



# Executive Summary

- Despite great strides in cleaning the air over the past several decades, the Los Angeles area still has the highest levels of ozone (smog) in the nation.
- Meeting the 2015 federal ozone standard requires reducing emissions of nitrogen oxides (NO<sub>x</sub>) – the key pollutant that creates ozone – by 67 percent more than is required by adopted rules and regulations in 2037.
- The only way to achieve the required NO<sub>x</sub> reductions is through extensive use of zero emission technologies across all stationary and mobile sources.
- South Coast Air Quality Management District's (South Coast AQMD) primary authority is over stationary sources which account for approximately 20 percent of NO<sub>x</sub> emissions.
- The overwhelming majority of NO<sub>x</sub> emissions are from heavy-duty trucks, ships and other State and federally regulated mobile sources that are mostly beyond the South Coast AQMD's control.
- The region will not meet the standard absent significant federal action.
- In addition to federal action, the 2022 Air Quality Management Plan (AQMP) requires substantial reliance on future deployment of advanced technologies to meet the standard.
- The required transition to zero and low emission technologies to meet the standard will be more expensive than traditional control strategies developed for previous federal standards. Ensuring the transition is equitable and affordable will be key to the success of the AQMP.

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## Overview

The 17 million residents of the greater Los Angeles area have historically suffered from some of the worst air quality in the nation. While air pollution has reduced greatly, more needs to be done. The region has the worst levels of ground-level ozone (smog) and among the highest levels of fine particulate matter (PM2.5). The air pollution levels in the region exceed both National and California Ambient Air Quality Standards for both these air pollutants. The health impacts associated with the high levels of air pollution cause respiratory and cardiovascular disease, exacerbate asthma, and can lead to premature death. We also know that our Environmental Justice (EJ) communities experience the brunt of the health effects from air pollution. In this document, EJ communities are defined as census tracts in the top 25 percent in the California Office of Environmental Health Hazard Assessment’s California Communities Environmental Health Screening Tool (CalEnviroScreen).<sup>1</sup> Approximately 42 percent of the South Coast Air Basin (Basin) residents and 11 percent of Coachella Valley residents live in EJ communities.

The U.S. Environmental Protection Agency (U.S. EPA) requires areas that do not meet a National Ambient Air Quality Standard (NAAQS or standard) to develop and submit a State Implementation Plan (SIP) for approval. SIPs are used to show how the region will meet the standard. Regions must attain NAAQS by specific dates or face the possibility of sanctions by the federal government and other consequences under the Clean Air Act (CAA). This can result in increased permitting fees, stricter restrictions for permitting new projects, and the loss of federal highway funds.

The South Coast AQMD SIPs are developed within the agency’s Air Quality Management Plans (AQMPs). The most recent AQMP was developed in 2016 and addressed the 1997 8-hour and 2008 8-hour ozone standards, as well as PM2.5 standards. This document is the 2022 AQMP and is focused on attaining the 2015 8-hour ozone standard of 70 parts per billion (ppb).

In August 2018, the U.S. EPA designated the Basin as “extreme” nonattainment and the Coachella Valley as “severe-15” nonattainment for the 2015 8-hour ozone standard. The South Coast Air Basin includes large areas of Los Angeles, Orange, Riverside, and San Bernardino counties. The Coachella Valley is the desert portion of Riverside County in the Salton Sea Air Basin. “Extreme” nonattainment areas must attain this standard by August 2038 and “severe” nonattainment areas must attain by August 2033 (Table ES-1).

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<sup>1</sup> Full details of the CalEnviroScreen methodology and data sources can be found in the CalEnviroScreen 4.0 report released in October 2021. Available online at: <https://oehha.ca.gov/calenviroscreen/report/calenviroscreen-40>.

**TABLE ES-1**  
**NONATTAINMENT STATUS OF 2015 8-HOUR OZONE NAAQS**

Standard	Nonattainment Area	Classification	Attainment Year
2015 8-Hour Ozone	South Coast Air Basin	Extreme	2037 <sup>2</sup>
	Coachella Valley	Severe-15	2032 <sup>3</sup>

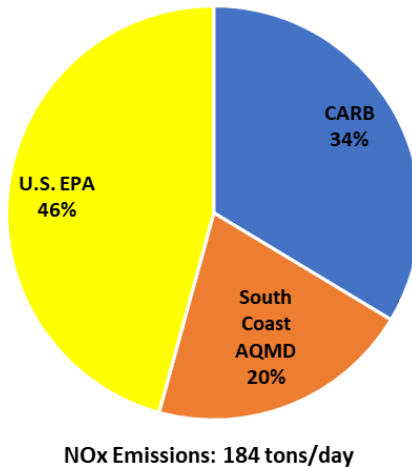
The 2022 AQMP builds upon measures already in place from previous AQMPs. It also includes a variety of additional strategies such as regulation, accelerated deployment of available cleaner technologies (e.g., zero emissions technologies, when cost-effective and feasible, and low NO<sub>x</sub> technologies in other applications), best management practices, co-benefits from existing programs (e.g., climate and energy efficiency), incentives, and other CAA measures to achieve the 2015 8-hour ozone standard.

The 2015 8-hour ozone standard is the most stringent standard to date. Because current ozone levels in the Basin are so high, meeting the standard will require substantial emissions reductions above and beyond current programs. We project that emissions of NO<sub>x</sub> – the key pollutant controlling formation of ozone – must be reduced by 67 percent beyond what we would achieve through current programs by 2037 to meet the standard. The magnitude of such an emission reduction means that all sources of emissions must be controlled as stringently as possible. This also means that we will have to rely on flexibilities provided by Section 182(e)(5) of the CAA, known as “black box” measures, to show that we are able to meet the standard. These “black box” measures can include the development and deployment of future technologies to reduce emissions as well as the reduction of NO<sub>x</sub> from sources regulated by the federal government. As depicted in Figure ES-1, 46 percent of NO<sub>x</sub> emissions in 2037 will come from federal sources, while 34 percent will come from State regulated sources, and only 20 percent will come from South Coast AQMD regulated sources.

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<sup>2</sup> Attainment date is August 3, 2038, which is 20 years from the designation as “extreme” nonattainment areas. The U.S. EPA requires that all control measures in the attainment demonstration must be implemented no later than the beginning of the attainment year ozone season. The U.S. EPA also defines the attainment year ozone season as the ozone season immediately preceding a nonattainment area’s maximum attainment date, which is August 3, 2038, therefore, 2037 is the attainment year for the Basin.

<sup>3</sup> Attainment date is August 3, 2033, which is 15 years from the designation as “severe” nonattainment area. The attainment year is the ozone season preceding August 3, 2033, which leads to 2032 as attainment year.

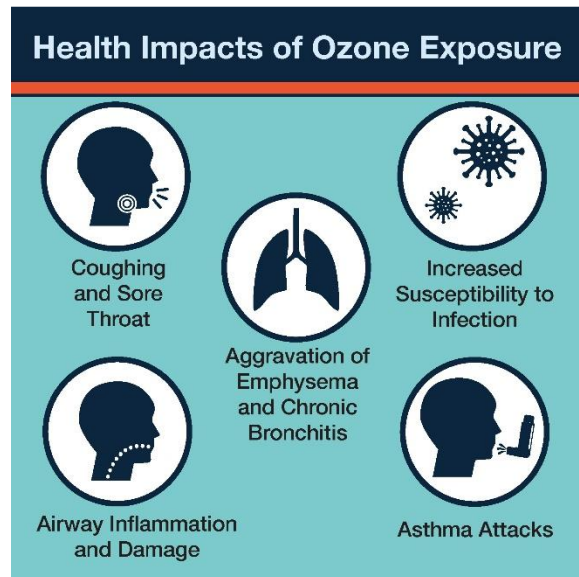


**FIGURE ES-1**  
**2037 EMISSIONS INVENTORY BY AGENCY RESPONSIBILITY**

## Health Effects and Air Quality Trends

Breathing high levels of ozone can cause a variety of negative health impacts such as asthma, chronic bronchitis, and emphysema; and increased susceptibility to lung infection. Individuals working outdoors, children, older adults, people with preexisting lung disease, and individuals with certain nutritional deficiencies are the most susceptible to these effects. Exposure to high levels of ozone levels can increase school absences, hospital visits, disease, and death.

Improvements in cleaner technology and strict regulations have reduced ozone levels since its peak in the mid-twentieth century. However, ozone levels have remained unacceptably high over the past decade despite significant reductions. This trend is due to the changes in climate and other weather conditions such as the increase in hot, stagnant days that can lead to the formation of ozone that we have experienced in recent years. While this AQMP predominantly addresses ozone, the trends and attainment status of all criteria air pollutants are presented in Chapter 2 and Appendix II. The Basin meets federal standards for particulate matter less than 10 microns in diameter (PM<sub>10</sub>), nitrogen dioxide (NO<sub>2</sub>), carbon monoxide (CO), sulfur dioxide (SO<sub>2</sub>) and



lead, but does not meet federal ozone and PM<sub>2.5</sub> standards. The Coachella Valley does not meet federal ozone and PM<sub>10</sub> standards, but attains federal PM<sub>2.5</sub>, NO<sub>2</sub>, and CO standards.<sup>4</sup>

## Emissions in the Basin and Reductions Needed for Attainment

Unlike most other air pollutants, ozone is not directly emitted, but instead is formed in the atmosphere. Ozone is formed when NO<sub>x</sub> and volatile organic compounds (VOCs) react in the presence of sunlight.<sup>5</sup> While both NO<sub>x</sub> and VOCs contribute to ozone, the key to attaining the ozone standard is to reduce NO<sub>x</sub>.

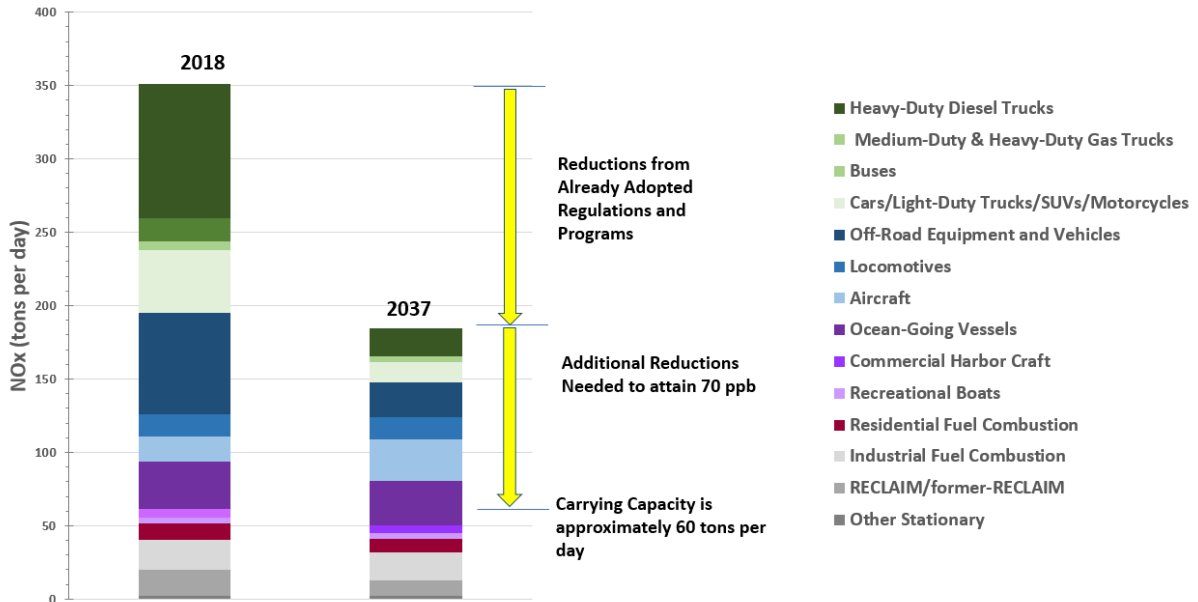
In the Basin, mobile sources – heavy-duty trucks, ships, airplanes, locomotives, and construction equipment – account for 80 percent of NO<sub>x</sub> emissions. Meanwhile, stationary sources – such as power plants, refineries, and factories – will be responsible for the remaining 20 percent in 2037. This is an important point as the majority of South Coast AQMD’s regulatory authority is for stationary sources with only limited authority to control mobile sources.

In 2037, we project that 184 tons per day of NO<sub>x</sub> will be emitted. This is known as the “baseline” and includes the implementation of existing regulations and programs, but does not include the actions proposed in this AQMP. This level is 48 percent lower than NO<sub>x</sub> emissions in 2018. In order to meet the ozone standard, the amount of NO<sub>x</sub> that can be emitted into the atmosphere is 60 tons per day and is known as the “carrying capacity.” This means that NO<sub>x</sub> needs to be reduced about 67 percent beyond the current 2037 baseline and about 83 percent below current levels (Figure ES-2).

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<sup>4</sup> Lead and SO<sub>2</sub> concentrations were not measured in the Coachella Valley. In 2020, however, historic analyses have shown concentrations to be less than the federal standards and no major sources of these pollutants are located in the Coachella Valley.

<sup>5</sup> Ozone formation is complex and is described in greater detail in Chapter 2.

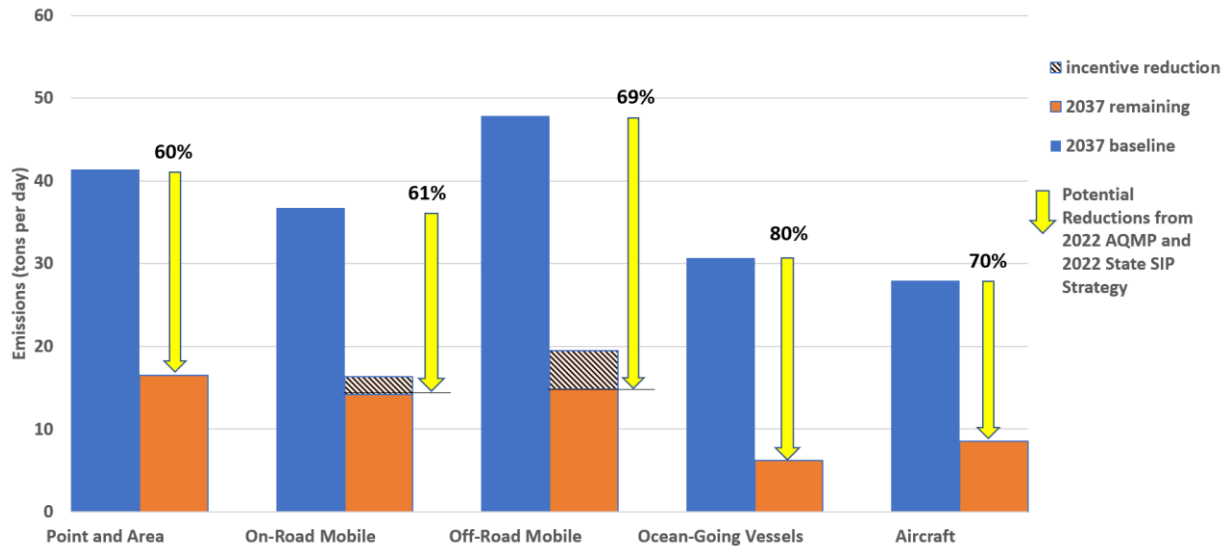


**FIGURE ES-2**  
**BASELINE NO<sub>x</sub> EMISSIONS INVENTORIES AND ADDITIONAL REDUCTIONS REQUIRED TO ATTAIN THE 2015 OZONE STANDARD**

## Control Strategy

Reducing significant amounts of NO<sub>x</sub> emissions poses a serious challenge. Previous AQMPs have relied on increasingly stringent regulations targeting tailpipe and exhaust stack emissions, new engine technologies, or fuel mix improvements. However, these approaches rely on additional reductions from already strictly regulated sources and cannot achieve an additional 67 percent reduction beyond the 2037 baseline. Therefore, there is no viable pathway to achieve the needed reductions without widespread adoption of zero emissions (ZE) technologies across all mobile sectors and stationary sources, large and small.

An overview of the control strategy by category is shown in Figure ES-3. Low NO<sub>x</sub> technologies will also need to play a significant role for some areas where ZE technology is not ready or commercially available. These lower emissions technologies will also assist with attainment of other air quality standards with earlier deadlines.



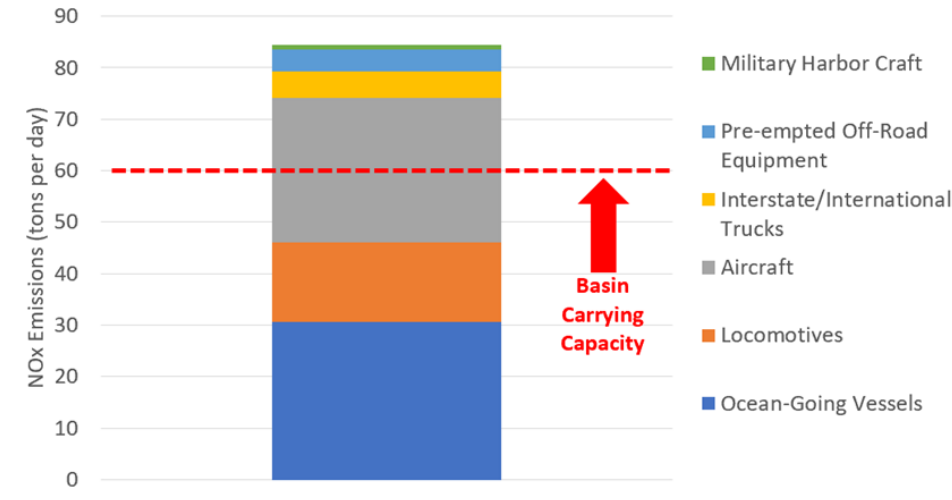
**FIGURE ES-3  
SUMMARY OF APPROACH TO REDUCING NO<sub>x</sub> EMISSIONS BY MAJOR SOURCE CATEGORY**

The control strategy for the 2022 AQMP includes aggressive new regulations and the development of incentive programs to support early deployment of advanced technologies. The two key areas for incentive programs are (1) promoting widespread deployment of available ZE and low NO<sub>x</sub> technologies and (2) developing new ZE and ultra-low NO<sub>x</sub> technologies for use in cases where the technology is not currently available. South Coast AQMD will prioritize distribution of incentive funding in EJ areas and seek opportunities to focus benefits on the most disadvantaged communities. Cost-effectiveness and affordability will be further considered during the rulemaking or incentive program development process.

Given the bulk of the Basin’s NO<sub>x</sub> emissions in 2037 will be coming from federally regulated sources, the South Coast AQMD and the California Air Resources Board (CARB) cannot sufficiently reduce emissions to meet the standard without federal action. It is therefore imperative that the federal government act decisively to reduce emissions from federally regulated sources of air pollution, including interstate heavy-duty trucks, ships, locomotives, aircraft, and certain categories of off-road equipment.

Emissions from federal and international sources are estimated to be 85 tons per day in 2037 (see Figure ES-4). Even if all sources regulated by CARB and South Coast AQMD were zero emissions, federal sources alone would emit substantially more than the 60 tons per day NO<sub>x</sub> limit, thwarting any other actions to meet the standard.





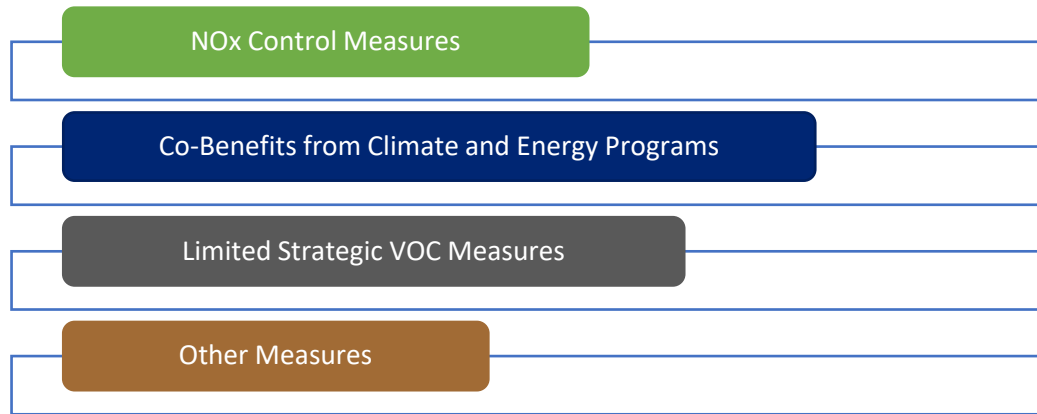
**FIGURE ES-4**  
**NO<sub>x</sub> EMISSIONS IN 2037 FROM SOURCES UNDER FEDERAL JURISDICTION IN RELATION TO THE CARRYING CAPACITY FOR THE 2015 8-HOUR OZONE NAAQS**

## Control Measures

South Coast AQMD proposes a total of 49 control measures for the 2022 AQMP. Thirty-one control measures targeting stationary sources are categorized into four groups (Figure ES-5). The NO<sub>x</sub> measures are further grouped by residential, commercial, and large industrial combustion. The first two groups mostly target non-permitted sources and have a 70 percent reduction goal by 2037. Large industrial combustion sources have a goal of 37 percent reductions by 2037 and predominantly address permitted equipment. Many control measures focus on widespread deployment of ZE and low NO<sub>x</sub> technologies through a combination of regulatory approaches and incentives and will require technology assessments to better understand where and when ZE and low NO<sub>x</sub> technologies can be implemented. New funding and programs are needed for research, development, demonstration, and deployment of advanced technologies.

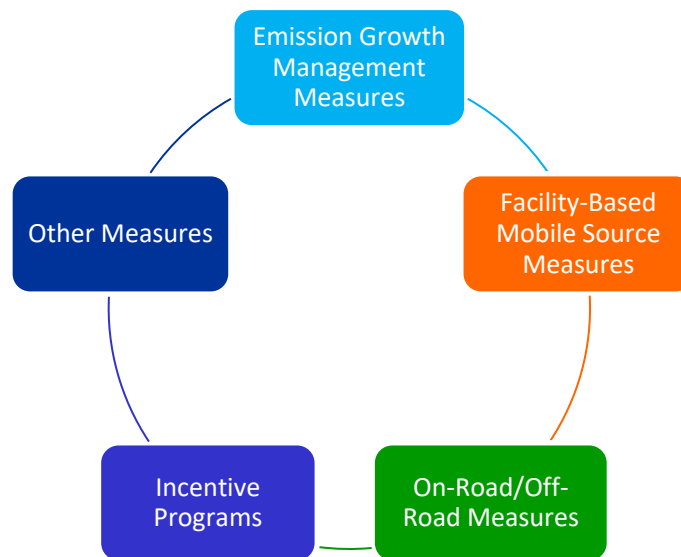
The residential and commercial measures are frequently referred to as “building measures,” which are in line with California’s aggressive climate goals to reduce greenhouse gases (GHG) emissions across various sectors. State climate actions, such as Title 24 energy code requirements and building electrification (e.g., Assembly Bill 3232), can also help reduce NO<sub>x</sub> emissions. In addition, as part of the 2022 State Strategy for the State Implementation Plan, CARB has proposed a statewide zero GHG emissions standard for residential and commercial building appliances, which would have criteria pollutant co-benefits. South Coast AQMD has also developed multiple building-related control measures to address emissions from residential and commercial combustion equipment for space heating, water heating, cooking, and others.

In addition to the NO<sub>x</sub> measures, this AQMP relies on co-benefits from climate and energy efficiency programs for further reductions, limited strategic measures for VOC reductions, and other actions.



**FIGURE ES-5  
SOUTH COAST AQMD STATIONARY AND AREA SOURCE CONTROL STRATEGY**

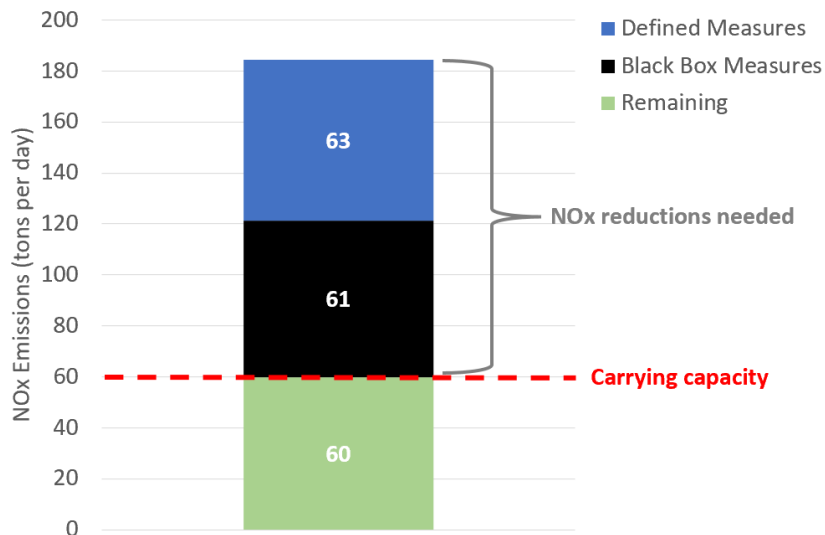
The remaining 18 control measures target mobile sources. They are facility-based mobile source measures, emission reductions from incentive programs, and partnerships with local, State, federal, and international entities (Figure ES-6).



**FIGURE ES-6  
SOUTH COAST AQMD MOBILE SOURCE CONTROL STRATEGY**

Further deployment of cleaner technologies will be necessary to attain the ozone standard. These are the CAA section 182(e)(5) “black box” measures that point to deployment of developing advanced technologies. Given that the zero and low NOx emissions technologies needed for attainment of the ozone standard are still being developed, reliance on section 182(e)(5) measures provides flexibility and time for the development of new technology and improvement of existing technologies. South Coast AQMD measures include modest black box NOx reductions of 3 tons per day for stationary sources and 7 tons per day for mobile source incentives. However, a much larger black box is needed to accommodate emissions reductions from sources regulated by the U.S. EPA, namely aircraft, ships, and interstate trucks. The black box is needed because the U.S. EPA has not adopted aggressive controls targeting these sources.

The black box includes 58 tons per day of NOx reductions from sources subject to U.S. EPA authority. Collectively, black box measures comprise 61 tons per day or 49 percent of the NOx emissions reductions needed to reach attainment. A summary of the emissions reductions are shown in Figure ES-7.



**FIGURE ES-7**  
**CONTRIBUTION OF CONTROL MEASURES TO NOx EMISSION REDUCTIONS<sup>6</sup>**

## Attainment Demonstration

Air quality modeling is used to demonstrate future attainment of the ozone standard and is an integral part of the planning process. Modeling allows us to demonstrate the connection between emissions reductions and a path to attainment. It reflects updated emissions estimates, new technical information, enhanced air quality modeling techniques, updated attainment demonstration methodology, and the control strategy.

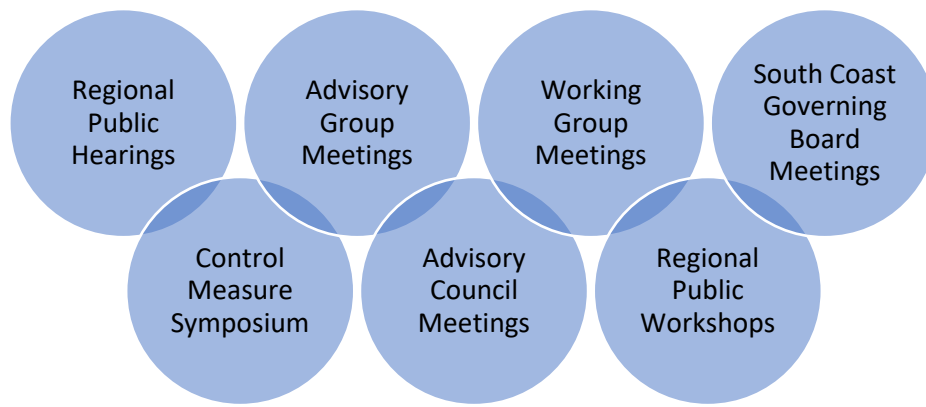
Under baseline conditions, NOx emissions are expected to decline by nearly 48 percent from 2018 to 2037, yet air quality modeling shows the standard would not be met. However, modeling shows we would meet the ozone standard in 2037 with a 67 percent additional reduction from baseline emissions achieved through the control strategies proposed in this AQMP.

Air quality modeling indicates that the Coachella Valley will not meet the 70 ppb standard by its 2032 deadline. Therefore, South Coast AQMD is requesting the redesignation of the Coachella Valley as an “extreme” nonattainment area, giving it a new attainment deadline of August 2038. Modeling demonstrates attainment in Coachella Valley in 2037.

<sup>6</sup> Mobile source measures reflect CARB’s commitment from the 2016 and 2022 State SIP Strategies. Available online at: <https://ww2.arb.ca.gov/resources/documents/2022-state-strategy-state-implementation-plan-2022-state-sip-strategy> and <https://ww3.arb.ca.gov/planning/sip/2016sip/rev2016statesip.pdf>.

## Collaboration, Public Process, and Outreach

The development of the 2022 AQMP has been a regional, multi-agency effort that includes South Coast AQMD, CARB, the Southern California Association of Governments, and the U.S. EPA. The 2022 AQMP also incorporates collaborative efforts by a wide range of stakeholders such as businesses, environmental and health organizations, community groups, and academia. As shown in Figure ES-8, numerous meetings were conducted to promote the collaborative process and public participation. Meeting materials for the public workshops and regional public hearings were translated to Spanish and each had one meeting that featured live Spanish translation. Agendas and presentations for each meeting are available at the South Coast AQMD’s website.<sup>7</sup>



**FIGURE ES-8**

### **VENUES ACCOMMODATING STAKEHOLDER PARTICIPATION**

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<sup>7</sup> [www.aqmd.gov/2022aqmp](http://www.aqmd.gov/2022aqmp).