SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT
GOVERNING BOARD

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PREFACE

On behalf of the 16.5 million residents of the South Coast Basin, the 2007 AQMP must rise to meet the following major challenges.

Stiff new Federal standards have been set in place for ozone and PM2.5.

- Slightly longer timeframe for attainment than was allowed under previous standards, but significantly more stringent than old (withdrawn) standards.
- Fast-approaching and very difficult PM2.5 deadline (2014).
- Even more challenging 8-hour ozone deadline by 2020 timeframe.
- Recently revised 24-hour PM2.5 standard more stringent than current standards.

Significant reductions are needed from all sources, but especially Mobile Sources, since the bulk of the remaining air quality problem stems from Mobile Source emissions.

- Need new ultra-low emission standards for both new and existing fleet, including on-road and off-road heavy-duty trucks, industrial & service equipment, locomotives, ships & other watercraft, and aircraft.
- Must dramatically accelerate fleet turnover to achieve benefits of cleaner engines.
- Significant reformulation of consumer products which collectively are a major source of pollutant emissions.
- Stationary sources must continue to do their fair share of the emission reduction effort including expedited equipment modernization and technology advancements.

Even today's improved smog conditions result in known public harm. New and additional health studies indicate urgent public health concerns, especially from fine particulate exposure.

- Impaired lung function in children growing up in Southern California.
- Increased episodes of respiratory disease symptoms.
- Increase in doctor visits for heart disease.
- Increase in death rates.

To have any reasonable expectation of meeting the 2014 PM2.5 deadline, the pace of improvement must intensify for Mobile Sources under state and federal jurisdiction.

- At current pace, South Coast would fail to reach attainment of old standards.
- Given the huge challenge and the public health threat involved, there is no margin for error in the overall Plan strategy, and there is no room for wavering or hesitation in the implementation of its control measures.
- Substantial public and private funding is needed to expedite the retirement of older, higher-polluting engines and vehicles.
- The time for all responsible authorities to expeditiously adopt and aggressively implement effective control strategies is **now.**

INTRODUCTION

The long-term trend of the quality of air we Southern Californians breathe shows continuous improvement, although recent leveling off in ozone improvement causes marked concern. The remarkable historical improvement in air quality since the 1970's is the direct result of Southern California's comprehensive, multiyear strategy of reducing air pollution from all sources as outlined in its Air Quality Management Plan (AQMP). Yet the air in Southern California is far from meeting all federal and state air quality standards and, in fact, is among the worst in the nation. Although the new federal fine particulates (PM2.5) and 8-hour surface level ozone standards provide a longer compliance schedule, the standards are much more stringent than the previous PM10 and 1-hour surface level ozone standards. To reach clean air goals in the next seven to fifteen years provided by the Clean Air Act deadlines, Southern California must not only continue its diligence but intensify its pollution reduction efforts.

Continuing the Basin's progress toward clean air is a challenging task, not only to recognize and understand complex interactions between emissions and resulting air quality, but also to pursue the most effective possible set of strategies to improve air quality while maintaining a healthy economy. To ensure continued progress toward clean air and comply with state and federal requirements, the South Coast Air Quality Management District (AQMD or District) in conjunction with the California Air Resources Board (CARB), the Southern California Association of Governments (SCAG) and the U.S. Environmental Protection Agency (U.S. EPA) is preparing the Draft 2007 revision to its AQMP (2007 AQMP or 2007 Plan). This Draft 2007 AQMP employs up-to-date science and analytical tools and incorporates a comprehensive strategy aimed at controlling pollution from all sources, including stationary sources, on-road and off-road mobile sources and area sources. While many technical tasks are still underway to complete the Plan revision, there is sufficient information to begin framing policy discussions on clean air strategies. Hence, this Draft Plan has been prepared and is being released for early public review and participation.

The Draft Plan proposes potential attainment demonstration of the federal PM2.5 standards through a more focused control of sulfur oxides (SOx), directly-emitted PM2.5, and nitrogen oxides (NOx) supplemented with volatile organic compounds (VOC) by 2014. The 8-hour ozone control strategy builds upon the PM2.5 strategy, augmented with additional VOC reductions to meet the standard by 2020. An extended attainment date (i.e., additional three years) is allowed under the Clean Air Act if a "bump-up" request is made by the state showing the need for such extension; this topic is discussed further in the Policy Issues section that follows.

The Draft 2007 AQMP proposes policies and measures currently contemplated by responsible agencies to achieve federal standards for healthful air quality in the Basin and those portions of the Salton Sea Air Basin (formerly named the Southeast Desert Air Basin) that are under District jurisdiction (namely, Coachella Valley).

This Draft Plan also addresses several federal planning requirements and incorporates significant new scientific data, primarily in the form of updated emissions inventories, ambient measurements, new meteorological episodes and new air quality modeling tools. This Draft Plan builds upon the approaches taken in the 2003 AQMP for the South Coast Air Basin for the attainment of the federal ozone air quality standard. However, this Draft Plan highlights the significant amount of reductions needed and the urgent need to identify additional strategies, especially in the area of mobile sources, to meet all federal criteria pollutant standards within the timeframes allowed under federal Clean Air Act.

This Draft Plan as well as other key supporting information are available electronically and can be downloaded from the District's home page on the Internet (http://www.aqmd.gov, "Inside AQMD" tab at top, and click on "Clean Air Plans").

WHY IS THIS DRAFT PLAN BEING PREPARED?

The federal Clean Air Act requires an 8-hour ozone non-attainment area to prepare a SIP revision by June 2007 and a PM2.5 non-attainment area to submit by April 2008. However, since the attainment date for PM2.5 is earlier than that for 8-hour ozone and because of the interplay between precursor emissions, it is prudent to prepare a comprehensive and integrated plan to design the most effective path to attain both standards within the specified timeframe. In addition, U.S. EPA requires that transportation conformity budgets be established based on the most recent planning assumptions (i.e., within the last five years) and approved motor vehicle emission model. The Draft Plan is based on assumptions provided by both CARB and SCAG reflecting their upcoming computer model (EMFAC) for motor vehicle emissions and demographic updates. Additional updates will become available in the upcoming months. The District, however, believes it is critical that the initial findings and current plan approach be shared with the public to solicit input and to initiate public exploration regarding the path to clean air for this region.

IS AIR QUALITY IMPROVING?

Yes. Over the years, the air quality in the Basin has improved significantly, thanks to the comprehensive control strategies implemented to reduce pollution from mobile and stationary sources. For instance, the total number of days on which the Basin exceeds the federal 8-hour standard has decreased dramatically over the last two decades from about 150 days to less than 90 while Basin station-days [detail follows] decreased by approximately 80 percent. However, the Basin still exceeds the federal 8-hour standard more frequently than any other location in the U.S. Under federal law, the Basin is designated as a "severe-17" nonattainment area for the 8-hour ozone standard. Figure ES-1 shows the long-term trend in ambient ozone counts over the federal standard since 1990. The figure depicts two types of exceedance measurements: the number of Basin-days and Basin-station-days above the federal 8-hour ozone standard, which represent, respectively the number of days the standard was exceeded anywhere in the Basin or by any station. Lack of significant progress in ozone air quality for the last several years has raised some concern regarding the present-day effectiveness of control programs. The District is planning to hold a technical forum in October 2006 on ozone air quality, to examine the issue in detail including accuracy of emissions inventory, effectiveness of control strategies, ambient photochemistry, etc. The discussion outcome may help refine the draft control strategy approach, if necessary.

Relative to the 1-hour ozone standard, which was recently revoked by the U.S. EPA in favor of the new 8-hour ozone standard, the air pollution controls have had an overall positive impact. The number of days where the Basin exceeds the federal 1-hour ozone standard has continually declined over the years. However, while the number of days exceeding the federal 1-hour ozone standard has dropped since the 1990s, the rate of progress has slowed since the beginning of the decade. The Basin currently still experiences ozone levels over the federal standard on more than 20 days per year. By 2010, this plan shows that the Basin will still exceed the federal 1-hour ozone standard by 20 percent despite the implementation of existing air quality programs. The District and a number of environmental organizations have litigated against U.S. EPA's revocation of the 1-hour standard; the case is still pending.

In 2005, the annual PM2.5 standard was exceeded at several locations throughout the Basin. However, the 24-hour PM2.5 standard (98^{th} percentile greater than 65 ug/m^3) was not exceeded during the year[1]. In 2005, the Basin did not exceed the standards for carbon monoxide, nitrogen dioxide, sulfur dioxide, sulfates or lead. Figure ES-2 shows the annual average PM2.5 concentrations in the Basin in 2005.

The Basin has met the PM10 standards at all stations except for western Riverside where the annual PM10 standard has not been met as of 2006. Additional efforts, through localized programs, are under way to ensure compliance with this standard. These efforts are also outlined in the Draft 2007 AQMP.

[1] In September 2006, U.S. EPA issued revised PM2.5 NAAQs lowering the 24-hr standard to 35 ug/m^3. However, the present Plan is not required to address this standard.

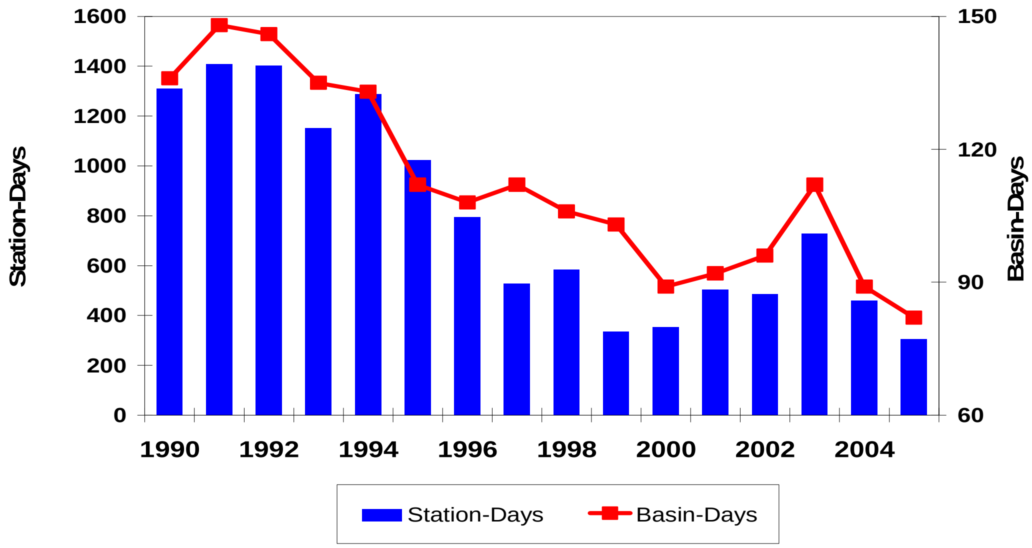


FIGURE ES-1

Total Basin-Days Above the Federal 8-Hour Ozone Standard from 1990-2005

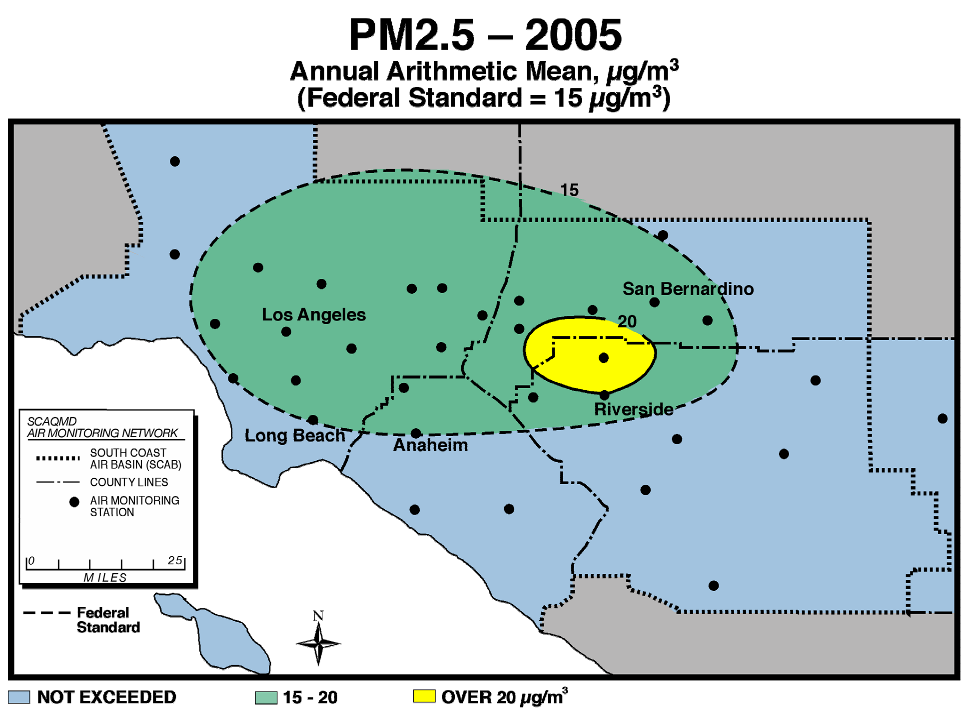


FIGURE ES-2
PM2.5 – 2005

Annual Average Concentration Compared to Federal Standard

WHAT ARE THE MAJOR SOURCES CONTRIBUTING TO AIR QUALITY PROBLEMS?

Figures ES-3 to ES-5 present the top ten categories for NOx, VOC, and SOx emissions.

FIGURE ES-3

Top Ten Categories for NOx Emissions

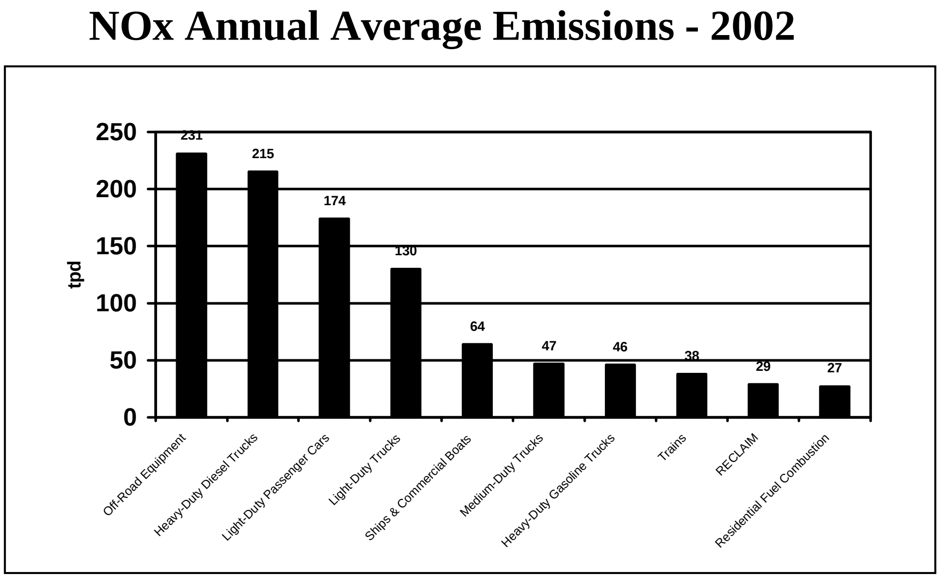


FIGURE ES-4

Top Ten Categories for VOC Emissions

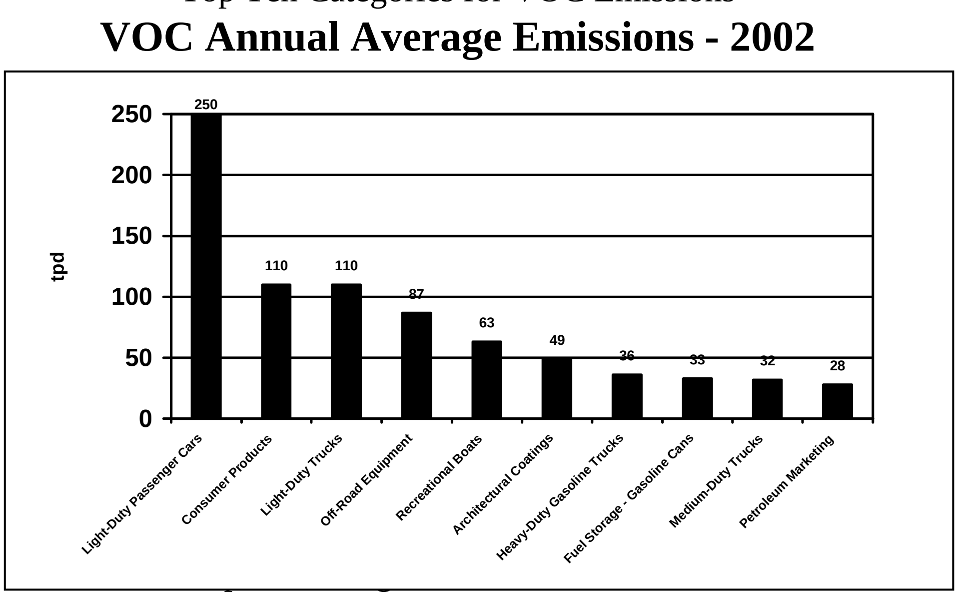
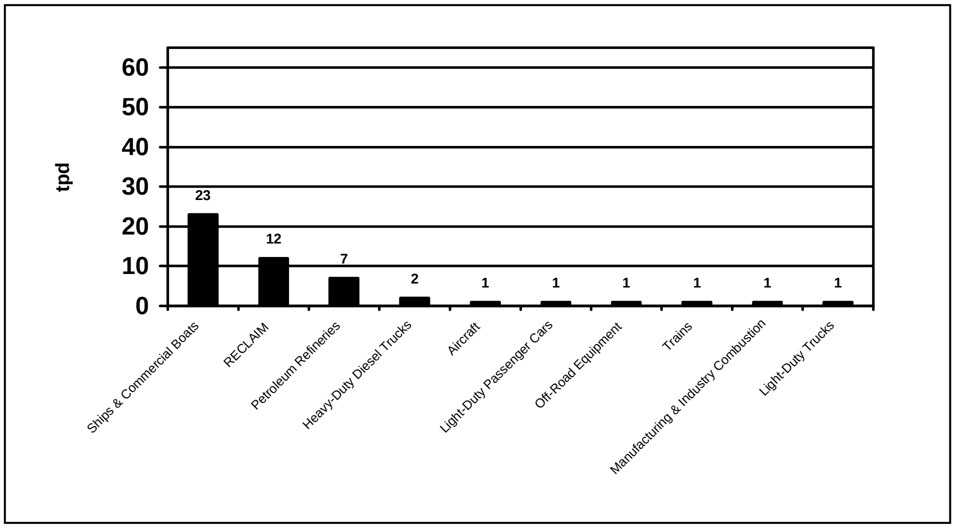


FIGURE ES-5

Top Ten Categories for SOx Emissions

SOx Annual Average Emissions - 2002



The combined Ports of Los Angeles and Long Beach including sources such as ocean-going vessels, harbor craft, trains, trucks, and cargo handling equipment represent the largest single source of emissions in the Basin, accounting for 73% of SOx, 24% of NOx, and 10% of PM2.5 in 2020.

WHAT IS THE OVERALL CONTROL STRATEGY TO MEET THE CURRENT AIR QUALITY STANDARDS?

The Draft 2007 AQMP builds upon improvements accomplished from the previous plans, and aims to incorporate all feasible control measures while balancing costs and socioeconomic impacts. The few years remaining to meet attainment deadlines afford little margin for error in implementing such a comprehensive control strategy. Further, the combined control strategies selected to attain the federal PM2.5 and 8-hour ozone standards must complement each other, representing the most effective route to achieve and maintain the standards.

The Draft 2007 AQMP relies on a comprehensive and integrated control approach aimed at achieving the PM2.5 standard by 2015 through implementation of short-term and mid-term control measures and achieving the 8-hour ozone standard by 2021/2024 based on implementation of additional long-term measures. Table ES-1 presents the overall reductions necessary for demonstrating attainment of the PM2.5 standard by 2015 and the 8-hour ozone standard by 2020. In order to demonstrate attainment by the prescribed deadlines, emission reductions needed for attainment must be in place by 2014 and 2020/2023 timeframe.

Table ES-1
Emission Reduction Targets for
PM2.5 and 8-Hour ozone Attainment
(tons per day, % reduction)

	2014	2020
NOx	**239 (36%)**	**286 (50%)**
VOC	**142 (24%)**	**300 (54%)**
SOx	**49 (70%)**	**----**
PM2.5	**14 (14%)**	**----**

Since PM2.5 in the Basin is overwhelmingly formed secondarily, the overall draft control strategy focuses on reducing precursor emission of SOx, directly-emitted PM2.5, NOx, and VOC instead of fugitive dust. Based on the District's modeling sensitivity analysis, SOx reductions, followed by directly-emitted PM2.5 and NOx reductions, provide the greatest benefits in terms of reducing the ambient PM2.5 concentrations. While VOC reductions are less critical to overall reductions in PM2.5 air quality (compared with equivalent SOx, directly-emitted PM2.5, and NOx reductions), they are heavily relied upon for meeting the 8-hour ozone standard. It is further determined that SOx is the only pollutant that is projected to grow in the future, due to ship emissions at the ports, requiring significant controls. Directly-emitted PM2.5 emission reductions from on-going diesel toxic reduction programs and from the short-term and mid-term control measures are also incorporated into the Draft 2007 AQMP. NOx reductions primarily based on mobile source control strategies (e.g., add-on control devices, alternative fuels, fleet modernization, repowers, retrofits) are also relied upon for attainment. Adequate VOC controls need to be in place in time for achieving significant VOC reductions needed for the 8-hour ozone standard by 2021/2024. Reducing VOC emissions in early years would also ensure continued progress in reducing the ambient ozone concentrations. The 8-hour ozone control strategy relies on the implementation of the PM2.5 control strategy augmented with additional long-term VOC and NOx reductions for meeting the standard by 2020/2023 timeframe. With respect to PM10, since the Basin will not attain the annual standard by 2006 for one station, additional local programs are proposed to address the attainment issue in an expeditious manner.

The Draft 2007 AQMP control measures consist of three components: 1) the District's Stationary and Mobile Source Control Measures; 2) State and Federal Control Measures recommended by CARB and/or District staff; and 3) Regional Transportation Strategy and Control Measures provided by SCAG. These measures are outlined in Appendices IV-A, IV-B, and IV-C, respectively.

The District's control strategy for stationary and mobile sources is 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 Draft AQMP also includes District staff's recommended State and federal stationary and mobile source control measures since the California Air Resources Board (CARB) has only developed an overview of a possible control strategy for PM2.5 (see Chapter 4). The measures, prepared by District staff and recommended for CARB's consideration for inclusion into the final AQMP, include strategies such as Smog Check Program enhancements, extensive fleet modernization of on-road heavy-duty diesel vehicles and off-road diesel equipment, accelerated penetration of advanced technology vehicles, low-sulfur fuel for marine engines, accelerated turn-over of high-emitting off-road engines, and gasoline and diesel fuel reformulations.

Finally, the emission benefits associated with the 2004 Regional Transportation Plan and the 2006 Regional Transportation Improvement Program are also reflected in the Draft 2007 AQMP.

WHAT ARE THE MAIN CHALLENGES OF ATTAINMENT?

Attainment of the new federal PM2.5 and 8-hour ozone standards poses yet another tremendous challenge for the South Coast Air Basin. The latest emissions inventory and air quality modeling analysis employed in the Draft 2007 AQMP indicate that significant reductions above and beyond those already achieved are still needed for meeting these standards. In order to determine the optimal path to clean air and the overall design of the final Plan, the following issues are presented for soliciting input from all stakeholders, technical experts, and the general public.

- <u>Uncertainties in Mobile Source Emissions Inventory</u>

Although the emissions inventory and projections in the Draft 2007 AQMP represent the latest available methodologies, emission factors, and growth projections, there are uncertainties in the mobile source emissions inventory which need to be addressed in the final AQMP or, if necessary, immediately following the AQMP adoption. The mobile source inventory for this Draft AQMP represents an increase over the previous AQMP primarily because of ethanol permeation, heavy-duty vehicle in-use emissions, increased evaporative emissions for pleasure craft, and other adjustments. Furthermore, there are some concerns over the projected emissions in the off-road model because of the equipment life and turn-over rate assumptions which may result in under-estimation of future emissions. While the technical work to improve the inventory is on-going, the past plan revisions have shown continuous upward adjustment of the mobile source inventory. The control strategy for attainment demonstration should provide a certain level of safety margin to address this potential underestimation of emissions with only seven years remaining for PM2.5 attainment.

- Adequacy of Reductions for PM2.5 Attainment

Attainment of the federal health-based PM2.5 standard would demand significant emission reductions in PM2.5 components within the next seven years. Based on the District's air quality modeling analysis, these reductions are on the order of 239 tons per day of NOx, 49 tons per day of SOx, 14 tons per day of PM2.5, and 142 tons per day of VOC emissions. Although the District will continue to refine its modeling analysis over the next few months for inclusion into the Final Plan, this range of reductions identifies the overall path to clean air and policy direction in designing the attainment strategy.

In 2014, emission sources under the District's jurisdiction will account for 11% of NOx and 24% of VOC and SOx emissions in the Basin. Although these stationary sources are currently subject to some of the most rigorous regulations known, in view of the magnitude of reductions for PM2.5 attainment, the District is proposing thirty short-term and mid-term control measures in the Draft AQMP. The estimated reductions from measures that have been quantified are 7.7 t/d of NOx, 3 t/d of SOx, 7.2 t/d of VOC, and 1.4 t/d of PM2.5 by 2014. Since emission reductions for many of the measures are to be better quantified at a later date, the total reductions will likely be higher.

However, in order to meet the federal PM2.5 standard by 2014, significant additional reductions are required from sources under state and federal jurisdictions. CARB has the overall responsibility of developing the State Element of the SIP outlining the state's specific short-term and long-term strategies for reducing emissions from mobile sources and consumer products. Traditionally, the District has incorporated CARB's proposed strategies in the Draft AQMP in developing the overall attainment strategy. However, for this Draft AQMP, CARB has not yet developed its Draft State Element and has only released its proposed concepts for reducing emissions from major mobile source categories and consumer products (Table 4-5).

Since CARB's proposed concepts appear to fall significantly short of the required reductions for PM2.5 attainment, the District staff is recommending a number of specific control measures with defined strategies and necessary reductions for mobile sources and consumer products for CARB's consideration (Table 4-6). Although CARB plans to release its Draft State Element in January 2007, the District staff believes that greater opportunity for public debate and review of the potentially alternative strategies for inclusion into the Final Plan is warranted. It is envisioned that the proposed measures in this Draft Plan will undergo further agency and public review and reflect any adjustments to emissions inventory and modeling before inclusion into the Final Plan.

- <u>8-Hour Ozone Non-Attainment Classification – Bump-Up Request</u>

The South Coast Air Basin is classified as a "severe-17" non-attainment area for the federal 8-hour ozone standard with an attainment date of 2021. Such classification precludes the Basin from relying on undefined reductions (i.e., "black box") which are based on the anticipated development of new control technologies or improvement of existing technologies (Section 182(e)(5) of the federal Clean Air Act) for attainment demonstration. However, the federal regulation allows regions such as the Basin to request for a bump-up to an "extreme" classification in order to be able to rely on 182(e)(5) measures for attainment. The District is considering exercising this option for the Draft 2007 AQMP because of the significant level of additional reductions required for attainment which are not likely to be achieved from existing technologies.

Although the "extreme" classification for the Basin would allow the use of long-term measures and possibly extend the attainment date by three years to 2024, there are concerns associated with the resulting increased stringency of requirements for stationary sources (i.e., higher offset ratio, lower major source definition for Title V facilities) under an "extreme" classification. Unless adequate defined control measures are identified for meeting the ozone reduction target by 2021, the District will have no choice but to request for this re-classification. During the public review process, the District will solicit additional control ideas to determine if existing technologies can be more aggressively implemented such that 182(e)(5) measures are not needed for the 8-hour attainment demonstration.

- <u>Fair Share Agency Responsibility</u>

In order to achieve necessary reductions for meeting air quality standards, all four agencies (i.e., AQMD, CARB, U.S. EPA, and SCAG) would have to aggressively develop and implement control strategies through their respective plans, regulations, and alternative approaches for pollution sources within their primary jurisdiction. Even though SCAG does not have direct authority over mobile source emissions, it will commit to the emission reductions associated with implementation of the 2004 Regional Transportation Plan and 2006 Regional Transportation Improvement Program which are imbedded in the emission projections. Similarly, the Ports of Los Angeles and Long Beach have authority they must utilize to assist in the implementation of various strategies if the region is to attain clean air by federal deadlines.

The following figures represent the projected emission contributions by agency primary authority for major pollutants in 2014 and 2020.

FIGURE ES-6

Emissions Contribution by Agency
(2014, Annual Average Inventory)

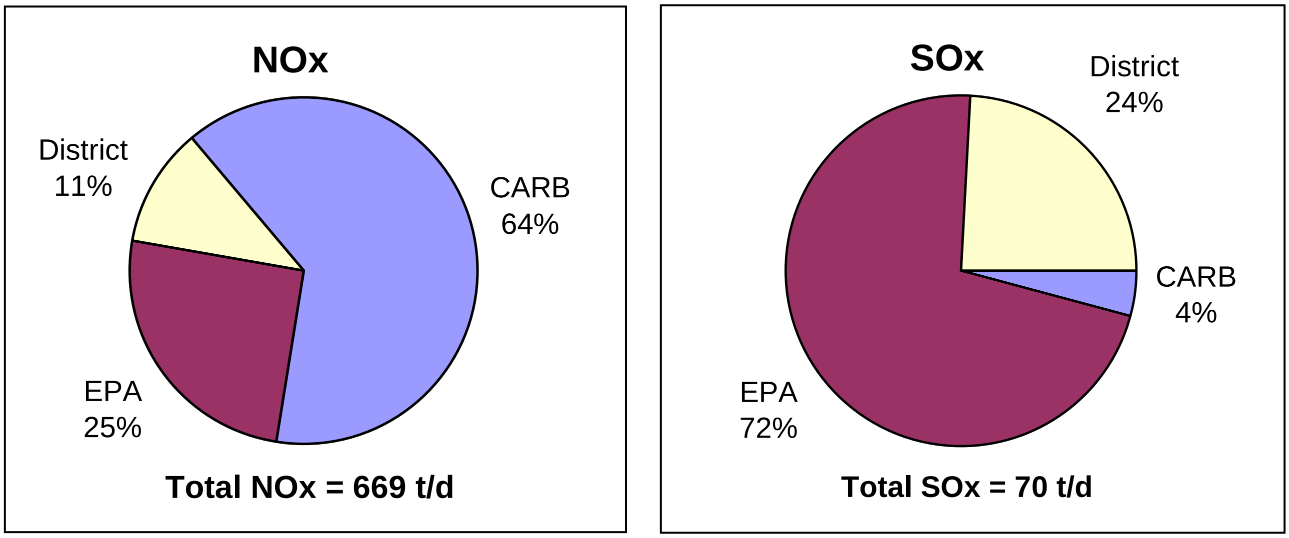
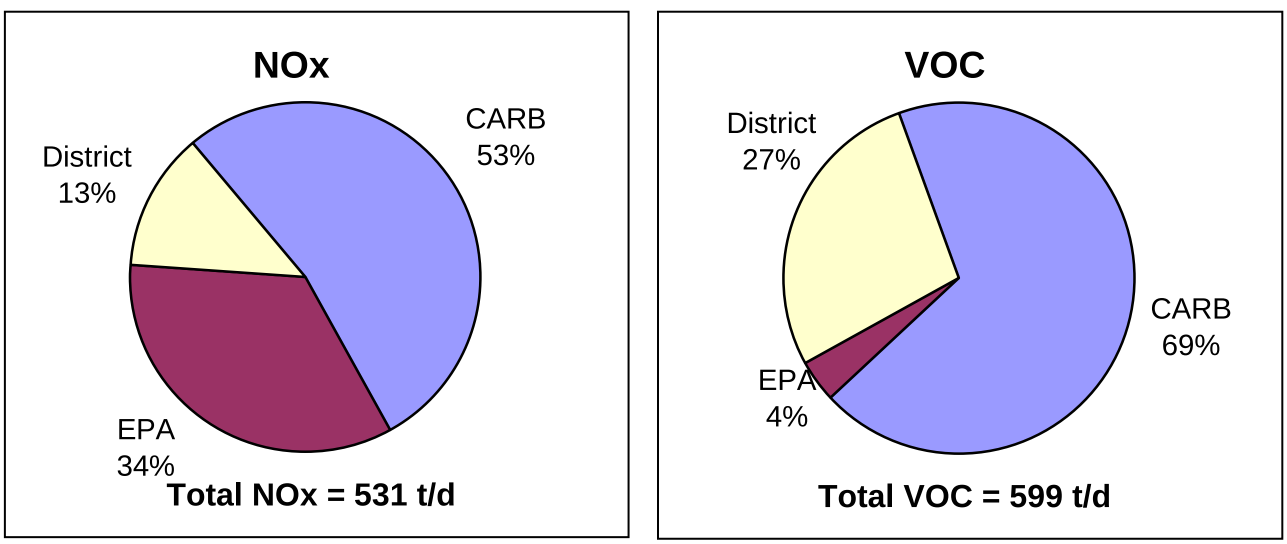


FIGURE ES-7

Emissions Contribution by Agency
(2020, Planning Inventory)



Although the District has completely met its obligations under the 2003 AQMP and stationary sources subject to the District's jurisdiction account for only 11% of NOx and 24% of SOx emissions in the Basin in 2014, the Draft 2007 AQMP contains several short-term and mid-term control measures aimed at achieving further NOx and SOx reductions (as well as VOC and PM2.5 reductions) from these already regulated sources. These strategies are based on facility modernization, energy conservation measures and more stringent requirements for existing equipment (e.g., space heaters, ovens, dryers, furnaces. In addition to short-term and mid-term control measures, the District is also committing to long-term VOC reductions of 32 t/d by 2020 for the 8-hour ozone attainment.

Clean air for this region requires CARB to aggressively pursue reductions and strategies for on-road and off-road mobile sources and consumer products. In addition, considering the significant contribution of federal sources such as marine vessels, locomotives, and aircraft in the Basin (i.e., 72% of SOx and 34% of NOx), it is imperative that the U.S. EPA pursue and develop regulations for new and existing federal sources to ensure that these sources contribute their fair share of reductions toward attainment of the federal standards. Unfortunately, regulation of these emission sources has not kept pace with other source categories and as a result, these sources are projected to represent a significant and growing portion of emissions in the Basin. Without a collaborative and serious effort among all agencies, attainment of the federal standards would be seriously jeopardized.

- <u>Funding Availability</u>

The overall costs of implementing the control measures proposed in the Draft 2007 AQMP are expected to be in the billions of dollars. In-use mobile source fleet modernizations, accelerated retirement of high-emitting vehicles and equipment, alternative fuels and their infrastructure, advanced retrofits, facility modernization, and product reformulations and replacements are among strategies which require significant levels of funding. For illustration purposes, the estimated costs associated with the recently released San Pedro Bay Port's Draft Clean Air Action Plan and CARB's Goods Movement Plan targeting ports and goods movement sectors alone are approximately $2 billion dollars and $10 billion dollars, respectively. The costs of implementing the AQMP control measures affecting virtually all source categories in the Basin will add to these estimates. However, the economic values of avoiding adverse health effects are projected to be many times higher than the implementation cost of clean air strategies.

In order to meet the federal PM2.5 and 8-hour ozone ambient air quality standards, a significant amount of public and private funding will be required to implement some measures. A close collaboration among all stakeholders, government agencies, businesses, and residents would be critical to identify and secure adequate funding sources for implementing the AQMP control measures.

In addition to public funding for mobile sources, financial assistance to stationary sources should be explored in light of the need to further reduce emissions from local businesses. The draft plan discussed the desire to seek tax incentives for early deployment of clean air technologies as part of plant modernization or to establish “Carl Moyer” type programs for stationary sources for pollution prevention, such as process changes to apply near-zero pollution technologies.

CHAPTER 1

INTRODUCTION

Purpose

Constraints in Achieving Standards

Control Efforts

Progress in Implementing the 2003 AQMP

2007 AQMP

Format of This Document

PURPOSE

The purpose of the 2007 Air Quality Management Plan (AQMP or Plan) for the South Coast Air Basin (Basin) is to set forth a comprehensive program that will lead the region into compliance with federal 8-hour ozone and PM2.5 air quality standards. The Plan will be submitted to U.S. EPA as a SIP revision once it is approved by the District's Governing Board and the California Air Resources Board (CARB). The key federal planning requirements are summarized briefly later in this chapter. Additional technical refinements are still underway to improve the planning assumptions, proposals, pollution control strategy, and attainment demonstration. Nonetheless, AQMD staff believes it is time to initiate broad public dialogue, to inform the public regarding the challenge ahead, and to solicit public input.

This Draft AQMP sets forth programs which require the cooperation of all levels of government: local, regional, state, and federal. Each level is represented in the Plan by the appropriate agency or jurisdiction that has the authority over specific emissions sources. Accordingly, each agency or jurisdiction commit to specific planning and implementation responsibilities.

At the federal level, the U.S. Environmental Protection Agency (U.S. EPA) is charged with establishing emission standards of 49-state on-road motor vehicle standards; train, airplane, and ship pollutant exhaust and fuel standards; and regulation of non-road engines less than 175 horsepower. The CARB, representing the state level, also oversees on-road vehicle emission standards, fuel specifications, some off-road source requirements and consumer product standards. At the regional level, the District is responsible for stationary sources and some mobile sources, including operational limitations. In addition, the District has lead responsibility for the development and adoption of the Plan. Lastly, at the local level, the cities and counties and their various departments (e.g., harbors and airports) have a dual role related to transportation and land use. Their efforts are coordinated through the regional metropolitan planning organization; for the South Coast Air Basin, the Southern California Association of Governments (SCAG) is the District's major partner in the preparation of the AQMP. Interagency commitment and cooperation are the keys to success of the AQMP.

Since air pollution physically transcends city and county boundaries, it is a regional problem. No one agency can design or implement the Plan alone and the strategies in the Plan reflect this fact.

CONSTRAINTS IN ACHIEVING STANDARDS

The District is faced with a number of constraints or confounding circumstances that make achieving clean air standards difficult. These include the physical and meteorological setting, the large pollutant emissions burden of the Basin (including pollution from international goods movement), and the rapid population growth of the area.

Setting

The District has jurisdiction over an area of approximately 10,743 square miles, consisting of the four-county South Coast Air Basin (Basin), and the Riverside County portions of the Salton Sea Air Basin (SSAB) and Mojave Desert Air Basin (MDAB). The Basin, which is a subregion of the SCAQMD's jurisdiction, is bounded by the Pacific Ocean to the west and the San Gabriel, San Bernardino, and San Jacinto mountains to the north and east. It includes all of Orange county and the nondesert portions of Los Angeles, Riverside, and San Bernardino counties. The Riverside county portion of the SSAB is bounded by the San Jacinto Mountains in the west and spans eastward up to the Palo Verde Valley. The federal nonattainment area (known as the Coachella Valley Planning Area) is a subregion of Riverside county and the SSAB that is bounded by the San Jacinto Mountains to the west and the eastern boundary of the Coachella Valley to the east. The Los Angeles county portion of the MDAB (known as north county or Antelope Valley) is bounded by the San Gabriel Mountains to the south and west, the Los Angeles/Kern county border to the north, and the Los Angeles/San Bernardino county border to the east. The SSAB and MDAB were previously included in a single large Basin called the Southeast Desert Air Basin (SEDAB). On May 30, 1996, the California Air Resources Board replaced the SEDAB with the SSAB and MDAB. In July 1997, the Antelope Valley area of MDAB was separated from the District and incorporated into a new air district under the jurisdiction of the newly formed Antelope Valley Air Pollution Control District (AVAPCD). The entire region is shown in Figure 1-1.

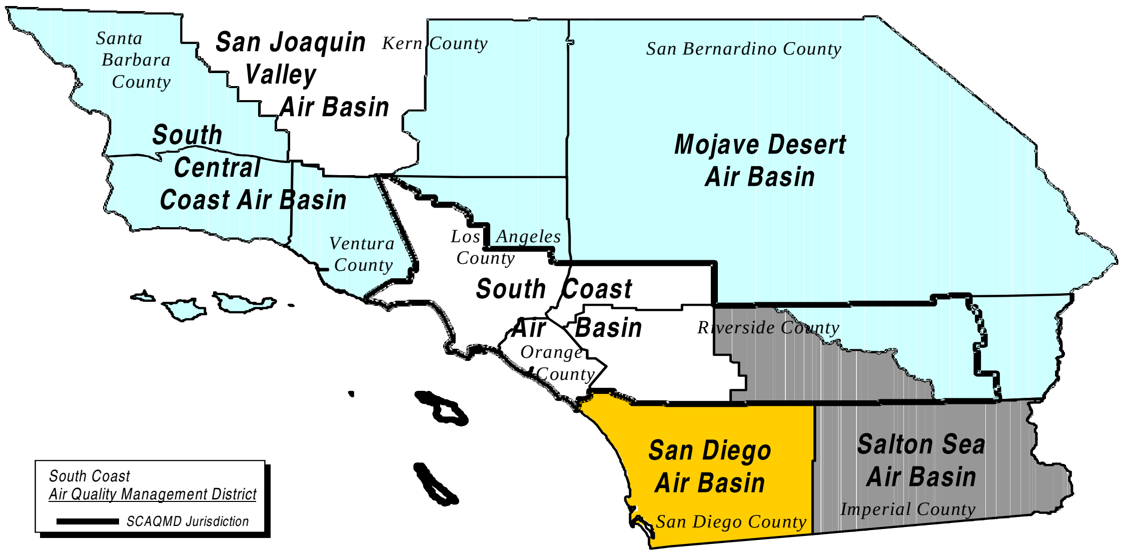


FIGURE 1-1

Boundaries of the South Coast Air Quality Management District
and Federal Planning Areas

The topography and climate of Southern California combine to make the Basin an area of high air pollution potential. During the summer months, a warm air mass frequently descends over the cool, moist marine layer produced by the interaction between the ocean's surface and the lowest layer of the atmosphere. The warm upper layer forms a cap over the cool marine layer and inhibits the pollutants in the marine layer from dispersing upward. In addition, light winds during the summer further limit ventilation. Furthermore, sunlight triggers the photochemical reactions which produce ozone. The region experiences more days of sunlight than any other major urban area in the nation except Phoenix.

The Basin's economic base is diverse. Historically, the four counties of the Basin have collectively comprised one of the fastest-growing local economies in the United States. Significant changes have occurred in the composition of the industrial base of the region in the past twenty years. As in many areas of the country, a large segment of heavy manufacturing, including steel and tire manufacturing and automobile assembly, has been phased down. Small service industries and businesses resulting from growth in shipping and trade have replaced much of the heavy industry.

The Coachella Valley Planning Area is impacted by pollutant transport from the South Coast Air Basin. In addition, pollutant transport occurs to the Antelope Valley, Mojave Desert, Ventura county, and San Diego county. As part of this AQMP revision, transport issues relative to the Coachella Valley Planning Area will be specifically addressed in the next several months and incorporated into the final 2007 AQMP.

Emission Sources

The pollution burden of the Basin is substantial. In spite of substantial reductions already achieved, additional significant reductions of volatile organic compounds, oxides of nitrogen, sulfur oxides, and particulate matter in the South Coast Basin (incl. SSAB & MDAB) are needed to attain the federal and state air quality standards.

Air pollution forms either directly or indirectly from pollutants emitted from a variety of sources. These sources can be natural, such as oil seeps, vegetation, or windblown dust. Emissions also result from fuel combustion, as in automobile engines; from evaporation of organic liquids, such as those used in coating and cleaning processes; through abrasion, such as from tires on roadways. The air pollution control strategy in the AQMP is directed almost entirely at controlling man-made sources. The emission sources in the Basin are described in Chapter 3. Natural emissions are accounted for in the background and initial conditions for the air quality modeling analysis in Chapter 5.

Population

Since the end of World War II, the Basin has experienced faster population growth than the rest of the nation. Although growth has slowed somewhat, the region's population is expected to increase significantly through 2020. Table 1-1 shows the projected growth based on SCAG's regional growth forecast.

Per-capita exposures to air pollutants have declined significantly over the years, primarily due to the impacts of the region's air quality control program. Figures 1-2 and 1-3 show the decline in per-capita exposure for levels above the 1-hour and 8-hour federal ozone standard, while Figure 1-4 depicts the trends in maximum recorded PM10 and PM2.5 concentration levels. As shown in the figures, drops in exposure levels above the federal ozone standards and maximum recorded annual average PM10 and PM2.5 concentration levels are significant. Although per-capita exposure to pollution has been brought down substantially in the Basin through several decades of implementing pollution controls, increases in the population over that time have made overall emission reductions more difficult. Many sources, such as automobiles, have been significantly controlled. However, increases in the number of sources, particularly those growing proportionally to population, reduce the potential air quality benefits of past and existing regulations. The net result is that unless significant steps are taken to further control air pollution, growth will overwhelm much of the improvement expected from the existing control program.

TABLE 1-1

Population Growth

Year	Population	Average Percent Increase Per Year Over the Period
1990	13.0 million	--
2000	14.8 million	1.4
2010	16.9 million	1.4
2020	18.4 million	0.9
2025	19.0 million	0.7
2030	19.6 million	0.6

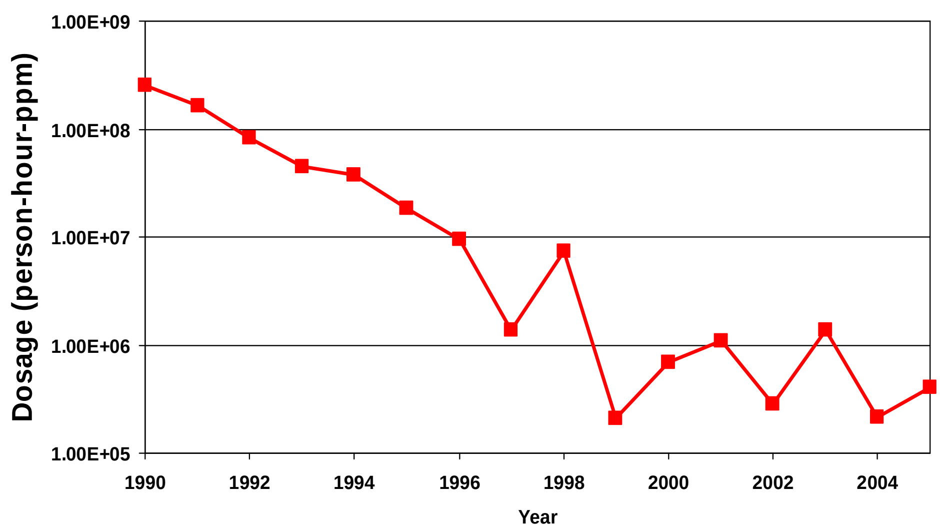


FIGURE 1-2

Basinwide Ozone Exposure Above Federal 1-Hour Standard

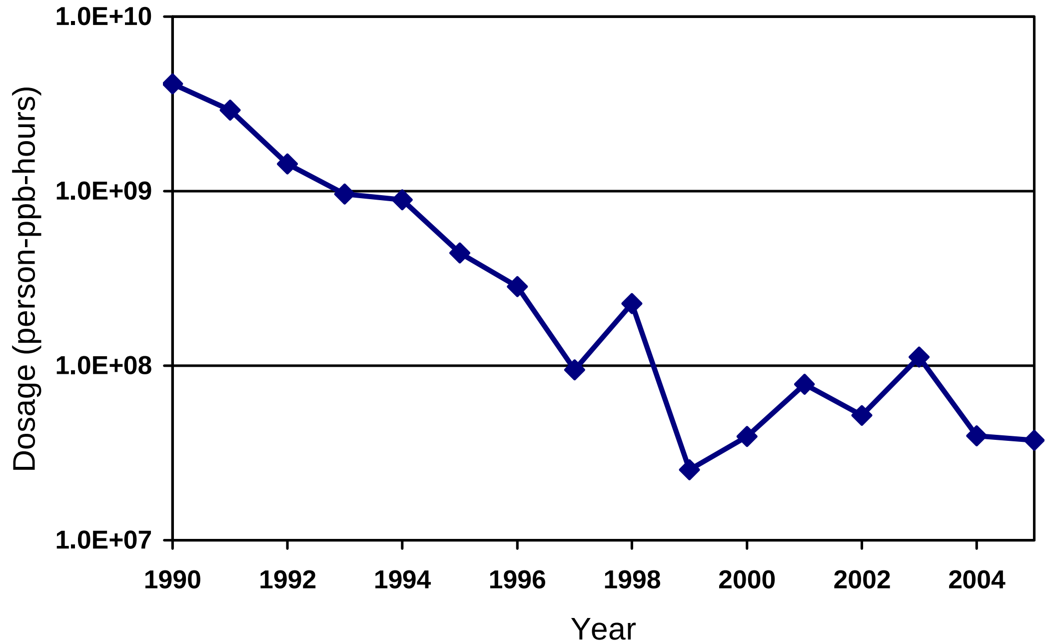


FIGURE 1-3

Basinwide Dosage Above the Federal 8-Hour Ozone Standard
(based on ozone season, May through October inclusive)

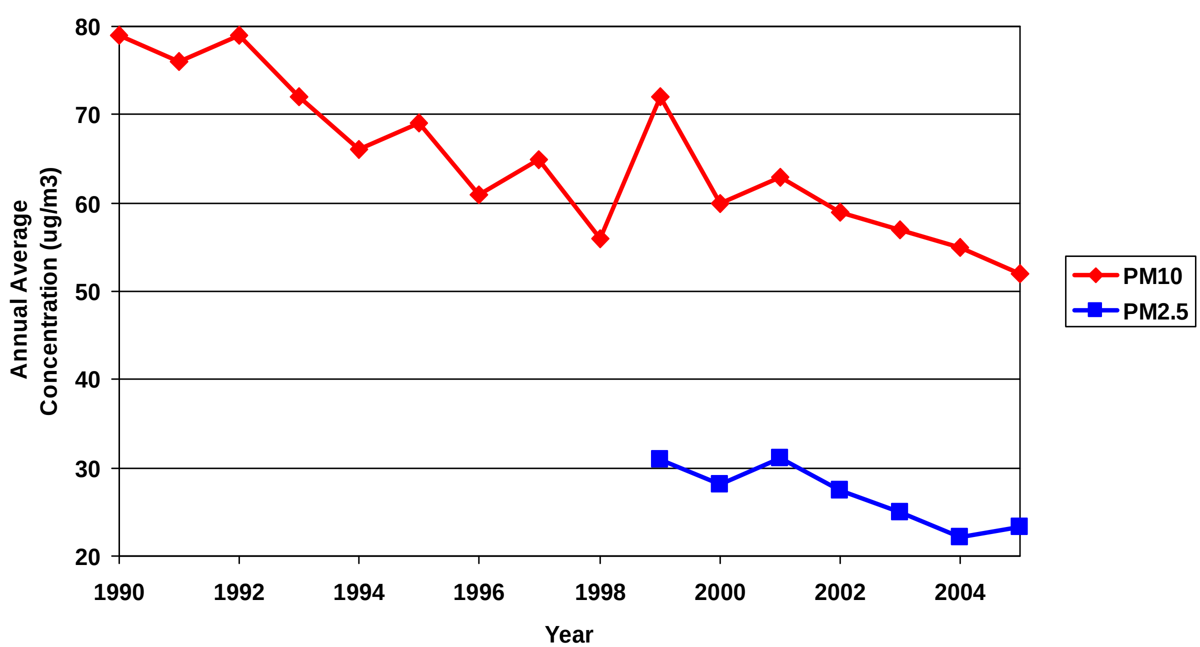


FIGURE 1-4

PM10 & PM2.5 Trends Basin Maxium

CONTROL EFFORTS

History

The seriousness of the local air pollution problem was recognized in the early 1940s. In 1946, the Los Angeles County Board of Supervisors established the first air pollution control district in the nation to address the problems of industrial air pollution. In the mid-1950s, California established the first state agency to control motor vehicle emissions. Countywide or regional air pollution districts were required throughout the state by 1970. Many of the controls, originating in California, became the basis for the federal control program which began in the 1960s.

Nearly all control programs developed to date have relied on the development and application of cleaner technologies and add-on emission control devices. Industrial and vehicular sources have been significantly affected by the use of these technologies. Only recently have preventive efforts come to the forefront of the air pollution control program, (e.g., alternative materials, waste minimization, and maintenance procedures for industrial sources).

In the 1970s, it became apparent at both the state and federal levels that local programs were not enough to solve a problem that was regional in nature and did not stay within city and county jurisdictional boundaries. Instead, air basins, defined by geographical boundaries, became the basis for regulatory programs.

In 1976, the California Legislature adopted the Lewis Air Quality Management Act which created the South Coast Air Quality Management District from a voluntary association of air pollution control districts in Los Angeles, Orange, Riverside, and San Bernardino counties. The new agency was charged with developing uniform plans and programs for the region to attain federal standards by the dates specified in federal law. The agency was also mandated to meet state standards by the earliest date achievable, using reasonably available control measures.

Rule development in the 1970s through 1990s resulted in dramatic improvement in Basin air quality (see Appendix II). However, the effort to impose incremental rule changes on the thousands of stationary sources through the command-and-control regulatory process had its limitations in economic efficiency. The 1991 AQMP introduced the concept of a Marketable Permits Program and outlined the framework of an idea that was forerunner to what is now known as the Regional Clean Air Incentives Market (RECLAIM). RECLAIM, a cap-and-trade program, calls for declining mass emission limits on the total emissions from all sources within a facility. In addition to the market trading program to achieve more cost-effective emission reductions, other incentive programs such as the Carl Moyer Memorial Air Quality Standards Attainment Program (Carl

Moyer Program) have been implemented and provided additional reductions that would otherwise have been difficult to obtain through regulatory mandates and their associated lead time for implementation.

In summary, while the District's effort to achieve applicable ambient air quality standards continues to rely on the successful command-and-control regulatory structure, the strategy is supplemented where appropriate with market incentive and compliance flexibility strategies.

Impact of Control Efforts

Air pollution controls have had a positive impact on the Basin's air quality relative to the 1-hour ozone standard. The number of days where the Basin exceeds the federal 1-hour ozone standard has continually declined over the years. However, while the number of days exceeding the federal 1-hour ozone standard has dropped since the 1990s, the rate of progress has slowed since the beginning of the decade. The Basin currently still experiences ozone levels over the federal standard on more than 20 days per year. By 2010, this plan shows that the Basin will still exceed the federal 1-hour ozone standard by 115 percent.

Although past controls were designed to address the federal 1-hour ozone and PM10 standards, they also improved on our ability to attain the 8-hour ozone and PM2.5 standards. The 8-hour ozone levels have been reduced by half over the past 30 years, nitrogen dioxide, sulfur dioxide, and lead standards have been met, and other criteria pollutant concentrations have significantly declined. The federal and state CO standards were also met as of the end of 2002. The Basin has met the PM10 standards at all stations except for western Riverside where the annual PM10 standard has not been met as of 2006. Additional effort is under way to comply with the PM10 standards for the entire Basin and is discussed in Chapter 4. The Basin still experiences substantial exceedances of health-based standards for 8-hour ozone and PM2.5. Air quality summaries and health effects in the Basin are briefly discussed in Chapter 2; Appendix II provides an in-depth analysis of air quality as measured within the District's jurisdiction.

PROGRESS IN IMPLEMENTING THE 2003 AQMP

District's Actions

While the 2003 AQMP has not been approved by U.S. EPA into the SIP, the District continues to implement the 2003 AQMP. Progress in implementing the 2003 AQMP can be measured by the number of control measures that have been adopted as rules and the resulting tons of pollutants targeted for reduction. Emission reduction commitments and reductions achieved in 2010 are based on the emissions inventory from the 2003 AQMP. Since October 2002, sixteen control measures or rules have been adopted or amended by the District through June 2006. Table 1-2 lists the District's 2003 AQMP short-term commitment and the control measures or rules that were adopted through June 2006. The primary focus of the District's efforts had been the adoption and implementation of VOC control measures. As shown in Table 1-2, for the control measures adopted by the District, 29.2 tons per day of VOC reductions, 7.1 tons of NOx, 3.8 tons of SOx, and 2.4 tons of PM10 will result. Based on the updated 2002 emissions inventory, adopted rules as of June 2006, and the 2007 AQMP growth assumptions, the projected VOC and NOx emissions from District sources in 2010 will be 137 and 84 tons per day, respectively, representing 10 to 12 tons per day below the AQMD allowable emission commitment in the 2003 AQMP (Figure 1-5).

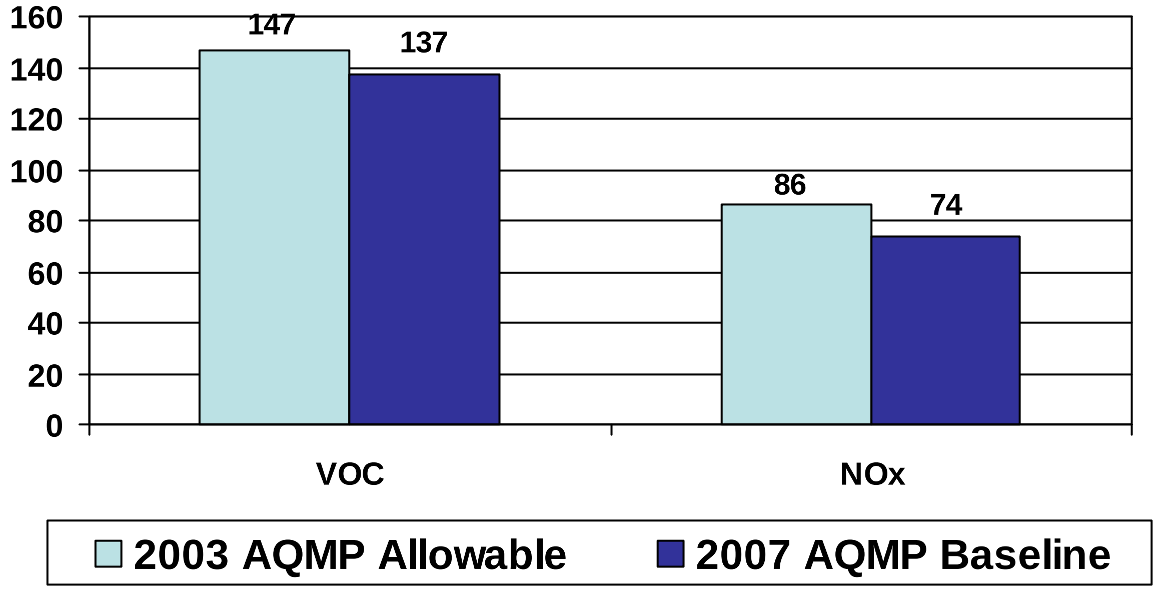


FIGURE 1-5

Projected 2010 Emissions from AQMD Sources Compared with 2010 Allowable Emissions Committed To Under the 2003 AQMP

CARB Actions

Table 1-3 lists the control measures committed to in the 2003 AQMP that have been adopted (either entirely or partially) by CARB since 2002. To date, CARB has achieved an estimated combined VOC and NOx reductions for 2010 of 51 tons per day as compared to the short-term commitment in the 2003 AQMP of 168 tons per day (low end), representing 30% of the combined VOC and NOx commitment for short-term measures.

TABLE 1-2

Rules and Regulations Adopted by District Since Adoption of 2003 AQMP
(October 2002 through June 2006[a])

Control Measure (Rule)	Title	SIP Commitment (tons/day)	Emission Reductions Achieved Through Rule Implementation (tons/day)	Adoption Date
FUG-05(I) (Rule 1173)	Fugitive Emission Sources at Petroleum Facilities and Chemical Plants (VOC)	0.6	0.6	2002
WST-02 (Rule 1133.2)	Co-Composting Operations (VOC)	1.2	1.2	2003
CTS-07 [f] (Rule 1171)	Architectural Coatings; Solvent Cleaning Operations (VOC)	8.5	8.5	2003
CTS-10 (I) (Rule 1113)	Architectural Coatings (VOC)	1.0	4.5 0.9	2003/ 2006
FUG-05 (II) (Rule 1148.1)	Oil and Gas Production Wells (VOC)	1.4	1.3	2004
WST-01 (Rule 1127)	Livestock Waste (VOC)	4.8	6.0	2004
CTS-10 (II) (Rule 1145)	Plastic, Rubber, and Glass Coatings (VOC)	1.0	0.9	2004
PRC-7 (I)	Industrial Process Operations (VOC)	1.0	[b]	[b]
PRC-07 (II) (Rule 1151)	Motor Vehicle and Mobile Equipment Non-Assembly Line Coating Operations (VOC)	1.0	4.2	2005
CTS-10 (III) (Rule 1107)	Metal Parts and Products Coatings (VOC)	1	1.1	2005
	Total VOC	**21.5**	**29.2**[c]	

TABLE 1-2
(continued)
Rules and Regulations Adopted by District Since Adoption of 2003 AQMP
(October 2002 through June 2006[a])

Control Measure (Rule)	Title	SIP Commitment (tons/day)	Emission Reductions Achieved Through Rule Implementation (tons/day)	Adoption Date
CMB-09[f] (Rule 1105.1)	Fluid Catalytic Cracking Units (PM_{10})	0.5	0.5	2003
BCM-07[f] (Rule 403 /Rule 1186)	Fugitive Dust/PM_{10} Emissions From Paved and Unpaved Roads, and Livestock Operations (PM_{10})	--	1.0	2004
PRC-03)	Restaurant Operations (PM_{10})	1.0	[d]	[d]
BCM-08 (Rule 1156/ Rule 1157)	Cement Manufacturing and Aggregate and Related Operations (PM_{10})	0.7	0.9	2005
	Total PM_{10}	**2.2**	**2.4**	
CMB-10[f, g] (RECLAIM)	Regional Clean Air Incentives Market (NO_x)	3.0	7.1	2005
MSC-05	Truck Stop Electrification	(2.1[e])	--	2005
	Total NO_x	**3**	**7.1**	
CMB-07 (Rule 1118)	Refinery Flares (SO_x)	2.1	3.8	2005
	Total SO_x	**2.1**	**3.8**	

[a] SCAQMD summer planning emissions in 2010 (rounded to the nearest whole number), based on 2003 SIP inventory.
[b] SIP commitment for this measure was achieved from Rule 1113 reductions of 4.5 tpd which was in excess of one tpd commitment under CTS-10(I).
[c] The excess reductions will be accounted toward 182(e)(5) reduction commitment.
[d] Due to the infeasibility of available control technologies, this measure is carried over to 2007 AQMP and the reduction commitment is fulfilled through BCM-07.
[e] AQMD's commitment of 2.1 tpd of NOx was achieved through CARB's truck idling regulation with a total reduction of 23.7 tpd. Not accounted toward AQMD's commitment.
[f] Rules which have been approved by U.S. EPA.
[g] Total reductions are 7.7 tpd to be achieved by 2011.

TABLE 1-3
State Measures Adopted Since 2003 AQMP

Strategy	Name	Adopted Date	ROG Commit-ment (tpd) [1]	ROG Achieved By 2010 (tpd)	NOx Commit-ment (tpd) [1]	NOx Achieved By 2010 (tpd)
NEAR-TERM CONTROL MEASURES						
LT/MED-DUTY-1 (ARB)	Replace or Upgrade Emission Control Systems on Existing Passenger Vehicles	In Progress	0-20	TBD	0-20	TBD
LT/MED-DUTY-2 (BAR)	Improve Smog Check to Reduce Emissions from Existing Passenger and Cargo Vehicles [2]	2003	5.6-5.8	5.6	8.0-8.4	10
ON-RD HVY-DUTY-1 (ARB)	Augment Truck and Bus Highway Inspections with Community-Based Inspections	In Progress	0-0.1	TBD	0	0
ON-RD HVY-DUTY-2 (ARB)	Capture and Control Vapors from Gasoline Cargo Tankers	In Progress	4-5	TBD	0	0
ON-RD HVY-DUTY-3 (ARB)	Pursue Approaches to Clean Up the Existing and New Truck/Bus Fleet [3]	2003-2006 (In Progress)	1.4-4.5	2.8-2.9	16-21	13-16
OFF-RD CI-1 (ARB)	Pursue Approaches to Clean Up the Existing Heavy-Duty Off-Road Equipment Fleet (Compression Ignition Engines) – Retrofit Controls	In Progress	2.3-7.8	TBD	8-10	TBD
OFF-RD CI-2 (ARB)	Implement Registration and Inspection Program for Existing Heavy-Duty Off-Road Equipment to Detect Excess Emissions (Compression Ignition Engines)	In Progress	NQ	TBD	NQ	TBD
OFF-RD LSI-1 (ARB)	Set Lower Emission Standards for New Off-Road Gas Engines (Spark Ignited Engines 25 hp and Greater) [4]	Combined with OFF-RD LSI-2	0	0	0.8	---
OFF-RD LSI-2 (ARB)	Clean Up Off-Road Gas Equipment Through Retrofit Controls and New Emission Standards (Spark-Ignition Engines 25 hp and Greater) [4]	2006	0.8-2.0	2.6	2-4	2.6

TABLE 1-3 (CONTINUED)
State Measures Adopted Since 2003 AQMP

Strategy	Name	Adopted Date	ROG Commit-ment (tpd) [1]	ROG Achieved By 2010 (tpd)	NOx Commit-ment (tpd) [1]	NOx Achieved By 2010 (tpd)
SMALL OFF-RD-1 (ARB)	Set Lower Emission Standards for New Handheld Small Engines and Equipment (Spark Ignited Engines Under 25 hp such as Weed Trimmers, Leaf Blowers, and Chainsaws) [5]	Combined with SMALL-OFF-RD-2	1.9	---	0.2	---
SMALL OFF-RD-2 (ARB)	Set Lower Emission Standards for New Non-Handheld Small Engines and Equipment (Spark Ignited Engines Under 25 hp such as Lawnmowers) [6]	2003	6.3-7.4	7.7	0.6-1.9	1.3
MARINE-1 (ARB)	Pursue Approaches to Clean Up the Existing Harbor Craft Fleet – Cleaner Engines and Fuels [6]	In Progress	0.1	TBD	2.7	0.4
MARINE-2 (ARB)	Pursue Approaches to Reduce Land-Based Port Emissions – Alternative Fuels, Cleaner Engines, Retrofit Controls, Electrification, Education Programs, Operational Controls [7]	In Progress	0.1	TBD	0.1	2.8
FUEL-1 (ARB)	Set Additives Standards for Diesel Fuel to Control Engine Deposits		NQ	TBD	NQ	TBD
FUEL-2 (ARB)	Set Low-Sulfur Standards for Diesel Fuel for Trucks/Buses, Off-Road Equipment, and Stationary Engines	2003	Enabling	Enabling	Enabling	Enabling
CONS-1 (ARB)	Set New Consumer Products Limits for 2006	2004	2.3	2	0	0
CONS-2 (ARB)	Set New Consumer Products Limits for 2008-2010	In Progress	8.5-15	TBD	0	0
FVR-1 (ARB)	Increase Recovery of Fuel Vapors from Aboveground Storage Tanks	In Progress	0-0.1	TBD	0	0
FVR-2 (ARB)	Recover Fuel Vapors from Gasoline Dispensing at Marinas	In Progress	0-0.1	TBD	0	0
FVR-3 (ARB)	Reduce Fuel Permeation Through Gasoline Dispenser Hoses	In Progress	0-0.7	TBD	0	TBD
PEST-1 (DPR)	Implement Existing Pesticide Strategy	---	Baseline	Baseline	NA	NA
Total for Near-Term Control Measures			**33.3-72.9**	**20.7-20.8**	**38.4-69.1**	**30.1-33.1**

TABLE 1-3 (CONTINUED)
State Measures Adopted Since 2003 AQMP

Strategy	Name	Adopted Date	ROG Commit-ment (tpd) [1]	ROG Achieved By 2010 (tpd)	NOx Commit-ment (tpd) [1]	NOx Achieved By 2010 (tpd)
ADDITIONAL NEAR-TERM MEASURES						
(ARB)	Achieve Further Emission Reductions from On-Road and Off-Road Mobile Sources and Consumer Products	2005-2008	97 [8]		---	

1. Based on CARB's summer planning emission inventory for the 2003 South Coast SIP.
2. Includes benefits from test only direction and truck loaded mode testing only.
3. Includes benefits from solid waste collection vehicles, chip reflash, engine manufacturer diagnostics (EMD), idling limits, heavy duty on-board diagnostics (OBD), new truck idling, in-use testing, and on-road public fleets.
4. OFF-RD LSI-1/LSI-2 adopted in one board action and achieved reductions are combined and shown under OFF-RD LSI-2. The amount of emission reductions shown under ROG achieved is reflective of a combined 2.6 tpd ROG + NOx.
5. SMALL OFF-RD-1/OFF-RD-2 adopted in one board action and achieved reductions are combined and shown under OFF-RD-2.
6. Reductions shown reflect implementation of CARB's low sulfur diesel fuel rule for harbor craft adopted in 2004.
7. Reductions shown reflect implementation of CARB's statewide cargo handling equipment rule adopted in 2005.
8. Shown as combined ROG and NOx

U.S. EPA Actions

Since the 2003 AQMP, the U.S. EPA has adopted low sulfur fuel standards for diesel fuel used in nonroad diesel engines, which phase in over time for a variety of sources including construction equipment, locomotives, and marine vessels. Several sources under federal control are being evaluated for future actions, including more stringent standards for locomotives, marine vessels, and aircraft. It should be noted that the reductions achieved for the low sulfur diesel fuel rule overlap with CARB regulations already adopted.

2007 AQMP

As mentioned earlier in this chapter, this Draft 2007 AQMP is designed to address the federal 8-hour ozone and PM2.5 air quality standards, to satisfy the planning requirements of the federal Clean Air Act, and to develop transportation emission budgets using the latest approved motor vehicle emissions model and planning assumptions. Once approved by the District Governing Board and CARB, the 2007 AQMP will be submitted to U.S. EPA as a SIP revision. The 2007 AQMP contains measures based on current technology assessments. The emission reduction commitment takes into account technical feasibility, cost effectiveness, and current emission estimates.

CAA Planning Requirements Addressed by the 2007 AQMP

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

The U.S. EPA promulgated the 8-hour ozone standard in July 1997; it was followed by legal actions, and eventually upheld in March 2002. The U.S. EPA finalized Phase 1 of the ozone implementation rule in April 2004. This rule set forth the classification scheme for nonattainment areas and continued obligations with respect to the existing 1-hour ozone requirements. As described by the Phase 1 rule, the Basin is classified as Severe 17 with an attainment date of June 2021, while the portion of the Salton Sea Air Basin under the District's jurisdiction (Coachella Valley Planning Area) is classified as serious, with an attainment date of June 2013. On November 9, 2005, the U.S. EPA followed up its Phase 1 implementation rule with the Phase 2 rule. The Phase 2 rule outlines the emission controls and planning requirements regions must address in their implementation plans. The U.S. EPA also revoked the 1-hour ozone standard, which had an attainment deadline of 2010. The AQMD, along with environmental group, has sued to challenge U.S. EPA's revocation. The 8-hour ozone attainment plan must be submitted to U.S. EPA by June 2007.

Similar to the 8-hour ozone standard, the U.S. EPA promulgated the PM2.5 standards in July 1997. The U.S. EPA issued designations in December 2004, and they became effective on April 5, 2005. Under the 1990 CAA Amendments and U.S. EPA's "Proposed Rule to Implement the Fine Particle National Ambient Air Quality Standards," each state having a non-attainment area must submit to U.S. EPA an attainment demonstration three years after the designations became effective. The final date for submittal of attainment demonstrations is April 5, 2008. The AQMD has elected to submit the PM2.5 attainment demonstration for the Basin concurrently with their 8-hour ozone attainment demonstration because many of the control strategies that reduce PM2.5 precursor emissions (e.g., NOx) are also needed to help attain the 8-hour ozone standard.

Unlike the 8-hour ozone standard, area designations for the PM2.5 standard did not have a classification system (e.g., serious, severe) and were designated as attainment, nonattainment, or unclassifiable. For the Basin and the portions of the Salton Sea Air Basin under the District's jurisdiction, the regions were designated non-attainment and unclassifiable, respectively. The initial attainment date for areas such as the Basin is April 2010. Unclassifiable regions such as the Coachella Valley Planning Area do not require a planning demonstration for the federal standard and are not addressed in this document. Projected air quality data for the Basin shows that the region will not be able to meet the April 2010 deadline. Under Section 172 of the CAA, U.S. EPA may grant an area an extension of the initial attainment date for a period of one to five years. In the case of the Basin, the District plans to request the full five year extension until April 2015.

There are several sets of general planning requirements, both for nonattainment areas [Section 172(c)] and for implementation plans in general [Section 110(a) (2)]. These requirements are listed and very briefly described in Tables 1-4 and 1-5, respectively. The general provisions apply to all applicable pollutants unless superseded by pollutant-specific requirements.

TABLE 1-4

Nonattainment Plan Provisions
[CAA Section 172(c)]

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

TABLE 1-5

General CAA Requirements for Implementation Plans

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

The CAA requires that most submitted plans include information on tracking plan implementation and milestone compliance. Requirements for these elements are described in Section 182(g). Chapter 7 will address these issues.

U.S. EPA also requires a public hearing on many of the required elements in SIP submittals before considering them officially submitted. The District's AQMP adoption process includes a public hearing on all of the required elements prior to submittal.

The CAA requires SIPs for most nonattainment areas to demonstrate reasonable further progress (RFP) toward attainment through emission reductions phased in from the time of the SIP submission out to the attainment date. The RFP requirements in the CAA are intended to ensure that each ozone nonattainment area provide for sufficient precursor emission reductions to attain the ozone NAAQS. Chapter 6 contains the detailed calculations of the RFP demonstration. Chapter 6 also provides an estimation of the emission levels at each of the milestone years compared to the CAA target levels.

The South Coast Air Basin both transports to and receives air pollutants from the coastal portions of Ventura and Santa Barbara counties in the South Central Coast Air Basin. The South Coast Air Basin also receives air pollutants from oil and gas development operations on the outer continental shelf. The control measures in this Plan meet the CAA transport requirements and will assist downwind areas in complying with the federal ozone air quality standard.

Monitoring data for the past several years have shown that the nitrogen dioxide concentrations were below the federal air quality standard. As required under Section 175A(a), the plan must provide for maintenance of the air quality standard for at least 10 years after the area is redesignated to attainment (which occurred in 1998). The Draft 2007 AQMP will serve as an update to the maintenance plan for nitrogen dioxide submitted with the 2003 AQMP. Similarly, the Basin met the carbon monoxide (CO) standard by December 2002. The 2003 AQMP revision to the carbon monoxide plan served a dual purpose: it replaced the 1997 attainment demonstration that lapsed at the end of 2000, and it provided the basis for a carbon monoxide maintenance plan in the future. In 2004, the AQMD formally requested U.S. EPA to redesignate the Basin as in attainment with the CO ambient air quality standard. No formal action has been taken on this submittal and the Draft 2007 AQMP serves as an update to the maintenance plan submitted as part of the 2003 AQMP.

Table 1-6 summarizes the key CAA planning requirements addressed by the Draft 2007 AQMP. The table lists the relevant CAA section along with the AQMP document or chapter where the submittal is discussed. It may be used as a reference guide showing where each of the CAA planning requirements is addressed. Some chapters and appendices that address CAA planning requirements are not being released at this time, and will become available shortly after release of the Final Draft 2007 AQMP. These include Chapter 8 – future Air Quality – Desert Non-Attainment, Chapter 9 – Contingency Measures, and Appendix V – Modeling and Attainment Demonstrations. Other submittals such as the RACM and RACT will be released under separate covers prior to their respective deadlines.

TABLE 1-6

CAA SIP Revisions and Submittals in the 2007 AQMP

Submittal	CAA Section	2007 AQMP Reference
PM2.5 Attainment Demonstration (Basin)	172(c)	Chapter 5 Appendix V[1]
PM2.5 Reasonable Further Progress Milestones	172(c)(2)	Chapter 6 Appendix V[1]
PM2.5 Motor Vehicle Emissions Budget	176(c)(2)(A)	Chapter 6
PM2.5 RACM/RACT Demonstration	172(c)(1)	Separate Cover
8-Hour Ozone Attainment Demonstration (Basin)	182(c)(2)(A)	Chapter 5 Appendix V[1]
8-Hour Ozone Attainment Demonstration for Salton Sea Air Basin (under District jurisdiction)[1]	182(c)(2)(A)	Chapter 8 Appendix V[1]
8-Hour Ozone Reasonable Further Progress Milestones	182(c)(2)(B)	Chapter 6 Appendix V[1]
8-Hour Ozone RACM/RACT Demonstration	172(c)(1)	Separate Cover
Maintenance Plan for Carbon Monoxide[1]	175A	Chapter 5 and 6 Appendix V[1]
Maintenance Plan for Nitrogen Dioxide[1]	175A	Chapter 5 and 6 Appendix V[1]

1. Pending release of Final Draft 2007 AQMP

State Law Requirements

The California Clean Air Act (CCAA) was signed into law on September 30, 1988, became effective on January 1, 1989, and was amended in 1992. Also known as the Sher Bill (AB 2595), the CCAA established a legal mandate to achieve health-based state air quality standards at the earliest practicable date. The Lewis Presley Act provides that the plan must also contain deadlines for compliance with all state ambient air quality standards and the federally mandated primary ambient air quality standards [Health and Safety Code (H&SC) 40462(a)]. In September 1996, AB 3048 (Olberg) amended Sections 40716, 40717.5, 40914, 40916, 40918, 40919, 40920, 40920.5, and 44241, and repealed Sections 40457, 40717.1, 40925, and 44246 of the Health and Safety Code relating to air pollution. The amendments to the Health and Safety Code became effective January 1, 1997. This plan revision reflects state planning requirements as they pertain to the South Coast Air Quality Management District. Through its many requirements, the CCAA serves as the centerpiece of the Basin's attainment planning efforts since it is generally more stringent than the federal Clean Air Act.

Based on pollutant levels, the CCAA divides nonattainment areas into categories with progressively more stringent requirements (H&SC 40918 - 40920.5). The categories are outlined in Table 1-7. The state nonattainment designations are on a county basis. The entire Basin is an extreme nonattainment area for ozone. Although PM10 and PM2.5 are not explicitly addressed in the CCAA, it is governed by the Lewis Presley Act. The plan therefore provides achieving all federal ambient air quality standards by their applicable date and state ambient air quality standards as early as possible.

TABLE 1-7

California Clean Air Act Nonattainment Area Classifications (H&SC 40921.5)

Category	Concentration Level (ppm) Ozone
Moderate	0.09 to 0.12*
Serious	0.13 to 0.15*
Severe	0.16 to 0.20*
Extreme	> 0.20

* Inclusive range.

Serious and above nonattainment areas are required to revise their air quality management plan to include specified emission reduction strategies, and to meet milestones in implementing emission controls and achieving more healthful air quality.

The key planning requirements are provided in Table 1-8. Some of these requirements are discussed in further detail in the next section. Chapter 6 addresses how these requirements are met in the Basin. The CCAA also includes some additional requirements that can significantly affect control strategy selection. These requirements are provided in Table 1-9. All of these mandates have either already been met through District regulations or are included/considered in the preparation of the Draft 2007 AQMP.

Plan Effectiveness

The CCAA requires, beginning on December 31, 1994 and every three years thereafter, that each district demonstrate the overall effectiveness of its air quality program. For those areas that do not attain state air quality standards by 2000, a comprehensive plan update was required to be submitted by December 31, 1997. In addition, Section 40925 of the Health and Safety Code requires that the plan incorporate new data or projections including, but not limited to, the quantity of emission reductions actually achieved in the preceding three-year period and the rates of population-related, industry-related, and vehicle-related emissions growth actually experienced in the district and projected for the future. The Draft 2007 AQMP serves as the comprehensive plan update for the South Coast Air Basin.

TABLE 1-8

California Clean Air Act Planning Requirements

Requirement	Description
Indirect and area source controls	An indirect and area source control program [H&SC 40918(a)(4)],
Best available retrofit control technology	Best available retrofit control technology (BARCT) for existing sources of specified sizes [H&SC 40918(a)(2))],
New source review	A program to mitigate all emissions from new and modified permitted sources [H&SC 40918(a)(1)) and 40920.5(b)],
Transportation control measures	Transportation control measures as needed to meet plan requirements [H&SC 40918(a)(3)], and
Clean fleet vehicle programs	Significant use of low-emission vehicles by fleet operators [H&SC 40919(a)(4)].

The CCAA suggests a number of air quality indicators to show plan effectiveness, including actual emission reductions, ozone design value improvements, population exposure reductions, and pollutant concentration hours. In Chapter 6, plan effectiveness is illustrated by trends in the following indicators:

- volatile organic compound and oxides of nitrogen emissions,
- ozone air quality (i.e., exceedance days),
- PM10 and PM2.5 concentration, and
- ozone population exposure above air quality standards.

TABLE 1-9

California Clean Air Act Requirements for Control Strategy Development

Requirement	Description
Rate-of-progress	Reducing pollutants contributing to nonattainment by five percent per year or all feasible control measures and an expeditious adoption schedule (H&SC 40914),
Public education programs	Public education programs [H&SC 40918(a)(6)],
Per-capita exposure	Reducing per-capita population exposure to severe nonattainment pollutants according to a prescribed schedule [H&SC 40920(c)],
Any other feasible controls	Any of the feasible controls that can be implemented or for which implementation can begin, within 10 years of adoption date of the most recent air quality plan [H&SC 40920.5(c)], and
Control measure ranking	Ranking control measures by cost-effectiveness and implementation priority (H&SC 40922).

Emission Reductions

According to the CCAA, districts must design their air quality management plan to achieve a reduction in basinwide emissions of five percent or more per year (or 15 percent or more in a three-year period) for each nonattainment pollutant or its precursors (H&SC 40914). However, an air basin may use an alternative emission reduction strategy which achieves a reduction of less than five percent per year if it can be demonstrated that either of the following applies:

- The alternative emission reduction strategy is equal to or more effective than the five percent per year control approach in improving air quality; or
- That despite the inclusion of every feasible measure, and an expeditious adoption schedule, the air basin is unable to achieve the five percent per year reduction in emissions.

For each district that is designated nonattainment for both state and federal ambient air quality standards for a single pollutant subject to the planning requirements (i.e., ozone), reductions in emissions shall be calculated with respect to the actual emissions during the baseline year applicable to the implementation plan required by the federal CAA. This baseline year is 2002.

Population Exposure

The CCAA also requires that exposure to severe nonattainment pollutants above standards must be reduced from 1986 through 1988 levels by at least 25 percent by December 31, 1994; 40 percent by December 31, 1997; and 50 percent by December 31, 2000. Reductions are to be calculated based on per-capita exposure and the severity of exceedances. This provision is applicable to ozone in the Basin [H&SC 40920(c)]. The definition of exposure is the number of persons exposed to a specific pollutant concentration level above the state standard times the number of hours. The per-capita exposure is the population exposure (units of pphm-persons-hours) divided by the total population. While this requirement has already been met in previous AQMPs, the exposure demonstration is provided again in the Draft 2007 AQMP for consistency.

Control Measure Ranking

The CCAA requires the District Governing Board to determine that the AQMP is a cost-effective strategy that will achieve attainment of the state standards by the earliest practicable date (H&SC 40913). In addition, the Plan must include an assessment of the cost-effectiveness of available and proposed measures and a list of the measures ranked from the least cost-effective to the most cost-effective [H&SC 40922(a)].

In addition to the relative cost-effectiveness of the measures, the District must consider other factors as well in developing an adoption and implementation schedule [H&SC 40922(b)]. The other factors noted in the CCAA include technological feasibility, emission reduction potential, rate of reduction, public acceptability, and enforceability. Efficiency, equity, and legal authority were also included in the 2007 AQMP for prioritization purposes because of their importance. The results of the prioritization are not available for inclusion in the Draft 2007 AQMP and will be provided with the Final Draft 2007 AQMP.

FORMAT OF THIS DOCUMENT

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

Chapter 2, "Air Quality and Health Effects," discusses the Basin's air quality in comparison with the federal and state air pollution standards.

Chapter 3, "Base Year and Future Emissions," summarizes recent updates to the emissions inventories, estimates current emissions by source and pollutant, and projects future emissions with and without controls.

Chapter 4, "AQMP Control Strategy," presents the attainment strategies.

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

Chapter 6, "Clean Air Act Requirements," discusses specific federal and state requirements as they pertain to the 2007 AQMP.

Chapter 7, "Implementation," presents the implementation schedule of the various control measures and delineates each agency's area of responsibility.

Chapter 8, "Future Air Quality - Desert Nonattainment Areas," describes the future air quality in the Coachella Valley Planning Area. This chapter is omitted in the Draft 2007 AQMP, but will be released upon completion of the Draft Final 2007 AQMP.

Chapter 9, "Contingency Measures," presents contingency measures as required by the federal CAA. This chapter is omitted in the Draft 2007 AQMP, but will be released upon completion of the Draft Final 2007 AQMP.

Chapter 10, "Looking Beyond Current Requirements" examines the recently approved lowering of the 24 hour PM2.5 standard from 65 ug/m^3 to 35 ug/m^3 as well as the technical uncertainties associated with the current plan analysis.

Chapter 11, "Ultrafine Particles" examines the extent, impacts, and sources of the air pollution problem caused by particles smaller than PM2.5.

For convenience, a "Glossary" is provided at the end of the document, presenting definitions of commonly used terms found in the Draft 2007 AQMP.

CHAPTER 2

AIR QUALITY AND HEALTH EFFECTS

Introduction

Ambient Air Quality Standards

Comparison to Other U.S. Areas

Current Air Quality Summary

INTRODUCTION

In this chapter, year 2005 air quality in both the South Coast Air Basin (Basin) and the portion of the Salton Sea Air Basin (SSAB) monitored by the South Coast Air Quality Management District (District) is compared to state and federal ambient air quality standards. More monitoring stations have been added since the last AQMP for most pollutants. For those pollutants for which the Basin is in nonattainment of the federal standards, maps have been included which compare the year 2005 air quality in different areas of the Basin. Nationwide air quality for 2005 is also briefly summarized in this chapter. A comparison of air quality in the Basin to that of other U.S. and California urban areas is presented in the following pages. Appendix II provides more information on current air quality and air quality trends, as well as more information on specific monitoring station data.

Although the federal 1-hour ozone standard was revoked by the U.S. EPA and replaced by the 8-hour average ozone standard, statistics presented in this chapter refer to both standards for purposes of historical comparison.

AMBIENT AIR QUALITY STANDARDS

Ambient air quality standards for ozone, carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter (PM10 and PM2.5), and lead (Pb) have been set by both the California state and federal governments. The state has also set standards for sulfate and visibility. The ambient air quality standards for each of these pollutants and their effects on health are summarized in Table 2-1.

In 2005, the Basin exceeded the federal standards for ozone, PM10 or PM2.5 on a total of 89 days at one or more locations; this compares to 128 days in 2003 and 94 days in 2004 (based on the current 8-hour average federal standard for ozone). Despite the substantial improvement in air quality over the past few decades, some areas in the Basin still exceed the National Ambient Air Quality Standard (NAAQS) for ozone more frequently than any other area of the U.S. In 2005, the location in the nation most frequently exceeding the federal standard levels for ozone was within the Basin. Also, five of the ten locations in the nation that most frequently exceeded the 8-hour average federal ozone standard level were located in the District. The Basin has technically met the CO standards since 2003. Redesignation for attainment for the federal CO standard has been requested, but is still pending at this time.

TABLE 2-1

Ambient Air Quality Standards*

AIR POLLUTANT	STATE STANDARD CONCENTRATION/ AVERAGING TIME	FEDERAL PRIMARY STANDARD CONCENTRATION/ AVERAGING TIME	MOST RELEVANT EFFECTS
Ozone	0.09 ppm, 1-hr. avg. > 0.07 ppm, 8-hr avg.>	0.08 ppm, 8-hr avg.>	(a) Pulmonary function decrements and localized lung edema in humans and animals; (b) Risk to public health implied by alterations in pulmonary morphology and host defense in animals; (c) Increased mortality risk; (d) Risk to public health implied by altered connective tissue metabolism and altered pulmonary morphology in animals after long-term exposures and pulmonary function decrements in chronically exposed humans; (e) Vegetation damage; (f) Property damage
Carbon Monoxide	9.0 ppm, 8-hr avg. > 20 ppm, 1-hr avg. >	9 ppm, 8-hr avg.> 35 ppm, 1-hr avg.>	(a) Aggravation of angina pectoris and other aspects of coronary heart disease; (b) Decreased exercise tolerance in persons with peripheral vascular disease and lung disease; (c) Impairment of central nervous system functions; (d) Possible increased risk to fetuses
Nitrogen Dioxide	0.25 ppm, 1-hr avg. >	0.053 ppm, ann. avg.>	(a) Potential to aggravate chronic respiratory disease and respiratory symptoms in sensitive groups; (b) Risk to public health implied by pulmonary and extra-pulmonary biochemical and cellular changes and pulmonary structural changes; (c) Contribution to atmospheric discoloration
Sulfur Dioxide	0.04 ppm, 24-hr avg.> 0.25 ppm, 1-hr. avg. >	0.03 ppm, ann. avg.> 0.14 ppm, 24-hr avg.>	Bronchoconstriction accompanied by symptoms which may include wheezing, shortness of breath and chest tightness, during exercise or physical activity in persons with asthma
Suspended Particulate Matter (PM10)	20 $\mu g/m^3$, ann. arithmetic mean > 50 $\mu g/m^3$, 24-hr average>	50 $\mu g/m^3$, ann. arithmetic mean > 150$\mu g/m^3$, 24-hr avg.>	(a) Exacerbation of symptoms in sensitive patients with respiratory or cardiovascular disease; (b) Declines in pulmonary function growth in children; (c) Increased risk of premature death from heart or lung diseases in the elderly
Suspended Particulate Matter (PM2.5)	12 $\mu g/m^3$, ann. arithmetic mean >	15 $\mu g/m^3$, ann. arithmetic mean > 65 $\mu g/m^3$, 24-hr avg.>	
Sulfates	25 $\mu g/m^3$, 24-hr avg. ≥		(a) Decrease in ventilatory function; (b) Aggravation of asthmatic symptoms; (c) Aggravation of cardio-pulmonary disease; (d) Vegetation damage; (e) Degradation of visibility; (f) Property damage
Lead	1.5 $\mu g/m^3$, 30-day avg. ≥	1.5 $\mu g/m^3$, calendar quarter>	(a) Learning disabilities; (b) Impairment of blood formation and nerve conduction
Visibility-Reducing Particles	In sufficient amount such that the extinction coefficient is greater than 0.23 inverse kilometers (to reduce the visual range to less than 10 miles) at relative humidity less than 70 percent, 8-hour average (10am - 6pm)		Visibility impairment on days when relative humidity is less than 70 percent

* For the readers' convenience in identifying standards quickly, concentration appears first; e.g. "0.12 ppm, 1-hr avg. >" means 1-hr avg. > 0.12 ppm.

COMPARISON TO OTHER U.S. AREAS

The Basin's severe air pollution problem is a consequence of the combination of emissions from the nation's second largest urban area and meteorological conditions which are adverse to the dispersion of those emissions. The average wind speed for Los Angeles is the lowest of the nation's ten largest urban areas. In addition, the summertime maximum mixing height (an index of how well pollutants can be dispersed vertically in the atmosphere) in Southern California averages the lowest in the U.S. The Southern California area is also an area with abundant sunshine, which drives the photochemical reactions which form pollutants such as ozone.

In the Basin, high concentrations of ozone are normally recorded during the spring and summer months. In contrast, higher concentrations of carbon monoxide are generally recorded in late fall and winter. High PM10 and PM2.5 concentrations can occur throughout the year, but occur most frequently in fall and winter. Although there are changes in emissions by season, the observed variations in pollutant concentrations are largely a result of seasonal differences in weather conditions.

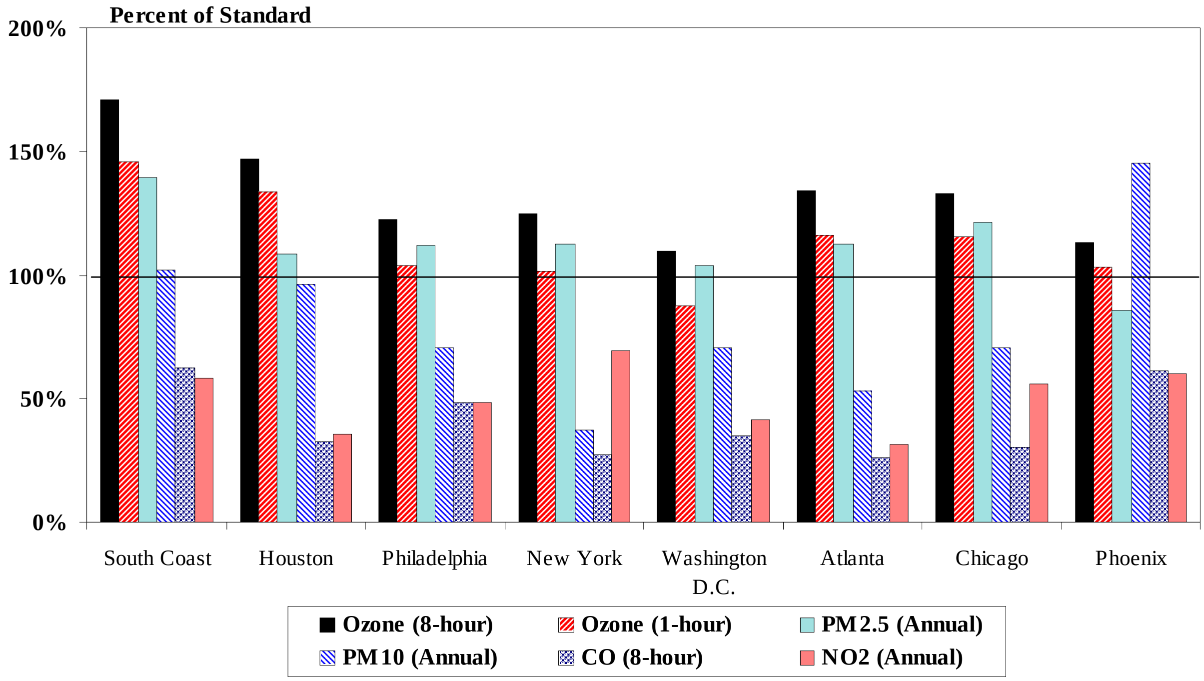
In the year 2005, the 1-hour[1] and 8-hour average federal standard levels for ozone were exceeded at one or more Basin locations on 30 and 84 days, respectively. The federal PM2.5 24-hour standard was exceeded on 6 days sampled[2]. Other criteria pollutants did not exceed the ambient air quality standards.

Figures 2-1A and 2-1B show maximum pollutant concentrations in 2005 for the South Coast Air Basin compared to other urban areas in the U.S. and California. Maximum concentrations in all of these areas exceeded the federal 8-hour ozone standard. The PM10 standard was exceeded in the Basin and in one of the other U.S. urban areas shown (Phoenix). The PM2.5 standard was exceeded in most of the large U.S. urban areas and many California air basins. None of the areas shown in Figure 2-1 exceeded the carbon monoxide standard or nitrogen dioxide standards.

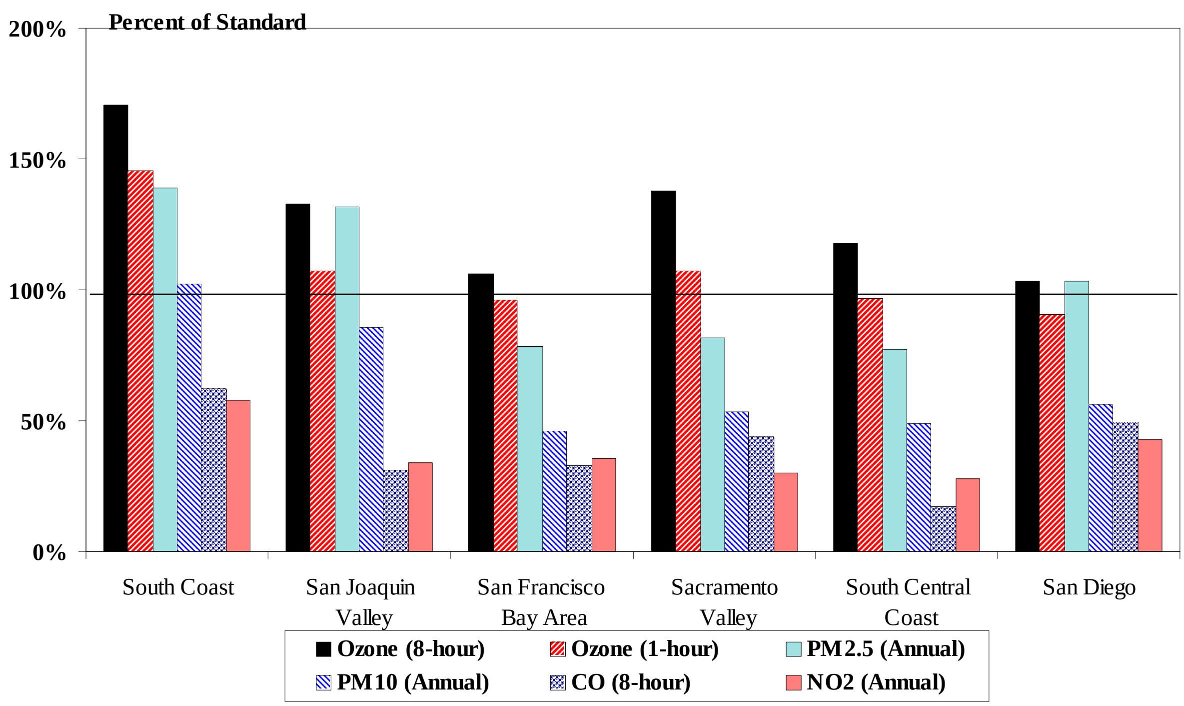
In 2005, the Central San Bernardino Mountains area in the Basin recorded the highest maximum 1-hour and 8-hour average ozone concentrations in the nation (0.182 and 0.145 ppm, respectively). The highest 8-hour average concentration was more than one and a half times the federal standard. In 2005, eight out of ten areas with the highest maximum

[1] The federal 1-hour ozone standard has been revoked by U.S. EPA. The information is included in this chapter for comparison purposes.

[2] Particulate matter exceedances may have been higher since PM10 samples are collected every 6 days (except for two sites at which samples are collected every 3 days); PM2.5 samples are collected every 3 days at most sites except for a few sites which are sampled every day. The gaseous pollutants, such as ozone and carbon monoxide, are sampled continuously.



A) South Coast Air Basin Compared to other Major U.S. Metropolitan Areas



B) South Coast Air Basin Compared to Other Air Basins in California

FIGURE 2-1
2005 Air Quality
Maximum Pollutant Concentrations as Percentages of the Federal Standard

8-hour average concentrations in the nation were located in the Basin. Outside California, the area with the next-highest ozone concentration is Houston, Texas. Like Los Angeles, Houston is an area with abundant sunshine which creates favorable conditions for the photochemical reactions that yield ozone and other photochemical pollutants.

The urban areas shown in Figure 2-1B exceeded the ozone standard but by a smaller margin than the South Coast Air Basin. San Diego and South Central Coast Air Basins, located immediately south and north of the South Coast Air Basin, respectively, are subject to ozone transport from the South Coast Air Basin.

In the year 2005, no location in the Basin or any other area of the U.S. exceeded the nitrogen dioxide standards. The Los Angeles County portion of the Basin was the last area of the U.S. to exceed the federal standard for nitrogen dioxide, but has remained in compliance since 1991. Sulfur dioxide concentrations in the Basin continued to remain well below federal standards. Concentrations of sulfur dioxide in urban areas in the Eastern U.S. have generally been higher than those in the Basin due to the use of fuels such as coal which have relatively high sulfur content.

CURRENT AIR QUALITY SUMMARY

In 2005, the maximum ozone, PM10 and PM2.5 concentrations continued to exceed federal standards by wide margins. Maximum 1-hour and 8-hour average ozone concentrations (0.182 ppm and 0.145 ppm, both recorded in Central San Bernardino Mountains areas) were 146 and 171 percent of the federal standard, respectively. Maximum 24-hour average and annual average PM10 concentrations (131 $\mu g/m^3$ recorded in South Coastal Los Angeles County area and 52.0 $\mu g/m^3$ recorded in the Metropolitan Riverside County area) were 87 and 103 percent of the federal 24-hour and annual average standards, respectively. Maximum 24-hour average and annual average PM2.5 concentrations (132.7 $\mu g/m^3$ recorded in East San Gabriel Valley area and 21.0 $\mu g/m^3$ recorded in Metropolitan Riverside County area) were 203 and 139 percent of the federal 24-hour and annual average standards, respectively.

Carbon monoxide concentrations did not exceed the standards in 2005. The highest 8-hour average carbon monoxide concentration recorded (5.9 ppm in the South Central Los Angeles County area) was 62 percent of the federal carbon monoxide standard. The maximum annual average nitrogen dioxide concentration (0.0313 ppm recorded in the Northwest San Bernardino Valley area) was 59 percent of the federal standard. Concentrations of other pollutants remained well below the federal standards.

Figure 2-2 shows the maximum pollutant concentrations in the Basin as percentages of the federal standards for the past two decades.

Figures 2-3A and 2-3B show the number of days on which the federal 1-hour and 8-hour ozone standards were exceeded at the Basin locations which had the most frequent exceedances for the years 1995 to 2005. In the early- and mid-1990s, the short-term 1-hour federal ozone standard (which has been revoked) was exceeded most frequently in the East San Gabriel Valley and Santa Clarita Valley areas located in the northern portion of Los Angeles County, extending to the northwest valleys. As emissions were reduced, resulting in a fewer number of days exceeding the ozone standard throughout the Basin, the areas with the highest exceedances shifted towards the eastern portions of the Basin, including the East San Bernardino Valley and Central San Bernardino Mountains areas, mainly due to reduced reactivity of the pollutant cloud and the longer time required to form ozone. The Santa Clarita Valley area and the eastern portions of the San Bernardino Valleys and Mountains remained as the areas mostly affected by the hourly high ozone concentrations in the Basin for the most recent years.

The highest daily long-term 8-hour average ozone concentration, however, has been consistently recorded in the East San Bernardino Valley and Central San Bernardino Mountains areas since the 1990s. The Central San Bernardino Mountains area has remained as the most affected area in terms of the number of days exceeding the 8-hour federal standard in recent years and the area shows a slower downtrend as compared to the East San Gabriel Valley area where the highest number of exceedances used to occur in the 1980s (Figure 2-3B).

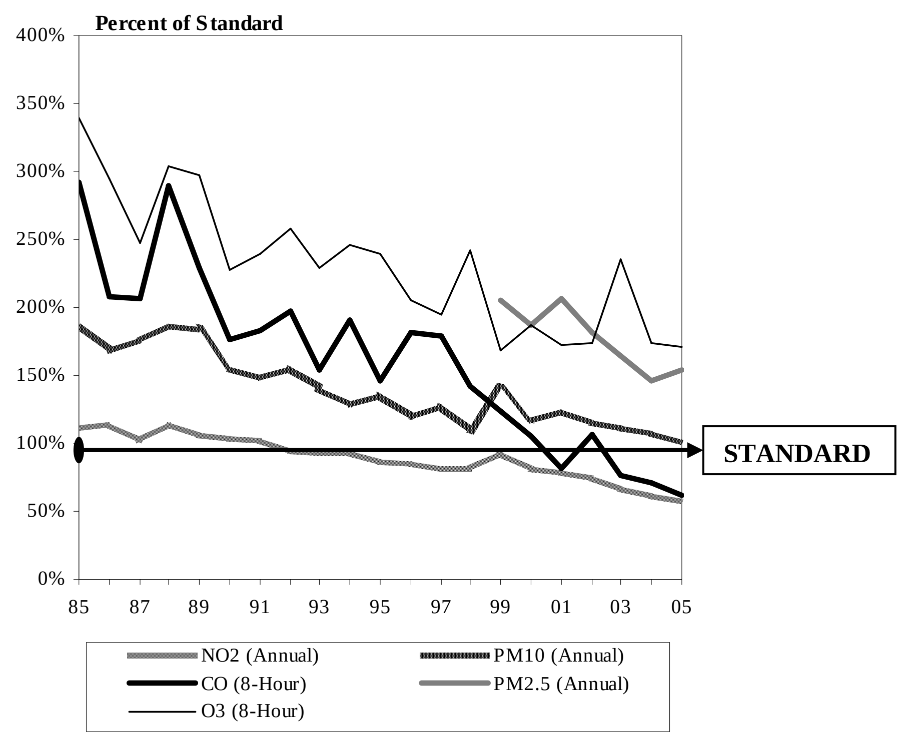
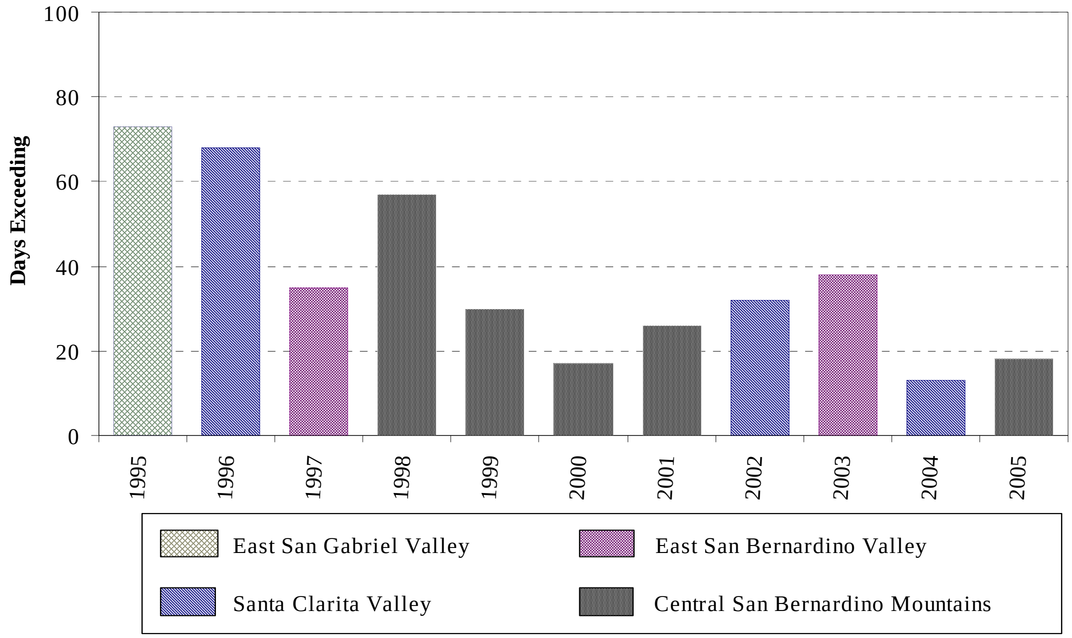
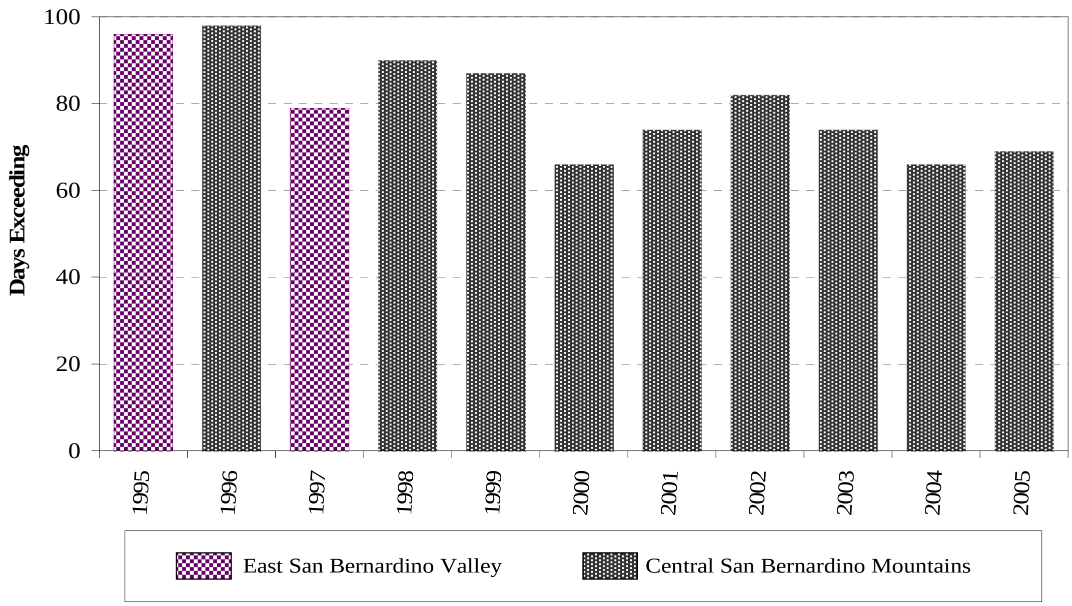


FIGURE 2-2

Maximum Pollutant Concentrations as Percent of Federal Standards



A) 1-Hour



B) 8-Hour

FIGURE 2-3
Location that Exceeded the Federal Ozone Standards
the Most Days in Each Year

Ozone (O_3) Specific Information

Health Effects

Individuals exercising outdoors, children and people with preexisting lung disease, such as asthma and chronic pulmonary lung disease, are considered to be the most susceptible sub-groups for ozone effects. Short-term exposures (lasting for a few hours) to ozone at levels typically observed in Southern California can result in breathing pattern changes, reduction of breathing capacity, increased susceptibility to infections, inflammation of the lung tissue, and some immunological changes. Elevated ozone levels are associated with increased school absences. In recent years, a correlation between elevated ambient ozone levels and increases in daily hospital admission rates, as well as mortality, has also been reported. An increased risk for asthma has been found in children who participate in multiple sports and live in high ozone communities.

Ozone exposure under exercising conditions is known to increase the severity of the above-mentioned observed responses. Animal studies suggest that exposures to a combination of pollutants which include ozone may be more toxic than exposure to ozone alone. Although lung volume and resistance changes observed after a single exposure diminish with repeated exposures, biochemical and cellular changes appear to persist, which can lead to subsequent lung structural changes.

Air Quality

In 2005, the District regularly monitored ozone concentrations at 29 locations in the Basin and SSAB. All areas monitored were below the stage 1 episode level (0.20 ppm), but the maximum concentrations in the Basin exceeded the health advisory level (0.15 ppm). Maximum ozone concentrations in the SSAB areas monitored by the District were lower than in the Basin and were below the health advisory level. Tables 2-2 and 2-3 show maximum 1-hour and 8-hour ozone concentrations by air basin and county.

The number of days exceeding the federal standards for ozone in the Basin varies widely by area. Figures 2-4 and 2-5 show the number of days exceeding the 1-hour and 8-hour ozone federal standards in different areas of the Basin in 2005. The 1-hour federal standard was not exceeded in areas along or near the coast, due in large part to the prevailing sea breeze which transports polluted air inland before high ozone concentrations can be reached. The standard was exceeded most frequently in the Central San Bernardino Mountains extending from Central San Bernardino Valleys through the Riverside-San Bernardino area in the east, and in the Santa Clarita Valleys in the west. The Central San Bernardino Mountains area recorded the greatest number of exceedances of the state standard (80 days), 1-hour and 8-hour federal standards (18 days and 69 days, respectively) and health advisory level (7 days).

The number of exceedances of the 8-hour federal ozone standard was also lowest at the coastal areas, increasing to a peak in the Riverside-San Bernardino Valley and adjacent mountain areas.

TABLE 2-2

2005 Maximum 1-Hour Ozone Concentrations by Basin and County

Basin/County	Maximum 1-Hr Avg. ppm	Percent of Federal Standard	Area
South Coast Air Basin			
Los Angeles	0.173	138	Santa Clarita Valley
Orange	0.125	100	Saddleback Valley
Riverside	0.149	119	Lake Elsinore
San Bernardino	0.182	146	Central San Bernardino Valley
Salton Sea Air Basin			
Riverside	0.139	111	Coachella Valley

TABLE 2-3

2005 Maximum 8-Hour Ozone Concentrations by Basin and County

Basin/County	Maximum 8-Hr Avg. ppm	Percent of Federal Standard	Area
South Coast Air Basin			
Los Angeles	0.141	166	Santa Clarita Valley
Orange	0.085	100	Saddleback Valley
Riverside	0.131	154	Banning Airport
San Bernardino	0.145	171	Central San Bernardino Mountains
Salton Sea Air Basin			
Riverside	0.095	112	Coachella Valley

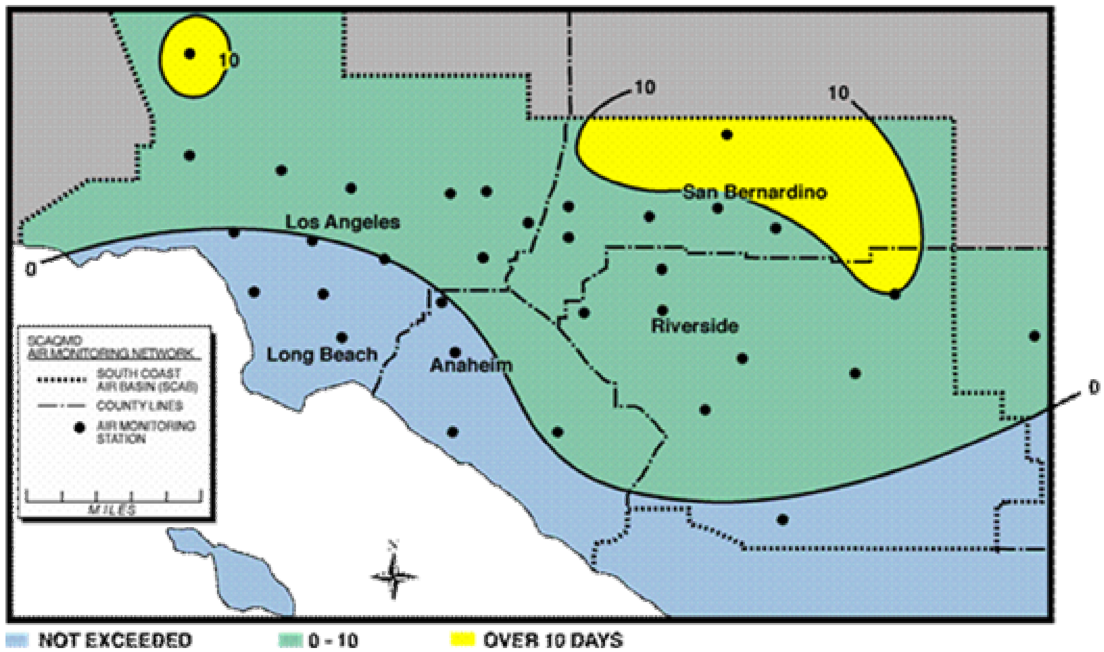


FIGURE 2-4
Ozone - 2005
Number of Days Exceeding the Federal Standard
(1-hour average ozone > 0.12 ppm)

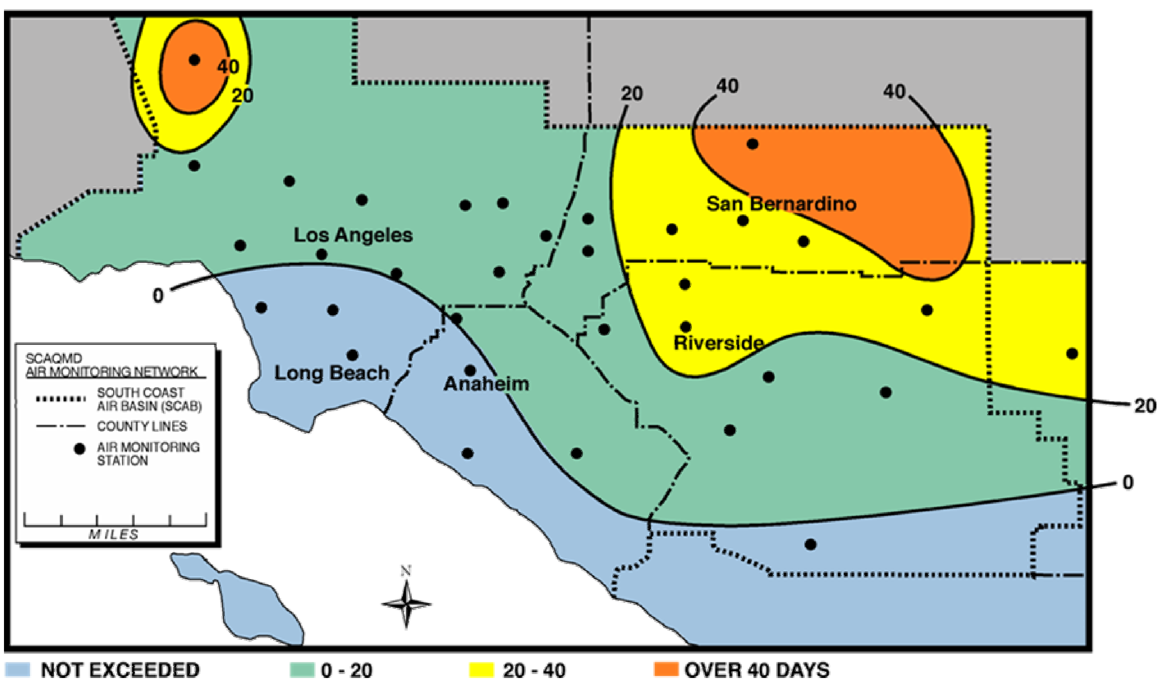


FIGURE 2-5
Ozone - 2005
Number of Days Exceeding the Federal Standard
(8-hour average ozone > 0.08 ppm)

Particulate Matter (PM10 and PM2.5) Specific Information

Health Effects

A consistent correlation between elevated ambient fine particulate matter (PM10 and PM2.5) levels and an increase in mortality rates, respiratory infections, number and severity of asthma attacks and the number of hospital admissions has been observed in different parts of the United States and various areas around the world. In recent years, studies have reported an association between long-term exposure to air pollution dominated by fine particles (PM2.5) and increased mortality, reduction in life-span, and an increased mortality from lung cancer.

Daily fluctuations in fine particulate matter concentration levels have also been related to hospital admissions for acute respiratory conditions, to school and kindergarten absences, to a decrease in respiratory function in normal children and to increased medication use in children and adults with asthma. Recent studies show lung function growth in children is reduced with long-term exposure to particulate matter.

The elderly, people with pre-existing respiratory and/or cardiovascular disease and children appear to be more susceptible to the effects of PM10 and PM2.5.

Air Quality, PM10

The District monitored PM10 concentrations at 20 locations in 2005. Maximum 24-hour and annual average concentrations are shown in Tables 2-4 and 2-5.

Figure 2-6 shows the 2005 annual average PM10 concentrations in different areas of the Basin. The federal annual PM10 standard was exceeded at only one location in the District in 2005. Highest PM10 concentrations were recorded in Riverside and San Bernardino Counties in and around the Metropolitan Riverside County area, and further inland in San Bernardino Valley areas. The federal 24-hour standard was not exceeded at any of the locations monitored in 2005. The much more stringent state standards were exceeded in most areas.

TABLE 2-4

2005 Maximum 24-hour Average PM10 Concentrations by Basin and County

Basin/County	Maximum 24-Hr Avg. µg/m^3	Percent of Federal Standard	Area
South Coast Air Basin			
Los Angeles	131	87	South Coastal Los Angeles County
Orange	65	43	Central Orange County
Riverside	123	81	Metropolitan Riverside County
San Bernardino	108	72	Central San Bernardino Valley
Salton Sea Air Basin			
Riverside	106	70	Coachella Valley

TABLE 2-5

2005 Maximum Annual Average PM10 Concentrations by Basin and County

Basin/County	Annual Average µg/m^3	Percent of Federal Standard	Area
South Coast Air Basin			
Los Angeles	43.4	86	South Coastal Los Angeles County
Orange	28.2	56	Central Orange County
Riverside	52.0	103	Metropolitan Riverside County
San Bernardino	50.0	99	Central San Bernardino Valley
Salton Sea Air Basin			
Riverside	45.7	90	Coachella Valley

Air Quality, PM2.5

The District began regular monitoring of PM2.5 in 1999 following the U.S. EPA's adoption of the national PM2.5 standards in 1997. In 2005, PM2.5 concentrations were monitored at 19 locations throughout the District. Maximum 24-hour and annual average concentrations are shown in Tables 2-6 and 2-7. Maximum 24-hour average concentration has increased at some locations compared to 2001, the basis of the 2003 AQMP air quality data. The PM2.5 annual average concentrations and the highest 98th percentile PM2.5 concentrations (which the federal 24-hour PM2.5 standard is based on), however, are lower than 2001 levels at all locations monitored.

TABLE 2-6

2005 Maximum 24-hour Average PM2.5 Concentrations by Basin and County

Basin/County	Maximum 24-Hr Avg. μg/m^3	Percent of Federal Standard	Area
South Coast Air Basin			
Los Angeles	132.7	203	East San Gabriel Valley
Orange	54.7	84	Central Orange County
Riverside	98.7	151	Metropolitan Riverside County
San Bernardino	106.3	162	Central San Bernardino Valley
Salton Sea Air Basin			
Riverside	44.4	68	Coachella Valley

TABLE 2-7

2005 Maximum Annual Average PM2.5 Concentrations by Basin and County

Basin/County	Annual Average μg/m^3	Percent of Federal Standard	Area
South Coast Air Basin			
Los Angeles	18.1	120	Central Los Angeles
Orange	14.7	97	Central Orange County
Riverside	21.0	139	Metropolitan Riverside County
San Bernardino	18.9	125	Central San Bernardino Valley
Salton Sea Air Basin			
Riverside	10.5	70	Coachella Valley

Figure 2-7 shows the distribution of annual average PM2.5 concentrations in different areas of the Basin. Similar to PM10 concentrations, PM2.5 concentrations were higher in the inland valley areas of San Bernardino and Metropolitan Riverside counties. However, PM2.5 concentrations were also high in the metropolitan area of Los Angeles county. The high PM2.5 concentrations in Los Angeles county are mainly due to the secondary formation of smaller particulates resulting from mobile and stationary source activities. In contrast to PM10, PM2.5 concentrations were low in the Coachella Valley area of SSAB. PM10 concentrations are normally higher in the desert areas due to windblown and fugitive dust emissions.

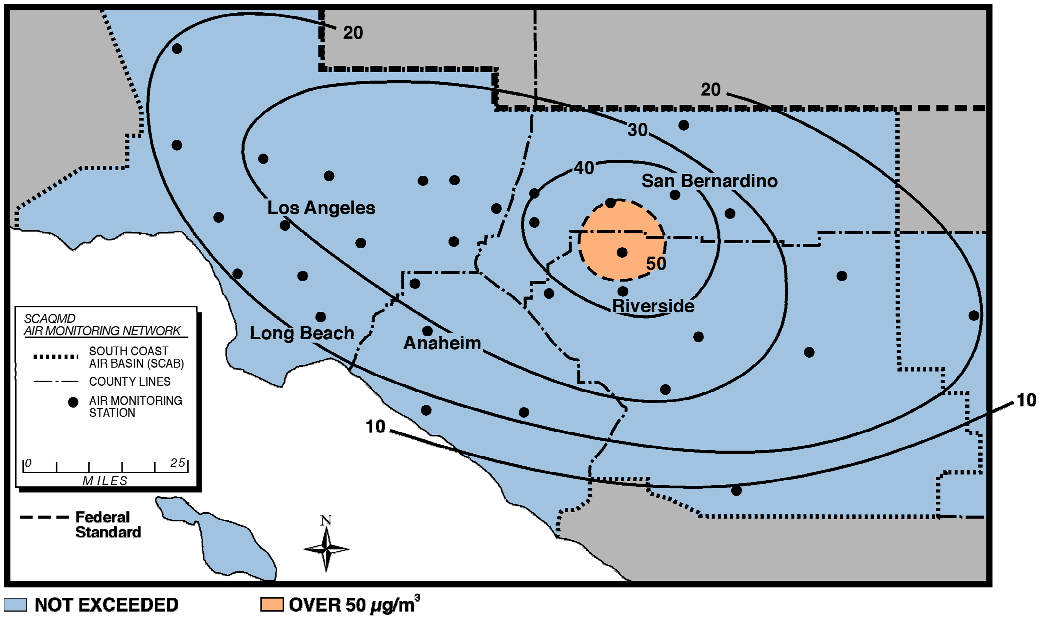


FIGURE 2-6

PM10 - 2005

Annual Average Concentration Compared to Federal Standard

(Federal standard = 50 µg/m^3, annual arithmetic mean)

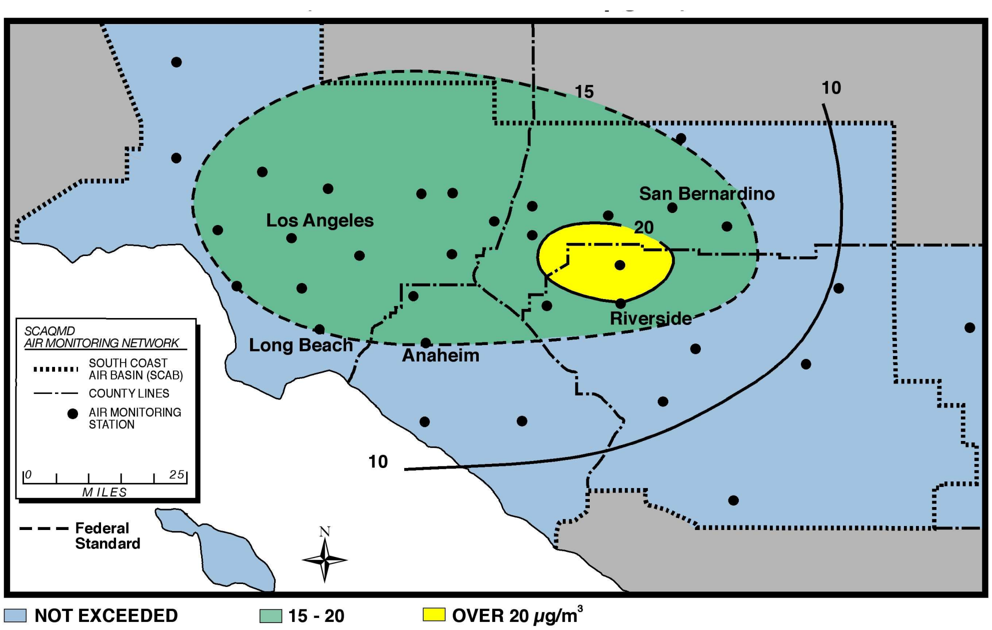


FIGURE 2-7

PM2.5 - 2005

Annual Average Concentration Compared to Federal Standard

(Federal standard = 15 µg/m^3, annual arithmetic mean)

Carbon Monoxide (CO) Specific Information

Health Effects

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

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

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

Air Quality

Carbon monoxide concentrations were measured at 25 locations in the Basin and neighboring SSAB areas in 2005. Table 2-8 shows the 2005 maximum 8-hour average concentrations of carbon monoxide by air basin and county.

In 2005, no areas exceeded the carbon monoxide air quality standards. The highest concentrations of carbon monoxide continued to be recorded in the areas of Los Angeles County where vehicular traffic is most dense, with the maximum concentration (5.9 ppm) recorded in the South Central Los Angeles County area. All areas continued to remain below the federal standard level since 2003.

TABLE 2-8

2005 Maximum Carbon Monoxide Concentrations by Basin and County

Basin/County	Maximum 8-Hr Avg. ppm	Percent of Federal Standard	Area
South Coast Air Basin			
Los Angeles	5.9	62	South Central L.A. County
Orange	3.3	35	North Coastal Orange County
Riverside	2.6	27	Metropolitan Riverside County
San Bernardino	3.4	36	Central San Bernardino Valley
Salton Sea Air Basin			
Riverside	1.0	11	Coachella Valley

Nitrogen Dioxide (NO_2) Specific Information

Health Effects

Population-based studies suggest that an increase in acute respiratory illness, including infections and respiratory symptoms in children (not infants), is associated with long-term exposures to NO_2 at levels found in homes with gas stoves, which are higher than ambient levels found in Southern California. Increase in resistance to air flow and airway contraction is observed after short-term exposure to NO_2 in healthy subjects. Larger decreases in lung functions are observed in individuals with asthma and/or chronic obstructive pulmonary disease (e.g., chronic bronchitis, emphysema) than in healthy individuals, indicating a greater susceptibility of these sub-groups.

More recent studies have found associations between NO_2 exposures and cardiopulmonary mortality, decreased lung function, respiratory symptoms and emergency room asthma visits.

In animals, exposure to levels of NO_2 considerably higher than ambient concentrations results in increased susceptibility to infections, possibly due to the observed changes in cells involved in maintaining immune functions. The severity of lung tissue damage associated with high levels of ozone exposure increases when animals are exposed to a combination of ozone and NO_2.

Air Quality

In 2005, nitrogen dioxide concentrations were monitored at 24 locations. No area of the Basin or SSAB exceeded the federal or state standards for nitrogen dioxide. Maximum annual average concentrations for 2005 are shown in Table 2-9. The Basin has not exceeded the federal standard for nitrogen dioxide (0.0534 ppm) since 1991, when the Los Angeles County portion of the Basin recorded the last exceedance of the standard in any U.S. county.

The nitrogen dioxide state standard was not exceeded at any District monitoring location in 2005. The highest 1-hour average concentration recorded (0.13 ppm in Central Los Angeles) was 50 percent of the state standard.

TABLE 2-9

2005 Maximum Nitrogen Dioxide Concentrations by Basin and County

Basin/County	Maximum Annual Avg. ppm	Percent of Federal Standard	Area
South Coast Air Basin			
Los Angeles	0.0312	58	South Central Los Angeles County; Pomona/Walnut Valley
Orange	0.0249	47	North Orange County
Riverside	0.0222	41	Metropolitan Riverside County
San Bernardino	0.0313	59	Northwest San Bernardino Valley
Salton Sea Air Basin			
Riverside	0.0120	22	Coachella Valley

Sulfur Dioxide (SO_2) Specific Information

Health Effects

Exposure of a few minutes to low levels of SO_2 can result in airway constriction in some asthmatics. All asthmatics are sensitive to the effects of SO_2. In asthmatics, increase in resistance to air flow, as well as reduction in breathing capacity leading to severe breathing difficulties, are observed after acute higher exposure to SO_2. In contrast, healthy individuals do not exhibit similar acute responses even after exposure to higher concentrations of SO_2.

Animal studies suggest that despite SO_2 being a respiratory irritant, it does not cause substantial lung injury at ambient concentrations. However, very high levels of exposure can cause lung edema (fluid accumulation), lung tissue damage, and sloughing off of cells lining the respiratory tract.

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

Air Quality

No exceedances of federal or state standards for sulfur dioxide occurred in 2005 at any of the seven District locations monitored. Though sulfur dioxide concentrations remain well below the standards, sulfur dioxide is a precursor to sulfate, which is a component of fine particulate matter, PM10, and PM2.5. Standards for PM10 and PM2.5 were both exceeded in 2005. Maximum concentrations of sulfur dioxide for 2005 are shown in Table 2-10. Sulfur dioxide was not measured at SSAB sites in 2005. Historical measurements showed concentrations to be well below standards and monitoring has been discontinued.

TABLE 2-10

2005 Maximum Sulfur Dioxide Concentrations by Basin and County

Basin/County	Maximum 24-hr Avg. ppm	Percent of Federal Standard	Area
South Coast Air Basin			
Los Angeles	0.012	9	Southwest Coastal LA County
Orange	0.008	6	North Coastal Orange County
Riverside	0.011	8	Metropolitan Riverside County
San Bernardino	0.004	3	Central San Bernardino Valley
Salton Sea Air Basin			
Riverside	N.D.		

N.D. = No Data. Historical measurements indicate concentrations are well below standards.

Sulfates ($SO_4^=$) Specific Information

Health Effects

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

Clinical studies of asthmatics exposed to sulfuric acid suggest that adolescent asthmatics are possibly a subgroup susceptible to acid aerosol exposure. Animal studies suggest that acidic particles such as sulfuric acid aerosol and ammonium bisulfate are more toxic than non-acidic particles like ammonium sulfate. Whether the effects are attributable to acidity or to particles remains unresolved.

Air Quality

In 2005, the state sulfate standard was not exceeded anywhere in the Basin. Maximum concentrations by air basin and county are shown in Table 2-11. No sulfate data were obtained at SSAB stations in 2005. Historical sulfate data showed concentrations in the SSAB areas to be well below the standard, and measurements have been discontinued.

TABLE 2-11

2005 Maximum Sulfate Concentrations by Basin and County

Basin/County	Maximum 24-hr Avg. µg/m^3	Percent of Federal Standard	Area
South Coast Air Basin			
Los Angeles	17.3	69	South Central Los Angeles
Orange	N.D.		
Riverside	10.3	41	Metropolitan Riverside County
San Bernardino	10.9	44	Central San Bernardino Valley
Salton Sea Air Basin			
Riverside	N.D.		

N.D. = No Data. Historical measurements indicate concentrations are well below standards.
State standard = 25 µg/m^3

Lead (Pb) Specific Information

Health Effects

Fetuses, infants, and children are more sensitive than others to the adverse effects of lead exposure. Exposure to low levels of lead can adversely affect the development and function of the central nervous system, leading to learning disorders, distractibility, inability to follow simple commands, and lower intelligence quotient. In adults, increased lead levels are associated with increased blood pressure.

Lead poisoning can cause anemia, lethargy, seizures, and death. It appears that there are no direct effects of lead on the respiratory system. Lead can be stored in the bone from early-age environmental exposure, and elevated blood lead levels can occur due to breakdown of bone tissue during pregnancy, hyperthyroidism (increased secretion of hormones from the thyroid gland), and osteoporosis (breakdown of bony tissue). Fetuses and breast-fed babies can be exposed to higher levels of lead because of previous environmental lead exposure of their mothers.

Air Quality

The federal and state standards for lead were not exceeded in any area of the District in 2005. There have been no violations of the standards at the District's regular air monitoring stations since 1982, as a result of removal of lead from gasoline. However, special monitoring stations immediately adjacent to stationary sources of lead have recorded exceedances of the standards in localized areas of the Basin as recently as 1991 for the federal standard and 1994 for the state standard. Table 2-12 shows the maximum concentrations recorded in 2005. The maximum monthly and quarterly average lead concentration (0.44 $\mu g/m^3$ and 0.34 $\mu g/m^3$ in Central Los Angeles), measured at special monitoring sites immediately adjacent to stationary sources of lead were 29 and 23 percent of the state and federal standards, respectively.

TABLE 2-12

2005 Maximum Lead Concentrations by Basin and County

Basin/County	Maximum Quarterly Average $\mu g/m^3$	Percent of Federal Standard	Area
South Coast Air Basin			
Los Angeles	0.03	2	South Central Los Angeles County
Orange	N.D.		
Riverside	0.02	1	Metropolitan Riverside County
San Bernardino	0.02	1	Northwest San Bernardino Valley
Salton Sea Air Basin			
Riverside	N.D.		

N.D. = No Data. Historical measurements indicate concentrations are well below standards.

Summary

In 2005, the Basin exceeded federal and state standards for ozone, PM10, and PM2.5. The Salton Sea Air Basin areas continued to exceed standards for ozone and PM10. Maximum concentrations of PM2.5 and ozone exceeded the federal standards by the widest margins nationwide. In 2005, carbon monoxide concentrations did not exceed the standards anywhere in the Basin for the third consecutive year. Maximum concentrations for nitrogen dioxide, sulfur dioxide, sulfate, and lead continued to remain below the state and federal standards.

CHAPTER 3

BASE YEAR AND FUTURE EMISSIONS

Introduction

Emission Inventories

Base Year Emissions

Future Emissions

Top Ten Source Categories (2002, 2014, 2020)

INTRODUCTION

This chapter summarizes emissions that occurred in the Basin during the base year 2002, and projected emissions in the years 2014, 2020, and 2023. More detailed emission data analyses are presented in Appendix III of the Draft 2007 AQMP. Additional emission inventories for other interim years (i.e., 2005, 2008, 2010, 2011, 2017, and 2030) are also developed. These inventory years are selected to comply with federal and state Clean Air Act requirements. The 2002 base year emissions inventory reflects adopted air regulations with current compliance dates as of 2002; whereas future baseline emissions inventories are based on adopted air regulations with both current and future compliance dates. A list of AQMD and CARB rules and regulations that are part of the base year and future-year baseline emissions inventories is presented in Appendix III of the Draft 2007 AQMP. The District is committed to implement the AQMD rules that are incorporated in the Draft 2007 AQMP baseline emissions inventories.

The emissions inventory is divided into four major classifications: point, area, off-road, and on-road sources. The 2002 base year point source emissions are based principally on reported data from facilities. The area source and off-road emissions are estimated jointly by CARB and the District. The on-road emissions are calculated using the CARB EMFAC2007 Working Draft emission factors and the transportation activity data provided by SCAG from their modified 2004 Regional Transportation Plan (2004 RTP). In this document Outer Continental Shelf (OCS) emissions (i.e. ships beyond the three-mile state waters line) are included in the ships emissions. The future emission forecasts are based on demographic and economic growth projections provided by the Southern California Association of Governments (SCAG). In addition, emission reductions resulting from District regulations adopted by June 30, 2006 are included in the emission forecasts. CARB regulations adopted by June 2005 are also included in the baseline, except there are some rules that are not yet incorporated into the EMFAC2007 Working Draft and are therefore not reflected in the inventory. These reductions will be treated as external adjustments to the baseline emissions.

This chapter also includes information on the top ten source categories that contribute to the majority of the emissions inventory in 2002, 2014, and 2020.

EMISSION INVENTORIES

Three inventories are prepared for the Draft 2007 AQMP for the purpose of regulatory and SIP performance tracking and transportation conformity: an annual average inventory, a summer planning inventory, and a winter planning inventory. Baseline emissions data presented in this chapter are based on average annual day emissions (i.e., total annual emissions divided by 365 days) and seasonally adjusted planning inventory emissions. The Draft 2007 AQMP uses annual average day emissions to estimate the cost-effectiveness of control measures, to rank control measure implementation, and to perform PM2.5 modeling and analysis. The planning inventory emissions developed to capture the emission levels during a poor air quality season are used to report emission reduction progress as required by the federal and state Clean Air Acts.

Detailed descriptions of the base year and future baseline emission inventories are presented in Appendix III of the Draft 2007 AQMP.

Attachment F to Appendix III has been added to this AQMP due to the recent significance placed on diesel emissions, showing emissions associated with combustion of diesel fuel for various source categories.

Stationary Sources

Stationary sources can be divided into two major subcategories: point and area sources. Point sources are generally large emitters with one or more emission sources at a permitted facility with an identified location (e.g., power plants, refineries). Area sources generally consist of many small emission sources (e.g., residential water heaters, architectural coatings) which are distributed across the region. Their emissions over a given area may be calculated using socioeconomic data. For 2002, reported data are used for point sources emitting more than 4 tons per year of the following criteria air contaminants: VOC, NOx, SOx, and PM2.5. For CO, facilities report if they are over 100 tons per year. If any of these thresholds are triggered, all pollutants are reported by the facility.

Area source emissions were jointly developed by CARB and the District for approximately 350 categories. Several special studies were conducted to improve the area source inventory. Specific source categories such as gasoline dispensing, consumer products, architectural coatings, fugitive dust, and ammonia sources were updated (see Appendix III). For consumer products and architectural coatings, revised and updated survey data were used. For fugitive dust, the PM10 to PM2.5 ratio was changed based on a study by the Western Regional Air Partnership (WRAP).

Mobile Sources

Mobile sources consist of two subcategories: on-road and off-road sources. On-road vehicle emissions are calculated using socioeconomic data and transportation models provided by SCAG, spatial distribution data from Caltrans' Direct Travel Impact Model (DTIM4), and EMFAC2007 Working Draft inventories obtained from CARB. The EMFAC2007 Working Draft reflects SCAG's revised baseline activity data from the modified 2004 RTP. The 2000 Census data, combined with SCAG's 2001 origin and destination survey data, are used in SCAG's modified 2004 RTP and in this AQMP. Major improvements made to the EMFAC2007 Working Draft include:

1. Heavy heavy-duty diesel vehicles population redistribution;
2. Vehicle miles traveled updates;
3. Heavy heavy-duty diesel factors updates;
4. Pending vehicles updates;
5. Fuel correcting factors updates;
6. Ethanol permeation effects;
7. New population data; and
8. New temperature and relative humidity profiles corresponding to the federal 8-hour ozone standard.

Figure 3-1A compares the on-road baseline emissions between EMFAC2002 and the EMFAC2007 Working Draft used in the 2003 AQMP and Draft 2007 AQMP, respectively. It should be noted that the comparison reflects changes in methodology, adopted rules, and updated growth projections since the release of EMFAC2002.

Emissions from off-road vehicle categories (e.g., trains, ships, construction equipment, ports and rail cargo handling equipment) were developed primarily based on estimated activity levels and emission factors. The major changes made to the off-road model include:

1. Off-road equipment population, activity, and emission factor updates;
2. Locomotive inventory reflecting the 1998 South Coast Locomotive MOU and the 2005 CARB/Railroad MOU;
3. Cargo handling equipment updates;
4. Portable fuel containers updates;

5. Marine vessel updates; and

6. Commercial harbor craft updates.

The inventory for trains was revised from the 2003 AQMP to reflect projected emission reductions based on the 1998 South Coast MOU and the 2005 CARB/Railroad MOU. Significant improvements have been made to the marine vessel category, which includes ocean-going vessels, commercial harbor craft, and other ships. For both the Port of Los Angeles and Port of Long Beach, more recent and comprehensive emission inventories and projections have been included in the Draft 2007 AQMP. New surveys and data sources for marine vessels have been used, as described in Appendix III.

Figure 3-1B shows a comparison of the off-road baseline emissions based on the OFFROAD model revisions used for the 2003 AQMP and Draft 2007 AQMP. As the inventory methodology has improved, more emissions have been quantified, resulting in equal or higher emissions than previously anticipated in spite of more rules being adopted. This creates a greater challenge for attainment. It should be noted that reductions from the Carl Moyer program from past projects are not reflected in the baseline inventories. These reductions are quantified and applied externally to the baseline inventories, as described in Appendix III.

Uncertainty in the Inventory

An effective AQMP relies on an adequate emission inventory. Over the years, significant improvements have been made to quantify emission sources upon which control measures are developed. Increased use of continuous monitoring and source tests has contributed to the improvement in point source inventories. Technical assistance to facilities and auditing of reported emissions by the District also have improved the accuracy of the emissions inventory. Area source inventories that rely on average emission factors and regional activities have inherent uncertainty. Industry-specific surveys or source-specific studies during rule development have provided much-needed refinement to the emissions estimates.

Mobile source inventories remain the greatest challenge due to the high number and types of equipment and engines involved, in-use performance variables, and complex emission characteristics. Every AQMP revision provides an opportunity to further improve the current knowledge of mobile source inventories. There is no exception to the Draft 2007 AQMP. As described earlier, many improvements were made to the EMFAC2007 Working Draft and such work is still ongoing. However, it should be acknowledged that there are still areas that may not have been adequately addressed. For example, ethanol permeation not accounted for in the stationary source inventory for gasoline-powered equipment or gas stations, how best to reflect heavy heavy-duty truck in-use emissions with limited test data, and appropriate spatial and temporal distribution of recreational boats need to be examined further. The best available science should be followed to support the AQMP development.

In addition, there are also some CARB rules that are not yet incorporated into the EMFAC2007 Working Draft and the associated emission reductions will need to be reflected in the inventory in near-term refinements that will occur subsequent to the release of this Draft 2007 AQMP.

Relative to future growth, there are many challenges with making accurate projections. For example, where vehicle trips will occur, the distribution between various modes of transportation (such as trucks and trains), as well as estimates for population growth and changes to the number and type of jobs – although they are forecast with the best information available; nevertheless, they contribute to the overall uncertainty in emission projections.

Gridded Emissions

For air quality modeling purposes, the region is composed of the South Coast Air Basin, Coachella Valley, Antelope Valley, Ventura County (upwind area), and Mojave Desert. The modeling area is divided into a grid system composed of 5 km by 5 km grid cells defined by Universal Transverse Mercator (UTM) coordinates. Both stationary and mobile source emissions are allocated to individual grid cells within this system. In general, the modeling emission data features episodic-day emissions. Seasonal variations in activity levels are taken into account in developing gridded stationary point and area source emissions. Variations in temperature, hours of operation, speed of motor vehicles, or other factors are considered in developing gridded motor vehicle emissions. Hence, "gridded" emissions data used for ozone modeling applications (Chapter 5) differ from the average annual day or planning inventory emission data in two respects: 1) the modeling region covers larger geographic areas than the Basin; and 2) emissions represent day-specific instead of average or seasonal conditions. In the Draft 2007 AQMP, gridded inventories associated with selected ozone episodes have been prepared for air quality modeling analyses. In addition, gridded emissions for 2005 and 2014 were developed to calculate annual average PM2.5 concentrations.

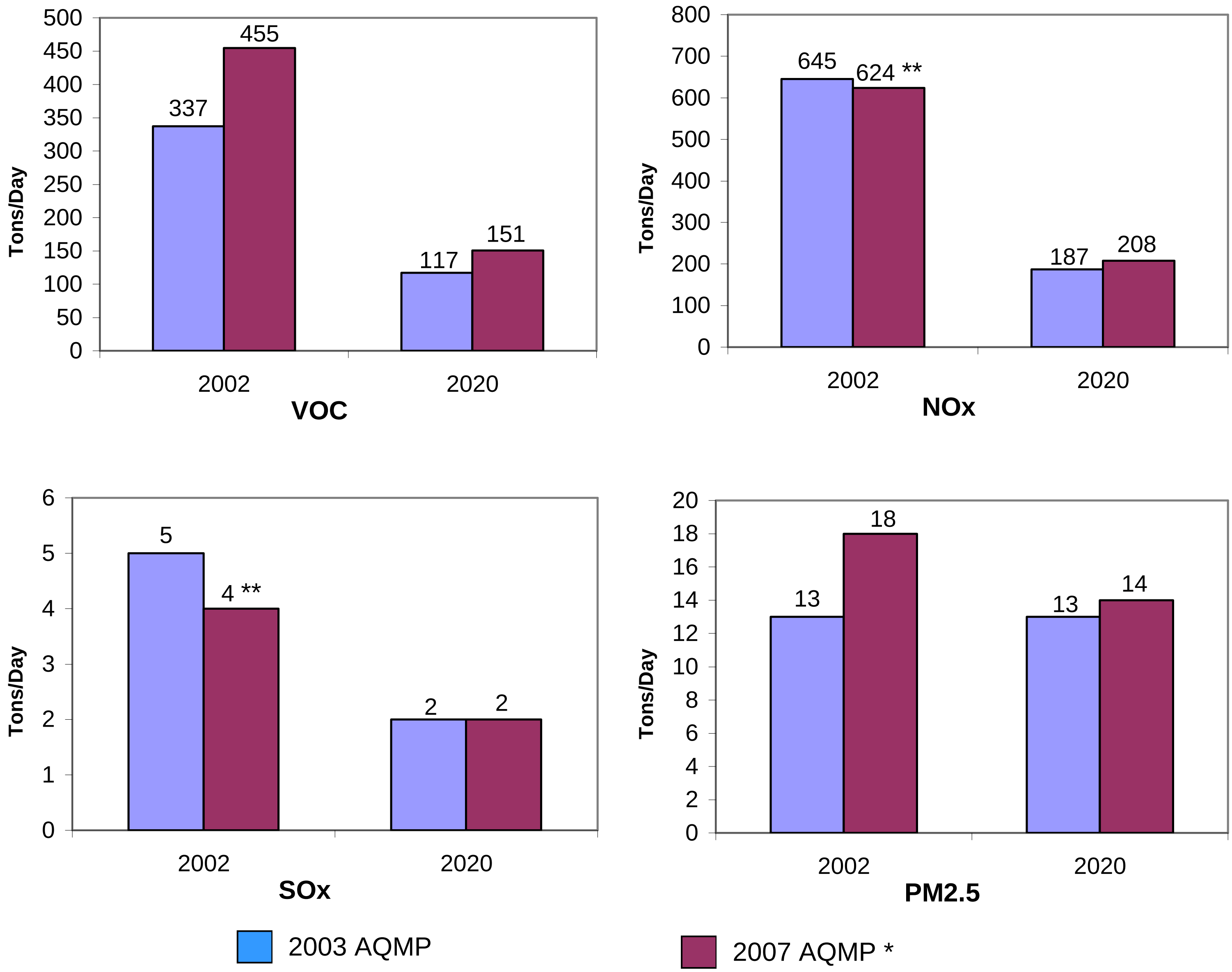


FIGURE 3-1A

Comparison of On-Road Emissions Between EMFAC2002 (2003 AQMP) and EMFAC2007 Working Draft (Draft 2007 AQMP)
(VOC & NOx – Summer Planning; SOx & PM2.5 – Annual Average Inventory)

* Year 2020 inventories incorporate rules adopted since the release of EMFAC2002.
** Redistribution of the heavy-duty truck VMT in the EMFAC2007 Working Draft causes heavy duty truck VMT reduction in the SCAB. As a result, NOx and SOx emissions are relatively lower in the Draft 2007 AQMP than in the 2003 AQMP.

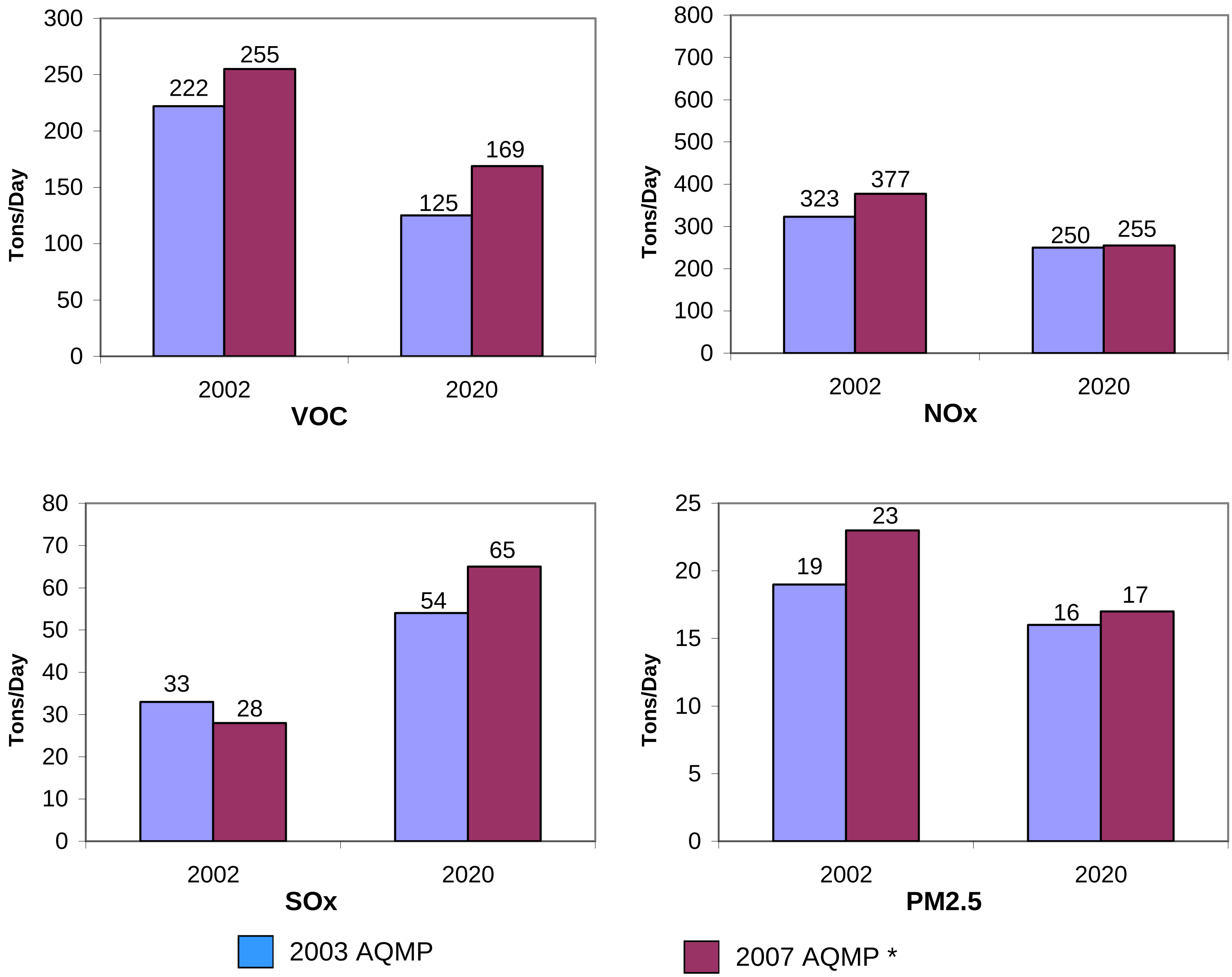


FIGURE 3-1B

Comparison of Off-Road Emissions Between EMFAC2002 (2003 AQMP)
and EMFAC2007 Working Draft (Draft 2007 AQMP)
(VOC & NOx – Summer Planning; SOx & PM2.5 – Annual Average Inventory)

* Year 2020 inventories incorporate rules adopted since the release of EMFAC2002

BASE YEAR EMISSIONS

2002 Emission Inventory

Table 3-1 shows the 2002 emissions inventory by major source category. Table 3-1A shows annual average emissions, while Table 3-1B shows the planning inventories for summer and winter.

Overall, total mobile source emissions account for 69 percent of the VOC and 92 percent of the NOx emissions for these two ozone-forming pollutants, based on the annual average inventory. The on-road mobile category alone contributes about 47 and 58 percent of the VOC and NOx emissions, respectively, and approximately 77 percent of the CO for the annual average inventory.

Figure 3-2 characterizes relative contributions by stationary and mobile source categories. Stationary sources are subdivided into point (e.g., chemical manufacturing, petroleum production, and electric utilities) and area sources (e.g., architectural coatings, residential water heaters, and consumer products). Mobile sources consist of on-road (e.g., light-duty passenger cars) and off-road sources (e.g., trains and ships). Entrained road dust is also included in Figure 3-2.

On- and off-road sources continue to be the major contributors for each of the 5 pollutants, as seen in Figure 3-2. For example, mobile sources represent 69 percent of VOC emissions, 92 percent of NOx emissions, and 98 percent of CO emissions. For directly emitted PM2.5, mobile sources represent 41 percent of the emissions with another 20 percent due to vehicle-related entrained road dust.

Within the category of stationary sources, point sources contribute more SOx emissions than area sources. Area sources play a major role in VOC emissions, emitting about five times more than point sources. Area sources are the predominant source (30 percent) of directly emitted PM2.5 emissions, including sources such as cooking.

TABLE 3-1A

Summary of Emissions By Major Source Category: 2002 Base Year
Average Annual Day (tons/day[1])

Source Category	VOC	NOx	CO	SOx	PM2.5
Stationary Sources					
Fuel Combustion	7	35	52	2	6
Waste Disposal	8	2	1	0	0
Cleaning and Surface Coatings	54	0	0	0	1
Petroleum Production and Marketing	35	0	9	7	1
Industrial Processes	22	0	2	0	5
Solvent Evaporation					
Consumer Products	110	0	0	0	0
Architectural Coatings	49	0	0	0	0
Others	3	0	0	0	0
Misc. Processes *	16	27	62	0	47
RECLAIM Sources	0	29	0	12	0
Total Stationary Sources	**304**	**93**	**126**	**22**	**60**
Mobile Sources					
On-Road Vehicles	455	642	4150	4	18
Off-Road Vehicles	216	369	1114	28	23
Total Mobile Sources	**671**	**1011**	**5264**	**32**	**41**
TOTAL	**975**	**1104**	**5390**	**54**	**101**

TABLE 3-1B

Summary of Emissions By Major Source Category: 2002 Base Year
Planning Inventory** (tons/day[1])

	SUMMER OZONE PRECURSORS		WINTER INVENTORY	
Source Category	VOC	NOx	NOx	CO
Stationary Sources				
Fuel Combustion	7	36	35	54
Waste Disposal	8	2	2	1
Cleaning and Surface Coatings	60	0	0	0
Petroleum Production and Marketing	35	1	1	9
Industrial Processes	24	0	0	2
Solvent Evaporation				
Consumer Products	110	0	0	0
Architectural Coatings	57	0	0	0
Others	4	0	0	0
Misc. Processes	14	21	33	102
RECLAIM SOURCES	0	29	29	0
Total Stationary Sources	**318**	**89**	**100**	**168**
Mobile Sources				
On-Road Vehicles	455	624	695	4103
Off-Road Vehicles	255	377	357	910
Total Mobile Sources	**710**	**1001**	**1052**	**5013**
TOTAL	**1028**	**1090**	**1152**	**5181**

* Travel-related road dust included.
[1] Values are rounded to nearest integer.

**Planning inventories are not used for PM2.5 analysis.

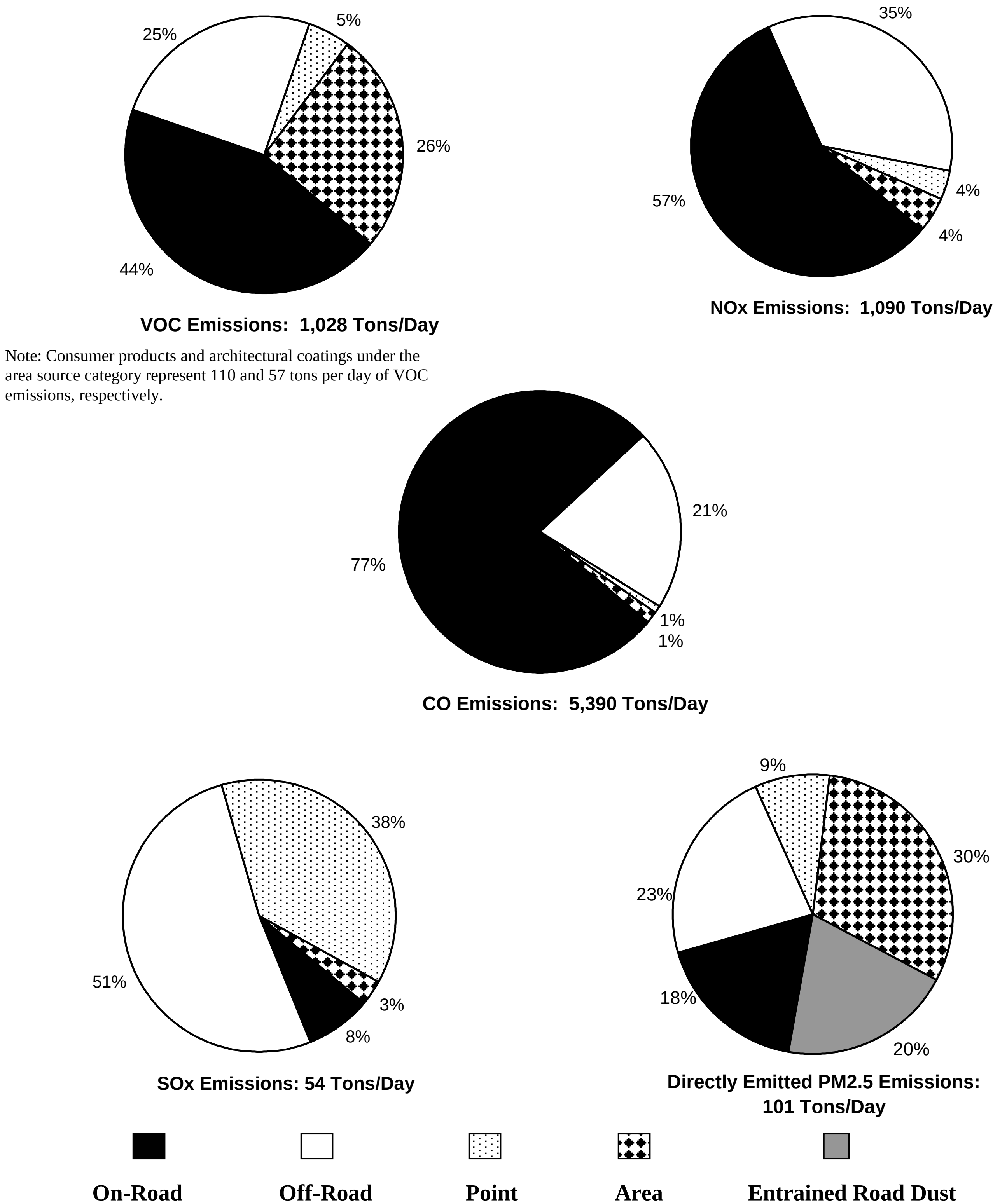


FIGURE 3-2

Relative Contribution by Source Category to 2002 Emission Inventory
(VOC & NOx – Summer Planning; CO, SOx & PM2.5 – Annual Average Inventory)

In the mobile source category, emissions from on-road vehicles are much higher than those from off-road sources for all criteria pollutants except SOx and PM2.5. This can be explained by the fact that the sulfur content in fuels used for off-road vehicles is relatively higher than those for on-road vehicles, and commercial/industrial off-road equipment generates high levels of PM2.5.

FUTURE EMISSIONS

Data Development

The milestone years 2002, 2005, 2008, 2010, 2011, 2014, 2017, 2020, 2023, and 2030 are the target years for emissions rate-of-progress estimates under the federal Clean Air Act and the state Clean Air Act. Future emissions are divided into RECLAIM and non-RECLAIM emissions. Future NOx and SOx emissions from RECLAIM sources are estimated based on their allocations as specified by AQMD Rule 2002 –Allocations for NOx and SOx. The forecasts for non-RECLAIM emissions were derived using: 1) emissions from the 2002 base year; 2) expected controls after implementation of District rules adopted by June 30, 2006, and most CARB rules adopted as of June 2005; and 3) emissions growth in various source categories between the base and future years. AQMD rules adopted after June 30, 2006 are treated as baseline adjustments for emissions reduction accounting purposes, while some CARB rules adopted prior to June 30, 2006 are not yet incorporated into the draft EMFAC2007 Working Draft or the inventories. A detailed description of the forecasting methodology is provided in Appendix III.

Demographic growth forecasts for various socioeconomic categories (e.g., population, housing, employment by industry), developed by SCAG for their interim 2007 RTP, were used in the modified 2004 RTP to estimate future emissions. Industry growth factors for 2002, 2005, 2010, 2015, 2020, 2025, and 2030 were provided by SCAG. Growth factors for other interim years were interpolated between key forecast years. Table 3-2 summarizes key socioeconomic parameters used in the Draft 2007 AQMP for emissions inventory development.

TABLE 3-2
Baseline Demographic Forecasts in the Draft 2007 AQMP

Category	2002	2020	(% Growth)	2030	(% Growth)
Population (Millions)	15.1	18.4	22%	19.6	30%
Housing Units (Millions)	4.8	5.9	23%	6.4	33%
Total Employment (Millions)	6.8	8.2	21%	9.0	32%
Daily VMT (Millions)	349	407	17%	437	25%

Current forecasts indicate that this region will experience a population growth of 22 percent by the year 2020 with a 17 percent increase in vehicle miles traveled (VMT).

As compared to the projection from the 2003 AQMP, the current projection for the year 2020 shows about a 200,000 (1%) increase in population, 300,000 (3.5%) decrease in total employment and 47.7 million mile (10%) decrease in the daily VMT forecast. The decrease in VMT forecast is primarily due to the redistribution of VMT to the eastern portion of the region outside of the SCAB.

Summary of Baseline Emissions

Emission data by source categories (point, area, on-road mobile and off-road mobile sources) and by pollutants are presented in Tables 3-3 through 3-5 for the years 2014, 2020, and 2023. The tables provide annual average, and summer and winter planning inventories.

Without any additional controls, VOC, NOx, and CO emissions are expected to decrease due to existing regulations, such as controls on off-road equipment, new vehicle standards, and the RECLAIM program. Figure 3-3 illustrates the relative contribution to the 2020 inventory by source category. A comparison between Figures 3-2 and 3-3 indicates that the on-road mobile category continues to be a major contributor to CO and NOx emissions. However, due to the adopted regulations, by 2020 on-road mobile accounts for about 25 percent of total VOC emissions compared to 44 percent in 2002. Meanwhile, area sources become the major contributor to VOC emissions from 26 percent in 2002 to 39 percent in 2020. See Figures 3-7 through 3-18 for the top ten ranking by source category for 2002, 2014, and 2020.

TABLE 3-3A

Summary of Emissions By Major Source Category: 2014 Base Year
Average Annual Day (tons/day[1])

Source Category	VOC	NOx	CO	SOx	PM2.5
Stationary Sources					
Fuel Combustion	7	24	51	3	6
Waste Disposal	8	2	1	0	0
Cleaning and Surface Coatings	41	0	0	0	1
Petroleum Production and Marketing	32	0	6	2	1
Industrial Processes	23	0	3	0	6
Solvent Evaporation					
Consumer Products	107	0	0	0	0
Architectural Coatings	24	0	0	0	0
Others	3	0	0	0	0
Misc. Processes*	11	22	68	0	51
RECLAIM Sources	0	27	0	12	0
Total Stationary Sources	**256**	**75**	**129**	**17**	**65**
Mobile Sources					
On-Road Vehicles	196	322	1572	2	15
Off-Road Vehicles	142	271	1071	51	18
Total Mobile Sources	**338**	**593**	**2643**	**53**	**33**
TOTAL	**594**	**668**	**2772**	**70**	**98**

TABLE 3-3B

Summary of Emissions By Major Source Category: 2014 Base Year
Planning Inventory** (tons/day[1])

	SUMMER OZONE PRECURSORS		WINTER INVENTORY	
Source Category	VOC	NOx	NOx	CO
Stationary Sources				
Fuel Combustion	7	25	24	53
Waste Disposal	8	2	2	1
Cleaning and Surface Coatings	45	0	0	0
Petroleum Production and Marketing	33	0	0	6
Industrial Processes	24	1	1	3
Solvent Evaporation				
Consumer Products	107	0	0	0
Architectural Coatings	29	0	0	0
Others	3	0	0	0
Misc. Processes	8	16	29	113
RECLAIM Sources	0	27	27	0
Total Stationary Sources	**264**	**71**	**83**	**176**
Mobile Sources				
On-Road Vehicles	203	315	344	1553
Off-Road Vehicles	177	277	261	890
Total Mobile Sources	**380**	**592**	**605**	**2443**
TOTAL	**644**	**663**	**688**	**2619**

* Travel-related road dust included.
[1] Values are rounded to nearest integer.

**Planning inventories are not used for PM2.5 analysis.

TABLE 3-4A

Summary of Emissions By Major Source Category: 2020 Base Year
Average Annual Day (tons/day[1])

Source Category	VOC	NOx	CO	SOx	PM2.5
Stationary Sources					
Fuel Combustion	7	22	53	3	6
Waste Disposal	8	2	1	1	0
Cleaning and Surface Coatings	44	0	0	0	1
Petroleum Production and Marketing	34	0	6	2	1
Industrial Processes	24	0	3	0	6
Solvent Evaporation					
Consumer Products	112	0	0	0	0
Architectural Coatings	26	0	0	0	0
Others	3	0	0	0	0
Misc. Processes*	11	22	72	0	54
RECLAIM Sources	0	27	0	12	0
Total Stationary Sources	**269**	**73**	**135**	**18**	**68**
Mobile Sources					
On-Road Vehicles	145	212	1042	2	14
Off-Road Vehicles	137	250	1128	65	17
Total Mobile Sources	**282**	**462**	**2170**	**67**	**31**
TOTAL	**551**	**535**	**2305**	**85**	**99**

TABLE 3-4B

Summary of Emissions By Major Source Category: 2020 Base Year
Planning Inventory** (tons/day[1])

	SUMMER OZONE PRECURSORS		WINTER INVENTORY	
Source Category	VOC	NOx	NOx	CO
Stationary Sources				
Fuel Combustion	7	24	23	54
Waste Disposal	8	2	2	1
Cleaning and Surface Coatings	49	0	0	0
Petroleum Production and Marketing	34	0	0	7
Industrial Processes	26	0	0	3
Solvent Evaporation				
Consumer Products	112	0	0	0
Architectural Coatings	31	0	0	0
Others	4	0	0	0
Misc. Processes	8	15	29	120
RECLAIM Sources	0	27	27	0
Total Stationary Sources	**279**	**68**	**81**	**185**
Mobile Sources				
On-Road Vehicles	151	208	226	1028
Off-Road Vehicles	169	255	241	944
Total Mobile Sources	**320**	**463**	**467**	**1972**
TOTAL	**599**	**531**	**548**	**2157**

* Travel-related road dust included.
**Planning inventories are not used for PM2.5 analysis.
[1] Values are rounded to nearest integer.

TABLE 3-5A

Summary of Emissions By Major Source Category: 2023 Base Year
Average Annual Day (tons/day[1])

Source Category	VOC	NOx	CO	SOx	PM2.5
Stationary Sources					
Fuel Combustion	7	22	54	3	6
Waste Disposal	9	2	1	0	0
Cleaning and Surface Coatings	45	0	0	0	1
Petroleum Production and Marketing	35	0	6	2	1
Industrial Processes	25	0	3	0	6
Solvent Evaporation					
Consumer Products	114	0	0	0	0
Architectural	27	0	0	0	0
Others	3	0	0	0	0
Misc. Processes*	11	22	73	1	56
RECLAIM Sources	0	27	0	12	0
Total Stationary Sources	**276**	**73**	**137**	**18**	**70**
Mobile Sources					
On-Road Vehicles	127	181	867	2	14
Off-Road Vehicles	136	254	1143	75	18
Total Mobile Sources	**263**	**435**	**2010**	**77**	**32**
TOTAL	**539**	**508**	**2147**	**95**	**102**

TABLE 3-5B

Summary of Emissions By Major Source Category: 2023 Base Year
Planning Inventory** (tons/day[1])

	SUMMER OZONE PRECURSORS		WINTER INVENTORY	
Source Category	VOC	NOx	NOx	CO
Stationary Sources				
Fuel Combustion	7	24	23	55
Waste Disposal	9	2	2	1
Cleaning and Surface Coatings	50	0	0	0
Petroleum Production and Marketing	35	0	0	7
Industrial Processes	27	0	0	3
Solvent Evaporation				
Consumer Products	114	0	0	0
Architectural	31	0	0	0
Others	4	0	0	0
Misc. Processes	8	15	29	123
RECLAIM Sources	0	27	27	0
Total Stationary Sources	**285**	**68**	**81**	**189**
Mobile Sources				
On-Road Vehicles	134	177	192	855
Off-Road Vehicles	167	259	246	961
Total Mobile Sources	**301**	**436**	**438**	**1816**
TOTAL	**586**	**504**	**519**	**2005**

* Travel-related road dust included.
[1] Values are rounded to nearest integer.

**Planning inventories are not used for PM2.5 analysis.

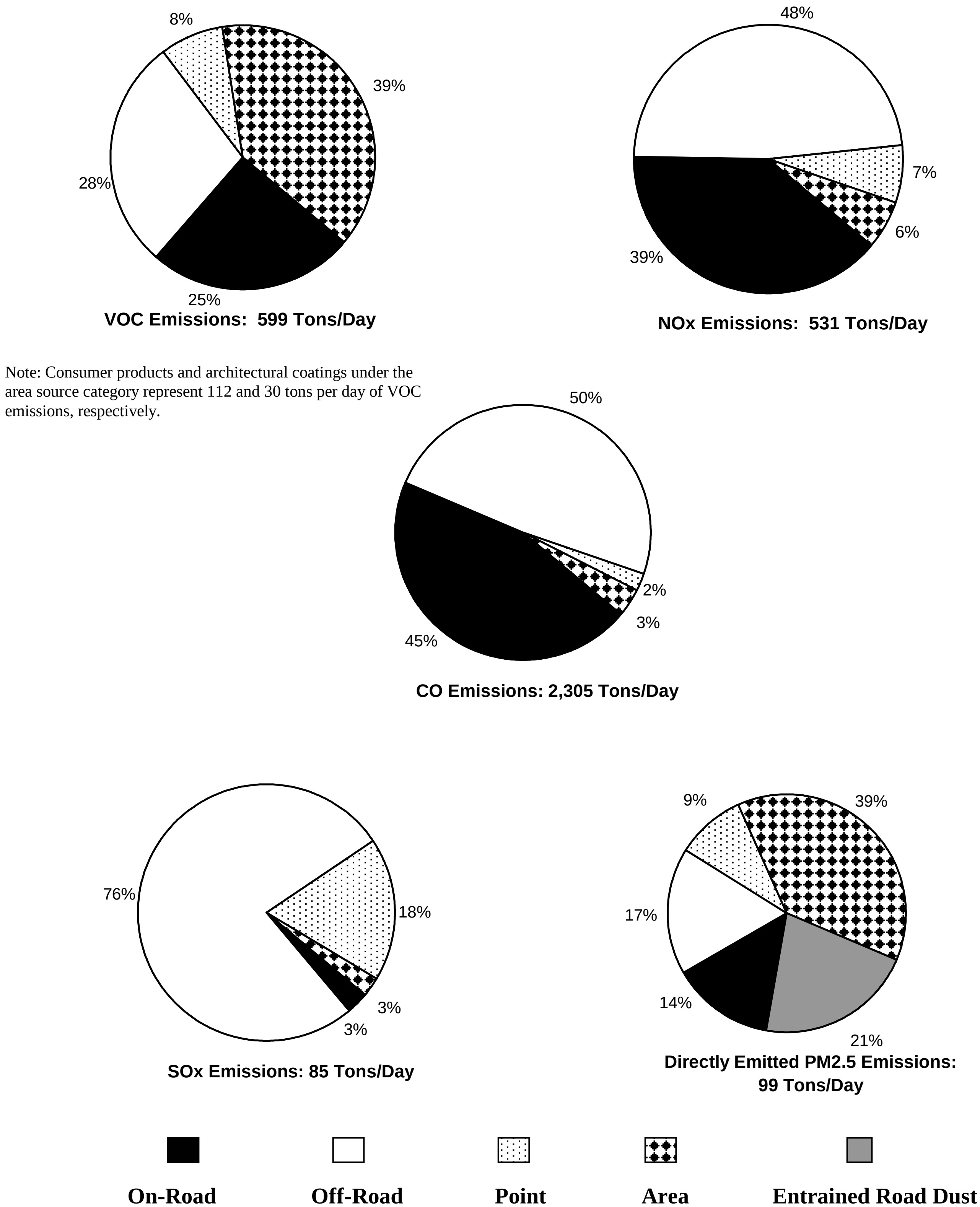


FIGURE 3-3

Relative Contribution by Source Category to 2020 Emission Inventory
(VOC & NOx – Summer Planning; CO, SOx & PM2.5 – Annual Average Inventory)

Impact of Growth

To illustrate the impact of growth, year 2020 no-growth emissions were estimated by removing the growth factors from the 2020 baseline emissions. Figure 3-4 presents the comparison of the 2020 projected emissions with and without growth. It should be noted that in this analysis the benefit of New Source Review is not included. As shown in this figure, projected growth will offset significant progress made in VOC and NOx reductions through adopted regulations. PM2.5 represents directly emitted emissions.

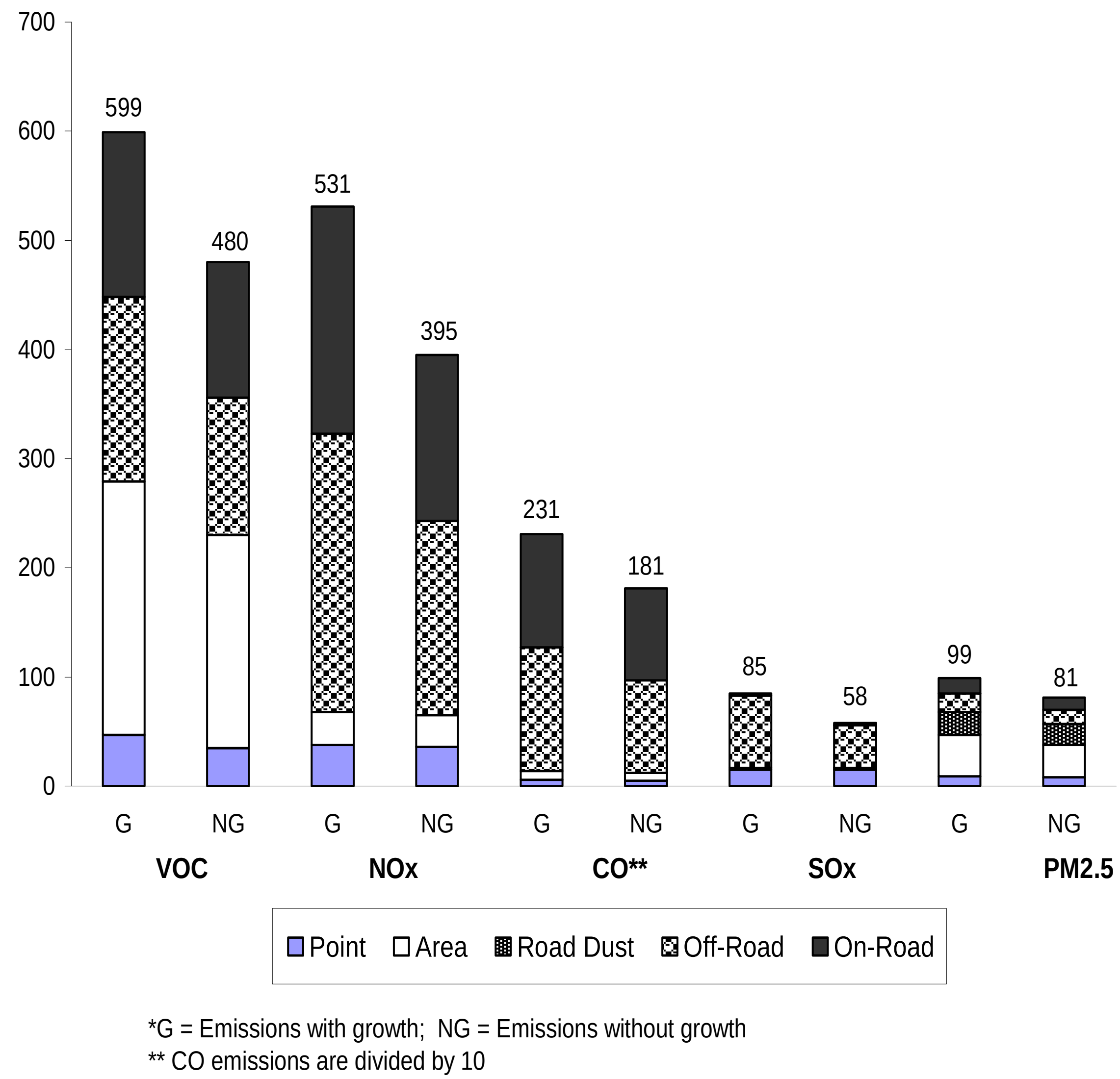


FIGURE 3-4
2020 Emissions Forecast With and Without Growth
(VOC & NOx – Summer Planning; CO, SOx & PM2.5 – Annual Average Inventory)

Locomotive Emissions

To illustrate the impact of growth on future emissions, the following information on locomotive emissions is provided. As part of the emissions inventory development, all regulatory actions affecting future emissions limits are built into the baseline emissions inventory estimates. Relative to locomotive emissions, emission reductions associated with the current federal emissions standards and the state MOU with the two major locomotive operators have been incorporated into the future projected baseline emissions inventory out to 2020. In addition, projected future economic growth has been incorporated into the baseline inventories.

Recently, the U.S. EPA provided preliminary estimates of locomotive emissions of NOx and PM projected out to the year 2040. Figures 3-5 and 3-6 provide the emission projections from the various types of locomotives operating in the future. As older, uncontrolled locomotives (depicted in the figures as Uncontrolled and Tier 0 fleets) are turned over to newer, lower emission locomotives (depicted as Tier 1 and Tier 2 fleets, it is anticipated that the locomotive fleet will be cleaner in the future. However, with the economic growth projected out to 2040, locomotive emissions are projected to decrease at a much slower rate. Eventually, the emissions begin to increase if no further controls are placed on the new locomotives.

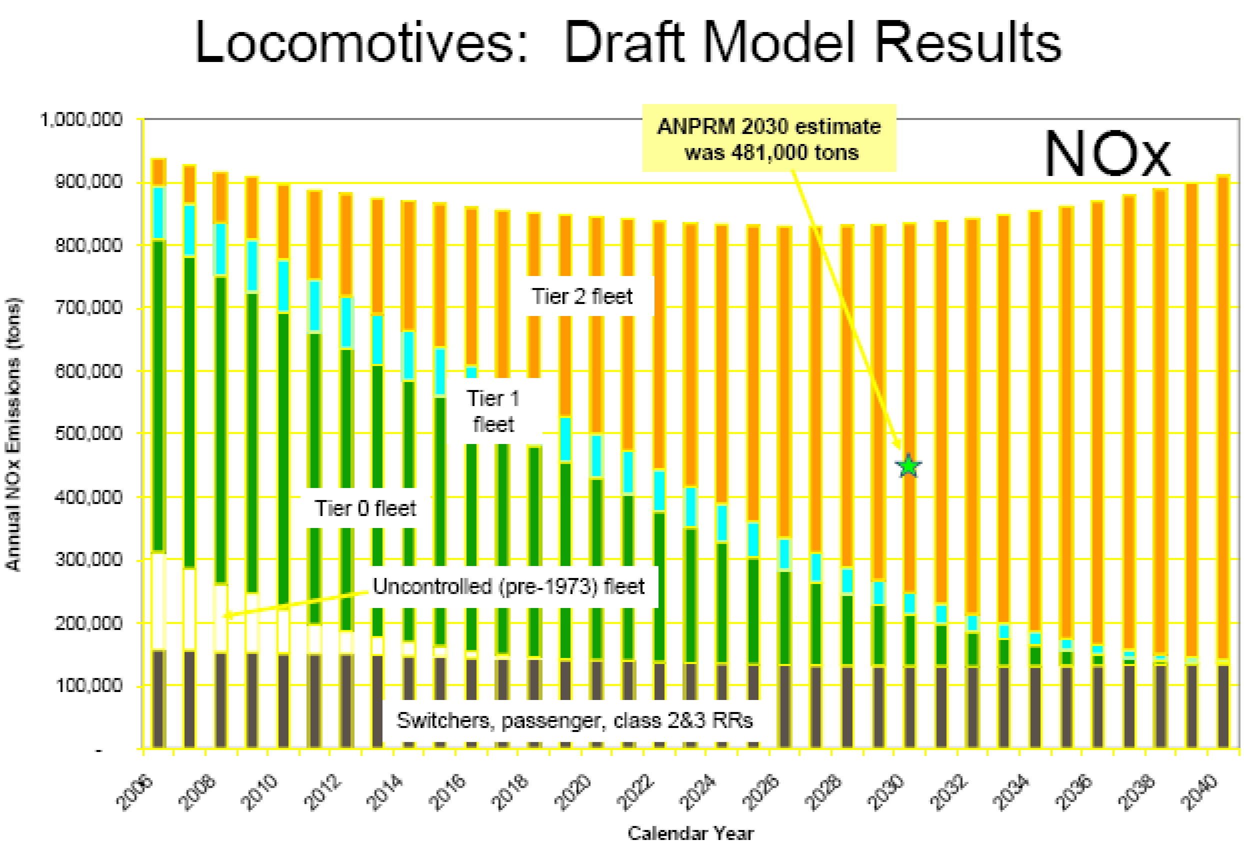
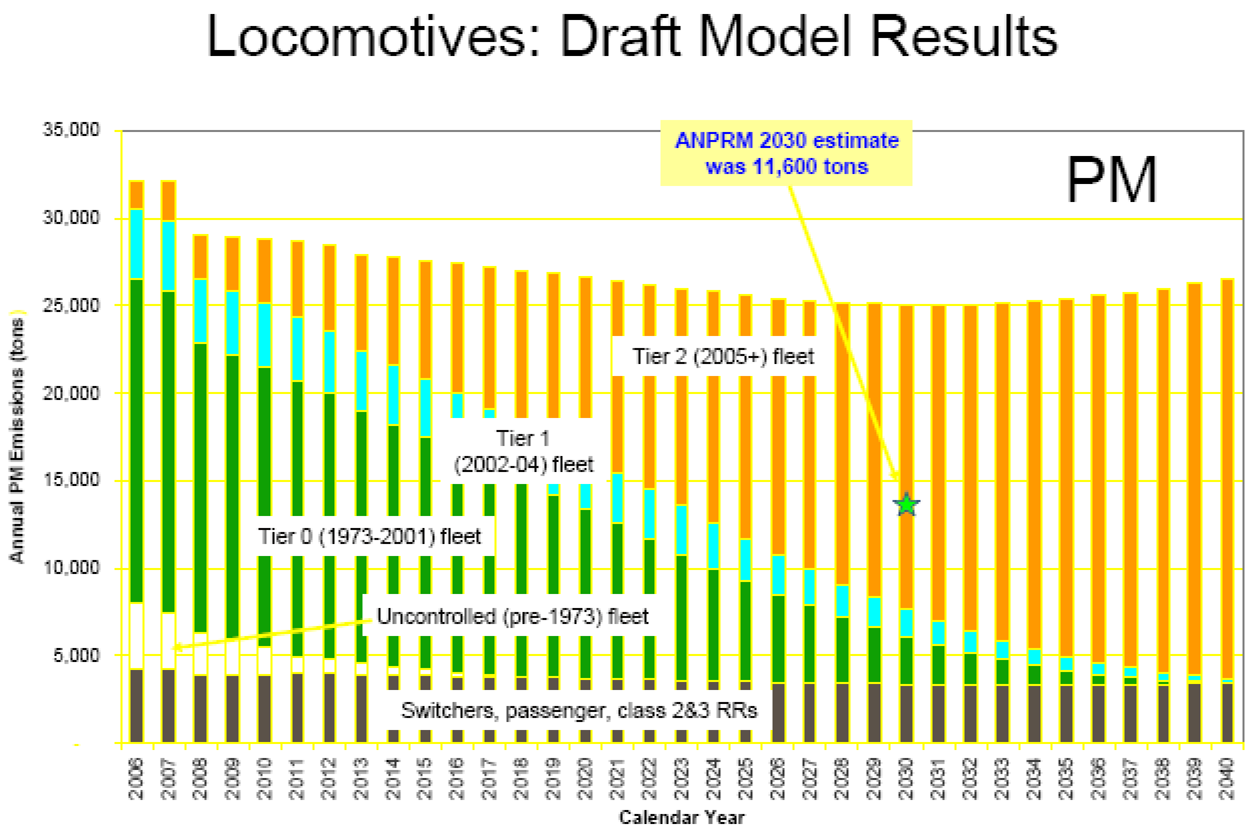


FIGURE 3-5
Projected Nationwide NOx Emissions from Locomotives



Source: U.S. EPA, Presentation at the Second Public Meeting to Discuss Future Locomotive Emissions Control Factors, CARB (July 13, 2006).

FIGURE 3-6

Projected Nationwide Particulate Matter Emissions from Locomotives

The California MOUs with the locomotive industry would seek greater penetration of Tier 2 locomotives to operate in the South Coast Air Basin. As shown in Figures 3-5 and 3-6, the South Coast would show a somewhat greater benefit in having cleaner engines earlier. However, the emissions trend would be similar relative to future growth. As such, the anticipated growth will overtake the benefits of the cleaner Tier 2 locomotives. This AQMP seeks to provide the cleanest technologically feasible locomotives to accelerate emission reductions as early as possible.

TOP TEN SOURCE CATEGORIES (2002, 2014, 2020)

This portion of Chapter 3 provides the ranking of the top 10 contributors to the inventory for the years 2002, 2014, and 2020. The annual average inventory for VOC, NOx, SOx and PM2.5 are shown in the following figures. VOC and NOx inventories are usually presented with a planning inventory, but the ranking would not change between planning and annual average. The categorization can be done several ways. These categories are fairly broad, intended for illustration purposes.

Table 3-6 lists the top 10 categories for each of the three years for VOCs. The top five categories in each year are fairly consistent, although the ranking changes slightly for some categories. Fuel storage – gasoline cans is on the top 10 list only for 2002. Mobile source categories and consumer products are responsible for a large portion of the emissions; the top 10 categories account for 68 percent of the total VOC inventory in 2002.

TABLE 3–6

Top Ten Ranking for VOC Emissions (2002, 2014, 2020), from Highest to Lowest

	2002*	**2014***	**2020***
1	Light-Duty Passenger Cars	Consumer Products	Consumer Products
2	Consumer Products	Light-Duty Passenger Cars	Light-Duty Passenger Cars
3	Light-Duty Trucks	Light-Duty Trucks	Light-Duty Trucks
4	Off-Road Equipment	Off-Road Equipment	Recreational Boats
5	Recreational Boats	Recreational Boats	Off-Road Equipment
6	Architectural Coatings	Petroleum Marketing	Petroleum Marketing
7	Heavy-Duty Gasoline Trucks	Architectural Coatings	Off-Road Recreational
8	Fuel Storage – Gasoline Cans	Off-Road Recreational	Architectural Coatings
9	Medium-Duty Trucks	Heavy-Duty Gasoline Trucks	Coatings & Related Processes
10	Petroleum Marketing	Coatings & Related Processes	Medium-Duty Trucks

* Refer to Figures 3-7 to 3-18 for the annual average emissions totals.

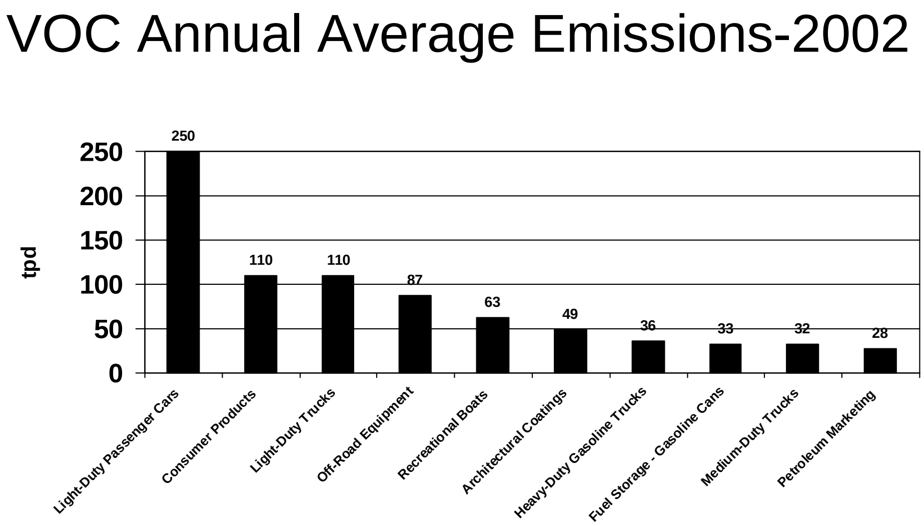


FIGURE 3-7
Top Ten Categories for VOC 2002

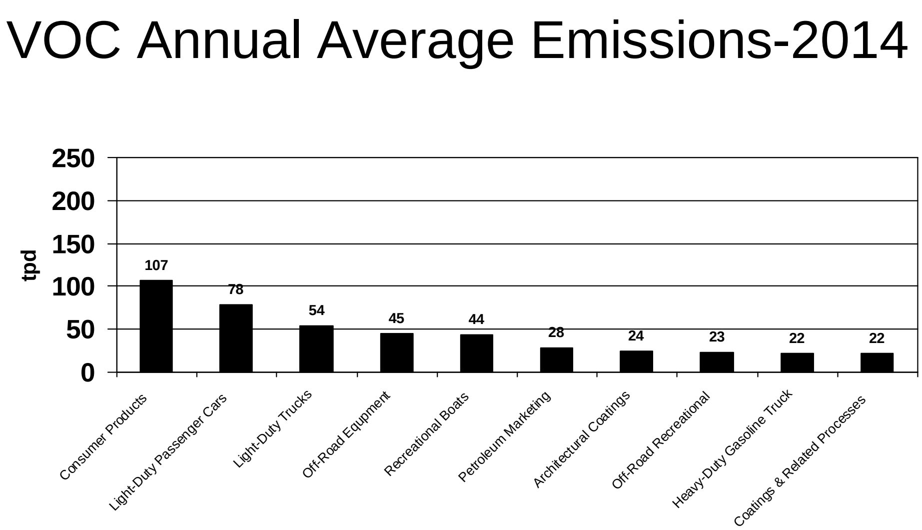


FIGURE 3-8
Top Ten Categories for VOC 2014

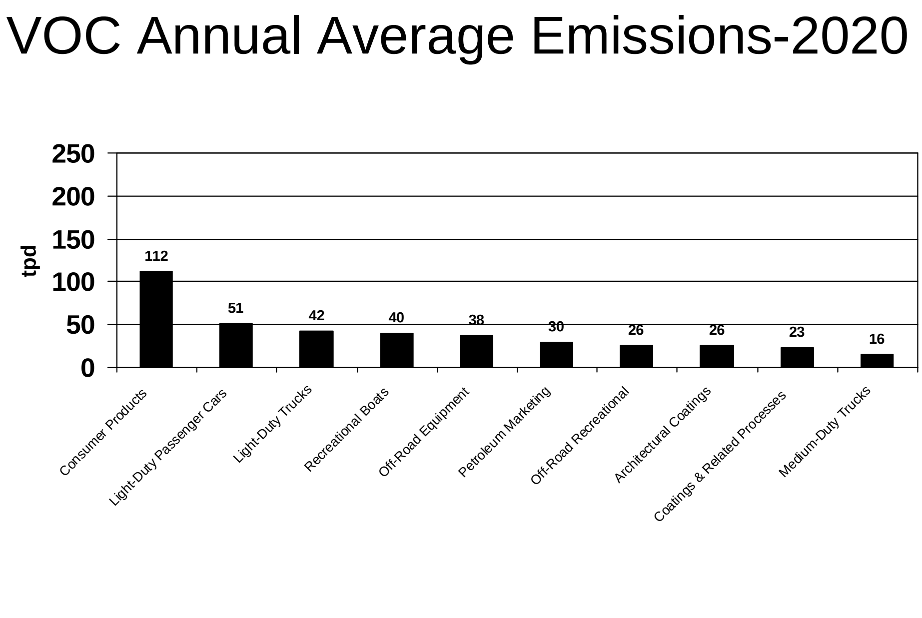


FIGURE 3-9
Top Ten Categories for VOC 2020

Table 3-7 shows the top 10 categories for each of the three years for NOx. As with their predominant contribution to VOC emissions, mobile source categories are the predominant contributor to NOx emissions. For NOx, RECLAIM and residential fuel combustion are the stationary and area source categories that are in the top 10 list. The top 10 categories account for 92 percent of the total NOx inventory in 2002.

TABLE 3-7
Top Ten Ranking for NOx Emissions (2002, 2014, 2020), from Highest to Lowest

	2002*	2014*	2020*
1	Off-Road Equipment	Heavy-Duty Diesel Trucks	Ships & Commercial Boats
2	Heavy-Duty Diesel Trucks	Off-Road Equipment	Heavy-Duty Diesel Trucks
3	Light-Duty Passenger Cars	Ships & Commercial Boats	Off-Road Equipment
4	Light-Duty Trucks	Light-Duty Passenger Cars	Light-Duty Trucks
5	Ships & Commercial Boats	Light-Duty Trucks	Light-Duty Passenger Cars
6	Medium-Duty Trucks	Heavy-Duty Gasoline Trucks	Aircraft
7	Heavy-Duty Gasoline Trucks	RECLAIM	RECLAIM
8	Trains **	Trains **	Trains **
9	RECLAIM	Aircraft	Heavy-Duty Gasoline Trucks
10	Residential Fuel Combustion	Residential Fuel Combustion	Residential Fuel Combustion

* Refer to Figures 3-7 to 3-18 for the annual average emissions totals.
** This assumes that the CARB railroad MOU is fully effective. It is likely that this may not occur because there are broadly worded exemptions in the MOU that could result in less emission reductions. However, if AQMD Rules 3501 - Recordkeeping for Locomotive Idling and 3502 - Minimization of Emissions from Locomotive Idling are implemented, more certainty in achieving emission reductions will occur. In the next several months, AQMD staff will work with CARB staff to quantify additional reductions from Rules 3501 and 3502, for incorporation into emission baselines. AQMD staff intends to submit these rules into the State Implementation Plan (SIP).

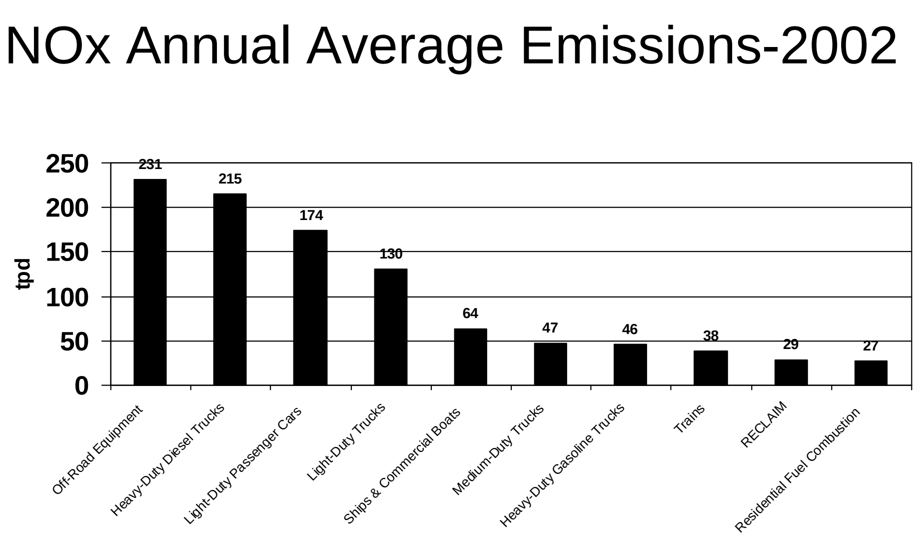


FIGURE 3-10
Top Ten Categories for NOx 2002

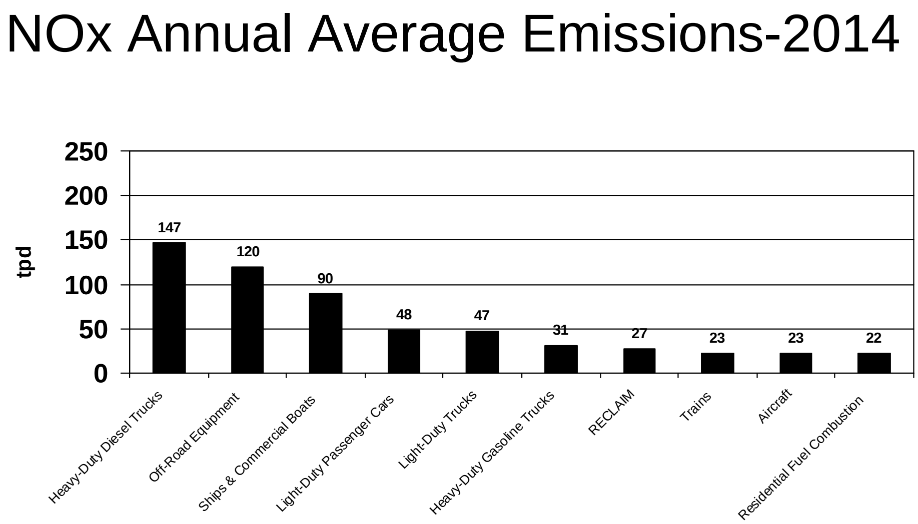


FIGURE 3-11
Top Ten Categories for NOx 2014

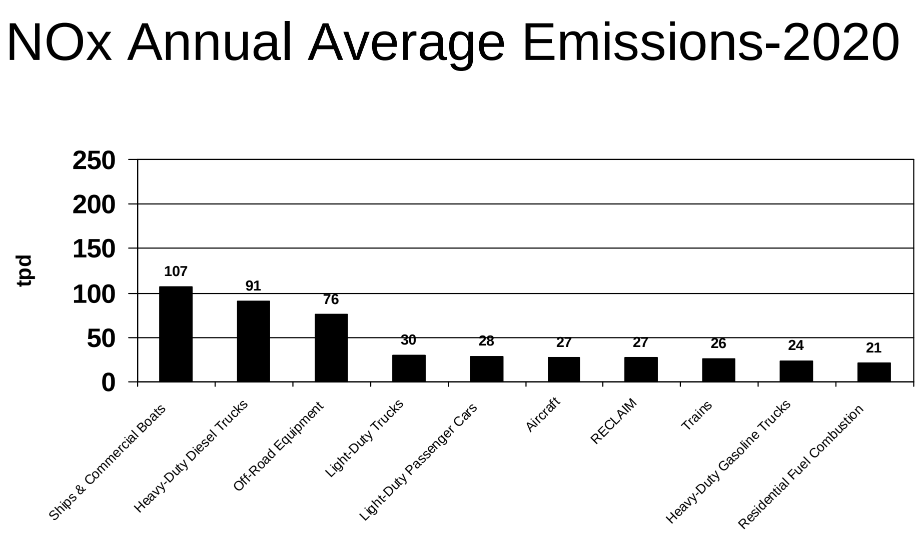


FIGURE 3-12
Top Ten Categories for NOx 2020

Table 3-8 shows the top 10 categories for each of the three years for SOx. Ship emissions are a more significant contributor for SOx than for the other three pollutants in this section. RECLAIM is consistently in the top three by ranking. Ships and commercial boats increase emissions significantly between 2002 and 2020. The top ten categories represent 94 percent of the total SOx inventory in 2002.

TABLE 3-8

Top Ten Ranking for SOx Emissions (2002, 2014, 2020), from Highest to Lowest

	2002*	**2014***	**2020***
1	Ships & Commercial Boats	Ships & Commercial Boats	Ships & Commercial Boats
2	RECLAIM	RECLAIM	RECLAIM
3	Petroleum Refineries (non-RECLAIM)	Aircraft	Aircraft
4	Heavy-Duty Diesel Trucks	Petroleum Refineries (non-RECLAIM)	Petroleum Refineries (non-RECLAIM)
5	Aircraft	Manufacturing & Industry Combustion	Manufacturing & Industry Combustion
6	Light-Duty Passenger Cars	Light-Duty Passenger Cars	Light-Duty Passenger Cars
7	Off-Road Equipment	Service & Commercial Combustion	Light-Duty Trucks
8	Trains **	Light-Duty Trucks	Services & Commercial Combustion
9	Manufacturing & Industry Combustion	Residential Fuel Combustion	Residential Fuel Combustion
10	Light-Duty Trucks	Landfills	Landfills

* Refer to Figures 3-7 to 3-18 for the annual average emissions totals.

** This assumes that the CARB railroad MOU is fully effective. It is likely that this may not occur because there are broadly worded exemptions in the MOU that could result in less emission reductions. However, if AQMD Rules 3501 - Recordkeeping for Locomotive Idling and 3502 - Minimization of Emissions from Locomotive Idling are implemented, more certainty in achieving emission reductions will occur. In the next several months, AQMD staff will work with CARB staff to quantify additional reductions from Rules 3501 and 3502, for incorporation into emission baselines. AQMD staff intends to submit these rules into the State Implementation Plan (SIP).

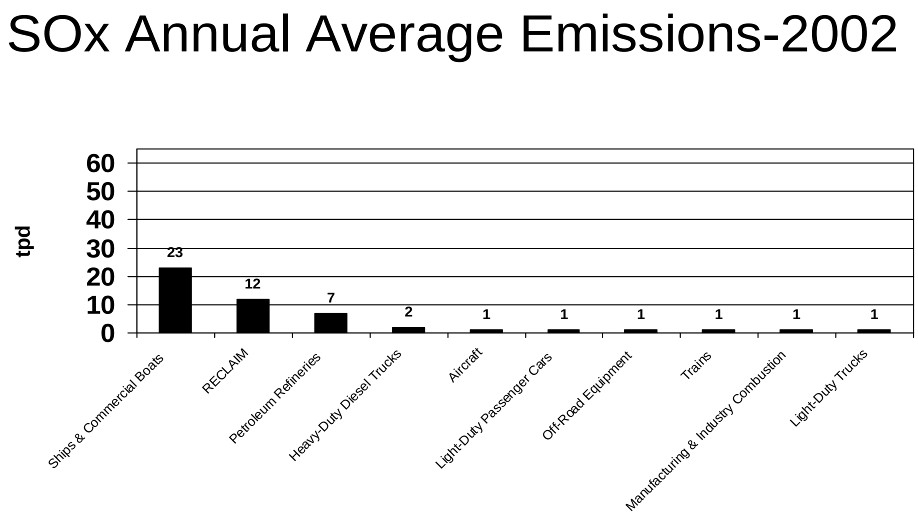


FIGURE 3-13
Top Ten Categories for SOx 2002

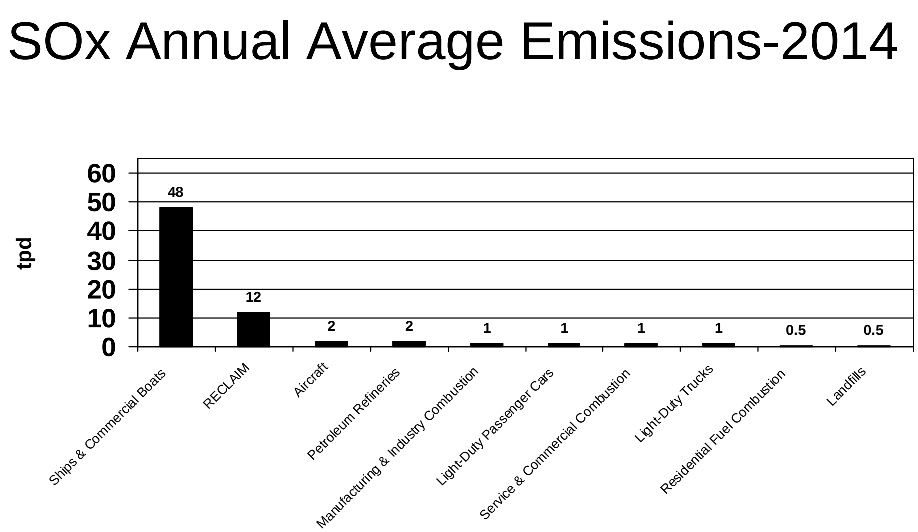


FIGURE 3-14
Top Ten Categories for SOx 2014

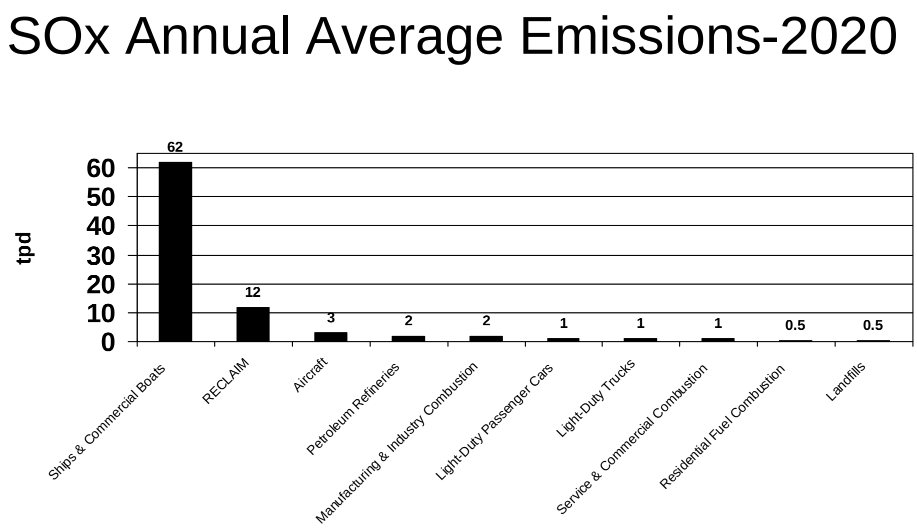


FIGURE 3-15
Top Ten Categories for SOx 2020

Table 3-9 shows the top 10 categories for each of the three years for directly emitted PM2.5. In contrast to the rankings for the other three pollutants in this section of the chapter, paved road dust and cooking are consistently at the top of the ranking for PM2.5 emissions. Each of these categories increases over time. The top ten categories represent 80 percent of the total directly emitted PM2.5 inventory in 2002, however, total directly emitted PM2.5 only accounts for about 25 percent of all ambient PM2.5.

TABLE 3-9
Top Ten Ranking for Directly Emitted PM2.5 Emissions (2002, 2014, 2020), from Highest to Lowest

	2002*	**2014***	**2020***
1	Paved Road Dust	Paved Road Dust	Paved Road Dust
2	Commercial Cooking	Commercial Cooking	Commercial Cooking
3	Off-Road Equipment	Residential Fuel Combustion	Residential Fuel Combustion
4	Heavy-Duty Diesel Trucks	Ships & Commercial Boats	Ships & Commercial Boats
5	Residential Fuel Combustion	Construction & Demolition Dust	Construction & Demolition Dust
6	Ships & Commercial Boats	Heavy-Duty Diesel Trucks	Light-Duty Passenger Cars
7	Recreational Boats	Light-Duty Passenger Cars	Light-Duty Trucks
8	Light-Duty Passenger Cars	Light-Duty Trucks	Off-Road Equipment
9	Construction & Demolition Dust	Wood & Paper	Wood & Paper
10	Light-Duty Trucks	Recreational Boats	Heavy-Duty Diesel Trucks

* Refer to Figures 3-7 through 3-18 for the annual average emissions totals.

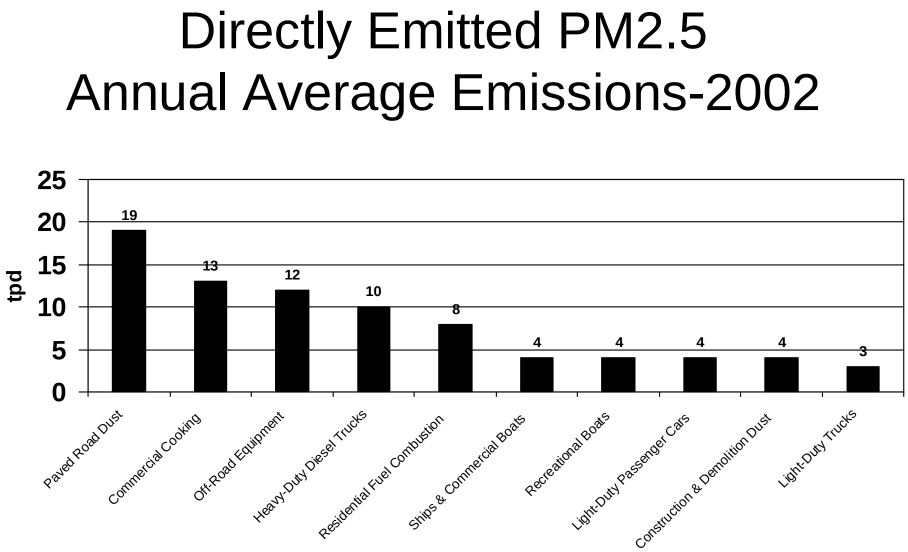


FIGURE 3-16
Top Ten Categories for PM2.5 2002

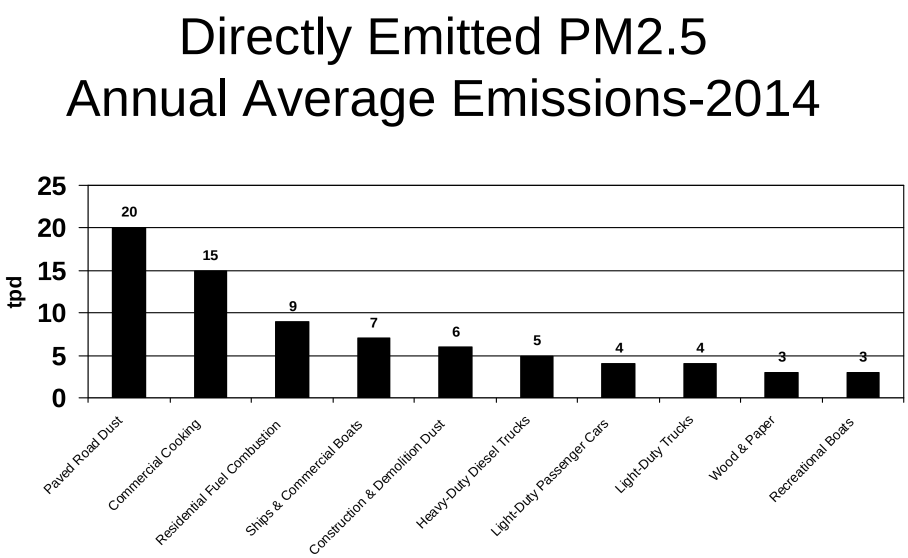


FIGURE 3-17
Top Ten Categories for PM2.5 2014

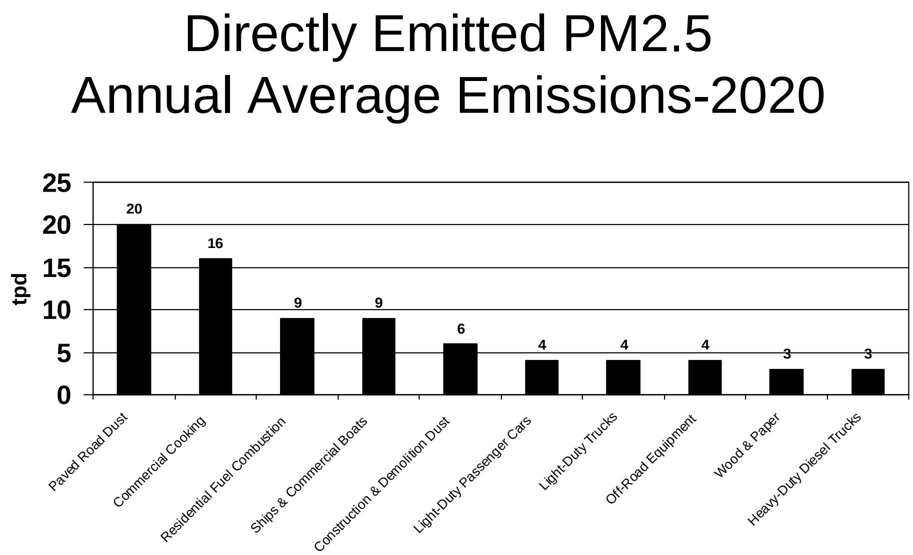


FIGURE 3-18
Top Ten Categories for PM2.5 2020

CHAPTER 4

AQMP CONTROL STRATEGY

Introduction

Overall Attainment Strategy

District Stationary and Mobile Source Control Measures

SCAG's Regional Transportation Strategy and Control Measures

State and Federal Short-Term and Mid-Term Control Measures

District Staff's Recommended State and Federal Stationary and Mobile Source Control Measures

Long-Term Control Strategy

Overall Emission Reductions

INTRODUCTION

The overall control strategy in the AQMP provides a path to achieving emission reductions and air quality goals. Implementation of the 2007 AQMP will be based on a series of control measures and strategies that vary by source type (i.e., stationary or mobile) as well as by the pollutant that is being targeted. Although great strides have been made in air pollution control technologies and emission reduction programs, air quality goals cannot be achieved without significant further emission reductions.

This chapter presents the control measures for the Draft 2007 AQMP and associated emission reductions where currently quantifiable. For additional information and details on control measures, please refer to Appendix IV-A: District's Stationary and Mobile Source Control Measures; Appendix IV-B: District Staff's Recommended State and Federal Stationary and Mobile Source Control Measures; and Appendix IV-C: Regional Transportation Strategy and Control Measures. For additional information regarding baseline emission projections and air quality modeling, please refer to Appendix III and Chapter V, respectively.

OVERALL ATTAINMENT STRATEGY

The overall control strategy for this draft Plan is designed to meet applicable federal and state requirements, including attainment of ambient air quality standards. The focus of the Plan is to demonstrate attainment of the federal PM2.5 ambient air quality standard by 2015 and the federal 8-hour ozone standard by 2021 while making expeditious progress toward attainment of state standards. The proposed strategy, however, does not attain the previous federal 1-hour ozone standard by 2010 as previously required prior to the recent change in federal regulations.

As demonstrated herein, a "bump-up" request will likely be made to the U.S. EPA to be designated as an "extreme" non-attainment area with a possible extended attainment date of 2024 for ozone. The Draft 2007 AQMP relies upon the most recent planning assumptions and the best available information such as CARB's latest EMFAC working draft for the on-road mobile source emissions inventory, CARB's off-road model for the off-road mobile source emission inventory, latest point source and improved area source inventories as well as the use of new episodes and air quality modeling analysis, and SCAG's forecast assumptions based on its modified 2004 Regional Transportation Plan.

The proposed control measures in the Draft 2007 AQMP are based on implementation of all feasible control measures through the application of available technologies and management practices as well as development and implementation of advanced technologies and control methods. These measures rely on proposed actions to be taken by several agencies that currently have the statutory authority to implement such measures. Similar to the 2003 AQMP approach, the SIP commitment is to bring each control measure for regulatory consideration in a specified time frame. Each agency is also committed to achieve a total emission reduction target with the ability to substitute for control measures deemed infeasible, so long as equivalent reductions are met by other means. These measures are also designed to satisfy the federal Clean Air Act requirement of reasonably available control technologies [Section 172(c)], and the California Clean Air Act requirement of Best Available Retrofit Control Technologies (BARCT) [Health and Safety Code Section 40919, Subsection C].

To ultimately achieve the PM2.5 and 8-hour ozone ambient air quality standards and demonstrate attainment, significant additional short- and mid-term as well as long-term emissions reductions will be necessary from sources including those primarily under the jurisdiction of CARB (e.g., on-road motor vehicles, off-road equipment, and consumer products) and U.S. EPA (e.g., aircraft, ships, trains, and pre-empted off-road equipment). Without an adequate and fair-share level of reductions from all sources, the emissions reduction burden would unfairly be shifted to sources that have already been doing their part for clean air. Moreover, the District will continue to use its available regulatory authority to further control mobile source emissions where federal or State action does not meet regional needs.

Designing the Overall Strategy

To develop the Draft Plan's required control strategy for meeting state and federal requirements, an iterative process of technology/strategy review and ambient air quality modeling is utilized. Specifically, a remaining emissions target is initially defined utilizing air quality modeling that will achieve the ambient air quality standards based on reductions from all sources. Control measures based on technological advancements are then evaluated to determine their effectiveness in meeting this remaining emissions target. Further modeling analyses are conducted using the actual emissions reductions achieved based on the technology forecast. Ultimately an overall emissions target (i.e., carrying capacity) is determined that achieves the ambient air quality standards and for which controls have been proposed.

Figure 4-1 illustrates this iterative process used to define the proposed control strategy.

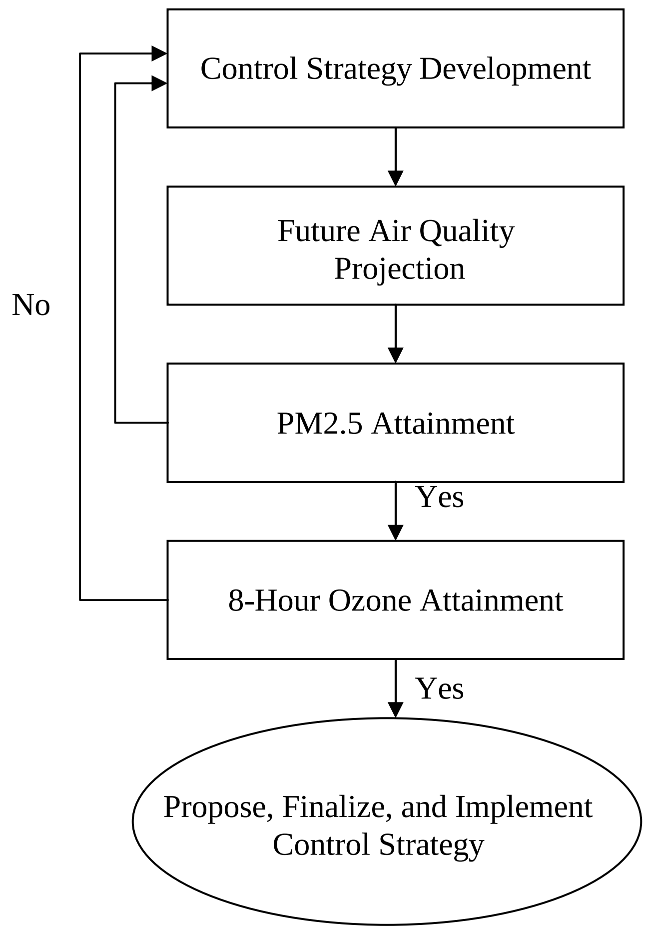


FIGURE 4-1

Iterative Process to Define Emission Reduction Scenario

The Draft 2007 AQMP relies on a comprehensive and integrated control approach aimed at achieving the PM2.5 standard by 2015 through implementation of short-term and mid-term control measures and achieving the 8-hour ozone standard by 2021/2024 based on implementation of additional long-term measures. The PM2.5 control strategy is designed to provide expeditious progress toward the 8-hour ozone attainment in conjunction with additional long-term reduction needed for full attainment. The District's air quality modeling analysis and carrying capacity determination outlined in Chapter 5 and later in Appendix V provide the basis for designing the attainment strategies. Ammonium nitrates and ammonium sulfates represent a dominant fraction of PM2.5 components and are formed in the atmosphere through secondary reactions of precursor emissions of NOx, SOx, and ammonia. Based on the District's modeling sensitivity analysis, SOx reductions, followed by directly-emitted PM2.5 and NOx reductions, provide the greatest benefits in terms of reducing the ambient PM2.5 concentrations. Carbonaceous aerosols such as VOC contribute, to a lesser extent, to improvements in ambient PM2.5 air quality, yet are critical to the 8-hour ozone control strategy.

Therefore, the PM2.5 attainment strategy is primarily focused on SOx, directly-emitted PM2.5, and NOx reductions supplemented with additional VOC reductions which can be feasibly achieved by 2014 (the year in which full reductions have to be realized for demonstrating attainment in 2015). SOx and NOx emissions are both products of fuel combustion. Reducing the fuel sulfur content has proven to be one of the most effective strategies for achieving significant SOx reductions and has already been adopted for stationary sources, on-road mobile sources, and the majority of off-road mobile sources except for ocean-going vessels. Therefore, clean fuel strategies based on the use of low-sulfur marine fuel in this single source category will result in significant PM2.5 air quality improvements. In addition, NOx reductions are viable because technologies for implementing NOx control strategies (e.g., add-on control devices, alternative fuels, fleet modernization, repowers, retrofits) are commercially available and are continually undergoing further development. NOx reductions are also needed to attain the 8-hour ozone standard.

The PM2.5 strategy also builds upon on-going diesel toxic reduction programs which not only reduce the toxic impact of diesel emissions but also contribute to PM2.5 air quality benefits. The Draft AQMP incorporates the emissions benefit associated with these adopted programs as well as the PM2.5 reductions from the short-term and mid-term control measures. VOC emissions also contribute to the formation of secondary particulates (including organic carbon) and enhance ammonium nitrate production. While VOC reductions are less critical to overall reductions in PM2.5 air quality (compared with equivalent SOx, directly-emitted PM2.5, and NOx reductions), they are heavily relied upon for meeting the 8-hour ozone standard. Adequate VOC controls need to be in place in time for achieving significant VOC reductions needed for the 8-hour ozone standard by 2021/2024. Reducing VOC emissions in early years would also ensure continued progress in reducing the ambient ozone concentrations. The 8-hour ozone control strategy relies on the implementation of the PM2.5 control strategy augmented with additional long-term VOC and NOx reductions for meeting the standard by 2020 timeframe.

Based on the District's modeling analysis, the estimated reduction targets for PM2.5 attainment are approximately 239 tons per day (t/d) of NOx, 49 t/d of SOx, 14 t/d of PM2.5, and 142 t/d of VOC emissions in 2014, while the reduction targets for the 8-hour ozone attainment are estimated at 300 t/d of VOC and 286 t/d of NOx from the projected inventories in 2020. The PM2.5 attainment strategy is based on the implementation of short-term and mid-term control measures by the District, CARB, U.S. EPA and SCAG. These measures have defined control methods and specific SIP reduction commitments with adoption dates in the 2007-2010 timeframe with implementation dates from 2008 to 2020. Long-term measures are relied upon for the 8-hour ozone strategy, referring to measures which are based on further development and improvement of known low- and zero-emission control technologies in addition to new technological advancements. Long-term measures have adoption dates in the 2011-2015 timeframe and implementation dates in the 2015 to 2020/2023 timeframe.

The sheer magnitude of emission reductions needed for the attainment of the federal PM2.5 and 8-hour ozone standards poses a tremendous challenge to the South Coast Basin. Without an aggressive control strategy and close collaboration of efforts among the federal, state, and regional governments, local agencies, businesses, and the public, the attainment of these standards will not be likely. This chapter outlines the overall proposed control strategy and specific control measures required for achieving these air quality goals in the Basin.

Draft 2007 AQMP Control Measures

The Draft 2007 AQMP control measures consist of three components: 1) the District's Stationary and Mobile Source Control Measures; 2) State and Federal Control Measures recommended by District staff; and 3) Regional Transportation Strategy and Control Measures provided by SCAG. Overall, the Plan includes 29 stationary and 29 mobile source measures which are defined at this time. A summary of these measures is provided below. A detailed description of each component's control measures is provided in the following appendices:

Appendix IV-A:	District's Stationary and Mobile Source Control Measures
Appendix IV-B:	District Staff's Recommended State and Federal Stationary and Mobile Source Control Measures
Appendix IV-C:	Regional Transportation Strategy and Control Measures

These measures primarily rely on the traditional command-and-control approach, facilitated by market incentive programs, as well as advanced technologies expected to be implemented by 2015 (for PM2.5) and 2021/2024 (for 8-hour ozone).

DISTRICT'S STATIONARY AND MOBILE SOURCE SHORT- AND MID-TERM CONTROL MEASURES

Since the adoption of the 2003 AQMP, the District has made significant strides in achieving further emission reductions from stationary sources. Table 1-2 of Chapter 1 provides a listing of rules adopted by the District since adoption of the 2003 AQMP as well as the SIP commitment and the emission reductions achieved for each rule.

For the draft 2007 AQMP control measure development, District staff conducted an AQMP Summit in June 2006 to solicit new control concepts and innovative ideas. Internal and external brainstorming sessions were also conducted for identifying additional control measures and assessing control feasibility. The stationary source control measures presented in the Draft 2007 AQMP are proposed to further reduce emissions from both point sources (permitted facilities) and area sources (generally small and non-permitted). The basic principles followed in developing the District's stationary source control measures included: 1) identify SOx and NOx reduction opportunities and maximize reductions by 2014, and 2) initiate programs or rule making activities for VOC control strategies aiming at maximum reductions by 2020. Therefore, the proposed control strategy for stationary sources under the District's jurisdiction include remaining revised and partially implemented measures from the 2003 AQMP and new measures that are deemed feasible to provide additional control opportunity. In addition, to foster further technology advancement, long-term measures are also included aimed at achieving additional reductions from stationary sources based on implementation and accelerated penetration of advanced technologies. For each control measure, the District will seek to achieve the maximum reduction potential if deemed technically feasible and cost-effective.

Furthermore, in light of significant reductions needed for PM2.5 and ozone attainment demonstrations, the District will expand its regulatory programs to mobile sources where the District has existing legal authority, and is evaluating the possibility of additional limited authority for cost-effective local controls. The District is also considering other innovative ideas to mitigate the impact of emissions growth. For example, the District is proposing a back-stop measure to ensure that port-related programs achieve their intended reductions, and a control measure with various approaches for reducing emissions from new and redevelopment residential, industrial and commercial projects.

The District's control strategy for stationary and mobile sources is also 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. Table 4-1 provides a listing of District's proposed control measures under each of the seven Draft Plan control approaches.

Table 4-1
District's Proposed Control Approaches and Measures

Facility Modernization	
Number	**Title**
MCS-01	Facility Modernization [All Pollutants]
Energy Efficiency/Conservation	
Number	**Title**
MCS-02	Urban Heat Island [All Pollutants]
MCS-03	Energy Efficiency and Conservation [All Pollutants]
Good Management Practices	
Number	**Title**
FUG-01	Improved Leak Detection and Repair [VOC]
FUG-02	Emission Reductions from Gasoline Transfer and Dispensing Facilities [VOC]
FUG-04	Emission Reductions from Pipeline and Storage Tank Degassing [VOC]
BCM-01	PM Control Devices (Bag Leak Detectors/Wet Scrubbers/Electrostatic Precipitators, Other Devices) [PM]
MCS-04	Emissions Reduction from Green Waste Composting [VOC, PM and NH_3]
MCS-06	Improved Start-up, Shut-down & Turnaround Procedures [All Pollutants]
Market Incentives/Compliance Flexibility	
Number	**Title**
CTS-02	Clean Coating Certification Program [VOC]
CMB-02	Reduction of Emissions in RECLAIM (BARCT) [SOx]
FLX-01	Economic Incentive Programs [All Pollutants]
FLX-02	Petroleum Refinery Pilot Program [VOC and NOx]
Area Source Programs	
CTS-01	Industrial Lubricants [VOC]
CTS-03	Consumer Products Labeling and Emission Reductions from Use of Consumer Products at Institutional and Commercial Facilities [VOC]
FUG-03	Cutback Asphalt [VOC]
CMB-01	NOx Reduction from Non-RECLAIM Ovens, Dryers and Furnaces [NOx]
CMB-03	Further NOx Reductions from Space Heaters [NOx])
CMB-04	Natural Gas Fuel Specifications [NOx]
BCM-02	PM Emission Hot Spots – Localized Control Program [PM]

BCM-03	Emission Reductions from Wood Burning Fireplaces and Wood Stoves [PM]
BCM-04	Additional PM Emission Reductions from Rule 444 – Open Burning [PM]
BCM-05	Emission Reductions from Under-Fired Charbroilers [PM]
MCS-05	Emission Reductions from Non-Dairy Livestock Waste [VOC, PM and NH_3]
MCS-07	Application of All Feasible Control Measures [All Pollutants]
Emission Growth Management	
Number	**Title**
EGM-01	Emission Reductions from New or Redevelopment Projects [All Pollutants]
EGM-02	Emission Budget and Mitigation for General Conformity Projects [All Pollutants]
EGM-03	Emissions Mitigation at Clean Air Act Permit Sites [All Pollutants]
Mobile Source Programs	
Number	**Title**
MOB-01	Mitigation Fee for Federal Sources [All Pollutants]
MOB-02	Expanded Exchange Program [All Pollutants]
MOB-03	Backstop Measures for Indirect Sources of Emissions from Ports and Port-Related Facilities [All Pollutants]
MOB-04	Emissions Reduction from Carl Moyer Program

The Draft AQMP includes 28 short-term and mid-term stationary and 4 mobile source control measures proposed for District implementation. In order to demonstrate attainment by 2015 for PM2.5 and 2021/2024 for ozone, emission reductions needed for attainment must be in place by 2014 and 2020/2023. Table 4-2A provides a listing of the District's short-term and mid-term control measures in the Draft 2007 AQMP for which the emission reductions are quantified. These measures are estimated to achieve a total of 7.7 tons per day of NOx, 3 tons per day of SOx, 7.2 tons per day of VOC, and 1.4 tons per day of PM2.5 emission reductions by 2014 and have proposed rule adoption schedules between 2007 and 2010 with implementation dates between 2008 and 2020. The 2020 reductions from these measures are estimated to be 18 tons per day of VOC, 14.2 tons per day of NOx, 3 tons per day of SOx, and 3.2 tons per day of PM2.5 reductions. Tables 4-2B presents the District's remaining control measures in the Draft 2007 AQMP which are either not quantified at this time due to data limitations or do not result in direct emission benefits (e.g., Urban Heat Island). In the next two months, District staff will continue its technical analysis to better quantify the estimated emission reductions.

Appendix IV-A provides detailed descriptions for the District's stationary and mobile source control measures. Overall, eight control measures originally contained in the

2003 AQMP have been updated or revised for inclusion into the Draft 2007 AQMP. In addition, twenty four new measures are incorporated into the Draft 2007 AQMP based on replacement of the District's long-term reduction measures from the 2003 AQMP with more defined control measures or development of new control measures.

TABLE 4-2A

District's Short-Term and Mid-Term Stationary Control Measures with Quantified Emission Reduction Estimates

Control Measure #	Title		Reduction Target[1] (tons/day)
Remaining 2003 AQMP Revision Control Measures			
FUG-02	Emission Reductions from Gasoline Transfer and Dispensing Facilities [VOC]		3.7/3.9
BCM-03	Emission Reductions from Wood-Burning Fireplaces and Wood Stoves [PM2.5]		0.7/0.7
New Control Measures			
CTS-01	Industrial Lubricants [VOC]		1.5/1.6
CMB-01	NOx Reduction from Non-RECLAIM Ovens, Dryers and Furnaces [NOx]		3.7/4.0
CMB-02	Reduction of Emissions in RECLAIM [SOx]		3.0/3.0
CMB-03	Further NOx Reductions from Space Heaters [NOx]		1.0/3.2
MCS-01	Facility Modernization	[VOC]	2.0/12.0
		[NOx]	3.0/6.0
		[PM2.5]	0.7/2.0
EGM-01	Emission Reductions from New and Redevelopment Projects	[NOx]	0.0/1.0
		[VOC]	0.0/0.5
		[PM2.5]	0.0/0.5
MOB-04	Emission Reductions from Carl Moyer Program[2]	[NOx]	10.1/13.4
		[PM2.5]	0.3/0.4
	Total	**VOC**	**7.2/18.0**
		NOx	**7.7/14.2**
		SOx	**3.0/3.0**
		PM2.5	**1.4/3.2**

[1] The emission reduction estimates are based on the 2014 annual average inventory and 2020 planning inventory in the Draft 2007 AQMP. The actual reductions are subject to change during the rulemaking based on the latest available emission inventory data.

[2] Emission reductions from Carl Moyer Program are reflected in the baseline adjustments and District staff's recommended control measures and are not included in total reductions in this table.

TABLE 4-2B

District's Short-Term and Mid-Term Stationary and Mobile Source Control Measures Without Emission Reduction Estimates

Control Measure #	Title
Remaining 2003 AQMP Revision Control Measures	
BCM-05	Emission Reductions from Under-Fired Charbroilers [PM]
MCS-02	Urban Heat Island [All Pollutants]
CMB-04	Natural Gas Fuel Specifications [NOx]
MCS-04	Emissions Reduction from Green Waste Composting [VOC, PM, NH3]
FLX-01	Economic Incentive Programs [All Pollutants]
MOB-01	Mitigation Fee for Federal Sources [All Pollutants]
New Control Measures	
CTS-02	Clean Coating Certification Program [VOC]
CTS-03	Consumer Products Labeling and Emission Reductions from Use of Consumer Products at Institutional and Commercial Facilities [VOC]
FUG-01	Improved Leak Detection and Repair [VOC]
FUG-03	Emission Reductions from Cutback Asphalt [VOC]
FUG-04	Emission Reductions from Pipeline and Storage Tank Degassing [VOC]
BCM-01	PM Control Devices [PM]
BCM-02	PM Emission Hot Spots – Localized Control Program [PM]
BCM-04	Additional PM Emission Reductions from Rule 444 - Open Burning [PM]
FLX-02	Petroleum Refinery Pilot Program [VOC, NOx]
MCS-03	Energy Efficiency and Conservation [NOx]
MCS-05	Emission Reductions from Non-Dairy Livestock Waste [VOC, PM, NH3]
MCS-06	Improved Start-up, Shut-down & Turnaround Procedures [All Pollutants]
MCS-07	Application of All Feasible Control Measures [All Pollutants]
EGM-02	Emission Budgets and Mitigation for General Conformity Projects [All Pollutants]
EGM-03	Emissions Mitigation at Clean Air Act Permit Sites [All Pollutants]
MOB-02	Expanded Exchange Program [All Pollutants]
MOB-03	Backstop Measures for Indirect Sources of Emissions from Ports and Port-Related Facilities [All Pollutants]

Stationary Source Control Methods and Associated Emission Reductions

Stationary source control measures rely on a variety of control technologies and management practices, as identified in Table 4-3. Control technologies vary according to the source type and pollutant being controlled and generally include a process or physical modification such as product reformulation, installation of air pollution control equipment, etc. In addition, management practices include administrative changes such as improved leak detection techniques, inspection and maintenance programs, etc.

TABLE 4-3
Stationary Source Control Methods

Source Category	Control Method
Coatings and Solvents	• Reformulation • Higher Transfer Efficiency • Process Improvements • Add-On Controls • Alternative Coating and Solvent Application Methods • Market Incentives • Improved Housekeeping Practices
Petroleum Operations and Fugitive VOC Emissions	• Process Modifications • Add-On Controls Systems • Market Incentives • Enhanced Inspection and Maintenance • Improved Vapor Recovery Systems • Good Management Practices
Combustion Sources	• Add-On Controls • Market Incentives • Process Improvement • Improved Energy Efficiency
Fugitive Dust Sources	• Road Dust Suppression • Watering or Revegetation of Disturbed Surface Areas • Chemical Stabilization of Unpaved Areas • Track-Out Prevention • Reduced Vehicular Speeds on Unpaved Roads • Add-On Controls

TABLE 4-3 (continued)
Stationary Source Control Methods

Source Category	Control Method
Multiple Component Sources	• Process Modifications and Improvements • Add-On Controls • Best Management Practices • Best Available Control Technology • Market Incentives • Energy Efficiency and Conservation
Compliance Flexibility Programs	• Compliance Flexibility to Lower Costs • Promotion of Early Reductions • Incentivize Clean Technologies • Investment in Clean Technologies
Emission Growth Management	• Emission Increase Mitigations • Mitigation Fees

The following text describes a brief description of the District's short-term and mid-term measures for the eight groups of control measures: Group 1 – Coatings and Solvents; Group 2 – Petroleum Operations and Fugitive VOC Emissions; Group 3 – Combustion Sources; Group 4 – PM Sources; Group 5 – Multiple Component Sources; Group 6 – Compliance Flexibility Programs; Group 7 – Emission Growth Management; and Group 8 - District's Mobile Source Control Measures.

Coatings and Solvents

The category of coatings and solvents is primarily targeted at reducing VOC emissions from these VOC-containing products. This category includes three proposed control measures that are based on additional emission reductions from lubricants, products used at institutions, and a Clean Coating Certification program.

CTS-01 - INDUSTRIAL LUBRICANTS: This control measure would seek to reduce VOC emissions from industrial lubricants, a category under solvent operations, over a defined implementation period. Lubricants are used by various companies in the South Coast Basin including, but not limited to, machine shops, auto rebuilders, and auto parts manufacturers. Lubricants are believed to emit a significant amount of VOCs, as many lubricant compounds consist of at least 50 percent VOC solvents. It is important to note that there are low-emitting alternatives to petroleum-based lubricants available, including synthetics, semi-synthetics, and vegetable oils. Thus, the reduction requirements may apply to the end user, but may also be imposed at the point of sale.

CTS-02 - CLEAN COATING CERTIFICATION PROGRAM: VOC content in various industrial coatings has been regulated for many years. Many compliant products are significantly lower than the current rule limits. This measure is designed to encourage and to recognize supercompliant products. This proposed control measure would seek to implement an ultra-low VOC content certification program for coatings similar to the certification program for the ultra-low VOC solvents under Rule 1171 or Rule 1122. The District's certification can be an effective marketing tool that it would encourage manufacturers to voluntarily lower their VOC content below the limits. This control measure would incorporate a Clean Air Coating Certification through amendments to existing rules under Regulation II - Permits and XI – Source-Specific Standards, as well as be considered in any future regulatory development. The District will explore the feasibility of a voluntary program, as well as mandatory participation through source-specific rules. This method of control will include public education, outreach, and various marketing elements to help incentivize manufacturers and create consumer awareness and demand.

CTS-03 – CONSUMER PRODUCT LABELING AND EMISSION REDUCTIONS FROM USE OF CONSUMER PRODUCTS AT INSTITUTIONAL AND COMMERCIAL FACILITIES (VOC): Consumer products are defined under the California Health and Safety Code as chemically formulated products used by institutional and household consumers. This control measure would seek to reduce VOCs from consumer products used at commercial and institutional facilities by developing new rules to establish a VOC labeling program, and by adopting usage limitations or prohibition of use for consumer products other than ultra low- or zero-VOC products at high volume commercial and institutional facilities.

<u>Petroleum Operations and Fugitive VOC Emissions</u>

This category pertains primarily to operations and materials associated with the petroleum, chemical, and other industries. Within this category, there is one proposed control measure targeting fugitive VOC emissions with improved leak detection and repair. Other proposed measures include reductions from gasoline transfer and dispensing, pipeline and storage tank degassing, and cutback asphalt facilities.

FUG-01 – IMPROVED LEAK DETECTION AND REPAIR: Proposed Control Measure FUG-01 affects a variety of VOC emissions sources including, but not limited to, oil and gas production facilities, petroleum refining and chemical products processing, storage and transfer facilities, marine terminals, and other sources, where VOC emissions occur from fugitive leaks in piping components, wastewater system components, and process and storage equipment leaks. Most of these facilities are required under District and federal rules to maintain a leak detection and repair (LDAR) program that involves individual screening of all of their piping components and periodic inspection programs of equipment to control and minimize VOC emissions. This measure is taking advantage of the latest technology, called optical gas imaging (Smart LDAR), using an infrared camera that readily detects and displays an image of a VOC leak in a manner that is less time consuming and labor intensive. The control measure would be implemented in two phases: Phase I would consist of a pilot program, followed by Phase II, during which full implementation would be expected. There are no emission reductions quantified for this control measure.

FUG-02 – EMISSION REDUCTIONS FROM GASOLINE TRANSFER AND DISPENSING FACILITIES: This proposed control measure applies to all gasoline dispensing facilities (GDF) in the District. The proposed measure seeks to reduce VOC and toxic emissions from GDF operations by improving the implementation of the CARB enhanced vapor recovery (EVR) regulation. The proposed methods of control include improvement of the functions of the in-station diagnostic (ISD) to provide early alerts of vapor recovery degradation and allow preventative repairs. The methods of control also redefine the function of the reset button of the ISD to allow dispensing of gasoline only after all the defective components of the vapor recovery system are repaired. The proposed methods of control include the installation of a “shutdown” mechanism in the fuel line to stop fueling if the fueling flow rate drops below the system certification standards which may cause vapor recovery failure. The complete implementation of the EVR will achieve a 98 percent control efficiency of GDF emissions.

FUG-03 - CUTBACK ASPHALT: The purpose of this proposed control measure is to reduce emissions from asphalt paving applications by limiting the use of cutback asphalt and/or replacing it with emulsified asphalt. U.S. EPA Region 9 noted that District Rule 1108, "Cutback Asphalt," does not contain RACT for asphalt paving (i.e. seasonal and usage limitations). U.S. EPA recommended staff to consider this option in the 2007 AQMP. In the District's RACT submittal to EPA, a commitment was made to evaluate the potential for limiting the use of cutback asphalt. This control measure is intended to fulfill this commitment.

FUG-04 – EMISSION REDUCTIONS FROM PIPELINE AND STORAGE TANK DEGASSING: The purpose of this proposed control measure is to reduce emissions from pipeline and storage tank degassing and cleaning by requiring the vapor space exhaust to be vented to an air pollution control device that limits the exhaust concentration. The source category would be expanded to include previously unregulated aboveground storage tanks with capacities less than 19,815 gallons and pipeline degassing. The Reid vapor pressure limit for liquids subject to the rule would also be reduced. The same control devices used for tank degassing would be applicable to the expanded category sources. This control measure would impact refineries, chemical plants, gasoline stations, and an unknown number of new facilities in the paint, solvent, adhesive, and ink manufacturing industries.

Combustion Sources

This category includes four proposed measures targeting stationary combustion equipment. There is one control measure reducing NOx from non-RECLAIM ovens, dryers, and furnaces. A second proposed measure targets the reduction of SOx emissions from RECLAIM facilities. In addition, there is one new proposed control measure that seeks to further reduce NOx emissions from space heaters. The last measure seeks to specify fuel standards for natural gas used in stationary sources as a means of preventing potential increase in NOx emissions.

CMB-01 – NOx REDUCTIONS FROM NON-RECLAIM OVENS, DRYERS AND FURNACES: This proposed control measure applies to ovens, dryers and furnaces, incinerators and other external combustion equipment at non-RECLAIM facilities. Some of these equipment have NOx emission limits based on BACT/LAER requirements at the time the equipment is permitted. In addition, equipment exempt from permit requirements are not currently subject to NOx controls. NOx emissions from these types of equipment can be reduced using low-NOx burners through retrofit or replacement. NOx emission reductions of 50 to 75% are achievable for the equipment which is not subject to current BACT limits.

CMB-02 – REDUCTIONS OF EMISSIONS IN RECLAIM (BARCT) [SOx]: This proposed control measure identifies a series of control approaches that can be implemented as part of the Best Available Retrofit Control Technology (BARCT) from the SOx RECLAIM program. The District will seek further reductions in SOx allocations from the year 2011 through 2014.

CMB-03 – FURTHER NOx REDUCTIONS FROM SPACE HEATERS: This control measure applies to natural gas-fired residential (and commercial) space heaters used for comfort heating. District Rule 1111 - NOx Emissions from Natural Gas-Fired Fan Type Central Furnaces regulates space heaters with input rates less than 175,000 Btu/hr. This measure proposes to establish more stringent emission limit for new space heaters which can be achieved through the use of low-NOx burners or other technologies. Control measure will be implemented through an amendment to Rule 1111.

CMB-04 – NATURAL GAS FUEL SPECIFICATIONS (NOx): The purpose of this new control measure is to prevent emission increases from the combustion of natural gas with uncharacteristically high heating value (HHV) in stationary applications. The high heating value of such gas relative to natural gas with a lower heating value may result in increased combustion temperature and, possibly, higher NOx emissions. This control strategy considers setting an upper limit of the heating value of natural gas. Natural gas producers/suppliers could achieve the objective of this control strategy by either not supplying hot gas to the District, or by removing higher hydrogen compounds or otherwise reducing the Btu value of the hot gas. The District will continue data collection to further determine the relationship between the HHV for natural gas fuel and NOx emissions from gas-fired equipment. Based on this information, the District will make a final determination about the potential emission reductions that can be realized from this measure.

PM Sources

This category includes three new proposed control measures which would require further reductions in fugitive dust emissions from PM control devices, a localized control program and an enhanced open burning program. The localized controls would be introduced in high PM areas to reduce community exposure. There are also two control measures that have been carried over from the 2003 AQMP, i.e., PM reductions from wood stoves and fireplaces and charbroilers.

BCM-01 - PM CONTROL DEVICES (BAGHOUSES/WET SCRUBBERS/ELECTROSTATIC PRECIPITATORS, OTHER DEVICES): This proposed control measure seeks to further reduce PM emissions from add-on control devices previously identified to achieve PM reductions (e.g., BACT or command-and-control requirements). AQMD rules establish particulate matter emissions limits and visible opacity standards that may be achieved with baghouse control equipment, electrostatic precipitators, wet scrubbers, or other PM control devices. This measure would establish requirements similar to Rule 1156 (cement operations) to establish and maintain operation and maintenance (O&M) procedures, install and operate Continuous Opacity Monitor System (COMS) or Bag Leak Detection System (BLDS) for top process emitters under new, and/or install U.S. EPA certified filtration devices.

BCM-02 – PM EMISSION HOT SPOTS – LOCALIZED CONTROL PROGRAM: This proposed new control measure seeks to reduce PM emissions in areas where local influence is the main contributor to the overall exposure. Due to the broad nature of the Basin with areas at various stages of economic development, certain locations may be prone to significantly higher levels of PM as compared to the broader surrounding area. For example, the highest levels of PM10 concentrations are measured at the AQMD's Rubidoux monitoring station. Primary contributors to those levels are sources of crustal material (better known as entrained fugitive dust). In and around the area of the Rubidoux monitoring station there are unstabilized vacant lots, many roads have unimproved road shoulders and are thereby not subject to street sweeping, and some roads and residential parking areas are unpaved. This proposed control measure would establish a localized program to supplement the regional approach to address PM hot spots through a cooperative effort with local agencies to reduce emissions from direct sources of PM.

BCM-03 – EMISSION REDUCTIONS FROM WOOD BURNING FIREPLACES AND WOODSTOVES: The 2003 AQMP included a control measure to reduce emissions, primarily PM, from wood burning fireplaces and wood burning stoves. Control options identified include voluntary or mandatory wood burning curtailment during periods of poor air quality; prohibiting the installation of indoor or outdoor uncontrolled fireplaces in new or existing developments; moisture content requirements for wood sold as seasoned; change-out of wood heating appliances during property transfers, and prohibition of burning non-wood items. PM emission reductions have been quantified for mandatory wood burning curtailments in other areas and the Bay Area and Sacramento AQMDs have estimated emission reductions for new residential development standards. It should be noted that AQMD staff is currently working on development of a regulation to implement this measure.

BCM-04 – ADDITIONAL PM EMISISON REDUCTIONS FROM RULE 444 – OPEN BURNING [PM]: This control measure seeks to reduce PM emissions through further reduction of open burning practices. The Open Burning rule was adopted to reduce visible emissions and minimize public nuisance from smoke emissions. The rule now includes limits on prescribed and agricultural burning. PM emission reductions may be achieved through the establishment of "no burn days" based on a PM2.5 threshold of the current 24-hour standard of 65 $\mu g/m^3$ or the future standard of 35 $\mu g/m^3$. Additional PM emission reductions may also be achieved through the phasing-out of agricultural burning by 2015, similar to San Joaquin Valley APCD's reduction strategy. That is, the requirement of alternatives (i.e, chipping/grinding and/or composting). Other measures include the establishment of stricter criteria for training burns that are conducted for fire protection purposes.

BCM-05 – EMISSION REDUCTIONS FROM UNDER-FIRED CHARBROILERS: This control measure seeks to stimulate technology advancement in reducing PM emissions from under-fired charbroilers of which a significant fraction is in the PM2.5 range. In December 2004, a finding of infeasibility was made by the Governing Board for under-fired charbroilers due to the lack of identification of any cost-effective control technology. Emission substitutions were made for the purposes of the SIP. Monies were granted to support demonstration projects for possible controls but no applications have been received. On this basis, staff proposes this measure with the intent of stimulating technology advancement in the next few years and possible implementation prior to 2014.

Multiple Component Sources

There are a total of seven control measures proposed in this category. The first measure seeks reductions of all criteria pollutants through the modernization of permitted equipment and the application of supercompliant materials. The approach for this measure is to either replace or retrofit existing equipment at the end of a pre-determined life span with BACT and utilize supercompliant materials. In addition a new control measure has been proposed to promote energy efficiency and conservation.

Two control measures are included in this category that address VOC and ammonia emissions from non-dairy livestock waste and composting operations. A third measure promotes the use of lighter color roofing, road materials, or tree planting. Additional measures seek to minimize emissions during equipment startup and shutdown and reduce emissions by applying the state requirement of all feasible control measures.

MCS-01 - FACILITY MODERNIZATION: This proposed measure is designed to achieve further emission reductions from permitted sources by means of facility modernization and use of supercompliant materials. Existing equipment would be retrofitted or replaced with BACT at the end of a pre-determined lifespan. The District would work with the legislature to develop federal and/or state tax credits to encourage early replacement of equipment. Consideration will be given to prior investment in equipment retrofits. During rule development, staff will explore opportunities to provide temporary emission reduction credits for meeting BACT earlier than required by the control measure.

MCS-02 – URBAN HEAT ISLAND (ALL POLLUTANTS): This proposed measure seeks to provide incentives for voluntary actions to reduce VOC or NOx by lowering the ambient temperature through the use of lighter colored roofing and paving materials. This measure is implemented in part through the U.S. EPA’s Cool Communities Program. The U.S. EPA and the District have been moving forward with the promotion of the use of lighter color roofing and paving materials. Several demonstration projects are currently being conducted nationally (one with the City of Los Angeles). In addition, tree planting programs are being promoted throughout the region. The District has sponsored several studies to further quantify the benefits of these actions.

MCS-03 – ENERGY EFFICIENCY AND CONSERVATION: This proposed control measure seeks to provide incentives for businesses to use energy efficient equipment in the District and increase the effectiveness of energy conservation programs. The District will work with local governments to promote energy conservation programs, and with electric and natural gas utilities to identify source categories and provide additional incentives for property owners and businesses to purchase energy efficient equipment. The District may also examine its market incentive or fee programs to identify opportunities for implementation of energy conservation and efficiency measures.

MCS-04 – EMISSIONS REDUCTION FROM GREENWASTE COMPOSTING: Greenwaste composting is an important component of the solid waste industry; it provides resource conservation through source reduction, recycling, and reuse. However, as with other industrial processes, greenwaste composting produces air emissions that are largely uncontrolled. Greenwaste composting is a direct source of fine particulate dust (PM10), volatile organic compounds (VOC), and ammonia (NH3), a precursor of particulate matter. Greenwaste composting also releases carbon dioxide, water vapor, and methane, which are greenhouse gases. Although PM10 emissions are unknown at this time, greenwaste composting results in approximately 4.4 tons per day VOC and 1 ton per day NH_3. This control measure calls for the development and implementation of Best Management Practices (BMPs) that would aim for reductions of PM10, VOC, and NH_3. The District will convene a working group to involve all stakeholders in developing wholesale solutions to reduce greenwaste emissions.

MCS-05 - EMISSION REDUCTIONS FROM NON-DAIRY LIVESTOCK WASTE: Although confined animal facilities have been relocating out of the District's jurisdictional boundaries for years, the District retains over nine million poultry (egg layers and broilers) and more than 15,000 hogs and pigs (swine). In accordance with SB 700 (Florez) – Agricultural Sources, AQMD adopted Rule 223 – Emission Reduction Permits for Large Confined Animal Facilities, that requires permitting and other requirements for large confined animal facilities. Additional VOC and NH_3 emission reductions, above those required by Rule 223, could be achieved by requiring air pollution control devices (i.e., biofilters) where technically and economically feasible. For example, AQMD Rule 1133.2 – Emission Reductions from Co-Composting Operations includes a requirement for control devices at large-scale composting facilities with required efficiencies ranging from 70 to 80 percent from the baseline uncontrolled emissions. This proposed control measure would aim to require the Class Two Mitigation Measures of Rule 223 with a higher level of overall control efficiency for the larger facilities subject to Rule 223, and seek reductions from the smaller facilities not subject to the rule.

MCS-06 – IMPROVED STARTUP, SHUTDOWN, AND TURNAROUND PROCEDURES: This proposed control measure seeks to reduce emissions during equipment startup, shutdown, and turnaround. Environmental organizations and community action groups have identified the minimization or optimization of these operations as a means to further reduce emissions. Opportunities for these emission reductions potentially apply at refineries as well as other industries. Examples of possible areas for improvement include better engineering and equipment design, diverting or eliminating process streams that are vented to flares, and installation of redundant equipment to increase operational reliability.

MCS-07 - APPLICATION OF ALL FEASIBLE MEASURES (ALL POLLUTANTS): This control measure addresses the attainment of further emission reductions through the amendment of existing rules and regulations. In particular, existing regulations on VOC coatings and solvents would be targeted for further emission reductions as well as rules and regulations for other pollutants such as NOx and SOx. Existing rules and regulations for pollutants such as VOC, NOx, SOx and PM reflect current best available retrofit control technology (BARCT). However, BARCT is ever evolving as new BARCT becomes available that is feasible and cost-effective. Through this proposed control measure, the District would commit to the adoption and implementation of the new retrofit control technology standards.

Compliance Flexibility Programs

This category includes a proposed control measure carried over from the 2003 AQMP that enhances regulatory compliance by providing additional flexibility and compliance options thereby lowering compliance costs and incentivizing early reductions and advancement of clean technologies. A second control measure was mentioned in the 2003 AQMP but not previously listed as a control measure. This measure is a pilot program that could be used by the Petroleum Refining businesses as a compliance option to achieve their emission reduction obligations through either on-site or off-site controls.

FLX-01 – ECONOMIC INCENTIVE PROGRAMS (ALL POLLUTANTS): Proposed Control measure FLX-01 (Intercredit Trading Program) is designed to complement command-and-control measures. The primary objectives of this measure are to enhance regulatory compliance flexibility by providing additional compliance options and thereby lowering compliance costs, and to incentivize early reductions and advancement of clean technologies through emission credit provisions. Regulatory flexibility programs, such as District credit rules and the Air Quality Investment Program, are essential to the successful introduction of the advanced control measures. The District will continue to develop incentive-based credit generation rules to provide technology advancement or early implementation of mobile, area, and stationary source emission reduction projects. Credit rules may be developed for use in RECLAIM, command-and-control programs, or for use by projects subject to New Source Review (Regulation XIII). The EIP would be considered in development of rules to help facilitate CARB and EPA review and approval.

FLX-02 - PETROLEUM REFINERY PILOT PROGRAM: This proposed control measure is a pilot program that is geared to provide an alternative means of compliance to existing refineries by allowing them to achieve their emission reduction obligations by reducing emissions from on-site or off-site projects. Based on a recommendation provided in the 2003 AQMP, the District initiated a collaborative multi-stakeholder process to consider whether to implement this approach as a pilot program for refineries in the Basin. This process has been ongoing since the initial July 2005 Working Group meeting. If such a program is adopted, then upon achieving at least the equivalent reductions, the pilot program would subsume any short- and mid-term control measures and long-term reduction obligations proposed in the Draft 2007 AQMP for the refinery sector.

The implementation of this pilot program does not preclude future adjustments to the overall reduction targets established for this source category if warranted by attainment demonstrations or inventory changes in future SIP revisions.

Emission Growth Management

There are three proposed control measures within this category. The first measure addresses emission reductions from new or redevelopment projects. Projects will evaluate significant air emissions pursuant to the California Environmental Quality Act (CEQA). The AQMD will encourage developers and local agencies to participate in a mitigation program. The last two new control measures address the General Conformity projects. The first of these measures creates a budget and mitigation program for these projects. The second measure addresses the impacts of these projects at Clean Air Act Permit sites.

EGM-01 - EMISSION REDUCTIONS FROM NEW OR REDEVELOPMENT PROJECTS (NOX, VOC, AND PM2.5): The purpose of this proposed control measure is to mitigate the significant impacts from new development and redevelopment projects. The measure will evaluate three potential approaches for projects with significant VOC, PM2.5, and NOx emissions to implement applicable mitigation measures, namely the San Joaquin Valley Unified Air Pollution Control District's approach; a new development project threshold approach, and a CEQA approach. The District will establish a working group involving local governments, and residential, commercial, and industrial developers to explore these approaches.

EGM-02 - EMISSION BUDGET AND MITIGATION FOR GENERAL CONFORMITY PROJECTS (ALL POLLUTANTS): A General Conformity determination is required by the federal Clean Air Act (CAA) for federal actions other than transportation actions. The requirements for General Conformity are contained in the federal Clean Air Act (CAA) and must, in general, support the goals of the State Implementation Plan (SIP). One method of determining conformity is for the District to identify applicable emission budgets for the federal agencies to determine if the total of the direct and indirect emissions from the General Conformity project meets the emission budget in the SIP. The District proposes to make this determination through a combination of setting aside emissions from each source category, offsetting emissions exceeding budgets, and mitigation fees.

EGM-03 - EMISSIONS MITIGATION AT FEDERALLY PERMITTED SITES (ALL POLLUTANTS): This control measure addresses mitigation measures for federally permitted projects impacting the District. This need for mitigations was the result of a recently proposed liquefied natural gas facility to be located in federal waters offshore of Ventura County. While this project is located within Ventura County and must obtain an air permit from the U.S. EPA, the Basin is downwind and will be directly impacted by the proposed project and the quality of natural gas may significantly affect the District's progress towards achieving air quality goals in the Basin.

District's Mobile Source Control Measures

In order to complement the proposed state and federal source control strategies, the District is proposing four local control measures aimed at achieving additional emission reductions from mobile sources, described below. One control measure seeks to impose a mitigation fee program on federal sources such as planes, trains, and ships in order to fund emission reduction projects. The second measure promotes accelerated turnover of in-use small off-road engines (SORE) and other engines such as recreational outboard engines through expanded exchange programs. The third measure introduces backstop measures for indirect sources of emissions from ports and port-related facilities. The District will exercise its existing legal authority or seek additional authority to adopt and implement these measures. Finally, a new control measure is added based on implementation of the Carl Moyer Program.

MOB-01 – MITIGATION FEE PROGRAM FOR FEDERAL SOURCES (ALL POLLUTANTS): In order to achieve a fair share reduction commitment from federal sources, this new control measure proposes to implement a mitigation fee program which is to be adopted by U.S. EPA with the mitigation fee to be paid by federal sources through EPA rulemaking and/or U.S. EPA grants to the District.

Federal sources include emission source categories such as aircraft, ocean-going vessels, trains, and pre-empted off-road equipment that are under the jurisdiction of U.S. EPA. These sources continue to represent a significant source of emissions in the Basin in the absence of adequate federal regulations. Under this control measure, the District will use the monies collected to implement strategies for both federal and non-federal sources to achieve equivalent reductions for SIP purposes. Projects funded by the Mitigation Fee Program for federal or other sources would be selected based on specific criteria, including but not limited to: quantifiable emission benefits, emission reduction potential, cost-effectiveness, and proximity to affected areas (e.g., environmental justice areas). These projects would have to be approved by the District's Governing Board.

MOB-02 – EXPANDED EXCHANGE PROGRAM (ALL POLLUTANTS): In order to increase the penetration of electric equipment or new low emission gasoline-powered equipment, this control measure seeks to expand the existing lawn mower/leaf blower exchange programs. This expansion will be accomplished by increasing the number of exchange events and available funding for these programs. In addition, other small off-road equipment (SORE) equipment, as well as recreational outboard engines used in pleasure craft, may also be considered for exchange programs for accelerating the turnover of existing engines

MOB-03 - BACKSTOP MEASURE FOR INDIRECT SOURCES OF EMISSIONS FROM PORTS AND PORT-RELATED FACILITIES [ALL POLLUTANTS]: This proposed control measure will address emissions from all new and existing stationary and mobile sources at ports and port-related facilities, including nonattainment criteria pollutants and toxics emissions. The objective of this backstop measure is to ensure the adequacy of and effective implementation of port measures and strategies proposed or developed by ports or CARB. Possible control approaches include limitations on increases in health risks caused by toxic air contaminants; reduction of health risks caused by toxic emissions from ports and port projects; prevention of emission increases of nonattainment pollutants for port projects; and emission reduction goals for ports to implement AQMP measures.

MOB-04 – EMISSIONS REDUCTION FROM CARL MOYER PROGRAM [NOx, PM2.5]: The proposed control measure is based on the implementation of the Carl Moyer Program by the District. The measure proposes to take credit for the emission reductions achieved through past and future projects funded under this program for SIP purposes, in two phases. Examples of projects include on-road heavy-duty vehicle modernization, installation of retrofit units, and engine repowers. Phase I of this control measure is based on the projects implemented from 1998 to 2006. Phase II of this measure is based on the reductions to be achieved from the implementation of new projects under the Carl Moyer Program. These reductions were estimated based on the committed level of funding for this Program and a conservative cost-effectiveness assumption of $14,300 per ton specified in the Carl Moyer Program guidelines (although existing projects have substantially lower (better) cost-effectiveness estimates).

SOUTHERN CALIFORNIA ASSOCIATION OF GOVERNMENTS' (SCAG'S) REGIONAL TRANSPORTATION STRATEGY AND CONTROL MEASURES

Transportation plans within the Basin are statutorily required to conform to air quality plans in the region, as established by the 1990 Federal Clean Air Act and subsequently reinforced by the Intermodal Surface Transportation and Efficiency Act (ISTEA), Transportation Equity Act for the 21st-Century (TEA-21) and the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU).

The region must demonstrate that its transportation plans and programs conform to the mandate to meet the NAAQS in a timely manner. The regulations governing the implementation of transportation projects within air basins are stipulated in U.S. EPA’s Transportation Conformity Rule (40 CFR Parts 51 and 93) and also the Joint Federal Highway Administration (FHWA)/Federal Transit Administration (FTA) regulations, "Planning Assistance and Standards," 23 CFR Part 450 and 49 CFR Part 613.

The long-term transportation planning requirements for emission reductions from on-road mobile sources within the Basin are met by SCAG’s Regional Transportation Plan (RTP) which is developed every four years with a 20-year planning horizon. The short-term implementation requirements of the Transportation Conformity Rule are met by SCAG’s biennial Regional Transportation Improvement Program (RTIP), the first two years of which are fiscally constrained and demonstrate timely implementation of a special category of transportation projects called Transportation Control Measures (TCMs).

The region is required to identify TCMs, as specified in the Federal Clean Air Act (Section 108 (f)(1)(A)) and also by U.S. EPA’s Transportation Conformity Rule (40 CFR Part 93). In the event the region fell out of conformity, only those projects identified as TCMs may go forward. However, once a project is identified as a TCM, certain special conditions and obligations arise.

- Timely Implementation: Projects identified as TCMs are tracked for timely implementation. In the event that a particular TCM project is delayed or otherwise fails, a substitute project must be implemented. SAFETEA-LU includes specific requirements on the substitution of TCMs, including similar time frame and emissions reductions, adequate funding and implementation through a collaborative process.

• Emission Reductions: In the event that a TCM project is not implemented, an alternative project that provides equal or greater emissions reduction must be provided as a replacement for the original project.

• Reasonably Available Control Measure (RACM) Analysis: The region must demonstrate that it has considered all reasonably available control measures, and that projects identified as TCMs have been chosen on the basis of such an analysis.

In general, TCMs are those projects that provide emission reductions from on-road mobile sources, based on changes in the patterns and modes by which the regional transportation system is used. The various strategies considered as part of the 2004 RTP and 2006 RTIP are defined, collectively, as a single TCM, with specific strategies grouped into its following three components:

• High Occupancy Vehicle (HOV) Strategy: This strategy attempts to reduce the proportion of commute trips made by single occupancy vehicles - the clearly preferred mode of travel within the Southern California region, constituting over 75% of all home-to-work trips, according to the 2000 U.S. Census - by increasing the share of HOV ridership within the region. HOV lanes are one example of such projects, where particular segments of heavily used freeways are designated for exclusive use by HOV vehicles, particularly during rush-hour traffic. The purpose of such measures is to make car-pooling and ride-sharing practices more attractive to individuals who may otherwise prefer the convenience of a single occupancy vehicle commute trip.

• Transit and Systems Management: This strategy relies primarily on the provision of facilities and infrastructure that incentivize an increase in the proportion of regional trips that make use of transit as a transportation mode. Such measures also promote the use of alternative modes of transportation (e.g., bicycle and pedestrian modes) and seek to incentivize increases in the average vehicle occupancy (AVO) or ridership (AVR) by facilitating van-pools, smart shuttles and other such strategies.

• Information-based Transportation: This strategy relies primarily on the innovative provision of information in a manner that successfully influences the ways in which individuals use the regional transportation system. Typically, such measures seek to induce changes in trip behavior that beneficially influence the congestion and air pollution impacts of travel. One strategy attempts to increase the proportion of ride-sharing and car-pooling trips by providing information that makes it easier to match up people traveling to and from particular sets of origin and destination points. Another strategy attempts to shift the time-profile of demand - thus, transportation demand management (TDM) - by redistributing traffic flows from peak to off-peak hours. This strategy relies on providing single occupancy vehicle operators with realistic and near-real time estimates of congestion using internet-based information networks, in an effort to influence their decision to defer traveling to a less congested time of day.

The TCMs specified in the 2004 RTP, as well as the projects listed for implementation in the first two years of the 2006 RTIP, were developed as part of an extensive and comprehensive decision-making process that actively sought the input of key stakeholders throughout the region. At the culmination of the process, SCAG's Regional Council approved the transportation control measures and strategies included in the 2004 RTP, and subsequently the investment commitments contained in the 2006 RTIP. These measures and recommendations have accordingly been moved forward for inclusion in the region's air quality plans.

Table 4-4 provides the categories of TCMs as included in the 2006 RTIP, and based on the 2004 RTP, and consistent with the 1994, 1997/99 and 2003 AQMP/SIPs. Listings of the draft 2007 AQMP TCMs and the fiscally constrained projects from the 2004 RTP are contained in Appendix IV-C, Attachments A and B, respectively.

It should be noted that while there have been and continue to be significant improvements in the emission control technology required for on-road vehicles[1], trends assessed as part of the regional transportation planning process indicate that the increase in vehicle emissions resulting from increases in the number of vehicles on the road and the number of vehicle miles they each are driven may overwhelm future benefits from technology improvements. As a result, it is imperative that the region seek alternative and innovative ways to reduce transportation-related air pollution and environmental impacts.

[1] Such measures are outside the definition of TCMs, which are discussed in more detail in Appendix IV-C: Regional Transportation Strategy and Control Measures.

TABLE 4-4
TCM Project Categories

Based on the 2006 Regional Transportation Improvement Program (RTIP)

Project Description
A. High Occupancy Vehicle Measures *HOV projects, and their pricing alternatives*
▪ New HOV Lanes – Extensions and Additions to Existing Facilities
▪ New HOV Lanes – With New Facility Projects
▪ New HOV Lanes -- With Facility Improvement Projects
▪ HOV to HOV Bypasses, Connectors, and New Interchanges with Ramp Meters
▪ High Occupancy Toll (HOT) Lanes and Pricing Alternatives
B. Transit and System Management Measures *Bus, rail and shuttle transit expansion and improvements; park and ride lots and inter-modal transfer facilities; bicycle and pedestrian facilities; railroad consolidation programs such as the Alameda Corridor, grade separation projects, channelization, over-passes, underpasses; traffic signalization; intersection improvements*
Transit
▪ Rail Track – New Lines
▪ Rail Track – Capacity Expansion of Existing Lines
▪ New Rolling Stock Acquisition -- Rail Cars and/or Locomotives
▪ Express Busways – Bus Rapid Transit and Dedicated Bus Lanes
▪ Buses – Fleet Expansion
▪ Shuttles and Paratransit Vehicles – Fleet Expansion
Intermodal Transfer Facilities
▪ Rail Stations - New
▪ Rail Stations - Expansion
▪ Park & Ride Lots – New
▪ Park & Ride Lots – Expansion
▪ Bus Stations & Transfer Facilities – New
▪ Bus Stations & Transfer Facilities – Expansion
Non-motorized Transportation Mode Facilities (non-recreational)
▪ Bicycle & Pedestrian Facilities - New
▪ Bicycle & Pedestrian Facilities - Expansion
▪ Bicycle Facilities - New
▪ Bicycle Facilities - Expansion
▪ Pedestrian Facilities - New
▪ Pedestrian Facilities - Expansion

TABLE 4-4 (continued)
TCM Project Categories

Based on the 2006 Regional Transportation Improvement Program (RTIP)

C. Information-based Transportation Strategies *Programs that promote and popularize multi-modal commute strategies to maximize alternatives to single-occupancy vehicle commute trips; marketing and promoting the use of HOV lanes or rail lines to the general public; educating the public regarding cost, locations, accessibility and services available at Park and Ride lots; promoting and marketing vanpool formation and incentive programs; promoting ride-matching services through the Internet and other means of making alternative travel option information more accessible to the general public; Urban Freeway System Management improvements; Smart Corridors System Management programs; Congestion Management Plan-based demand management strategies; county-/corridor-wide vanpool programs; seed money for transportation management associations (TMAs); and TDM demonstration programs/projects eligible for programming in the RTIP.*
▪ Marketing for Rideshare Services and Transit/TDM/Intermodal Services
▪ Intelligent Transportation Systems/Control System Computerization
▪ Telecommuting Programs/Satellite Work Centers
▪ Real-time Rail, Transit, or Freeway Information Systems (changeable message signs)

The emission benefits associated with the 2004 RTP and 2006 RTIP are already reflected in the projected emissions.

STATE AND FEDERAL SHORT-TERM AND MID-TERM CONTROL MEASURES

In addition to District and SCAG's measures, the draft 2007 AQMP includes additional short- and mid-term control measures aimed at reducing emissions from sources that are primarily under State and federal jurisdiction, including on-road and off-road mobile sources, and consumer products. These measures are required in order to achieve the remaining emission reductions necessary for PM2.5 attainment.

The on-road motor sources category includes passenger cars, light-duty trucks, medium-duty vehicles, heavy-duty vehicles, and motorcycles. There are currently approximately 12 million vehicles in this category in the South Coast Basin. In 2002, these vehicles traveled more than 349 million miles per day; they are projected to travel about 407 million miles per day by the year 2020. CARB and U.S. EPA have primary authority to reduce emissions from on-road mobile sources, through the adoption of emission standards and other related requirements. The District has some restrictions on its authority to impose requirements to reduce emissions from these sources. However, the District has reduced emissions from this source category through its trip reduction requirements for large employers (Rule 2002), public fleet rules, vehicle scrapping programs, and incentive programs.

Off-road mobile sources refer to off-road vehicles and mobile non-vehicular equipment categories such as aircraft, trains, marine vessels, farm and construction equipment (e.g., bulldozers), industrial equipment (e.g., forklifts), and utility equipment (e.g., lawn mowers). The authority to develop and implement regulations for off-road mobile sources lies primarily with the U.S. EPA and CARB. The District has limited authority to adopt retrofit requirements for some off-road mobile sources and has authority to adopt use and operation limits for such equipment.

Consumer products include products such as detergents, polishes, cosmetics, hairsprays, and disinfectants that are used primarily by household and institutional consumers. These products represent a significant source of VOC emissions in the Basin. Overall emissions from this category are determined both by the emissions characteristics of the types of products within the category, and by increases in product usage that are largely tied to population increases. CARB has the authority and responsibility to achieve the maximum technologically and commercially feasible VOC emission reductions from consumer products. However, CARB is prohibited from eliminating a product type (e.g., mode of dispensing).

Since the adoption of the 2003 AQMP, CARB has adopted a number of rules for mobile sources and consumer products as outlined in Table 1-3. However, these reductions fall short of CARB's commitment for its short-term measures in the 2003 AQMP. Collectively, mobile sources and consumer products account for 76% of VOC (487 t/d), 89% of NOx (554 t/d), and 76% of SOx (53 t/d) in 2014. Therefore, a significant component of the PM2.5 (and ozone) attainment strategy is based on achieving substantial reductions from these sources.

CARB is developing a new statewide emission reduction strategy to achieve federal PM2.5 and 8-hour ozone standards in California. While the most severe ozone nonattainment areas have up to 2024 to achieve the federal standard, the PM2.5 standard must be achieved no later than 2015. CARB staff is focusing first on near-term emission reductions to meet the 2015 deadline. These strategies will provide additional new reductions post-2015 and form the foundation for longer term strategies needed for ozone attainment. Table 4-5 shows emission reduction estimates for the concepts CARB is evaluating for possible inclusion in the new statewide strategy. CARB has also provided brief descriptions of these concepts.

Over the next several months, CARB staff will provide a number of opportunities for the public to participate in the formal process to develop the Statewide control strategy. On October 12, 2006, CARB staff will host a SIP Symposium to seek public input into developing emission reduction strategies necessary to achieve

federal clean air standards.[1] In November, CARB will hold additional public meetings to provide more opportunity for public comment on the concepts presented at the Symposium. In early 2007, CARB staff will release a Draft State strategy and hold additional workshops. CARB will hold a public hearing to consider adoption of a proposed Statewide strategy in Spring 2007
.

Table 4-5

Summary of the New Statewide Strategy Under Evaluation
by CARB Staff

Emission Reduction Estimate2 from
Near-Term Concepts Under Evaluation for State and Federal Measures

	Ozone and PM2.5 Precursor Reductions (2014, tpd)	
	NOx	**VOC**
Passenger Vehicles	24	39
Smog Check Improvements Expanded BAR Vehicle Retirement plus Parts Replacement California Phase 3 Reformulated Gasoline Modifications Expanded Motorcycle Standards		
Trucks	51	5
Expanded Diesel Truck Fleet Modernization Program Additional Reductions from Out-of-State Trucks in California Diesel Truck Emissions Tracking and Inspection Program		
Goods Movement[3]	40	1
Tugboat Cold Ironing Auxiliary Ship Engine Hotelling Main Ship Engine Clean Fuel Enhanced Main Ship Engine Control		

[1] For further information on the SIP Symposium, please refer to the ARB website at (http://www.arb.ca.gov/planning/sip/2006sym/2006sym.htm)

[2] These are initial concepts. ARB staff will work closely with the regulated communities, manufacturers of emission control technologies and equipment, environmental and community advocacy groups, and local, state and federal governmental agencies to develop the emission control strategy the Board ultimately considers in the spring of 2007.

[3] Emission benefits are based on the full implementation of the strategies in the Emission Reduction Plan for Ports and Goods Movement in California adopted by ARB in April 2006, excluding emission reductions from the private truck fleet rule component. Emission reductions from the private truck fleet rule are evaluated in the "Trucks" category.

Table 4-5
(Concluded)

	Ozone and PM2.5 Precursor Reductions (2014, tpd)	
Goods Movement (continued)		
Port Truck Modernization Locomotive Engines		
Construction Equipment	15	2
Construction Equipment Fleet Averages/Fleet Modernization Construction Equipment Idling Limitations		
Agricultural Equipment	NYQ	NYQ
Other Engine Exhaust and Evaporation	6	11
Accelerate Turnover of Pre-1999 Outboard/Personal Water Craft (PWC) Engines Lower (Catalyst-Based) Exhaust Standards for Outboard/PWCs GSE - Increase Percent ZEVs / Lower Fleet Averages Recreational Vehicle Evaporative Standards 2006 Large Spark Ignited Engine Regulation		
Consumer Products	0	9
Pesticides[1]	0	NYQ
Approximate Total from State and Federal Measures	**135**	**65**

* NYQ – Not Yet Quantified

[1] The California Department of Pesticide Regulation is currently developing pesticide emission control concepts for inclusion in the statewide strategy.

CARB'S DESCRIPTION OF CONTROL CONCEPTS

PASSENGER VEHICLES

SMOG CHECK IMPROVEMENTS

Low Pressure Evaporative Test. Require low pressure evaporative system testing and repair of evaporative system leaks for all vehicles subject to Smog Check inspection.

More Stringent Cutpoints. Set more stringent Smog Check cutpoints. Many vehicles that are repaired under Smog Check are likely to fail the next time they are tested. More stringent cutpoints would require more cars to be repaired, and help ensure more complete and durable repairs.

Annual Inspections for Older Vehicles. Inspect older vehicles annually rather than every two years. Older vehicles tend to have more deterioration of emission controls, and consequently, higher emissions.

Annual Inspections for High Annual Mileage Vehicles. Inspect annually, rather than every two, vehicles that accrue very high mileage on an annual basis years. High mileage vehicles tend to have more deterioration of emission controls, and consequently, higher emissions.

Add Visible Smoke Test. Check for visible smoke as part of the Smog Check inspection to identify vehicles with excess PM emissions that would otherwise pass Smog Check.

Idle Testing in Enhanced Smog Check Areas. Supplement the dynamometer testing currently required in Enhanced Smog Check areas with an idle emissions test. Results from a pilot program conducted in Enhanced Smog Check areas indicate that testing emissions at idle has the potential to identify excess emissions that would not be identified through dynamometer testing alone.

Inspection of Light and Medium Duty Diesels. Include light and medium duty diesel vehicles in the Smog Check program. This control concept would reduce excess emissions from these vehicles by encouraging improved maintenance for this part of the fleet, and by requiring the repair of poorly maintained or old emission systems.

Inspection of Motorcycles. Include motorcycle inspections as part of Smog Check. Studies indicate that motorcycles are subject to high rates of exhaust system tampering.

EXPANDED BAR VEHICLE RETIREMENT PROGRAM PLUS PARTS REPLACEMENT. Ramp up BAR scrappage program from current 18,000 per year. Offer scrap for vehicles within 20 percent of cutpoints and off the regular Smog Check cycle. Additionally, provide consumer incentives to replace emission control system parts (particularly catalysts) in vehicles that pass their Smog Check Inspections but have ROG or NOx emissions concentrations within 20 percent of cut-points.

CALIFORNIA PHASE 3 REFORMULATED GASOLINE MODIFICATIONS. Modify California's Reformulated Gasoline Program to offset ROG emissions due to the increased use of ethanol. This rulemaking activity is currently underway and is intended to fully mitigate the emission increase. These increases are in the current inventory.

TIGHTER MOTORCYCLE STANDARDS. Reduce motorcycle exhaust and evaporative emissions standards by 50 percent beginning in 2013.

TRUCKS

EXPANDED TRUCK FLEET MODERNIZATION PROGRAM. Accelerate the modernization of California's heavy-duty truck fleet by requiring older trucks to be replaced with newer, cleaner trucks that use advanced technology engines (trucks that meet "Tier 3" standards) in calendar years 2010-2015. Use incentive funds, where available, to assist in the replacement, repowering, or retrofit of older "captive" fleets used for short to medium distance hauling.

ADDITIONAL REDUCTIONS FROM OUT-OF-STATE TRUCKS IN CALIFORNIA. Reduce emissions from out-of-state trucks that operate in California, using either a rule or another mechanism such as an MOU. Trucks registered outside of California are estimated to account for approximately 25 percent of statewide mileage accrued by heavy-duty trucks.

TRUCK EMISSIONS TRACKING AND INSPECTION PROGRAM. Reduce excess emissions from heavy-duty trucks that can be attributed to engine deterioration, poor maintenance, or tampering by expanding the Heavy-Duty Vehicle Inspection Program (HDVIP) to include visual, under-the-hood inspections of the emission control devices, an electronic check of the truck's on-board computer, and use of remote emission sensing technology to identify and screen trucks for roadside inspections.

GOODS MOVEMENT

TUGBOAT COLD IRONING. Require tugboats to use shore-based electrical power when idling.

AUXILIARY SHIP ENGINE HOTELLING. Reduce hotelling emissions with at-dock technologies such as cold ironing and other clean technologies (i.e., the “hood”).

MAIN SHIP ENGINE CLEAN FUELS. Require ships to use low sulfur diesel fuel (0.1 percent) in main engines when operating within 24 miles of shore.

ENHANCED MAIN SHIP ENGINE CONTROL. Modernize main engines through added retrofits such as selected catalytic reduction. Support efforts by ports and appropriate local entities to encourage the accelerated use of cleaner ships and rebuilds through other tools such as lease restrictions.

PORT TRUCK MODERNIZATION. Retrofit or replace the older heavy-duty diesel trucks that service ports, and work with port authorities to prevent older trucks from joining the fleet. Retrofit all trucks with diesel particulate filter by 2010 and, where feasible, NOx retrofits. Require trucks entering port service in 2007 and later years to meet 2003 standards; trucks entering port service after 2012 to meet 2007 standards, and trucks entering port service after 2015 to meet 2010 standards. Require remaining pre-2007 trucks to be retired or replaced with newer trucks by 2019.

LOCOMOTIVE ENGINES. Replace existing line haul locomotive engines with newer, cleaner Tier 3 engines beginning 2012; concurrently rebuild older engines to more modern (Tier 2.5) standards. Efforts are already underway to reduce community exposure to toxic diesel particulate matter from locomotives through reduced locomotive idling, the increased use of clean fuels, and the accelerated replacement of older “switcher” locomotives with newer, cleaner technologies.

CONSTRUCTION EQUIPMENT

CONSTRUCTION EQUIPMENT FLEET AVERAGES/FLEET MODERNIZATION. Establish fleet average emission limits for construction fleets that would require older, dirtier engines to be replaced with engines reflecting current technologies.

CONSTRUCTION EQUIPMENT IDLING LIMITATIONS. Adopt regulations to eliminate unnecessary idling by construction equipment.

AGRICULTURAL EQUIPMENT

AGRICULTURAL EQUIPMENT FLEET MODERNIZATION. Accelerate the modernization of the fleet of agricultural equipment used in California, removing older, dirtier equipment from service to be replaced with engines reflecting cleaner technologies.

OTHER ENGINE EXHAUST AND EVAPORATION

OUTBOARD MOTORS. Accelerate the retirement of pre-1999 two-stroke outboard engines. Adopt catalyst-based standards (5 g/kW-hr) for new outboard engines.

RECREATIONAL VEHICLE EVAPORATIVE STANDARDS. Adopt evaporative emission standards to reduce the amount of reactive organic gases that evaporate from sources such as fuel tank, carbon canisters, and fuel lines.

AIRPORT GROUND SERVICE EQUIPMENT. Set requirements for the use of zero emission equipment and lower fleet average emission.

2006 LARGE SPARK-IGNITION (LSI) ENGINE REGULATION. More stringent exhaust standards and declining fleet average to accelerate turnover of older, higher emitting engines. (adopted in 2006)

CONSUMER PRODUCTS

CONSUMER PRODUCTS. Continue setting standards based on the current survey and reformulation approach in the near-term followed by new more innovative approaches post-2015.

PESTICIDES

PESTICIDES. The California Department of Pesticide Regulation will identify strategies to reduce emissions from commercial and agricultural pesticide use in California through reformulation, reduced usage, and use of innovative technologies and practices.

DISTRICT STAFF'S RECOMMENDED STATE AND FEDERAL STATIONARY AND MOBILE SOURCE CONTROL MEASURES

For this Draft 2007 AQMP, based on CARB's proposed concepts, District staff is recommending for CARB's consideration more defined control measures for reducing emissions from sources under State and federal jurisdiction that local authorities, the California Air Resources Board, U.S. EPA, and the District could implement in order to attain applicable air quality standards. This is done because: 1) the reductions associated with CARB's proposed concepts are not expected to achieve the reductions necessary for the PM2.5 and ozone attainment, as initially proposed; 2) these concepts lack the specificity in the proposed control measures which are needed for public review and federal approval; and 3) the PM2.5 attainment strategy cannot rely on undefined or long-term control measures because "black box" or Section 182(e)(5) measures of the federal Clean Air Act are not allowed for PM2.5 attainment purposes. Thus, the recommended measures are intended to better define short-term and mid-term control measures needed for reaching attainment by 2015 and to meet legal requirements.

The District staff's recommended measures are also intended to highlight the level of stringency and reductions needed from State and federal sources and to initiate discussions on the extent these sources need to be controlled in order to attain the fine particulate air quality standards by 2015 and the 8-hour ozone air quality standard by 2021. More importantly, full implementation of the proposed measures will result in significant reductions in air toxic contaminants by 2021. The District will exercise its existing legal authority or seek additional authority to adopt and implement cost-effective mobile source controls as necessary. It is envisioned that during the public review process (i.e., CARB's symposium in October and other public meetings, AQMP public workshops), these control measures will be further refined for possible inclusion into the final 2007 AQMP based on additional technical feasibility and economic feasibility (e.g., funding) considerations.

Table 4-6 provides a listing of District staff's recommended control measures for on-road and off-road mobile sources as well as consumer products with estimated reductions in 2014 and 2020. These measures represent District staff's initial technical assessment of potential strategies for sources under the jurisdiction of CARB and U.S. EPA. For goods movement source categories such as marine vessels, trucks, rail, and cargo handling equipment, the proposed control measures are primarily based on a hybrid of measures and strategies outlined in CARB's Goods Movement Emissions Reduction Plan and the draft San Pedro Bay Ports Clean Air Action Plan. However, where warranted, a number of measures from these plans have been revised to reflect a higher level of stringency or fleet penetration in order to achieve the necessary reductions for attainment. Detailed descriptions of these control measures are provided in Draft Appendix IV-B.

For example, the recommended mobile source control measures focus on aggressive accelerated turnover of older, existing vehicles with the cleanest engines commercially available. This would require the commercial availability of on-road partial zero emissions vehicles (PZEV) or cleaner vehicles in the light- and medium-duty sector and heavy-duty vehicles that meet future exhaust emission standards. Several automobile manufacturers are producing gasoline hybrid electric vehicles that meet the PZEV levels. Some of the newer models meet the cleanest PZEV level (commonly termed, advanced technology PZEV or AT-PZEV). Control Measure ONRD-06 calls for an accelerated replacement of about 1.2 million older existing vehicles with vehicles that meet the AT-PZEV by 2014 and additional 1.2 million vehicles by 2020. Based on the estimated annual sales of about 600,000 new vehicles per year, District staff believes that if such a program is implemented, the proposed replacement could occur. Relative to heavy-duty vehicles, Control Measures ONRD-09 and ONRD-12 would seek about 20,000 older existing heavy-duty diesel vehicles be replaced with new vehicles meeting either the 2007 or 2010 exhaust emission standards (depending on year of implementation). There are about 190,000 heavy-duty vehicles estimated to be operating in the South Coast Basin in 2014. The accelerated replacement program would seek essentially a replacement of 10 percent of the total fleet with the cleanest commercially available vehicles.

For the off-road mobile source sector, the recommended control measures call for the replacement of these mostly uncontrolled emissions with newer, cleaner models. Control Measure OFFRD-01 proposes that older construction and industrial equipment be replaced or repowered with the cleanest available engines. A large number of recreational vehicles and pleasure craft are operated on older two-stroke engines. As such, Control Measures OFFRD-02 and OFFRD-03 would seek accelerated replacement of older two stroke engines that emit higher levels of VOC, NOx, and PM. Control Measures OFFRD-12 and OFFRD-13 call for accelerated replacement of lawn and garden equipment and airport ground support equipment with electrified units.

In addition to accelerated fleet turnover, several of the measures recommend accelerated retrofits of vehicle and equipment with after-treatment control devices to further reduce NOx and PM emissions. Specifically, Control Measure ONRD-08 seeks about 20,000 pre-2007 on-road heavy-duty vehicles to be retrofitted with control devices to reduce NOx emissions by at least 30 percent and PM emissions on the order of 30 to 85 percent (depending on model year). Control Measure OFFRD-01 calls for similar emission benefits through an accelerated retrofit program for construction and industrial equipment operating on diesel fuel.

Relative to goods movement related sources, Control Measures OFFRD-05 – locomotives, OFFRD-08 – cargo handling equipment, and OFFRD-10 – ocean-going vessels and harbor craft, seek accelerated replacement and retrofitting of existing engines and equipment similar to proposals in the draft San Pedro Bay Ports Clean Air Action Plan and CARB's Goods Movement Emissions Reduction Plan. OFFRD-07 calls for an aggressive implementation of shore-side power for marine vessels as provided in the Goods Movement Emissions Reduction Plan. In addition, OFFRD-09 calls for mandatory speed reduction for ocean-going vessels entering and leaving the ports similar to the proposal in the San Pedro Bay Ports Clean Air Action Plan.

Furthermore, the District staff's recommended control measures include three measures that call for cleaner fuels and greater use of diesel fuel alternatives. Control Measure ONRD-03 calls for a reformulation of gasoline to mitigate the impacts of low-level blending of gasoline with ethanol. Control Measure ONRD-07 calls for a cleaner diesel fuel reformulation that would reduce NOx and PM emissions. In addition, ONRD-07 calls for greater use of diesel fuel alternatives such as gas-to-liquid fuels, emulsified diesel, and dimethyl ether fuels. These two control measures affect all categories of engines that rely on gasoline or diesel fuel. Control Measure OFFRD-06 calls for all ocean-going vessels to begin using a 0.2 percent sulfur content fuel beginning in 2008 with the expectation that these vessels will begin using a 0.1 percent sulfur content fuel beginning in the 2010 timeframe. Finally, Control Measure CONS-01 recommends achieving an aggressive target of 30% VOC reduction by 2014 through extensive product reformulation.

The District staff's recommended State and federal control measures are estimated to achieve 135 tons per day of VOC, 231 tons per day of NOx, 46 tons per day of SOx, and 13 tons per day of PM2.5 emission reductions in 2014. In 2020, the estimated reductions for these measures are 203 tons per day of VOC, 233 tons per day of NOx, 60 tons per day of SOx, and 13 tons per day of PM2.5 emissions.

An alternative approach based on higher NOx reductions and lower emission reductions of SOx, VOC, and PM2.5 will also demonstrate attainment of the PM2.5 standard by 2014. The overall reductions for this approach will be 86 tons per day of VOC and 337 tons per day of NOx augmented with 40 tons per day of SOx, and 2 tons per day of PM2.5 reductions in 2014. This type of control approach will also have the added benefit of making expeditious progress toward the 8-hour ozone standard and the new 24-hour PM2.5 standard.

Table 4-6

District staff's Recommended Control Measures for Sources Under State and Federal Jurisdiction

Control Measure Number	Title	Estimated Reductions (t/d)	
		2014	2020
ONRD-01	Smog Check Improvements	VOC: 18.7 NOx: 13.3 PM2.5: 0.1	VOC: 16.5 NOx: 12.7 PM2.5: 0.1
ONRD-02	Expanded BAR Vehicle Retirement and Mandatory Part Replacement	VOC: 0.6 NOx: 0.9	VOC: 0.4 NOx: 0.4
ONRD-03	California Phase 3 Reformulation Gasoline Modifications	VOC: 10.6 NOx: 14.9	VOC: 11.2 NOx: 10.0
ONRD-04	More Stringent Motorcycle Standards	VOC: 0.8 NOx: 0.3	VOC: 1.6 NOx: 0.6
ONRD-05	PM Testing for Light- and Medium-Duty Vehicles	PM2.5: 0.01	PM2.5: 0.01
ONRD-06	Accelerated Penetration of Partial Zero-Emission and Zero Emission Vehicles	VOC: 18.2 NOx: 7.5 PM2.5: 0.6	VOC: 13.1 NOx: 6.6 PM2.5: 0.8
ONRD-07	Greater Use of Diesel Fuel Alternatives and Diesel Fuel Reformulation	NOx: 30.3 PM2.5: 2.3	NOx: 19.1 PM2.5: 1.2
ONRD-08	Accelerated Retrofits of Heavy-Duty Vehicles	NOx: 3.2 PM2.5: 0.2	NOx: 4.6 PM2.5: 0.3
ONRD-09	In-Use Emission Reductions from On-Road Heavy-Duty Vehicles	VOC: 0.3 NOx: 6.1 PM2.5: 0.1	VOC: 0.3 NOx: 5.1 PM2.5: 0.1
ONRD-10	Further Emission Reductions from Out-of-State/International Registered Heavy-Duty Vehicles	NOx: 0.4 PM2.5: 0.03	NOx: 0.6 PM2.5: 0.03
ONRD-11	Enhanced Inspection and In-Use Emissions Tracking of Heavy-Duty Vehicles	VOC: 1.5 NOx: 16.7 PM2.5: 0.2	VOC: 1.4 NOx: 17.8 PM2.5: 0.1
ONRD-12	Further Emission Reductions from Heavy-Duty Trucks Providing Freight Drayage Services	VOC: 0.1 NOx: 2.6 PM2.5: 0.1	VOC: 0.1 NOx: 2.3 PM2.5: 0.1
OFFRD-01	Construction/Industrial Equipment Fleet Modernization	VOC: 5.6 NOx: 48.6 PM2.5: 2.1	VOC: 4.1 NOx: 33.6 PM2.5: 1.1

Table 4-6
(Concluded)

Control Measure Number	Title	Estimated Reductions (t/d) 2014	2020
OFFRD-02	Accelerated Turnover and Catalyst-based Standards for Pleasure Craft	VOC: 14.4 NOx: 3.8 PM2.5: 2.2	VOC: 36.1 NOx: 10.3 PM2.5: 2.1
OFFRD-03	More Stringent Exhaust Standards for Off-Road Recreational Vehicles	VOC: 12.9 NOx: 0.4	VOC: 21.3 NOx:0.6
OFFRD-04	Evaporative Standards for Recreational Vehicles and Pleasure Craft	VOC: 7.9	VOC: 23.8
OFFRD-05	Further Emission Reductions from Locomotives	NOx: 15.3 PM2.5: 0.5	NOx: 17.7 PM2.5: 0.7
OFFRD-06	Clean Marine Fuel Requirements for Ocean-Going Marine Vessels	NOx: 7.3 SOx: 45.6 PM2.5: 4.0	NOx: 9.3 SOx: 59.6 PM2.5: 5.2
OFFRD-07	Further Emission Reductions from Ocean-Going Marine Vessels and Harbor Crafts While at Berth	VOC: 0.5 NOx: 20.4 SOx: 0.6 PM2.5: 0.6	VOC: 0.7 NOx: 27.4 SOx: 0.8 PM2.5: 0.9
OFFRD-08	Further Emission Reductions from Cargo Handling Equipment	NOx: 1.0	NOx: 0.6
OFFRD-09	Vessel Speed Reduction	NOx: 17.4	NOx: 23.2
OFFRD-10	Further Emission Reductions from Ocean-Going Vessels	NOx: 13.9	NOx: 24.1
OFFRD-11	Emission Reductions from Aircraft	VOC: 2.4 NOx: 4.4	VOC: 2.8 NOx: 5.3
OFFRD-12	Lower Exhaust and Evaporation Standards and Fleet Modernization for Lawn and Garden Equipment	VOC: 5.7	VOC: 13.3
OFFRD-13	Emission Reductions from Airport Ground Support Equipment	VOC: 0.4 NOx: 2.3 PM2.5: 0.04	VOC: 0.3 NOx: 1.4 PM2.5: 0.02
CONS-01	Further Emission Reductions from Consumer Products	VOC: 34.6	VOC: 56.0
	Total	**VOC: 135** **NOx: 231** **SOx: 46** **PM2.5: 13**	**VOC:203** **NOx: 233** **SOx: 60** **PM2.5: 13**

The following text provides a brief description of the District staff's proposed mobile source and consumer products control measures:

ONRD-01 – SMOG CHECK IMPROVEMENTS: This control measure proposes improvements and enhancements to the existing Smog Check II Program for light- and medium-duty vehicles in the South Coast. Enhancements include: evaporative leak check tests; more stringent testing cutpoints; accelerated simulation monitoring (ASM) testing for all-wheel and four-wheel drive vehicles; enhanced on-board diagnostics; remote sensing for purposes of identifying high emitting vehicles and subsequent off-cycle repairs or vehicle retirement through incentives; two-speed idle emission testing in urbanized regions; inclusion of diesel-powered light- and medium-duty vehicles; and inclusion of motorcycles into California's Smog Check Program.

ONRD-02 – EXPANDED BAR VEHICLE RETIREMENT AND MANDATORY PART REPLACEMENT: This proposed control measure calls for promoting the permanent retirement of eligible vehicles through financial incentives currently offered through the California Smog Check Program. In addition, the proposal includes the implementation of a mandatory parts replacement program of critical emission control systems after a vehicle has reached a certain mileage cap. The proposal calls for increasing the current vehicle retirement program within BAR's Consumer Assistance Program from approximately 18,000 vehicles per year statewide to 50,000 vehicles, with approximately half targeted for the South Coast Air Basin. This proposed control measure would only affect those vehicles currently on-cycle (those vehicles within three months of their Smog Check test date).

ONRD-03 – CALIFORNIA PHASE 3 REFORMULATION GASOLINE MODIFICATIONS: This measure seeks to offset the impacts of greater use of ethanol in low level blended gasoline. The proposed reformulation would offset a portion of the ethanol impacts and provide additional oxides of nitrogen benefits. However, not all of the ethanol impacts will be mitigated through reformulation and other measures must be implemented to fully mitigate the impacts of low ethanol gasoline blends.

ONRD-04 – MORE STRINGENT MOTORCYCLE STANDARDS: This proposed control measure calls for the establishment of a 50 percent reduction target applicable to the exhaust emission standards over all three classes of motorcycles beginning with the 2010 model year. Given that the tightest passenger car emission standards are approximately 40 times more stringent that the current applicable emission standards, a significant reduction in current on-road motorcycle emission standards should be technologically and commercially feasible. Expected technologies that could be deployed on motorcycle engines could include improved fuel delivery, engine modifications, catalytic converter enhancements, and engine calibrations techniques. Additionally, the proposed control measures would also be augmented with a 50 percent increase in stringency from the current evaporative standard.

ONRD-05 – PM TESTING FOR LIGHT- AND MEDIUM-DUTY VEHICLES: This proposed control measure calls for the inclusion of light- and medium-duty diesel vehicles into the current Smog Check program. The proposed program would incorporate a visible smoke test requirement into the existing Smog Check test requirements within the next year. Additionally, this proposed control measure would have the State of California adopt an in-use particulate matter criteria (PM cutpoint) for gasoline and diesel powered vehicles subject to the Smog Check test requirements by the year 2010 with applicable test methods for purposes of measurements.

ONRD-06 – ACCELERATED PENETRATION OF PARTIAL ZERO-EMISSION AND ZERO-EMISSION VEHICLES: This proposed control measure focuses on the accelerated penetration and implementation of advanced technologies that are capable of achieving partial zero-tailpipe emissions. CARB through its fleet averaging requirements under the current Low Emission Vehicle II program can ensure the availability of partial zero-emission vehicles (PZEVs) in the California market. In conjunction with an aggressive vehicle retirement program targeting older high-emitting vehicles identified via a remote sensing program, the proposed control measure would offer sufficient vouchers to replace such vehicles with vehicles achieving PZEV emission standards. This proposed measure would generally replace the oldest model year vehicles identified via remote sensing with one of the cleanest commercially available vehicles. This proposal would call for a 50 percent sales target of PZEV's beginning in calendar year (CY) 2010. In CY 2014, the fleet of PZEVs would grow to 1.2 million in the South Coast.

ONRD-07 – GREATER USE OF DIESEL FUEL ALTERNATIVES AND DIESEL FUEL REFORMULATION: This measure calls for a two-phase approach to achieve additional emission benefits from engines powered by diesel fuel. The first phase would have CARB adopt by mid-2007, enhanced diesel fuel specifications. The proposal reflects the achievement of tighter in-use aromatic controls being feasible and the improvements in sulfur control technology now allowing for diesel fuel to be refined down to the detection limit of sulfur. Additionally, recent test data indicates that higher cetane levels are associated with lower emissions of VOC and NOx. The proposed reformulation will also reflect the application of the latest refining technology to reduce polycyclic aromatic hydrocarbons, which have been associated with higher levels of mutagenicity and toxic impacts relative to other diesel components, such as paraffinic compounds.

The second phase of the control measure calls for greater use of alternatives to diesel fuel including gas-to-liquid fuels, dimethyl ether, alternative fuels, or other emulsified diesel fuel that provide additional oxides of nitrogen or particulate matter reductions. User or supplier incentives would be established to ensure that at least 50% of current volume of conventional diesel fuel – approximately 1.5 billion gallons statewide annually – would be displaced with diesel alternatives.

ONRD-08 – ACCELERATED RETROFITS OF HEAVY-DUTY VEHICLES: This measure calls for accelerated retrofit programs for heavy-duty vehicles operating primarily in the South Coast jurisdictional boundaries. This measure covers all heavy-duty vocations except for Class 8 over-the-road trucks that provide freight drayage services. This measure would target approximately 20,000 heavy-duty diesel vehicles, between 1988 through 2009 model-year for retrofitting by CY 2014. In addition, for calendar year 2020, an additional 20,000 heavy-duty diesel vehicles will be targeted for retrofitting. The retrofit requirement would include a 30 percent reduction in oxides of nitrogen and either a 25 or 85 percent reduction in particulate matter, depending on the model year of the vehicle.

ONRD-09 – IN-USE EMISSION REDUCTIONS FROM ON-ROAD HEAVY-DUTY VEHICLES: This measure would call for accelerated replacement of on-road heavy-duty vehicles with vehicles meeting the 2010 on-road heavy-duty exhaust emissions standards, beginning in 2010. The proposal calls for resources to be directed at replacing the older "captive" fleet used for short to medium distance hauling. About 12,000 heavy-heavy-duty diesel and medium-heavy-duty diesel vehicles would be targeted for replacement in the jurisdictional boundaries of the SCAQMD over a 10-year period. It is envisioned that half the truck replacement would be diesel powered and the remaining half would be alternative fuel powered.

ONRD-10 – FURTHER EMISSION REDUCTIONS FROM OUT-OF-STATE/INTERNATIONAL REGISTERED HEAVY-DUTY VEHICLES: This measure calls for the development of a federal incentives program similar to the state's Carl Moyer Program for heavy-duty vehicles registered outside of California. The federal program would provide funding assistance to either retrofit or replace older over-the-road trucks with commercially available control technologies. There are a number of retrofit technologies that are commercially available that could be used to potentially support this program.

ONRD-11 – ENHANCED INSPECTION AND IN-USE EMISSIONS TRACKING OF HEAVY-DUTY VEHICLES: This measure would have CARB develop an expanded inspection and maintenance program for heavy-duty-diesel vehicles. The current tools that CARB has available include the current smoke inspection program which the proposal calls for expansion of, to include the following: 1) a visual under-the-hood inspection of the emission control devices, 2) an electronic check of the truck's on-board computer, and 3) use of remote sensing technology to assess in-use heavy-duty diesel trucks emissions. An added component to this measure is to incorporate a not-to-exceed limit for 1998 and older trucks to ensure in-use emissions are kept to a minimum.

ONRD-12 – FURTHER EMISSIONS REDUCTIONS FROM HEAVY-DUTY TRUCKS PROVIDING FREIGHT DRAYAGE SERVICES: This measure calls for the retrofit or replacement of existing over-the-road trucks providing drayage services at marine ports, intermodal facilities, or warehouse distribution centers. This measure contains elements of ONRD-08 and ONRD-09. A similar program is proposed in the Draft San Pedro Bay Ports Clean Air Action Plan. The state is currently developing a regulation on trucks operating at marine ports. The proposed control measure would complement statewide actions.

OFFRD-01 – CONSTRUCTION/INDUSTRIAL EQUIPMENT FLEET MODERNIZATION: Over the last ten years and over the next seven years, new off-road diesel engines will have met or will need to meet more stringent emissions standards. These standards are designated by different Tiers with pre-Tier 0 engines being the oldest and most polluting through Tier 4 engines which will be the cleanest off-road engines with emission standards somewhat higher than those for similarly aged on-road engines. This measure will, through incentives and regulation, replace or retrofit the oldest diesel engines with new engines that will meet the diesel engine on-road 2010 emission standards. Reductions from this measure were calculated by assuming that by 2014 all pre-Tier 2 off-road engines for construction, industrial, and transport refrigeration unit (TRU) engines are replaced with new on-road engines meeting the 2010 standard or retrofitted with equipment that meets the 2010 standard. In addition all Tier 2 and Tier 3 engines are retrofitted with verified diesel emission control (VDEC) equipment that reduces their diesel PM emissions by 85%. By 2020 it is further assumed that all pre Tier 4 engines are replaced with on-road engines meeting the 2010 standard or better.

OFFRD-02 – ACCELERATED TURNOVER AND CATALYST BASED STANDARDS FOR PLEASURE CRAFT: This measure proposes to accelerate the turnover of outboard engines, personal watercraft, and inboard/sterndrive boats to ensure that by 2014 that the outboard engines and personal watercraft fleet average meets Tier 3 standard levels (the most stringent levels in place today), and the inboard/sterndrive fleet average meets 2008 standard levels (the cleanest levels currently promulgated). By 2020, new emission standards will be developed and the outboard engines and personal watercraft fleet average will meet emission levels approximately three times more stringent than the 2014 levels, and the inboard/sterndrive fleet average will meet emission standard levels approximately 10 times more stringent than the 2014 levels.

OFFRD-03 – MORE STRINGENT EXHAUST STANDARDS FOR OFF-ROAD RECREATIONAL VEHICLES: New emission standards and accelerated fleet turnover are proposed to reduce emissions from this category. Off-road motorcycles and all terrain vehicles (ATV) must meet a standard that was promulgated in 1994. This measure would propose that new standards be adopted based on catalyst technology, and incentives be developed to accelerate fleet turnover such that by 2014 the fleet average meets the new standard. By 2021, it is assumed that new emission standards approximately 10 times more stringent than those in place in 2014 are adopted and incentives are in place to accelerate fleet turnover to ensure that the average fleet emission level meets or exceeds the new emission standard levels.

OFFRD-04 – EVAPORATIVE STANDARDS FOR RECREATIONAL VEHICLES AND PLEASURE CRAFT: Some vehicles or vessels in the off-road recreational vehicle and the pleasure craft categories need to meet or will soon be required to meet evaporative emission control standards. However, technology exists that could provide additional reductions. This measure proposes through retrofit, incentives, and regulation, to reduce evaporative emissions by 45% in 2014 and 90% in 2020. More stringent evaporative controls are proposed which will include methods for controlling permeation and venting emissions from off-road recreational vehicles such as motorcycles and all-terrain vehicles (ATVs) and from pleasure craft including personal watercraft, outboard motors, and inboard/sterndrive boats.

OFFRD-05 – FURTHER EMISSION REDUCTIONS FROM LOCOMOTIVES: This measure calls for all locomotives operating in the Basin to meet Tier 3 equivalent emissions by 2014. In addition, the measure proposes that all locomotives moving in and out of the twin ports in the Southern California region to be equipped with Tier 3-equivalent controls by 2011. Existing technologies can reduce oxides of nitrogen and particulate matter emissions by over 90 percent.

OFFRD-06 – CLEAN MARINE FUEL REQUIREMENTS FOR OCEAN-GOING MARINE VESSELS: This measure would require all ocean-going vessels to use 0.2 percent sulfur content marine distillate fuels beginning in 2008. Ocean-going vessels would be required to switch to the cleaner fuel when traveling within 40 nautical miles of Point Fermin.

OFFRD-07 – FURTHER EMISSION REDUCTIONS FROM OCEAN-GOING MARINE VESSELS AND HARBOR CRAFT WHILE AT BERTH: This control measure would require ocean-going vessels and harbor craft to use shore-side power or other equivalently clean alternative technology while at berth. It is envisioned that a specific number of berths can be equipped with shore-side power by 2014 and a majority of the berths will provide shore-side power by 2020.

OFFRD-08 – FURTHER EMISSION REDUCTIONS FROM CARGO HANDLING EQUIPMENT: This control measure seeks additional emission reductions from cargo handling equipment beyond the state regulation. This measure would implement the proposed San Pedro Bay Ports Clean Air Action Plan beyond the five year horizon of the

Clean Air Action Plan. The Plan calls for accelerated turnover of existing equipment with engines that meet 2007 or 2010 on-road emissions standards or Tier 4 off-road emissions standards.

OFFRD-09 – VESSEL SPEED REDUCTION: This measure would implement a 12 knot speed limit to ocean-going vessels traveling within 40 nautical miles of Point Fermin. A majority of ocean-going vessels are currently complying with a 12 knot speed limit within 24 nautical miles on a voluntary basis. Implementation of the proposed measure would further reduce oxides of nitrogen emissions.

OFFRD-10 – FURTHER EMISSION REDUCTIONS FROM OCEAN-GOING MARINE VESSELS: This measure seeks further emission reductions of oxides of nitrogen or particulate matter from ocean-going vessels and harbor craft. Current technologies such as advanced slide valve designs can provide immediate emissions benefits on the order of 30 percent. Combining this technology with other control technologies such as water injection can lead to greater than 50 percent reduction in oxides of nitrogen emissions.

OFFRD-11 – EMISSION REDUCTIONS FROM AIRCRAFT: This measure calls for the federal government to establish more stringent emissions standards for aircraft engines. In addition, recent research in fuel reformulation could lead to cleaner aviation fuels that would result in additional emission reductions.

OFFRD-12 – LOWER EXHAUST AND EVAPORATION STANDARDS AND FLEET MODERNIZATION FOR LAWN AND GARDEN EQUIPMENT: With over 6 million pieces of lawn and garden equipment in the South Coast region, there exist many options to continue reducing emissions from this category. Through an appropriate mix of more stringent exhaust and evaporative standards and incentives for accelerated fleet turnover as well as electrification, a 25% reduction in NOx and VOCs are proposed by 2014. Following similar strategies through to 2020, an additional 25% reduction is assumed for year 2020.

OFFRD-13 – EMISSION REDUCTIONS FROM AIRPORT GROUND SUPPORT EQUIPMENT: This measure would seek emission reductions from airport ground support equipment primarily through electrification. In addition, equipment that could not be electrified would be required to use cleaner fuels or be repowered.

CONS-01 – FURTHER EMISSION REDUCTIONS FROM CONSUMER PRODUCTS: Consumer products include products such as detergents, polishes, cosmetics, hairsprays, and disinfectants that are used primarily by household and institutional consumers. Consumer products represent a significant source of VOC emissions in the Basin. Although existing regulations for consumer products have reduced projected emissions from this category, VOC emissions from this category are estimated to be about 108 tons per day, or 18% of the total VOC inventory in the Basin in 2014. Under Health and Safety Code 41712, CARB has the authority and responsibility to achieve the maximum technologically and commercially feasible VOC emission reductions from consumer products. However, CARB is prohibited from eliminating a product type (e.g., mode of dispensing). The proposed measure seeks to achieve about 30% reduction by 2014 and 50% reduction by 2020. The 2020 reduction target is incorporated as part of the long-term Control Measure LTM-01 (Reactivity-Based Controls).

LONG-TERM CONTROL STRATEGY [(182)(E)(5) MEASURES OR "BLACK BOX"]

In order to demonstrate attainment of the 8-hour ozone standard, long-term emission reductions above and beyond those achieved from short-term and mid-term measures by the District, CARB, and SCAG are required by the 2020/2023 timeframe. Although the PM2.5 strategy would provide continuous progress in improving the ozone air quality, additional long-term VOC and NOx reductions are needed for full ozone attainment. Long-term reductions are primarily based on long-term measures that anticipate the development of new control techniques or improvement of existing control technologies. The federal Clean Air Act (CAA) Section 182(e)(5) specifically authorizes the inclusion of such long-term measures for extreme ozone nonattainment areas – these measures are often referred to as the "black box." The size of the black box is based on the difference between the final attainment target (carrying capacity) for each pollutant and the emissions remaining after the implementation of short-term and mid-term control measures.

Although the South Coast Air Basin is classified as a "severe-17" non-attainment area for the 8-hour ozone standard with an attainment date of 2021, the federal regulation allows such regions to request for a bump up to "extreme" classifications in order to be able to rely on 182(e)(5) measures for demonstrating attainment The District will likely consider this option because of the magnitude of additional reductions required for attainment not achievable through existing pollution control approaches. The new attainment date under the "extreme" classification will be 2024 with necessary reductions achieved by 2023.

Achieving the reductions ascribed to the black box by the 2021/2024 attainment deadline will pose a tremendous challenge to the agencies, businesses, and residents of California. Based on the latest emission inventory and modeling analysis, the overall reduction targets for meeting the 8-hour ozone standard are 300 tons per day of VOC and 286 tons per day of NOx in 2021(or 2024).

The Draft 2007 AQMP's long-term strategy builds upon the long-term reductions associated with the implementation of short- and mid-term control measures or actions proposed by the District, SCAG, and CARB. For achieving the remainder of reductions needed for attainment, the long-term strategy primarily relies on long-term control measures based on new advanced technologies or significant improvement of existing technologies which cannot be specifically defined at this time (i.e., "black box"). After implementation of the short-term and mid-term control measures, the size of the black box is estimated to be 135 tons per day of VOC and 40 tons per day of NOx reductions.

The following sections describe the long-term strategy proposed by the District for stationary sources as well as for the State and federal sources.

District's Portion of Long-Term Strategy – By 2020, emission sources under the District's jurisdiction account for 27% of VOC and 13% of NOx emissions in the Basin. Nevertheless, in view of the magnitude of the reductions required for attainment demonstration, the District is prepared to do its fair share of long-term measures to achieve additional reductions from stationary sources. These measures primarily rely on the development of reactivity-based reformulations for coatings, advanced controls for fugitive VOC sources, and long-term reductions from the RECLAIM Program (e.g., efficiency improvements. Specifically, the District is proposing the following long-term measures:

LTM-01	Reactivity-Based Controls
LTM-02	Further Emission Reduction from NOx RECLAIM Facilities
LTM-03	Long-Term Measure for Fugitive Emissions

For the purpose of this Draft 2007 AQMP, the District's long-term reduction target associated with Control Measures LTM-01 and LTM-03 is estimated at 32 t/d of VOC in 2020. Control Measure LTM-01 is proposed to be implemented by the District for the architectural coatings and miscellaneous coatings and solvent categories and by CARB for consumer products. The long-term emission reductions from Control Measure LTM-02 are not quantified at this time. For the Final 2007 AQMP, the District will refine its long-term reduction commitment to incorporate any revisions to the emissions inventory, air quality modeling analysis, and carrying capacity. A brief description of the District's long-term measures is presented below. Appendix IV-A provides a more detailed description of these measures.

LTM-01 – REACTIVITY-BASED CONTROLS (VOC): Under this control measure, the District is proposing to further reduce the air quality impacts of the VOC-containing materials by reducing the overall reactivity of these materials. The proposed measure would require architectural coatings and miscellaneous coatings and solvent categories to be formulated with a minimum 50 percent by volume acetone reactivity-equivalent materials beginning in 2015 or achieve equivalent mass reductions of about 24 tons per day by 2020.

LTM-02 – FURTHER EMISSION REDUCTION FROM NOx RECLAIM FACILITIES (NOx): The proposed measure is separated into two implementation phases. Under Phase I, beginning in 2008 the RECLAIM allocations will be reduced to offset potential emission increases due to the introduction of natural gas with a Wobbe Index greater than 1360 (See Control Measure CMB-04 for details). Phase II addresses the potential reduction of NOx emissions due to evolving BARCT in the next 10 to 15 years and any BACT installations due to RECLAIM NSR requirements.

LTM-03 – LONG-TERM MEASURE FOR FUGITIVE EMISSIONS (VOC): The emission sources targeted under this control measure include a variety of fugitive emissions from gasoline dispensing facilities, petroleum refineries, chemical plants, and green waste composting. This control measure will be implemented in two phases. In the first phase, emissions data and characteristics for each source category will be developed and refined. Depending on the result of the assessment, specific control strategies will be developed for implementation in the second phase.

Any excess reductions achieved during implementation of the District's short-term and mid-term measures will also be credited toward the long-term commitment. Furthermore, permanent reductions in emission estimates due to improvement in inventory methodology are SIP creditable if the changes are approved by the AQMD Governing Board at its regularly scheduled public meetings.

In order to achieve the District's long-term emission reduction commitments, several mechanisms will be used by District staff to identify and implement new control strategies. These mechanisms described below include, but are not limited to: 1) Annual Technology Assessment Workshops; 2) Emissions Inventory Updates/Studies; 3) VOC Reactivity Studies; 4) Periodic BACT Evaluations, and 5) Collaboration with State Agencies on Concurrent Reductions. In addition to these mechanisms, advanced control technologies (mobile and stationary sources) and innovative control approaches (e.g., market incentive programs, localized controls), presented later in this Chapter, are also expected to play a major role in achieving the long-term reductions required for demonstrating attainment with the federal 8-hour ozone standard. A brief description of the above mechanisms is provided here:

(1) Annual Technology Assessment Workshops

The District will conduct annual technology assessment workshops with participation from a broader audience including consultants, technical experts, and other interested parties to identify the latest technology improvements and process changes which could lead to implementation of cost-effectiveness control strategies to further reduce VOC emissions. Potential control methods will include, but are not limited to near-zero or zero-VOC coating and solvent formulations and technologies (e.g., water-based, ultraviolet/electrobeam curing technologies, powder coatings), add-on controls, improved inspections and maintenance programs, and process modifications. Manufacturing processes identified through the enforcement of stationary source rules such as Rule 442 – Usage of Solvents, will also be used to identify potential control strategies.

(2) Emissions Inventory Updates/Studies

As part of the effort in identifying new source categories for potential controls, specific emission studies will be conducted to refine emission inventories. Any emission studies conducted that resulted in permanent emission reductions (relative to 2007 AQMP inventory) due to changes in inventory methodology or emission factor update, will be credited toward the District's SIP commitment for long-term measures. These changes will be approved by the AQMD Governing Board at a public meeting to allow public review and comments. Also, studies conducted as part of implementing the Annual Emissions Reporting (AER) Program (i.e., reviewing/auditing AER filings from large facilities) will be used to identify any new emission reduction strategies voluntarily implemented by facilities (for reducing annual emission fees) which may exceed the limits under the District's existing regulations.

(3) VOC Reactivity Studies

Studies conducted to evaluate the reactivity of VOC compounds will lend support to the possibility of using low-reactivity-based products for incorporation into future rule development for further VOC reductions.

(4) Periodic BACT Evaluations

BACT evaluations will be conducted periodically to identify new control strategies that may result from add-on controls or process changes for existing sources.

(5) Collaboration with State Agencies on Concurrent Reductions

The District will work closely with State agencies responsible for implementing global warming strategies (i.e., CARB, California Energy Commission, Public Utilities Commission) to quantify concurrent emissions reductions of criteria pollutants associated with strategies for stationary and mobile sources.

New control measures identified through any of the above five mechanisms will be reported to the Governing Board in December of every year, as part of the District's Annual Rule and Control Measure Forecast Report. This report will also provide a preliminary estimate of the expected emission reductions from each newly identified measure along with the proposed rule adoption calendar. Furthermore, in January of each year, District staff will provide a summary of the emission reductions achieved through adoption of the control measures by the Governing Board in the previous year(s) to track the performance of its SIP commitment.

The District is committed to continue actively seeking cost-effective and technically feasible control measures. Once these measures are identified, they will be adopted and implemented as early as practicable while meeting all public notification requirements. The reductions achieved in aggregate would then be used first to satisfy the District's short-term commitment, if there is a shortfall – otherwise, the District's long-term SIP commitment. Any excess reductions achieved would be contributed to the State/federal long-term reduction goals. However, it bears repeating that all source categories should produce their fair share of cost-effective emission reductions.

District staff's Recommended State and Federal Portion of Long-Term Strategy – To support attainment of the federal 8-hour ozone standard in the South Coast Basin, the state and federal governments have the responsibility to further reduce emissions from sources under their jurisdictions. These sources, namely on-road and off-road mobile sources and consumer products, account for 73% of VOC emissions and 86% of NOx emissions in 2020. Therefore, significant long-term emission reductions from these sources will still be required through new technological advancements and or early fleet turnover and improvement of existing mobile source control technologies and consumer products strategies (e.g., reformulation, product replacement). The long-term reduction target for these sources is estimated to be 103 tons per day of VOC and 40 tons per day of NOx based on the implementation of the following three long-term control measures. However, CARB could consider any combination of long-term measures in the final AQMP which are capable of achieving equivalent emission reductions needed for attainment.

LTM-01 – REACTIVITY-BASED CONTROLS (VOC): Under this control measure, additional VOC reductions will be sought from consumer products by reducing the overall reactivity of these products. The proposed measure would require consumer products to be formulated with a minimum 50 percent by volume acetone reactivity-equivalent materials beginning in 2015 or achieve equivalent mass reductions of approximately 56 tons per day by 2020.

LTM-04 – CONCURRENT REDUCTIONS FROM GLOBAL WARMING STRATEGIES (ALL POLLUTANTS): Achieving the AB32 greenhouse gas reduction targets would require significant development and implementation of energy efficiency technologies and extensive shifting of energy production to renewable sources. In addition to reducing GHG emissions, such strategies would concurrently reduce emissions of criteria pollutants associated with fossil fuel combustion. This long-term measure proposes to quantify the concurrent emission reductions associated with Statewide GHG programs targeted at stationary and mobile sources in the Basin working with various state agencies. Emission reductions from these programs will be applied toward the long-term reduction targets for meeting the federal ozone standard by 2021 (or 2024). The District will continue to collaborate with various State agencies in quantifying the concurrent combustion emission reductions. The control measure assumes a 15% reduction of emissions from all combustion sources by 2020.

LTM-05 – FURTHER VOC REDUCTIONS FROM MOBILE SOURCES – Under this long-term control measure, CARB will achieve further VOC reductions from various on-road and off-road mobile source categories by 2020 beyond the reductions achieved through the short-term control measures based on the implementation of various control strategies (e.g., accelerated vehicle and equipment turnover, retrofits).

CARB should establish a formal process to examine the universe of source categories for which the State has jurisdiction to determine how additional reductions can be achieved to satisfy the remainder of the long-term commitment. The examination should also include approaches that require federal participation and implementation to meet reduction goals.

Table 4-7 contains an initial list of the District's recommended approaches for CARB to consider in identifying suitable long-term measures. The proposed approaches illustrate the types of aggressive strategies which are needed from mobile sources and consumer products given the significant level of emission reductions required for attainment in the Basin. CARB should also solicit additional proposals for innovative control concepts from the public and conduct technical workshops to further explore promising ideas. CARB has indicated that it will identify the remaining measures needed to fulfill the long-term commitment in an expeditious manner, and to commit to adopt such measures by the earliest feasible date and implement them prior to the beginning of the ozone season in 2021/2024.

TABLE 4-7
Additional Recommended State and Federal Long-Term Control Approaches

Light/Medium Duty Vehicles	▪ Extensive retirement of all high-emitting vehicles and accelerated penetration of PZEVs and ZEVs
Smog Check	▪ Expanded parts replacement program
On-Road Heavy Duty Vehicles	▪ Expanded modernization and retrofit of heavy-duty trucks and buses ▪ Advanced Cargo Transportation Technologies
Off-Road Vehicles	▪ Expanded modernization and retrofit of off-road equipment
Marine Vessels	▪ More stringent emission standards and programs for new and existing ocean-going vessels and harbor craft
Aircraft	▪ More stringent emission standards for jet aircraft (engine standards, clean fuels, retrofit controls)
Locomotives	▪ More stringent emission standards for new and remanufactured line-haul and switcher locomotives
Pleasure Craft	▪ Accelerated replacement and retrofit of high-emitting engines
Lawn and Garden Equipment	▪ Extensive replacement of existing residential and commercial equipment with electric models
Fuels	▪ Extensive infrastructure for zero emission vehicles – electric, fuel cell, hydrogen
Consumer Products	▪ Extensive product reformulations toward ultra low or zero-VOC products and product replacements
Pesticides	▪ Pursue approaches to further reduce emissions from pesticides

Advanced Technologies

The proposed attainment strategy will require an aggressive development and commercialization of advanced mobile and stationary source control technologies. In addition, significant use of new and advanced technologies into in-use applications is critical if the additional reductions are to be realized by 2020.

Some of the advanced technologies and innovative control approaches which may be relied on to achieve the additional emission reductions, needed for attainment demonstration, are briefly described below.

Fuel Cells

Fuel cells are electrochemical devices that convert hydrogen and oxygen directly into electricity and water with little or no pollutant emissions. Most fuel cell systems use ambient air as the oxygen source, and the hydrogen fuel is either provided directly to the fuel cell or produced first from a fossil fuel (e.g. natural gas or methanol). The process of producing hydrogen from a fossil fuel is termed "reforming" and can be done external to the fuel cell or internally within the stack, such as with the high temperature molten carbonate fuel cells. Fuel cells are similar to batteries in that both offer zero or near-zero emissions, high efficiency, responsive power, few moving parts, and low noise. A battery, however, is an energy storage device and can only provide power until its reservoir of stored chemical reactants is spent, at which point it must be recharged. Fuel cells, on the other hand, are energy conversion devices which can provide power as long as the fuel and oxidant are provided. Although fuel cells have been around for decades, the major hurdles affecting their commercialization are their high (but improving) cost of production, fueling infrastructure (for mobile applications), and reliability and durability.

The U.S. Department of Energy (DOE) adopted the Freedom Car Program in January 2002 to accelerate the introduction and commercialization of fuel cell vehicles. Additionally, the District's Technology Advancement Office program has played a leading role toward addressing these issues and expediting the commercialization of fuel cells for both mobile and stationary applications. For example, the District is contributing resources to support both the California Fuel Cell Partnership ("Partnership") and the California Stationary Fuel Cell Collaborative ("Collaborative"). The goals of both statewide initiatives are to advance the deployment and commercialization of fuel cell technologies for clean air and efficiency benefits engendered by the technology. Both the Partnership and the Collaborative seek to form alliances between government agencies and industry to the benefit of California residents. The District has also participated in the development of the California Hydrogen Network Blueprint Plan and continues to provide input as the plan is being implemented. This coordinated effort has resulted in OEM announcements of deploying hundreds of fuel cell vehicles by 2010.

In addition, the District has been proactive in establishing demonstration projects for the advancement of stationary fuel cells in California. In 2004, the Governing Board awarded two contracts to install two-250 kW molten carbonate fuel cell units at TST-Timco metal foundry in Fontana. This is part of an effort to deploy multiple fuel cell units in industrial/commercial applications to capitalize on the heat recovery potential of these higher temperature fuel cell technologies. The fuel cell units at TST-Timco have been in operation since Spring 2006. Demonstrating fuel cells in these industrial/commercial settings, where high efficiency and economical operation are demanded, will provide excellent opportunities to identify optimum performance scenarios. These data can then be used by other industries to select the most appropriate fuel cell technology for deployment.

The District is developing and demonstrating an integrated hydrogen production, storage, and fuel cell power facility located at the AQMD's Diamond Bar headquarters. Currently, hydrogen is produced renewably using an electrolyzer powered by an upgraded solar array; the hydrogen is used for fueling hybrid internal combustion engine (ICE) vehicles and fuel cell vehicles, and can be used to fuel an ICE generator for backup and premium power. The AQMD is also considering adding an energy station, which is a stationary fuel cell coupled with hydrogen production for vehicle fueling. This demonstration project exemplifies the required technology integration for a near-zero emission hydrogen economy. The engineering, operational, and economical integration scenarios will be addressed to provide data for key decision makers. All of these types of projects will help assess the different fuel cell technologies in realistic situations and advance the commercialization of truly viable products.

Hybrid-Electric Vehicles and Advanced Batteries

Hybrid electric systems can vary significantly in their design configurations as well as components. Hybrid electric vehicles (HEVs) are typically either parallel or series systems, but the variety of designs is increasing. Engines of various sizes can either drive a generator to charge the batteries or provide power directly to the wheels or both. The batteries can provide primary power to the traction drive motor or supplement the internal combustion engine (ICE). The major automobile manufacturers have been actively developing and commercializing HEVs with the objective of meeting the CARB LEV II regulations, which provide mechanisms for technologies other than battery electric and hydrogen fuel cells to earn partial ZEV credits.

Innovative approaches to HEV systems are also under development that could improve performance, fuel efficiency, and reduce emissions relative to the first HEVs commercially introduced. Innovations that may be considered for demonstration include: advancements in the auxiliary power unit, either ICE or other heat engine, especially using alternative fuels including natural gas and hydrogen; battery-dominant hybrid systems utilizing off-peak re-charging; and non-conventional light-duty and medium-duty HEVs including delivery vans, shuttles, and other medium-duty vehicles.

Of particular interest are HEV strategies that can plug in to an ordinary wall socket to recharge the larger battery pack, enabling the vehicle to operate on battery-only for several miles with the engine coming on just as needed to sustain the batteries. This type of "plug-in" HEV can provide true zero-tailpipe emissions for a portion of the driving cycle but can also make extended trips by refueling quickly with gasoline or other fuel.

One major OEM has partnered with AQMD and others to demonstrate prototype plug-in hybrid vans with up to 20 miles electric range.

The District has also been involved in the development and demonstration of energy storage systems for electric and hybrid-electric vehicles, including lead acid, nickel-cadmium, and lithium-ion (Li-Ion) battery packs. Lead acid batteries continue to be preferred for low speed vehicle applications and serve as cost-effective energy storage as well as counterweight for electric forklifts. Over the past few years, additional technology consisting of nickel sodium chloride and lithium manganese batteries have been used in light- and heavy-duty applications. NiMH batteries have been deployed in most gasoline fueled passenger hybrid vehicles from major OEMs, but increasing competition for nickel in the production of stainless steel has increased the cost of all nickel containing products. Commercialization of Li-Ion advanced batteries for consumer electronics and power tools may help increase production volumes and reduce the cost for these batteries, enabling Li-Ion power batteries to replace NiMH in many hybrid vehicle applications. A variety of Li-Ion battery designs are in development to optimize power, energy, life, and cost/weight reductions for safe implementation in vehicles.

Other technology providers are developing alternative energy storage devices, including ultracapacitors, flywheels and hydraulic systems. Flywheel systems can capture the kinetic energy from internal combustion engines, microturbines, and regenerative braking systems, store the energy, and then re-release the energy to provide electric power. Hydraulic energy storage systems are available in various forms. Typically, these systems can store retardation energy and provide this energy as a secondary source of propulsion, especially during acceleration. These hydraulic hybrid systems have shown significant fuel economy benefits in refuse truck applications. Both energy storage systems can be retrofitted into existing platforms to significantly increase fuel economy, especially in medium- and heavy-duty vehicles with frequent stopping in urban environments.

Goods Movement Related Sources (Marine Vessels, Portside Equipment, Locomotives, and On-Road Vehicles)

Marine vessels and portside equipment, which primarily run on diesel fuel, contribute a significant portion of NO_x, PM10, greenhouse gas and toxic emissions particularly in coastal regions and in and around shipping ports. However, implementation of the cost-effective District and CARB programs has resulted in significant emission reductions through incentive programs such as RECLAIM Executive Order Emissions Mitigation, RECLAIM AQIP, Rule 2202 AQIP, Carl Moyer, and State Emissions Mitigation programs. The primary emission reduction technologies are outlined below.

Replacement with Cleaner Technologies/Equipment
Replacement existing older trucks and cargo handling equipment (CHE) with new models offers major opportunities for NOx and PM emission control. The District, CARB, Ports of Los Angeles and Long Beach, and Gateway Cities are involved in implementing fleet modernization and expansion programs, and one segment of the program involves the use of natural gas drayage trucks at the ports. Existing diesel CHE can be replaced with cleaner technologies using on-road diesel or alternative fueled engines. Relative to ocean-going vessels, new ships that are cleaner than the International Maritime Organization (IMO) emission standards could be routed to South Coast marine ports. This approach is adopted in CARB's Goods Movement Emission Reduction Plan and is being considered for the San Pedro Bay Ports Clean Air Action Plan. Existing diesel locomotives could be replaced with hybrid (Green Goat type) locomotives, alternative fueled locomotives, or fuel cell locomotives in the future.

Retrofit with Cleaner Technologies
Retrofitting trucks, CHE, locomotives, and marine vessels with diesel particulate filters (DPF), selective catalytic reduction (SCR), diesel oxidation catalyst (DOC), and emulsified fuel offer significant emission reduction opportunities. In Europe, DPFs are being used on locomotives and NOx reductions are achieved on ocean-going vessels through the use of SCR and water emulsification technologies. Water emulsification and slide valves are cost effective approaches to reduce oxides of nitrogen and particulate matter from ocean-going vessels.

Another alternative is to use SCR and DPF in stationary units and direct the emissions of the idling locomotives and marine vessels into the cleanup apparatus through a "bonnet" system. Advanced Cleanup Technologies, Inc. has developed this technology and successfully demonstrated the system at the Roseville Railyard in partnership with CARB, the District, and Union Pacific. This technology will also be applied at the Port of Long Beach in 2007. Both the on-road and stationary SCR systems offer the potential for greatly reducing NOx and PM by up to 90%.

Use of Alternative Fuels and Other Cleaner Fuels
Significant oxides of nitrogen and particulate matter emission reductions have been associated with the use of alternative fuels such as natural gas, liquid petroleum gas (LPG), emulsified diesel, or biodiesel (as long as any associated oxides of nitrogen emission increases are mitigated) wherever possible in on-road heavy-duty vehicles, CHE, locomotives, and marine vessels. Alternatives to diesel such as gas to liquids (Fisher-Tropsch Diesel) and Di-Methyl Ether (DME) can also reduce NOx and PM emissions. The use of biodiesel can also have beneficial impacts relative to PM reductions. Depending upon the biodiesel blends, increased NOx emissions may be mitigated through fuel borne additives. CARB recently adopted a regulation requiring the use of 0.5% sulfur marine distillate fuels in auxiliary engines when marine vessels are

within 24 miles of the California coastline. Maersk, one of the largest cargo shipping lines, announced in 2006 that they will be using a 0.2% marine distillate fuel immediately.

For light-duty vehicles, greater attention has been given to E-85 fuel to reduce dependency on petroleum fuel. Presently, auto manufacturers only manufacture flexible fuel vehicles that operate on either gasoline or E85. However, encouraging greater use of E85 fuel would result in additional emission benefits.

Electrification of goods movement related vehicles and equipment should also be considered. Electrification of the infrastructure at the ports and the Alameda Corridor can significantly reduce emissions from on-road trucks and locomotives. Providing shore-side power for marine vessels while at berth will also greatly reduce the emissions that would otherwise result from hotelling.

Advanced Transportation Infrastructure

Advanced container transportation systems such as Maglev or other linear induction technologies could be used to transfer containers from the ports to "distant" intermodal facilities thereby significantly reducing emissions from on-road trucks and locomotives. A test Maglev track capable of moving 20-foot cargo containers, built by General Atomics, is in operation in San Diego. The Texas Transportation Institute has proposed a "Freight Shuttle System" using linear induction motors to move cargo containers between the ports and inland facilities. The Maglev and Freight Shuttle System approaches also reduce noise pollution and fugitive dust. On-dock container loading onto locomotives instead of moving containers by trucks to an interim intermodal site can also reduce significant amounts of emissions from on-road trucks. Emission reductions from on-dock container loading can be further enhanced/increased with the use of automated crane systems operating on electricity or incorporating cleaner advanced control technologies.

Advanced Engine and After-Treatment Technologies

With the introduction of low-sulfur diesel, many emission control technologies that were not otherwise possible with conventional diesel fuel are now being planned for use in diesel engines. These technologies include diesel particulate filters (DPFs), diesel oxidation catalysts (DOCs), exhaust gas recirculation (EGR), improved fuel injection and electronics, and improved air handling (variable geometry turbochargers). Most on-road diesel engines starting in 2007 will have DPFs and EGR.

Heavy-duty engine technologies are also under development to meet the 0.2 g/bhp-hr NO_x standard for 2010 models. These include lean NO_x absorbers, selective catalyst reduction (SCR), lean NO_x catalysts, advanced fuel injection, and more powerful electronics. For natural gas engines, additional technologies include advanced natural-gas direct-injection systems, three-way catalysts (TWC) with stoichiometric combustion, and electronically controlled engine valves ("throttleless" engine). These technologies will enable heavy-duty engines to operate with very low emissions while retaining good performance and acceptable fuel economy. Two major natural gas engine manufacturers announced their intentions to have natural gas engines certified to 2010 emissions standards as early as 2007. Once these technologies are adopted on new engines and vehicles, they have the capability to achieve even lower emissions as the technologies mature. Future emission performance includes reduced deterioration, possible ULEV- or SULEV-type emissions (0.05 g/bhp-hr NO_x or lower), zero air toxics, and better fuel economy.

The reduction in heavy-duty emissions can be multiplied by incorporating these low-emission engines into hybrid vehicles. Such vehicles use two propulsion schemes: a low-emission engine and auxiliary propulsion such as an electric drive system, or a low-emission engine with hydraulic pump and pressure storage system. In addition to propelling the vehicle, the auxiliary systems are used to store energy normally lost during braking and re-use this energy to propel the vehicle, reducing both emissions and fuel consumption. With new heavy-duty engine technologies, natural-gas hybrid vehicles have the capacity to achieve near-zero emissions, as low as fuel cell vehicles with onboard fuel reforming.

Renewable Power Generation Technologies

Renewable power generation technologies such as solar and wind electric power generation technologies may also play a role in long-term attainment strategies. The District will evaluate the application of renewable power generation technologies through market incentive programs in order to achieve additional emission reductions (e.g., area source credit rule). Future market incentive programs will focus on renewable power generation technologies used in residential and commercial applications.

Other possible strategies for increasing the penetration of renewable power generating technologies include encouraging solar and wind turbine use where applicable. Examples of possible renewable energy applications include powering electric motors used to run agricultural pumps with wind energy and utilizing solar panels in the residential and commercial sectors. The District has provided incentive money to convert diesel powered agricultural pumps to electric motors. The eastern portion of the district may have sufficient wind resources such that these electric motors could be cost-effectively driven by wind energy.

For the last few years, there have been substantial incentives available from California Public Utilities Commission and California Energy Commission to install solar panels on private residential rooftops. These incentives have been heavily utilized by the commercial sector, but those for the residential sector remain substantially unused, due to lack of awareness by the public. While LADWP is vigorously advertising the availability of their incentives, other energy providers have done less in this regard. The District can possibly promote and, depending on the availability of funds, leverage the incentives for rooftop solar panels currently available from other public agencies.

The District has also recently augmented its current 20 kW solar array with an additional 80 kW system consisting of 344 semi-crystalline solar panels. The 100 kW of solar energy is used to help offset the District's electrical load while also providing an educational opportunity with a computer kiosk in the headquarters main lobby to show visitors the real-time benefits of solar power.

The District is also investigating renewable fuels, including biodiesel, ethanol, and gas-to-liquids. All of these projects are being conducted to ensure the air quality emissions are not increased when using these fuels. The District is keenly interested in reducing both greenhouse gas emissions and petroleum use, but not at the expense of addressing criteria pollutants.

<u>Advanced Low-VOC Technologies</u>

VOC emissions from stationary sources result primarily from the use of VOC containing materials such as coatings, inks, adhesives and cleaning solvents. The VOC-containing materials are used in a wide variety of industries which include: manufacturing and coating of metal, wood, plastic, and other products; printing operations such as lithography, flexography, screen printing, gravure and letterpress; cleaning operations at repair and maintenance facilities; and numerous industries where adhesives are used.

Some of the advanced low-VOC alternative technologies developed by the industry include: waterborne technologies, radiation-curing technologies, and high solids, powder coating technologies, and exempt solvent-based formulations.

<u>Waterborne Technology</u>

One way of eliminating VOC emissions is to replace solvent-based products with waterborne products. Typical solvent-based products are comprised of resins and solids dissolved in the solvent, which evaporates and leaves behind the pigment and resin to form the dried film. With waterborne products, the resins are dissolved in water, but typically dry to a non-water soluble film upon the substrate. Waterborne products also contain some VOCs, which work as a coalescent, provide resin stability, and help achieve certain desirable properties for application. Waterborne technology is quite advanced in most chemistry types, with recent research being done to minimize the amount of solvent or to attempt to switch to the non-HAP (Hazardous Air Pollutant) solvents.

The drying properties of waterborne products are more sensitive to ambient temperature and humidity characteristics, as compared to their solvent-based counterparts. The newer resin chemistries and formulations offer many advantages, which include lower VOC emissions, reduced fire hazards, increased worker safety, lower odor, ease of application, and easy cleanup. Waterborne technology has been successfully used in automotive refinish, wood refinishing, industrial maintenance, architectural and marine coatings; flexographic, screen and gravure printing; adhesives, and cleaning solvents. Overall performance studies completed to date indicate equivalent or superior performance compared to their higher-VOC solvent-based counterparts.

Radiation-Curing Technologies
Radiation-curing products are liquids with low viscosity that are 100 percent solids. The main difference between traditional solvent-based products and radiation-curing products is the curing mechanism. Radiation-curing products do not dry in the sense of losing solvents to the atmosphere as is the case with solvent-based products. Instead, when radiation-curing products are exposed to radiation, a polymerization reaction starts which converts the liquid to a hard, tough, cured solid film in a fraction of a second. This process typically results in significantly lower VOC emissions compared to solvent-based products. The most common radiations used to cure the products are ultraviolet light (UV) and electron beam (EB). The UV-curing products need a chemical called photoinitiator, which initiates the polymerization (curing) process when exposed to UV-light. The EB-cured products do not contain photoinitiators and are cured when the electrons generated with the EB equipment react directly with monomers and polymers in the liquid product.

Due to almost instant curing of these products, the concept of drying time is eliminated which allows any post-application operation to commence immediately or in-line. Other advantages include the attainment of very high gloss levels, reduction of VOC emissions and solvent odors, and reduced energy consumption. UV and EB-curing products can be used on virtually all substrates, from metal and wood to glass and plastic. Applications of UV and EB-curing products are numerous and proliferating rapidly. Examples include: paper, furniture, automotive components, no-wax flooring, credit cards, packaging, lottery tickets, golf balls, eyeglass lenses, CDs, baseball bats, beer cans and hundred of other items. These technologies have also registered significant progress toward alleviating previous limitations in technology for field applications. UV applications are also making headway in automotive field repair, and efforts are underway for applying this technology for aerospace and military field uses.

High Solids Technology
Another way of reducing VOC emissions is to replace conventional low solids products with higher solids products, thus reducing VOC content. This requires product formulators to increase the solid content, while maintaining the important application and performance characteristics. The characteristics of higher and low solids products are significantly different. This makes the development of high-performance, higher solids products a more difficult formulating task than simply replacing the amount of solvent

used in low solids products. A higher solids content increases the viscosity and, in some cases, the surface tension, as well as affecting application and performance properties. While these increases can be minimized by the utilization of lower molecular weight polymers, they can be further reduced by the incorporation of a good solvent system into the formulation. The combination of reducing the molecular weight of the polymer and employing a balanced solvent system has contributed to the successful development of many of the commercial higher solids products in use today.

Powder Coating Technology

Powder coating is a 100 percent solid coating with virtually no VOC emissions. In a powder coating application process, dry paint particles are supplied to a spray gun where particles acquire electrostatic charge. The charged particles are sprayed and attracted to a grounded object and form a uniform layer of powder coating on its surface. The coating is then cured by applying heat.

Some of the benefits of this technology are: solvent-free systems, reduced fire risk and associated insurance costs, reduced waste disposal cost, good solvent and chemical resistance, flexibility and impact resistance. Due to these benefits, powder coatings have become popular with OEM baked coating markets, especially in the decorative market. This system also has limited application for field finishing.

Exempt Solvent Technology

Over the past ten years, the U.S. EPA exempted several solvents with low photochemical reactivity from consideration as a VOC. These exempt solvents are used to extend or replace many organic solvents, including toluene, xylene, mineral spirits, acetone, methyl ethyl ketone, tricholorethylene, and percholoroethylene. Acetone, para chlorobenzotrifluoride, and to a limited degree, tertiary butyl acetate, have been incorporated into coating, adhesive, and cleaning solvent formulations, and have contributed to significant reduction in VOCs as well as HAPs.

Innovative Control Approaches

Because of the significant level of reductions needed for attainment demonstration, innovative control approaches need to be explored which can be implemented in conjunction with advanced emission control technologies. Three innovative approaches including market incentive programs, reactivity-based controls, localized controls, and public awareness and education programs are briefly discussed here.

Market Incentive Programs

Since the adoption of the 1997/1999 SIP, the District has adopted several market incentive programs designed to offer stationary sources short-term compliance flexibility while at the same time incentivizing the introduction of low-emission mobile and area source technologies. In 2001, five pilot credit generation mobile and area source rules were adopted to allow generation of mobile source emission reduction credits (MSERCs) and area source credits (ASCs) that could be used as RECLAIM trading credits in the RECLAIM compliance program. A sixth pilot credit generation rule was adopted in 2002. The District has used collected monies from the Executive Order (EO) RECLAIM Mitigation Fee Program for power producing facilities to maximize the funding for low emission mobile and area source projects through the pilot credit generation programs. In turn, these programs have allowed RECLAIM sources to obtain short-term compliance with their RECLAIM allocations while long-term solutions to meeting their allocations are sought. Credit generated under these programs cannot be used past a specific year which in most cases is 2006; however, one rule has a 2010 deadline.

Market incentive programs can continue to play a key role in the development and penetration of low-emission technologies. These programs can be expanded by maximizing the funding sources (e.g., private funding) to provide monies to purchase low-emission technologies. Expansion of these programs will continue to provide short-term flexibility for stationary sources while also producing creditable emission reductions after emission reduction credits can no longer be used (i.e., 2006 – 2010). Thus, any emission reductions still occurring after the rule's specific deadlines may be credited toward the current and future SIP commitments.

Reactivity-Based Controls

Over the past two decades, regulations for coating and solvents have primarily focused on lowering the VOC content which has significantly reduced the VOC emissions from these categories. Reformulation of high-VOC compounds to low-VOC alternatives has resulted in substantial reductions in VOC emissions and improvement of ambient air quality. However, different chemicals used in coatings and solvents would exhibit different reactivity rates in forming ozone in the atmosphere. Therefore, because of the need to achieve additional VOC reductions for ozone attainment demonstration, reformulation based on lower reactive compounds needs to be evaluated and considered in future rulemakings for coatings and solvents in order to provide a viable compliance option. Further study would also be required to evaluate the reactivity of different compounds under various meteorological conditions.

Localized Controls

To complement the 2007 AQMP's overall control strategies, localized controls may also be considered to achieve reductions from specific areas which contribute to the exceedance of ambient air quality standards. In instances where the exceedances of the air quality standards are attributed only to emissions from a specific geographical area, it would be infeasible to develop region-wide regulations for the purpose of attaining the standard in a local area. For example, it appears that local PM10 sources in the eastern portion of the Basin are primarily responsible for the remaining exceedance of PM10 air quality in that area. Therefore, it would be more feasible and cost-effective to develop localized controls to achieve the necessary reduction rather than subject the entire Basin to additional regulations which would not benefit the attainment in the local area. For this local area, the District is proposing to establish a localized program through a cooperative effort with local agencies to reduce emissions from direct sources of PM. As the District nears the attainment dates for other federal air quality standards, localized controls may offer a more viable approach in meeting these standards.

Demand-Side Strategies

Demand-side strategies use differential pricing as a mechanism to influence consumer choice when purchasing or operating a product. Examples include charging higher fees for registering or purchasing a higher-emitting vehicle or a consumer product. Another example may include charging higher user fees for recreational boats for access to water ways unless their engines meet a low-emission standard. Charging a vehicle miles traveled (VMT) or emission-based fee for higher mileage and higher emitting vehicles, respectively, is another example. A pilot project could be considered as a way of initiating and evaluating this type of strategy. A task force could be convened to further explore and evaluate demand-side strategies. To improve public acceptance, these programs can be designed to be minimize the socioeconomic impacts on low-income residents of the Basin.

Public Awareness and Education Programs

The concept of public awareness and education programs is to educate consumers and select area and stationary sources about lower-emitting products and process alternatives. The District instituted a program called Clean Air Choice in 2003 to increase public awareness of the availability of low-emission motor vehicles. AQMD staff recruited voluntary support from new car dealerships in the four counties to place window stickers on new vehicles meeting the program's criteria for low emissions. The AQMD is in the process of refocusing the program on direct outreach to consumers and new car buyers.

A possible method to implement a similar concept relative to consumer products would be through a certification program for manufacturers. Manufacturers of consumer products that meet or exceed a specified emission limit would be eligible for a label certified by CARB or the AQMD that indicates that their product contains low or zero VOCs and is environmentally friendly.

For stationary and area sources, a series of public awareness programs could be established to educate facilities about control methods that would reduce emissions at their facility or business. Public awareness and education programs could include, but are not limited to, educational brochures, videos, articles, and workshops.

DISTRICT'S SIP EMISSION COMMITMENT

The SIP commitment of the 2007 AQMP is structured into two components: reductions from adopted rules and reductions from the 2007 AQMP control measures. Taken together, these reductions are relied upon to demonstrate expeditious progress and attainment of the federal PM2.5 and 8-hour ozone standards. The following sections first describe the methodology for SIP emission reduction calculations and the creditable SIP reductions, then describe what procedures will be followed to ensure fulfillment of the commitment.

SIP Emission Reduction Tracking

For purposes of tracking progress in emission reductions, the baseline emissions for the year 2014 annual average and 2020 planning inventory in the 2007 AQMP will be used, regardless of any subsequent new inventory information that reflects more recent knowledge. This is to ensure that the same "currency" is used in measuring progress as was used in designing the AQMP. This will provide a fair and equitable measurement of progress. Therefore, whether progress is measured by emission reductions or remaining emissions for a source category makes no difference. However, current emission inventory information at the time of rule development will continue to be used for calculating reductions, and assessing cost-effectiveness and socioeconomic impacts of the proposed rule. Therefore, for future rulemaking activity, both the current and AQMP inventories will be reported.

Any non-mandatory emission reductions achieved beyond the existing District regulations are creditable only if they are also SIP-enforceable. Therefore, in certain instances, the District may have to adopt regulations to reflect the existing industry practices in order to claim SIP reduction credit with the understanding that there may not be additional reductions beyond what has already occurred. Exceptions can be made where reductions are real, quantifiable, surplus to the 2007 AQMP baseline inventories, and enforceable through other State and/or federal regulations. Also, any emissions inventory revisions, which have gone through a peer review and public review process, can also be SIP creditable.

Reductions from Adopted Rules

A number of control measures contained in the 2003 AQMP have been adopted as rules. These adopted rules and their projected emission reductions become assumptions in developing AQMP's future year inventories. Although they are not part of the control strategy in the 2007 AQMP, continued implementation of those rules is essential in achieving clean air goals and maintaining the attainment demonstration. Table 1-2 of Chapter 1 lists the rules adopted by the District since the adoption of the 2003 AQMP and their expected emission reductions.

Reductions from District's Stationary Source Control Measures

For purposes of implementing an approved SIP, the District is committed to adopt and implement control measures that will achieve, in aggregate, emission reductions specified in Table 4-8 (short- and mid-term measures) as well as the long-term reductions (i.e., 32 t/d of VOC reductions). Emission reductions achieved in excess of the amount committed to in a given year can be applied to the emission reduction commitments of subsequent years. The District is committed to adopt the control measures in Table 4-2A and 4-2B unless these measures or a portion thereof are found infeasible and other substitute measures that can achieve equivalent reductions in the same adoption/implementation timeframes are adopted. Findings of infeasibility will be made at a regularly scheduled meeting of the District Board with proper public notification. For purposes of SIP commitment, infeasibility means that the proposed control technology is not reasonably likely to be available by the implementation date in question, or achievement of the emission reductions by that date is not cost-effective. The District acknowledges that this commitment is enforceable under Section 304(f) of the federal Clean Air Act.

Adoption and Implementation of District's Stationary Source Control Measures (Table 4-2A and 4-2B) – In response to concerns raised by the regulated community that costly controls may be required to meet the SIP obligations, the District establishes a threshold of $16,500 per ton of VOC reduction for tiered levels of analysis. Specifically, proposed rules with an average cost-effectiveness above the threshold will trigger a more rigorous average cost-effectiveness, incremental cost-effectiveness, and socioeconomic impact analysis. A public review and decision process will be instituted to seek lower cost alternatives. In addition, the District staff, with input from stakeholders, will attempt to develop viable control alternatives within the industry source categories that a rule is intended to regulate. If it is determined that control alternatives within the industry source category are not feasible, staff will perform an evaluation of the control measure as described in the next paragraph. Viable alternatives shall be reviewed by the District Governing Board at a public meeting no less than 90 days prior to rule adoption and direction given back to staff for further analysis. During this review process, incremental cost-effectiveness scenarios and methodology will be specified, and industry-specific affordability issues will be identified as well as possible alternative control measures. The District Governing Board may adopt the original or an alternative that is consistent with state and federal law. In addition, staff shall include in all set hearing items a notification that proposed rules do or do not exceed the cost threshold.

Adoption and Implementation of Alternative/Substitute Measures – Under the 2007 AQMP, the District will be allowed to substitute District stationary source measures in Table 4-2A with other measures, provided the overall equivalent emission reductions by adoption and implementation dates in Table 4-8 are maintained and the applicable measure in Table 4-2A is infeasible. In order to provide meaningful public participation, when new control concepts are introduced for rule development, the District is committed to provide advanced public notification beyond its regulatory requirements (i.e., through its Rule Forecast Report). The District will also report quantitatively on the AQMP's implementation progress annually at its regularly scheduled Board meetings. Included in the reports will be any new control measures being proposed or measures, or portions thereof, that have been found to be infeasible and the basis of such finding. In addition, at the beginning of the year, any significant emission reduction related rules to be considered would be listed in the Board's Rule Forecast Report. Upon finding of a new feasible control measure, rule development will be completed no later than 12 months from the adoption date of the control measure substituted, and implementation of the new measure will occur no later than two years from the final implementation date of the measure substituted. The existing rule development outreach efforts such as public workshops, stakeholder working group meetings or public consultation meetings will continue to solicit public input. In addition, if additional technical analysis, including source testing, indicates that actual emissions are less than previously estimated, the reductions would then be creditable toward SIP commitments. In order for reductions from improved emission calculation methodologies to be SIP creditable, a public review process will also be instituted to solicit comments and make appropriate revisions, if necessary.

TABLE 4-8

Short- and Mid-Term VOC, NOx, SOx, and PM2.5 Emission Reductions Commitment by AQMD to be Achieved Through Rule Adoption and Implementation

-2014/2020 Annual Average Inventory-

(Tons/Day)

Year	VOC		PM2.5		NOx		SOx	
	Based on Adoption Date	Based on Implementation Date[a]	Based on Adoption Date	Based on Implementation Date[a]	Based on Adoption Date	Based on Implementation Date[a]	Based on Adoption Date	Based on Implementation Date[a]
2007	---	---	0.7/0.7	---	---	---	3.0/3.0	---
2008	1.5/1.7	---	0.1	0.7	3.7/4.3	---	---	---
2009	3.7/4.1	---	0.2	---	1.0/3.5	---	---	---
2010	2.0/12.2	2.7	0.7/2.2	---	3.0/6.4	3.7	---	---
2011	---	1.2	---	---	---	---	---	---
2012	---	1.9	---	0.2	---	1.3	---	1.0
2013	---	0.7	---	0.2	---	1.3	---	1.0
2014	---	0.7	---	0.2	---	1.3	---	1.0
2015	---	1.7	---	0.2	---	0.9	---	---
2016	---	1.7	---	0.2	---	0.9	---	---
2017	---	1.7	---	0.2	---	0.9	---	---
2018	---	1.7	---	0.2	---	0.9	---	---
2019	---	1.7	---	0.2	---	0.9	---	---
2020	---	1.7	---	0.7	---	1.9	---	---
Total	**7.2/18.0**	**7.2/18.0**	**1.4/3.2**	**1.4/3.2**	**7.7/14.2**	**7.7/14.2**	**3.0/3.0**	**3.0/3.0**

[a] Represents the final, full implementation date; typically a rule contains multiple implementation dates.

OVERALL EMISSION REDUCTIONS

A summary of emission reductions for the proposed control measures for the years 2014 and 2020 is provided in Tables 4-9 through 4-11. These reductions reflect the emission reductions associated with implementation of control measures under local, State, and federal jurisdiction. Emission reductions represent the difference between the projected baseline and the remaining emissions. For 2014, Table 4-9 identifies projected reductions based on the annual average inventory for all criteria pollutants (VOC, NOx, CO, SOx, and PM2.5). It represents the level of emission reductions needed to achieve the federal PM2.5 standard. For 2020, Tables 4-10 and 4-11 identify projected reductions based on the summer planning inventory for VOC and NOx emissions and the winter planning inventory for CO and NOx emissions. Emission reductions by 2020 illustrate the extent of controls needed for achieving the federal ozone standard.

TABLE 4-9

Emission Reductions for 2014 Based on
Average Annual Emissions Inventory (tons per day)

Sources	VOC	NOx	CO	SOx	PM2.5
Year 2014 Baseline[1]	594	668	2772	70	98
Baseline Adjustment[2]	(5)	8	3	2	0
Emission Reductions:					
District's Short-Term and Mid-Term Control Stationary Source Control Measures	7	8	0	3	1
District Staff's Recommended State and Federal Stationary and Mobile Source Control Measures	135	231	267	46	13
Total Reductions (All Measures)	142	239	267	49	14
2014 Remaining Emissions	457	421	2502	19	84

[1] Emission benefits from SCAG's 2004 Regional Transportation Strategy and Control Measures are already reflected in the baseline for the draft AQMP. These emission benefits will be reflected in the final AQMP.

[2] Reflects baseline inventory adjustments for Rule 1118, emissions for the purpose of set-aside tracking (5 t/d VOC) and emission benefits from Carl Moyer Program (6.8 t/d NOx and 0.2 t/d PM2.5) and NSR Program benefits (1.2 t/d NOx). () denotes emission increases. See Appendix III.

TABLE 4-10

Emission Reductions for 2020 Based on
Summer Planning Inventory (tons per day)

Sources	VOC	NOx
Year 2020 Baseline[1]	599	531
Baseline Adjustment[2]	(5)	7
Emission Reductions:		
District's Short-Term and Mid-Term Control Stationary Source Control Measures	18	13
District Staff's Recommended State and Federal Stationary and Mobile Source Control Measures[3]	147	233
Long-Term Measures[4]	135	40
Total Reductions (All Measures)	300	286
2020 Remaining Emissions	304	238

[1] Emission benefits from SCAG's 2004 Regional Transportation Strategy and Control Measures are already reflected in the baseline for the draft AQMP. These emission benefits will be reflected in the final AQMP.

[2] Includes emissions for the purpose of set-aside tracking (5 t/d VOC) and emission benefits from Carl Moyer Program (6.3 t/d NOx) and NSR Program benefits (1.2 t/d NOx). () denotes emission increases. See Appendix III.

[3] Emission reductions from consumer products in 2020 are incorporated in the long-term measure for reactivity-based controls (LTM-01).

[4] Includes long-term reductions from LTM-01, LTM-03, LTM-04, and LTM-05. Emission reductions for LTM-01 are based on a 50% reduction in reactivity which is equivalent to about 80 tons per day of VOC reductions.

TABLE 4-11

Emission Reductions for 2020 Based on
Winter Planning Inventory (tons per day)

Sources	CO	NOx
Year 2020 Baseline[1]	2157	548
Baseline Adjustment[2]	3	7
Emission Reductions:		
District's Short-Term and Mid-Term Control Stationary Source Control Measures	0	16
District Staff's Recommended State and Federal Stationary and Mobile Source Control Measures	223	235
Long-Term Measures[3]	270	41
Total Reductions (All Measures)	500	292
2020 Remaining Emissions	1661	249

[1] Emission benefits from SCAG's 2004 Regional Transportation Strategy and Control Measures are already reflected in the baseline. These emission benefits will be reflected in the final AQMP.
[2] Reflects baseline inventory adjustments for Rule 1118, emission benefits from Carl Moyer Program (6.3 t/d NOx) and NSR Program benefits (1.2 t/d NOx). See Appendix III.
[3] Includes long-term reductions from LTM-04.

CHAPTER 5

FUTURE AIR QUALITY

Introduction

Modeling Approach

Future Air Quality

Summary and Conclusions

Basin Emissions Carrying Capacity (Emissions Budget)

INTRODUCTION

Air quality modeling is an integral part of the planning process to achieve clean air. As mentioned in Chapter 1, the submittal of the 2003 California Ozone SIP served as the ozone attainment demonstration for the South Coast Air Basin and those portions of the Southeast Desert Modified Nonattainment Area which are under the District's jurisdiction. The attainment demonstrations provided in this Draft Plan reflect the updated emissions baseline estimates, new technical information, enhanced air quality modeling techniques, and the control strategy provided in Chapter 4.

The Basin is currently designated nonattainment for PM2.5, and severe-17 nonattainment for ozone. These two pollutants PM2.5, and ozone - are linked to common precursor emissions. The District's goal is to develop an integrated control strategy which: 1) ensures that ambient air quality standards for all criteria pollutants are met by the established deadlines in the federal Clean Air Act (CAA); and 2) achieves an expeditious rate of reduction towards the state air quality standards. The overall control strategy is designed so that efforts to achieve the standard for one criteria pollutant do not cause unnecessary deterioration of another. A two-step modeling process has been conducted for the Draft 2007 AQMP. First, future year annual and 24-hour average PM2.5 is simulated to demonstrate attainment by 2015. The future year 8-hour average ozone emissions control strategy then builds upon the PM2.5 strategy to demonstrate attainment of the federal 8-hour average ozone standard in 2021. This two-step approach is consistent with the approach used in the 2003 AQMP to first demonstrate attainment in 2006 of the PM10 standard and subsequent attainment of the 1-hour average ozone standard in 2010.

During the development of the 2003 Plan, the District convened a panel of seven experts to independently review the regional air quality modeling conducted for ozone and PM10. The consensus of the panel was for the District to move to the more current state-of-the-art dispersion platforms and chemistry modules. The model selected for the Draft 2007 AQMP attainment demonstrations is the Comprehensive Air Quality Model with Extensions (CAMx) [Environ, 2002], using SAPRC99 chemistry. Moreover, this model and chemistry package is consistent with the previous advice of the outside peer reviewers. CAMx is a state-of-the-art air quality model that can simulate ozone and PM2.5 concentrations together in a "one-atmosphere" approach for the attainment demonstrations.

On February 24, 2006, CARB forwarded the District's request to U.S. EPA to redesignate the Basin attainment for carbon monoxide. Air quality monitoring data measured from 2001 through 2005 indicated that the standard had been achieved and currently continues to be met. Future year projections of CO provided in the 2003 AQMP and projections from CARB's EMFAC2002 emissions model were used to support the redesignation request and provide the basis for a CO maintenance plan for the Basin. EPA's final approval of the redesignation request is currently pending.

On September 21, 2006 the U.S. EPA administrator signed the final documents that eliminated the existing annual PM10 standard. Only one Basin monitoring station (Riverside-Rubidoux) reports annual levels of PM10 that exceeds the revoked standard. It is expected that the Rubidoux will continue to nominally exceed the federal standard in 2006. In spite of EPA's recent decision on the annual PM10 standard, efforts are underway to work towards meeting the attainment target to protect public health and assist in on-going compliance of the retained 24-hour PM10 standard in the Basin.

Detailed information on the modeling approach, data gathering, model development and enhancement, model application, and interpretation of results is presented in Appendix V. The following sections summarize the results of the modeling efforts. Future ozone air quality projections for the Coachella Valley are presented in Chapter 8 and in Appendix V.

MODELING APPROACH

Design Values and Relative Reduction Factors (RRF)

The Draft 2007 AQMP modeling approach to demonstrate attainment of the air quality standard relies heavily on the use of design values and relative reduction factors to translate regional modeling simulation output to the form of the air quality standard. Both ozone and PM2.5 have standards that require three consecutive years of monitored data, averaged by a designed form, to assess compliance. In the case of ozone, compliance to the standard is determined from a three year average of the 4^{th} highest daily ozone 8-hour average concentration. The PM2.5 annual design value is determined from quarterly average PM2.5 concentrations, averaged by year, for a three year period. For the 24-hour average PM2.5 design value, the 98^{th} percentile daily concentration sampled from a year is selected and then averaged for a three year period. The complexity of the design values does not lend itself to a direct attainment demonstration that relies on explicit air quality model simulation predictions of future air quality based on one or several meteorological episodes.

To bridge the gap between air quality model output evaluation and applicability to the health based air quality standards, EPA guidance has proposed the use of relative reduction factors (RRF). The RRF is simply a ratio of future year predicted air quality with the control strategy fully implemented to the simulated air quality in the base year. The attainment demonstration consists of multiplying the non-dimensional RFF to the base year design value to predict the future year design value. Thus, the simulated improvement in air quality, based on one or more meteorological episodes, is translated as a metric that directly determines compliance in the form of the standard. Equations 5-1 and 5-2 summarize the calculation.

Eq 5-1.

$$RRF = \text{Future-Year Model Prediction} / \text{Base-Year Model Prediction}$$

Eq 5-2.

$$\text{Attainment Demonstration} = RRF \times \text{Design Value} \leq \text{Air Quality Standard}$$

The modeling analyses described in this chapter use the RRF and design value approach to demonstrate future year attainment of the standards.

PM2.5

Within the Basin, PM2.5 particles are either directly emitted into the atmosphere (e.g., primary particles), or are formed through atmospheric chemical reactions from precursor gases (e.g., secondary particles). Primary PM2.5 includes road dust, diesel soot, combustion products, and other sources of fine particles. Secondary products, such as sulfates, nitrates, and complex carbon compounds are formed from reactions with oxides of sulfur, oxides of nitrogen, VOCs, and ammonia.

The Draft 2007 AQMP employs CAMx using the "one atmosphere" approach comprised of the CB-IV gas phased chemistry and a static two-mode particle size aerosol module as the particulate modeling platform. The CAMx "one atmosphere" chemistry approach is more mass consistent and takes advantage of an advanced dispersion platform. Parallel testing was conducted to evaluate the CAMx/AERO-LT performance against CAMx indicated that the two model/chemistry packages performance were similar.

Speciated PM2.5 data measured at 10-sites from the Multiple Air Toxic Evaluation Program (MATES-III) during 2005 provided the characterization for evaluation and validation of the CAMx annual and episodic demonstrations.

The following section summarizes the PM2.5 modeling approach conducted in preparation for this Plan. Details of the PM2.5 modeling are presented in Appendix V.

Annual PM2.5 Modeling Approach

The Draft 2007 AQMP annual average PM2.5 modeling employs a deterministic approach to demonstrate attainment of the PM2.5 in 2015. CAMx was used to simulate 2005 meteorological and air quality data to determine Basin annual average and episodic

$PM_{2.5}$ concentrations. Model performance was evaluated against speciated particulate $PM_{2.5}$ air quality data for ammonium, nitrates, sulfates, secondary organic matter, elemental carbon, primary and total particulate mass for nine MATES-III monitoring sites (Los Angeles, Anaheim, Wilmington, Long Beach, Compton, Burbank, Pico Rivera, Rubidoux, and Fontana). The future year attainment demonstration was analyzed for 2015, the target set by the federal CAA. The 2015 simulation relied on projected controlled emissions for 2014, thus enabling a full year demonstration based on a control strategy that would be fully implemented by January 1, 2015.

Future year PM2.5 air quality was determined using site and species specific relative reduction factors applied to 2005 PM2.5 design values per EPA guidance documents. The design values were calculated using the federal reference method Source Selective Inlet (SSI) High-Vol PM2.5 data measured at the District's air monitoring network from 2005. The SSI PM2.5 data were apportioned by species based on the distribution observed in the MATES-III data. This enabled a direct comparison of the total PM2.5 mass to the design value and standard. The breakdown by species provided guidance to the effectiveness of the control strategy.

CAMx was simulations used the same gridded region (5 km squared, 280 easting and 3650 northing, 65 by 40 grid cells) as that used for the 2003 UAMAERO-LT analyses. The vertical structure was increased to 11 layers (compared with the 5-layer analysis of UAMAERO-LT) but less than the 19 layers used for the MM5 simulations in effort to conserve computational resources. MM5 was used to generate the meteorological profile for each day in 2005. The MM5 simulations were generated for the larger SCOS97 modeling domain employing a 5 km square grid and fit to the smaller PM2.5 grid. The MM5 simulations were initialized from NCEP analyses and run for 5-day increments without the option for four dimensional data assimilation (FDDA).

Point source emissions were extracted from the District stationary source and RECLAIM inventories. Mobile source emissions were included using weekday, Saturday and Sunday profiles based on CALTRANS weigh-in-motion and vehicle population data. Monthly anthropogenic and biogenic emissions were temperature and humidity corrected. Monthly boundary conditions were derived from the Western Regional Air Partnership Regional Haze CMAQ simulations. As with the 2003 AQMP, the simulations benefited from enhancements made to the emissions inventory including updated an ammonia inventory, improved emissions characterization that split organic compounds into coarse, fine and primary categories, and updated spatial allocation of primary paved road dust emissions.

Calculation of the future year design value for the 9 sites was based on quarterly modeling performance (base and future year controlled) and the 2005 quarterly design values (based on 2003, 2004 and 2005 observed data). Table 5-1 provides the 2005 quarterly, annual and 24-hour average annual PM2.5 design values for the Basin.

Episodic 24-Hr Average PM2.5 Modeling Approach

Per PM2.5 guidance, two options are provided to determine RRFs for the future year 24-hour average PM2.5 attainment demonstration. The first option uses episodic modeling with day-specific emissions for representative meteorological episodes to calculate RRFs. The Draft 2007 AQMP uses the second approach proposed by EPA that relies on the annual model performance.

For this approach, the 2005 observational data are sorted by quarter of year and further into the top 25 percent of days in each quarter. PM2.5 RRFs are calculated on a quarterly basis from the future and base year annual simulations for only those days in the top 25 percentile per quarter. The quarterly RRFs are then applied to the quarterly 24-hour average PM2.5 design values to develop quarterly future year design values which are later aggregated into an annual 24-hour future year design value to assess attainment. (The quarterly 24-hour average PM2.5 design values were comprised of the 98^{th} percentile data in each quarter for the years 2003, 2004 and 2005. The quarterly 24-hour average PM2.5 design values are presented in Appendix V).

Weight of Evidence

PM2.5 modeling guidance strongly recommends the use of corroborating evidence to support the future year attainment demonstration. The weight of evidence demonstration for the Draft 2007 AQMP includes emissions trends analysis, speciated linear rollback analyses, as well as future year PM2.5 predictions at "hot spot" grids, where emissions have significant uncertainty. A supplemental PM2.5 simulation is provided for the 2010 future-year control scenario to provide a mid-course evaluation of the control strategy and comparison with the 2003 AQMP UAMAERO-LT projections for that year. Detailed discussions of all model results and the weight of evidence demonstration are provided in Appendix V.

Ozone

The CAA requires that ozone nonattainment areas designated as serious and above use a photochemical grid model to demonstrate attainment. As previously discussed, the 2003 AQMP ozone attainment demonstration relied upon UAM as the photochemical modeling platform for the analysis. Responding to the recommendations of the expert panel as well as EPA updated ozone modeling guidance including revised Appendix W, the Draft 2007 AQMP 8-hour ozone standard attainment demonstration was conducted using CAMx (version 4.4) with SAPRC99 as the primary modeling tool. Performance statistics and model inputs are discussed extensively in Appendix V.

TABLE 5-1

PM2.5 2005 Design Values (µg/m³)

Monitoring Site	Quarter-1	Quarter-2	Quarter-3	Quarter-4	Annual	24-Hours
Anaheim	17.6	12.4	15.4	20.0	16.3	47.0
Azusa	16.2	15.9	21.1	19.6	18.2	54.2
Big Bear	12.8	8.0	7.7	14.7	10.8	30.3
Burbank	18.7	15.2	20.7	24.3	19.7	53.3
Los Angeles	19.7	16.3	20.2	22.2	19.6	60.7
Fontana	18.7	19.2	20.2	23.2	20.3	54.8
Long Beach	18.0	12.7	15.7	22.9	17.3	44.6
Lynwood	19.3	14.6	18.3	22.9	18.8	51.3
Mission Viejo	12.0	10.2	12.7	12.9	11.9	33.5
Ontario	21.0	17.9	20.5	25.3	21.2	58.8
Pasadena	15.5	14.6	18.6	18.5	16.8	46.0
Pico Rivera	20.3	14.4	18.8	23.2	19.2	52.2
Reseda	14.3	13.4	15.9	17.8	15.4	47.0
Magnolia	18.9	19.8	20.6	22.5	20.5	49.0
Rubidoux	21.2	21.9	22.6	24.9	22.6	64.8
San Bernardino	18.2	20.3	21.6	21.8	20.5	58.1

Modeling Approach

CAMx simulations were conducted using the 5 km squared grid over the SCOS97 modeling domain. Specifically, the UTM Zone 11 coordinates of the domain are 150-700 km UTM East and 3580-3950 km UTM North. The modeling analyses were run using 16 vertical layers up to 5000 m above ground level.

CAMx simulations were generated for six meteorological episodes including two periods in 2004, three periods in 2005 and one in 1997. The August 1997 SCOS97 meteorological episode was retained for this analysis to provide a bridge from the 2003 AQMP attainment demonstration. Table 5-2 characterizes the selected episodes two ways: first by an assessment of the meteorological profile using a statistical model to rank the episodes based on meteorological stagnation potential and second by comparing observed maximum ozone concentrations to the annual design values. The meteorological classification is based on an empirical analysis presented in the 2003 AQMP which provides both a stagnation severity rank (1 being the highest) and the percentile the meteorological episode had in a 22-year distribution. The observed maximum 8-hour average concentrations on each episode day, and the average of the 8-hour maximum concentrations observed for each multi-day episode are also provided for comparison to the annual 4th highest 8-hour average ozone value observed in the year that the episode takes place.

Briefly, the selected episode days mostly rank in the 95th percentile or higher for meteorological stagnation potential. The episode average of the 8-hour maximum concentrations is either equal to or with 5 ppb of the annual 4th highest 8-hour observed concentration for four of the six simulation periods. The episodes failing to meet this criterion were characterized by more severe stagnation and higher average concentrations.

The five episodes observed in 2004 and 2005 occurred during MATES-III, a period of enhanced air quality monitoring in the Basin. Supporting MATES-III, the District operated three radar wind profilers in the Basin, with radio acoustic sounders. Additional profiler data was obtained from operating sites in Ventura and San Diego Counties.

Selection of episodes from 2004 and 2005 was also made to avoid the commingling associated with the Phase III California Fuel Reformulation where the primary oxygenate was changed from MTBE to ethanol. Commingling of ethanol and non-ethanol based fuels leads to enhanced evaporative VOC emissions and thus more ozone. Quantification of the amount of commingling taking place on a daily or episodic basis was nearly impossible. Implementation of the fuel switch from MTBE to ethanol took place in California during 2003 and was assumed to be completed by December 31, 2003. Selecting meteorological episodes post 2003 reduced the uncertainty associated with the estimation of the VOC emissions inventory due to commingling.

The meteorological fields used for the CAMx ozone simulations were generated using MM5 with the FDDA option. The meteorological fields were developed using a Lambert Conformal grid that roughly overlaid the SCOS97 modeling domain. MM5 was simulated using 34 vertical layers and simulations were initialized using NCEP global weather forecast model analysis. The MM5 fields were post processed to layer averaged winds to the levels defined for the CAMx simulations and to adjust coordinates to the UTM system.

TABLE 5-2

Ozone Meteorological Episodes Used for the Ozone Attainment Demonstration
Ranking Applied to Historical 22-Year Period (1981-2002)

Episode	Stagnation Severity Rank	Percentile	8-Hour Maximum Ozone (ppb)	Episode Average 8-Hour Maximum Ozone (ppb)	Annual 4th Highest Observed 8-Hour Maximum Ozone / Station (ppb)
8/5/97	198	98	124	127	127 San Bernardino
8/6/97	203	97	130		
6/5/04	83	99	148	138	116 Crestline
6/6/04	524	93	127		
8/6/04	1009	87	94	114	
8/7/04	331	96	127		
8/8/04	144	98	122		
5/21/05	389	95	112	129	125 Crestline
5/22/05	50	99	145		
7/15/05	265	96	143	132	
7/16/05	22	99	141		
7/17/05	15	99	141		
7/18/05	73	99	127		
7/19/05	567	93	110		
8/27/05	160	98	130	126	
8/28/05	138	98	121		

Day specific point, mobile and area emissions inventories were generated for each meteorological episode. Mobile source emissions were temperature corrected by grid using a VMT weighted scheme. County-wide area source emissions were temperature corrected and gridded using the spatial emissions surrogate profiles developed for the 2003 AQMP. Appendix V presents a more detailed description of the meteorological episode selection, meteorological modeling and validation and the episodic emissions inventory development.

Application of RRF's

Unlike the regional ozone modeling conducted for the 2003 AQMP that based the attainment demonstration on the direct results of a future year simulations, the procedure for determining future year attainment of the 8-hour ozone standard for the Draft 2007 AQMP relies on the use of site specific RRF's determined from a series of simulations for the 2002 and 2020 controlled emissions. The basic procedure is outlined earlier in this chapter. The ozone attainment demonstration is anchored by the 2002 base-year emissions. The meteorological episodes are first validated based on model performance in the using day-specific emissions for each base-case (e.g. 1997, 2004 or 2005). The suites of validated episodes are then simulated using the 2020 controlled and 2002 emissions to determine a site specific average set of RRFs. The site specific RRF is applied to the 2002 design value to determine whether attainment has been satisfied.

A minimum of 5-episode days is required to determine the site specific RRF. The evaluation requires that the model performance for the day is within guidelines and that a minimum observed concentration at each site used in the analysis exceeds 70 ppb or is simulated at 85 ppb or greater. Per EPA modeling guidance, since the CAMx regional modeling is based on a 5 km squared grid, the ozone performance evaluation and peak RRF calculation is based on a comparison of the observed concentration and the predicted concentration within a 15 km radius of the grid hosting the observation. (Data are evaluated for a 7 X 7 grid area).

Weight of Evidence

As with PM2.5 the modeling guidance strongly recommends the use of corroborating evidence to support the future year ozone attainment demonstration. The weight of evidence demonstration for the Draft 2007 AQMP includes ozone air quality, population exposure and emissions trends analyses, supplemental air quality simulations for 2010 (1-hour and 8-hour average impacts), and 2013. Detailed discussions of all model results and the weight of evidence demonstration are provided in Appendix V.

Carbon Monoxide

As discussed above, the request to re-designate the Basin attainment for the 8-hour federal CO standard has been forwarded to U.S. EPA and is currently being evaluated. No additional regional or hot-spot monitoring is provided in the Draft 2007 AQMP to further demonstrate attainment of the 8-hour average ozone standard.

PM10

As previously discussed, on September 21, 2006 the U.S. EPA administrator signed the final documents that eliminated the existing annual PM10 standard. The action retained 24-hour PM10 standard at its existing concentration of 150 μg/m^3. The form of the 24-hour PM10 standard allows for one violation of the standard annually. The Basin currently meets the 24-hour average federal standard. (The only days that exceed the standard are associated with high wind natural events or exceptional events due to wildfires).

For this analysis, the annual second maximum concentration is used for the attainment demonstration (given the standard allows for one violation annually). Riverside Rubidoux has been the PM10 24-hour design site in nine of the past ten years when high wind days have been excluded from the analysis. The 2005 design value at Rubidoux is 86 percent of the federal standard. The standard attainment demonstration is conducted to assure that the Basin will continue to be in compliance in future years.

As a conservative analysis, only emissions reductions associated with the PM2.5 portion of the 24-hour PM10 concentration are assumed to be impacted by future year emission controls. Future year predictions of maximum and second maximum 24-hour average PM10 are calculated using the site specific annual average PM2.5 RRFs applied to the PM2.5 portion of the PM10 design concentration. The average PM2.5 RRFs calculated from the nine sites, for 2005 to 2014, are applied to the fine portion of the 24-hour PM10 distribution for sites other than the MATES III which have the PM2.5 speciation. The coarse portion of the PM10 is assumed to be held constant in this analysis. The predicted reductions to the fine portion are then added to the coarse to estimate a 2015 second maximum PM10 24-hour average concentration.

Visibility

In July 1999, U.S. EPA adopted the federal Regional Haze Regulations [40 CFR Part 51] to address Section 169A of the CAA which set forth a national goal for future visibility with specific focus to remedy any visibility impairments to Class I areas nationwide. States are required to provide to EPA emissions reduction strategies to improve visibility in all mandatory Class I national parks and wilderness areas. In response to the requirements of the regulations, California joined the Western Regional Air Partnership (WRAP), a multi-agency organization that is coordinating implementation of the regional haze rules. States with PM2.5 non-attainment areas are require to submit "haze plans" to EPA within 3-years following PM2.5 designation and develop future year (2018) inventories of emissions that lead to visibility reduction. The ARB has assumed the responsibility for the plan and inventory development requirements for the state.

The emissions reductions needed to attain the PM2.5 standard in the Basin will directly contribute to improved future year visibility. California continues to maintain a state standard for visibility structured to reduce aerosol particles (8-hour average) that contribute to an extinction coefficient value of 0.23 per kilometer (or 10 miles of visual range) when relative humidity is less than 70 percent. The previous form of the standard assessed the number of days when visual range was less than 10 miles for the same humidity consideration. Visibility is among the strongest indicators to air quality and its value is paramount. As such, future year visibility is used in the socioeconomic evaluation of the AQMP to estimate monetary benefits that arise from improved visual range through the implementation of the plan. Future-year visibility in the Basin is projected empirically using the results derived from a regression analysis of visibility with air quality measurements. The regression data set consisted of aerosol composition data collected during a special monitoring program conducted concurrently with visibility data collection (prevailing visibility observations from airports and visibility measurements from District monitoring stations). A full description of the visibility analysis is given in Technical Report V-C of the 1994 AQMP.

FUTURE AIR QUALITY

PM2.5

Under the federal Clean Air Act, the Basin must comply with the federal PM2.5 air quality standards by April, 2010 [Section 172(a)(2)(A)]. An extension of up-to five years could be granted if attainment cannot be demonstrated and several other conditions are satisfied. As indicated in Chapter 1, the District is formally requesting U.S. EPA to grant the five-year extension based upon the severity of the problem and the modeled attainment demonstration that clearly indicates that significant reductions in daily emissions of NOx and SOx are required to meet the 2015 attainment date. Figure 5-1 depicts future annual average PM2.5 air quality projections at nine PM2.5 monitoring sites having comprehensive particulate species characterization compared to federal and state annual PM2.5 standards, respectively. Shown in the figure are the estimated baseline conditions for 2005 along with projections for 2015, and 2021 with control measures in place. All sites will attain the federal annual standard by the year 2015. None of the sites will meet the state annual PM2.5 standard (12 $\mu g/m^3$) by 2015. Implementation of the 8-hour ozone control strategy will continue to lower annual PM2.5 concentrations.

The projections for the 24-hour state and federal standards are shown in Figure 5-2. The results are similar to those for the annual standards. All areas will be in attainment of the federal 24-hour standard (65 $\mu g/m^3$) by 2015. However, as shown in Figure 5-2, the Draft 2007 AQMP does not achieve the revised 24-hour PM2.5 standard (35 $\mu g/m^3$) by 2015 or 2021. Additional controls are needed. California does not have a separate 24-hour PM2.5 standard.

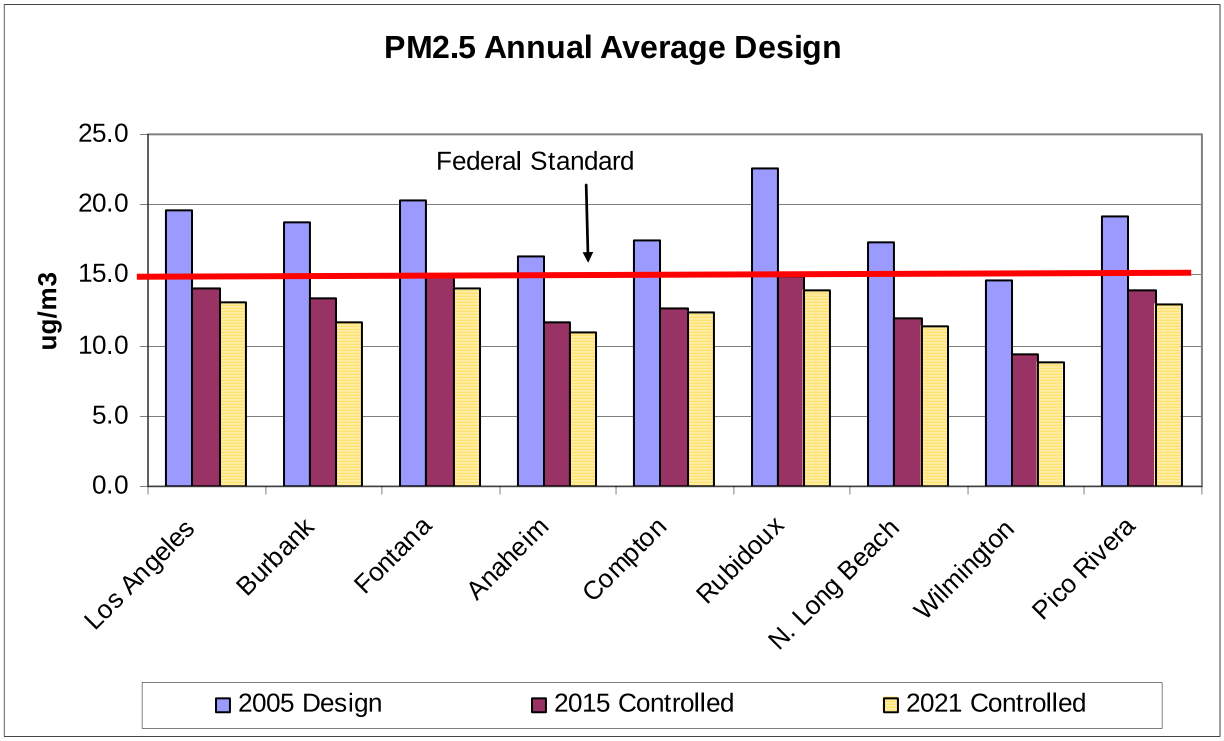


FIGURE 5-1

Annual Average PM2.5 Design Concentrations:
2005, 2015 Controlled, and 2021 Controlled

Control Strategy Choices

PM2.5 has five major precursors that contribute to the development of the aerosol including ammonia, NOx, SOx, VOC, and directly emitted PM2.5. Various combinations of reductions in these pollutants could all provide a path to clean air. The attainment strategy presented in this Draft 2007 AQMP relies on the maximum extent possible reductions of SOx, direct PM2.5, followed by VOC and NOx. As discussed in Chapter 4, the proposed strategy focuses on the reductions of SOx and primary PM2.5 through cleaner marine fuels and extensive diesel trap retrofits respectively.

It is useful to weigh the value of the per ton precursor emissions to microgram reductions of PM2.5. Recent trends of PM2.5 and NOx emissions suggest a direct response between lower emissions and improving air quality. This weight of evidence discussion is valuable to the control strategy development however, the formation of PM2.5 is non-linear and as such individual precursors contribute differently to the overall mass. The CAMx simulations provide a relative rate of reduction per ton of emissions reduced based on complex aerosol chemistry. Similarly, linear rollback can also provide a weight of evidence directional rate of reduction but no interaction among species is assumed in the analysis. This is a major limitation because interactions between VOC and NOx are critical to secondary aerosol formation and the competition between SOx and NOx for ammonium sets the rate of formation of sulfates and nitrates. In general, the rollback calculation will provide a ballpark estimate of the range of emissions reductions needed to attain the standard but can't be relied on for an attainment demonstration. Using the simulated chemistry provides individual precursor to pollutant weighting to estimate a per ton reduction currency. For PM2.5, the simulations determine that VOC emissions reductions have the lowest return in terms of micrograms reduced per ton reduction. NOx reductions are approximately three times more effective in lowering PM2.5 concentrations but not as effective as sulfate and direct PM2.5 emissions reductions. Table 5-4 summarizes the relative importance of precursor emissions reductions to the analysis.

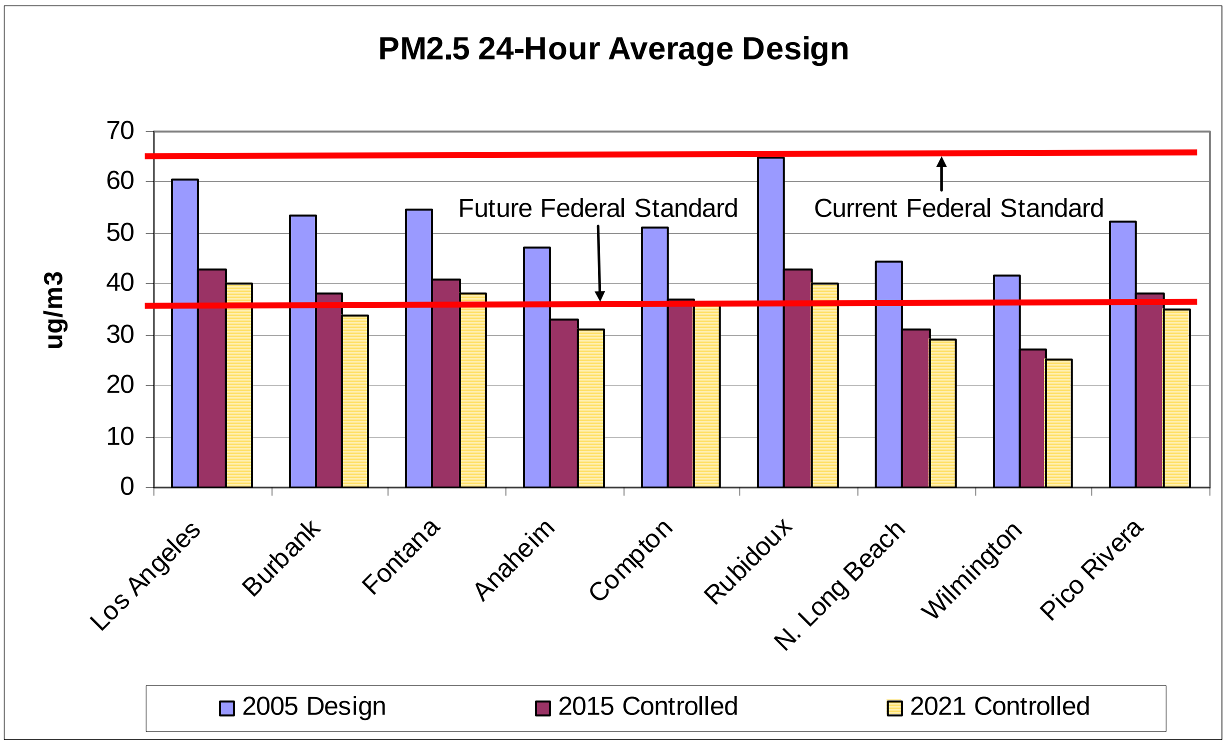


FIGURE 5-2

Maximum 24-Hour Average PM2.5 Design Concentrations:
2005 Baseline, 2015 Controlled, and 2021 Controlled

The District's proposed control strategy maximizes reductions of direct PM2.5 and SOx to the extent possible due to their effectiveness as well as the likelihood schedule of implementation within the next seven years. Substantial additional VOC and NOx emissions reductions are also required for attainment. However the strategy, nonetheless attempts to maximize the potential PM2.5 concentration reduction per identified ton precursor emissions reduction. Table 5-4 lists the mix of the four primary precursor's emissions reductions targeted for the SOx – PM2.5focused approach.

During Plan preparation a series of sensitivity model runs were performed indicating that it is possible to demonstrate attainment using lower SOx (50%), VOC (10%) and direct PM2.5 (5%) emissions while substantially higher NOx controls (50%). It would require an additional 105 TPD of NOx emissions reductions.

TABLE 5-4

Relative Contributions of Precursor Emissions Reductions to Simulated Controlled Future-Year PM2.5 Concentrations

Precursor (TPD)	PM2.5 Component ($\mu g/m^3$)	Standardized Contribution to Mass
VOC	Organic Carbon	Factor of 1
NOx	Nitrate	Factor of 3
PM2.5	Elemental Carbon & Others	Factor of 5
SOx	Sulfate	Factor of 10

TABLE 5-5

Draft 2007 AQMP
PM2.5 Attainment Strategy
Allowable Emissions (TPD)

	VOC	NOx	SOx	PM2.5
2014 Baseline	594	668	70	98
Allowable Emissions	457	421	19	84
Reduction	23%	37%	73%	14%

PM10

Dependent upon the PM10 sampling protocol (one-in-six days, one-in-three days, or daily) either the annual maximum or 2^{nd} maximum is used to determine compliance. As such, the future year (2015) assessment of the PM10 compliance to the 24-hour standard is conducted by examining the both the predicted maximum and 2^{nd} maximum for all Basin stations. Table 5-6 summarizes the results of the analysis.

In general, all monitoring locations in the Basin are predicted to continue to meet the federal 24-hour PM10standard through 2015. While the bulk of the sites are predicted to have concentrations less than half of the current federal standard only one quarter of the locations are projected to meet the more restrictive California 24-hour average PM10 standard of 50 $\mu g/m^3$.

Ozone

The Basin is designated as a Severe-17 non-attainment area, and must meet the federal 8-hour ozone air quality standard by 2021. The attainment demonstration shown here addresses this requirement. As discussed earlier, selected days from six meteorological episodes are used in the ozone attainment demonstration. The ozone modeling discussion differs from previous AQMP's in that future year attainment is projected using modeling results applied to a base year design value as opposed to being explicitly compared to the standard. The analysis is structured to address the form of the 8-hour standard which allows the standard threshold concentration (80 ppb) to be exceeded on three or more days in any year, under varying meteorological conditions. The design value accounts for the historical frequency of meteorological episodes that lead to higher ozone concentrations. In this analysis, base year (2002) and future year emissions (2020) are simulated for several meteorological episodes to develop an average response to reducing ozone precursor emissions. The response factor or RRF is calculated for each site that has a base year design value that exceeds the federal standard. The site-specific RRF are applied to the base year design to estimate the future year (2021) design value for comparison to the standard.

Control Strategy Choices

Table 5-7 summarizes the emissions inventories used for the 2002 and 2020 baseline and the 2020 controlled scenarios with and without long-term control measures. Without long-term measures, the regional modeling results indicate that the federal 8-hour ozone standard would not be attained. Attainment will require additional long-term emissions reductions based upon the development of new technology. The inclusion of the additional long term-control measures will require the District petition U.S. EPA prior to or at submittal of this Plan to revise the current attainment status from Severe-17 to Extreme to enable the use of long-term measures under Section 182(e)(5) of the CAA.

Episode-day-specific specific inventories that are temperature and humidity corrected are provided in Appendix V.

TABLE 5-6

24-Hour Average Maximum and Average 2nd Maximum Basin PM10:
2003-2005 Baseline Design and 2015 Controlled

City	2003-2005		2015 Controlled	
	Average Maximum ($\mu g/m^3$)	Average 2nd Maximum ($\mu g/m^3$)	Average Maximum ($\mu g/m^3$)	Average 2nd Maximum ($\mu g/m^3$)
Azusa	93	79	74	65
Burbank	82	73	67	60
Long Beach	96	63	75	52
Los Angeles	74	69	61	57
Snata Clarita	60	54	51	47
Hawthorne	53	61	47	52
Anaheim	78	67	64	57
Mission Viejo	51	44	45	40
Rubidoux	141	129	103	95
Perris	102	88	77	68
Banning Airport	79	55	62	46
Crestline	49	47	44	42
Fontana	105	96	85	79
San Bernardino	96	85	79	70
Redlands	80	70	67	59
Mira Loma	90	77	69	61

TABLE 5-7

2002, 2020 Base Year and 2020 Future Year Controlled Emissions Scenarios (TPD)

Year	Scenario	VOC	NOx	CO
2002	Baseline	1030	1090	5525
2020	Baseline	599	531	2475
2020	Controlled without Long- Term Measures	439	278	1915
2020	Controlled with Long-Term Measures	304	238	1661

Table 5-8 provides the 2002 base year design value, the predicted 2021 base year with out additional controls and the predicted 2021 design values with the control strategy implemented for the required monitoring sites in the Basin. With controls in place, it is expected that all stations in the Basin will meet the federal 8-hour ozone standard. The east Basin stations of Crestline and Fontana are projected to have the highest 8-hour controlled design values. Both sites are downwind receptors along the primary wind transport route that moves precursor emissions and developing ozone eastward during by the daily sea breeze. Future year projections of ozone along the northerly transport route through the San Fernando Valley indicate that the ozone design value in the Santa Clarita Valley will be approximately 13 percent below the standard.

It is important to reiterate that the form of the ozone standard allows for at least 3-days to have 8-hour average concentrations that exceed 80 ppb in any year. So, although the demonstration satisfies the criteria for attainment, areas of the Basin are likely to experience occasional higher ozone days (greater than 80 ppb) under severe meteorological conditions.

Equally important, is the rate of progress specified by the timing of the new standard. The 2003 AQMP 1-hour ozone demonstration set a 2010 attainment carrying capacity of 330 TPD of VOC and 540 TPD of NOx. Sensitivity simulations were conducted to assess progress towards attaining the revoked 1-hour ozone standard for a current 2010 baseline emissions estimate. The results indicated that the currently predicted 1-hour average ozone concentrations for 2010 are expected to be approximately 20 percent above the revoked 1-hour federal standard assuming full implementation of port-related measures.

The spatial distribution of ozone design values for the 2002 base year is shown in Figure 5-3. Future year ozone air quality projections for 2020 with and without implementation of all control measures are presented in Figures 5-4 and 5-5. The predicted ozone concentration will be significantly reduced in the future years in all parts of the Basin with the implementation of proposed control measures in the South Coast Air Basin.

Appendix V provides base year model performance statistics, grid level spatial plots of simulated ozone (base cases and future year controlled) as well as weight of evidence discussions to support the modeling attainment demonstration.

TABLE 5-8

Model-Predicted 8-Hour Ozone Concentrations

City	2002 Design (PPB)	2020 Base Design (PPB)	2020 Controlled Design (PPB)
Azusa	101	91	67
Burbank	92	81	53
Reseda	104	90	63
Pomona	96	89	67
Pasadena	96	84	57
Santa Clarita	122	103	70
Glendora	112	100	76
Riverside	112	104	79
Perris	112	87	74
Lake Elsinore	107	95	63
Banning	115	99	70
Upland	110	103	77
Crestline	129	118	84
Fontana	118	110	83
San Bernardino	116	104	76
Redlands	125	110	80

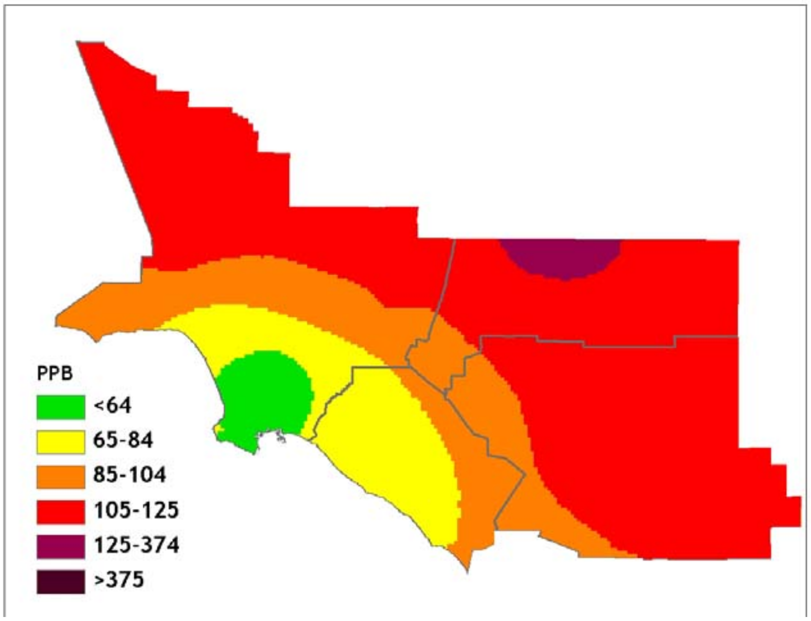


FIGURE 5-3

2002 Baseline 8-Hour Ozone Design Concentrations (ppb)

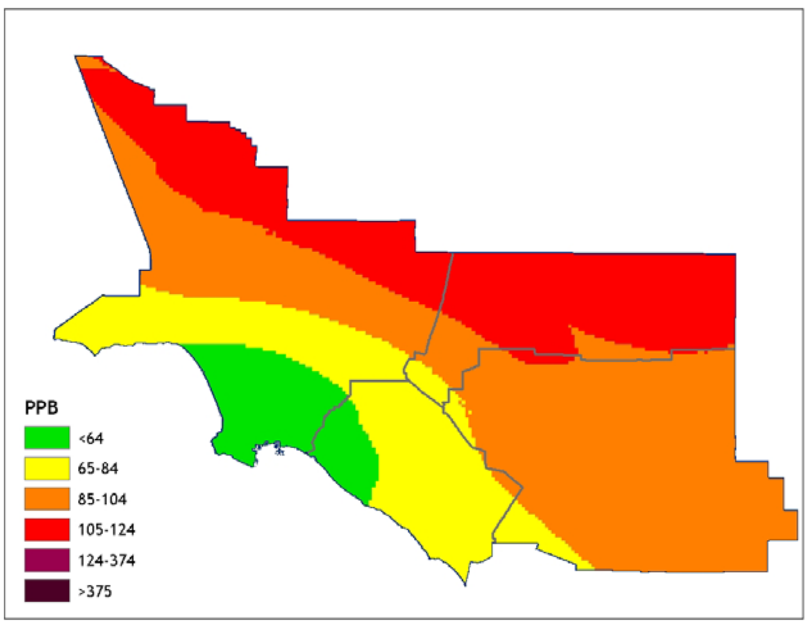


FIGURE 5-4

Model-Predicted 2021 Baseline 8-Hour Ozone Design Concentrations (ppb)

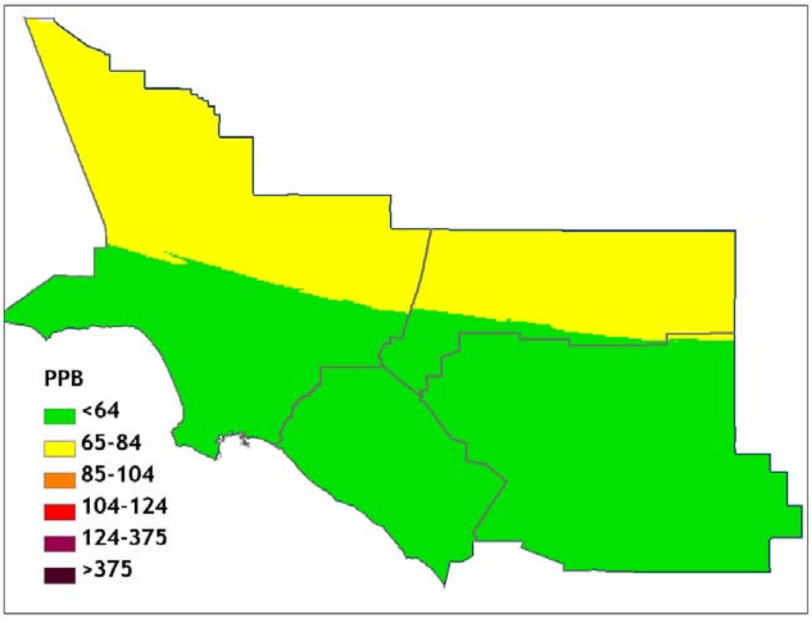


FIGURE 5-5

Model-Predicted 2021 Controlled 8-Hour Ozone Design Concentrations (ppb)

Visibility

The results of the visibility analysis for Rubidoux are illustrated in Figure 5-6. With future year reductions of PM2.5 from implementation of all proposed emission controls for 2015, the annual average visibility would improve from 12 miles (calculated for 2005) to over 20 miles at Rubidoux.

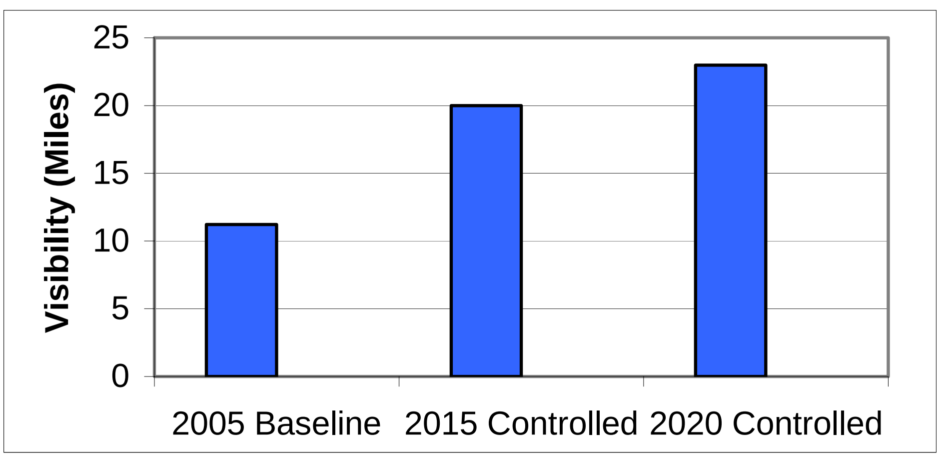


FIGURE 5-6
Annual Average Daytime Visibility Projections at Rubidoux

Visual range in 2021 is estimated Visibility at all other Basin sites is expected to equal or exceed the Rubidoux visual range. Visual range is expected to double from 2005 due to reductions of secondary PM2.5, (by more than one third), direct PM2.5 emissions including diesel soot and lower nitrogen dioxide concentrations as a result of 2007 AQMP controls.

SUMMARY AND CONCLUSIONS

Figure 5-7 shows the 2002 observed and model-predicted regional peak concentrations for the three nonattainment criteria pollutants, as percentages of the most stringent federal standard, for the years 2010, 2015, and 2021, (with and without further emission controls). Figure 5-8 shows similar information related to the most stringent California state standards. Note: the revoked federal 1-hour standard comparison has been included for reference. The 2010 baseline 1-hour average ozone concentrations are projected to exceed the revoked standard.

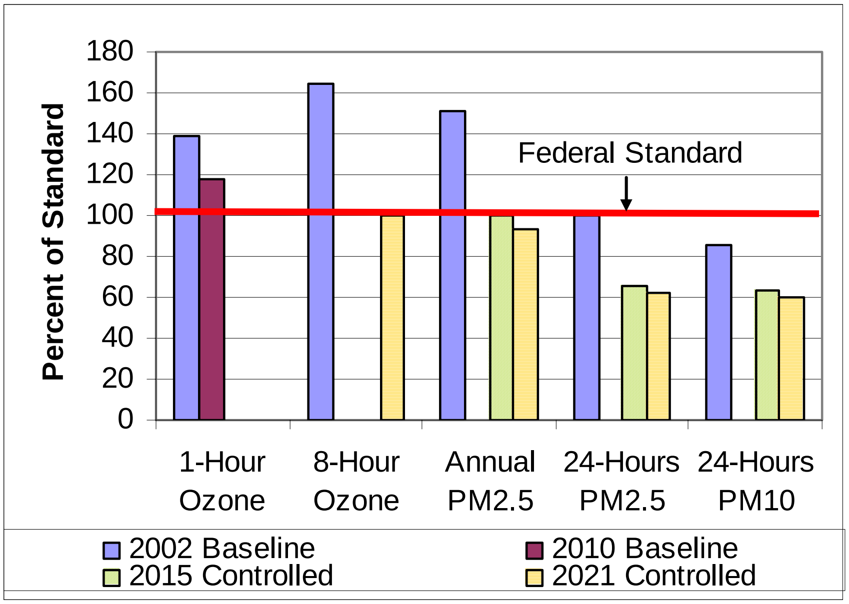


FIGURE 5-7

Projection of Future Air Quality in the Basin in Comparison with the Most Stringent Federal Standards.

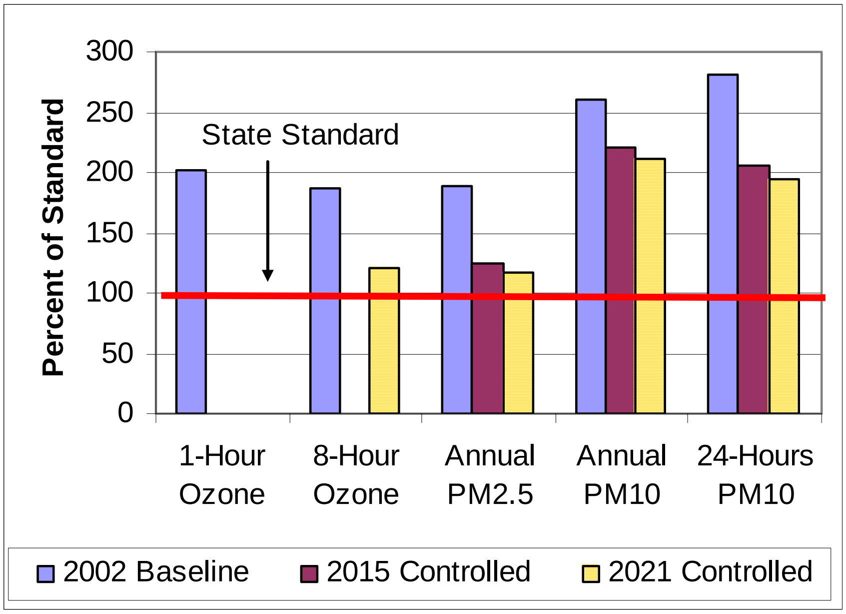


FIGURE 5-8

Projection of Future Air Quality in the Basin in Comparison with Most Stringent California State Standards

Table 5-9 summarizes the expected year for attainment of the various federal and state standards for the four pollutants analyzed. As shown, the Basin will be in compliance with federal standards by the year 2021. The Basin will require additional time beyond 2021 to meet the state ozone, PM2.5 and PM10 standards.

BASIN EMISSIONS CARRYING CAPACITY (EMISSIONS BUDGET)

The District is required to separately identify the emission reductions and corresponding type and degree of implementation measures required to meet federal and state ambient air quality standards. Section 40463(b) of the California State Health and Safety Code specifies that, with the active participation of the Southern California Association of Governments, a South Coast Air Basin emission carrying capacity for each state and federal ambient air quality standard shall be established by the South Coast District Board for each formal review of the Plan and shall be updated to reflect new data and modeling results.

A carrying capacity is defined as the maximum level of emissions that enable the attainment and maintenance of an ambient air quality standard for a pollutant. Emission carrying capacity for state standards shall not be a part of the State Implementation Plan requirements of the Clean Air Act for the South Coast Air Basin.

TABLE 5-9

Expected Year of Compliance with State and Federal Standards for the Four Criteria Pollutants

Pollutant	Standard	Concentration Level	Expected Compliance Year
Ozone	NAAQS 8-hours	125 ppb	2021
	CAAQS 1-hour	90 ppb	beyond 2021
	CAAQS 8-hours	70 ppb	beyond 2021
$PM_{2.5}$	NAAQS Annual	15 ug/m^3	2015
	NAAQS 24-hours	65 ug/m^3	2005
	CAAQS Annual	20 ug/m^3	beyond 2021
PM_{10}	NAAQS 24-hours	150 ug/m^3	2000
	CAAQS 24-hours	50 ug/m^3	beyond 2021
CO*	NAAQS 1-hour	35 ppm	1990
	NAAQS 8-hours	9 ppm	2002
	CAAQS 8-hours	9 ppm	2002
NO2	NAAQS Annual	0.0534 ppm	1995
	CAAQS 24-hours	0.25 ppm	2003

* The Basin has been achieving the federal 1-hour CO air quality standard since 1990. In 2002, the Basin achieved the 8-hour CO air quality standard. The Basin is still considered nonattainment until a petition for redesignation is submitted by the state and is approved by EPA.

Emission carrying capacity as defined in the Health and Safety Code is an overly simplistic measure of the Basinwide allowable emission levels for specific ambient air quality standards. It is highly dependent on the spatial and temporal pattern of the emissions. Because of the multi-component nature of PM2.5, the carrying capacity for the contributing emittants can vary significantly and like ozone it is a non-linear function among their precursors.

The federal Clean Air Act requires that plans contain an emissions budget that represents the remaining emissions levels that achieve the applicable attainment deadline. Based on the modeling results, a set of carrying capacities can be defined corresponding to federal and state ambient air quality standards for annual PM2.5, and ozone. VOC and oxides of nitrogen are used for ozone. PM2.5 additionally requires reductions of sulfur oxides and directly emitted PM2.5. Table 5-10 shows the emissions carrying capacities for the Basin to meet federal air quality standards. These estimates are based on emission patterns estimated for each of the federal attainment years: 2015 for PM2.5, and 2021 for ozone.

TABLE 5-6

Emissions Carrying Capacity Estimations[1] for the South Coast Air Basin (tons/day) based on the Planning Inventory

a) PM2.5 Attainment Strategy to meet NAAQS (2015)

VOC	NOx	SOx	$PM_{2.5}$
457	421	19	84

b) Ozone Attainment Strategy to meet NAAQS (2021)

VOC	NOx	CO
304	238	1661

[1] On October 6, 2006, CARB released its preliminary estimates of the Basin carrying capacity for PM2.5. Based on rollback, CARB estimated that new regional emissions reductions of at least 25 percent NOx, 10 percent VOC and 50 percent SOx would be needed in beyond the 2014 baseline to meet the 2015 standard. CARB also stated that further reductions beyond those previously defined may be required to achieve attainment in areas of the Basin with the most persistent PM2.5 problems. CARB did not release any preliminary target for future year Basin 8-hour average ozone attainment .

CHAPTER 6

CLEAN AIR ACT REQUIREMENTS

Introduction

Federal Clean Air Act Requirements

California Clean Air Act Requirements

INTRODUCTION

The purpose of the 2007 revision to the AQMP for the South Coast Air Basin is to set forth a comprehensive program that will lead the Basin and those portions of the Salton Sea Air Basin under the District's jurisdiction into compliance with all federal and state air quality planning requirements. Specifically, the 2007 AQMP revision is designed to satisfy the SIP submittal requirements of the federal CAA to demonstrate attainment of the new 8-hour ozone and PM2.5 ambient air quality standards, the California CAA triennial update requirements and fulfill the District's commitment to update transportation emission budgets based on the latest approved motor vehicle emissions model and planning assumptions. Specific requirements related to the planning requirements for portions of the Salton Sea Air Basin under the District's jurisdiction will be included in the Draft Final Plan scheduled for release late fall of 2006. The Final Plan will be submitted to U.S. EPA as SIP revisions once approved by the District's Governing Board and CARB.

FEDERAL CLEAN AIR ACT REQUIREMENTS

In November 1990, Congress enacted a series of amendments to the CAA intended to intensify air pollution control efforts across the nation. One of the primary goals of the 1990 CAA Amendments was an overhaul of the planning provisions for those areas not currently meeting NAAQS. The CAA identifies specific emission reduction goals, requires both a demonstration of reasonable further progress and an attainment demonstration, and incorporates more stringent sanctions for failure to attain or to meet interim milestones. There are several sets of general planning requirements, both for nonattainment areas [Section 172(c)] and for implementation plans in general [Section 110(a)(2)]. These requirements are listed and briefly described in Chapter 1 (Tables 1-4 and 1-5). The general provisions apply to all applicable pollutants unless superseded by pollutant-specific requirements.

The following sections discuss the federal CAA requirements for ozone, PM2.5, CO, and NO_2.

Ozone Planning Requirements

The U.S. EPA promulgated the 8-hour ozone standard in July 1997, which was followed by legal actions, and eventually upheld in March 2002. U.S. EPA finalized Phase 1 of the ozone implementation rule in April 2004. This rule set forth the classification scheme for nonattainment areas and continued obligations with respect to the existing 1-hour ozone requirements. As described by the Phase 1 rule, the Basin is classified as

Severe 17 with an attainment date of June 2021, while the portion of the Salton Sea Air Basin under the District's jurisdiction (Coachella Valley Planning Area) is classified as serious, with an attainment date of June 2013. On November 9, 2005, the U.S. EPA followed up its Phase 1 implementation rule with the Phase 2 rule. The Phase 2 rule outlines the emission controls and planning requirements regions must address in their implementation plans. This section describes how the Draft 2007 AQMP meets the major 8-hour ozone planning requirements of this Phase 2 rule for the Basin. 8-hour ozone Planning requirements for the Coachella Valley Planning Area will be addressed in Chapter 8 of the Draft Final 2007 AQMP. The requirements specifically addressed for the Basin are:

1. attainment demonstration and modeling;
2. reasonable further progress;
3. reasonably available control technology (RACT);
4. reasonably available control measures (RACM);.
5. new source review (NSR);
6. contingency measures; and
7. transportation control measures

<u>Ozone Attainment Demonstration and Modeling</u>

The CAA requires areas classified as nonattainment to attain the 8-hour ozone standard as expeditiously as practicable and within the CAA's deadlines. For the Basin, which is classified as Severe-17, the deadline for achieving the 8-hour standard is June 2021. The Phase 2 rule provides the timing and guidelines and identifies the modeling guidance to make the demonstration required. As required by the Phase 2 rule, areas required to submit an attainment demonstration must do so no later than three years after the effective date of designation for the 8-hour ozone standard. Thus, the AQMD must submit the Final 2007 AQMP to U.S. EPA by June of 2007. Under Section 181(b)(3) of the CAA, areas may elect to request a voluntary reclassification to the next higher classification. This so called "bump up" provision is being considered by the AQMP, but as of this date, no decision has been made to request a "bump up." Any "bump up" would mean that the Basin would be subject to the requirements of the CAA under the Extreme classification; delaying the attainment 3 years and allowing for 182(e)(5) measures. A summary of the 8-hour ozone attainment demonstration is provided in Chapter 5. The ozone attainment demonstration is fully described in Appendix V which will be released with the Draft Final 2007 AQMP later this year.

Reasonable Further Progress (RFP)

The CAA requires SIPs for most nonattainment areas to demonstrate reasonable further progress (RFP) toward attainment through emission reductions phased in from the time of the SIP submission out to the attainment date. The reasonable further progress requirements in the CAA are intended to ensure that each ozone nonattainment area provide for sufficient precursor emission reductions to attain the ozone national ambient air quality standard. Specifically, Section 182(b)(1)(A) requires that each moderate or above area provide for VOC reductions of at least 15 percent from baseline emissions within six years from the baseline year (i.e., 2002). Furthermore, Section 182(c)(2)(B) requires that serious and above areas provide VOC and/or NOx reductions of an additional 3 percent per year starting at the end of the baseline year and out to their attainment year. However, U.S. EPA in its Phase 2 rule specified that areas which have already completed and received approval for their 15 percent VOC Rate of Progress (ROP) for the 1-hour ozone standard will not be required to do another 15 percent VOC-only reduction plan for the 8-hour ozone standard. Therefore, the AQMD is only required to provide for VOC and/or NOx reductions of 3 percent per year from the 2002 baseline year averaged over each consecutive three-year period beginning in 2008 until the Basin's attainment date (i.e., June 2007). Table 6-1 shows the percent emission reductions for both VOC and NOx emissions necessary to meet the 3 percent requirement. Tables 6-2A and 6-2B summarize the RFP calculations. Figures 6-1A and 6-1B depict the target level and projected baseline RFP demonstration.

Up until the year 2017, projected VOC baseline emissions are sufficient to meet the CAA requirements. For the milestone years 2017 and 2020, the baseline VOC emission levels are below the target levels. In 2017, VOC planned reductions from control measures in the Draft Plan are needed to show compliance with the targeted VOC thresholds. Year 2020 is the attainment year and the Phase 2 implementation rule requires the District to meet the percent reduction targets necessary for attainment, regardless whether the targets are above the 3 percent per year target level. In the case of 2020, the ozone carrying capacities require reduction target levels beyond the 3 percent per year goal, and are estimated to be 70.4 and 78.2 percent for VOC and NOx, respectively.

TABLE 6-1

Percent of VOC and NO_x Emission Reductions from the 2002 Baseline to meet RFP Requirements

Year	VOC	NOx	CAA*
2008	18.0	0.0	18.0
2011	27.0	0.0	27.0
2014	36.0	0.0	36.0
2017	45.0	0.0	45.0
2020	70.4	78.2	Attainment

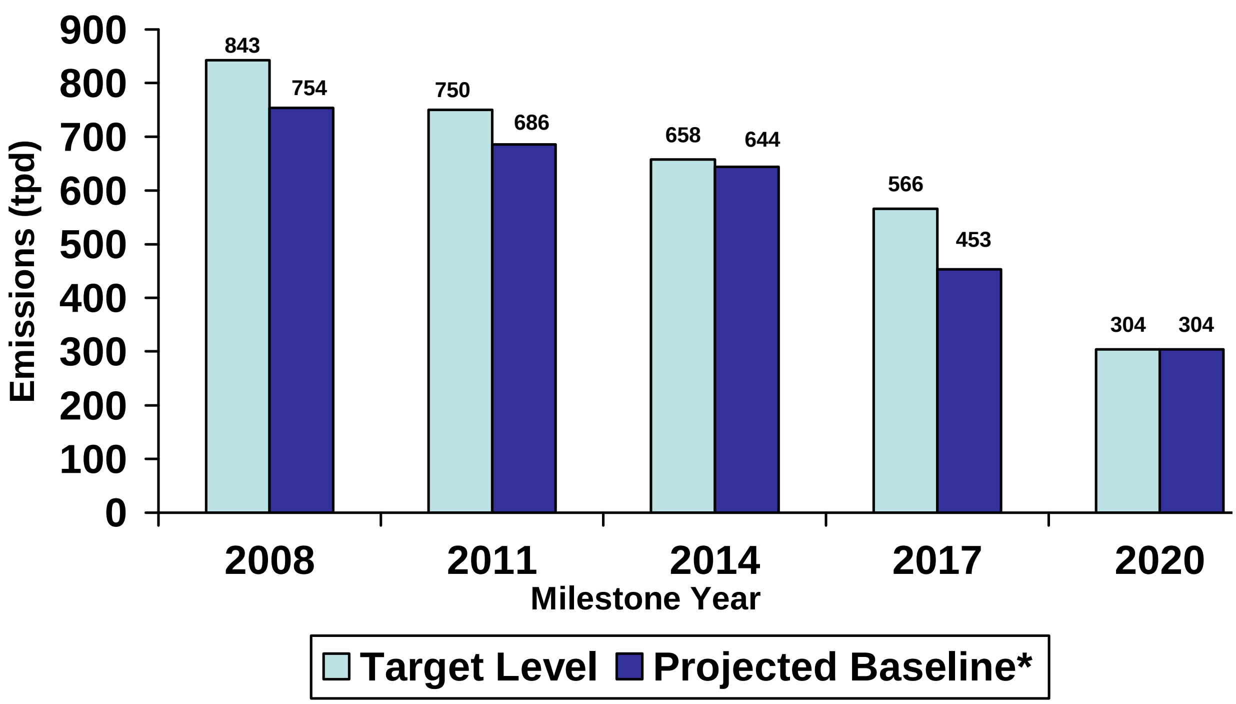
* The percent VOC and NOx reductions must equal the CAA percent reduction requirements listed here.

TABLE 6-2A

Summary of Reasonable Further Progress Calculations- VOC

ROW	CALCULATION STEP [a]	2008	2011	2014	2017	2020
1	2002 Base Year Emissions [b]	1028.1	1028.1	1028.1	1028.1	1028.1
2	Required Reduction (%) [c]	18%	27%	36%	45%	70.4%
3	Emission Reductions [d]	185.1	277.6	370.1	462.6	723.8
4	Target Level [e]	843.0	750.5	658.0	565.5	304.0
5	Projected Baseline [f]	754.8	686.5	644.0	617.2	598.9
6	Additional Planned Reductions Needed[g]	----	----	----	164.6	294.9
7	Adjusted Projected Baseline[h]	----	----	----	452.6	304.0

[a] Units are in tons per day (summer) unless otherwise noted; [b] Contains only anthropogenic emissions;
[c] 3% per year (total VOC reductions from 2002 baseline year); [d] [(Row 3) x (Row 4)]/100;
[e] (Row 1) – (Row 3); [f] Projected baseline emissions shown in Appendix III taking into account existing rules and projected growth.; [g] Planned emission reductions from 2007 AQMP control measures; [h] (Row 5) – (Row 6)



* Projected Baseline for year 2017 incorporates planned emission reductions needed; Targeted and Projected Baseline for 2020 reflects Basin carrying capacity

FIGURE 6-1A

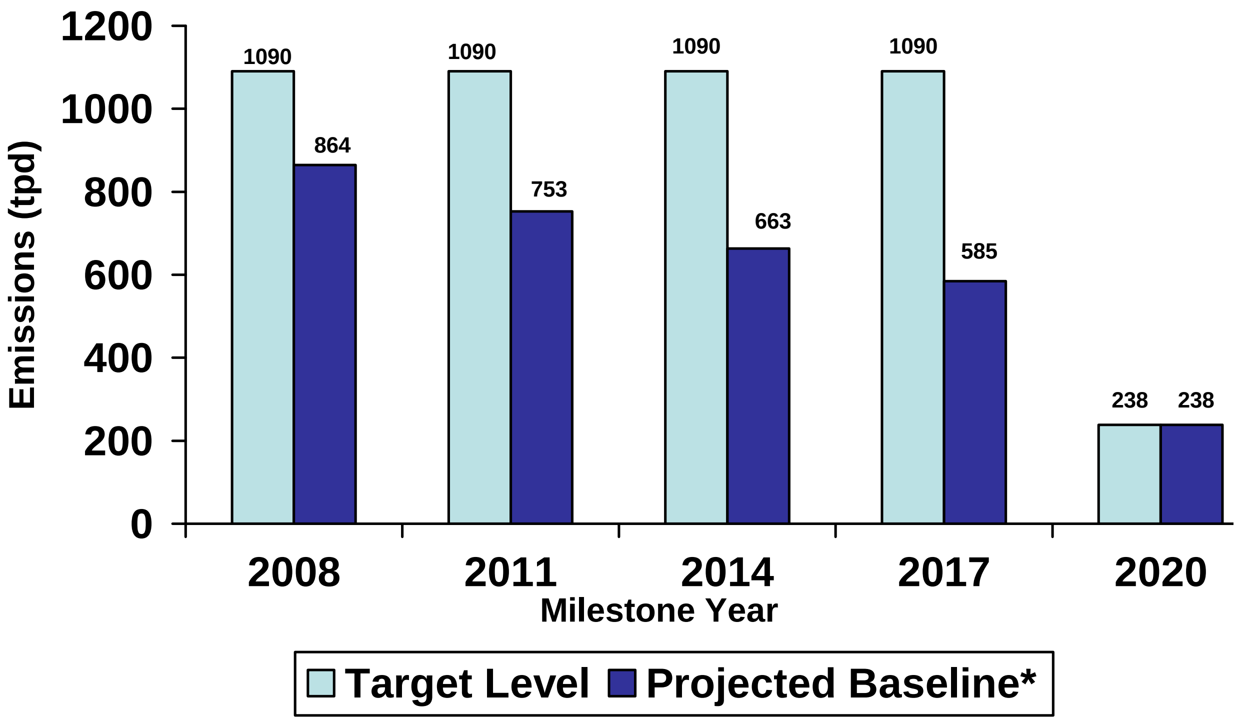
Reasonable Further Progress – VOC

TABLE 6-2B

Summary of Reasonable Further Progress Calculations – NOx

ROW	CALCULATION STEP [a]	2008	2011	2014	2017	2020
1	2002 Base Year Emissions [b]	1090.2	1090.2	1090.2	1090.2	1090.2
2	Required Reduction (%) [c]	0.0%	0.0%	0.0%	0.0%	78.2%
3	Emission Reductions [d]	0.0	0.0	0.0	0.0	848.2
4	Target Level [e]	1090.2	1090.2	1090.2	1090.2	238.0
5	Projected Baseline [f]	864.7	753.3	663.2	585.1	530.9
6	Additional Planned Reductions Needed[g]	----	----	----	----	292.9
7	Adjusted Projected Baseline[h]	----	----	----	----	238.0

[a] Units are in tons per day (summer) unless otherwise noted; [b] Contains only anthropogenic emissions;
[c] Total % NOx reductions substituted for VOC from 2002 baseline year; [d] [(Row 3) x (Row 4)]/100;
[e] (Row 1) – (Row 3); [f] Projected baseline emissions shown in Appendix III taking into account existing rules and projected growth.; [g] Planned emission reductions from 2007 AQMP control measures; [h] (Row 5) – (Row 6)



* Targeted and Projected Baseline for 2020 reflects Basin carrying capacity

FIGURE 6-1B

Reasonable Further Progress – NOx

Reasonably Available Control Technology (RACT)

The CAA requires SIPs for nonattainment areas to require at least emission controls that are economically and technologically feasible. RACT is defined as the lowest emission limit that a particular source is capable of meeting through the application of control technology that is reasonably achievable considering technological and economic feasibility. Under the Phase 2 rule, U.S. EPA specified that areas which are subject to subpart 2 of the CAA must submit a RACT determination within 27 months after designation. AQMD was required to submit its RACT determination by September 15, 2006. On July 7, 2006, the AQMD Governing Board adopted the District's RACT determination and forwarded it to CARB for subsequent submittal to U.S. EPA by the deadline date.

Reasonably Available Control Measures (RACM)

For each nonattainment area required to submit an attainment demonstration, Section 172(c)(1) and (c)(2) of the CAA requires the region to demonstrate that it has adopted all control measures necessary to show that it will attain the 8-hour ozone standard as expeditiously as practicable and to meet any RFP requirements. In order to comply with this provision, AQMD must identify and evaluate all measures it has implemented or plans to implement in the future and compare them with measures implemented by other agencies within and outside of the state. During the recently completed evaluation process for the AQMD's RACT determination, the AQMD concluded that: (1) all Control Technique Guideline (CTG) and non-CTG sources in the Basin were subject to SIP approved rules; and (2) all AQMD rules fulfilled RACT for the 8-hour ozone standard. In addition, pursuant to California Health and Safety Code Section 39614 (SB 656), the AQMD evaluated a statewide list of feasible and cost-effective control measures to reduce directly emitted particulate matter (PM10 and PM2.5) and their precursor emissions (e.g., NOx). The AQMD concluded that for the majority of stationary and area source categories, the AQMD was identified as having the most stringent rules in California. However, one control measure (Wood Burning Fireplaces/Heaters) from the statewide list was identified for adoption by the AQMD and is included in the Draft 2007 AQMP for near-term adoption. Under the RACM guidelines, transportation control measures must be included in the analysis. Consequently, SCAG has completed a RACM determination for transportation control measures in the Draft 2007 AQMP, included in Appendix IV-C.

New Source Review

New source review (NSR) for point sources of ozone precursors is presently addressed through the District's NSR and RECLAIM programs (Regulations XIII and XX).

Contingency Measures

The federal CAA requires ozone contingency measures to be implemented in the event of failure to meet milestone emission reduction targets and/or failure to attain the standard by the attainment date in 2014 (CAA Section 172(c)(9)). Contingency measures are not included in the Draft 2007 AQMP, but will appear in Chapter 9 – Contingency Measures of the Draft Final 2007 AQMP. The full descriptions of each of the contingency measures will be contained in Appendix IV-A of the Draft Final 2007 AQMP.

Transportation Control Measures

Section 182 (d)(1)(A) of the CAA requires the District to include transportation control strategies and TCMs in the Plan that offset any growth in emissions from growth in vehicle trips and vehicle miles traveled and attain reduction of mobile source emissions. Such control measures must be developed in accordance with the guidelines listed in Section 108(f) of the CAA. The programs listed in Section 108(f) of the CAA include, but are not limited to, public transit improvement projects, traffic flow improvement projects, the construction of high occupancy vehicle (HOV) facilities and other mobile source emission reduction programs. TCMs have been developed for the Draft 2007 AQMP and are described in Appendix IV-C – Regional Transportation Strategy & Control Measures. TCMs included in the Draft 2007 AQMP have been developed to meet the requirements of Section 182(d)(1)(A) and 108(f) of the CAA and include the capital-based and non-capital-based facilities, projects and programs contained in the Regional Transportation Plan (RTP) and programmed through the Regional Transportation Implementation Plan (RTIP) process. As an additional measure of reducing mobile source emissions, Section 182(d)(1)(B) of the CAA allows the implementation of employer-based trip reduction programs that are aimed at improving the average vehicle occupancy (AVO) rates. As an alternative to trip reduction programs, Section 182(d)(1)(B) also allows the substitution of these programs with alternative programs that achieve equivalent emission reductions. Rule 2202 - On-Road Motor Vehicle Mitigation Options, adopted in December 1995, was developed to comply with CAA Section 182(d)(1)(B); emission reductions from Rule 2202 are reflected in the baseline inventory.

PM2.5 Planning Requirements

Results of ambient air quality monitoring data indicate that the Basin exceeds federal and state standards for PM2.5. These microscopically fine particles can originate from several industrial processes, including direct emissions and atmospheric chemical reactions which convert gases into particles (referred to as “secondary” particulates), and from a variety of fugitive dust sources, both natural and man-made. Mobile sources also contribute directly to ambient PM2.5 levels through tailpipe emissions including PM2.5 and precursor pollutants and, indirectly, through resuspension of road dust.

The U.S. EPA promulgated the PM2.5 standards in July 1997, followed by legal actions, and eventually upheld in March 2002. U.S. EPA issued designations in December 2004, and they became effective on April 5, 2005. Under the 1990 CAA Amendments and U.S. EPA's "Proposed Rule to Implement the Fine Particle National Ambient Air Quality Standards," each state having a nonattainment area must submit to U.S. EPA an attainment demonstration three years after the designations became effective. The final date for submittal of attainment demonstrations is April 5, 2008. The District has elected to submit a PM2.5 attainment demonstration for the Basin concurrently with their 8-hour Ozone attainment demonstration because many of the control strategies that reduce PM2.5 precursor emissions (e.g., NOx) are also needed to help attain the 8-Hour ozone standard. In fact the attainment date for the PM2.5 standard is earlier than that for the 8-hour ozone standard. It becomes imperative that the District takes an integrated approach in designing the attainment plan. In January 2006, U.S. EPA proposed to lower the 24-hour PM2.5 standard from 65 ug/m^3 35 ug/m^3. U.S. EPA has recently finalized this change. This chapter does not address the revised standard; Chapter 10 – Future Requirements of the Draft 2007 AQMP will discuss this change.

Unlike the 8-hour ozone standard, area designations for the PM2.5 standard did not have a classification system (e.g., serious, severe) and were designated as attainment, non-attainment, or unclassifiable. For the Basin and the portions of the Salton Sea Air Basin under the District's jurisdiction, the regions were designated nonattainment and unclassifiable, respectively. The initial attainment date for areas such as the Basin is April 2010. Unclassifiable regions such as the Coachella Valley Planning Area do not require a planning demonstration for the federal standard and are not addressed in this document. Projected air quality data (with planned controls) for the Basin shows that the region will not be able to meet the April 2010 deadline. Under Section 172 of the CAA, U.S. EPA may grant an area an extension of the initial attainment date for a period of one to five years. In the case of the Basin, the District plans to request the full five-year extension until April 2015 as part of this plan submittal to U.S. EPA.

Current PM2.5 Requirements

For areas such as the Basin that are classified nonattainment for PM2.5, Section 172 of subpart 1 applies. Section 172(c) requires states with nonattainment areas to submit an attainment demonstration. Section 172(c)(2) requires that nonattainment areas demonstrate Reasonable Further Progress (RFP). Under subpart I of the CAA, all nonattainment areas must include in their SIPs contingency measures. Section 172(c)(1) of the CAA requires nonattainment areas to provide for implementation of all reasonably available control measures (RACM) as expeditiously as possible, including through the adoption of reasonably available control technology (RACT). Section 172 of the CAA requires the implementation of a new source review program including the use of "best available control technology" (BACT) for point sources of PM2.5 and precursor emissions (i.e., precursors of secondary particulates). It should be noted that federal BACT is equivalent to California best available retrofit technology (BARCT). All the preceding requirements are addressed individually in the sections that follow.

PM2.5 Attainment Demonstration

Section 172(c) of the CAA requires a PM2.5 attainment demonstration. This attainment demonstration consists of: (1) technical analyses that locate, identify, and quantify sources of emissions that contribute to violations of the PM2.5 standard; (2) analysis of future year emission reductions and air quality improvement resulting from adopted and proposed local control measures; (3) adopted emission reduction measures with schedules for implementation; and (4) analysis supporting the region's proposed attainment date by performing a detailed modeling analysis. Chapter 3 of the Draft 2007 AQMP discusses baseline and future emissions inventories in the Basin, while Chapters 4 – Control Strategy and 7 – Implementation include the proposed control measures (Chapter 4) and schedule (Chapter 7). The modeling results of the attainment demonstration are summarized in Chapter 5.

Reasonable Further Progress (RFP)

Section 172(c)(2) of the CAA requires that nonattainment area plans show sufficient annual incremental emissions reductions as are necessary to ensure that the ambient air quality standard is attained by the applicable date. Emission reductions required under an RFP plan for PM2.5 may be either directly emitted PM2.5 or an applicable precursor air pollutant such as NOx or SOx. The baseline year for purposes of tracking RFP is 2002. U.S. EPA requires that the RFP plan show linear progress according to emission reduction milestones the region establishes for 2010 and every three years thereafter until the attainment year. Emission reductions and program milestone years used in the RFP plan must be based on the prior years' emissions. Since the District is requesting an extension for attainment of the PM2.5 standard out to 2015, the years 2009, 2012, and 2014 are used to determine RFP. The PM2.5 milestone targets for RFP are shown in Table 6-3.

TABLE 6-3

PM2.5 Attainment Year Targets
(Annual Average - Tons per Day)

Pollutant	2002	2009	2012	2014
PM2.5	101	91	87	84
NOx	1,104	707	541	434
SOx	54	33	25	19
VOC	975	673	546	457

Reasonably Available Control Measures (RACM) and Reasonably Available Control Technology (RACT) Requirements

Section 172(c)(1) of the CAA requires nonattainment areas to provide for implementation of all reasonably available control measures (RACM) as expeditiously as possible, including through the adoption of reasonably available control technology (RACT). With regards to the RACM and RACT for PM2.5, the District will be submitting its demonstrations under a separate cover prior to the April 2008 PM2.5 attainment demonstration deadline. This is primarily due to the complexity and resources required to conduct the appropriate analysis and the limited time available to submit the PM2.5 plan at the same time as the 8-hour ozone plan. However, based on the recently completed RACT submittal for the 8-hour ozone standard where the District concluded that the region was meeting RACT for all sources, the District is confident that the region is implementing RACM and RACT for PM2.5 in the Basin.

New Source Review for Point Sources

As mentioned in previous SIP submittals, new source review (NSR) for point sources of PM2.5 and PM2.5 precursors is presently addressed through the District's NSR and RECLAIM programs (Regulations XIII and XX).

Transportation Control Measures

As part of the requirement to demonstrate that RACM has been implemented, transportation control measures meeting the CAA requirements must be included in the plan. Previous SIPs, including the 1994, 1997, and 2003 California Ozone SIP have included transportation control measures. Updated transportation control measures necessary for attainment of the federal PM2.5 and 8-hour ozone standards are described in Appendix IV-C.

Contingency Measures for PM2.5

The federal CAA requires PM2.5 contingency measures to be implemented in the event of failure to meet milestone emission reduction targets and/or failure to attain the standard by the attainment date in 2014 (CAA Section 172(c)(9)). Contingency measures are not included in this Draft 2007 AQMP, but will be included in Chapter 9 – Contingency Measures of the Draft Final 2007 AQMP. The full descriptions of each of the contingency measures will be contained in Appendix IV-A, Section 2 of the Draft Final 2007 AQMP.

Carbon Monoxide Attainment Demonstration

The South Coast Basin has historically had a persistent CO problem. However, there has been considerable improvement in CO air quality in the Basin from 1976 to 2005. In 2001, the Basin met both the federal and state 8-hour CO standards for the first time at all monitoring stations. The 2003 AQMP revision to the CO plan served a dual purpose:

it replaced the 1997 attainment demonstration that lapsed at the end of 2000, and it provided the basis for a CO maintenance plan in the future. In 2004, the AQMD formally requested U.S. EPA to redesignate the Basin as in attainment with the CO ambient air quality standard. No formal action has been taken on this submittal and the Draft 2007 AQMP serves as an update to the maintenance plan submitted as part of the 2003 AQMP. The update to the CO maintenance plan will be further described in Chapter 5 – Future Air Quality, and Appendix V - Modeling and Attainment Demonstration, in the Draft Final 2007 AQMP.

Section 175A(d) of the CAA requires maintenance plans contain contingency measures, if deemed necessary by the U.S. EPA, to assure that the region will promptly correct any violation occurring after redesignation of an area as an attainment area. Due to the continuing improvement in CO air quality it is unlikely that the CO standard would be exceeded in the future. Therefore, no CO contingency measures are included in the Draft 2007 AQMP.

Nitrogen Dioxide Maintenance Plan

The federal annual NO_2 standard was met for the first time in 1992 and the standard has been met every year since. The South Coast Air Basin was redesignated as an attainment area in 1998. Section 175A(a) of the CAA states that any district that submits a request for redesignation of a nonattainment area to attainment must submit a revision of the applicable SIP that provides for maintenance for at least 10 years after the redesignation. In addition, Section 175A(b) requires that 8 years after redesignation of an area to attainment status, the area must submit an additional revision to the NO_2 plan for maintaining the NO_2 standard for an additional 10-year period after the original 10-year maintenance cycle. It has been 8 years since the Basin was redesignated as attainment for NO_2 and the Draft 2007 AQMP serves as an update to the original maintenance plan. Based on the ambient nitrogen dioxide measurements and the projected baseline future-year emissions, the Basin will maintain the federal nitrogen dioxide air quality standard. As with the update to the CO maintenance plan, the update to the NO_2 maintenance plan will be further described in Chapter 5 – Future Air Quality, and Appendix V - Modeling and Attainment Demonstration, in the Draft Final 2007 AQMP.

CALIFORNIA CLEAN AIR ACT REQUIREMENTS

The Basin is designated as in nonattainment with the state ambient air quality standards for ozone, PM10, and PM2.5. The California Clean Air Act (CCAA) requires that a plan for attaining the ozone standard be reviewed and revised every three years (H&SC 40925). The Draft 2007 AQMP satisfies this triennial update requirement. The CCAA established a number of legal mandates to facilitate achieving health-based state air quality standards at the earliest practicable date. The following CCAA requirements are addressed in the remainder of this chapter:

(1) Demonstrate the overall effectiveness of the air quality program;

(2) Reduce nonattainment pollutants at a rate of five percent per year, or include all feasible measures and an expeditious adoption schedule;

(3) Reduce Population Exposure to severe nonattainment pollutants according to a prescribed schedule; and

(4) Rank control measures by cost-effectiveness.

Plan Effectiveness

The CCAA requires, beginning on December 31, 1994 and every three years thereafter, that the District assess its progress toward attainment of the state ambient air quality standards [H&SC 40924(b)] and that this assessment be incorporated into the District's triennial plan revision. Trends in the following air quality indicators are used to demonstrate the effectiveness of the District's program:

(1) VOC, and NO_x, emissions; and

(2) ozone exceedance days and Basin maximum annual average PM10 and PM2.5 concentrations

(3) Ozone population exposure

Trends in the Basin-wide annual average rate of reduction of VOC, and NO_x, emissions since 1990 are shown in Appendix III – Base and Future Year Emissions Inventories. From 1990 to 2006, emissions of VOC, and NOx have decreased overall by 61 percent and 40 percent, respectively.

The number of days exceeding state standards in 1990 through 2005 for ozone, and the trends in maximum recorded PM10 and PM2.5 concentration levels are illustrated in Figure 6-2. Over this time period, it is evident that air quality has improved in the Basin. The number of days exceeding the state ozone standard of 0.09 ppm from 1990 to 2005 is shown in Figure 6-2. Figure 6-2 shows a 45 percent decrease in the number of exceedance days. However, recent air quality monitoring has shown a leveling off of ozone concentrations in the Basin. This leveling off in ozone concentration runs counter to the fact that emissions continue to decline. To examine this issue in more detail, the District is planning a roundtable discussion on the current state of ozone air quality in October 2006.

Also shown in Figure 6-2 are the trends in Basin maximum PM10 and PM2.5 annual average concentrations. Basin maximum annual PM10 concentrations have decreased continuously since 1990 from a high of nearly 80 μg/m^3 to the current level of just above 50 μg/m^3. PM2.5 concentrations have decreased nearly 30 percent since 1999. The state annual standards are 20 μg/m^3 and 12 μg/m^3 for PM10 and PM2.5, respectively.

NO_2 and CO air quality have also improved substantially since 1990. NO_2 and CO metrics are not shown since the Basin currently meets all state and federal NO_2 and CO standards. The reader is referred to Appendix II – Current Air Quality for a more comprehensive discussion of local air quality trends.

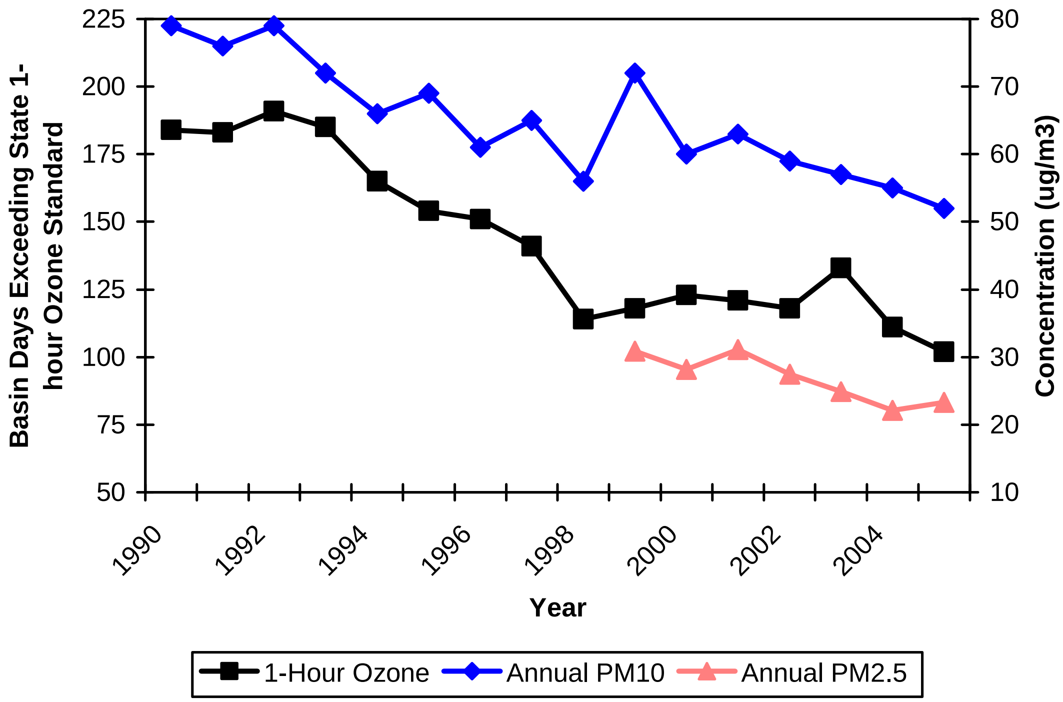


FIGURE 6-2

Ozone, PM10, and PM2.5 Trends Since 1990

Emission Reductions

The CCAA requires that each district plan be designed to achieve a reduction in district-wide emissions of 5 percent or more per year for each non-attainment pollutant or its precursors, averaged every consecutive three-year period (H&SC 40914). If this cannot be achieved, a plan may instead show that it has implemented all feasible measures as expeditiously as possible Furthermore, for each district that is designated nonattainment for both state and federal ambient air quality standards for a single pollutant subject to the planning requirements (i.e., ozone), reductions in emissions shall be calculated with respect to the actual emissions during the baseline year applicable to the implementation plan required by the federal CAA. This baseline year is 2002.

The planning inventory 2002 baseline emissions and estimated emission reductions for the reporting year 2005 are presented in Table 6-4. These estimates are based on the controlled emissions. As seen in the table, the existing control strategy falls short of the CCAA emission reduction goals (i.e., five percent per year for all nonattainment pollutants) even with the implementation of maximum feasible controls. Nonetheless, the strategy represents "all feasible control measures" and an "expeditious adoption schedule" as permitted under H&S Code 40914.

TABLE 6-4

Summary of 2007 AQMP Emissions Based on Planning Inventory Emissions (tons/day)*

Year	Summer Ozone Inventory VOC		NO_x	
2002 Baseline	1,028		1,090	
Emission Reductions				
2005	891	(13%)	1,023	(6%)
CCAA Requirement		(15%)		(15%)

Population Exposure

The CCAA also requires a reduction in overall population exposure to criteria pollutants. Specifically, exposure to the designated severe nonattainment pollutants (i.e., ozone) above standards must be reduced by at least:

(1) 25 percent by December 31, 1994;

(2) 40 percent by December 31, 1997; and

(3) 50 percent by December 31, 2000.

Reductions are to be calculated based on per-capita exposure and the severity of exceedances. For the Basin, this provision is applicable to ozone [H&S Code 40920(c)]. The definition of exposure is the number of persons exposed to a specific pollutant concentration level above the state standard times the number of hours exposed. The per-capita exposure is the population exposure (units of pphm-persons-hours) divided by the total population. While this requirement has already been met in previous AQMPs, the exposure demonstration is provided again in the Draft 2007 AQMP for consistency.

The Regional Human Exposure (REHEX) model is used to estimate per-capita exposure reduction. It considers population mobility; time spent indoors, outdoors and in transit; exposure by age classification; and activity pattern by season and weekday/weekend.

An analysis using the REHEX model indicates that the CCAA Amendments exposure reduction targets have been achieved for ozone with a margin of safety. Figure 6-3 summarizes the results and compares exposure reductions to the targets. It should be noted that the CCAA exposure requirement for 2000 is shown for 2005, since it is not required beyond 2000.

The REHEX model also allows more detailed exposure reduction estimates disaggregated by age group and county. These results are summarized in Figures 6-4 and 6-5, respectively. As shown, the greatest exposure reduction for an individual age class is for children, who have longer exposure to outdoor concentrations; the geographic location with the most improvement for all age groups is that comprised of the two inland counties.

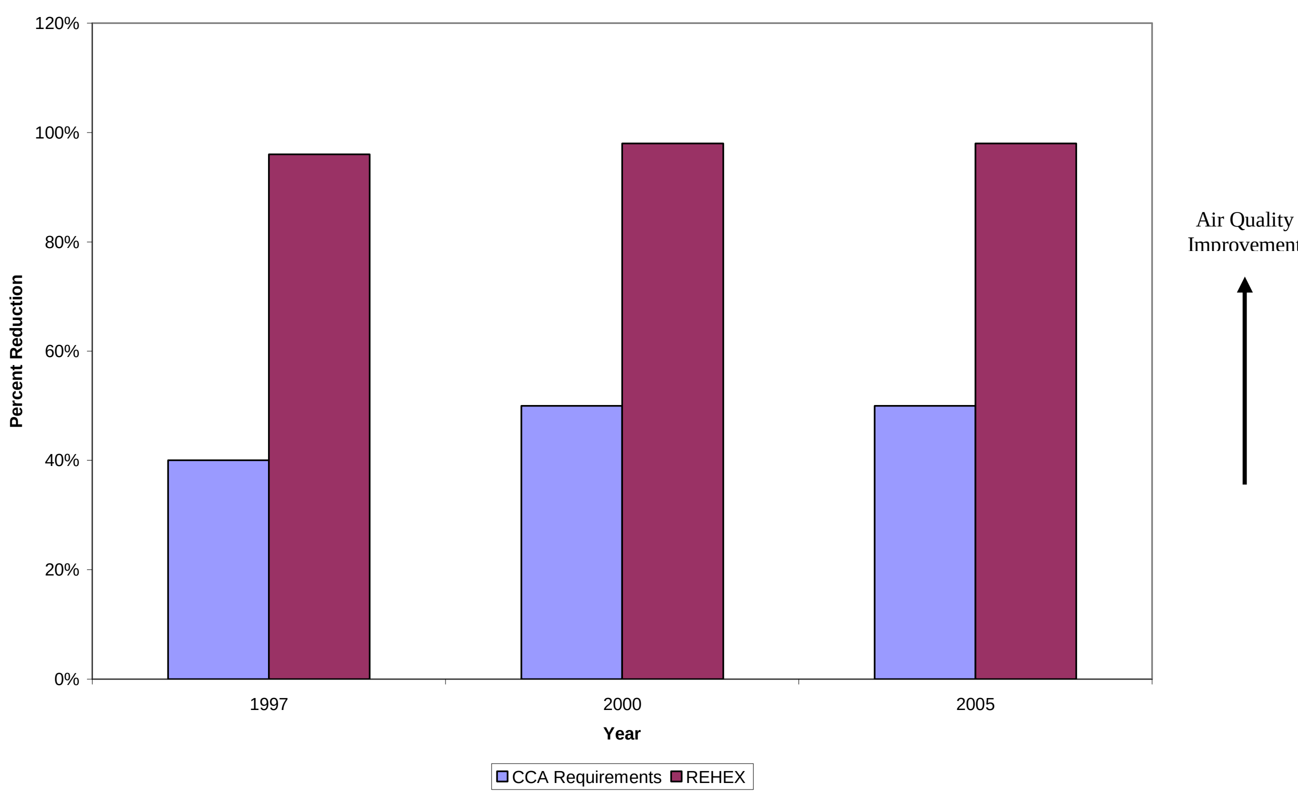


FIGURE 6-3

Percent Reductions in Annual Average Per-Capita Exposure to Ozone

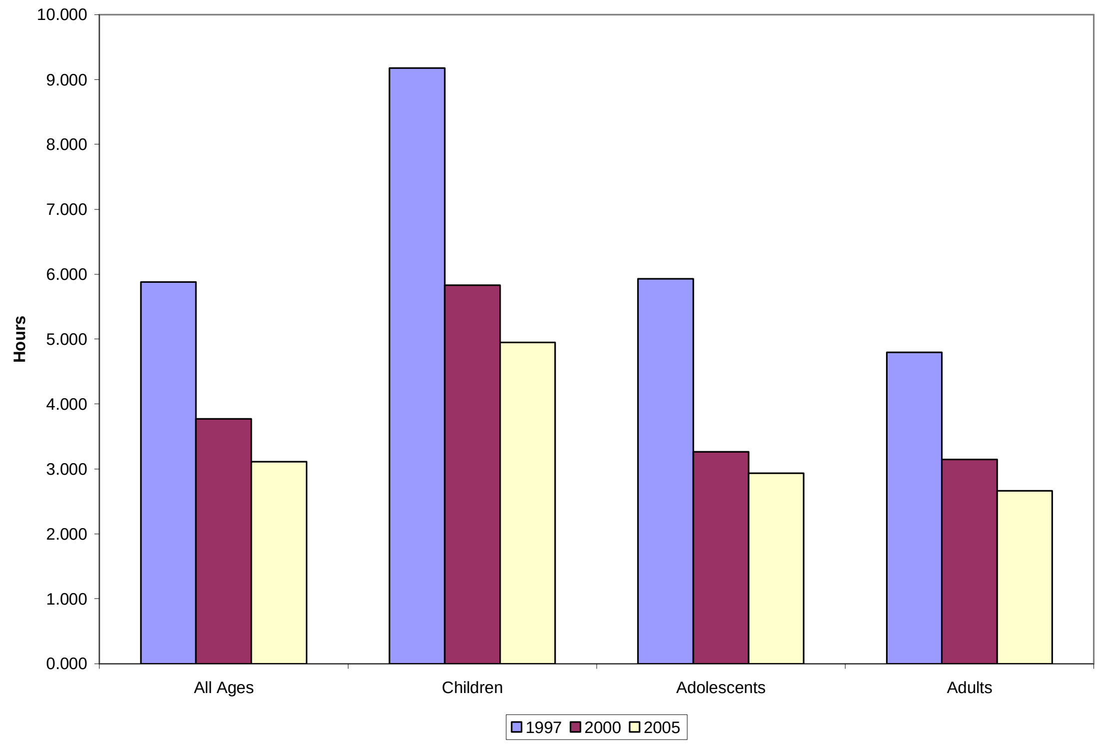


FIGURE 6-4

Per-Capita Ozone Exposure Above the State Standard by Age Group

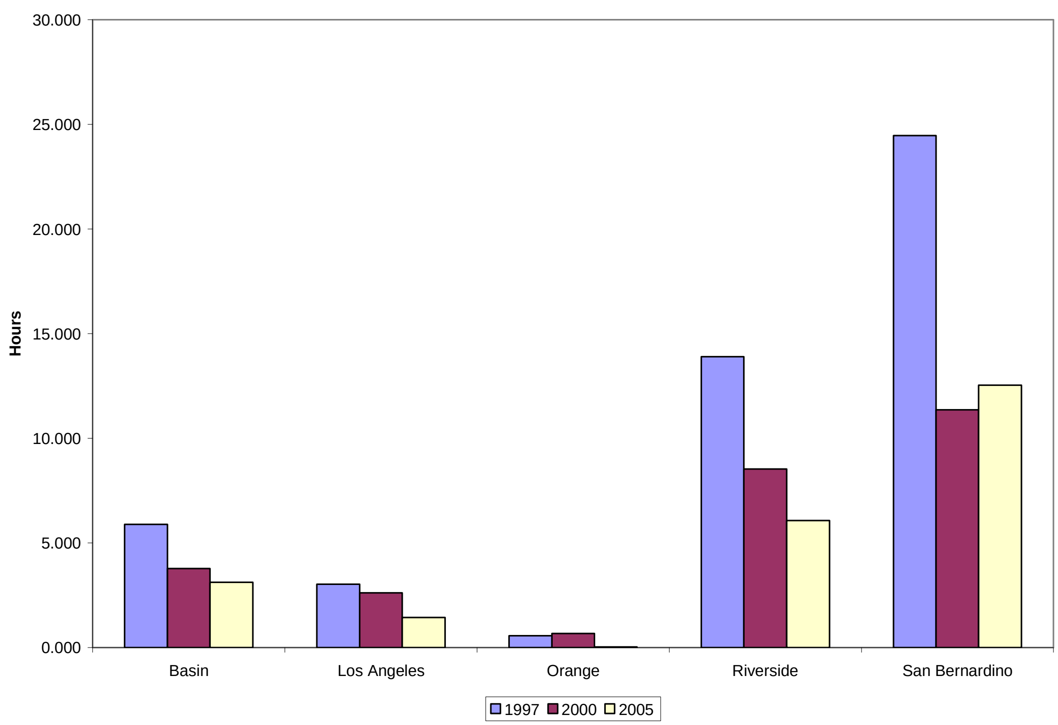


FIGURE 6-5

Per-Capita Ozone Exposure Above the State Standard by County

Cost Effectiveness Ranking

The CCAA requires that each plan revision shall include an assessment of the cost effectiveness of available and proposed control measures and shall contain a list which ranks the control measures from the least cost-effective to the most cost-effective. Cost-effectiveness ranking is not included in the Draft 2007 AQMP, but will be included in the Draft Final 2007 AQMP once the measures are further refined and the cost-effectiveness analysis is competed.

In developing an adoption and implementation schedule for a specific control measure, the district shall consider the relative cost effectiveness of the measure as well as other factors including, but not limited to, technological feasibility, total emission reduction potential, the rate of reduction, public acceptability, and enforceability. The implementation schedule is provided in Chapter 7 –Implementation.

TRANSPORTATION CONFORMITY BUDGETS

The Draft 2007 AQMP sets forth the strategy for achieving the federal 8-hour ozone, PM2.5, and maintaining the federal CO and NO_2 standards. For on-road mobile sources, Section 176(c) of the CAA requires that transportation plans and programs do not cause or contribute to any new violation of a standard, increase the frequency or severity of any existing violation, or delay the timely attainment of the air quality standards. Therefore, on-road mobile sources must "conform" to the attainment demonstration contained in the SIP.

U.S. EPA's transportation conformity rule, found in 40 CFR parts 51 and 93, details the requirements for establishing motor vehicle emissions budgets in SIPs for the purpose of ensuring the conformity of transportation plans and programs with the SIP attainment demonstration. The on-road motor vehicle emissions budgets act as a "ceiling" for future on-road mobile source emissions. Exceedances of the budget indicate an inconsistency with the SIP, and could jeopardize the flow of federal funds for transportation improvements in the region. As required by the CAA, a comparison of regional on-road mobile source emissions to these budgets will occur during the periodic updates of regional transportation plans and programs.

The on-road motor vehicle emissions estimates for the Draft 2007 AQMP were analyzed using the EMFAC2007 Working Draft for estimating on-road mobile source emissions in conjunction with the most recent motor vehicle activity data from SCAG. For the Draft 2007 AQMP, emissions forecasts are provided in Tables 6-5 through 6-8 for milestone years 2014 and 2020. The motor vehicle emission budgets should be considered preliminary for discussion purposes and will be revised upon release of the EMFAC2007 in November 2006, and be part of the Draft Final 2007 AQMP. Emissions were generated for the summer, winter, and annual average planning inventory for each milestone year. The ozone emissions budgets for VOC and NOx are derived from the summer planning inventory and the reductions from defined new measures in the 2007 SIP. The PM2.5 emissions budgets for PM2.5, and the PM2.5 precursors VOC and NOx, are derived from the annual average inventory. These budgets reflect existing control programs and new commitments for technology and transportation control measures. The CO and NO_2 emissions budgets established in the 2003 AQMP for CO and NOx, respectively, remain unchanged. The baseline winter planning inventories for CO and NO_2 indicate that the region will continue to meet the budgets for these two pollutants.

This approach is consistent with U.S. EPA's transportation conformity rule, which provides that if emissions budgets rely on new control measures, these measures should be specified in the SIP and the emissions reductions from each control measure should be quantified and supported by agency commitments for adoption and implementation schedules. Moreover, the rule provides that conformity analyses by transportation agencies may not take credit for measures which have not been implemented unless the measures are "projects, programs, or activities" in the SIP supported by written implementation commitments by the responsible agencies (62 FR 43780, 40 CFR 93, subpart A).

The emissions budgets for ozone and PM2.5 are provided here for up to the respective attainment year. However, since transportation analyses are needed beyond the attainment dates, the carrying capacities for PM2.5 and ozone attainment demonstration also serve as the budgets for future years (e.g., 2030 for PM2.5 and ozone). Ozone precursor emissions from motor vehicles are projected to continue declining through these extended periods.

TABLE 6-5

Preliminary Motor Vehicle Emissions Budgets: PM2.5 *
(Annual Average - Tons Per Day)

		2014	2020
VOC	Baseline Inventory	196.0	144.4
	New Defined State Measures**	48.1	0.0
	Mobile Source Emission Budgets* **	**148.0**	**106.0**
		2014	**2020**
NOx	Baseline Inventory	322.0	212.0
	New Defined State Measures	82.3	71.9
	Mobile Source Emission Budgets* **	**240.0**	**140.0**
		2014	**2020**
PM2.5	Baseline Inventory	15.1	13.9
	Re-entrained road dust (paved)	19.5	20.3
	Re-entrained road dust (unpaved)	1.0	1.0
	Road Construction dust	0.1	0.1
	Adjusted Inventory	35.7	35.3
	New Defined State Measures	2.6	2.3
	New Defined State Measures	2.6	2.3
	Mobile Source Emission Budgets* **	**33.0**	**33.0**

* 2020 budget is applicable to all future years beyond 2020. Budgets are preliminary and will change upon release of EMFAC2007 and any other applicable data

** Based on District staff's recommended measures affecting on-road mobile categories

*** Rounded up to the nearest ton.

TABLE 6-6

Preliminary Motor Vehicle Emissions Budgets: Ozone
(Summer Planning - Tons Per Day)*

		2014	**2020**
VOC	Baseline Inventory	202.9	151.0
	New Defined State Measures**	50.7	40.7
	Mobile Source Emissions* **	**152.0**	**110.0**

		2014	**2020**
NOx	Baseline Inventory	315.5	208.3
	New Defined State Measures**	80.7	70.6
	Mobile Source Emissions* **	**235.0**	**138.0**

* 2020 budget is applicable to all future years beyond 2020. Budgets are preliminary and will change upon release of EMFAC2007 and any other applicable data
** Based on District staff's recommended measures affecting on-road mobile categories
*** Rounded up to the nearest ton.

TABLE 6-7

Preliminary Motor Vehicle Emissions Budgets: Carbon Monoxide
(Winter Planning - Tons Per Day)*

		2002
CO	Baseline Inventory	4,103
	New Defined State Measures	0.0
	Mobile Source Emission Budgets**	**4,103**

* 2002 budget applicable to future years, including the last year of maintenance plan (i.e., 2010).
** Rounded up to the nearest ton.

TABLE 6-8

Preliminary Motor Vehicle Emissions Budgets: Nitrogen Dioxide *
(Winter Planning - Tons Per Day)

		2002
NO_2	Baseline Inventory	694.8
	New Defined State Measures	0.0
	Mobile Source Emission Budgets**	**695**

* 2002 budget is applicable to all future years beyond 2020.
** Rounded up to the nearest ton.

PORT EMISSIONS

Port related sources such as ships, trucks, cargo handling equipment, harbor craft, and locomotives are a major contributor to the emissions inventory in the Basin. In April 2006, CARB adopted its Emission Reduction Plan for Ports and Goods Movement in California (GMP) which established the framework for actions to reduce the air quality and health impacts from the Ports and other goods movement activities in the state. In June 2006, both ports released the San Pedro Bay Ports Clean Air Action Plan (CAAP) which set out emission reduction goals and control strategies necessary to reduce the emissions from port-related sources. Emission reductions from port-related sources are required in order to show attainment with the ambient air quality standards for both PM2.5 and 8-hour standard. The Draft 2007 AQMP contains port-related measures that build upon both the GMP and CAAP with enhancements by the District to reflect the reductions needed for attainment. Specifically, the Draft 2007 AQMP proposes locomotives go beyond the GMP and CAAP by requiring all locomotives operating in the Basin to be Tier 3 equivalent by 2020. For ocean going vessels, the Draft 2007 AQMP proposes that all ships operating within 40 nautical miles to operate on 0.2 percent sulfur fuel beginning in 2008, with another reduction to 0.1 percent sulfur beginning in 2010. In addition, the draft plan calls out for ships to comply with the vessel speed reduction proposal specified in the CAAP, as well as similar retrofit penetration rates for 2014 and 2020 to what is called for in the GMP. The estimated emission reductions and final emissions targets needed from port-related sources to demonstrate attainment are shown in Table 6-9.

TABLE 6-9

Preliminary Port Emissions Targets (tpd)*

		2002	2014	2020
NOx	Baseline Inventory	116.0	119.9	128.7
	Emission Reductions		71.1	96.0
	Port Emissions Targets	**116.0**	**48.8**	**32.7**
		2002	**2014**	**2020**
SOx	Baseline Inventory	24.1	47.8	62.4
	Emission Reductions		46.2	60.4
	Port Emissions Targets	**24.1**	**1.6**	**2.0**
		2002	**2014**	**2020**
PM2.5	Baseline Inventory	6.6	7.9	9.3
	Emission Reductions		4.5	6.5
	Port Emissions Targets	**6.6**	**3.4**	**2.8**

*Port emissions estimated by assigning all ships, harbor craft, and port-related cargo handling equipment emissions to port inventory. Emissions from trucks and locomotives operating at the ports are based on the percentage of international goods movement compared to all goods movement (international plus domestic) emissions from CARB's GMP statewide estimate for trucks and locomotives.

CHAPTER 7

IMPLEMENTATION

Introduction
Responsible Agencies
Control Measures
Technology Advancement
Implementation Support Activities
Monitoring

INTRODUCTION

Achieving clean air objectives requires the effective and timely implementation of the measures defined in Chapter 4. In general, these measures rely on the application and advancement of technologies and management practices. These strategies also require actions by numerous agencies. This chapter presents the adoption and implementation schedule of the control measures proposed in the Plan and delineates each agency's area of responsibility. Implementation support activities are also discussed.

RESPONSIBLE AGENCIES

Implementation of the Plan's strategies requires a cooperative partnership of governmental agencies at the federal, state, regional and local level. As described in Table 7-1, these agencies form the four cornerstones from which implementation programs will evolve.

At the federal level, the U.S. EPA and other agencies are charged with reducing emissions from federally controlled sources such as commercial aircraft, trains, marine vessels, and other sources. As discussed in Chapter 4, the 2007 AQMP incorporates several measures carried over from the 1997 AQMP and 1999 Amendment to the 1997 Ozone SIP.

At the state level, CARB is responsible for reducing emissions from motor vehicle and consumer products. The Plan's on-road and off-road mobile source control program is principally based on CARB's proposed control measures. Also, California's inspection and maintenance program for on-road vehicles is administered by the Bureau of Automotive Repair (BAR), a part of the California Department of Consumer Affairs.

At the regional level, the District is responsible for the overall development and implementation of the AQMP. The District is specifically authorized to reduce the emissions from stationary point, and some area sources such as coatings and industrial solvents. Emission reductions are also sought through funding programs designed to provide monies for the purchase of new low-emission equipment and vehicles and the retrofit of existing off-road sources to low-emission alternatives. In addition, the district regulates indirect sources under Health and Safety Code 40716 by implementing a mandatory ride sharing program or equivalent mobile source emission reduction alternative program for large employers. As a means of achieving further emission reductions, the District may seek additional authority to regulate sources that have not been under the District's jurisdiction in the past such as marine vessels, consumer products, and other on-road and off-road sources. The District implements its responsibilities with participation from the regulated community through an extensive rule development and implementation program. This approach maximizes the input of those parties affected by the proposed rule through consultation meetings, public workshops, and ongoing working groups.

At the regional level, the Southern California Association of Governments (SCAG) assists sub-regional and local governments in playing a formative role in the air quality elements of transportation planning. In addition, local governments serve an important role in developing and implementing the Plan's transportation control measures. SCAG is responsible for providing the socioeconomic forecast (e.g., population and growth forecasts) upon which the Plan is based. SCAG also provides assessments for conformity of regionally significant transportation projects with the overall Plan and is responsible for the adoption of the Regional Transportation Plan (RTP) and the Regional Transportation Improvement Program (RTIP) which include growth assumptions and transportation improvement projects that could have significant air quality impacts, and transportation control measures as required by the CAA.

TABLE 7-1

Agencies Responsible for Implementation
of the 2007 AQMP Revision for the South Coast Air Basin

Agency	Principal responsibilities
EPA	• Forty-nine state mobile vehicle emission standards; • Airplanes, trains, and ships; • New off-road construction & farm equipment below 175 hp;
ARB	• On-road/Off-road vehicles • Motor vehicle fuels; and, • Consumer products
SCAQMD	• Stationary (e.g., industrial/commercial) and area sources; • Indirect sources • Some mobile sources (e.g., visible emissions and use regulations from trains and ships)
SCAG	• AQMP conformity assessment • Regional Transportation Improvement Program • Transportation Control Measures
Local Government/ CTCs	• Transportation and local government actions (i.e., land use approvals & ports); and, • Transportation facilities

CONTROL MEASURES

The Plan proposes measures that can be implemented using currently available technologies and management practices as well as a long-term strategy necessary to meet attainment of the ozone standard. Control measures are to be implemented by all levels of government including federal agencies, the state ARB, the District and local governments and SCAG.

Control Measure Ranking

The California Clean Air Act requires air pollution control districts to assess the effectiveness of control measures in reducing ambient ozone concentrations as part of their plan submittals. The CCAA requires districts to determine that their AQMPs are cost-effective strategies that attain air quality standards by the earliest practicable date [H&SC 40913(b)]. In addition, plans must include an assessment of the cost-effectiveness of available and proposed control measures and a list of the measures ranked from the least cost-effective to the most cost-effective [H&SC 40922(a)]. Tables 6-6 and 6-7 in Chapter 6 show the ranking of the control measures by cost-effectiveness. In developing their control strategy implementation schedule, districts must consider the other effectiveness criteria including technological feasibility, total emissions reduction potential, rate of reduction, public acceptability, and enforceability [H&SC 40922(b)]. The criteria used for this Plan are listed in Table 7-2.

Table 7-3 lists the control measures, the responsible agency, and the proposed adoption and implementation dates. New items proposed for the first time in this Plan have been placed in the appropriate position on the existing schedule based on a review of the AQMP control measure prioritization factors described above.

CARB

CARB is responsible for adopting on- and off-road mobile source emission standards, fuel requirements, and consumer product regulations. Table 7-3 identifies the suggested control measures and their proposed adoption and implementation dates that CARB will be responsible for implementing in the 2007 AQMP.

TABLE 7-2

Criteria for Evaluating 2007 AQMP Control Measures

Criteria	Description
Cost-Effectiveness	The cost of a control measure to reduce air pollution by one ton [cost covers obtaining, installing, and operating the control measure].
Efficiency	The positive effects of a control measure compared to its negative effects.
Emission Reduction Potential	The total amount of pollution that a control measure can actually reduce.
Enforceability	The ability to force polluters to comply with a control measure.
Equity	The fairness of the distribution of all the positive and negative effects among various socioeconomic groups
Legal Authority	Ability of the District or other adopting agency to implement the measure or the likelihood that local governments and agencies will cooperate to approve a control measures
Public Acceptability	The support the public gives to a control measure.
Rate of Emission Reduction	The time it will take for a control measure to reduce a certain amount of air pollution.
Technological Feasibility	The likelihood that the technology for a control measure will be available as anticipated.

TABLE 7-3

2007 AQMP Control Measures, Implementing Agency, Adoption Date and Implementation Period

Control Measure Number	Control Measure Name	Implementing Agency	Adoption Date	Implementation Period
<u>Facility Modernization</u>				
MCS-01	Facility Modernization [All Pollutants]	SCAQMD	2008-2010	Beginning 2012
<u>Energy Efficiency/Conservation</u>				
MCS-02	Urban Heat Island [All Pollutants]	SCAQMD	On-going	On-going
MCS-03	Energy Efficiency and Conservation [All Pollutants]	SCAQMD	2008-2010	Beginning 2010
<u>Good Management Practices</u>				
FUG-01	Improved Leak Detection and Repair [VOC]	SCAQMD	2008-2009	2009-2010
FUG-02	Emission Reductions from Gasoline Transfer and Dispensing Facilities [VOC]	SCAQMD	2009	2010-2012
FUG-04	Emission Reductions from Pipeline and Storage Tank Degassing [VOC]	SCAQMD	2007	2008-2009
BCM-01	PM Control Devices (Bag Leak Detectors, Wet Scrubbers, Electrostatic Precipitators, Other Devices) [PM]	SCAQMD	2008-2009	2010-2012
MCS-04	Emissions Reductions from Green Waste Composting [VOC, PM, NH_3]	SCAQMD	Phase 1: 2009-08 Phase 2: 2010	2012
MCS-06	Improved Start-up, Shut-down and Turnaround Procedures [All Pollutants]	SCAQMD	2010	2012
<u>Market Incentives/Compliance Flexibility</u>				
CTS-02	Clean Coating Certification Program [VOC]	SCAQMD	2008-2009	2010
CMB-02	Reduction of Emissions in RECLAIM (BARCT) [SOx]	SCAQMD	2007-2008	2011-2014
FLX-01	Economic Incentive Programs [All Pollutants]	SCAQMD	On-going	On-going
FLX-02	Petroleum Refinery Pilot Program [VOC and NOx]	SCAQMD	2007-2008	2010
<u>Area Source Programs</u>				
FUG-03	Cutback Asphalts [VOC]	SCAQMD	2008	2010
CTS-01	Industrial Lubricants [VOC]	SCAQMD	2009	2010

TABLE 7-3 (continued)

2007 AQMP Control Measures, Implementing Agency, Adoption Date and Implementation Period

Control Measure Number	Control Measure Name	Implementing Agency	Adoption Date	Implementation Period
Area Source Programs (Continued)				
CTS-03	Consumer Products Labeling and Emissions Reductions from Use of Consumer Products at Institutional and Commercial Facilities [VOC]	SCAQMD	2007-2010	2010-2020
CMB-01	NOx Reduction from Non-RECLAIM Ovens, Dryers ad Furnaces [NOx]	SCAQMD	2008	2010
CMB-03	Further NOx Reductions from Space Heaters [NOx])	SCAQMD	2009	2012
CMB-04	Natural Gas Fuel Specifications [NOx]	SCAQMD	2008	2009
BCM-02	PM Emission Hot Spots – Localized Control Program [PM]	SCAQMD	On-going	On-going
BCM-03	Emission Reductions from Wood Burning Fireplaces and Wood Stoves [PM]	SCAQMD	2007	2008
BCM-04	Additional PM Emission Reductions from Rule 444 – Open Burning [PM]	SCAQMD	2007	2008-2010
BCM-05	Emission Reductions from Charbroilers [PM]	SCAQMD	2010	2012
MSC-05	Emission Reductions from Non-Dairy Livestock Waste [VOC, PM and NH_3]	SCAQMD	2009	2011
MSC-07	Application of All Feasible Control Measures [All Pollutants]	SCAQMD	2007-2010	2010-2020
Emission Growth Management				
EGM-01	Emission Reductions from New or Redevelopment Projects [All Pollutants]	SCAQMD	Phase 1: On-going Phase 2: On-going Phase 3: 2008	Phase 1: On-going Phase 2: On-going Phase 3: 2010
EGM-02	Emission Budget and Mitigation for General Conformity Projects [All Pollutants]	SCAQMD	Beginning 2007	Beginning 2007
EGM-03	Emissions Mitigation at Federally Permitted Projects [All Pollutants]	SCAQMD	Beginning 2007	Beginning 2007

TABLE 7-3 (continued)

2007 AQMP Control Measures, Implementing Agency, Adoption Date and Implementation Period

Control Measure Number	Control Measure Name	Implementing Agency	Adoption Date	Implementation Period
District's Mobile Source Program				
MOB-01	Mitigation Fee Program for Federal Sources [All Pollutants]	SCAQMD	2007-2010	2010-2020
MOB-02	Expanded Exchange Program [All Pollutants]	SCAQMD	2007-2010	2010-2020
MOB-03	Backstop Measure for Indirect Sources of Emissions from Ports and Port-Related Facilities [All Pollutants]	SCAQMD	2007-2010	2010-2020
MOB-04	Emission Reductions from Carl Moyer Program [NOx, PM]	SCAQMD	On-going	On-going
Suggested On-Road Mobile Source Control Measures*				
ONRD-01	Smog Check Improvements [VOC, NOx, CO, PM]	CARB	2007-2010	2010-2020
ONRD-02	Expanded BAR Vehicle Retirement and Mandatory Part Replacement [VOC, NOx]	CARB	2007-2010	2010-2020
ONRD-03	California Phase 3 Reformulation Gasoline Modifications [VOC, SOx]	CARB	2007-2010	2010-2020
ONRD-04	More Stringent Motorcycle Standards [VOC, NOx]	CARB	2007-2010	2010-2020
ONRD-05	PM Testing for Light/Medium Duty Vehicles [PM]	CARB	2007-2010	2010-2020
ONRD-06	Accelerated Penetration of Partial Zero-Emission and Zero Emission Vehicles [All Pollutants]	CARB	2007-2010	2010-2020
ONRD-07	Greater Use of Diesel Fuel Alternatives and Diesel Fuel Reformulation [NOx, PM]	CARB	2007-2010	2010-2020
ONRD-08	Accelerated Retrofits of Heavy Duty Vehicles [NOx, PM]	CARB	2007-2010	2010-2020
ONRD-09	In-Use Emission Reductions from On-Road Heavy-Duty Vehicles [VOC, NOx, PM]	CARB	2007-2010	2010-2020
ONRD-10	Further Emission Reductions from Out-of-State/International Registered Heavy-Duty Vehicles [NOx, PM]	CARB	2007-2010	2010-2020
ONRD-11	Enhanced Inspection and In-Use Emissions Tracking of Heavy-Duty Vehicles [VOC, NOx, PM]	CARB	2007-2010	2010-2020

TABLE 7-3 (continued)

2007 AQMP Control Measures, Implementing Agency, Adoption Date and Implementation Period

Control Measure Number	Control Measure Name	Implementing Agency	Adoption Date	Implementation Period
Suggested On-Road Mobile Source Control Measures (Continued)*				
ONRD-12	Further Emissions Reductions from Heavy-Duty Trucks Providing Freight Drayage Services [VOC, NOx, PM]	CARB	2007-2010	2010-2020
Suggested Off-Road Mobile Source Control Measures*				
OFFRD-01	Construction/Industrial Equipment Fleet Modernization [VOC, NOx, PM]	CARB	2007-2010	2010-2020
OFFRD-02	Accelerated Turnover and Catalyst Based Standards for Pleasure Craft [VOC, NOx, PM]	CARB	2007-2010	2010-2020
OFFRD-03	More Stringent Exhaust Standards for Off-Road Recreational Vehicles [VOC, NOx]	CARB	2007-2010	2010-2020
OFFRD-04	Evaporative Standards for Recreational Vehicles and Pleasure Craft [VOC]	CARB	2007-2010	2010-2020
OFFRD-05	Further Emission Reductions from Locomotives [NOx, PM]	U.S. EPA	2007-2010	2010-2020
OFFRD-06	Clean Marine Fuel Requirements for Ocean-Going Marine Vessels [NOx, SOx, PM]	CARB	2007-2010	2010-2020
OFFRD-07	Further Emission Reductions from Ocean-Going Marine Vessels and Harbor Craft while at Berth [All Pollutants]	CARB	2007-2010	2010-2020
OFFRD-08	Further Emission Reductions from Cargo Handling Equipment [NOx]	CARB	2007-2010	2010-2020
OFFRD-09	Vessel Speed Reduction [NOx]	CARB	2007-2010	2010-2020
OFFRD-10	Further Emission Reductions from Ocean-Going Vessels [NOx]	CARB	2007-2010	2010-2020
OFFRD-11	Emission Reductions from Aircraft [VOC, NOx]	CARB	2007-2010	2010-2020
OFFRD-12	Lower Exhaust and Evaporation Standards and Fleet Modernization for Lawn and Garden Equipment [VOC]	CARB	2007-2010	2010-2020
OFFRD-13	Emission Reductions form Airport Ground Support Equipment [VOC, NOx, PM]	CARB	2007-2010	2010-2020

TABLE 7-3 (continued)

2007 AQMP Control Measures, Implementing Agency, Adoption Date and Implementation Period

Control Measure Number	Control Measure Name	Implementing Agency	Adoption Date	Implementation Period
Suggested Consumer Products Control Measure*				
CONS-01	Further Reductions for Consumer Products [VOC]	CARB	2007-2010	2010-2020
Transportation Control Measures				
TCM-A	HOV Improvements	SCAG, CTCs, Local Gov't	2007	2007-2023
TCM-B	Transit & Systems Management	SCAG, CTCs, Local Gov't	2007	2007-2023
TCM-C	Information Based Measures	SCAG, CTCs, Local Gov't	2007	2007-2023
Long-Term Control Measures				
LTM-01	Reactivity Based Controls [VOC]	SCAQMD, CARB	2009-2012	2012-2014
LTM-02	Further Emission Reductions from NOx RECLAIM Facilities [NOx]	SCAQMD	2009-2012	2012-2014
LTM-03	Long-Term Control Measure for Fugitive Emissions [VOC]	SCAQMD	2009-2012	2012-2014
LTM-04	Concurrent Reductions from Global Warming Strategies [All Pollutants]	CARB	On-going	On-going
LTM-05	Further VOC Reductions from Mobile Sources [VOC]	CARB	2009-2012	2012-2014

* Annual rulemaking schedule to be developed by CARB within adoption date window but at earliest practicable date.

District

The District is responsible for implementing the stationary and mobile source control measures proposed by the District. As shown in Table 7-3, stationary source control measures will be implemented primarily through District rules and regulations as specified in federal and state law.

As indicated in Chapter 4, several key approaches are proposed for implementing the stationary source emission reduction measures. Specifically, the Plan proposes to use source-specific control approaches and market incentives to implement most of the stationary source measures. Chapter 4 and Appendix IV-A provide more detail relative to these implementation approaches.

Southern California Associations of Governments

The region's long-range transportation blueprint, its previously triennial and now quadriennial Regional Transportation Plan (RTP), and the shorter-term programming needed to fund the improvements, the Regional Transportation Improvement Program (RTIP), together form the foundation for improving transportation system performance while at the same time assuring the timely attainment of air quality goals within the South Coast Air Basin. The RTIP is the vehicle used to implement the goals of the long-range RTP and provides for timely implementation of Transportation Control Measures (TCMs) for the South Coast Air Basin. The RTIP is a short-term document covering six years, and it must be updated at least every two years. As the biennial element of the RTIP is revised, the list of fiscally constrained projects (i.e., projects for which funding has been identified), will be updated.

Local Governments and Transportation Agencies

Local governments (cities and counties) are also responsible for helping to provide supportive actions through participation in voluntary programs. Local governments and transportation agencies are also responsible for implementing several measures in the Plan including, but not limited to, the transportation improvements called for in the Plan. SCAG helps local governments coordinate their efforts and ensure that the region's transportation projects, programs and plans conform to the SIP. In addition, actions by the Ports of Los Angeles and Long Beach are needed to help address goods movement related air pollution.

Congestion Management Program Linkage to the AQMP

The Congestion Management Program is a comprehensive strategy to relieve traffic congestion and maintain levels of service on roadways within the Southern California region. The County Transportation Commissions (CTCs) are the designated Congestion Management Agencies (CMA) within the SCAG region and are directly responsible for the preparation of Congestion Management Plans (CMP) for their respective counties. SCAG reviews and incorporates CMPs into the RTP through the regular update cycle.

The CMPs interlink with the AQMP in several areas, particularly through TCMs. Most TCM projects identified in the RTIP are designed to help relieve congestion at the local level. Thus, implementation of the AQMP helps local governments tackle congestion, which, in turn, reduces emissions from idling vehicles or the number of vehicles traveling on congested roadways, and also helps maintain the level of service standards. At the same time, the CMP process provides local governments a mechanism to contribute to the regional effort toward attaining the NAAQS. In addition, the process gives local governments an opportunity to work cooperatively with their CTCs and subregional agencies to craft integrated trip reduction strategies to meet the CMP trip reduction requirements.

The CMP process and the AQMP are further linked through the local capital improvement program. This required element of the CMP must be consistent with the RTIP, which in turn must be consistent with the RTP. The relationship between the air quality management plans and the regional transportation planning process is iterative. Thus, for example, the 2004 RTP must conform to the 2003 AQMP, and, in turn, forms the basis for the 2006 RTIP, and both these, together, provide the context for the current AQMP.

Southern California Economic Partnership (The Partnership)

The Partnership is a non-profit organization assigned the mission of accelerating the deployment of advanced transportation technologies (ATTs) throughout Southern California. It was established in 1994 based on the SCAG Regional Mobility Element and the AQMP as an implementation organization for advanced transportation technology strategies. The technology focus is on technologies that improve traffic flow, transit usage, carpooling, telecommuting, alternative fuel vehicles and infrastructure and commuter information services.

The Partnership, through its public/private participatory structure, is capable of providing networking and guidance to those parties interested in the deployment of advanced transportation technologies throughout Southern California. "Stakeholder Workshops" are held to discuss implementation barriers and assist in the development of deployment and marketing strategies. In addition to its administrative support of programs such as Clean Cities, eCommute and ITS Southern California, it has in effect become a clearinghouse of ATT information and progress.

To aid Southern California cities and counties in ATT deployment, The Partnership has developed various documents and web site materials and links that provide goals and objectives, implementation worksheets, model policies, model resolutions, building codes, product/service technology updates, infrastructure suggestions and requirements, training and safety requirements, case studies, funding opportunities and an activity recognition program. The Partnership produces these documents and conducts workshops and presentations to encourage participants to use ATTs. It also develops and distributes ATT newsletters and promotional materials to heighten awareness and garner unified understanding and support for the technologies from both the public and private sectors. Most of this information is also presented on The Partnership's web site (www.the-partnership.org) which is continuously updated with deployment achievements throughout the region.

Workshops and Outreach

To generate additional interest and understanding of technology deployment, The Partnership occasionally hosts technology workshops at the District and other convenient locations for local elected officials, city planners and managers, with considerable private sector involvement and support. In addition to these workshops, The Partnership also: 1) makes presentations to cities, schools and organizations; 2) distributes monthly technology "News Flashes" to all stakeholders via email or published on The Partnership's web site; and 3) attends the meetings of related organizations and project developers.

Information Distribution and Industry Networking Support

Since the Partnership works closely with the stakeholders in supporting transportation technologies, it has become a de facto clearinghouse of ATT information. In this capacity, it is suited to direct and introduce interested participants to other stakeholders with similar goals and into the formation of productive and mutually beneficial public/private partnerships.

TECHNOLOGY ADVANCEMENT

The District's Technology Advancement Office (TAO) sponsors public-private research and development partnerships in order to identify and promote low- and zero-emissions technologies for both stationary and mobile sources. The TAO has several programs through which advanced mobile and stationary source control strategies are funded, researched, and commercialized. One such program is the Carl Moyer Program which is a state-wide funding program that provides monies to purchase low-emission on- and off-road vehicles and equipment and marine engines to reduce NOx and PM. A second program overseen by TAO is the RECLAIM Executive Order Fee Program which channels monies collected from funds established under Executive Order and Rule 2020 – RECLAIM Reserve to fund projects with approved protocols established under Regulation XVI – Mobile Source Offset Programs. The TAO also administers projects funded through the Mobile Source Air Pollution Reduction Review Committee (MSRC). The MSRC, which was established in 1990 with the adoption of Assembly Bill 2766, funds projects to reduce air pollution from motor vehicles as needed for implementing the California Clean Air Act of 1988. The fourth mechanism where advanced mobile and stationary source control strategies are funded, researched, and commercialized is under the Clean Fuels Program, which was established in state law in 1988 under the California Health and Safety Code, 40448.5. The Clean Fuels Program leverages cost-share from other government agencies (e.g., CARB, CEC, U.S. EPA, and DOE) as well as the technology providers themselves.

Table 7-4 lists some key recently-completed or currently-underway projects sponsored by the TAO to facilitate development and commercialization of low-polluting technologies. Some of the stationary source projects do not have specific linkages to the control measures but serve as future technologies that may be available to meet current regulations with future compliance dates or AQMP control measures.

SCAQMD Clean Fuels Program – Technology Advancement Plan

SCAQMD Cleans Fuels Program – Technology Advancement Plan is a formal plan required by state law to be adopted by the District's Governing Board. The most recent update of the Technology Advancement Plan for 2006 focused on potential projects for research, development, demonstration, and commercialization of clean fuels technologies and advanced technologies that may reduce emissions and help meet the clean air goals of the District. The key areas of the 2006 Technology Advancement Plan are summarized below.

TABLE 7-4

Current or Recently Completed TAO Projects

Project Description	Pollutant(s)	Goal(s)	Associated Control Measure
<u>Alternative Fuels – On-Road Applications</u>			
Remote Sensing of High Emitting Light-Duty Vehicles	VOC, NO_x, CO, PM10	A, B, C	ONRD-01 ONRD-05
Development & Demonstration of Advanced Natural Gas Engine Meeting 2010 On-Road Heavy-Duty Exhaust Emission Standards	VOC, NO_x, CO, PM10	A, B, C	ONRD-08 ONRD-09 ONRD-12
Aftertreatment Technologies for PM Emissions Control of CNG-Fueled Heavy-Duty Engines	PM10	A, B	ONRD-08
Demonstrate Fischer-Tropsch Synthetic Fuel in Heavy- & Medium-Duty Vehicles	NO_x, PM10	A, B, C	ONRD-07
Demonstration of Fischer Tropsch Synthetic Fuel in Heavy & Medium-Duty Vehicles; and Advanced Diesel Fuels, Engines, NO_x Absorber Catalyst & Diesel Particulate Filter Project	VOC	A, B, C	ONRD-08
Perform Evaporative Emission Testing on Gasoline Heavy-Duty Hybrid-Electric Bus	VOC, NO_x, CO, PM10	A, B, C	ONRD-09
Development of Heavy-Duty Diesel Engines Meeting 2010 On-Road Heavy-Duty Exhaust Emissions Standards	NOx, PM10	A, B, C	ONRD-09 ONRD-10 ONRD-12

TABLE 7-4 (continued)

Currently or Recently Completed TAO Projects

Project Description	Pollutant(s)	Goal(s)	Associated Control Measure
Alternative Fuels – Infrastructure			
Cost-Share Small-Scale Natural Gas Liquefaction Plant	VOC, NO_x, CO, PM10	B	ONRD-09 ONRD-12
Cost-share Installation of CNG Fueling Facility	VOC, NO_x, CO, PM10	B	ONRD-09 ONRD-12
Incentive Buydown Program for CNG Home Refueling Appliances	VOC, NO_x, CO, PM10	B	ONRD-06
Fuel Cell and Hydrogen Technologies			
Develop, Demonstrate & Evaluate Truck Fuel Cell Auxiliary Power Unit	VOC, NO_x, CO, PM10	A, D	ONRD-09 ONRD-10
Develop & Demonstrate Advanced Storage Tanks for Storing CNG/LNG and Compressed and Liquid Hydrogen	VOC, NO_x, CO, PM10	A, D	ONRD-06 ONRD-09
Demonstrate & Develop Hydrogen Refueling Stations	VOC, NO_x, CO, PM10	A, D	ONRD-06
Develop & Demonstrate Hydrogen Internal Combustion Engine Vehicles	VOC, NO_x, CO, PM10	A	ONRD-06
Electric and Hybrid Electric Technologies			
Develop & Demonstrate Hydrogen-Internal Combustion Engine for Hybrid-Electric Buses	VOC, NO_x, CO, PM10	A, D	ONRD-09
Evaluate Hybrid Electric Vehicles	VOC, NO_x, CO, PM10	A, B, C	ONRD-06
Optimize & Demonstrate Plug-In Hybrid Electric Vehicles	VOC, NO_x, CO, PM10	A, B, C	ONRD-06
Develop & Demonstrate Hydraulic-Hybrid System for Heavy-Duty Vehicles	VOC, NO_x, CO, PM10	A, B, C	ONRD-08 ONRD-09
Alternative Fuels – Off-Road Applications			
Demonstrate Retrofit Technologies on Switcher and Head End Power Locomotives	NO_x, PM10	A, B, C	OFFRD-05
Demonstration of Particulate Trap Technologies	VOC, NO_x, CO, PM10	A, B, C, D	OFFRD-01 OFFRD-08

TABLE 7-4 (continued)

Currently or Recently Completed TAO Projects

Project Description	Pollutant(s)	Goal(s)	Associated Control Measure
Emissions Analysis			
Conduct In-Use Emissions Testing of On-Road Heavy-Duty Trucks	VOC, NO_x, CO, PM10	C, D	ONRD-09 ONRD-10 ONRD-12
Stationary Sources - Clean Energy Technologies			
Professional Wet Cleaning Technology Demonstration & Pilot Incentive Program	VOC, NO_x, CO, PM10	A, B, C	Long-Term Measure
Stationary Sources – VOC Reduction Technologies			
Zero- & Low-VOC Resin Technology for Advance Control Measure Development	VOC	A, B, C	CTS-01 CONS-01

A. Supports technical feasibility
B. Supports commercialization
C. Demonstration of current or potential CARB standards or guidelines
D. Enhances databases (e.g., emission factors, inventories, health data, etc.)

Carl Moyer Program

The Carl Moyer Memorial Air Quality Standards Program (Carl Moyer Program) provides incentive funding to reduce emissions from heavy-duty diesel-powered vehicles and equipment as well as gross polluting passenger cars and small trucks. The main objective of the program is to support projects that would provide emission reductions that are not already required by statute, rule, order, or regulation. The program was first funded in 1998 by the Governor, formally established by the Legislature in 1999, and is administered by the CARB and local and regional air pollution control districts. The District will be administering incentive funds through the Carl Moyer Program for the replacement of diesel-fueled on- and off-road vehicles including refuse haulers, heavy-duty trucks, transit and school buses, construction equipment, marine and port applications and other vehicles and equipment. New engines, re-powers and retrofits are allowed within the program.

A variety of vehicle classes and types are funded under the Carl Moyer Program to help purchase new vehicles or new engines/repowers and for installation of retrofit units on older engines. New vehicles and engines must achieve at least a 30 percent reduction, and repowered vehicles and retrofits must achieve at least a 15% reduction of NOx emissions compared to current emission standards. New engines must be CARB-certified, when applicable, and retrofits must be CARB-verified. Projects reducing PM and/or VOC are also eligible for funding provided they are cost-effective. Alternative fuel engines, such as those using compressed natural gas, liquefied natural gas, propane and electricity will be given preference for funding. Cleaner diesel engines may also be considered in the off-road category. In addition, the District is conducting a car and small truck remote sensing and repair or scrap project under the program.

As part of the Draft 2007 AQMP, the District will continue to aggressively seek out Carl Moyer dollars and fund projects that produce surplus, verifiable, and enforceable emission reductions. Surplus emission reductions achieved through the Carl Moyer Program are important to the success of the PM2.5 and ozone attainment strategies.

Alternative Fuels - Incentives Program

Exhaust emissions from high-emitting diesel-fueled school buses are harmful to children and are a key source of public exposure to toxic diesel particulate matter and smog forming pollutants. There are thousands of older school buses on the road that have remained in service primarily because school districts lack funds to replace them. Since 1999, with the help of state funding, the District has approved almost $59 million to clean up and replace diesel-powered school buses in the Southland. Projects approved include the purchase of 286 compressed natural gas-powered school buses (with an additional 133 for the District's Governing Board to consider in October 2006), 86 lower-emitting new diesel buses and the retrofitting of 2,101 diesel buses with particulate emission traps (an additional 452 diesel school buses will be considered by the District's Governing Board in October 2006). Recent state budget cuts have resulted in a reduction of about $2 billion from school budgets, potentially affecting the transition to less-polluting school buses.

The District recently proposed that $14M of its AB923 funds be recognized in the "Lower-Emission School Bus Replacement & Retrofit Program Fund" and used to facilitate the acquisition of new compressed natural gas buses by school districts and the concomitant reduction or elimination of diesel-fueled school buses. Distribution of the funds for school buses will take into consideration several elements, including, but not limited to, the environmental justice provisions of the Health & Safety Code as amended by AB-1390 (Firebaugh), population distribution among various counties, and the mix of older versus newer buses.

Alternative Fuels - On-Road

Major emission reductions are required in this area, particularly from heavy-duty vehicles. Continued efforts focused on the development of lower-NO_x and PM emitting heavy-duty natural gas and diesel engines, as well as development and demonstration of alternative fuel school buses and other heavy-duty vehicles. The District has initiated projects for the development of heavy-duty natural gas engines that will meet the 2010 on-road heavy-duty exhaust emissions standard of 0.2 g/bhp-hr NO_x. Two of the major natural gas engine manufacturers have announced their intentions to certify heavy-duty natural gas engines meeting 2010 emission standards as early as 2007. Additionally, plans to demonstrate zero-emission technology for idling heavy-duty trucks and trailers were included.

The District is interested in ethanol (E85) and biodiesel and has initiated projects to evaluate the emissions benefits of these renewable fuels. There are many flexible fuel vehicles (FFVs) that can run on either E85 or gasoline. E85 should exhibit decreased HC emissions due to the fuel's lower volatility, but the District is investigating the potential for permeation issues in older vehicles when E85 is mixed with conventional gasoline. The District is also concerned that no FFVs has been certified to SULEV emissions levels.

The District has also initiated a program to evaluate the emissions from biodiesel in heavy-duty trucks. High levels of biodiesel blends (e.g., B99) have shown greatly reduced PM but with higher NOx emissions. The District is evaluating biodiesel in tandem with two different SCR systems to mitigate any NOx increases.

Alternative Fuels - Infrastructure

Since 2001, the District funded the development of natural gas refueling sites, and studies on compressors, meters, and home dispensing and liquefaction equipment. Plans to conduct additional studies to enhance the liquefied natural gas manufacturing, distribution, and detection technologies are contained in the 2006 update. Another area of focus will be to develop best practices that can lead to standardization and modularization, as well as develop templates for the design and installation of alternative fuel re-fueling stations. The continued support and development of home refueling for alternative fuels is also an area of interest.

The District is also focused on the development and deployment of renewable biofuels, including ethanol and biodiesel. The specifications of the fuels themselves and their emissions under different load cycles and applications will be carefully evaluated to ensure that any increases in pollutant emissions are mitigated.

Fuel Cell Technologies

The District is currently demonstrating fuel cell vehicles in its daily fleet activities and plans to expand the demonstration of fuel cell vehicles in other conventional and non-conventional fleets. The plan also proposed to co-sponsor studies to develop more realistic demonstration specifications for fuel cell transit buses, specifically to evaluate realistic operational availability, training, on site service, and warranty issues.

In the area of hydrogen fueling infrastructure, the plan included development and demonstration of distributed hydrogen production and refueling stations for fleet and commercial uses, as well as home refueling appliances. Furthermore, the plan included additional work on cosponsoring studies for certifying hydrogen components and subsystems, as well as the personnel involved in the installation, operation, and maintenance of hydrogen systems. To facilitate the development of the hydrogen refueling infrastructure, the District funded the development and demonstration of thirty hydrogen-powered internal combustion engines. The thirty vehicle demonstration also serves as a transition path to dedicated hydrogen and fuel cell vehicle technologies.

Aftertreatment

The heavy-duty in-use fleet is responsible for a large portion of the mobile source emissions in the Basin. The District continues to evaluate after treatment technologies to be used on a wide variety of model year trucks, including diesel particulate filters, oxidation catalysts, and selective catalytic reduction systems.

Electric and Hybrid Electric Technologies

Electric and Hybrid Electric Technologies, including demonstration of light-duty and heavy-duty electric and hybrid-electric vehicles, as well as refinement of charging technologies and advanced energy storage systems are proposed in the 2006 TAO Plan. The District will continue the development and demonstration programs, with focus on a variety of fleets, including transit buses and heavy-duty trucks. There will also be continued focus on advanced energy storage devices such as ultra-capacitors, lithium-technology, and high-speed flywheel battery applications. The District also plans to upgrade hybrid-electric development and demonstration projects with current, better-performing components resulting in enhanced reliability and lower emissions, as well as plug-in recharging capability.

The District is also evaluating the use and application of electric technologies for container movement. Examples of such technologies include electrification of gantry cranes, linear induction motors, and magnetic levitation systems for container movement within and from the ports.

Alternative Diesel Fuels - Off-Road Applications

The District plans to evaluate various off-road technologies. Some of these include demonstration of low- and zero-emission locomotives, low-emission alternative fuel off-road engines using technology developed for on-road engines, including retrofit equipment. Another area of focus will be the use of gas-to-liquid fuels, emulsified fuels, bio-diesel, and low-sulfur diesel fuels in construction equipment and other off-road uses. These alternative diesel fuels offer the potential for large PM and NOx reductions especially when used in tandem with after treatment devices. Demonstration of particulate control technologies is a high priority area. The plan also includes projects pertaining to low-emission marine engines, including hybrid-electric technology.

Stationary Sources

The District funded numerous projects for the use of microturbines for stationary power generation. The District plans to support this effort in assembling and demonstrating portable microturbine technology that utilizes natural gas or propane. Another distributed generation project of interest will be the demonstration of a hybrid fuel cell/microturbine power plant that could provide electricity at much higher efficiencies than conventional generator systems. Another area of focus will be the development and demonstration of emulsified fuel technology for portable power generators. The 2006 plan also included projects focusing on technology assessments of future VOC limits in various District rules, as well as additional development and demonstration of near-zero or zero-VOC technologies for solvents, coatings, and adhesives.

IMPLEMENTATION SUPPORT ACTIVITIES

Implementation of the 2007 AQMP will require support activities sponsored by the District and SCAG. These efforts are described in the following subsections.

District Assistance and Outreach Programs

Since the adoption of the 1991 AQMP the District has provided assistance to the agencies charged with implementing the Plan. A key accomplishment was the District's CEQA Air Quality Handbook to assist local governments in assessing and mitigating air quality impacts from projects within their jurisdiction. The District has designed and implemented a City Executive Outreach Campaign to raise awareness among city managers and administrators of District programs affecting them and the types of District resources available to them. Areas being covered during this process include:

- Fleet rule compliance and funding opportunities, including technical assistance available
- Complaint Process/Constituents Issues
- Building Department Services
- No-cost, no-fault, compliance assistance for small businesses
- Training programs for city and county building and safety staff, and
- Incorporation of a model air quality element into General Plans.

Local Governments Assistance Program

In May 2005, the District developed a guidance document for assisting local governments in addressing air quality issues in their general plans and local planning. The guidance document provides a list of suggested goals, objectives, policies, and strategies that local governments can implement to prevent or reduce potential air pollution impacts and protect public health. A number of cities have already adopted Air Quality Elements in their General Plans or have in place different air quality programs or policies, while the majority of cities do not have such programs. In order to facilitate an even stronger collaboration between the District and local governments, the District would develop two types of local government pilot programs to seek emission reductions within city or county operations:

Partnership Program

Under this program, the District will seek to partner with local governments to implement targeted programs to reduce emissions. An example of this program will be a targeted lawn and garden equipment exchange program jointly funded and implemented by the District and the local governments. Other feasible strategies include modernization of corporate fleet on-road and off-road vehicles, low-emitting shuttles for city transportation, energy efficiency and conservation programs, and public outreach and education programs. The District could set aside funding for city contractors who could meet the minimum air quality criteria.

City Leadership Award

Each year, the District will award 3 to 5 cities with innovative proposals to implement emission reductions strategies. The District will work with local governments to explore and design the program to capture reduction opportunities within their operations.

Business Assistance

The District has initiated several programs to assist businesses that must comply with the requirements promulgated in the Plan. These programs include: permit streamlining practices, interaction with small and medium-sized businesses, source education programs, compliance assessment programs, and tax incentives.

The Public Advisor assures business input to the District's policy makers through community workshops, industry-specific meeting, and ethnic business working groups. Fee Review and other technical assistance helps companies resolve issues in a cooperative manner.

The District's Small Business Assistance office helps owners/operators participate in the District's policy and rule development process and helps them comply with applicable requirements. It offers permit application and processing assistance as well as compliance and financial assistance.

As part of its efforts to implement to promote facility modernization, the District will forge partnerships with local businesses, trade organizations, environmental groups, and other stakeholders, and pursue state and federal tax incentives. Any early replacement of equipment prior to a specified useful life may qualify for tax incentives, or potentially credit generation.

SCAG Assistance

SCAG has provided significant assistance and outreach to County Transportation Commissions (CTC) and local governments in understanding, assessing and implementing programs to address TCMs and associated air quality issues. SCAG provides funding to its thirteen subregions to help develop policies and strategies and prepare monitoring programs which address TCMs, air quality and mobility requirements--identifying locally sensitive implementation options and continuing to develop monitoring programs to report progress.

In cooperation with the District, SCAG helped create and launch the now independent Southern California Economic Partnership (The Partnership), as discussed previously in this chapter. SCAG continues to participate in an active role to implement new strategies to improve air quality and mobility.

MONITORING

The 2007 AQMP sets the course for attaining the federal and state air quality standards in the Basin. As the Plan is implemented, it is essential to periodically assess the effectiveness of the air pollution control programs in reducing emissions, and to determine whether or not the Basin is still proceeding along the course set forth in the AQMP. Monitoring the AQMP's effectiveness will also be an integral part of preparing the annual rule work plan. Once every three years, the District is required to assess the overall effectiveness of its air quality program as discussed in Chapter 6. Significant enhancements have been incorporated into the modeling approach for the 2007 AQMP as discussed in Chapter 5. SCAG with the assistance of County Transportation Commissions (CTC), and CARB will also be responsible for monitoring their portion of the Plan.

CHAPTER 8

FUTURE AIR QUALITY - DESERT NONATTAINMENT AREAS

This chapter has been omitted from the Draft 2007 AQMP and will be available for public review at least 90 days prior to Final Plan approval

CHAPTER 9

CONTINGENCY MEASURES

This chapter has been omitted from the Draft 2007 AQMP and will be available for public review at least 90 days prior to Final Plan approval. Since all currently identified measures are needed for the main control strategy, additional suggestion regarding potential contingency measures are being solicited from all stakeholders.

CHAPTER 10

LOOKING BEYOND CURRENT REQUIREMENTS

Introduction

A First Look at the Year 2030 Ozone Air Quality

New Federal Air Quality Standard for Fine Particulates

California's PM Air Quality Standards

INTRODUCTION

This Chapter presents additional analyses which are not required under law to be included in this draft AQMP, but are presented here for informational purposes because they have significant future implications to the region's ability to reach clean air. Specifically this chapter provides a first look at projected ozone concentrations b eyond the 2010 attainment year and the impact of the new federal 24-hour PM2.5 ambient air quality standard.

A FIRST LOOK AT THE YEAR 2030 OZONE AIR QUALITY

With continued growth in the South Coast Air Basin, concerns have been raised whether the South Coast Air Basin can maintain the federal ozone air quality standard beyond 2021. As such, an ozone air quality analysis for 2030 was performed. Data on the projected growth in the Basin and surrounding areas were provided by SCAG.

The future year (2030) ozone air quality projections suggest that additional emissions reductions will be required to offset growth to maintain the 8-hour ozone standard. Mobile source emissions projections through 2030 indicate that continued reductions in VOC, NOx and CO will occur as newer vehiles are introduced. Mobile source VOC and NOx emissions will be reduced by about 25 and 15 percent respectively. CO emissions will be reduced by roughlt 15 percent, assuring continued maintenance of the federal standard. Nominal growth is projected in the area source category that will partially act to offset the mobile source VOC reductions by 2030. Since the projected growth in this category is small, it is not expected to reverse the trend of lowering ambient ozone concentrations.

NEW FEDERAL AIR QUALITY STANDARDS FOR FINE PARTICULATES

In September 2006, U.S. EPA revised the national ambient air quality standards for particulate matter.

As part of the requirements of the CAA, every five years the U.S. EPA must review the ambient air quality standards and propose revisions, if necessary, to "protect public health with an adequate margin of safety," based on the latest, best-available science. This review process includes a comprehensive evaluation of the latest health studies; a redrafting, if appropriate, of the relevant pollutant criteria document; and a staff report recommending the position of the U.S. EPA staff relative to the air quality standards. Further, these documents and U.S. EPA staff recommendation are reviewed by a panel of independent experts authorized by the CAA, the Clean Air Science Advisory Committee (CASAC).

In promulgating the new standards, U.S. EPA followed the elaborate review process described above, which took several years to complete. The evaluation of thousands of peer-reviewed scientific studies led to the conclusion that existing standards for the two pollutants, ozone and particulates, were not adequately protective of public health and resulted in the promulgation of the new standards. The studies indicated that for $PM_{2.5}$, short-term exposures at levels below 24-hour standard of 65 µg/m^3 were found to cause acute health effects, including asthma attacks, breathing and respiratory problems. With regards to the annual $PM_{2.5}$ standard debate focused on a proposal to lower the standard from the current value of by as much as three µg/m^3.

The debate also extended to coarse particulate matter. The proposal revoked the annual PM10 standard and replaced it with an annual $PM_{10\text{-}2.5}$ standard. In addition, the 24-hour PM10 standard would remain in effect for selected urban areas until implementation of a new 24-hour average $PM_{10\text{-}2.5}$ standard could be finalized.

What are the Health Concerns?

A brief summary of the effects associated with these pollutant exposures at levels observable in Southern California is presented. A more detailed discussion of health effects is provided in Appendix I.

The major categories of adverse health effects associated with $PM_{2.5}$ include: increase in mortality associated with acute and chronic exposures; exacerbation of preexisting respiratory and cardiovascular diseases leading to an increase in hospital admissions and emergency room visits; school absences; work loss days and restricted activity days; changes in lung function and structure; and altered lung defense mechanisms.

A review and statistical analysis of recent population studies published on acute adverse effects of $PM_{2.5}$ indicates that an incremental increase can lead to a significant increase in both mortality and morbidity risks. The elderly, people with preexisting respiratory and/or cardiovascular disease(s) and children appear to be most susceptible to the effects of $PM_{2.5}$. These findings suggest that even when an area meets the existing NAAQS for $PM_{2.5}$ the community is likely to continue to have the adverse impact from ambient $PM_{2.5}$ exposures.

The focus on the health effect of particulate matter exposure has moved through the years from epidemiological assessments of total supended particulates to the impacts from the respireable portions less than 10 micons in size. More and more studies confirm the impacts of both PM_{10} and $PM_{2.5}$ on health with greater focus on smaller particles. Current research is focusing on the health impacts of ultrafine particulate of aerodynamic diameter less than 1 micron. An extensive discussion on ultrafine particulate its characterisitics, health impacts and prospect for future control is presented in Chapter 11 of this document.

What is the new Federal PM Standard?

On September 21, 2006, U.S. EPA signed the "Final Revisions to the National Ambient Air Quality Standards for Particle Pollution (Particulate Matter)." Through this action U.S. EPA established a lower 24-hour average standard for the fine fraction of particulates. The new 24-hour average $PM_{2.5}$ standard is set at 35 µg/m^3. No changes were made to existing annual $PM_{2.5}$ standard which remains at 15 µg/m^3. The annual component of the standard was set to provide protection against typical day-to-day exposures as well as longer-term exposures, while the daily component protects against more extreme short-term events. For the new 24-hour $PM_{2.5}$ standard, the form of the standard continues to be based on the 98th percentile of 24-hour $PM_{2.5}$ concentrations measured in a year (averaged over three years) at the monitoring site with the highest measured values in an area. This form of the standard will reduce the impact of a single high exposure event that may be due to unusual meteorological conditions and thus provide a more stable basis for effective control programs.

EPA's action immediately revoked the annual PM_{10} standard, yet retained the 24-hour average standard at the current level (150 µg/m^3). No action was taken to establish either an annual or short-term "coarse particulate-$PM_{10-2.5}$ standard.

While retaining the 24-hour PM_{10} standard, U.S. EPA has also retained the current form of the 24-hour PM10 standard set at 150 µg/m^3. not to be exceeded more than once per year averaged over a three year period.

Implementation of the New Federal Standard

It is expected that EPA will designate the new 24-hour $PM_{2.5}$ nonattainment areas by Novemeber 2009, and they will become effective April 2010. A SIP revision will be due to EPA by April, 2013 demonstrating an attainment date of April, 2015 with a possible extension to April, 2020. The modifications made to the 24-hour $PM_{2.5}$ standard will not change the planning requirements for the 2007 AQMP attainment demonstration. However, the plan should be designed with the new standard in mind with respect to the need for future controls. The existing standard of 65 µg/m^3 standard that will remain in effect until 2010.

Assessment of the New Federal 24-Hour $PM_{2.5}$ Standard

A comparison of the current $PM_{2.5}$ standards, the PM_{10} 24-hour standard and the new 24-hour $PM_{2.5}$ standard for 2005, 2015 and 2021 are shown in Table 10-1. The 2005 values are derived from the measurements sampled through the routine Basin particulate air monitoring. The 2005 design values are presented to assess compliance to the federal standards. The 2015 and 2021 $PM_{2.5}$ and PM_{10} values are estimated from the particulate modeling applications (discussed in Chapter 5 and Appendix V).

While the 2005 maximum 24-hour avererage $PM_{2.5}$ concetration exceeded the 65 $\mu g/m^3$ threshold, the design value for the Basin based on a 3-year average of the 98th percentile observation met the standard. When the 2005 maximum 24-hour average concentration and 3-year design value is compared to the new standard, the concentration exceeds the threshold by 279 percent and the design value by 85 percent. The 2005 Basin annual average $PM_{2.5}$ maximum concentraion of 21.0 $\mu g/m^3$ was 40 above the federal standard and contributed to a design value of 22.6 $\mu g/m^3$ which was 51 percent above the standard. The maximum observed 24-hour average PM_{10} concentration in 2005 was approximately 80 percent of the federal standard and the 3-year average standard is met.

As projected in 2015, the current 24-hour $PM_{2.5}$ and PM_{10} average and annual $PM_{2.5}$ standard will be met. The estimated 2015 design value will exceed the new $PM_{2.5}$ standard by 29 percent. The current simulations project a similar profile for particulate air quality in 2020. The projected 24-hour $PM_{2.5}$ design value is expected to nominally exceed the new standard $PM_{2.5}$ by 6 percent. As previously discussed in this chapter, uncertainties in the analysis are expected. While the estimated 2021 design value is projected to be close to the 24-hour standard, additional emissions controls are likely to ensure and maintain compliance.

It is also important in looking into the future to understand the significant components of $PM_{2.5}$ as projected for the years 2015 and 2020. The 2005 annual average $PM_{2.5}$ mass is comprised of approximately 57 percent ammonium, nitrate and sulfate. Figure 10-1 shows the relative contributions of these components to the total mass in 2015 and 2021. Ammonium, nitrate and sulfate are reduced to approximately 46 percent in 2015 due to the focus on reductions of NOx and SOx emissions. Other's, including crustal metals, sea salts, bonded water, organic and elemental carbon are percentage-wise greater contributors to the total mass in 2015. By 2021, the $PM_{2.5}$ estimated maximuim concentration will be mostly (67 percent of the mass) comprised of ammonium, sulfate and nitrate, despit the significant NOx and SOx emissions reductions. The other's category continues to contribute 21 percent to the total mass. In essence, background or boundary conditions will become very important to future year standard attainment for both annual and episodic (24-hour) basis.

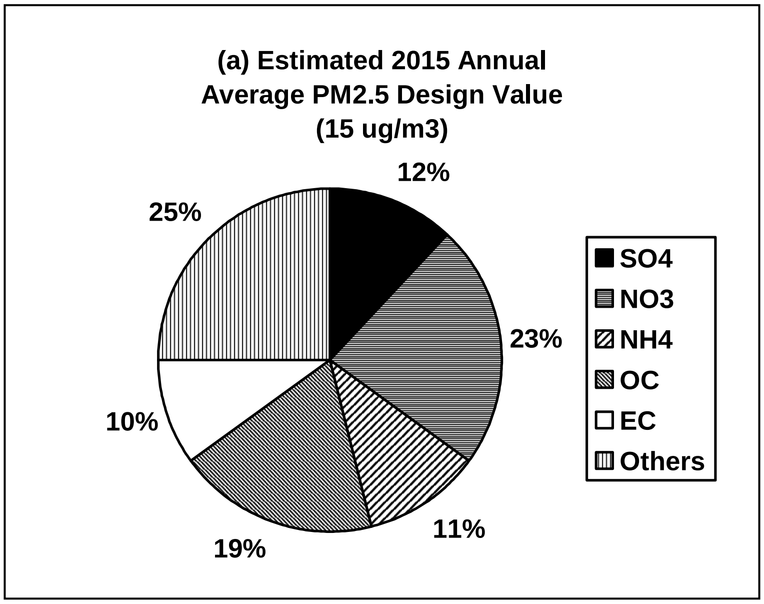
TABLE 10-1

Comparison of Federal Particulate Matter Standards

Standard	Observed Max Value (µg/m^3)	% above Std.	Design Value (µg/m^3)	% above Std	Predicted Design (µg/m^3)	% above Std	Predicted Design (µg/m^3)	% above Std
	2005		2005		2015 Controlled		2021 Controlled	
Current 24-hour PM_{10} (150 µg/m^3)	131	Met	117	Met	~92	Met	~77	Met
Current Annual $PM_{2.5}$ (15 µg/m^3)	21.0	40	22.6	51	15.0 <	Met	15.0 <	Met
Current 24-hour $PM_{2.5}$ (65 µg/m^3)	133	104	64.8	Met	45	Met	37	Met
New Annual $PM_{2.5}$ (35 µg/m^3)	133	279	64.8	85	45	29	37	6

CALIFORNIA PM AIR QUALITY STANDARDS

On June 2002, CARB also adopted stricter standards for particulate matter that affect both the corse as well as fine particulate fraction. The recently adopted standards reduced the PM_{10} annual average standard from 30 microgram per cubic meter to 20 micrograms per cubic meter and retained the 24-hour PM_{10} standard of 50 micrograms per cubic meter. The $PM_{2.5}$ annual average standard was set at 12 micrograms per cubic meter. The California standards are one third the federal PM_{10} 24-hour standard, 80 percent the federal annual $PM_{2.5}$ threshold. Obviously, achieving these standards poses an even greater challenge than meeting the new federal 8-hour ozone and $PM_{2.5}$ standards.



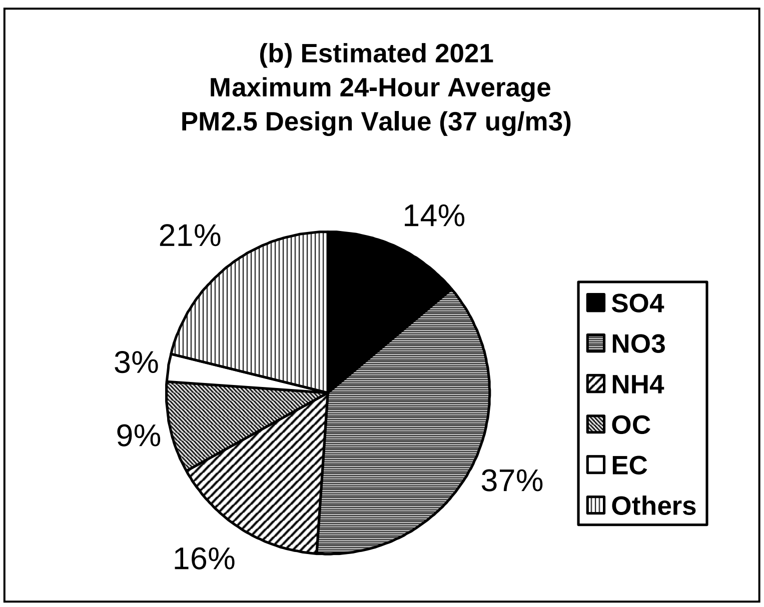


FIGURE 10-1

$PM_{2.5}$ Components in the (a) estimated 2015 Annual Average Design Value and (b) estimated 2021 Maximum 24-hour Average Design Value.

GREENHOUSE GASES

There is broad scientific consensus that the increased concentrations of greenhouse gases (GHGs) in the atmosphere will lead to global climate change in this century. The industrial revolution and the increased consumption of fossil fuels (e.g., gasoline, diesel, wood, coal, etc.) have contributed to substantial increase in atmospheric levels of greenhouse gases primarily carbon dioxide, methane, nitrous oxide, and hydrofluorocarbons. These gases trap the sun's heat in the atmosphere, like a blanket, causing the atmospheric temperatures to rise. Over time, the increased temperature will result in climate change effects such as raising sea levels, altering precipitation patterns, and changing water supplies and crop yields. Global warming could also adversely affect human health, harm wildlife, and damage fragile ecosystems. Higher atmospheric temperatures would also result in more emissions, increased smog levels, and the associated health impacts.

In June 2005, Governor Schwarzenegger signed Executive Order #S-3-05 which established the following greenhouse gas targets:

By 2010, Reduce to 2000 Emission Levels
By 2020, Reduce to 1990 Emission Levels
By 2050, Reduce to 80% Below 1990 Levels

These targets were recently codified into the state law through AB32. The emission levels in California were estimated to be 426 million metric tons CO2 equivalent for 1990, 473 million metric tons CO2 equivalent for 2000, 532 million metric tons CO2 equivalent for 2010, and 600 million metric tons CO2 equivalent for 2020. The AB32's goals for emission reductions were estimated to be approximately 59 and 174 million tons CO_2 equivalent by 2010 and 2020, respectively.

Achieving the AB32's target would require significant development and implementation of energy efficiency technologies and extensive shifting of energy production to renewable sources. In addition to reducing GHG emissions, such strategies would concurrently reduce emissions of criteria pollutants associated with fossil fuel combustion.

The Draft 2007 AQMP proposes to quantify the concurrent emission reductions associated with Statewide GHG programs targeted at stationary and mobile sources in the Basin working with various state agencies. Emission reductions from these programs will be applied toward the long-term reduction targets proposed in the Draft 2007 AQMP for meeting the federal ozone standard by 2021 (or 2024). Any GHC impacts from the control strategies contained in the Draft 2007 AQMP will be assessed in the Plan's CEQA document.

The District will continue to collaborate with various local and state State agencies in implementing the proposed GHG strategies and quantifying the concurrent combustion emission reductions.

CHAPTER 11

ULTRAFINE PARTICLES

Introduction

Background and Current Knowledge
- **Ambient Levels**
- **Health Effects**
- **Sources**
- **Control Technologies**

Current Activities
- **District-Sponsored Research**
- **CARB Ultrafine and Nanoparticle Program**

Future Actions
- **Research Needs**
- **Policy Future**

INTRODUCTION

In response to the ever-increasing body of research findings pointing to adverse health effects of ultrafine and nanoparticle air pollution that could potentially be significantly greater than the health effects associated with coarse (PM10) and fine particulate (PM2.5), the District Governing Board in recent years began to actively monitor scientific developments in the field of ultrafine particulate matter (PM). In December 2004 a representative of the District Governing Board participated in a nanoparticle health effects and technology forum held in Switzerland. In early 2005, staff prepared a report on the key issues associated with the state of knowledge of ultrafine particles, including how AQMD's policies on particulate emissions fit with the California Air Resources Board (CARB) current research and regulatory plans. In spring 2006, the District hosted a three-day conference titled Ultrafine Particles: The Science, Technology, and Policy Issues, with several panels of academia, technology experts, and public policy makers and more than 400 attendees.

This AQMP presents background information on ultrafine particles and the state of current knowledge on the subject. Potential control strategies discussed herein include effectiveness of current controls, improvement of engine combustion systems, use of low-sulfur fuel, reformulation of lubrication oils, and utilization of effective particulate after-treatment devices in conjunction with catalyst technology. A view of ongoing and potential research areas that could facilitate the development of control strategies for ultrafine particles is presented. Lastly, recommendations are made regarding future policy direction and actions.

BACKGROUND AND CURRENT KNOWLEDGE

U.S. EPA is mandated to review, and where necessary, revise ambient air quality standards every five years. The current federal standards for particulate matter air pollution are established for annual and 24-hour periods for PM10 and PM2.5. The state also sets ambient air quality standards for annual and 24-hour PM10 and annual PM2.5. Presently, there are no efforts at the federal or state level to consider separate air quality standards for ultrafine particulates.

Particulate matter is broadly classified as "coarse" PM with a diameter of 2.5μm to 10 μm, or "fine" (PM2.5) with a diameter less than 2.5 μm. PM10 includes all particles with diameters less than 10 μm. Ultrafine particles are loosely defined as those with a diameter less than 0.1 μm (or 100 nm). Ultrafines are sometimes alternatively referred to as nanoparticles, often with an upper diameter of 0.05μm (or 50 nm).

Both the federal and California PM ambient air quality standards are based on mass concentrations in air. Due to their small size, ultrafine particles generally make up a very small fraction of the ambient PM2.5 or PM10 mass (less than 10%), but make up the majority of airborne particles by number. As an example, a particle mass concentration of approximately 10 $\mu g/m^3$ is equivalent to a count of one particle per cm^3 for particulates with a diameter of 2.5 µm, but equivalent to a count of more than 2 million particles per cm^3 for particles of a diameter of 0.02 µm (Oberdorster, et al. 1995).

AMBIENT CONCENTRATIONS

Ultrafine particle number and mass concentrations are not routinely measured in the U.S. Thus, there is little data on long-term trends. However, there are a few published reports of ultrafine particle counts and characterization. Recent measurements taken in Southern California show a wide range in particle counts in different environments (Westedahl et al., 2003). The highest counts are found very near mobile sources, with some of the highest concentrations observed on busy roadways. Examples of particle counts found in different areas are shown below in Table 11 - 1.

Table 11 - 1: Ultrafine Particle Counts in Southern California

Area	**Particle Number Concentration (particles/cm^3)**
Coastal area	600-2000
Office Spaces	500-2000
Urban air	10,000 - 40,000
Freeways	40,000 – 1,000,000
Industrial site	Up to 100,000

From Westerdahl, 2003

In the urban environment, motor vehicles are a major source of ultrafine particulates. Other recent studies conducted in Southern California have shown high counts of particulates near freeways. Substantially higher numbers of particles are found near the roadway, while a sharp reduction in particle count has been shown to occur within 100-300 meters downwind of the roadway (Zhu, 2002a, 2002b).

As high particle number concentrations are very localized and dependent on nearby source activity, they exhibit large geographical and temporal variation. Monthly averages for particle number count have been collected at several urban sites in Southern California as part of the Children's Health Study (CHS). Average particle counts tend to be higher in winter compared to spring and summer. The higher number counts during the winter months are likely due to lower temperatures, favoring particle formation by condensable organics freshly emitted from vehicles, as well as a decreased atmospheric mixing height and more stagnant conditions increasing the influence of localized emissions (Sioutas, 2004). The highest ultrafine particle mass measurements also occur during the winter months, with the ultrafine fraction contributing 10% or less of the total average PM10 mass (Sardar, et al. 2005).

Figure 11-2 shows a comparison of monthly average particle counts for the period of October through December 2001. The highest monthly averages were found at monitoring sites in Long Beach, Upland, Mira Loma, and Riverside (Peters, et al. 2004).

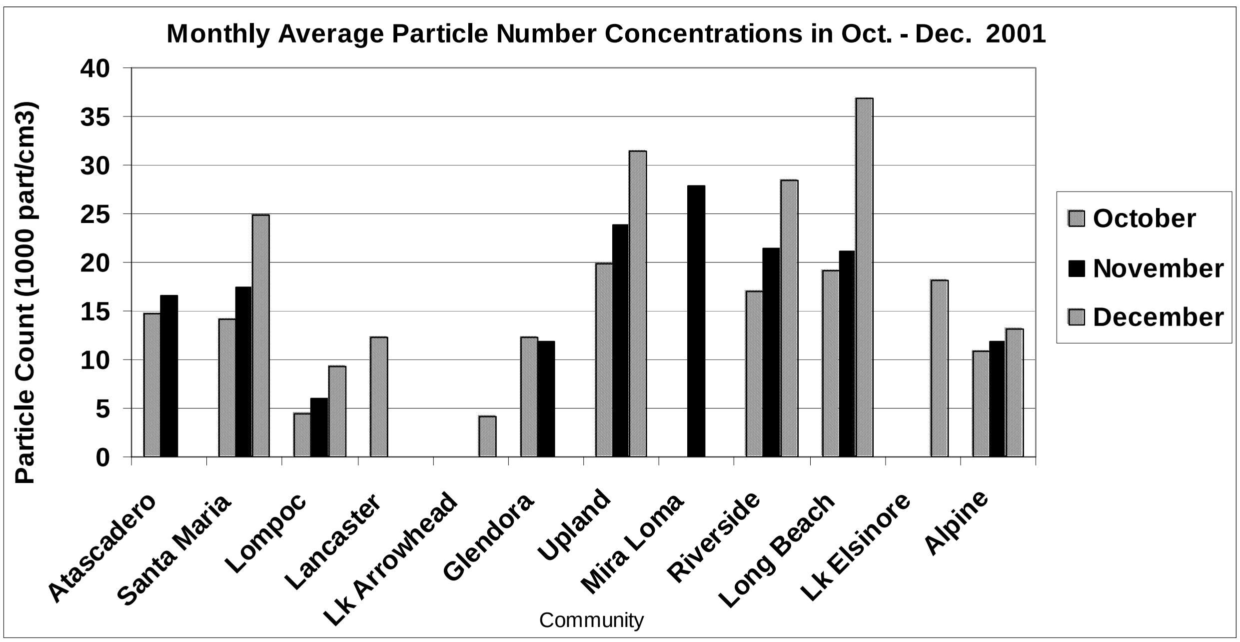


Figure 11 - 2: Monthly average particle number concentrations in CHS communities in October–December 2001. (Peters, et al. 2004)

HEALTH EFFECTS

Numerous studies have associated particulate matter levels with adverse health effects, including increased mortality, hospital admissions, and respiratory disease symptoms (U.S. EPA, 2004). Each year, more is known about health effects associated with PM exposure and its mechanisms. The vast majority of these studies used particle mass as the measure of exposure. Some researchers have postulated, however, that ultrafine particles may be responsible for some of the observed associations between particulate matter and health outcomes (Oberdorster, et al. 1995; Seaton, et al. 1995).

Results from several studies and postulated health effects mechanisms suggest that the ultrafine portion of PM may be important in determining the toxicity of ambient particulates. Some of these findings are discussed below.

For a given mass concentration, ultrafine particles have much higher numbers and surface areas compared to larger particles. Particles can act as carriers for other agents, such as trace metals and organic compounds which can collect on the particles' surfaces; the ultrafine particles with larger surface area may transport more of such toxic agents into the lungs than larger particles. Furthermore, smaller particles can also be inhaled and deposited deeper into the lungs than larger particles. As much as 50% of the particles with 0.02 μm or smaller are estimated to be deposited in the alveolar region of the lung.

In laboratory toxicity studies, a greater inflammatory and oxidative stress response has been elicited from ultrafine particles compared to larger particles at comparable mass doses. Oxidative stress is a term to describe cell, tissue or organ damage caused by reactive oxygen species. Oxidative stress and the biological production of numerous chemicals associated with oxidative processes have been postulated to underlie at least some of the observed effects of particulates. For example, studies using laboratory cell preparations have suggested that the substances adsorbed onto ambient ultrafine particles are responsible for some of the effects observed, rather than the particles themselves (Xia, et al. 2004).

After inhalation, ultrafine particles may penetrate rapidly into lung tissue; and some portions may be translocated to other organs of the body (Oberdoster, et al. 2002; Kreyling, et al. 2002; Nemmar, et al. 2002). A recent study also found evidence that particles may be translocated via neural cells from the nose and pharynx to the olfactory bulb of the brain (Oberdoster, 2004).

Additionally, ultrafine particles were found to penetrate cells and subcellular organelles. In cell cultures exposed to ambient particles, ultrafine particles were found in mitochondria where they induce structural damage (Li, et al. 2003).

Almost all epidemiology studies of particulate effects focus on measurements of particulate mass, either PM10 or PM2.5. However, a few studies have also measured ultrafine particle number counts. For example, in studies conducted in Germany, both the mass and number of particles were assessed in relation to mortality rates (Wichmann, et al. 2000; Stolzel, et al. 2003). Both the mass and number of ultrafine particles were associated with elevations in daily non-accidental mortality. Ultrafine particle number, as well as fine particle mass, has also been found to be associated with impaired lung function and medication use among individuals with asthma (von Klot, et al. 2002; Wichmann, et al. 2000).

European regulations (Euro III, IV, and V) on PM emissions from mobile sources are established on the basis of mass emissions. The Euro IV/V PM emissions limit is 0.02 gram per kilo-watt-hr (g/kWh), an 80 percent reduction in the mass of PM limit required under

Euro III (0.10 g/kWh). These regulations lack standards limiting ultrafine particle number emissions because there is currently no widely acceptable test protocol for measuring particle numbers. In recognition of harmful health effects of ultrafine emissions, a Particulate Measurement Program (PMP) is established to assess the appropriateness of a particle number standard, and develop and test a new protocol for measuring particulate emissions. Once PMP work is completed, the European PM standards will be changed to reflect the new test protocol, and a PM number standard may be implemented.

While the information on the health effects of ultrafine particles is limited, these and other studies suggest that ultrafine particles may have significant health effects greater than or independent of the effects due to the larger particles that comprise the majority of ambient PM mass.

SOURCES

PM emissions derive from many natural and man-made activities. This discussion is focused on ultrafine PM emissions formed during engine combustion and in the atmosphere, immediately after leaving the tailpipe as emitted gases condense and rapidly dilute and cool. Internal combustion engines have been identified as significant sources of ultrafine PM. A significant proportion of diesel emission particles have diameters smaller than 100 nm (0.1 μm). Particles emitted from gasoline-powered engines are generally less than 80 nm (0.08 μm) in diameter. Particles from compressed natural gas (CNG) fueled engines are smaller than from diesel emissions, with the majority lying between 20 and 60 nm (0.02 μm – 0.06 μm). Typically, these particles are a complex mixture of solid and more volatile particles. The solid particles are formed during the combustion process in the engine and are generally larger than the volatile particles. They consist mainly of agglomerated elemental carbon (soot) and act as an absorbent for some of the more volatile organic species formed during combustion. The smaller, more volatile particles are generally spherical. While some of the smaller, spherical particles may be formed in the engine or tailpipe, the majority are formed outside of the engine by the nucleation of hydrocarbon, sulfuric acid, and water vapor as the exhaust undergoes natural processes of dilution and cooling in the atmosphere. The number, size and growth rates of these more-volatile particles depend on variables affecting condensation such as, dilution rate, temperature, residence time, surface area of pre-existing particles, and humidity (Khalek, et al., 1999, 2000). Figure 11-3 shows a typical diesel engine exhaust mass and number weighted size distributions.

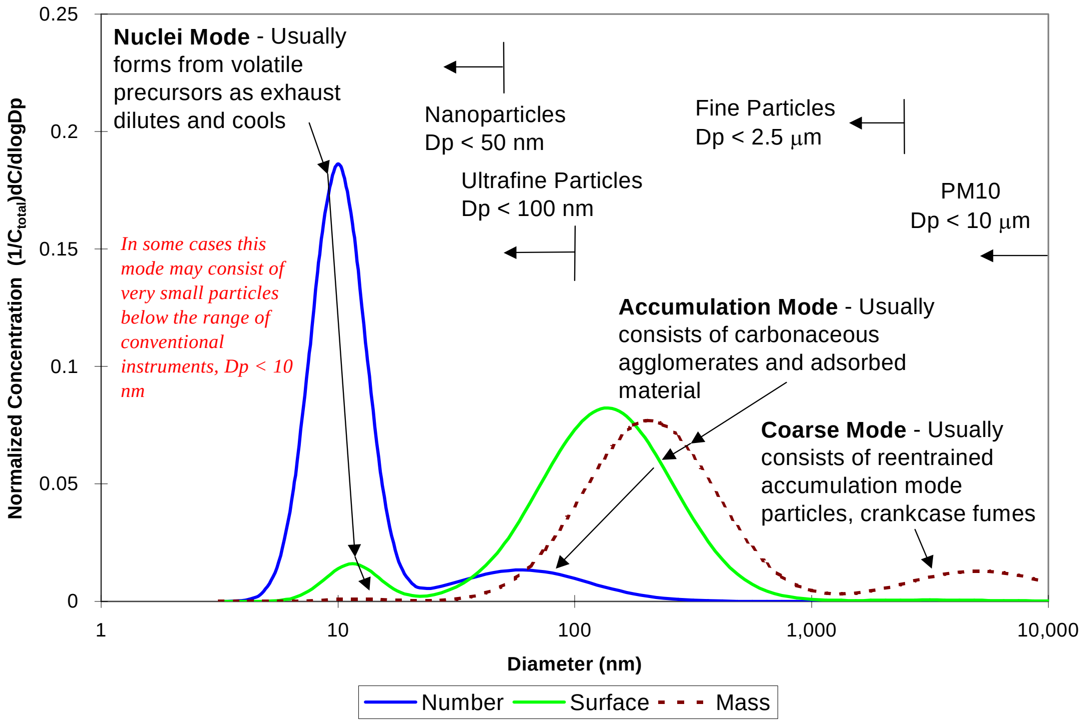


Figure 11 - 3: Typical mass and number-weighted size distributions of diesel PM (Kittelson, 1998).

The number of ultrafine particles formed outside the tailpipe is largely influenced by the available surface area of the solid particles. As the total PM mass emissions are reduced by advanced engine technology and effective PM aftertreatment devices, the number, and thus surface area of the larger, solid particles is significantly lowered. With fewer larger particles on which to condense, cooled gas phase species will instead nucleate to form new particles, leading to production of ultrafine numbers as exhaust is diluted and cooled. These particles are formed from condensing gas-phase hydrocarbon precursors. Studies have shown that the hydrocarbon particle precursors are effectively removed by oxidation catalyst technology.

The formation of ultrafine particle numbers in and near the tailpipe is also influenced by the sulfur content of the fuel and the composition of lubricating oil. A fraction of sulfur in fuel is oxidized to sulfur trioxide, SO_3. The SO_3 binds with water forming sulfuric acid, one of the gas-phase species that can nucleate to form new smaller particles. Many studies (Kittelson, et al. 2002; Ristovski, et al. 2002a; Ristovski, et al. 2002b; Sakurai, et al. 2001; Wei, et al. 2001) have addressed the influence of fuel sulfur level on ultrafine particle formation from vehicles. In general, most of these studies suggest that a significant reduction of the number of ultrafine particles emitted occurs when fuel sulfur levels are reduced.

Recent studies comparing regulated emissions from diesel and natural gas (CNG) engines show that CNG engines emit a lower level of PM mass emissions than diesel powered engines. It is probable that lubricating oils used in both diesel and CNG engines produce gas phase ultrafine precursors either due to the sulfur in the oil or components of reformulated oil. In the absence of larger, solid particles, the precursors in lube oil (sulfur, metals and heavy hydrocarbons) undergo nucleation in the vehicles' exhaust systems or immediately after exiting the tailpipe. The exhaust temperatures have been found to decrease from approximately 1,000^{o}F (at the exhaust manifold) to 400^{o}F – 600^{o}F at the outlet of the exhaust. It should be noted that sulfuric acid nucleates to form a mist at temperatures below 620^{o}F. When the sulfuric acid in the exhaust nucleates, the nuclei serve as absorption sites for the semi-volatile and heavier hydrocarbons. Reducing the sulfur and metal content of lubricating oils, as well as using oxidation catalyst technology to reduce hydrocarbon precursors, can reduce the particle numbers from such sources.

CONTROL TECHNOLOGIES

In response to U.S. EPA's and CARB's tighter engine exhaust emissions standards, vehicle and engine manufacturers, emission control manufacturers, and researchers have continued to direct considerable efforts and resources to developing strategies to reduce PM and other criteria pollutant mass emissions. These efforts have resulted in many options available for improving engine design and developing aftertreatment devices to achieve greater emission reductions. Overall, an improved engine combustion system is effective in reducing engine-out total PM mass emissions (mostly accumulation mode particles 0.1 μm to 1 μm), while a well-engineered particulate filter and oxidation catalyst are effective in removing both larger (accumulation/coarse mode) and smaller (ultrafine) particles.

Particulate filters are generally flow-through devices capable of achieving over 90% reduction of the solid portion of the total exhaust particles, particles mostly in the accumulation mode. However, they could be minimally effective or totally ineffective in controlling the gas phase precursors of ultrafine particles unless an oxidation catalyst is used in conjunction with the filter. With most of the solid particles removed, nucleation, rather than condensation, of gas phase species is favored, thereby promoting increased particle number emissions. Specially formulated oxidation catalysts are capable of removing more than 90% of the soluble organic fraction (SOF) as well as ultrafine particles on a number basis. Thus, an effective control technology should be based on a system approach involving both a particulate filter and oxidation catalyst technology. In a recent study to demonstrate the effectiveness of particulate filter technology on reducing particulate emissions from natural gas engines, the research found that total PM emissions were significantly reduced and the filter was capable of reducing ultrafine particles by 99 percent.

Oxidation catalyst technology (OCT) is effective in removing the SOF fraction of total emissions as well as ultrafine particles formed later in the exhaust. Its effectiveness, however, depends on whether the catalyst is formulated to produce little or no sulfate emissions at high temperature. In fact, special catalyst formulation must be employed to hinder the catalytic generation of sulfate particles from sulfur dioxide present in the exhaust gas. While OCT is effective in reducing SOF fraction and smaller particles, it has little effect on larger accumulation or coarse mode particles. Studies have substantiated the effectiveness of OCT in removing ultrafine particles.

Holmen and Ayala (2002) recently studied the effect of particulate filters and oxidation catalyst on the characteristics of particle emissions from heavy-duty CNG and diesel transit buses. The mix of buses included buses equipped with particulate filters (diesel) and oxidation catalysts (CNG). The study showed that particulate filters effectively reduce diesel particles in both in the ultrafine and accumulation modes. In addition, the oxidation catalyst equipped CNG bus showed significant reduction in ultrafine particles.

Gautam, et al. (2004) also measured the particle number emissions from an Orion natural gas fueled transit bus powered by an engine operating at 20 miles per hour under steady state conditions and equipped with OCT. The result of that study showed OCT to be more effective in removing ultrafine particle number at hot versus cold conditions, with the particle count reduced to near background levels. When the same bus was equipped with a catalyzed filter installed upstream of the OCT, the volatile organic species that participate in forming new particles are oxidized by the OCT; and hence this test vehicle showed a near absence of any particles in the exhaust stream.

CURRENT ACTIVITIES

DISTRICT-SPONSORED RESEARCH

Some studies are now showing an increase in the number of ultrafine particles in emissions from engines with low PM mass emissions and engines equipped with currently available aftertreatment devices. The results of these studies and the potential for adverse health effects of particle number concentrations have prompted the District to co-sponsor several projects to investigate ultrafine mass and number of particle emissions from engines. AQMD and West Virginia University recently conducted a study to chemically characterize exhaust emissions from a 40-foot Orion bus powered by a Cummins C8.3G plus CNG engine equipped with a catalyzed particulate filter and an oxidation catalyst.

The District is sponsoring a study on the contribution of lubricating oil to PM emissions from a 40-foot Orion bus with a Cummins C8.3G Plus engine equipped with a catalyzed particulate filter. This study assessed the performance and emission reduction potential of the particulate filter and oxidation catalyst on total PM mass and number. Finally, the District is working to optimize an oxidation catalyst technologies to achieve the maximum reduction possible of benzene, formaldehyde, total PM (ultrafine and nanoparticles), and non-methane hydrocarbon emissions.

Research to assess the health effects of ultrafine particles on elderly individuals is being co-funded with the National Institutes of Health and CARB. Groups of volunteers with heart disease are being followed over time, and any changes in cardiovascular health and particulate exposures are being measured.

CARB ULTRAFINE AND NANOPARTICLE PROGRAM

Over the last few years, CARB has engaged in several programs to measure PM emissions and assess the influence of ultrafine particles on public health. As mentioned earlier, CARB (Holmen and Ayala, 2002) recently collaborated with other public agencies and research institutions to collect emissions data from two late-model heavy-duty transit buses powered by similar engine and fueled by Emission Control Diesel (ECD-1) and CNG. The goals of this project are to: (1) examine the impact of driving cycle on emissions; (2) compare toxicity among new and cleaner heavy duty engine technologies in use in California; and (3) assess total PM and ultrafine particle emissions.

CARB is conducting ambient air measurements at several local freeway and surface street traffic areas in Southern California to collect real-time on-road measurements of pollutants, including black carbon, polycyclic aromatic hydrocarbons (PAH), and particle count and size distribution data of particles between 5 and 600 nm in diameter. A previous study, cited above, deployed condensation particle counters (CPCs) at the 12 Children's Health Study air monitoring sites in Southern California to provide a continuous record of the ultrafine particle count concentration in ambient air. Mobility particle sizers were periodically deployed at each monitoring station to obtain spatial and temporal information with respect to the particle size distribution between 10 and 450 nm. Finally, CARB is sponsoring a research project to investigate possible links between exposure to freeway-related ultrafine particles and changes in measures of cardiovascular function.

CARB staff does not have a plan at this time to regulate emissions of ultrafine particles on a mass or number basis, but will continue to study unresolved issues relating to ultrafines, such as formation, ambient concentrations, spatial and temporal variability, measurement issues, test protocols, and health impacts.

FUTURE ACTIONS

RESEARCH NEEDS

There are key areas pertaining to ultrafine particulates and their impacts on health and the environment where further research is needed. When developing technologies to reduce the mass of particulate matter, there should also be a focus on technologies to significantly reduce engine-out ultrafine particles and gaseous precursors to ultrafine particles. With the goal of protecting health in mind, the following recommendations are offered for further research and refinement of control strategies.

1. Encourage and support projects that will lead to better understanding of ultrafine particle formation and composition, including further analysis of the relationship between PM mass, surface area, and number concentration with respect to reduction strategies, potential standards, and health impacts.
2. Further support studies into the health effects of ultrafine particles.
3. Develop and finalize measurement methodologies, testing protocols and on-road emission factors.
4. Further characterize exposures to and toxicity of ambient ultrafine particles.
5. Use fuels with reduced sulfur content to minimize formation of sulfate-based ultrafine particles.
6. Develop advanced engine technologies to reduce engine-out ultrafine particles and gas-phase precursors.
7. Develop strategies for the use of both particulate filters and oxidation catalysts in liquid and gaseous powered vehicles with the catalyst specially formulated to reduce and/or prevent creation of gas-phase precursors of particles, to the extent possible.
8. Assess the impact of lubrication oil on engine emissions and develop advanced or improved lubricating oil formulated to reduce oil derived emissions, including the development and demonstration of advanced re-formulated lubricating oil in heavy-duty vehicles.
9. Work with other public agencies and the private sector to establish lubrication oil standards to reduce emissions of ultrafine particles.
10. Conduct studies to account for the existing and aging (legacy) fleet of diesel trucks in the inventory of ultrafine particle emissions.

POLICY FUTURE

Currently, it is recognized that ultrafine particulates are predominately formed through combustion processes and the highest concentrations are associated with mobile sources. Furthermore, ultrafine particles have been implicated in adverse health effects independent of PM mass. Newer generation control technologies have been demonstrated to be cost-effective and are currently available. Current and future regulatory requirements to reduce engine emissions necessitate the use of particulate filters (with oxidation catalyst coatings) and oxidation catalysts in order to meet the current and future emission standards. However, it is necessary to proceed slowly in establishing regulatory requirements in this new area because: additional health studies will be beneficial to fully understanding the impacts of ultrafine particles; further consideration is appropriate relative to the regulation of ultrafine particles on the basis of number versus mass; and the regulatory action to be taken at the local, state, and federal levels, respectively.

It is with this knowledge that the following key recommendations are made:

- Encourage use of after-treatment technologies combined with oxidation catalyst technology to produce concurrent benefit of ultrafine particle reduction.

- Encourage equipment and vehicle manufacturers to develop diesel particulate filters (DPF) with integrated controls for ultrafines since the additional cost may be relatively minor.

- Work with CARB, US EPA, and other stakeholders in conducting research studies and control strategy development efforts.

- When developing control measures for the reduction of PM10 and PM2.5, consideration should be given for reducing any undesired effects on ultrafine number emissions, where feasible.

- Work with CARB and US EPA in developing strategies to reduce ultrafines from mobile and stationary sources.

- Encourage auto manufacturers to include ultrafine particle filters in passenger vehicles to reduce exposure to on-road emissions of particle mass and number.

- Consider ultrafine PM issues in AQMD's PM control and air toxics strategy.

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GLOSSARY

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AAQS (Ambient Air Quality Standards): Health and welfare based standards for clean outdoor air that identify the maximum acceptable average concentrations of air pollutants during a specified period of time. (See NAAQS)

Acute Health Effect: An adverse health effect that occurs over a relatively short period of time (e.g., minutes or hours).

Aerosol: Particles of solid or liquid matter that can remain suspended in air for long periods of time because of extremely small size and light weight.

Air Pollutants: Amounts of foreign and/or natural substances occurring in the atmosphere that may result in adverse effects on humans, animals, vegetation, and/or materials.

Air Quality Simulation Model: A computer program that simulates the transport, dispersion, and transformation of compounds emitted into the air and can project the relationship between emissions and air quality.

Air Toxics: A generic term referring to a harmful chemical or group of chemicals in the air. Typically, substances that are especially harmful to health, such as those considered under EPA's hazardous air pollutant program or California's AB 1807 toxic air contaminant program, are considered to be air toxics. Technically, any compound that is in the air and has the potential to produce adverse health effects is an air toxic.

Airborne Toxic Control Measure (ATCM): A type of control measure, adopted by the ARB (Health and Safety Code Section 39666 et seq.), which reduces emissions of toxic air contaminants from nonvehicular sources.

Alternative Fuels: Fuels such as methanol, ethanol, natural gas, and liquid propane gas that are cleaner burning and help to meet ARB's mobile and stationary emission standards.

Ambient Air: The air occurring at a particular time and place outside of structures. Often used interchangeably with "outdoor" air.

APCD (Air Pollution Control District): A county agency with authority to regulate stationary, indirect, and area sources of air pollution (e.g., power plants, highway construction, and housing developments) within a given county, and governed by a district air pollution control board composed of the elected county supervisors. (Compare AQMD.)

AQMD (Air Quality Management District): A group or portions of counties, or an individual county specified in law with authority to regulate stationary, indirect, and area sources of air pollution within the region and governed by a regional air pollution control board comprised mostly of elected officials from within the region. (Compare APCD.)

AQMP (Air Quality Management Plan): A Plan prepared by an APCD/AQMD, for a county or region designated as a nonattainment area, for the purpose of bringing the area into compliance with the requirements of the national and/or California Ambient Air Quality Standards. AQMPs are incorporated into the State Implementation Plan (SIP).

ARB (California Air Resources Board): The State's lead air quality agency, consisting of a nine-member Governor-appointed board. It is responsible for attainment and maintenance of the State and federal air quality standards, and is fully responsible for motor vehicle pollution control. It oversees county and regional air pollution management programs.

Area-wide Sources (also known as "area" sources): Stationary sources of pollution (e.g., water heaters, gas furnaces, fireplaces, and wood stoves) that are typically associated with homes and non-industrial sources. The CCAA requires districts to include area sources in the development and implementation of the AQMPs.

Atmosphere: The gaseous mass or envelope surrounding the earth.

Attainment Area: A geographic area which is in compliance with the National and/or California Ambient Air Quality Standards (NAAQS OR CAAQS).

Attainment Plan: In general, a plan that details the emission reducing control measures and their implementation schedule necessary to attain air quality standards. In particular, the federal Clean Air Act requires attainment plans for nonattainment areas; these plans must meet several requirements, including requirements related to enforceability and adoption deadlines.

BACT (Best Available Control Technology): The most up-to-date methods, systems, techniques, and production processes available to achieve the greatest feasible emission reductions for given regulated air pollutants and processes. BACT is a requirement of NSR (New Source Review) and PSD (Prevention of Significant Deterioration). BACT as used in federal law under PSD is defined as an emission limitation based on the maximum degree of emissions reductions allowable taking into account energy, environmental & economic impacts and other costs. [(CAA Section 169(3)]. The term BACT as used in state law means an emission limitation that will achieve the lowest achievable emission rates, which means the most stringent of either the most stringent emission limits contained in the SIP for the class or category of source, (unless it is demonstrated that one limitation is not achievable) or the most stringent emission limit achieved in practice by that class in category of source. “BACT” under state law is more stringent than federal BACT and is equivalent to federal LAER (lowest achievable emission rate) which applies to NSR permit actions.

BAR (Bureau of Automotive Repair): An agency of the California Department of Consumer Affairs that manages the implementation of the motor vehicle Inspection and Maintenance Program.

CAA (Federal Clean Air Act): A federal law passed in 1970 and amended in 1977 and 1990 which forms the basis for the national air pollution control effort. Basic elements of the act include national ambient air quality standards for major air pollutants, air toxics standards, acid rain control measures, and enforcement provisions.

CAAQS (California Ambient Air Quality Standards): Standards set by the State of California for the maximum levels of air pollutants which can exist in the outdoor air without unacceptable effects on human health or the public welfare. These are more stringent than NAAQS.

CCAA (California Clean Air Act): A California law passed in 1988 which provides the basis for air quality planning and regulation independent of federal regulations. A major element of the Act is the requirement that local APCDs/AQMDs in violation of state ambient air quality standards must prepare attainment plans which identify air quality problems, causes, trends, and actions to be taken to attain and maintain California's air quality standards by the earliest practicable date.

CEQA (California Environmental Quality Act): A California law which sets forth a process for public agencies to make informed decisions on discretionary project approvals. The process aids decision makers to determine whether any environmental impacts are associated with a proposed project. It requires environmental impacts associated with a proposed project to be identified, disclosed, and mitigated to the maximum extent feasible.

CFCs (Chlorofluorocarbons): Any of a number of substances consisting of chlorine, fluorine, and carbon. CFCs are used for refrigeration, foam packaging, solvents, and propellants. They have been found to cause depletion of the atmosphere's ozone layer.

Chronic Health Effect: An adverse health effect which occurs over a relatively long period of time (e.g., months or years).

CMB (Chemical Mass Balance): This receptor model is used for PM10 source apportionment, matching the measured chemical components of the PM10 samples with known chemical profiles, or signatures, of individual sources of PM10 particles. The 1995 PTEP enhanced PM monitoring program results have been used to update the 1986 analysis used in previous AQMPs.

CO (Carbon Monoxide): A colorless, odorless gas resulting from the incomplete combustion of fossil fuels. Over 80% of the CO emitted in urban areas is contributed by motor vehicles. CO interferes with the blood's ability to carry oxygen to the body's tissues and results in numerous adverse health effects. CO is a criteria air pollutant.

Conformity: Conformity is a process mandated in the federal Clean Air Act to insure that federal actions do not impede attainment of the federal health standards. General conformity sets out a process that requires federal agencies to demonstrate that their actions are air quality neutral or beneficial. Transportation conformity sets out a process that requires transportation projects that receive federal funding, approvals or permits to demonstrate that their actions are air quality neutral or beneficial.

Congestion Management Program: A state mandated program (Government Code Section 65089a) that requires each county to prepare a plan to relieve congestion and reduce air pollution.

Consumer Products: Products such as detergents, cleaning compounds, polishes, lawn and garden products, personal care products, and automotive specialty products which are part of our everyday lives and, through consumer use, may produce air emissions which contribute to air pollution.

Contingency Measure: Contingency measures are statute-required back-up control measures to be implemented in the event of specific conditions. These conditions can include failure to meet interim milestone emission reduction targets or failure to attain the standard by the statutory attainment date. Both state and federal Clean Air Acts require that District plans include contingency measures.

Electric Motor Vehicle: A motor vehicle which uses a battery-powered electric motor as the basis of its operation. Such vehicles emit virtually no air pollutants. Hybrid electric motor vehicles may operate using both electric and gasoline powered motors. Emissions from hybrid electric motor vehicles are also substantially lower than conventionally powered motor vehicles.

EMFAC: The EMission FACtor model used by ARB to calculate on-road mobile vehicle emissions. This model is part of ARB's overall on-road mobile source Mobile Vehicle Emission Inventory (MVEI) model. The 1997 AQMP is based on the latest version of EMFAC and MVEI, which is 7G. (The 1994 AQMP was based on the previous version, EMFAC7F.)

Emission Inventory: An estimate of the amount of pollutants emitted from mobile and stationary sources into the atmosphere over a specific period such as a day or a year.

Emission Offset (also known as an emission trade-off): A rule-making concept whereby approval of a new or modified stationary source of air pollution is conditional on the reduction of emissions from other existing stationary sources of air pollution. These reductions are required in addition to reductions required by BACT.

Emission Standard: The maximum amount of a pollutant that is allowed to be discharged from a polluting source such as an automobile or smoke stack.

EPA (Environmental Protection Agency): The United States agency charged with setting policy and guidelines, and carrying out legal mandates for the protection of national interests in environmental resources.

FIP (Federal Implementation Plan): In the absence of an approved State Implementation Plan (SIP), a plan prepared by the EPA which provides measures that nonattainment areas must take to meet the requirements of the Federal Clean Air Act.

Fugitive Dust: Dust particles which are introduced into the air through certain activities such as soil cultivation, off-road vehicles, or any vehicles operating on open fields or dirt roadways.

Growth Management Plan: A plan for a given geographical region containing demographic projections (i.e., housing units, employment, and population) through some specified point in time, and which provides recommendations for local governments to better manage growth and reduce projected environmental impacts.

Hydrocarbon: Any of a large number of compounds containing various combinations of hydrogen and carbon atoms They may be emitted into the air as a result of fossil fuel combustion, fuel volatilization, and solvent use, and are a major contributor to smog. (Also see VOC.)

Indirect Source: Any facility, building, structure, or installation, or combination thereof, which generates or attracts mobile source activity that results in emissions of any pollutant (or precursor) for which there is a state ambient air quality standard. Examples of indirect sources include employment sites, shopping centers, sports facilities, housing developments, airports, commercial and industrial development, and parking lots and garages.

Indirect Source Control Program: Rules, regulations, local ordinances and land use controls, and other regulatory strategies of air pollution control districts or local governments used to control or reduce emissions associated with new and existing indirect sources.

Inspection and Maintenance Program: A motor vehicle inspection program implemented by the BAR. It is designed to identify vehicles in need of maintenance and to assure the effectiveness of their emission control systems on a biennial basis. Enacted in 1979 and strengthened in 1990. (Also known as the "Smog Check" program.)

LEV (Low Emission Vehicle): A vehicle which is certified to meet the ARB 1994 emission standards for low emission vehicles.

Maintenance Plan: In general, a plan that details the actions necessary to maintain air quality standards. In particular, the federal Clean Air Act requires maintenance plans for areas that have been redesignated as attainment areas.

Mobile Sources: Sources of air pollution such as automobiles, motorcycles, trucks, off-road vehicles, boats and airplanes. (Contrast with stationary sources.)

NAAQS (National Ambient Air Quality Standards): Standards set by the federal EPA for the maximum levels of air pollutants which can exist in the outdoor air without unacceptable effects on human health or the public welfare.

Nitrogen Oxides (Oxides of Nitrogen, NO_x): A general term pertaining to compounds of nitric acid (NO), nitrogen dioxide (NO_2), and other oxides of nitrogen. Nitrogen oxides are typically created during combustion processes, and are major contributors to smog formation and acid deposition. NO_2 is a criteria air pollutant, and may result in numerous adverse health effects; it absorbs blue light, resulting in a brownish-red cast to the atmosphere and reduced visibility.

NonAttainment Area: A geographic area identified by the EPA and/or ARB as not meeting either NAAQS or CAAQS standards for a given pollutant.

NSR (New Source Review): A program used in development of permits for new or modified industrial facilities which are in a nonattainment area, and which emit nonattainment criteria air pollutants. The two major requirements of NSR are Best Available Control Technology and Emission Offset.

Ozone: A strong smelling, pale blue, reactive toxic chemical gas consisting of three oxygen atoms. It is a product of the photochemical process involving the sun's energy. Ozone exists in the upper atmosphere ozone layer as well as at the earth's surface. Ozone at the earth's surface causes numerous adverse health effects and is a criteria air pollutant. It is a major component of smog.

Ozone Precursors: Chemicals such as hydrocarbons and oxides of nitrogen, occurring either naturally or as a result of human activities, which contribute to the formation of ozone, a major component of smog.

Permit: Written authorization from a government agency (e.g., an air quality management district) that allows for the construction and/or operation of an emissions generating facility or its equipment within certain specified limits.

PIC (Particle-in-Cell) Model: An air quality simulation model that is used to apportion sulfate and nitrate PM10 concentrations to their precursor emissions sources. The PIC model uses spatially and temporally resolved sources of NOx and SOx emissions, with meteorological, physical, and simplified chemical processes, to calculate the contributions from various emission source categories.

PM (Particulate Matter): Solid or liquid particles of soot, dust, smoke, fumes, and aerosols.

PM10 (Particulate Matter less than 10 microns): A major air pollutant consisting of tiny solid or liquid particles of soot, dust, smoke, fumes, and aerosols. The size of the particles (10 microns or smaller, about 0.0004 inches or less) allows them to easily enter the air sacs in the lungs where they may be deposited, resulting in adverse health effects. PM10 also causes visibility reduction and is a criteria air pollutant.

PM2.5 (Particulate Matter less than 2.5 microns): A major air pollutant consisting of tiny solid or liquid particles, generally soot and aerosols. The size of the particles (2.5 microns or smaller, about 0.0001 inches or less) allows them to easily enter the air sacs deep in the lungs where they may cause adverse health effects, as noted in several recent studies. PM2.5 also causes visibility reduction, but is not considered a criteria air pollutant at this time.

PSD (Prevention of Significant Deterioration): A program used in development of permits for new or modified industrial facilities in an area that is already in attainment. The intent is to prevent an attainment area from becoming a non-attainment area. This program, like NSR, can require BACT and, if an AAQS is projected to be exceeded, Emission Offsets.

PTEP (PM10 Technical Enhancement Program): A cooperative study to improve the technical knowledge base for PM10, particularly ambient PM measurements (mass and composition), improved emission inventory estimates, and improved PM modeling tools.

Public Workshop: A workshop held by a public agency for the purpose of informing the public and obtaining its input on the development of a regulatory action or control measure by that agency.

RME (Regional Mobility Element): The Regional Mobility Element (RME) is the principal transportation policy, strategy, and objective statement of the Southern California Association of Governments, proposing a comprehensive strategy for achieving mobility and related air quality mandates. The impacts of RME are included in the AQMP.

ROG (Reactive Organic Gas): A reactive chemical gas, composed of hydrocarbons, that may contribute to the formation of smog. Also sometimes referred to as Non-Methane Organic Compounds (NMOCs). (Also see VOC.)

SIP (State Implementation Plan): A document prepared by each state describing existing air quality conditions and measures which will be taken to attain and maintain national ambient air quality standards (see AQMP).

Smog Check Program: (See Inspection and Maintenance Program.)

Smog: A combination of smoke, ozone, hydrocarbons, nitrogen oxides, and other chemically reactive compounds which, under certain conditions of weather and sunlight, may result in a murky brown haze that causes adverse health effects. The primary source of smog in California is motor vehicles.

Smoke: A form of air pollution consisting primarily of particulate matter (i.e., particles). Other components of smoke include gaseous air pollutants such as hydrocarbons, oxides of nitrogen, and carbon monoxide. Sources of smoke may include fossil fuel combustion, agricultural burning, and other combustion processes.

SO_2 (Sulfur Dioxide): A strong smelling, colorless gas that is formed by the combustion of fossil fuels. Power plants, which may use coal or oil high in sulfur content, can be major sources of SO_2. SO_2 and other sulfur oxides contribute to the problem of acid deposition. SO_2 is a criteria pollutant.

Stationary Sources: Non-mobile sources such as power plants, refineries, and manufacturing facilities which emit air pollutants. (Contrast with mobile sources.)

Toxic Air Contaminant: An air pollutant, identified in regulation by the ARB, which may cause or contribute to an increase in deaths or in serious illness, or which may pose a present or potential hazard to human health. TACs are considered under a different regulatory process (California Health and Safety Code Section 39650 et seq.) than pollutants subject to CAAQS. Health effects due to TACs may occur at extremely low levels, and it is typically difficult to identify levels of exposure which do not produce adverse health effects.

Transportation Control Measure (TCM): Any control measure to reduce vehicle trips, vehicle use, vehicle miles traveled, vehicle idling, or traffic congestion for the purpose of reducing motor vehicle emissions. TCMs can include encouraging the use of carpools and mass transit.

UAM (Urban Airshed Model): The three-dimensional photochemical grid model used to simulate ozone formation. Used to project episodic ozone concentrations. (See also air quality simulation model.)

UAM/Aero (Urban Airshed Model with Aerosol Chemistry): A three-dimensional photochemical grid model used to simulate PM and ozone formation, based on the UAM. Additional chemical mechanism modules are used to simulate PM aerosol components. Used to project episodic PM concentrations.

UAM/LC (Urban Airshed Model with Linear Chemistry): A three-dimensional photochemical grid model used to simulate PM formation, particularly particulate sulfates and nitrates. The complex, non-linear chemical mechanism used in UAM and UAM/Aero is replaced by a simplified, linear chemistry that uses empirical relationships to determine particulate nitrate and sulfate levels. Used to project annual average PM component concentrations.

Visibility: The distance that atmospheric conditions allow a person to see at a given time and location. Visibility reduction from air pollution is often due to the presence of sulfur and nitrogen oxides, as well as particulate matter.

VOCs (Volatile Organic Compounds): Hydrocarbon compounds that exist in the ambient air. VOCs contribute to the formation of smog and/or may themselves be toxic. VOCs often have an odor, and some examples include gasoline, alcohol, and the solvents used in paints.