California Environmental Protection Agency
AIR RESOURCES BOARD

PROPOSED REVISION TO THE CALIFORNIA STATE IMPLEMENTATION PLAN

-- ON-ROAD HEAVY-DUTY VEHICLES --

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EXECUTIVE SUMMARY

What is the California State Implementation Plan (SIP)?

The California State Implementation Plan (SIP) includes rules, regulations, and proposed future control measures that are adopted and implemented by State and local agencies in order to achieve federal air quality standards. In 1994 California adopted a comprehensive Ozone SIP, which is a fifteen-year "blueprint" for cleaner air that demonstrates attainment of the federal ozone standard and shows a steady rate-of-progress toward that goal for the six areas in California with the most severe smog problem. The U.S. Environmental Protection Agency (U.S. EPA) approved this component of the California SIP in 1996. The Air Resources Board's (ARB's or Board's) element of the 1994 Ozone SIP included a series of commitments to develop new strategies to reduce emissions of reactive organic gases (ROG) and oxides of nitrogen (NOx), which react to form ozone. The most ambitious commitments are designed to bring the South Coast Air Basin into attainment by the 2010 deadline in the Clean Air Act.

What SIP revisions are we proposing?

The staff is proposing a very narrow SIP revision to withdraw an infeasible ARB mobile source measure (M-7) and submit a new ARB measure (M-17) affecting the same sources.

What is measure M-7 and why are we proposing to withdraw it from the SIP?

Measure M-7, Accelerated Retirement of Heavy-Duty Vehicles, committed to reduce emissions of ozone precursors in the South Coast by 11 tons per day (TPD) in 2010, with lesser reductions expected in earlier years. This measure envisioned that the reductions would be achieved through the annual retirement (scrapping or removal) of about 1,600 of the oldest, high emitting trucks in the South Coast, from 1999 through 2010. Although this approach seemed feasible in 1994, subsequent work revealed major obstacles to successful implementation. Since we have concluded that this measure is not feasible on the scale envisioned, we are proposing to update the SIP to formally withdraw measure M-7.

What is measure M-17 and why are we proposing to add it to the SIP?

Concurrent with withdrawal of measure M-7, ARB must submit a new measure that delivers adequate emission reductions to ensure the SIP continues to meet federal requirements for attainment and rate-of-progress. Measure M-17, Additional Reductions from Heavy-Duty Vehicles, is a new measure designed to achieve the same 11 TPD of emission reductions for South Coast in 2010 that M-7 would have provided. The measure describes the strategies ARB staff will pursue to achieve those reductions. The most

promising strategy is to expand the in-use compliance program for heavy-duty vehicles by adding testing for excessive NOx emissions as part of the existing smoke inspection programs. To the extent that additional incentive funding (beyond that needed for other SIP commitments) is available, those monies could speed the introduction of engines capable of emission levels below the new 2004 national truck standards.

When would ARB adopt and implement measure M-17?

We will adopt the program to implement measure M-17 by January 2004. We will begin implementing measure M-17 in 2005 to achieve the emission reduction commitments for that year.

Which areas and plans would be affected by the proposed SIP revisions?

The proposed SIP revisions affect only the South Coast Air Basin. Since measure M-7 was limited to the South Coast, we will ask U.S. EPA to credit measure M-17 to only that area at this time (although the strategies would likely be implemented statewide). Three revisions to the California SIP rely on measure M-7 to demonstrate attainment or rate-of-progress: the approved 1994 Ozone SIP, plus the South Coast 1997 Air Quality Management Plan (AQMP) Elements for Ozone and Particulate Matter (PM10), which have been submitted to U.S. EPA but not yet approved.

Would the new measure M-17 entirely replace the emission reductions lost by withdrawal of measure M-7 from the 1994 Ozone SIP and the other plans?

Measure M-17 would provide identical emission reductions to measure M-7 from 2006 (the PM10 attainment year) through 2010 (the ozone attainment year). The new measure would fall short of the reductions expected from measure M-7 in between 1999-2005 because of the need to develop NOx sensing technology to ensure that NOx reductions are achieved.

Would the proposed SIP revisions interfere with the demonstrations of attainment and rate-of-progress in the affected plans?

No. The attainment demonstrations would remain "whole" because measure M-17 would provide the full emission reductions credited to measure M-7 in the attainment year for each of the affected plans. The rate-of-progress demonstrations in the two ozone plans would also remain intact. The rate-of-progress demonstration for PM10 would need to be revised to reflect the longer phase-in period for measure M-17, which is allowed by the Clean Air Act.

Can ARB make the proposed SIP revisions without performing air quality modeling?

Yes. Since the proposed revisions are narrowly focused on the same category of sources, with the same complement of emission reductions in the attainment year, these changes can be made without affecting the modeled attainment demonstrations.

Are the proposed SIP revisions consistent with the Clean Air Act and approvable?

Yes. The Clean Air Act permits SIP revisions that would not interfere with an area's ability to meet rate-of-progress requirements or timely attainment. The proposed revisions satisfy those criteria.

Does the recent change to the federal ozone standard affect the need for these revisions?

No. In 1997, U.S. EPA revised the federal ozone standard of 0.12 parts per million (ppm) over one hour and replaced it with a new standard of 0.08 ppm over eight hours. However, the one-hour standard remains in place for all areas (including the South Coast) that were not in compliance at the time of the revision. As a result, the 1994 Ozone SIP remains enforceable until all areas of California attain the one-hour federal standard or until the plan is revised.

Will the proposed changes affect transportation conformity?

Yes. The Clean Air Act requires transportation plans to conform to air quality plans. Since each of the affected plans showed the reductions expected in early years from measure M-7, those reductions were included in the motor vehicle emission budgets established for ozone and particulate matter. As part of this revision, we must amend the emission budgets to reflect the schedule for anticipated emission reductions from measure M-17.

Would the proposed SIP revisions be expected to cause a significant adverse environmental or economic impact compared to the current plans?

No. The 1994 Ozone SIP identified the potential impacts from new strategies, including M-7. We do not expect that implementation of measure M-17 would result in significant adverse environmental impacts or be significantly less cost-effective than measure M-7.

Why should the Board adopt the proposed SIP revisions?

Although the proposed revisions would shift our strategy from a single specific (albeit infeasible) strategy to a combined in-use compliance and incentive approach, the end result will be a more effective truck strategy. By focusing on the critical issue of in-use emissions, measure M-17 can lead to a long-term regulatory program providing emission benefits statewide through 2010 and beyond. The revisions provide the legally-required emission reductions, including the full tons needed in the South Coast for attainment of the ozone and

PM10 standards. While the revisions would not supply all of the reductions identified in the affected plans for 1999 through 2005, the proposed measure M-17 is the most feasible approach and schedule to achieve additional emission reductions from trucks and buses.

THE STATE IMPLEMENTATION PLAN

The State Implementation Plan (SIP) includes all of California's state and local plans, regulations, permit programs, inventories, test methods, and other elements submitted to, and approved by, the U.S. Environmental Protection Agency (U.S. EPA) over the last two decades to attain the national ambient air quality standards for ozone, carbon monoxide, particulate matter, and other pollutants.

The 1994 Ozone SIP identifies the measures needed to bring six areas of California into attainment with the one-hour federal ozone standard by the applicable deadlines in the Clean Air Act. Since ozone is formed in the atmosphere and not directly emitted, these measures are designed to reduce emissions of ozone precursors -- reactive organic compounds (ROG) and oxides of nitrogen (NOx) -- to the attainment target for each area, as determined by air quality modeling.

The California Air Resources Board (ARB or "Board") adopted the 1994 Ozone SIP on November 15, 1994, and submitted it to the U.S. Environmental Protection Agency (U.S. EPA), as required by the Clean Air Act. U.S. EPA announced its final approval of the 1994 Ozone SIP on September 25, 1996, and noticed that action in the *Federal Register* on January 8, 1997.

The 1994 Ozone SIP includes: state strategies for mobile sources and fuels, consumer products, and pesticides; identified federal measures needed to reduce emissions from mobile sources under its control; and local plans adopted by the affected districts to control the industrial, commercial, and area wide stationary pollution sources under their jurisdiction. The state strategies rely on a combination of previously adopted regulations and commitments to develop and implement new measures. For mobile sources, the state strategies are a mix of emission standards and market-based incentives. Commitments for new SIP strategies for mobile sources are labeled as "M" measures, with numbers ranging from M-1 through M-16 (see Appendix A for a complete list).

The most far-reaching and ambitious component of the plan focuses on the nation's smoggiest area -- the South Coast Air Basin (all or part of the counties of Los Angeles, Orange, Riverside, and San Bernardino). The Clean Air Act requires the South Coast to attain the federal one-hour ozone standard by 2010. Although air quality in the South Coast has

improved dramatically over the last two decades, the region continues to violate the federal ozone standard (and the more health-protective state standard) many days each year.

At the time the Board adopted the 1994 Ozone SIP, both the Board and the staff recognized the need for the plan to adapt over time. The Overview of the 1994 Ozone SIP (Volume 1 - Overview; p. I-9) notes that even after it is approved, the SIP may be revised at any time -- provided the resulting change does not adversely affect any region's attainment demonstration or its rate-of-progress performance. U.S. EPA concurred with this assessment in the *Federal Register* notice approving the SIP and in testimony during the 1994 hearings, saying "the SIP can be as dynamic as you choose to make it..." Additionally, in Resolution 94-60 approving the 1994 Ozone SIP, the Board directed the Executive Officer to continue evaluating, improving, and further enhancing emission models and inventories to ensure the best information was available. The Board also directed the Executive Officer to continue to review both the cost-effectiveness and technological feasibility of the proposed control strategies and to propose necessary and appropriate modifications.

On November 15, 1996, the South Coast Air Quality Management District (South Coast District) adopted its 1997 Air Quality Management Plan (AQMP), which addresses multiple pollutants, including ozone and inhalable particulate matter (PM10). The 1997 AQMP revised the local component of the 1994 Ozone SIP and demonstrated attainment of the federal PM10 standards as well. The 1997 AQMP relies on all of the state and federal strategies defined in the 1994 Ozone SIP. ARB approved the 1997 AQMP Elements for Ozone and PM10 as SIP revisions on January 23, 1997, and submitted them to U.S. EPA on February 5, 1997. U.S. EPA has not yet acted on any element of the 1997 AQMP. In this report, the term "affected plans" will refer to the 1997 AQMP, as well as the 1994 Ozone SIP.

HEAVY-DUTY TRUCKS AND BUSES

The 1994 Ozone SIP contains several measures that focus on reducing emissions from heavy-duty trucks and buses -- one of the largest sources of NOx emissions in California. These heavy-duty vehicles operate primarily on diesel fuel. Of the total emissions from these vehicles in California, about three-quarters are from vehicles based in California, with the remaining emissions from out-of-state trucks operating here. While ARB has regulatory authority for the trucks and buses based in California, emissions from out-of-state vehicles are regulated by U.S. EPA or their country of origin.

Although tighter state and national emission standards are cutting overall emissions from heavy-duty trucks and buses, the number of vehicles and the miles traveled in California are projected to steadily increase. To address heavy-duty vehicles, the 1994 Ozone SIP identifies a variety of measures, including emission standards, incentive programs for cleaner engines, and an accelerated retirement program. These new measures, in combination with existing emission standards and in-use compliance programs, are expected to continue reducing emissions from heavy-duty vehicles.

Engine Emission Standards

As of 1998, California and national emission standards are aligned at 4 grams of NOx per brake-horsepower-hour (g/bhp-hr). Two of the 1994 Ozone SIP measures, measures M-5 and M-6, call for ARB and U.S. EPA to adopt tighter standards for new engines. In June 1995, ARB, U.S. EPA, and engine manufacturers signed a Statement of Principles agreement for cleaner trucks and buses, beginning in 2004. In October 1997, U.S. EPA finalized regulations to cut the combined emission standard for NOx plus non-methane hydrocarbon standard to 2.4 g/bhp-hr and to extend the regulated life of the engines from 290,000 miles to 435,000 miles. The new national standards include an averaging, banking and trading program which allows engine manufacturers to claim bankable credits for emission reductions achieved by introducing the cleaner engines earlier than required.

ARB plans to align state requirements with the new national standards. The staff held a workshop in December 1997 to discuss the proposed state regulations, which would establish state emission standards identical to the national levels, with slight modifications to the administrative elements to be consistent with state law, and provide for state enforcement.

"Off-Cycle" Emissions

Heavy-duty engines are emission-certified on engine dynamometers using a federal test cycle which mimics the light-loads and low speeds typical of urban driving. Excessive, and unexpected, emissions may occur during real-world driving conditions which are not simulated by the urban test cycle. These "off-cycle" emissions are not accounted for in the motor vehicle inventory.

The high speed, high-load operating conditions typical of interstate trucks are not well-represented in the test cycle and result in off-cycle emissions. In addition, onboard computers can be used to optimize fuel economy, at the expense of emissions, in the high speed, high-load conditions favored by interstate trucks. Significant off-cycle emissions could undermine the emissions benefits associated with the new national truck standards. ARB is extremely concerned about off-cycle emissions and is working with U.S. EPA to ensure these emissions are addressed as soon as possible.

In-Use Compliance

No matter how clean new engines are, the sustained air quality benefit depends on in-use maintenance. Since trucks and buses may last 500,000 to over one million miles before the engine is rebuilt or replaced, the issue of increasing emissions over time is especially critical for these vehicles. California has a number of programs that seek to ensure the vehicles are properly maintained.

Heavy-Duty Vehicle (Roadside) Inspection Program

As required by state law (Stats. 1988, ch. 1544, Presley), ARB began a statewide heavy-duty vehicle inspection program (HDVIP) in 1991. Under the HDVIP, heavy-duty diesel trucks and buses are tested for excessive smoke emissions. The opacity of smoke from diesel engines is measured with a hand-held electronic smokemeter. Heavy-duty vehicles fueled with both diesel and gasoline are inspected for tampering. Vehicles are tested statewide by ARB inspectors at California Highway Patrol facilities and weigh stations, and at random roadside locations. The program was implemented from November 1991 until October 1993, when ARB temporarily suspended enforcement of the program pending completion of a new procedure for the smoke testing.

In February 1996, the Society of Automotive Engineers (SAE) issued the new procedure SAE J1667 “Snap-Acceleration Smoke Test Procedure for Heavy-Duty Diesel Powered Vehicles.” During the snap-acceleration test, the vehicle remains stationary while the operator quickly moves the throttle to the fully open position. This step is repeated several times while the inspector uses an electronic smokemeter to measure the opacity of the exhaust.

In December 1997, ARB amended the roadside program to use the SAE J1667 test procedure and establish new opacity cutpoints or smoke standards for heavy-duty vehicles -- the exhaust cannot exceed 55 percent opacity for pre-1991 model year engines or 40 percent opacity for 1991 and subsequent model year engines. Vehicles which exceed the smoke standards must be repaired. Those with especially high smoke also pay a monetary penalty. Enforcement testing is scheduled to resume in Summer 1998.

Periodic Smoke (Self-) Inspection Program

The Periodic Smoke Inspection Program (PSIP) is also required by state law (Stats. 1990, ch.1453, Killea) to promote self-inspection of fleet vehicles. The PSIP applies generally to all diesel vehicles with a gross vehicle weight rating greater than 6,000 pounds. Under the PSIP, California-based truck and bus fleets with two or more vehicles must inspect their own vehicles annually to measure smoke opacity and check for tampering. Many single vehicles are not commercially owned and are consequently driven more like passenger cars and light-duty trucks. The PSIP also exempts vehicles based out-of-state since these vehicles are generally serviced and maintained at facilities outside of California as well. ARB does not have the legal authority to require smoke testing and repair at facilities outside California. However, these vehicles are subject to the HDVIP's roadside testing, repair, and enforcement requirements.

The smoke opacity test procedure and standards are identical to the HDVIP program. To ensure program compliance, ARB staff audits fleets by reviewing their maintenance and inspection records, and testing a representative sample of vehicles.

ARB originally adopted the PSIP in December 1992, with a scheduled effective date of January 1, 1995. However, ARB postponed implementation of the program pending adoption of the new SAE J1667 test procedure. In the interim period, ARB has been encouraging fleets to perform the self-inspections on a voluntary basis. In December 1997, the Board approved revisions to the PSIP and the program is expected begin in Summer 1998.

PROPOSED REVISIONS TO THE STATE IMPLEMENTATION PLAN

As SIP measures go through the regulatory development process, they may be modified in light of new information. For measures that cannot fully satisfy the emission reduction commitment, or must be completely withdrawn due to infeasibility, additional emission reductions are sought from the same sector. The proposed SIP revisions would withdraw one commitment for reductions from heavy-duty trucks and buses and submit another measure for the same source category.

Withdrawal of Measure M-7: Accelerated Retirement of Heavy-Duty Vehicles

To achieve greater emission reductions from older trucks, the 1994 Ozone SIP included measure M-7, Accelerated Retirement of Heavy-Duty Vehicles. This measure envisioned the annual retirement (scrapping or removal) of about 1,600 of the oldest, high emitting trucks in the South Coast Air Basin, beginning in 1999 and continuing through 2010. This measure was a tonnage commitment, meaning that ARB has the responsibility to scrap as many, or as few, trucks as necessary to meet the emission reduction commitment outlined in the 1994 Ozone SIP. Table 1 shows the emission reductions identified in the 1994 Ozone SIP for measure M-7 in the appropriate years.

Table 1
Emission Reductions Expected from Measure M-7 in the South Coast
(tons per day)

	1999	2002	2005	2008	2010
ROG	0	0	1	1	1
NOx	3	6	7	9	10

At the time the 1994 ozone SIP was adopted, ARB staff anticipated that the retirement program could be self-sustaining through the sale of both the best old trucks (for export) and recovered parts from scrapped trucks. However, as ARB staff worked with the trucking industry and other stakeholders to develop this measure, it became clear that M-7 would not be able to deliver the emission reductions for two reasons -- funding and the lack of expected emission benefits. The prospects for a self-funded program dimmed when the anticipated overseas market for old California trucks did not materialize and we better understood the value of these older vehicles to their owners. Analysis also indicates that the older, high emitting trucks removed from the fleet are not likely to be replaced with cleaner vehicles, but rather with trucks of similar age from outside the area, providing little or no emission benefit. In response to the obstacles to implementation of a successful truck scrappage program on the

scale envisioned in the 1994 Ozone SIP, ARB staff believes it must pursue alternative strategies to achieve the needed emission reductions from this source sector.

Submission of New Measure M-17: Additional Emission Reductions from Heavy-Duty Vehicles

ARB staff also proposes to revise the affected plans to include measure M-17, a new measure to obtain additional emission reductions from on-road heavy-duty vehicles by pursuing a combination of expanded in-use compliance and additional market-based incentives for cleaner engines. We will adopt the program to implement measure M-17 by January 2004. We will begin implementing measure M-17 in 2005. Table 2 shows the total emission reductions that ARB would commit to achieve from measure M-17 in the South Coast.

Table 2
Emission Reductions Expected from Measure M-17 in the South Coast
(tons per day)

Pollutant	1999	2002	2005	2006	2008	2010
ROG	0	0	1	1	1	1
NOx	0	0	4	8	9	10

In-Use Compliance Programs

In-use emissions are a critical factor in motor vehicle emission control. However, current in-use compliance programs for heavy-duty vehicles are not as comprehensive as those for passenger cars and light-duty trucks. We believe there are opportunities for significant NOx emission reductions by expanding the existing in-use compliance programs. Some of the options for evaluation include:

Incorporate NOx screening into the Heavy-Duty Vehicle Inspection and Periodic Smoke Inspection Programs (HDVIP and PSIP). Currently, there is no regulatory requirement to test for or reduce NOx emissions in the HDVIP and PSIP. However, ARB is evaluating two ways of reducing NOx emissions while concurrently reducing smoke:

1. Ensure that heavy-duty engines are set to manufacturer specifications, instead of being repaired just to pass the smoke opacity test. To accomplish this with the current HDVIP and PSIP, we are working with the trucking industry, engine manufacturers, and others to educate truck owners and

operators, service technicians, and engine mechanics on the importance of setting heavy-duty engines to manufacturer specifications. Additionally, ARB could amend the HDVIP and PSIP regulations to require that engines be set to manufacturer specifications.

2. Require NOx screening during HDVIP and PSIP testing. The current snap-acceleration test does not place the vehicle under load, which is necessary to test for NOx emissions. Thus, screening for NOx emissions will require the development of a new test method.

   ARB will undertake efforts to develop an accurate, reliable, field NOx screening test, including the necessary test equipment. The test may involve placing the vehicle under load, or, for future vehicles, reading the diagnostic codes from the on-board diagnostic system. Repairing failing vehicles to manufacturer specifications will reduce NOx emissions.

In-use compliance testing and recall program. A testing and recall program for heavy-duty vehicles, similar to that currently in place for passenger cars and light trucks, may be effective at reducing emissions from trucks which have poorly designed emission control systems. However, heavy-duty engines are currently certified on an engine dynamometer, independent of the vehicle, and it is impractical to perform in-use compliance testing as long as the engine must be removed from the vehicle. ARB is currently funding an effort to determine if chassis screening is feasible and, if so, a chassis screening test cycle will be developed. These efforts could be aided by the introduction of on-board diagnostic systems to new heavy-duty vehicle engines.

Market-Based Incentives

Market-based incentives to encourage the early introduction of lower-emitting heavy-duty engines are already part of the SIP. To meet the emission reduction commitment for measure M-17, we will supplement in-use compliance programs by pursuing financial incentives for advanced heavy-duty technologies capable of emissions below the 2004 national standards.

ANALYSIS OF STATE IMPLEMENTATION PLAN IMPACTS

To evaluate the impact of the proposed revisions on the SIP, we must look at the demonstrations of attainment and rate-of-progress in each of the affected plans. We also need to consider the motor vehicle emission budgets established for transportation conformity by the affected plans.

Attainment Demonstrations

To examine the impact of the proposed revisions on the attainment demonstrations for each plan, we must consider any changes to: the total emission reductions, including the balance of ROG and NOx, plus the spatial and temporal distribution of the emissions. The measure to be withdrawn and the new measure to be submitted provide the same quantity and balance of emission reductions in the attainment year, and address the same source sector. Table 3 shows the emission reductions credited from measure M-7 to attainment in each of the affected plans and the reductions committed from measure M-17 in the same years.

Table 3
Impact on the Attainment Demonstration for Each Affected Plan

	Emission Reductions in Attainment Year (tons per day)					
	1994 Ozone SIP (2010)		1997 AQMP-Ozone (2010)		1997 AQMP-PM10 (2006)	
	ROG	NOx	ROG	NOx	ROG	NOx
Reductions Credited from M-7	1	10	1	10	1	8
Reductions Committed from M-17	1	10	1	10	1	8

Since the existing fleet of heavy-duty vehicles is the focus of both M-7 and M-17, the temporal and spatial distribution of the remaining emissions would be consistent. Therefore, the proposed revisions should preserve the attainment demonstration for the South Coast in each plan.

Rate-of Progress Demonstrations

Each of the affected plans has its own demonstration that the South Coast will satisfy the rate-of-progress requirements in the Clean Air Act in the applicable milestone years.

Because the requirements differ for ozone and PM10, and the approach differs in each demonstration, we discuss the impact of the proposed SIP revisions on each affected plan.

1994 Ozone SIP

The post-1996 rate-of-progress requirement for ozone is a three percent per year reduction in 1990 baseyear emissions of volatile organic compounds, between 1997 and attainment. However, some reductions in NOx emissions can also be substituted. In this plan, the rate-of-progress demonstration for South Coast was based on ROG reductions alone, including reductions from both adopted measures and new commitments. The 1994 Ozone SIP and U.S. EPA's approval notice show both the calculated rate-of-progress targets for the milestone years and the total expected ROG emissions after accounting for the anticipated reductions from all measures, including M-7. In each year, the expected emission levels were substantially lower than the rate-of-progress target. Table 4 shows the relevant emission targets and reductions for the 1994 Ozone SIP.

Table 4
Rate-of-Progress for the 1994 Ozone SIP

	Pollutant	Emissions or Reductions in Milestone Year (tons per day)				
		1999	2002	2005	2008	2010
Rate-of-Progress Emission Target	ROG	1019	890	767	647	568
Reductions Credited from M-7	ROG	0	0	1	1	1
Reductions Committed from M-17	ROG	0	0	1	1	1

While the reductions from M-7 are beyond those needed to meet the minimum rate-of-progress requirement in this SIP, they are clearly needed for attainment.

1997 AQMP-Ozone Element

While the rate-of-progress requirement for ozone remained unchanged, the 1997 AQMP-Ozone Element established new emission targets reflecting changes in the 1990 baseyear emission levels in response to improved inventory models. Beginning in 2005, the South Coast District also relied on the ability to substitute NOx reductions for the required

VOC reductions. Table 5 shows the relevant emission targets and reductions for the 1997 AQMP-Ozone Element.

Table 5
Rate-of-Progress for the 1997 AQMP-Ozone Element

	Pollutant	Emissions or Reductions in Milestone Year (tons per day)				
		1999	**2002**	**2005**	**2008**	**2010**
Rate-of-Progress Emission Target	ROG	1161	1012	917	908	900
	NOx	0	0	1428	1303	1222
Reductions Credited from M-7	ROG	none				
	NOx					
Reductions Committed from M-17	ROG	none				
	NOx					

Since the 1997 AQMP-Ozone Element relied entirely upon reductions from previously adopted measures to demonstrate rate-of-progress, there was no need to apply anticipated reductions from new commitments like M-7 towards this requirement. Therefore, the proposed SIP revisions would not impact this demonstration.

1997 AQMP-PM10 Element

The rate-of-progress requirement for PM10 is "reasonable progress" towards attainment, without a specific percentage or quantity of reductions required. The South Coast District's demonstration of rate-of-progress for PM10 includes ROG and NOx reductions from measure M-7 because these pollutants are PM10 precursors (see Table 6).

Table 6
Rate-of-Progress for the 1997 AQMP-PM10 Element

	Pollutant	Emissions or Reductions in Milestone Year (tons per day)			
		1997	**2000**	**2003**	**2006**
Rate-of-Progress Milestone	ROG	994	866	746	623
	NOx	998	864	748	635
Reductions Credited from M-7	ROG	0	0	0	1
	NOx	1	4	6	8
Reductions Committed from M-17	ROG	0	0	0	1
	NOx	0	0	0	8
Revised Rate-of-Progress Emission Target	ROG	994	866	746	no change
	NOx	999	868	754	

The PM10 milestones identified in the 1997 AQMP-PM10 element reflect the estimated emissions of each pollutant after implementation of all the adopted and committed measures in the plan, including M-7. With the proposed SIP revisions, we must adjust the emission levels used to define the PM10 progress milestones to reflect the longer phase-in period for the new measure M-17.

Transportation Conformity and Motor Vehicle Emission Budgets

Under Section 176(c) of the Clean Air Act, federal funds and decisions may not support activities that contribute to violations of the national ambient air quality standards. The Act established a process, known as conformity, for assuring that federal decisions are consistent with the SIP. Transportation plans, transportation improvement programs, and projects that involve federal funds must be shown to result in emissions that do not exceed estimates for motor vehicles in the SIP's progress and attainment demonstrations. This ceiling on emissions is termed an emissions budget.

Because the proposed SIP revisions would affect estimated on-road emissions, a revision to emissions budgets for the South Coast Air Basin is needed and must be documented as part of this action. The applicable budgets for ozone (ROG and NOx) were established in the 1994 Ozone SIP. Budgets for PM10, and for NOx and ROG as precursors to secondary aerosols, were established in the South Coast District's 1997 AQMP. Table 7 shows the new emissions budgets that would result from the proposed SIP revisions, after

adjusting on-road emissions for the removal of measure M-7 and the addition of measure M-17 for the 1994 Ozone SIP and the 1997 AQMP for Ozone.

Table 7
Motor Vehicle Emissions Budgets for Ozone in the South Coast

	Pollutant	On-Road Motor Vehicle Emissions (tons per day)				
		1999	2002	2005	2008	2010
1994 Ozone SIP Emissions Budgets	ROG	288	211	155	110	49
	NOx	499	437	364	313	254
New 1994 Ozone SIP Emissions Budgets	ROG	288	211	155	110	49
	NOx	502	443	367	313	254
1997 AQMP Ozone Emissions Budgets	ROG	354	273	206	145	81
	NOx	527	447	369	310	278
New 1997 AQMP Ozone Emissions Budgets	ROG	354	273	206	145	81
	NOx	530	453	372	310	278

Table 8 shows the new emissions budgets for PM10 that would result from the proposed SIP revisions, after adjusting on-road emissions for the removal of measure M-7 and the addition of measure M-17 for the 1997 AQMP-PM10 Element.

Table 8
Motor Vehicle Emissions Budgets for PM10 in the South Coast

	Precursor Pollutant	On-Road Motor Vehicle Emissions (tons per day)		
		2000	2003	2006
1997 AQMP PM10 Emissions Budgets	ROG	340	258	187
	NOx	509	429	350
New 1997 AQMP PM10 Emissions Budgets	ROG	340	258	187
	NOx	513	435	350

For the South Coast Air Basin, the Southern California Association of Governments (SCAG) is responsible for demonstrating the conformity of transportation plans and programs with the SIP. SCAG has proposed a revision to the regional transportation plan and is preparing a conformity demonstration for the new plan. Adoption of the new plan and a finding of conformity are scheduled for consideration by SCAG's governing board (the Regional Council) on April 16, 1998. The U.S. Department of Transportation (U.S. DOT) must concur with SCAG's finding. An interruption in plan conformity would place limitations on the types of transportation projects that could be funded with federal dollars, until a new conformity finding is confirmed by U.S. DOT.

Because the proposed SIP revisions would alter some SIP emission budgets, there may be an impact on the tests to be undertaken by SCAG to demonstrate conformity. Specifically, new emission budgets for some future years may apply to the conformity finding. New ozone budgets would become applicable for conformity 45 days after U.S. EPA approval of the proposed SIP revisions. New budgets for PM10 would become applicable 45 days after submittal of the revisions to U.S. EPA. Where new budgets are necessary and become applicable, they will be larger than previous budgets. The credit SCAG may assume for state control measures will be reduced, however, so that the net effect of the budget revision should be neither negative nor positive for SCAG's conformity finding.

Consultation with transportation agencies regarding SIP revisions affecting mobile sources is a requirement of the conformity process. Staff is working carefully with SCAG, Caltrans, and other affected parties to assure that SIP revisions do not create a barrier to a successful conformity determination this spring. Because non-implementation of measure M-7 could, by itself, lead to a challenge of SCAG's conformity finding, timely adoption and approval of the proposed SIP revisions appears to be the most prudent course of action.

ENVIRONMENTAL IMPACTS

The 1994 Ozone SIP contained an evaluation of the potential environmental impacts of all new measures, including M-7. This section addresses the potential impacts of the new measure M-17, relative to the existing commitment for measure M-7.

Withdrawal of Measure M-7: Accelerated Retirement of Heavy-Duty Vehicles

As discussed in the 1994 Ozone SIP (Volume II - ARB Elements; p. IV-4 - IV-5), accelerated vehicle retirement programs, such as M-7, are expected to lead to an increase in the number of vehicles scrapped, which increases solid waste. However, it was also noted in the 1994 Ozone SIP that even in the absence of accelerated vehicle retirement programs, these vehicles would have eventually been retired. Accelerated vehicle retirement programs simply expedite the dismantling and disposal of older vehicles.

ARB staff is now proposing to withdraw M-7 from the 1994 Ozone SIP. Additional emission reductions from heavy-duty vehicles will be credited toward attainment in the South Coast in place of M-7.

Submission of Measure M-17: Additional Emission Reductions From Heavy-Duty Vehicles

The principal strategy for measure M-17 is to expand the existing smoke inspection programs to include NOx testing. To identify any potential environmental impacts that might result from implementation of this measure, we looked at the analysis done for the regulatory item to revise the smoke programs. In the Initial Statement of Reasons (Public Hearing to Consider Proposed Amendments to the California Regulations Governing the Heavy-Duty Vehicle Inspection Program and Periodic Smoke Inspection Program, October 1997), staff did not identify any "significant non-emissions adverse environmental impacts that would result" from the HDVIP and PSIP. We have identified no adverse environmental impacts associated with: including NOx testing and repair in the smoke inspection programs, creating an in-use compliance testing program with recall provisions, or using financial incentives to encourage early introduction of cleaner truck engines.

Since M-17 is a measure in a plan, not a specific regulatory proposal yet, it is not possible to quantify the impact on global warming or stratospheric ozone depletion, waste water treatment facilities and waterways, and solid and hazardous waste disposal facilities. When specific regulatory language is developed, it will be possible to analyze potential environmental impacts in detail and with reference to numerical data.

At this time, we do not expect implementation of these programs to result in substantial, adverse environmental impacts. Additional emission reductions from heavy-duty

vehicles, as defined in measure M-17, are expected to have a positive impact on the environment.

ECONOMIC IMPACTS

In the 1994 Ozone SIP, ARB staff estimated the direct costs of the proposed state level control strategies. The costs associated with emission reductions, as well as the cost-effectiveness for various mobile and stationary source categories were estimated for the year 2010. The cost-effectiveness for on-road mobile source categories ranged from a high of $16,000 to a low of $1,300 per ton of NOx and ROG reduced. All costs are stated in constant 1994 dollars.

For M-7, the cost-effectiveness calculated for the 1994 Ozone SIP was $6,300 per ton of ROG plus NOx. However, subsequent work on development of measure M-7 revealed that one of the primary obstacles to truck scrappage is the high value of the older trucks to their owners. As a result, the actual costs to implement the program described in the SIP would be significantly higher than the original estimate, making measure M-7 substantially less cost-effective.

The cost-effectiveness of the additional heavy-duty emission reductions from measure M-17 are expected to range from $5,000 to $15,000 per ton of ROG plus NOx reduced. Based on the higher than anticipated costs for truck scrappage, we expect the cost-effectiveness of measure M-17 to be consistent with measure M-7.

The in-use compliance strategies described in measure M-17 may increase the cost of doing business in California for firms located in the state. Smaller truck operators may find it more difficult to absorb the costs of additional heavy-duty diesel vehicle testing than larger companies. However, without a specific regulatory proposal, it is difficult to evaluate the potential impact. As ARB staff develops the specific strategies to implement measure M-17, the effects on small business will be analyzed, and means to mitigate those impacts will be considered.

This evaluation does not account for the enormous benefits to California businesses that the development of new technologies will bring. We expect that our industries will benefit economically from not only technological advancement, but also new product opportunities and a healthier, more productive labor force. These benefits in many instances may more than offset the costs of the planned measure, however, they are difficult to quantify.

LEGAL AUTHORITY

The Federal Clean Air Act Amendments of 1990 (the "Act" or "CAA"; 42 U.S.C. section 7401 et seq.) requires California to submit to the U. S. EPA revisions to the SIP for ozone and PM10 for certain areas. The primary tool to be used in the effort to attain national ambient air quality standards is a plan to be developed by any state with one or more nonattainment areas which provides for implementation, maintenance and enforcement of the standards --- the SIP (§110(a)(1)). Section 110(a)(2)(A) broadly authorizes and directs states to include in their SIPs:

> "...enforceable emission limitations and other control measures, means, or techniques (including economic incentives such as fees, marketable permits, and auctions of emissions rights), as well as schedules and timetables for compliance, as may be necessary or appropriate to meet the applicable requirements of the Act."

Pursuant to these codes, ARB is charged with coordinating state, regional and local efforts to attain and maintain both state and national ambient air quality standards. The direct statutory link between ARB and the mandates of the CAA is found in §39602 of the Health and Safety Code. Pursuant to this section--

> "The state board is designated the air pollution control agency for all purposes set forth in federal law.
>
> The state board is designated as the state agency responsible for the preparation of the state implementation plan required by the Clean Air Act (42 U.S.C., Sec. 7401, et seq.) and, to this end, shall coordinate the activities of all districts necessary to comply with that act.
>
> Notwithstanding any other provision of this division, the state implementation plan shall only include those provisions necessary to meet the requirements of the Clean Air Act."

The Act sets forth the requirements that the SIP revision must meet. CAA section 182(c)(2)(A) requires each serious and above ozone nonattainment area to demonstrate attainment of the federal ozone standard by each nonattainment area's applicable attainment date. In addition, CAA section 182(c)(2)(B) requires each serious and above ozone nonattainment area to demonstrate at least a three percent per year average reduction in volatile organic compounds (VOC) emissions after 1996.

Similarly, in section 188(c)(2), the Act requires areas designated serious for PM10 to attain the standard by 2001. Under section 188(e) of the Act, the South Coast Air Quality Management District and ARB have applied for a five-year extension of the attainment date

to 2006. U.S. EPA has not yet acted on this request. In addition, CAA section 189(b)(1)(A)(i) requires serious areas to demonstrate attainment of the federal PM10 standard by the applicable attainment date. In section 189(c)(1), the Act requires plan revisions to include quantitative milestones, to be achieved every three years, which demonstrate reasonable further progress toward attainment by the applicable date. Section 171(1) of the Act defines "reasonable further progress" as "annual incremental reductions in emissions...for the purposes of ensuring attainment of the applicable national ambient air quality standard by the applicable date."

The Act also recognizes that SIPs may need to be periodically revised to reflect more current information. As technical information and tools are updated and refined, SIPs must change to accommodate this new data. Section 110(a)(2)(H) specifically recognizes the need to revise SIPs "from time to time as may be necessary to take account of...the availability of improved or more expeditious methods of attaining" ambient air quality standards.

STAFF RECOMMENDATION

The staff recommends that the Board direct the Executive Officer to submit a SIP revision to U.S. EPA to withdraw measure M-7, Accelerated Retirement of Heavy-Duty Vehicles, from the approved 1994 Ozone SIP and the submitted South Coast 1997 AQMP Elements for Ozone and PM10. The staff further recommends that the Board direct the Executive Officer to submit measure M-17, Additional Emission Reductions From Heavy-Duty Vehicles to U.S. EPA as a revision to the 1994 Ozone SIP, and the submitted South Coast 1997 AQMP Elements for Ozone and PM10. To reflect the impact of these revisions between 1999 and 2006, the Board should also update the rate-of-progress demonstration for PM10 and the motor vehicle emission budgets for NOx. This action is consistent with Board Resolutions 94-60 and 94-61, as well as the federal Clean Air Act.

APPENDIX A
STATE IMPLEMENTATION PLAN MOBILE SOURCE "M" MEASURES
(with proposed revisions)

M-1: Accelerated Retirement of Light-Duty Vehicles
M-2: Improved Control Technology for Light-Duty Vehicles
M-3: Accelerated ULEV Requirement for Medium-Duty Vehicles
M-4: Heavy-Duty Diesel Vehicles: Early Introduction of 2.0 g/bhp-hr NOx Engines in Fleets Through Incentives
M-5: Heavy-Duty Diesel Vehicles: Additional NOx reductions in California
M-6: Heavy-Duty Diesel Vehicles: 2.0 g/bhp-hr NOx standard - National
~~M-7: Accelerated Retirement of Heavy-Duty Vehicles~~ [WITHDRAWN]
M-8: Heavy-Duty Gasoline Vehicles: Lower Emission Standards in California
M-9: Off-Road Diesel Equipment: 2.5 g/bhp-hr NOx Standard - California
M-10: Off-Road Diesel Equipment: 2.5 g/bhp-hr NOx Standard - National
M-11: Industrial Equipment: Gas and LPG - California
M-12: Industrial Equipment: Gas and LPG - National
M-13: Marine Vessels: National and International Standards
M-14: Locomotives: Nationwide Standards, New and Rebuilt
M-15: Aircraft: Nationwide Emission Standards
M-16: Pleasure Craft: Nationwide Emission Standards
M-17: Additional Emission Reductions From Heavy-Duty Vehicles [ADDED]

APPENDIX B
DESCRIPTION OF MEASURE M-17

M-17: Additional Emission Reductions From Heavy-Duty Vehicles

Under M-17, ARB commits to obtain additional emission reductions from on-road heavy-duty vehicles by pursuing a combination of expanded in-use compliance and additional market-based incentives for cleaner engines. We will adopt the program to implement measure M-17 by January 2004. We will begin implementing measure M-17 in 2005.

In-Use Compliance Programs

In-use emissions are a critical factor in motor vehicle emission control. However, in-use compliance programs for heavy-duty vehicles are not as comprehensive as those for passenger cars and light-duty trucks. We believe there are opportunities for significant NOx emission reductions by expanding the existing in-use compliance programs. Some of the options for evaluation include:

- **Incorporate NOx screening into the Heavy-Duty Vehicle Inspection and Periodic Smoke Inspection Programs (HDVIP and PSIP)** Currently, there is no regulatory requirement to test for or reduce NOx emissions in the HDVIP and PSIP. However, ARB is evaluating two ways of reducing NOx emissions while concurrently reducing smoke:

    1. Ensure that heavy-duty engines are set to manufacturer specifications, instead of being repaired just to pass the smoke opacity test. To accomplish this with the current HDVIP and PSIP, we are working with the trucking industry, engine manufacturers, and others to educate truck owners and operators, service technicians, and engine mechanics on the importance of setting heavy-duty engines to manufacturer specifications. Additionally, ARB could amend the HDVIP and PSIP regulations to require that engines be set to manufacturer specifications.

    2. Require NOx screening during HDVIP and PSIP testing. The current snap-acceleration test does not place the vehicle under load, which is necessary to test for NOx emissions. Thus, screening for NOx emissions will require the development of a new test method.

       ARB will undertake efforts to develop an accurate, reliable, field NOx screening test, including the necessary test equipment. The test may involve placing the vehicle under load, or, for future vehicles, reading the diagnostic

codes from the on-board diagnostic system. Repairing failing vehicles to manufacturer specifications will reduce NOx emissions.

- **In-use compliance testing and recall program:** A testing and recall program for heavy-duty vehicles, similar to that currently in place for passenger cars and light trucks, may be effective at reducing emissions from trucks which have poorly designed emission control systems. However, heavy-duty engines are currently certified on an engine dynamometer, independent of the vehicle, and it is impractical to perform in-use compliance testing as long as the engine must be removed from the vehicle. ARB is currently funding an effort to determine if chassis screening is feasible and, if so, a chassis screening test cycle will be developed. These efforts could be aided by the introduction of on-board diagnostic systems to new heavy-duty vehicle engines.

Market-Based Incentives

Market-based incentives to encourage the early introduction of lower-emitting heavy-duty engines are already part of the SIP. To meet the emission reduction commitment for measure M-17, we will supplement in-use compliance programs by pursuing financial incentives for advanced heavy-duty technologies capable of emissions below the 2004 national standards.

Emission Reductions
(Tons per day in the South Coast Air Basin)

Pollutant	1999	2002	2005	2006	2008	2010
ROG	0	0	1	1	1	1
NOx	0	0	4	8	9	10

Responsible Agency:
M-17: ARB