CHAPTER 6

CLEAN AIR ACT REQUIREMENTS

INTRODUCTION

The 1997 AQMP is designed to satisfy: 1) the State Implementation Plan (SIP) requirements under Title I of the Clean Air Act (CAA) and 2) Plan requirements of the California Clean Air Act (CCAA). The emphasis of this Plan is to meet federal CAA requirements for PM_{10} that are due by February 8, 1997 and to meet CCAA requirements to prepare a comprehensive plan update by December 31, 1997. In addition, based on new technical information, previous SIP submittals such as the 1994 California Ozone SIP and the Carbon Monoxide SIP are updated as part of this Plan.

The District has authority over the South Coast Air Basin (Basin) and this Plan satisfies the PM_{10} attainment demonstration requirements of the federal CAA, which is classified as a serious nonattainment area for PM_{10}. In addition, the District has jurisdiction over the Coachella Valley located in the Salton Sea Air Basin and the Los Angeles County portion of the Mojave Desert Air Basin. The Coachella Valley is also designated as a serious nonattainment area for PM_{10}. A separate Coachella Valley Maintenance Plan will be submitted to meet federal CAA requirements for this area (see Chapter 8). The Los Angeles County portion of the Mojave Desert Air Basin, known as the Antelope Valley, is currently unclassified for PM_{10} and there are no state or federal PM_{10} planning requirements.

The 1994 AQMP satisfied the ozone attainment and VOC rate-of-progress demonstration requirements of the CAA for the South Coast Air Basin, Antelope Valley, and Coachella Valley. The 1994 AQMP addressed the separate ozone attainment and VOC rate-of-progress demonstrations for each of these areas. Based on the control strategy provided in Chapter 4, ozone attainment and rate-of-progress demonstrations are presented in this chapter for the South Coast Air Basin and in Chapter 8 for the Antelope Valley and Coachella Valley.

FEDERAL CLEAN AIR ACT REQUIREMENTS

PM_{10} Planning Requirements

Results of ambient air quality monitoring data indicate that the Basin exceeds federal and state standards for PM_{10}. These microscopically fine particles can originate from several industrial processes, including direct emission 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. In the western portions of the Basin, secondary particulates account for about 45 percent of the annual average PM_{10}, while soil dust (referred to as “fugitive dust”) accounts for about 30 percent. In the eastern portion of the Basin, the contributions from secondary particulates and fugitive dust are approximately 40 percent each. Mobile sources also contribute directly to

ambient PM_{10} levels through tailpipe emissions and, indirectly, through resuspension of paved road dust.

Under the 1990 Clean Air Act Amendments the South Coast Air Basin was originally classified as a "moderate" PM_{10} nonattainment area. In response to State Implementation Plan (SIP) submittal requirements of the CAA for "moderate" areas, the District submitted applicable portions of the 1991 AQMP to the U.S. EPA prior to the November 15, 1991 statutory deadline. In accordance with the CAA requirements for moderate PM_{10} nonattainment areas, the moderate area PM_{10} SIP submittal proposed the implementation of "reasonably available control measures" (RACM) for fugitive dust sources, and relied upon the AQMP for reductions in precursor gaseous emissions as part of the ozone attainment plan. Modeling contained in the moderate area PM_{10} SIP demonstrated that the Basin would not attain the PM_{10} standards by December 1994 and would subsequently be reclassified as a "serious" nonattainment area. In February 1993, EPA reclassified the Basin from a "moderate" to a "serious" nonattainment area for PM_{10}. The moderate area SIP further showed that the complexity of the problem was of sufficient magnitude that the PM_{10} standards could not be attained by 2001 -- the deadline for serious nonattainment areas. The CAA provides a maximum five year extension to the attainment date for those areas that cannot meet the 2001 date after all best available control measures (BACM) have been implemented by 1997; thus making 2006 the latest attainment year possible. The District has shown in the 1994 AQMP that it will need until 2006 to meet the federal PM_{10} standards.

CAA Section 189(b)(2) requires areas reclassified as serious to submit a SIP revision within 18 months of a reclassification. For the Basin, the PM_{10} BACM SIP, submitted as part of the 1994 AQMP, met this requirement.

Current PM_{10} Requirements

For areas such as the Basin that are classified as serious nonattainment for PM_{10}, Section 189(b)(3) defines major PM_{10} sources that would be subject to CAA major source requirements. Sections 189(e) and 189(b)(1)(B) of the CAA require the implementation of "best available control technology" (BACT) for point sources of PM_{10} and precursor emissions (i.e., precursors of secondary particulates) and BACM for area sources of fugitive dust by February 8, 1997. U.S. EPA guidance[1] also states that, in instances where mobile sources contribute significantly to the area's exceedance of federal PM_{10} standards, transportation control measures (TCMs) are also to be included as part of the PM_{10} SIP submittal. An attainment demonstration for PM_{10} is required by the CAA as part of the SIP submittal due February 8, 1997. Section 189(c) requires the establishment of emission reduction milestones. Lastly, contingency measures for PM_{10}, in the event of

[1]U.S. EPA, State Implementation Plans for Serious PM-10 Nonattainment Areas, and Attainment Date Waivers for PM10 Nonattainment Areas Generally; Addendum to the General Preamble for the Implementation of Title I of the Clean Air Act Amendments of 1990, Federal Register, pp. 41998-42017, August 16, 1994.

failure to meet emission reduction milestones or achieve attainment, are also required as part of the SIP submittal.

Major PM_{10} Source Requirements

Section 189(b)(3) of the CAA defines a major source of PM_{10} as any stationary source that emits or has a potential to emit at least 70 tons per year of PM_{10}. These major sources then would be subject to major source requirements contained in the CAA. District Rule 1302(p) defines major PM_{10} sources in accordance with the CAA, making them subject to the major source requirements under New Source Review (NSR).

BACT for Point Sources

As mentioned in the 1994 AQMP, BACT for point sources of PM_{10} and PM_{10} precursors is presently addressed through the District's NSR and RECLAIM programs (District Rules 1303 and 2005).

BACM for Fugitive Dust Sources

For fugitive dust sources, the selection of BACM to be implemented must be based on a combination of technical feasibility, cost-effectiveness, and energy/environmental considerations; the selected BACM controls must be implemented by February 8, 1997. These candidate BACM are generally similar to the RACM (Reasonably Available Control Measure) strategy adopted in District Rule 403, except that they are elevated to a higher level of stringency. This is consistent with U.S. EPA policy, which states that "... more stringent control measures are needed in cases when the current control requirements will be insufficient to bring a particular area into attainment."[2] The District developed a list of candidate BACM as part of the 1994 PM_{10} BACM SIP submittal. These measures have been refined and updated for the 1997 AQMP. The following is a list of candidate BACM that are being considered as part of the 1997 PM_{10} SIP revision (a complete description of the candidate BACM can be found in Appendix IV, Section 1):

CM #97BCM-01:	Paved Roads	
	1a	Minimal Track-Out
	1b	Routine Street Cleaning
	1c	Post Event Street Cleaning
	1d/1e	Curbs and Gutters / Chemical Stabilization of Unpaved Road Shoulders
CM #97BCM-02:	Construction/Demolition Activities	
	Wider Application of Dust Control Plans	
CM #97BCM-03:	Unpaved Roads	
	Paving/Chemical Treatment/Speed Reductions	
CM #97BCM-04:	Agricultural Activities	
	Soil Conservation Plans	

[2] U.S. EPA,. State Implementation Plans for Serious PM-10 Nonattainment Areas, and Attainment Date Waivers for PM10 Nonattainment Areas Generally; Addendum to the General Preamble for the Implementation of Title I of the Clean Air Act Amendments of 1990, Federal Register, pp. 41998-42017, August 16, 1994.

CM #97BCM-05:	Miscellaneous Sources Controls on Weed Abatement
CM #97BCM-06:	Further Emission Reductions from Fugitive Dust Sources to meet Best Available Control Measures Requirements (RACM to BACM Upgrade)

In the 1994 PM_{10} BACM SIP, the District committed to adopt all identified candidate BACM via rulemaking action by December 31, 1996 and implement these BACM by February 8, 1997. However, any candidate measure may not be adopted if it is determined prior to September 1996 that such candidate BACM does not meet the technological and cost feasibility criteria for BACM acceptability. Such criteria are defined in Chapter 4.

To complete the technological and cost feasibility analyses, the District has undertaken the following actions:

(1) Participated in a fast-track emissions inventory update, as indicated in the Emissions Inventory Update Workplan, coordinated through the BACM SIP Working Group. This effort provided data on missing and incomplete fugitive dust source categories and processes. In addition, the District supplemented this effort through the PM_{10} Technical Enhancement Program (PTEP) emission inventory projects.

(2) The District compiled a revised baseline inventory for the fugitive dust emission sources and completed the revised inventory process, discussed in Chapter 3.

(3) Based on the revised emissions inventory and other available information, each of the candidate BACM are being evaluated for cost-effectiveness and control efficiency. The District has completed the BACM technological and cost feasibility analysis prior to July 1996. As discussed in Chapter 4, BCM-01(a/b/c), BCM-03, BCM-04, and BCM-06 meet both the technological and cost feasibility criteria.

(4) The District has identified those candidate BACM not meeting either the technological or cost feasibility criteria. Those candidate BACM, described in Chapter 9, are included as PM_{10} contingency measures. These measures are CTY-12 (formerly BCM-01d/e), CTY-13 (formerly BCM-02), and CTY-14 (formerly BCM-05).

The results of the initial feasibility and cost-effectiveness analysis are also discussed in Chapter 4. The federal CAA requires that the BACM and related contingency measures be adopted and implemented by February 8, 1997. The 1994 AQMP provided for the adoption of these measures by December 31, 1996. The BACM and contingency measures are under rule development as Proposed Amendments to Rule 403 (PAR 403) and Proposed Rule 1186 (PR 1186) and are scheduled to be considered for adoption in early 1997.

Transportation Control Measures

Transportation control measures meeting the CAA requirements have been submitted in previous SIPs, including the 1994 California Ozone SIP. Updated transportation control measures necessary of attainment of the federal PM_{10} and ozone standards are described in Appendix IV, Section 3.

PM_{10} Attainment Demonstration

Section 189(b)(1)(a) of the CAA requires a PM_{10} attainment demonstration. The results of the attainment demonstration are summarized in Chapter 5. The air quality modeling used for the PM_{10} attainment demonstration is described in Appendix V.

Establishing PM_{10} Milestone Targets

Section 189(c) of the CAA requires the establishment of PM_{10} milestone targets. The future milestone years for PM_{10} are 2000, 2003, and 2006. The milestone targets are set based on expected emission reductions in the target years. The PM_{10} milestone targets are shown in Table 6-1 and Appendix V.

TABLE 6-1

PM_{10} Milestone Targets
(Average Annual Day - Tons per Day)

	1997	2000	2003	2006
PM	309	307	303	301
NO_x	998	864	748	635
SO_x	71	66	64	67
VOC	993	866	746	623
TOTAL	2,371	2,103	1,861	1,626

Contingency Measures for PM_{10}

The federal CAA requires PM_{10} 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 2006. The PM_{10} contingency measures are those BACM measures that have failed either the technical feasibility or cost-effectiveness criteria or both. For the 1997 AQMP, those measures that have failed the criteria based on initial estimates of feasibility and cost-effectiveness are listed in Chapter 9. In addition to the fugitive dust contingency measures, other contingency measures for ozone serve as contingency for PM_{10} to reduce VOCs and oxides of nitrogen which are precursors to particulate organics and nitrates. The full descriptions of each of the PM_{10} contingency measures are contained in Appendix IV, Section 6.

Other Federal Clean Air Act Requirements

This section describes how the 1997 AQMP meets the major ozone planning requirements of the federal Clean Air Act (CAA) for the South Coast Air Basin. The requirements specifically addressed here are:

- the post-1996 VOC rate-of-progress requirements,
- the ozone attainment demonstration,
- the contingency measure requirements, and
- the average vehicle occupancy requirement.

Post-1996 VOC Rate-of-Progress

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. More specifically, Section 182(c)(2) requires that each serious and above ozone nonattainment area achieve actual VOC emission reductions of at least three percent per year averaged over each consecutive 3-year period beginning 6 years after enactment of the Act until the area's attainment date (i.e., November 15, 2010 for the South Coast Air Basin). This is called the "post-1996 rate-of-progress" requirement of the CAA.

According to Section 182(c)(2)(C), actual oxides of nitrogen (NO_x) emission reductions which occur after 1990 can be used to meet post-1996 VOC emission reduction requirements provided the NO_x reductions satisfy the following criteria. First, the control strategy used to demonstrate attainment must consist of both VOC and NO_x control measures. More specifically, the mix of VOC and NO_x emission reductions used to satisfy the post-1996 rate-of-progress requirements of the CAA must be consistent with the controlled VOC and NO_x emission levels used in the modeling demonstration. And lastly, the combined annual VOC and NO_x reductions must average 3 percent per year.

The post-1996 rate-of-progress demonstration is presented in Appendix V; Figure 6-1 and Table 6-2 summarize the results. Shown in the figure are the VOC (Figure 6-1a) and NO_x (Figure 6-1b) emission target levels and the projected uncontrolled baseline. Controlled emission levels are not shown since the VOC and NO_x emission reductions from existing District and ARB rules are sufficient to meet the CAA rate-of-progress requirements.

For the milestone years 1999 and 2002, the baseline VOC emission levels are below the target levels. Beginning in 2005, the VOC reductions in the baseline are insufficient and NO_x substitution is necessary and allowed according to Section 182(c)(2)(C) of the CAA. The proposed reduction rates for milestone years are shown in Table 6-2. These rates are determined by applying all the creditable VOC reductions at each milestone and providing

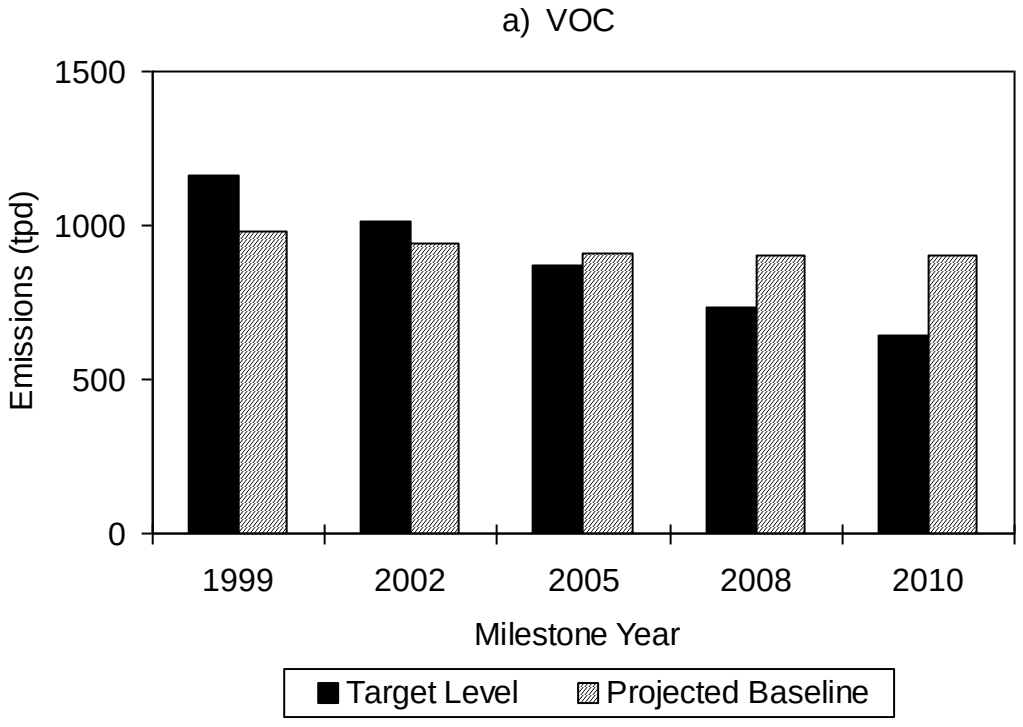
sufficient NO_x reductions to satisfy VOC reduction requirements of Section 182(c)(2). Note that NO_x substitution is used to satisfy most of the post-1996 rate-of-progress requirements after the year 2002.

TABLE 6-2

Percent of VOC and NO_x Emission Reductions to Meet the Post-1996 Rate-of-Progress Requirements

Year	VOC	NO_x	CAA*
1999	24.0	0.0	24.0
2002	9.0	0.0	9.0
2005	6.0	3.0	9.0
2008	0.5	8.5	9.0
2010	0.5	5.5	6.0

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



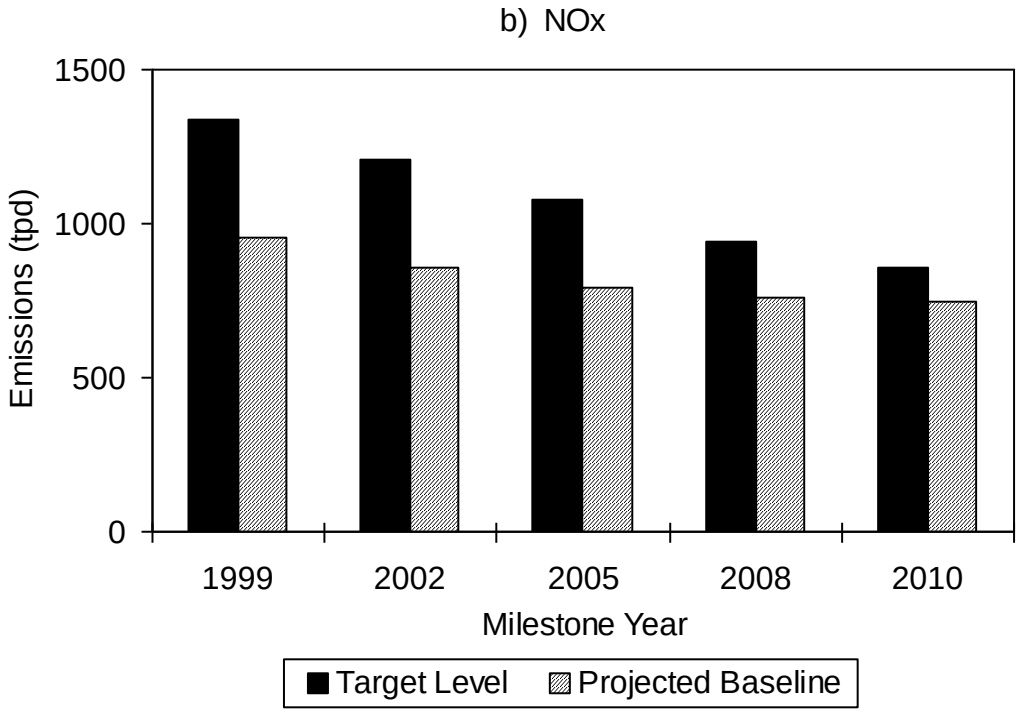


FIGURE 6-1

Post-1996 Rate-of-Progress Requirements

Ozone Attainment Demonstration

Under the Clean Air Act, air quality modeling is an integral part of the planning process to achieve clean air. Specifically, Section 182(b)(1)(A) requires that moderate and above ozone nonattainment areas must reduce VOC and NO_x emissions sufficiently to attain the national ambient air quality standard for ozone. It is not sufficient for extreme ozone nonattainment areas to meet the post-1996 rate-of-progress requirements of the CAA; extreme ozone nonattainment areas, such as the Basin, must also demonstrate attainment by November 15, 2010. This may result in emission reductions in addition to those required by the reasonable further progress components of the CAA [i.e., Sections 182(b)(1) and 182(c)(2)]. In this Plan, the modeling requirements are met by applying the U.S. EPA-recommended photochemical grid model called the Urban Airshed Model (UAM)[3] using U.S. EPA-approved modeling techniques[4].

[3] User's Guide for the Urban Airshed Model; prepared for the South Coast Air Quality Management District by Systems Applications International; June 18, 1990.

[4] Guidance on Urban Airshed Model (UAM) Reporting Requirements for Attainment Demonstration; U.S. Environmental Protection Agency; OAQPS, Research Triangle Park, NC, December 1993; EPA-454/R-93-056.

A summary of the ozone attainment demonstration is provided in Table 5-2 of Chapter 5. The ozone attainment demonstration is fully described in Appendix V.

Contingency Measures

Section 172(c)(9) of the 1990 CAA requires that the plan shall provide for implementation of specific measures in the event an area fails to make reasonable further progress or to attain the applicable standards by the specified dates. Such measures shall be included in the Plan revision as contingency measures to take effect without further action by the State or the Administrator. Measures which cannot be fully adopted by the time EPA acts on the Plan will be adopted within one year of EPA approval to satisfy conditional approval requirement of Section 110(k)(4). Section 182(c)(9) refers to contingency measures if the area does not achieve the applicable milestone; these measures are required to be submitted along with the November 15, 1994 ozone attainment demonstration. The District has already adopted a CO contingency measure, Rule 1504, parking cash-out, which implements existing state law.

Section 187(a)(3) of the 1990 CAA requires that adopted and enforceable contingency measures be included in the carbon monoxide attainment demonstration plan submittal (see Appendix IV). Contingency measures are required for carbon monoxide attainment planning, to be implemented if the area fails to attain the federal standard by the designated attainment date or fails to achieve the specific annual emission reductions necessary for attainment. A deviation from the forecasted VMT of more than a given percentage triggers implementation of contingency measures to offset either excess VMT or carbon monoxide emissions due to the additional VMT or equivalent emissions. According to the EPA General Preamble [Section 532(c)(1)], this percentage is three percent for 1997 and subsequent years or other appropriate values. The cumulative VMT growth cannot be greater than or equal to five percent above the VMT forecast used as the basis of the attainment demonstration.

A list of the contingency measures developed for these CAA requirements is provided in Chapter 9.

Average Vehicle Occupancy Requirements (AVO)

Section 182 (d)(1)(A) of the CAA requires the District to include in the Plan transportation control measures 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, transit improvement projects, traffic flow improvement projects, the construction of high occupancy vehicle (HOV) facilities and other mobile source emission reduction programs. Transportation Control Measure - 01, Transportation Improvements included in Appendix IV of the 1997 AQMP, has been developed to meet the requirements of Section 182(d)(1)(A)

and 108(f) of the CAA and includes the capital-based and non-capital-based facilities, projects and programs contained in the Regional Mobility Element and programmed through the 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 the CAA requirements and was submitted to EPA for approval.

CARBON MONOXIDE ATTAINMENT DEMONSTRATION

The South Coast Air Basin is designated as a serious nonattainment area for carbon monoxide (CO) under the federal Clean Air Act and is required to implement emissions reduction measures as "expeditiously as practicable" in order to attain federal carbon monoxide standards by December 31, 2000. A Federal Attainment Plan for Carbon Monoxide was approved by the District Governing Board on November 12, 1992 and submitted to the U.S. EPA. The Plan was revised for the 1994 AQMP as discussed in Appendix I-F of the 1994 Plan. It should be noted that the state 1-hour CO standard was met for the first time in the Basin in 1995, so CO air quality continues to improve. It is necessary to revise the CO Plan in the 1997 AQMP due to new VMT and emissions data and adjustments to the control strategy. As discussed in Chapter 5, the modeling results indicate that the state and federal 8-hour CO standards are projected to be met in 2000 through existing District and ARB rules. The proposed control strategy will get some additional CO air quality improvement. The revised CO attainment demonstration is contained in Appendix V.

As part of the federal Clean Air Act requirements under Section 187(d)(1), a carbon monoxide milestone demonstration was submitted to U.S. EPA in March 1996. However, the submittal was based on emissions estimates from the 1994 Plan. A commitment was made to submit carbon monoxide emissions as of December 31, 1995 for all sources with the adoption of the 1997 AQMP. The carbon monoxide emissions inventory for 1995 is provided in Appendix V.

1997 NITROGEN DIOXIDE MAINTENANCE PLAN

Under the CAA, an area can be redesignated as attainment if, among other requirements, the U.S. EPA determines that the NAAQS have been attained. Section 175A of the CAA states that any district that submits a request under Section 107(d) for redesignation of a nonattainment area to attainment must submit a revision of the applicable SIP that demonstrates attainment for at least 10 years after the redesignation. U.S. EPA guidance

states that a determination of compliance with the NAAQS must be based on three complete, consecutive calendar years of quality-assured air quality monitoring data.

Over the past three years (1993 through 1995), ambient nitrogen dioxide measurements in the South Coast Air Basin have shown that annual nitrogen dioxide concentrations are below the federal air quality standard of 0.053 ppm. As such, based on the ambient nitrogen dioxide measurements and the demonstration shown in Chapter 5 that the Basin will maintain the federal nitrogen dioxide air quality standard with the projected baseline future-year emissions, this Plan serves as the Nitrogen Dioxide Maintenance Plan for the South Coast Air Basin.

CALIFORNIA CLEAN AIR ACT REQUIREMENTS

The California Clean Air Act 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) Ensure no net increase in emissions from new or modified stationary sources;

(4) Reduce population exposure to severe nonattainment pollutants according to a prescribed schedule;

(5) Include any other feasible controls that can be implemented, or for which implementation can begin, within 10 years of adoption; and

(6) Rank control measures by cost-effectiveness.

Plan Effectiveness

The CCAA requires, beginning on December 31, 1994 and every three years thereafter, that the District demonstrate the overall effectiveness of its air quality program [H&SC 40924(b)]. Trends in the following air quality indicators are used to demonstrate the recent (i.e., for the three preceding years) effectiveness of the District's program:

(1) VOC, NO_x, and carbon monoxide (CO) emissions;

(2) NO_2, CO and ozone exceedance days; and

(3) NO_2, CO, and ozone population exposure.

Trends in Basin-wide VOC, NO_x, and CO emissions since 1993 are shown in Chapter 3. Since 1993 VOC, NO_x, and CO emissions have decreased by 3 percent, 3 percent, and 5 percent, respectively, due to current efforts. These decreases have occurred in spite of strong population growth over the period.

The percent of days exceeding state standards in 1990 through 1995 for ozone, CO, and PM_{10} air quality are illustrated in Figure 6-2. Even over this relatively short time period, it is evident that air quality has improved in the Basin.

Trends in nitrogen dioxide (NO_2) air quality are not shown in Figure 6-2; however, improvement in that pollutant is also evident in the last six years. The federal annual NO_2 standard was met for the first time in 1992 and the standard has been met every year since. Since 1993, the South Coast Air Basin has not experienced any exceedances of the state NO_2 air quality standard and the region has been redesignated to attainment for the state NO_2 air quality standard. The reader is referred to Appendix II for a more comprehensive discussion of local air quality trends.

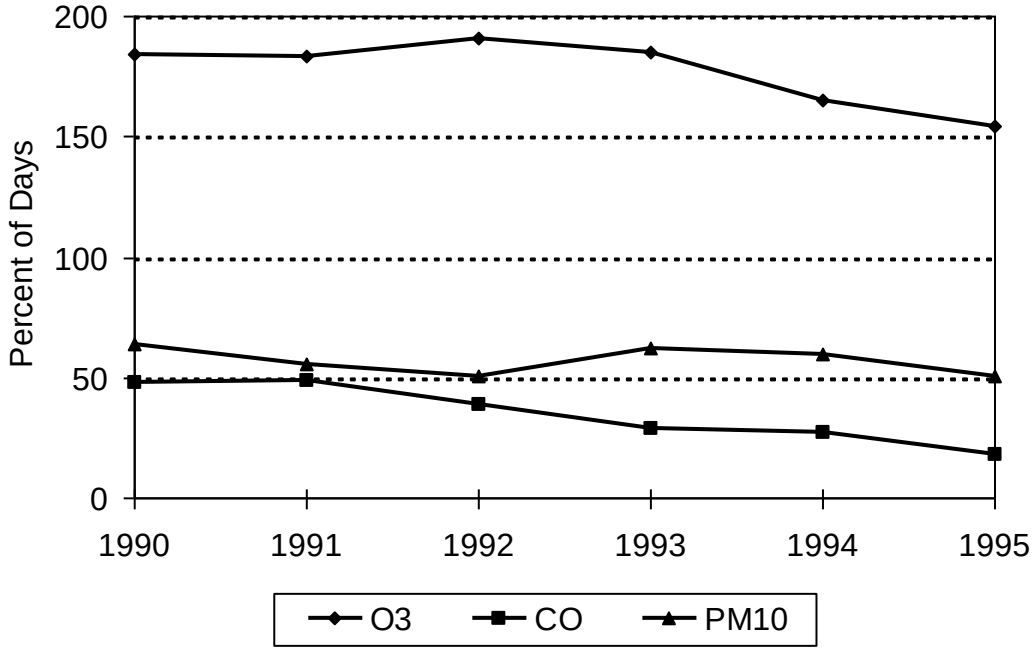


FIGURE 6-2

Percent of Days Exceeding State Standard

Trends in population exposure are shown in Table 6-3. Population exposure is a particularly good indicator of air quality trends since it takes into account spatial and temporal changes in air quality. For example, per-capita population exposure reflects the length of time the Basin population is exposed to unhealthful air quality. Table 6-3 shows the per-capita exposure to ozone, CO, and NO_2 for the historical period 1986-88 and for

two recent years, 1993 and 1995. The per-capita levels shown in the table represent average exposure above the state 1-hour standard levels for each pollutant.

TABLE 6-3

Trends in Annual Average Per-Capita Exposure to Ozone,
Carbon Monoxide (CO), and Nitrogen Dioxide (NO_2)
Based on 1-Hour Averages

Period or Year	Annual Average Per-Capita Exposure Ozone (pphm-hrs)	CO (ppm-hrs)	NO_2 (pphm-hrs)
1986-88	198.5	8.4	2.8
1993	71.8	0.1	< 0.1
1995	46.6	0.0*	0.0

*Exposures to 8-hr CO conditions are not calculated, but are estimated to be close to zero.

The table clearly shows that the per-capita exposure to ozone, carbon monoxide, and nitrogen dioxide has decreased dramatically since the 1986-88 period. The Basin is below the state 1-hour NO_2 standard, therefore the per-capita exposure to NO_2 is zero. The per-capita exposure to the state 8-hour CO standard is also near zero, since the Basin is, for the most part, in attainment of the standard. In 1995, the 8-hour CO standard was exceeded in the south-central Los Angeles area and the San Fernando Valley.

In summary, the trends of all the indicators show improved air quality in the South Coast Air Basin over the last five to eight years; the population is being exposed to unhealthful air quality less and less each year. These air quality improvements are the direct result of AQMP implementation.

Emission Reductions

The ARB has developed "planning inventories" to characterize emissions during periods when air quality standards are exceeded and to serve as the basis for emissions reduction accounting (see Chapter 3). As shown in Chapter 3, the planning inventories are 2 to 5 percent higher than the comparable annual average emission inventories. This difference is primarily due to seasonal temperature changes and the corresponding effects on pollutant emissions rates (e.g., higher solvent and gasoline evaporative emissions on hot summer days; more fuel combustion on cold days).

Table 6-4 presents baseline emissions and estimated emission reductions for the reporting years 1997 and 2000. These estimates are based on the adoption and implementation schedules contained in Chapter 7. As seen in the table, the proposed control strategy falls short of the CCAA emission reduction goals (i.e., five percent per year for all nonattainment pollutants) for all pollutants for all years even with the implementation of maximum feasible controls and an expeditious adoption schedule.

Nonetheless, the strategy represents the all feasible control measures and an expeditious adoption schedule as permitted under H&S Code 40914.

TABLE 6-4

Summary of 1997 AQMP Controlled Emissions Based on Planning Inventory Emissions (tons/day)*

Year	Summer O_3 Inventory VOC		Summer O_3 Inventory NO_x		Winter NO_2 Inventory NO_x		Winter CO Inventory CO	
1990 Baseline	1,733		1,472		1,537		9,277	
Emission Reductions								
1997	702	(41%)	438	(30%)	456	(30%)	3,538	(38%)
CCAA Requirement		(35%)		(35%)		(35%)		(35%)
2000	825	(48%)	573	(39%)	595	(39%)	4,309	(46%)
CCAA Requirement		(50%)		(50%)		(50%)		(50%)

*Emission reductions are estimated as the 1990 equivalent. Percent reduction from 1990 Baseline are shown in parenthesis.

Population Exposure

The CCAA also requires a reduction in overall population exposure to criteria pollutants. Specifically, exposure to severe nonattainment pollutants 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. This provision is applicable to ozone, CO and NO_2 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 exposed. The per-capita exposure is the population exposure (units of pphm-persons-hours) divided by the total population.

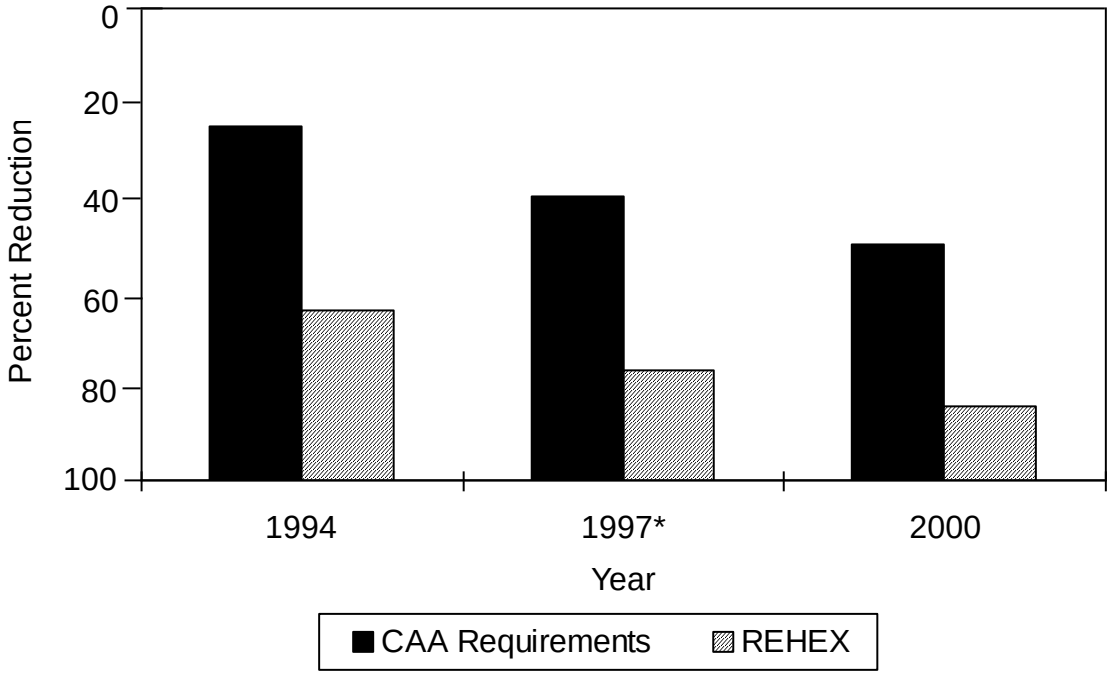
Methodology

For the 1997 AQMP, 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. In addition, REHEX utilizes future-year predicted ozone concentrations from the Urban Airshed Model (UAM) to project population exposure. The methodology and the model are discussed in more detail in Appendix V of the 1997 AQMP and in Technical Report V-H of the 1991 AQMP.

Ozone

An analysis using the REHEX model indicates that the CCAA exposure reduction targets will be achieved for ozone with a margin of safety. Thus, public health will be significantly improved with the implementation of the 1997 AQMP. Figure 6-3 summarizes the results and compares estimated exposure reductions to the targets. The exposure reductions shown in 1997 are the actual population exposures in 1995. Actual exposures in 1995 serve as better indicators of the 1997 exposure than model-predicted estimates.



* 1997 exposure based on actual 1995 data.

FIGURE 6-3

Percent Reductions in Annual Average Per-Capita Exposure to Ozone

The REHEX model also allows more detailed exposure reduction estimates disaggregated by age group and county. These results are summarized in Figures 6-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.

Carbon Monoxide

The REHEX modeling results for CO are shown in Figure 6-6. As shown, the proposed control strategy will greatly exceed the CCAA reduction requirements for CO exposure. As discussed in Chapter 5 and in Appendix V, the 1-hour and 8-hour CO standards are projected to be met by the year 2000. Therefore, the Basin population will not be exposed to unhealthful CO levels and thus per capita exposure is reduced 100 percent from the 1986-88 base levels. The exposure reductions shown in 1997 are the actual population exposures in 1995 and as discussed earlier the 1-hour CO standard was met for the first time in 1995.

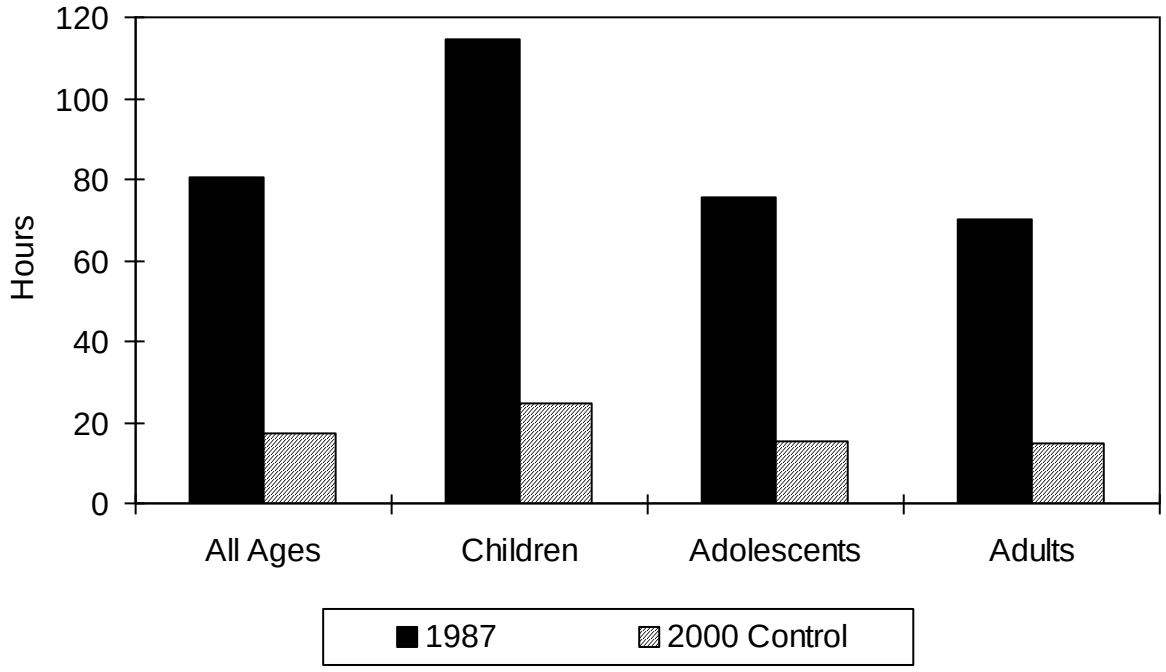


FIGURE 6-4

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

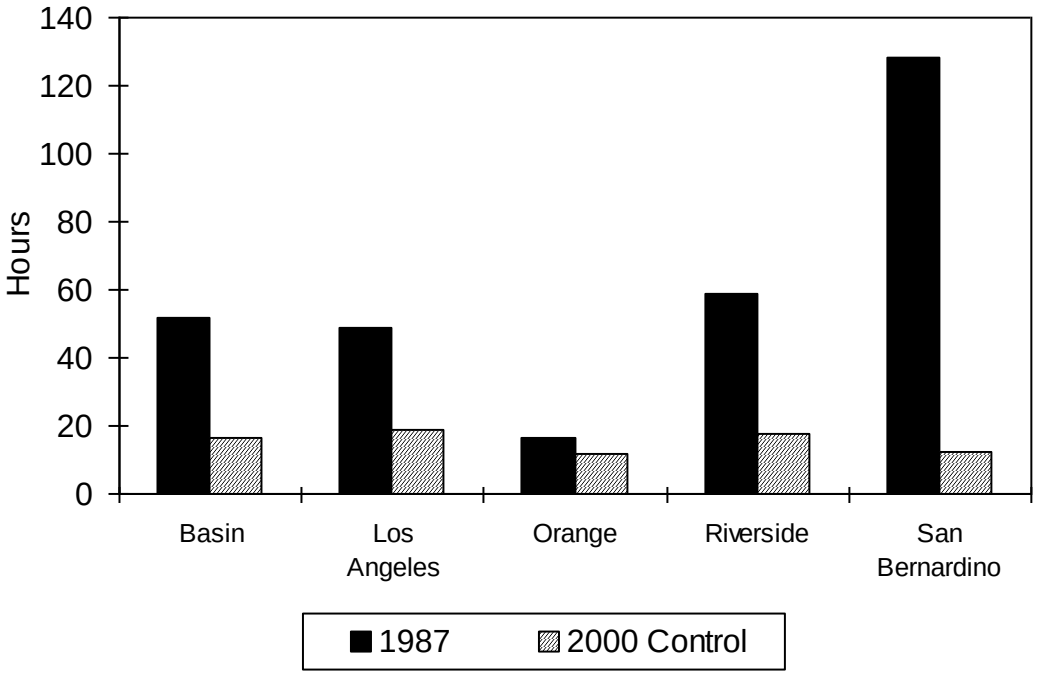
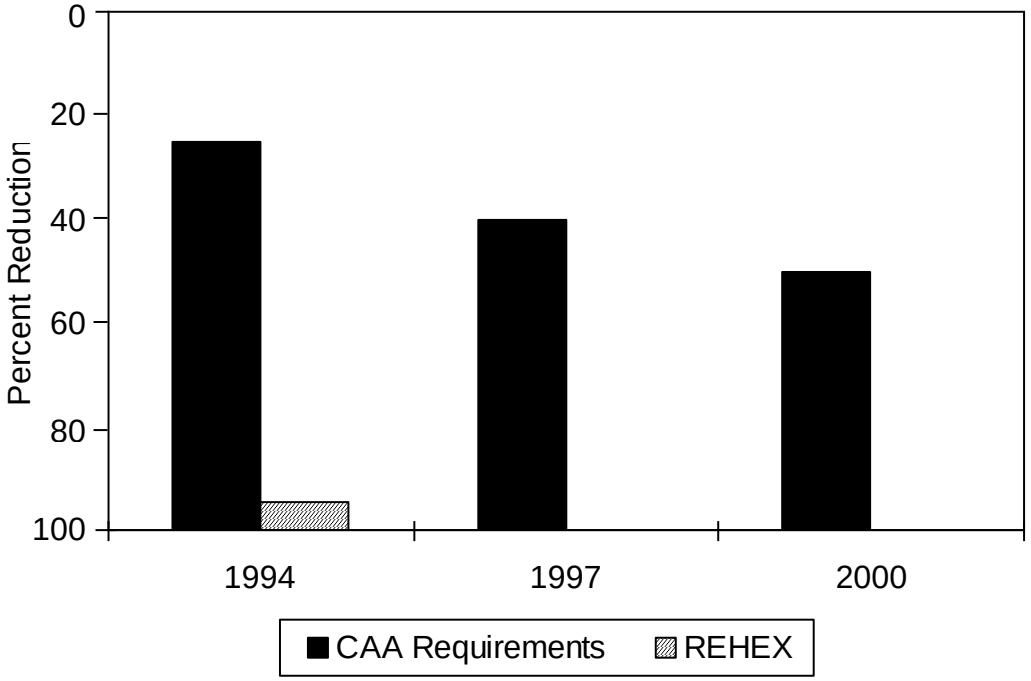


FIGURE 6-5

Per-Capita Ozone Exposure Above the State Standard by County



***1997 Exposure based on actual 1995 data (which met the standard).**

FIGURE 6-6

Percent Reductions in Annual Average Per-Capita Exposure to Carbon Monoxide

Nitrogen Dioxide

As discussed earlier, the 1-hour NO_2 standard was met in 1994 and 1995. In addition, the NO_x reductions from existing District and ARB rules assure that the NO_2 standards will continue to be met (see Chapter 5). Therefore, since 1994 and projected into the future the Basin's population will not be exposed to unhealthful levels of NO_2. The CCAA exposure goals have been satisfied through the District's AQMP.

Cost Effectiveness 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(b)]. 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].

Table 6-5 and Table 6-6 provide a listing of the short- and intermediate-term measures that have available cost information for stationary and mobile source measures, respectively. The cost-effectiveness for stationary source measures ranges from under $100 to as high as $12,300 per ton of pollutant reduced. Two methods are used to calculate the cost-effectiveness of the mobile source measures. The ARB transmitted the cost-effectiveness values for the mobile source measures based on incremental cost analyses, published reports and other internal methods. However, the District uses the Discount Cash Flow method in its calculations. The District has been using the Discount Cash Flow method since the 1987 AQMP. The Discount Cash Flow method is more versatile in analyzing complex financial cash flows and is the most widely used cost methodology by major businesses. In order to be consistent with the stationary source method, the District recalculated the mobile source cost-effectiveness values. Both sets of cost-effectiveness estimates are provided for consistency with ARB reported values. The proposed implementation schedule for these measures is provided in Chapter 7 and is based on this information and other relevant factors.

TABLE 6-5

Cost-Effectiveness Ranking of Stationary Source Control Measures[1]

Measure Number	Description	Dollars/Ton (1996 dollars)	Ranking by Cost Effectiveness*
Stationary Source Measures			
CTS-02N	Further Emission Reductions from Solvent Degreaser (R1122) (Formerly Part of ADV-CT1)	< $100	1
BCM-01	Emissions Reductions from Paved Roads (R403)	< $100	2
BCM-04	Emission Reductions from Agriculture Activities (R403)	$170	3
BCM-06	Further Emission Reductions from Fugitive Dust Sources to meet BACM Requirements (R403)	$240	4
BCM-03	Further Emission Reductions from Unpaved Roads	$630	5
CMB-06	Emission Reductions from Commercial and Residential Water Heaters (NO_x)	$660	6
CTS-02O	Further Emission Reductions from Usage of Solvents (R442) (Formerly Part of ADV-C T1)	$2,470	7
PRC-03	Emission Reductions from Restaurant Operations	$3,700	8
CTS-02H	Further Emission Reductions on Metal Parts and Products (R1107)	$4,560	9
CMB-02B	Control of Emissions from Small Boiler and Process Heater	$4,650	10
CTS-02M	Further Emissions Reductions from Plastic, Rubber, and Glass Coatings (R1145) (Formerly Part of ADV-CT1)	$4,850	11
CTS-02E	Further Emission Reductions from Adhesives (R1168)	$6,850	12
PRC-01	Emission Reductions from Woodworking Operations (PM_{10})	$8,160	13
CTS-07	Further Emission Reductions from Architectural Coatings (R1113)	$12,270	14

* The cost-effectiveness values of these measures are based on the discounted cashflow methodology and 4 percent real interest rate.

1 CP-02: Consumer products has a cost-effective value of $2100/ton calculated by ARB. However, a different methodology is used by ARB; therefore, it can not be ranked with other control measures.

TABLE 6-6

Cost-effectiveness Ranking of Mobile Source Control Measures

Measure Number	Description	District*		ARB**	
		$/Ton	Ranking	$/Ton	Ranking
Mobile Source Measures					
M-16	Pleasure Craft; Nationwide Emission Standards	$120	1	$120	1
M-11	Industrial Equipment, Gas & LPG - CA; Three-Way Catalyst Technology (ARB)	$410	2	$410	2
M-12	Industial Equipment, Gas & LPG - CA; Three-Way Catalyst Technology (U.S. EPA)	$430	3	$440	3
M-15	Aircraft; Nationwide Emission Standards	***		$2,080	4
ADV-M-9	Off-Road 2.5g/bhp NO_x Standard	$2,430	6	$2,370	5
M-10	Off-Road Diesel Equipment; 2.5g/bhp-hr NO_x Standard - National	$1,190	5	$2,370	6
M-13	Marine Vessels; Nationwide Standards, New and Rebuilt	***		$2,570	7
ADV-M-2	Enhanced LEV	$640	4	$2,600	8
M-14	Locomotives; Nationwide Standards, New and Rebuilt	***		$3,120	9
M-05	Heavy-Duty Diesel Vehicle; additional NO_x Reductions in CA	$3,120	7	$3,330	10
M-06	Heavy-Duty Diesel Vehicle; 2g/bhp-hr NO_x Standard - National	$3,120	8	$3,330	11
M-07	Accelerated Retirement of HDVs	$4,840	9	$6,550	12
M-04	Heavy-Duty Diesel Vehicle; 2g/bhp-hr NO_x Engines	$8,990	11	$8,990	13
M-01	Accelerated Retirement of LDVs	$5,500	10	$12,480	14

* District methodology for calculating cost-effectiveness is based on discounted cashflow methodology and 4 percent real interest rate.

** Cost-effectiveness calculated by ARB.

*** Insufficient data to calculate based on discounted cashflow methodology.