equipment type and fuel type (e.g., natural gas, electric, etc.) by analyzing South Coast AQMD's historical and current implementation of funding programs such as Carl Moyer and HVIP. The calculation ranked each vehicle category by cost-effectiveness (dollars per ton of NO<sub>x</sub> reduced in 2023) and assumed that the entire population of that category would be funded before moving on to the next most cost-effective category, and so on, until total available funding was utilized.

## **5. FEDERAL MEASURES AND FEDERAL RESPONSIBILITY**

### **5. a. NO<sub>x</sub> Emissions from Sources Under Federal Responsibility are an Increasing Portion of the Inventory**

Traditionally, NO<sub>x</sub> emissions from sources outside of California's control were a relatively small portion of the total NO<sub>x</sub> inventory in the State. In 2000, the emissions from aircraft, locomotives, and ocean-going vessels together made up less than 8 percent of the NO<sub>x</sub> inventory.

As California adopted programs to control NO<sub>x</sub> emissions from sources under State and local air district authority, the share of NO<sub>x</sub> emissions from sources under federal and international control has increased. For example, those same sources – aircraft, locomotives, and OGVs – will be responsible for over 25 percent of the NO<sub>x</sub> emissions in 2023. While total NO<sub>x</sub> emissions will decrease in the South Coast by almost 50 percent from 2012 levels in 2023, almost all of these reductions are from sources under California regulatory authority. For example, over this time NO<sub>x</sub> emissions from light-duty vehicles will be reduced by over 70 percent. Meanwhile, NO<sub>x</sub> emissions from aircraft, locomotives, and ocean going vessels will grow by almost 10 percent over this same period.

Because out-of-state heavy-duty vehicles operating in South Coast are a significant part of the fleet, timely federal action to implement a national low-NO<sub>x</sub> performance standard is necessary to achieve an in-use fleet average that provides the emission reductions from heavy-duty trucks needed for ozone attainment. A federal standard would be able to ensure that all trucks traveling within California would eventually be equipped with an engine meeting the lower NO<sub>x</sub> standard, while emission reductions resulting from California-only regulations would come mostly from Class 4-6 vehicles (as most Class 7 and 8 vehicles operating in California were originally purchased outside the State). The preponderance of interstate trucking's contribution to in-state VMT, especially within the heavier truck categories, means that a federal low-NO<sub>x</sub> standard would be substantially more effective at reducing in-state emissions than a just California-only standard.

Timely federal action is also needed on locomotives and ocean going vessels. Although EPA is currently working on revising the NO<sub>x</sub> emission standards for heavy-duty trucks, it appears that emission reductions will not occur before 2027. EPA has also been petitioned to act on locomotives but has to date failed to initiate rulemaking. Given the severity of South Coast AQMD's ozone air quality problem, and the level of reductions needed by 2023 to meet the 80 ppb ozone standard, NO<sub>x</sub> reductions from these sources are paramount and necessary to achieve clean air. While federal regulatory actions to achieve the remaining level of reductions for attainment in 2023 would provide assurance that the reductions are achieved, in lieu of this, significant federal incentive funding could also result in emissions reductions from the federal sources.

### **5. b. California Lacks Direct Regulatory Authority Over Significant Sources of Emissions**

Reductions from mobile sources rely on regulatory actions by CARB, Bureau of Automotive Repair (BAR), and U.S. EPA. California's authority to regulate mobile sources varies by category and circumstance. Under California law, CARB can set new engine standards for mobile sources, but federal preemptions and practical limitations apply to many diesel engine categories. For example,

under the federal Clean Air Act, only U.S. EPA can set new engine standards for locomotives, airplanes and construction and farm equipment equipped with off-road engines less than 175 horsepower. In the case of new heavy-duty diesel trucks and other new and in-use off-road engines, CARB may establish emission standards, but must obtain a waiver/authorization from U.S. EPA before it can enforce such regulations. With a waiver to establish its own truck standards, California can achieve reductions from trucks sold within the State. However, the interstate nature of trucking means that many of the trucks operating in the Basin on any given day are not subject to California's emissions standards. This makes national standards for new trucks operating in California a practical necessity for achieving healthy air for the residents in the Basin. With regards to emissions from shipping, we further recognize that U.S. EPA has the responsibility to represent California's interests in the international standard setting process for OGVs. In short, California must rely on federal action to set the new technology standards that will accelerate cleanup of legacy diesel fleets.

Given that California is required by federal law to reduce NO<sub>x</sub> emissions in the Basin to a sufficient level to meet the 80 ppb ozone standard, and that sources including OGVs, locomotives and aircraft under federal and international control are projected to account for approximately half of the allowable emissions in the attainment year, it is appropriate and necessary to include measures that get reductions from these sources. And given that the State is pushing the boundaries of technology to develop measures to reduce emissions from mobile sources under State control, the following federal measures are achievable and necessary to provide the NO<sub>x</sub> reductions from federal and international sources to meet the healthy air goals set by federal law.

#### **5. c. Defined Measures to Reduce NO<sub>x</sub> from Federal and International Sources**

California has identified the following actions regarding sources under federal and international control that are needed to usher in the cleanest technology and to address these sources' emissions, which are either increasing or not keeping pace with reductions in other sectors in the Basin. These measures represent the transition to cleaner technologies that is needed in all sectors to achieve the goals set forth in this document and to achieve air quality standards in the future. The emissions reductions from these measures represent complete transitions of these fleets and the maximum potential reductions from these sources. Thus, they may achieve more reductions that necessary to meet the standard if every single measure were implemented to the maximum extent. In any case, some combination of these federal measures are necessary, through regulations, incentives or other means, for California to achieve the final increment of emissions reductions needed to meet the 1997 ozone standard. These measures and the extent of the emissions reductions that can be achieved from them are summarized in the Table 5-1. More developed measures follow in the next section.

**TABLE 5-1**  
Potential Federal Measures

Measures	Measure Description	2023 NO <sub>x</sub> Reductions (tpd)
Low-NO <sub>x</sub> Heavy-Duty Vehicles	Heavy-duty vehicles (above 14,000 lbs. GVWR) powered by low-NO <sub>x</sub> standard in 2023	<b>Up to 35</b>
Low-NO <sub>x</sub> Ocean-Going Vessels	Ocean-going vessels coming to California powered by Tier 3 engines in 2023	<b>Up to 28</b>
Low-NO <sub>x</sub> Locomotives	Locomotives coming to California powered by Tier 4 engines in 2023	<b>Up to 11</b>
Low-NO <sub>x</sub> Aircraft	Aircraft NO <sub>x</sub> reductions assumption of 20% if emissions are held at 2012 levels.	<b>Up to 4</b>
<b>Total Reductions</b>		<b>Up to 78</b>



## 5. c. i. Accelerate Implementation of Federal Low-NO<sub>x</sub> Heavy-Duty Truck Standard

### *Proposed Actions*

With a federal low-NO<sub>x</sub> standard for all new heavy-duty trucks sold nationwide proposed to begin in 2024, all trucks traveling within California would eventually be equipped with an engine meeting the low-NO<sub>x</sub> standard. However, to meet the 2023 ozone standard, all heavy-duty trucks above 14,000 lbs. operating in the Basin must have low NO<sub>x</sub> engines by 2023. U.S. EPA would need to adopt the low-NO<sub>x</sub> standard to be in effect in 2022 and develop a strategy, through incentives or other actions, to turn over the fleet of vehicles registered outside of California and operating in the Basin ahead of the mandated standard.

### *Description of Source Category*

This measure addresses low-NO<sub>x</sub> engines for onroad heavy-duty engines used in class 4 through 8 medium-and heavy-duty trucks. Most of the NO<sub>x</sub> emissions from heavy-duty engines come from diesel engines, especially in the higher weight classes. Gasoline and natural gas Otto cycle spark-ignited engines are also used in heavy-duty trucks, to a lesser extent, and primarily in the lower weight classification vehicles. Medium and heavy-duty trucks are currently the fastest growing transportation sector in the United States, responsible for 25 percent of South Coast NO<sub>x</sub> emissions.

### *Background / Regulatory History*

California is the only state with the authority to adopt and enforce emission standards for new motor vehicle engines that differ from the federal emission standards. Since 1990, heavy-duty engine NO<sub>x</sub> emission standards have become dramatically more stringent, dropping from 6 grams per brake horsepower-hour (g/bhp-hr) in 1990 down to the current 0.2 g/bhp-hr standard, which took effect in 2010. Starting in 2015 in California, engine manufacturers could certify to three optional NO<sub>x</sub> emission standards of 0.1 g/bhp-hr, 0.05 g/bhp-hr, and 0.02 g/bhp-hr (i.e., 50 percent, 75 percent, and 90 percent lower than the current mandatory standard of 0.2 g/bhp-hr). The optional California standards allowed local air districts and CARB to preferentially provide incentive funding to buyers of cleaner trucks, which encouraged the development of cleaner engines. While California has the authority to regulate the engine standards for trucks sold in California, about 60 percent of total heavy-duty vehicle miles traveled in the South Coast on any given day are by trucks that were newly purchased outside of California. For this reason, it is critical that U.S. EPA establish a new national low-NO<sub>x</sub> standard for heavy-duty trucks. In response to petitions for a low-NO<sub>x</sub> rulemaking from over 20 organizations including state and local air agencies from across the country, on November 13, 2018, U.S. EPA announced the “Cleaner Truck Initiative” to develop regulations to further reduce NO<sub>x</sub> emissions from on-road heavy-duty trucks and engines. However, it is not clear whether the proposed rulemaking will result in early reduction.

**Possible Emission Reductions: Up to 35.7 tpd**

## 5. c. ii. Accelerate Implementation of Tier 3 Ocean Going Vessels

### *Proposed Actions*

U.S. EPA would advocate with international partners for the IMO to require extensive deployment of OGVs meeting Tier III NOx standards operating in the waters off the South Coast Air Basin by 2023. The measure could be implemented via regulation, incentives, voluntary agreements, or a combination of these approaches.

### *Description of Source Category*

OGVs are large vessels designed for deep water navigation and include large cargo vessels such as container vessels, tankers, bulk carriers, and car carriers, as well as passenger cruise vessels. These vessels transport containerized cargo; bulk items such as vehicles, cement, and coke; liquids such as oil and petrochemicals; and passengers. OGVs travel internationally and may be registered by the U.S. Coast Guard (U.S. flagged), or under the flag of another country (foreign-flagged). The majority of vessels that visit California ports are foreign-flagged vessels.

### *Background/Regulatory History*

While OGVs are a large contributor of NOx in the South Coast, the State has little authority to regulate this source. Regulation of these emissions is under the authority of the International Maritime Organization (IMO). The IMO Annex VI (“Regulations for the Prevention of Air Pollution from Ocean-going ships”, specifies new engine NOx standards and sets fuel sulfur limits. Tier II IMO NOx standards have applied to new vessels since 2011, and in 2016, Tier III NOx standards applied within NOx Emission Control Areas (ECAs) such as the North American ECA. Unfortunately, according to Mercator International LLC, San Pedro Bay Long-term Unconstrained Cargo Forecast, July 12, 2016, under current conditions, Tier 3 marine engines are not expected to infiltrate the South Coast ports in significant number until 2030 to 2040. This delayed arrival is a result of shipping companies generally assign the new OGVs to the Asia to Europe routes ahead of incorporating the OGVs in to the Asia to California routes. The delay in the production of Tier 3 OGVs are also caused by a significant increase in keels laid prior to Tier 3 standard deadline.

**Possible Emission Reductions: Up to 28.2 tpd**

### 5. c. iii. Accelerate Implementation of Tier 4 In-Use Locomotives

#### *Proposed Actions*

U.S. EPA would accelerate the turnover or repower of in-use locomotives in the South Coast to achieve extensive deployment of Tier 4 or better emission levels by 2023. This strategy may be executed through a regulation, incentives or other approaches to increase the turnover rate of in-use interstate, regional and switch locomotives to lower NO<sub>x</sub> emission locomotives that meet Tier 4 or better emission levels.

#### *Description of Source Category*

There are three major categories of freight locomotives BNSF and Union Pacific operate both nationally and in California. The first category is interstate line haul locomotives, which are primarily approximately 4,400 horsepower. The second category is made up of medium-horsepower (MHP) locomotives, as defined by CARB staff as typically between 2,301 and 3,999 horsepower. MHP locomotives are typically older line haul locomotives that have cascaded down from interstate service. And lastly, there are switch (yard) locomotives, specifically defined by U.S. EPA as between 1,006 and 2,300 horsepower.

Locomotives operating at railyards and traveling through California are a significant source of emissions of diesel PM, NO<sub>x</sub>, and GHGs. In addition, these emissions often occur in or near densely populated areas and neighborhoods, exposing residents to unhealthy levels of pollutants. The long useful life of locomotive engines means that natural turnover of engines to cleaner technology can take decades.

#### *Background/Regulatory History*

In 1998, U.S. EPA approved the initial set of national locomotive emission regulations. These regulations primarily emphasized NO<sub>x</sub> reductions through Tier 0, 1, and 2 emission standards. Tier 2 NO<sub>x</sub> emission standards reduced older uncontrolled locomotive NO<sub>x</sub> emissions by up to 60 percent (i.e., from 13.2 to 5.5 g/bhp-hr). CARB along with the California Railroads and the U.S. EPA signed a MOU in July 1998 that included provisions for early introduction of clean units, with requirements for a fleet average in the South Coast equivalent to U.S. EPA's Tier 2 locomotive standard by 2010.

In 2008, U.S. EPA approved a second set of national locomotive regulations. New, and older locomotives upon remanufacture, were required to meet more stringent particulate matter (PM) and NO<sub>x</sub> emissions standards. Both new Tier 3 and the remanufactured “Plus” standards result in 50 percent or more reductions in PM than the original Tier 0-2 PM emission standards. These standards also provided a small NO<sub>x</sub> benefit.

The 2008 regulations also included new Tier 4 (2015 and later model years) locomotive NO<sub>x</sub> and PM emissions standards. The U.S. EPA Tier 4 NO<sub>x</sub> and PM emissions standards further reduced emissions by approximately 95 percent from uncontrolled levels.

For the 2007 California State Strategy, CARB proposed a measure requesting U.S. EPA to replace existing locomotive engines with Tier 4 engines beginning in 2012 and conducting concurrent rebuilds of older engines to Tier 2.5 standards. CARB estimated that by 2023, the measure would reduce NO<sub>x</sub> by 70 percent from the locomotive fleet in the South Coast. This measure reiterates the need for U.S. EPA to act on replacing locomotives in the Basin with Tier 4 locomotives.

Even with U.S. EPA setting the Tier 4 Standard, there have been a minimal number of Tier 4 locomotives visiting the South Coast. In 2017, CARB petitioned U.S. EPA to exercise its authority to adopt more stringent emission standards for locomotives to lower emissions of toxic and criteria air pollutants beyond Tier 4 levels. CARB requested promulgation of updated emission standards, including standards for newly manufactured locomotives and standards for emissions upon remanufacture. To date, U.S. EPA has failed to initiate such action. U.S. EPA rulemaking to tighten the national locomotive emission standards beyond the current Tier 4 requirements is the most efficient and cost-effective path. Such U.S. EPA action would not only support attainment of the 80 ppb ozone standard in the Basin but also local environmental justice initiatives in rail-impacted communities.

**Possible Emission Reductions: Up to 11.2 tpd**

## 5. c. iv. Low-NO<sub>x</sub> Aircraft

### *Proposed Actions*

U.S. EPA would require engines in aircraft visiting airports in the Basin to substantially lower their NO<sub>x</sub> emissions.

### *Description of Source Category*

There are five commercial airports in the South Coast. NO<sub>x</sub> emissions from aircraft has grown dramatically over the 20 years. In 2000, aircraft only contributed a little more than 1 percent of the mobile NO<sub>x</sub> emissions in the Basin. By 2023, NO<sub>x</sub> emissions from aircraft are projected to be responsible for 8 percent of the NO<sub>x</sub> emissions in the Basin. And while total mobile NO<sub>x</sub> emissions will be reduced in the South Coast by close to 80 percent of 2000 NO<sub>x</sub> values in 2023, aircraft NO<sub>x</sub> emissions will increase by almost 60 percent in that time period.

### *Background / Regulatory History*

In 2012, U.S. EPA adopted emission standards for aircraft gas turbine engines with rated thrusts greater than 26.7 kilonewtons, primarily used on commercial passenger and freight aircraft. The requirements were previously adopted by the International Civil Aviation Organization (ICAO) and included two new tiers of more stringent emission standards for nitrogen oxides (NO<sub>x</sub>). These are referred to as Tier 6 standards and Tier 8 standards. The Tier 8 standards apply to engines in the United States for which the first individual production model is manufactured after December 31, 2013. Overall, Tier 8 represents an approximate 15 percent reduction in NO<sub>x</sub> emissions from Tier 6.

**Possible Emission Reductions:** Initial reductions are based on a range of reductions from a no growth assumption from 2012 to an assumption that Aircraft NO<sub>x</sub> reductions can be in line with other Heavy-duty transportation sources, i.e. Heavy Duty Diesel Vehicles, locomotives, and OGVs. If emissions are held at 2012 levels, 3.52 tpd of NO<sub>x</sub> reductions can be achieved in 2023, and if emissions are reduced by 63%, 10.9 tpd reductions can be achieved in 2023.

## 6. PUBLIC PROCESS

Development of the Draft CAA section 182(e)(5) Contingency Measures Plan was conducted through a public process. South Coast AQMD staff will hold a Public Workshop at South Coast AQMD Headquarters in Diamond Bar on October 18, 2019, to solicit information, comments, and suggestions from the public, affected businesses and stakeholders. Furthermore, the 2022 AQMP Advisory Group will provide feedback and recommendations on the development of the next plan as well as implementation of the 2016 AQMP. The Advisory Group represents a diverse cross section of stakeholders such as large and small businesses, government agencies, environmental and community groups, and academia. The Draft Contingency Measure Plan will be presented to the AQMP Advisory Group meeting on October 9, 2019 and to the Mobile Source Committee on October 18, 2019. A Public hearing will also be held at the South Coast AQMD Headquarters on December 6, 2019. Following approval by the South Coast AQMD Governing Board, the Draft Contingency Measure Plan will then be submitted for approval by the CARB Board at their Board meeting to be held on December 12 -13, 2019, in Sacramento, which will then be submitted to U.S. EPA for inclusion into the SIP.