SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

Staff Report

Proposed Rule 1195 – Clean On-Road School Buses

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INTRODUCTION

The South Coast Air Quality Management District (AQMD) is proposing a series of rules under the title of Clean Fleets Program, to address the problem of air pollution. The program objective is to reduce exhaust emissions from on-road vehicles and consequently reduce the public's exposure to air toxic contaminants and criteria pollutants through the use of cleaner-burning vehicles in public fleets and private fleets performing public services. Six of the seven proposed standalone rules were adopted in the past year. Proposed Rule (PR) 1195 – Clean On-Road School Buses is the last of this first series of clean fleet vehicle rules to provide additional time to address the significant concerns raised regarding the limited financial budgets of public school districts to provide public education and student transportation. Because of this concern, the proposed rule would require public and private school bus operators to acquire alternative-fueled heavy-duty school buses, ultra–low-emission vehicles (ULEV) or cleaner medium-duty school buses, or retrofitted school buses based on the bus types and whether funding is available. In addition, the proposed rule covers the purchase of newly manufactured buses and pre-owned school buses.

A key element of the proposed rule is the recognition of the limited funds available to public school districts. As such, the proposed rule provides an option to purchase conventionally-fueled (diesel-powered) school buses equipped with an approved control device if there are no external funding available to help offset the additional costs associated with the purchase of alternative-fueled school buses or the development of the alternative-fuel infrastructure. Alternative-fuel buses are powered by alternative fuels such as compressed or liquefied natural gas (CNG/LNG), liquefied petroleum gas (LPG or propane), methanol, electricity, or fuel cells. A repowered school bus is an existing diesel-powered school bus that has been converted to run on an alternative fuel, alternative-fueled engine.

The proposed rule language is provided in Appendix A. PR1195 requirements would become effective immediately for purchases, leases or contracts made after adoption of this rule. The proposed rule does not mandate a schedule to replace existing school buses or a schedule to purchase school buses. It is operative at the time the school bus operator is replacing or adding school buses to the existing fleet or forming a new fleet.The requirements of PR1195 apply to school districts, private contractors, and private schools with 15 or more school buses. Implementation of PR1195 would result in emission reductions of up to 90 tons per year of oxides of nitrogen (NOx), up to 0.5 tons per year of hydrocarbons, and up to 6 tons per year of particulate matter (PM) by 2010. The emission reductions include medium-duty and heavy-duty school buses. For heavy-duty school buses, emission reductions are estimated to be up to 71 tons per year of oxides of nitrogen and up to 5.8 tons per year of particulate matter by 2010. These estimates are based on current emission standards set by CARB and assuming that a total of 3,356 heavy-duty diesel buses are replaced or retrofitted to operate on alternative fuels. A range of emissions benefits are provided since exemptions are provided in the proposed rule that recognize the need for external funding programs to purchase alternative-fueled school buses or to offset the cost of building an alternative-fuel infrastructure. If no external funding sources are available, then any new purchase of school buses would be conventionally-fueled and the emissions benefits

of the proposed rule would be less than the estimates provided in this staff report. Because of this exemption, the AQMD will continue to seek external funding for the purchase of rule-compliant school buses. In addition, if CARB-approved control devices are not available at the time the operator is purchasing school buses, but funding is available to equip school buses with such devices, the AQMD would encourage that the school buses be equipped with such devices.

Emission reductions of up to 18.9 tons per year of NOx, 0.28 tons per year of particulate matter and up to 0.53 tons per year of hydrocarbons (HC) result from replacing medium-duty diesel and gasoline buses with ULEV school buses by 2010. These estimates are based on current medium-duty ULEV chassis and engine certification standards, and assuming that a total of 4,085 medium-duty vehicles become rule compliant. A range in emissions benefits is provided because the external funding exemption provisions would also apply to the purchase of medium-duty alternative-fueled school buses. However, the exemption applies to the purchase of alternative-fueled medium-duty ULEV school buses only.

BACKGROUND

The AQMD is the local governmental agency primarily responsible for air quality assessment and improvement in the South Coast Air Basin, the Riverside County portion of the Salton Sea Air Basin, and portions of Riverside County that is in the Mojave Desert Air Basin. The South Coast Air Basin, which includes Orange County and the non-desert portions of Los Angeles, Riverside and San Bernardino Counties, is designated as an extreme nonattainment area for ozone and a serious nonattainment area for particulate matter (PM10 - particulate matter under 10 microns).

The Air Quality Management Plan (AQMP) shows that mobile sources emit significant amounts of both particulate matter and oxides of nitrogen (NOx). NOx is a precursor to ozone and PM10. In addition, recent epidemiological studies conducted by University of Southern California (USC) and University of California at Los Angeles (UCLA) health investigators, nitrogen oxides, acids, and particulate matter were found to be significant contributors to decreased lung growth in children.

In August 1998, the CARB identified particulate matter from diesel engine exhaust as a surrogate for all toxic air contaminant (TAC) emitted from the exhaust. The AQMD's Multiple Air Toxics Exposure Study II (MATES II) conducted locally identified mobile sources, particularly diesel exhaust, as the overwhelming contributor to local air toxic risk levels. Based on the results of the MATES II study, in March 2000 the AQMD Governing Board adopted the Air Toxic Control Plan (ATCP), which included an early action control measure known as the Clean Fleets program.

The development of the Clean Fleets program, including PR1195, is in large measure being driven by the results of these two very important research and regulatory efforts, which are summarized below.

MATES II

In March 2000, the AQMD Governing Board approved the release of the final report of the MATES II study. The objectives of this study were to monitor and evaluate urban air toxics, update the toxics emission inventories for the Basin, and conduct air toxic dispersion modeling to simulate the monitored data. During the course of the study, the CARB listed diesel particulate emissions as a toxic air contaminant. As such, the study provided an analysis of the potential air toxic impacts of diesel emissions. The study represented one of the most comprehensive air toxics programs ever conducted in an urban environment. The scope of the study included the monitoring of more than 30 toxic air pollutants at 24 sites over a one-year period ending in the spring of 1999. The AQMD collected more than 4,500 air samples, and together with CARB, performed more than 45,000 separate laboratory analyses of these samples.

The findings of this study indicated that the cancer risk from some air toxics in the Basin has declined by as much as 75 percent over the last decade. However, it also showed that based upon more extensive monitoring of the variety of toxic compounds in the air, the current potential cancer risk from toxic air pollution averages about 1,400 in a million in the region. As shown in Figure 1, the study found that about 71 percent of this cancer risk is attributable to diesel particulate. Other important toxic species contributing significantly to this cancer risk, originating from both gasoline- and diesel-powered mobile sources as well as stationary sources, are 1,3 butadiene (8 percent of risk), benzene (7 percent of risk), and carbonyls, which include formaldehyde and acetaldehyde (3 percent of risk).

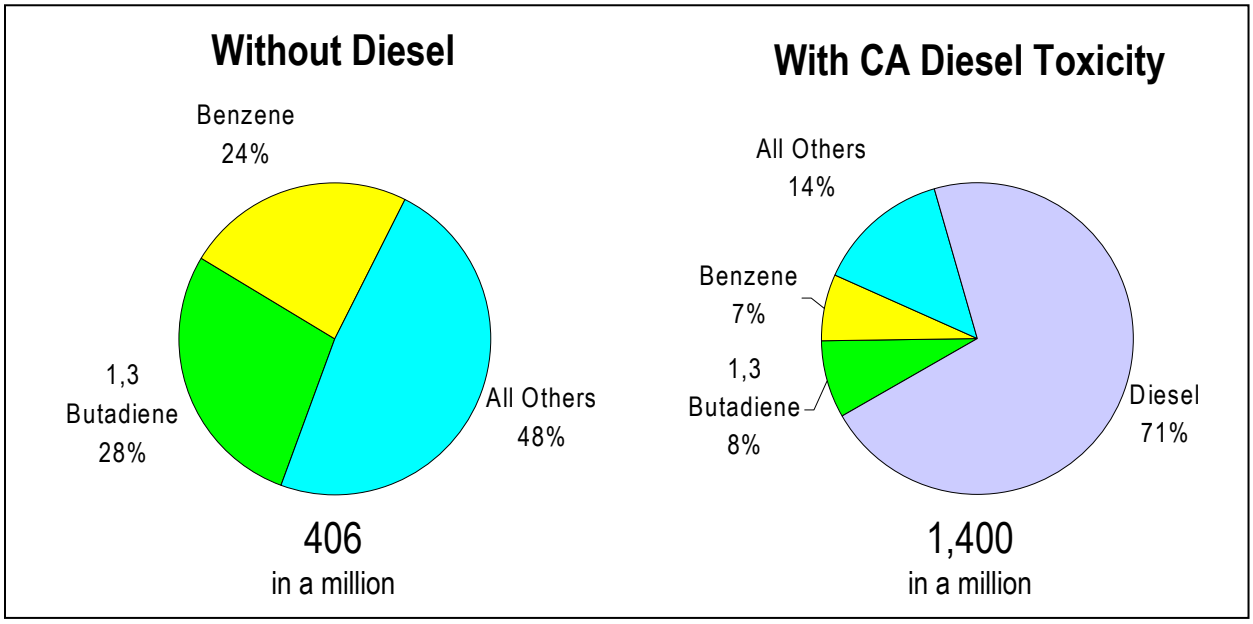


Figure 1
Estimated Average South Coast Air Basin Toxic Risk Contributions
based on findings from the MATES-II Study

CARB Identification of Diesel Emissions as a Toxic Air Contaminant

In the early 1980s, CARB established one of the nation's first comprehensive state air toxics programs — the California Air Toxics Program. Its goal is to protect public health by reducing toxic air emissions that pose the highest risk to residents. The program contains two parts: risk assessment and risk management. As part of the risk assessment, CARB identifies high risk substances called toxic air contaminants and provides methods for estimating potential cancer risks to these substances. As part of the risk management, CARB and local air pollution control districts investigate and adopt measures requiring air toxics sources to minimize risk to public health.

There are approximately 200 substances on the TAC list. More than 30 of these are found in diesel exhaust. On August 27, 1998, the TAC list was expanded to include diesel engine particulate matter exhaust (as a surrogate for all of the toxic air contaminants from diesel exhaust), culminating a near-decade long scientific investigation into the health effects of exposure to the fine particles and other pollutants in diesel exhaust.

GENERAL DESCRIPTION AND EXPLANATION OF RULE 1195 REQUIREMENTS

Applicability

The rule applies to school bus fleets operating in AQMD with 15 or more school buses, operated by public school districts, private schools, and by private entities who provide school transportation to public and private schools.

A school bus operator is a person who owns, leases, or operates school buses to provide home to school transportation services in the District. A school bus is any vehicle used for the express purpose of transporting students up to and including Grade 12 from home to school as defined in California Vehicle Code Section 545. There are different types of school buses in use in the District. For the purpose of this rule, a school bus can be a Type A, B, C, or D school bus. A Type A or B school bus is a medium-duty vehicle, which typically runs on either gasoline or diesel fuel. A Type A school bus is a conversion or body constructed upon a van-type or cutaway front-section vehicle with a left side driver's door with a gross vehicle weight rating (GVWR) of more than 10,000 pounds (Type A-I) or a GVWR less than 10,000 pounds (Type A-II). A Type B school bus is a conversion or body constructed upon a van or front-section vehicle chassis or stripped chassis, with a GVWR of more than 10,000 pounds. A Type C school bus is a heavy-duty vehicle with a front mounted engine and is capable of transporting 42 to 72 passengers. A Type D school bus is a heavy-duty vehicle and is capable of transporting 66 or more passengers.

Requirements

PR1195 proposes that upon adoption of the rule, the following requirements will apply topublic and private school bus operators when purchasing or leasing new or pre-owned medium-duty or heavy-duty school buses:

- For the purchase or lease of new heavy-duty school buses, public and private school bus operators are required to purchase or lease school buses that operate on alternative fuels. To acquire new medium-duty school buses the rule requires purchasing or leasing equivalent ULEV or cleaner school buses.

- For the purchase or lease of pre-owned heavy-duty school buses, public and private school bus operators are required to purchase or lease repowered school buses or alternative–fueled buses. The rule also requires purchasing LEV or cleaner gasoline-fueled school buses when acquiring used medium-duty school buses.

- For public and private fleets with between 15 to 50 school buses, the public fleet operator may begin compliance until July 1, 2002 if 25 percent of the existing school bus fleet is equipped with an approved control device by March 1, 2002 or until July 1, 2003 if 50 percent of the existing school bus fleet is equipped with an approved control device by January 1, 2003.

- A public school bus fleet operator or a private school that owns or operates school buses may purchase or lease diesel-powered school bus equipped with an approved control device if:

- sufficient funding is not available to offset the differential purchase cost of an alternative-fueled school bus compared to the cost of a new conventionally fueled school bus equipped with an approved control device, or
- prior to April 1, 2003, there is not sufficient funding of at least $13,000 or $8,000 from April 1, 2003 to January 1, 2004 per alternative-fueled school bus to build the alternative-fuel refueling infrastructure and to cover the cost of facility upgrades needed to maintain alternative-fueled school buses, or
- buses are needed for an unforeseen circumstance during the school year if an alternative-fueled school buses cannot be provided within one month lead time, or

The school bus fleet operator must purchase an intermediate diesel school bus as defined in the Statewide Lower-Emission School Bus Program (approved by CARB in December 2000) if funding is available for the purchase of such vehicle.

- Prior to January 1, 2004, private school bus fleet operators who provide school bus transportation services to public school districts or private schools may purchase diesel-powered school buses equipped with approved control devices if sufficient funds are not available to offset the differential cost of alternative-fueled school buses or to build the alternative-fuel infrastructure and:
  - The operator equips the new diesel school bus with approved control devices at the expense of the private school bus fleet operator; and
  - installs (at the operator's expense) on at least 15 percent of the diesel-powered school buses in the existing fleet with approved control devices on a yearly basis until the existing fleet consists of rule-compliant vehicles. The operator may apply for funding to help offset the cost to install such devices; or

- Public or private school bus fleet operators may purchase diesel-powered school buses equipped with approved control devices if:
  - an alternative-fuel refueling station for alternative-fueled school buses is not available within five miles of the vehicle storage or maintenance yards and the operator did not receive at least $13,000 per alternative-fueled school bus for infrastructure development. (This option is available prior to January 1, 2003 to public and private school bus fleet operator); or
  - no alternative fuel engine/chassis/body configuration is commercially available or could be used on a specific fixed bus route, or
  - for field trips out of the District and at the time the remainder of the fleet becomes rule compliant, up to 10 percent of the school bus fleet may be diesel-powered for school bus fleets with 100 or more school buses. For school bus fleets with 51 to 100 school buses, up to 10 school buses can be diesel-powered. For school bus fleets with 15 to 50 school buses, up to five school buses can be diesel-powered, or
  - there are contract agreements for the purchase or lease of school buses signed prior to the adoption of the rule. This exemption does not apply to unsigned options to purchase or lease school buses, or

- buses are acquired as part of a business merger.

- To accelerate replacement of the oldest buses in the fleet, an operator may purchase used diesel-powered school buses that are less than six years old if the operator scraps or renders permanently inoperable, the oldest school buses in the fleet. The number of buses to be scrapped is commensurate with the number of buses purchased.

LEGISLATIVE AUTHORITY

This proposal is based on Health and Safety Code Sections 40447.5, 40919, and 39037.05. Health and Safety Code Section 40447.5 allows the AQMD to require operators of public and commercial fleets, consisting of 15 or more vehicles, to purchase vehicles powered by methanol or other equivalently clean burning alternative fuels, when adding or replacing vehicle(s) to their fleet. For the purposes of this proposed rule, the AQMD is using its authority pursuant to Health and Safety Code Section 40447.5 to require new purchases of Type B, C, and D school buses weighing more than 14,000 pounds gross vehicle weight to be powered by alternative fuels or gasoline, based on the comparable clean burning characteristics of these fuels relative to methanol. With regard to the provision in the proposed rule that requires new purchases of Type A and B school buses weighing less than 14,000 pounds gross vehicle weight to be CARB certified ULEV or cleaner or corresponding used school bus purchases to be CARB certified LEV or cleaner, the AQMD is relying on Health and Safety Code Section 40919. This section of the Health and Safety Code allows certain nonattainment air districts (those that are designated serious or above for ozone) to adopt measure requiring fleets to use a significant number of low-emission vehicles. A "low-emission vehicle" is defined in Health and Safety Code Section 39037.05 as including a hydrocarbon standard requirement that is twice as stringent as otherwise allowed. CARB certified ULEV vehicles are approximately equal to this standard while CARB certified LEV vehicles meet a less stringent standard, but are being allowed for used school bus purchases due to the unavailability of used ULEV certified school buses

ENGINE AND VEHICLE MODEL AVAILABILITY

Alternative-fuel engines used to power school buses are commercially available. Some of the school districts in the District such as Alta Loma, Desert Sands, Los Angeles, Montebello, and Torrance Unified School Districts, are running alternative-fueled school buses. Several major school bus manufacturers produce school buses that are powered by alternative fuels. A list of school bus manufacturers with available alternative fuel engines is included in Appendix D. In addition, there are several manufacturers that have model year 2001 medium-duty engines certified to ULEV emission standards that are applicable to medium-duty school buses. Appendix D provides a list of some of the medium-duty school buses that would be considered rule compliant. Appendix D is provided for informational purposes and does not reflect all of the engines/school buses that are rule compliant since CARB certifies engines on an on-going basis.

CNG-POWERED HEAVY-DUTY VEHICLES AND FUEL AVAILABILITY

There are many alternative-fuel heavy-duty engine models available today that would comply with PR 1195 provisions. The newest generation natural gas engines have shown fuel efficiency to be almost the same as diesel engines when compared to earlier models.

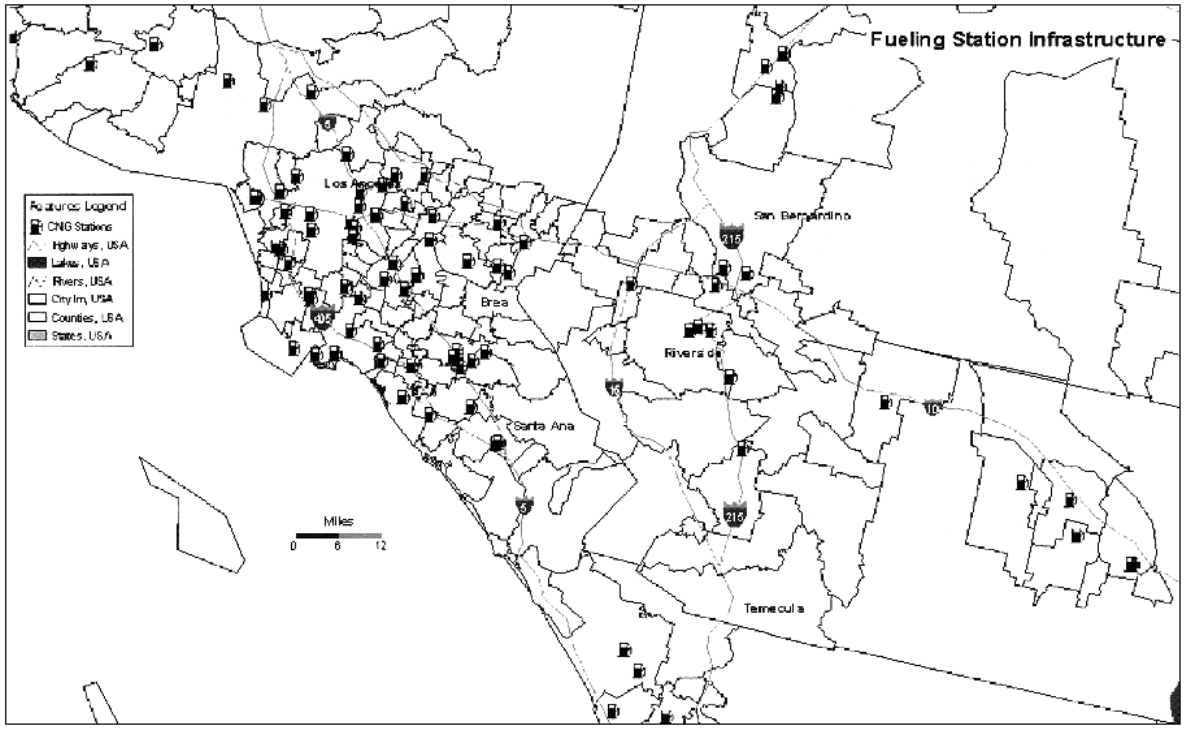
Compressed natural gas (CNG) is available at many stations throughout the AQMD's jurisdiction. Some agencies have dedicated CNG fueling stations and over 40 publicly available CNG stations are currently listed at www.cleancarmaps.com. (The web site www.cleancarmaps.com gives locations and status of a variety of alternative-fuel fueling stations, including driving directions to the nearest stations.) Alternative-fuel providers have indicated that they will be installing additional fueling stations in the near future. Also, alternative-fuel provider companies currently offer capital lease packages where the provider installs and maintains fueling stations and the end user pays a small premium on the fuel price to pay for the station and accompanying maintenance costs. Funding is available for construction of alternative-fueling stations (see Funding section).

Currently there are an estimated 100 alternative-fuel refueling facilities operating in the South Coast Air Basin. These totals are characterized by fuel and type of access in Table 1. In addition, Figure 2 shows the location of current CNG fueling stations in the Basin.

Table 1
Estimated Number of Refueling /Recharging Stations in the SCAQMD

Fuel Type	Number of Stations	Type of Access
Compressed Natural Gas (CNG)	37	Public; no restrictions
CNG	3	Public; limited times
CNG	46	Government personnel only**
CNG	11	Private; no public access
Total CNG Stations	**97**	
Liquefied Natural Gas (LNG)	2*	Business access by contract

* 5 stations are planned to function in near future
** School districts may be able to access these stations



Source: The Gas Company

Figure 2
Map of CNG Fueling Sites in the South Coast Air Basin

Compressed Natural Gas (CNG)

The types of CNG fueling systems currently in use in the SCAQMD are described as follows: vehicle refueling appliance, slow-fill, fast-fill, portable compressor station, and tube trailers. Natural gas is widely used and domestically produced. But the capital cost of a CNG refueling station varies widely, depending on the size and type of the fleet served and the fuel throughput required, as well as site preparation, and equipment and installation costs. For school bus application, it is anticipated that slow-fill systems will meet the needs of most school districts, however, for some larger school districts access to fast-fill systems may be necessary. AQMD staff is currently collecting further data on other CNG refueling stations of various capacities and design capabilities.

Liquefied Natural Gas (LNG)

There are at least two LNG refueling stations in the SCAQMD. A typical cost for a refueling station with a 13,000 to 15,000 gallon tank is approximately $500,000.

SCHOOL BUS FLEET BASELINE UNIVERSE

The AQMD conducted a comprehensive survey to identify the number of school buses operating in the District. There are 129 school districts in the four counties of Los Angeles, Orange, San Bernardino, and Riverside, 84 of which own and operate either their entire or part of their fleet. Twelve private school transportation contractors supply buses to the remaining schools. From all the schools and contractors surveyed, three school districts and three contractors did not respond which represent a very small percentage of the entire fleet

(the total number of buses owned by them does not exceed 100 to 150 buses). The survey shows that the total number of all school buses used in all four counties by the school districts and private contractors are 3,953 and 4,906, respectively. The survey also shows that the number of school buses used by public school districts and private contractors with 15 or more buses are 3,791 and 4,891, respectively. Private schools were not surveyed as part of the analysis. However, based on California Highway Patrol information there are about 600 school buses owned and operated partially or entirely by private schools in California and seven private schools own more than 15 school buses at this time. Appendix B includes a summarized vehicle population profile of school buses potentially affected by the proposed rule. An estimated 8,520 diesel school buses operate in the Basin. (About 3,416 diesel buses are operated by school districts, 258 diesel buses operated by private schools, and 4,846 diesel buses are operated by the contractors). The distribution of the school buses by fuel type is summarized below.

The rule applies to school bus operators with 15 or more school buses. As such, the following analyses include information regarding school buses affected by this rule. Table 2 provides the number of school buses operated by school districts, private schools, and private contractors. An estimated 8,192 diesel powered school buses are operated by school districts, private schools, and contractors with 15 or more buses. The number of diesel powered school buses operated by the school districts, private schools, and contractors are 3,288, 60, and 4,844, respectively. These buses can be grouped into two different types based on passenger capacity. School buses with greater than 41 passenger capacity (Type C and D), and less than or equal 41 passenger capacity Types (A and B).

Table 2
Estimated Number of School Buses By Fuel Type

	Diesel	Gasoline	Methanol	CNG	Propane	Electric	Total
School Districts	3,288	386	3	111	0	3	3,791
Private Schools	60	52	0	1	0	0	113
Contractors	4,844	45	0	2	0	0	4,891
Total	8,192	483	3	114	0	3	8,795

Analysis was conducted on distribution of the buses based on amount of miles traveled and the type. The summary of the analysis is shown in Tables B-1 through B-6 in Appendix B and listed as follows:

- From the 8,192 diesel school buses operated by school districts, private schools, and contractors, 85% of the buses (6,915 buses) traveled 10,000 to 20,000 miles annually. The distributions of these buses based on their types are 55% combination of Types C and D, and 45% combination of Types A and B.

- Of the 3,288 diesel school buses operated by school districts, 73% of the buses (2,333) travel 10,000 to 20,000 miles annually. The distributions of diesel buses operated by the school districts buses based on their types are 70% combination of Types C and D, and 30% combination of Types A and B. The annual average mile traveled for these buses is estimated to be 13,798 miles per year. This is based on averaging the annual mileage of all diesel buses operated by school districts excluding the ones with no reported miles (of 3,288 buses, 2,922 buses reported their annual mileage).
- Of the 4,844 diesel school buses operated by the private contractors, 94% of the buses (4,582) travel 10,000 to 20,000 miles annually. The distributions of diesel buses operated by the contractors based on their types are 45% combination of Types C and D, and 55% combination of Types A and B. The annual average mile traveled for these buses is estimated to be 17,034 miles per year. This is based on averaging the annual mileage of all diesel buses operated by the contractors excluding the ones with no reported miles (of 4,844 buses, 4,859 buses reported their annual mileage).
- Six private schools own more than 15 buses. Of the 60 buses operated by private schools, 115 buses are diesel-powered, 63 buses are gasoline-powered, and 1 bus is CNG powered. The distributions of diesel and gasoline buses operated by private schools based on their types are 35% combination of Types C and D, and 65% combination of Types A and B. No annual mileage was reported for these buses.
- Based on information obtained from several school bus vendors, the average fuel consumption for Types D, C, and A were estimated to be 5.75, 7.25, and 9.5 miles per gallon. The annual average fuel consumption for a school bus was estimated by multiplying the percent distribution of bus type by average fuel consumption for each type of bus. Therefore, the annual average fuel consumption for a diesel school bus operated by the school districts and private schools, and contractors was estimated to be 7.42 miles per gallon and 8.14 miles per gallon respectively.

The distribution of gasoline and diesel school buses by types are provided in Table 3 and 4.

Table 3
Estimated Diesel Bus Distribution
by Types, Average Mile and Fuel Usage

	Average Annual Mile Traveled	Ave. Fuel Usage (miles/gal)	Total Number of Buses	Number of Buses Based on Different Types	
				Type C+D	Type A+B
School Districts & Private Schools	13,798	7.42	3,348	2,335	1,013
Contractors	17,034	8.14	4,844	2,188	2,656
		Total:	8,192	4,523	3,669

Table 4
Estimated Gasoline Bus Distribution
by Types, Average Mile and Fuel Usage

	Average Annual Mile Traveled	Ave. Fuel Usage (miles/gal)	Total Number of Buses	Number of Buses Based on Different Types	
				Type C+D	Type A+B
School Districts & Private Schools	11,395	7.0	438	60	378
Contractors	14,994	7.0	45	7	38
		Total:	483	67	416

EMISSION BENEFITS

Criteria Pollutants

Emissions of NOx and PM from diesel powered and alternative-fueled for Types C and D school buses were estimated based on the CARB emission standards for heavy-duty engines and urban transit buses, respectively. The emissions are summarized in Tables C-1A and C-1B of Appendix C. In addition, NOx and HC emissions from medium-duty gasoline and diesel powered engines are summarized in Tables C-4A, C-4B, C-5A, and C-5B of Appendix C.

The following formula and assumptions are utilized in calculating the emission reductions resulted from implementation of the proposed rule. The methodology is based on the new purchase requirement provision, paragraph (d)(1) of the proposed rule.

1. *Emission reduction from conversion of Types C and D diesel school buses to alternative-fueled buses:*

Based on the annual fleet turnover of about 117 diesel-powered school buses for school districts and private schools, and 219 for private contractors, the annual emission reductions for a total of 3,359 school buses are estimated to be 71 tons per year of NOx and 5.8 tons per year of PM by 2010. Table 5 shows the emission reductions on a yearly basis for the years 2001 through 2011. Detailed analysis is included in Tables C-2A and C-2B of Appendix C.

Table 5
Proposed Rule 1195 Emission Reduction Estimates
Alternative-Fuel School Bus Purchased Requirements (tons/yr)
(heavy-duty engines)

	NOx		PM	
Year	Yearly	Cumulative	Yearly	Cumulative
2001	21	21	1	1
2002	18	39	1	2
2003	8	47	1	3
2004	8	55	1	4
2005	8	63	1	5
2006	0	71	1	6
2007	0	71	0	6
2008	0	71	0	6
2009	0	71	0	6
2010	0	71	0	6

The methodologies and assumptions used to estimate the above reductions are as follows:

Annual ER = (Number of school buses) * (Annual Fuel Consumption) *
(18.5 bhp-hr/gal) * (Mandatory Std – Optional std) / Useful life

Emission reductions are estimated using the emission reduction methodology used in the Carl Moyer program, which is based on fuel usage. For school buses operated by school districts and private schools, the fuel usage was estimated based on the assumption of 13,798 miles per year as the average vehicle miles traveled and 7.42 miles per gallon as

the average vehicle fuel consumption. As such, the average annual fuel consumption was calculated to be 1,860 gallons. For school buses operated by private contractors, the average annual fuel consumption was calculated to be 2,093 gallons using 17,034 miles per year as the average vehicle miles traveled and 8.14 miles per gallon as the average vehicle fuel consumption. A useful life of 20 years and 10 years were assumed for the buses operated by school districts and private schools, and private contractors, respectively. The total number of Types C and D diesel buses used by school districts, private schools, and private contractors are 2,297, 39, and 2,188, respectively. The following NOx and PM emission standards are used for alternative-fuel and diesel powered school buses:

Alternative-fuel school buses:

NOx:

Timeframe	Rate	Explanation
2001 - 9/2002	2.5 g/bhp-hr	Based on optional certification standards verified by ARB staff input.
10/2002 - 2007	1.4 g/bhp-hr	Based on discussions and concurrence with ARB technical staff regarding the appropriate nominal NOx emission level that corresponds with the expected certification level of 1.8 g/bhp-hr NMHC+NOx for alternative-fuel heavy-duty engines in this time frame.
2007 – 2010	1.1 g/bhp-hr	Based on recent U.S. EPA adopted emission standards

PM:

Timeframe	Rate	Explanation
2001 - 2007	0.03 g/bhp-hr	Based on ARB input and certification data for HDEs.
2007 – 2011	0.01 g/bhp-hr	

Diesel powered school buses:

NOx:

Timeframe	Rate	Explanation
2001 - 9/2002	4.0 g/bhp-hr	Mandatory ARB/U.S. EPA Emission Std.
10/2002 - 2010	2.0 g/bhp-hr	Nominal NOx emission level assumed by ARB as the NOx portion of the mandatory 2.5 g/bhp-hr

		NMHC+NOx emission standard, based on ARB staff input.
2007 – 2010	1.1 g/bhp-hr	Based on recent U.S. EPA adopted emission standards

PM:

Timeframe	Rate	Explanation
2001 - 2007	0.1 g/bhp-hr	Current standards for diesel HDEs
2007 – 2011	0.01 g/bhp-hr	

2. *Emission reduction from conversion of Types A and B diesel and gasoline school buses to ULEV:*

Based on the annual fleet turnover of about 139 buses for school districts and private schools, and 270 for private contractors, the annual emission reductions for total of 4,085 turned over fleets are estimated to be 19 tons per year of NOx and 0.32 tons per year of HC by 2010. Table 6 shows the emission reductions on a yearly basis for the years 2001 through 2010. Detailed analysis is included in Tables C-4A, C-4B, C-5A, and C-5B of Appendix C.

Table 6
Proposed Rule 1195 Emission Reduction Estimates
ULEV Purchase Requirements (tons/yr)
(medium-duty engine)

	NOx		HC		PM	
Year	Yearly	Cumulative	Yearly	Cumulative	Yearly	Cumulative
2001	11	11	0.09	0.09	0.05	0.05
2002	4	15	0.08	0.16	0.04	0.09
2003	4	19	0.06	0.23	0.03	0.12
2004	0	19	0.04	0.27	0.02	0.14
2005	0	19	0.04	0.31	0.02	0.16
2006	0	19	0.04	0.36	0.02	0.19
2007	0	19	0.04	0.40	0.02	0.21
2008	0	19	0.04	0.44	0.02	0.23
2009	0	19	0.04	0.49	0.02	0.25
2010	0	19	0.04	0.53	0.02	0.28

The methodologies and assumptions used to estimate the above reductions are as follows:

Annual ER = [(Number of chassis certified school buses / Useful life) * (Mandatory Std for chassis certified - ULEV Std for chassis certified) + (Number of engine certified school buses / Useful life) * (Mandatory Std for engine certified school buses – ULEV Std for chassis certified)* 2.5 conversion factor] * (Average annual miles traveled)

There are about 4,085 medium-duty (Type A or B) diesel- and gasoline-powered school buses operated by school districts, private schools, and contractors with 15 or more buses; of which, 3,669 buses are diesel-powered and 416 buses are gasoline-powered. The medium-duty diesel or gasoline powered school buses are either chassis certified or engine certified. Based on AQMD staff analysis, of the 3,669 diesel-powered buses, 880 buses are estimated to be chassis certified and of the 416 gasoline-powered school buses, 180 buses are estimated to be chassis certified. The details of this analysis are included in Appendix B and are summarized in Table 7.

Table 7
Type A and B Gasoline/diesel powered School Bus Distribution by Certified Chassis/Engine

	Diesel Powered School Buses		Gasoline Powered School Buses	
	Chassis Certified	Engine Certified	Chassis Certified	Engine Certified
School Districts	189	803	159	171
Private Schools	13	12	9	39
Contractors	678	1974	12	26
Total:	880	2,789	180	236

It is assumed that school buses with chassis certified consist of 33% MDV3, 33% MDV4, and 33% MDV5. The chassis certified phase-in percentage for model year 2001 is assumed to be 80% LEV and 20% ULEV, for model year 2002 is 70% LEV and 30% ULEV, for model year 2003 is 60% LEV and 40% ULEV, and for model year 2004 and after is 40% LEV and 60% ULEV (as required in the CARB LEV program). The emission standards for engine certified school buses are based on CARB's standards for different model year engine certified buses. These standards are 100% Tier 1 for model year 2001, 100% LEV for model years 2002 and 2003, and 100% ULEV for 2004 and after. A useful life of 10 years is assumed for the buses operated by both school districts and private contractors. The emission benefits quantification for medium-duty vehicles incorporate a 40 percent reduction factor as part of the calculation methodology. This factor addresses the statewide "emission credit" that the vehicle/engine manufacturer would receive through CARB's LEV program and use of approximately 40 percent of this credit in the Basin. The 40 percent value is used

since it represents the approximate market share of vehicle/engine sales in the Basin compared to the entire state of California.

The total yearly emission reductions from conversion of Types C and D diesel school buses to alternative fuel and from conversion of Types A and B diesel/gasoline school buses to ULEV are shown in Table 8 for the year 2001 through 2010.

Table 8
Total Emission Reduction of the Proposed Rule (tons/yr)
(heavy-duty and medium-duty engines)

	NOx		PM		HC	
Year	Yearly	Cumulative	Yearly	Cumulative	Yearly	Cumulative
2001	32	32	1	1	0.09	0.09
2002	22	54	1	2	0.08	0.17
2003	12	66	1	3	0.06	0.23
2004	8	74	1	4	0.04	0.27
2005	8	82	1	5	0.04	0.31
2006	8	90	1	6	0.04	0.35
2007	0	90	1	6	0.04	0.39
2008	0	90	1	6	0.04	0.43
2009	0	90	1	6	0.04	0.47
2010	0	90	1	6	0.04	0.51

Air Toxics

Estimated Relative Toxicity of Diesel, Gasoline, and Natural Gas Powered Heavy-Duty Vehicles.

The relative air toxic risks of diesel, gasoline, and corresponding natural gas heavy-duty vehicles were estimated using an approach based on determining risk-weighted emission factors for the two fuels under consideration. The risk-weighted emission factor is determined by multiplying the individual toxic constituents of the exhaust by their respective cancer potency factor, and then proportionately adjusting these values by an estimated annual mass emission rate of particulate matter (PM) and non-methane hydrocarbon emissions (NMHC). The purpose of this analysis is to use these risk-weighted emission factors to estimate the number of natural gas powered heavy duty vehicles roughly equivalent to one diesel powered heavy-duty vehicle based on toxic risk.

For the purposes of this analysis, the toxic component analyzed for diesel powered heavy-duty vehicles is limited to total PM emissions. This is because CARB has indicated that the toxic risk factor for diesel PM already incorporates toxic risks from all other constituents in diesel exhaust. For gasoline and natural gas heavy-duty vehicles, the relative toxic risk was

estimated based on the PM contribution of nickel and hexavalent chromium emissions, and the NMHC emissions of formaldehyde, acetaldehyde, benzene, and 1,3 butadiene. CARB speciation profiles were used to develop nickel and hexavalent fraction of the gasoline and natural gas PM exhaust. Hydrocarbon speciation profiles from ARB are used for gasoline engines. With regard to NMHC components of CNG vehicles, a paper from West Virginia University (SAE paper 972971) was used to develop the benzene and 1,3 butadiene NMHC fractions, and an CARB speciation profile from an industrial natural gas-powered internal combustion engine was used to develop the formaldehyde and acetaldehyde NMHC fractions. (The West Virginia University paper provided speciation data generated from a CNG-powered engine used in on-road vehicle applications, but did not specifically include formaldehyde and acetaldehyde data.)

For the purposes of this specific analysis, the annual PM emission rates for diesel and natural gas powered heavy-duty vehicles were developed using similar assumptions contained in the criteria pollutant benefit methodology. These assumptions include diesel heavy-duty vehicle PM emissions of 0.1 g/bhp-hr for 2000 and subsequent years, and natural gas heavy-duty vehicle PM emissions of 0.03 g/bhp-hr for 2000 and beyond. The annual mass emission rate of NMHC emissions for natural gas engines is highly variable based on input received by engine manufacturers, as evidenced by CARB certification data for natural gas engine families approved for sale in California. For the purposes of this analysis, a range of NMHC emissions was estimated using this certification data. Using this range, which corresponds to 0.3 g/bhp-hr to 0.8 g/bhp-hr, for the 2000-to-9/2002 time period and 0.3 to 0.5 g/bhp-hr for the 10/2002-and-later time period, assumed conversion factor of 2.5 bhp-hr/mi for heavy-duty vehicles, and an assumed annual mileage accumulation of 13,798 miles per year for diesel-powered buses operated by school districts and 17,034 miles per year for buses operated by the contractors, annual NMHC emissions were determined. For heavy-duty gasoline engines, a 1.4 multiplying factor is used to convert the total hydrocarbon emissions in units of g/bhp-hr to gm/mile. On average, heavy-duty gasoline engine hydrocarbon emissions is approximately 0.3 g/bhp-hr and PM emissions are approximately 0.036 g/bhp-hr.

Tables 9 and 10 show the annual PM and NMHC mass emission rates, risk-weighted emission factors for PM and NMHC exhaust components, and the overall risk-weighted emission factor based on estimated average annual mileage used by a school district and a private contractor, respectively. Since the estimated risk-weighted emission factor for heavy-duty gasoline engines is within the range for the CNG heavy-duty engines, a comparison between diesel and CNG engines was made. Based on these overall risk-weighted emission factors, Tables 9 and 10 show the number of CNG heavy-duty vehicles that is roughly equivalent to one corresponding diesel-powered heavy-duty vehicle based on assumptions used for school district versus contractors. The number is equal to the overall risk-weighted emission factor for the diesel powered heavy-duty vehicle divided by the corresponding value for the natural gas powered heavy-duty vehicle. Different timeframes are utilized in this analysis to account for more stringent NMHC emission standards that are implemented in the overall timeframe being analyzed.

Based on this analysis, significant toxic emission benefits will occur on a per vehicle basis from the use of a natural gas powered or gasoline powered heavy-duty vehicle versus a diesel

powered heavy-duty vehicle. Depending on the timeframe, one diesel powered heavy-duty vehicle is estimated to have the same toxicity as at least 56 up to 81 for school districts or 63 for private contractors corresponding natural gas powered heavy-duty vehicles based on different assumptions used for school districts and contractors, as shown in Tables 9 and 10. Depending on the availability of particulate traps that are still under development by control device and engine manufacturers, this ratio may be expected to decrease.

Table 9
(A) Estimated Relative Toxicity-Weighted Emissions
(School Districts)

POLLUTANT	COMPOUND	10/2002 & LATER		
		DIESEL	CNG	Gasoline
PM (lb/yr)		7.6	2.28	1.5
NMHC (lb/yr)		----	23-38	12.8
Resultant Toxicity-weighted Emission Factors				
	DIESEL PM[1]	22.8	-----	-----
	METALS[2]	----	0.08	0.05
	NMHC[3]	----	0.20-0.32	0.24
OVERALL RISK-WEIGHTED EMISSIONS		22.8	0.28-0.40	0.29

1. Based on ARB input, the unit risk factor associated with diesel PM includes toxic risk contributions for all other compounds in exhaust.
2. Toxic risk for PM exhaust in CNG vehicles based on nickel and hexavalent chromium (Cr^{+6}).
3. Toxic compounds in NMHC exhaust emissions for CNG vehicles included in this analysis are formaldehyde, acetaldehyde, benzene, and 1,3 butadiene.

(B) Estimated Vehicle Risk-Weighted Emissions Ratio[1]
(School Districts)

TIME PERIOD	RISK-WEIGHTED RATIO	
	MINIMUM	MAXIMUM
10/2002 and later	57	81

1. Number of CNG vehicles equal to one equivalent diesel vehicle based on toxic risk.

Table 10
(A) Estimated Relative Toxicity-Weighted Emissions
(Contractors)

POLLUTANT	COMPOUND	10/2002 & LATER		
		DIESEL	CNG	Gasoline
PM (lb/yr)		9.4	2.81	1.9
NMHC (lb/yr)		----	28-47	15.8
Resultant Toxicity-weighted Emission Factors				
	DIESEL PM[1]	28.2	-----	-----
	METALS[2]	----	0.10	0.07
	NMHC[3]	----	0.35-0.40	0.29
OVERALL RISK-WEIGHTED EMISSIONS		28.2	0.45-0.50	0.36

4. Based on ARB input, the unit risk factor associated with diesel PM includes toxic risk contributions for all other compounds in exhaust.

5. Toxic risk for PM exhaust in CNG vehicles based on nickel and hexavalent chromium (Cr^{+6}).

6. Toxic compounds in NMHC exhaust emissions for CNG vehicles included in this analysis are formaldehyde, acetaldehyde, benzene, and 1,3 butadiene.

(B) Estimated Vehicle Risk-Weighted Emissions Ratio[1] (Contractors)

TIME PERIOD	RISK-WEIGHTED RATIO	
	MINIMUM	MAXIMUM
10/2002 and later	56	63

2. Number of CNG vehicles equal to one equivalent diesel vehicle based on toxic risk.

COST ANALYSIS

Cost Impacts and Cost-Effectiveness

The proposed rule will affect medium- and heavy-duty school buses transporting students between home and schools. Various school districts and contractors providing such services to school districts own these school buses. Only those entities with at least 15 school buses will be subject to the proposed rule. It is assumed that the proposed requirement for replacing or leasing medium-duty school buses will not result in additional costs to the affected facilities since operators can purchase ULEV gasoline school buses. However, it is projected that the annualized cost of the proposed requirements for replacing or leasing

heavy-duty buses is $13 million.[1] The annualized costs for the affected public school districts and private school districts plus contractors are $4.5 and $8.6 million, respectively. Cost effectiveness of PR 1195 is estimated to be $122,523 per ton of combined pollutants of hydrocarbon, NOx, and PM reduced assuming that no funding is available to offset the costs to comply with the proposed rule.

It is assumed that various incentive programs will pay for the entire cost to public school districts ($4.5 million). Specifically, the Statewide Lower-Emission School Bus Program provides 75 percent of the total cost of a new alternative-fueled or cleaner diesel school bus. School districts would be required to provide up to 25 percent of the cost of the school bus or up to a maximum of $25,000. In addition, the School Bus Program is providing up to 10 percent set-aside per bus for the development of the alternative-fuel refueling infrastructure. The savings (which can be up to $75,000 per bus) incurred from the School Bus Program can be used towards facility upgrades and infrastructure development. Therefore, no shortfall is expected for the public school districts.

Currently, funding is available to pay for part of the cost that will be incurred by private school districts and contractors. The funding includes $2.5 million from the Carl Moyer program for the capital expenditure of alternative fuel buses, a one-time $1 million from CEC for the capital expenditure of infrastructure, and an annual $1 million from the MSRC/AB 2766. The shortfall for private school districts and contractors is estimated to be $4.9 million. Cost effectiveness of PR 1195 becomes $46,088 when funding is considered.

Incremental Cost-Effectiveness Analysis

Health and Safety Code Section 40920.6 requires an assessment of incremental cost effectiveness for proposed regulations relative to ozone, CO, SOx, NOx, and their precursors. Incremental cost effectiveness is defined as the difference in control costs divided by the difference in emission reductions between two potential control options that can achieve the same emission reduction goal of a regulation.

A more stringent control option to the proposed rule is also to require those public school districts having at least 15 vehicles (not limited to school buses) to purchase or lease alternative fuel buses when existing buses are due for replacement. This will affect an additional 622 school buses compared to the proposed rule. Incremental cost effectiveness of the more stringent option is $649,414 per ton of combined pollutants of hydrocarbon, NOx, and PM, assuming no funding is available.

Funding Programs

There are various funding programs available to assist the school bus operator in acquisition and operation of an alternative fuel school bus as described below:

[1]The cost assessment includes additional costs of replacing or leasing buses, constructing refueling stations, and modifying repair facilities. Operating and maintenance costs are also considered, when appropriate.

California Lower-Emission School Bus Program: This year the Governor included $50 million dollars in the state budget for the Lower-Emission School Bus Program. The primary goal of the program is to reduce the exposure of school children to both cancer causing and smog-forming pollution. The focus is on reduction of particulate matter (PM) emissions through replacement and retrofit of high polluting, older school buses. The program has two components, the older school bus replacement and infrastructure program, and the in-use school bus PM retrofit program. The School Bus Program proposed guidelines sets aside $25 million to be spent on alternative school bus replacement and infrastructure projects, 12.5 million on intermediatediesel school bus replacement, and $12.5 million on PM retrofit projects. The AQMD's allocation is $16.6 million for the school bus replacement ($11.1 million for alternative fuel school buses and $5.5 million for intermediate diesel school buses) and infrastructure projects and $5.5 million for the retrofit program. Funding for the new bus and infrastructure portion of the program is allocated to the CEC in the school bus program guidelines. CEC will pass through the local funding allocation to be administered by the AQMD. In addition to the state funds, the AQMD is providing an additional $1.66 million matching funds. As of April 3, 2001, the program is oversubscribed for purchases of alternative-fueled and intermediate diesel school buses.

Carl Moyer Memorial Air Quality Standards Attainment Program: The Carl Moyer Program was established by ARB in 1998 to provide incentives to encourage implementation of the cleanest commercially available heavy-duty engines, as a way to assist California to meet its air quality obligations under the State Implementation Plan (SIP). The incentives are grants for offsetting the higher costs of primarily alternative-fuel engines, and for supporting the fueling infrastructure. The CARB establishes overall program requirements and allocates funds to local air districts, for local program administration.

Primarily intended to reduce emissions from vehicles and equipment traditionally powered by heavy-duty diesel engines, the current program funds the incremental cost of cleaner heavy-duty vehicles and equipment from the following categories: on-road motor vehicles over 14,000 pounds GVW rating; off-road equipment over 50 horsepower; marine vessels; locomotives; stationary agricultural pump engines; forklifts; and airport ground support equipment. The program is not intended to fund engine research and development, certification testing, training, or operational controls.

The first two years of the Carl Moyer Program have been funded on a year-by-year basis. Assembly Bill 1571 (Villaraigosa, Brulte) codified the program criteria and created the Carl Moyer Program Advisory Board. The adopted legislation specifically prohibits the use of the Carl Moyer Program funds to meet regulatory mandates. However, CARB has stated that engines that meet CARB's optional low emission standards would be eligible for Carl Moyer funds. The Advisory Board is responsible for recommending a source and amount of continued funding for the program. The Advisory Board has recommended annual funding of $100 million through the year 2010.

The statewide FY 1998-99 appropriation for the Carl Moyer Program totaled $25 million. CARB allocated $11.3 million to the AQMD in April 1999. Governor Davis and the Legislature placed $19 million in CARB's FY 1999-2000 budget to continue this incentive program for low-emission heavy-duty vehicles and $2 million in the California Energy

Commission's (CEC) budget to support fueling infrastructure specific to the Carl Moyer program. The AQMD received $8.55 million from CARB and $900,000 from CEC, for a total of $9.45 million for the current fiscal year. For Fiscal Year 2000-2001, an estimated $20 million would be available under the Carl Moyer Program. About $2 to $3 million will be available specifically for school buses. Applications for projects must be submitted by April 20, 2001. The AQMD contact is the Technology Advancement Office at (909) 396-2105.

Mobile Source Air Pollution Reduction Review Committee's (MSRC) Discretionary Funds: Thirty percent of the funds collected each year from a $4 surcharge on vehicle registration (created by AB 2766 (Sher)) goes to the Mobile Source Air Pollution Reduction Review Committee (MSRC) to be used to implement programs to reduce mobile source emissions. Managers of the program have apportioned the available funding into several technology-specific categories, including: heavy-duty vehicles; zero-emission/ultra-low emission vehicles; research, development and demonstration of advanced low-emission transportation technologies; transportation control measures; and intelligent transportation systems. There is about $950,000 currently available for alternative-fueled school bus purchases. However, awards are made based on delivery of school buses prior to the end of the fiscal year. It is envisioned that most school bus fleet operators cannot access these funds in the current fiscal year given the lead time for delivery of new alternative-fueled school buses. However, the funds may be accessed for alternative fuel infrastructure development. The MSRC is considering a carry-over of the remaining monies into the next fiscal year. The AQMD contact is Ray Gorski (MSRC Technical Advisor) at 909-396-2479.

Adopt-A-School Bus Foundation: The AQMD Governing Board established an independent, non-profit foundation to assist in the effort to reduce children's exposure to diesel exhaust. The foundation has received approximately $1.5 million today and plans to focus first on assistance to school bus fleet operators in reducing emissions from existing diesel school buses by funding the purchase and installation of particulate traps and some infrastructure (fuel) costs. The Foundation's future goals are to assist in the funding of either engine retrofits to alternative fuels, or the cost differential to purchase an alternative fuel bus.

Local Government Subvention Funds: Forty percent of the funds collected each year from the vehicle registration surcharge goes to local governments based on a pro-rated share of population and must be used to reduce mobile source emissions. Local governments can use these funds to pay the incremental premium costs in the purchase alternative-fuel vehicles or engines. Funds not expended carry over from year to year. The AQMD staff contacts are Larry Rhinehart (AQMD) at 909-396-3780 and Oscar Abarca (AQMD) at 909-396-3242.

Air Quality Investment Program (AQIP): The AQMD uses AQIP funds to obtain emission reduction or air quality benefits that are equivalent to the total Emission Reduction Target (ERT) for all participating employers in the AQIP. The AQMD continually accepts proposals for the disbursement of AQIP funds. The amount of emission reductions required to demonstrate equivalency and the amount achievable under each proposal is evaluated. The Executive Officer then recommends to the AQMD Governing Board, on a quarterly basis, the most cost-effective proposals that achieve equivalent emission reductions. Since

its inception in July 1995, employers have invested over $9.5 million in this program. The AQMD contact is the Transportation Programs office at (909) 396-3271.

Congestion Mitigation and Air Quality Improvement Fund: The federal Congestion Mitigation and Air Quality Improvement Program (CMAQ) authorizes $8.1 billion for six years of Transportation Equity Act for the Twenty-First Century (TEA-21) funding and provides a flexible funding source to state and local governments for transportation projects and programs that meet Clean Air Act requirements. CMAQ will fund programs that incorporate transit improvements, travel demand management strategies, traffic flow improvements, and public fleet conversions to cleaner fuels. Approximately $1 billion over the six years of authorization has been allocated to the AQMD under CMAQ, specifically: Los Angeles County – $110,040,981 per year; Orange County – $30,696,885 per year; San Bernardino – $14,473,885 per year; and Riverside – $115,111,211 per year.

California Energy Commission: The California Energy Commission (CEC) has the following potential sources of funding available: $6 million to establish a clean fuels infrastructure for public agencies, including cities, counties, school districts and transit districts; $5 million to establish an incentive program for the lease or purchase of hybrid electric and fuel cell vehicles; and, $1 million to develop a hydrogen fuel cell infrastructure.

Infrastructure Construction Funding Opportunities: Several gaseous-fuel providers have stated that they would contract to build fueling stations at no capital cost to the users by means of a long-term contract if a minimum level of throughput could be guaranteed. According to one CNG fuel provider, the minimum necessary throughput would be equivalent to 600 gallons of CNG daily. This amount of throughput equates to fill-up of: 10 transit buses, or 15 refuse collection vehicles, or 20 large school buses, or 50 light-duty vehicles. If a facility is not able to guarantee the minimum throughput, construction costs may be offset by grants, or other private funds and in-kind services. For instance, if one million dollars of financing is available, a throughput of only 400 gallons daily may be sufficient for facility construction and operation by a private fuel provider.

State Energy Program: The State Energy Program is the result of the consolidation of two formula grant programs – the State Energy Conservation Program and the Institutional Conservation Program. The State Energy Program includes provisions for competitively awarded financial assistance for a number of state-oriented special project activities, including alternative fuels. In addition to funding for special project activities, states may choose to allocate base formula funds to program activities to increase transportation efficiency, including programs to accelerate the use of alternative transportation fuels for government vehicles. For more information, contact the State Energy Office or the DOE Regional Office for this region, listed under the Points of Contact section for California, or contact Ron Santoro at DOE Headquarters at (202) 586-8296.

COMPLIANCE AUDITING AND ENFORCEMENT

PR 1195 will require that affected school districts and private contractors keep sufficient vehicle data records to document rule compliance, and that these records be maintained for a minimum of two years. The AQMD intends to audit these records, either at the vehicle fleet

location or by requesting appropriate documents to be submitted to the AQMD for review. The specific data to be kept for each new vehicle will include the DMV Certificate of Title and registration, vehicle manufacturer, model-year, model, engine family number, and fuel type. If the school bus operator chooses to use an exemption from the rule requirements, the operator must demonstrate to the satisfaction of the Executive Officer or designee that the conditions are met through a streamlined process to be developed by the AQMD staff after adoption of the rule

The school bus operator shall demonstrate the viability of a gasoline-powered bus has been considered and submit supporting documentation as to the reasons for the need to purchase a diesel-powered bus if the diesel powered school bus is the final choice. In addition, the public school bus operator shall purchase of an intermediate diesel school bus as defined under the Statewide Lower-Emission School Bus Program (adopted by CARB December 2000) if external funding is available for such a vehicle. The cleaner diesel school bus must be certified by CARB as part of the Statewide Lower-Emission School Bus Program.

If a school district or private contractor is found to be in non-compliance with rule requirements, then the school district or contractor will be subject to penalties specified in Health and Safety Code Division 26, Part 4, Chapter 4, Article 3. The AQMD also plans to develop an enforcement guideline document that will stress the implementation of corrective actions by school districts and contractors rather than punitive monetary penalties during the initial years of rule implementation, for first time violators.

PUBLIC COMMENTS

The following summarizes public comments and staff responses regarding the development of Proposed Rule 1195 – Clean On-Road School Buses. The AQMD received comments from representatives of federal, state, and local agencies, as well as engine manufacturers, and environmentalists. Many of these comments were provided as part of the initial fleet vehicle rule development of Proposed Rule 1190 (dated December 1999).

Comment 1. More than 100 letters were written in support of staff proposed Rule 1195 which requires the purchase of alternative fuel school buses.

Response 1. Staff appreciates the comments. AQMD's intention is to maximize emission reductions of exhaust emissions from on-road vehicles and consequently reduce the public's exposure to air toxic contaminants and criteria pollutants.

Comment 2. The indoor facility requirements for maintenance of CNG buses are expensive and currently our school district does not have the funding required to make the retrofit.

Response 2. AQMD staff acknowledges this concern and believes that adequate funding opportunities are available to offset a significant amount of the rule implementation cost. We have received input from one school district indicating minimal cost impacts since bus maintenance is conducted

outdoors, taking advantage of Southern California's favorable weather conditions.

Comment 3. Inspections should be performed on the CNG tanks of the buses every three years. The tanks have to be replaced every fifteen years. There were questions regarding who will do the inspection and the cost associated with that.

Response 3. Based on staff conversation with Southern California Gas Company, a visual inspection is required by the school bus operator every 3 years. This is a routine inspection that can be conducted by the school bus operator and no excess cost will be incurred by the school bus operator. There is also training courses developed in tank inspections by West Virginia University with cooperation of Cylindrical Manufacturing. These courses are offered throughout the nation. There are also certified tank inspectors that school bus operators may choose to use.

Comment 4. There are not enough CNG stations. The fuel stations are located far a part. We have to travel twenty-seven miles each way to reach a station that will accommodate a forty-foot transit bus. Most of the time, there is no attendant present in case of problems.

Response 4. It is acknowledged that the alternative fuel infrastructure needs to be expanded to accommodate the increased demand for these fuels as a result of PR1195 implementation. Based on input received from a variety of natural gas suppliers indicating their ability to support PR1195 implementation by designing, building, and operating refueling stations using their own capital, staff does not believe that insufficient numbers of alternative fuel vendors is a significant issue. Staff believes that the refueling infrastructure will grow in a cost-effective manner as public and private fleets affected by the suite of fleet rules work together to plan, prioritize and strategically place CNG fueling stations. In addition, prior to January 1, 2003, the rule provides an exemption from the rule requirements if the alternative fuel station is not located within 5 miles of the vehicle storage or maintenance yards, and the fleet operator doesn't get at least $13,000 in external funds.

Comment 5. There are only few training classes that teach repair of the CNG vehicles and for the tank inspection. It is costly to attend these classes.

Response 5. To address this issue, AQMD staff is currently preparing a document to identify current repair technician training resources and opportunities that can be utilized by affected fleets. In addition, it should be noted that there is available funding (MSRC) that will help address training cost impacts. There are also community colleges such as Long Beach and Rio Hondo community colleges that offer heavy-duty mechanical training courses.

Comment 6. There is economic hardship and budget shortage associated with purchasing an alternative fueled buses.

Response 6. AQMD staff acknowledges this concern and has been attempting to identify funding sources to help mitigate the cost impacts of this rule for both school districts and private contractors. The proposed rule language provides relief to public school bus fleet operators from alternative fuel bus purchases if funding is not available to offset the additional cost of the alternative fuel school bus.

Comment 7. There is $50 million fund available for replacement of school buses purchased prior to 1977. Our school district would not qualify for reimbursement of the excess cost of purchasing CNG buses since we do not have any buses purchased before 1977.

Response 7. The current proposal will apply to all models of school bus regardless of age. If sufficient funding is not available to offset the differential purchase cost, the fleet operator is exempt from purchasing an alternative-fueled school bus. In addition, staff has identified other potential funding sources that could help pay for compliance costs including the Carl Moyer and MSRC. Staff will continue to increase available funding sources subsequent to rule adoption by working with the state legislation and other public and private entities to maximize funding for the proposes rule compliance.

Comment 8. Funding will be required for training of personnel, and the modification of existing garage facilities for such purposes as the replacement of all open-space heaters, electric lights, and electrical equipment to ensure that no sources of ignition would exist within the garage.

Response 8. See the response to Comment 5.

Comment 9. Because of limited range of CNG-fueled vehicles, more CNG fueling stations are required. This will increase our capital outlay, as well as our operating cost.

Response 9. AQMD staff acknowledges that the alternative fuel infrastructure needs to be expanded to accommodate the increased demand for these fuels as a result of AQMD fleet rule programs implementation. There is a cost for improved air quality. It should be noted that variety of natural gas suppliers have indicated their ability to support AQMD's fleet rule implementation by designing, building, and operating refueling stations using their own capital. See response to Comment 4.

Comment 10. Green diesel technology should be considered as an acceptable alternative since it would provide a pollution reduction equivalent to that of low-emission gasoline.

Response 10. Green diesel technology is a promising strategy to reduce NOx and PM emissions from diesel powered vehicles to levels that are approximately equivalent to alternative-fueled vehicles. ARB has certified its use in California. In addition, green diesel technology, unlike clean fuel technology, has not yet demonstrated NOx emission reductions similar to alternative-fuel technologies. At this time International Truck and Engine has been testing a diesel engine with a NOx exhaust emissions level at 3.0 gm/bhp-hr. Heavy-duty gasoline engines have NOx emissions levels that are about twice as clean as the International engine (typically about 1.5 gm/bhp-hr based on certification data).

Comment 11. School districts do not have the means of generating the funds necessary to implement the proposed requirements. Having to take money from educational programs to fund the proposed requirements for school buses would be unconscionable.

Response 11. The proposed rule provides an exemption from the rule requirements if sufficient funding is not available to offset the differential purchase cost of an alternative-fueled school bus compared to the cost of a new conventionally fueled school bus equipped with an approved control device. See response to Comment 7.

Comment 12. The California Constitution, in Section 6 of Article XIII B, provides that any new program or higher level of service mandated on any local government by the Legislature or any state agency must be reimbursed by the state.

Response 12. This section of California constitution applies to actions of a state agency or California legislature. This section is not applicable to SCAQMD rules and regulations.

Comment 13. There are used buses available from San Diego City Schools. The acquisition of these buses in an integral component of Temecula Valley Unified School District (TVUSD)'s school bus replacement plan. The proposed rule would prevent us from this option.

Response 13. A used school bus may be purchased and if funding is available it would be re-powered to alternative fueled engine. Otherwise, a particulate filter trap will be required.

Comment 14. AQMD should consider a possible alternative language in the proposed Rule 1195 allowing the purchase of late-model used buses over a specified period. This will soften the financial burdens imposed by the proposed rule and permit strategic budget planning for the purchase of alternative fuel buses and required investments for infrastructure needs and training of personnel.

Response 14. See Response to Comment 13.

Comment 15. AQMD should address pollution contributors that have the most significant impact on the environment such as diesel trucks and provide funding alternatives to mitigate the cost associated with implementing the proposed rule.

Response 15. See response to Comment 7.

Comment 16: The proposed rule requires schools to buy more expensive school buses unless they are exempted due to a lack of external funds to cover the incremental costs. These more expensive buses also are more expensive to operate, maintain, require new refueling and upgraded maintenance facilities, and inspect/replace the pressurized fuel tanks. Unless these other incremental costs are included in the exemption, schools will have to choose between books, fewer buses and clean air. These additional costs need to be included in the exemption provisions.

Response 16: AQMD staff believes there are sufficient funds available through the CARB Lower-Emission School Bus Program to cover the cost for new refueling stations, upgrading maintenance facilities, and inspection/ replacement of the pressurized fuel tanks. It is envisioned that a school district would pay a maximum of $25,000 to purchase a new CNG bus as part of this program, instead of approximately $100,000 for the purchase of a comparable conventional new diesel school bus absent the program. The savings associated with the purchase of an alternative fueled school bus under the program could be used to cover the costs to upgrade a facility or pay for the cost of building a refueling infrastructure.

Comment 17: The CARB Lower-Emission School Bus Program and a part of the Carl Moyer Program Funds are guaranteed school bus funding sources whether or not PR1195 is adopted. As such, any emission benefits from new/retrofitted buses that come from these programs cannot be included in the PR 1995 environmental benefits. The environmental benefit estimates must be revised to subtract such emission benefit.

Response 17: AQMD staff acknowledges that the CARB Lower-Emission School Bus program and part of Carl Moyer funds are available school bus funds; however, in the absence of this rule, these funds might not be fully utilized. For example, MSRC has had a program for funding low emission school buses, which has not been utilized to a great extent. PR1195 would require the school bus operators to purchase alternative-fueled buses, which creates demand for these funds. Staff does acknowledge that would some emission reduction benefits associated with the incentives programs. However, due to the voluntary nature of the incentives programs and the lack of participation by school districts in the past in such programs, it is not clear what portion is attributable to the incentives programs.

Comment 18: The proposed state budget for next year does not include any money for the CARB Lower-Emission School Bus Program or Carl Moyer. Other air quality funds may be impacted depending on the energy crisis. It appears that the staff assumes that sufficient outside funds will be available to address all the annual turnover of school buses for the next 10-20 years. This seems like an overly optimistic assumption and should be revised to reflect a more realistic situation.

Response 18: While future funding is not certain at this time, the AQMD will seek reauthorization of the current funding programs and develop other funding opportunities. One such opportunity is through the Adopt-A-School Bus Foundation that was established by the AQMD Governing Board to seek funding from the private sector.

Comment 19: The recent increase in natural gas and electricity costs are not included in the draft cost and cost effectiveness calculations. We assume increased fuel/electricity costs will be reflected in the revised calculations that have yet be released by the staff. In addition, a discussion of the short and long term availability of natural gas/electrical should be included in the report.

Response 19: AQMD staff acknowledges this comment and has incorporated increased in fuel prices in cost effectiveness calculations. For the socioeconomic calculations, staff assumed that the recent spikes in natural gas fuel cost will drop to about $1.25 per gallon equivalent.

Comment 20: CNG fuel tanks need to be inspected every 3 years and replaced every 15 years. Depending on the cost to replace tanks, CNG school buses may only have a useful life of 15 years. Staff should conduct an assessment of the cost of both the inspections and replacement of the tanks.

Response 20: The Southern California Gas Company recommended a visual inspection of the CNG tanks every 3 years. This is a routine inspection, which would be conducted by the school bus operator and no excess cost will be experienced by the school bus operator. They also recommended that the CNG tank to be replaced every 15 years. AQMD staff acknowledges that there is a cost associated with tank replacement as well as the tank inspection training program. Also, see Response to Comment 44.

Comment 21: Almost half of the buses in the SCAQMD are medium-duty buses. Very little discussion is included in the staff report concerning these buses. Nothing is included on the costs or availability of alternative-fueled medium-duty buses.

Response 21: Staff believes that the PR1195 staff report includes adequate discussion regarding both heavy-duty and medium-duty school buses. It should be noted that PR1195 does not require the purchase of alternative-fueled school buses when acquiring medium-duty school buses. The rule

requires the school bus operator to purchase or lease ULEV or cleaner gasoline-fueled school buses when acquiring medium-duty school buses. Purchasing or leasing an alternative-fueled school bus is required when school bus operator acquires heavy-duty school buses.

Comment 22: Diesel exhausts aggravates human health. More stringent rule requirements are needed to protect children's health from this pollutant.

Response 22: AQMD staff agrees with this comment since diesel exhaust has been identified as a known human carcinogen in addition to other negative human health impacts. The results of MATES II study concluded that over 70% of the cancer risk from ambient air is attributable to particulate from diesel combustion sources. AQMD staff believes the PR1195 requirements attempt to maximize the diesel particulate exhaust emissions reductions and consequently protect the children's exposure to air toxic contaminants and criteria pollutants.

Comment 23: AQMD should delay the effective date for PR1195 to a later time. This added time will provide the green diesel technology to be certified and made commercially available.

Response 23: Staff does not believe that delaying the effective date for PR1195 is necessary. AQMD staff began development PR1195 since January 2000. The fleet operators as well as engine and bus manufacturers have been aware of this proposed rule for more than a year. If green diesel's emission levels are certified to be equivalent or lower than corresponding alternative-fueled engine exhaust levels, staff would propose rule amendments to include the use of green diesel as an acceptable alternative for rule compliance.

Comment 24: PR1195 should be fuel neutral. For example, Green Diesel Technology reduces emissions of NOx and PM by 60% and 90% respectively. It is scheduled to be certified by August. The cost of green diesel is less than CNG.

Response 24: See response to comment 10.

Comment 25: PR1195 includes an exemption due to insufficient funds. Staff should define what insufficient fund means and if includes the infrastructure cost.

Response 25: Insufficient funds occur when there is not enough public funds available to fully offset the incremental purchase cost of an alternative-fueled school bus compared to the cost of a conventional diesel-powered bus. The exemption provided in PR1195 relative to insufficient funds applies only to the public schools and it does not apply to private contractors since public schools have limited financial resources for the purchase of new school buses and school transportation is not a mandatory program for

most school districts. The funds will pay at a minimum 75% of the purchase cost of a new bus. School districts will pay only 25% of the cost not to exceed $25,000, under the current CARB Lower-Emission School Bus Program.

Comment 26: The green diesel technology should not be considered as an alternative option since it has not yet been certified by state and it's emission standards are established based on the laboratory tests, not in use tests. The 60 day compliance period should be eliminated from the rule and the requirements should be implemented upon adoption. The funding should only be available to public schools since private schools and private contractors are in this business for money. The 5-mile exemption should be eliminated since fast fill is not required for school buses and there are several funds available to recover the cost of building refueling station. The rule should include more stringent requirement for purchasing used diesel-powered buses.

Response 26: Staff agrees that green diesel technology should not be considered as an alternative option since it has not been certified by the state (CARB) and its emissions performance in-use has not been established. Staff believes that the limited time five mile infrastructure exemption is appropriate to ensure that CNG refueling station costs do not overwhelm the financial resources of affected public school bus fleet operators. Finally, staff believes that the requirements associated with purchasing used school buses are appropriate given their expected limited utilization.

Comment 27: The Draft staff report states that our school owns 12 school buses. This is an error. We currently have 17 school buses. The PR1195 language should be revised to allow private schools to purchase used diesel powered buses equipped with filter traps if extra funding is not available. The proposed rule language should exempt the private schools with less than 20 school buses, and it should also provide an exemption for fleets without any fueling infrastructure in place until January 1, 2003. The 10% exemption be changed to allow a minimum of 5 exempted school buses for fleets of less than 50 school buses and the replacement of pre-1977 school buses be exempted from the rule.

Response 27: AQMD staff used California Highway Petrol (CHP) database to create the list of private schools with number of their school buses. The CHP's database lists your school with 12 buses. The draft staff report will be revised to incorporate the correct number of buses and subsequently the associated changes. With regard to the other suggested modifications, staff has revised the rule proposal to allow up to five diesel-powered school buses for school bus fleets with 15 to 50 school buses and up to ten diesel-powered school buses for school bus fleets with 51 to 100 school buses.

Comment 28: The definition of an alternative-fueled vehicle in PR1195 (c)(1) should be modified by adding the language "or a bus that is run exclusively on bio-diesel and has been fitted with a catalytic converter or other technology sufficient to reduce nitrogen oxide emissions (to a particular baseline)". AQMD staff should consider an immediate incentive program to encourage school bus fleets to utilize bio-diesel in existing fleets as part of Rule 1195. Bio-diesel is non-toxic and can be used in its pure form in all diesel engines with no modifications. Its incremental cost is far less than the vehicle acquisitions mandated by the PR1195. Most importantly, bio-diesel could improve the emissions in existing vehicles immediately and thus it could immediately reduce the exposure of school children to the risk of cancer.

Response 28: While bio-diesel may provide emission reductions for most of the diesel exhaust pollutants, it is the AQMD staff's understanding that the use of bio-diesel can lead to increases in nitrogen oxide emissions. In addition, there is no assurance that a operator will always use bio-diesel since conventional diesel fuel can be readily used in place of the bio-diesel.

Comment 29: The exemption provision in PR1195 regarding insufficient funding is not clear. This provision reads "a public school bus fleet operator may purchase a Type A or B school bus that is not certified by CARB as ULEV or cleaner, or Type C or D school bus that is not an alternative-fueled school bus as required under subdivision (d) if *sufficient funding is not available* to fully offset the differential purchase cost of an alternative-fueled school bus ……. Clarify the term "*if sufficient funding is not available*" since this language is open to interpretation. The exemption provision should be clarified to read "*if grant funding or funding from other special purpose programs for alternative-fueled vehicles is not available*.

Response 29: The language has been clarified in the latest version of the proposed rule based on the comment received.

Comment 30: PR1195 violates both state and federal law. It is not within the scope of the AQMD's purported authority to craft fleet rules under Health and Safety Code Section 40447.5. This section authorized AQMD to require fleet operators" to purchase vehicle which are capable of operating on methanol or other equivalently clean burning (equivalent to methanol) alternative fuel. Without utilization of such a current methanol benchmark, there is no non-arbitrary way to assess which of today's new heavy-duty motor vehicles and engines are "equivalent clean" to current methanol engines, as mandated under statute. Health and Safety Code section 40919(e) also cannot justify or legitimize PR1195. That section merely provides that the districts include in their attainment plan measures to achieve the use of a significant number of low-emission motor vehicles by operators of the motor vehicles. This section by its own terms, does

not relate to heavy-duty engines or vehicle such as school buses. AQMD staff has overlooked Health and Safety Code Section 40440(a) in its effort to find a foothold for its expanding ban on diesel-fueled engines and vehicle. That statutory provision makes it clear that the South Coast district board shall adopt rules and regulations that carry out the attainment plan and are not in conflict with state law and federal laws and rules and regulations.

Response 30: Staff disagrees with the Commentor. While there are no heavy-duty methanol engines certified today, the latest heavy-duty methanol engine certified was in 1993. State law states that operators would be required to purchase methanol or other equivalently clean-burning alternative-fueled engine. It is generally accepted that alternative-fueled engines are inherently cleaner that conventional diesel engines as shown through engine certification data. In addition, the majority of alternative-fueled engines certified today meet the CARB's optional low-NOx exhaust emission standards for heavy-duty engines. The methanol engine certified in 1993 would also meet the current optional low-NOx standard.

Comment 31: PR1195 is in direct contravention of controlling provisions of federal law (CAA Sections 209(a) and 177). PR1195 would mandate a de facto ban on the purchase and sale of new diesel-fueled engines and school buses. This mandate would obviously prohibit, within the SCAQMD, the purchase and sale of new motor vehicles and engines otherwise certified as meeting all applicable standards. Such mandates are unlawful and void.

Response 31: Staff believes that PR 1195 is consistent with state and federal law requirements since the proposed rule affects the purchase of vehicles for use in certain fleets and does not set emission standards. The proposed rule provides several exemptions for school bus operators that would allow the purchase of conventional-fueled school buses. In addition, the AQMD Governing Board has set a set of criteria for future diesel technologies to meet. If these criteria are met, then the AQMD staff is directed to amend the rule to allow for such future technologies to be rule compliant.

Comment 32: AQMD Board should adopt a fuel-neutral rule consistent with CARB Lower-Emission School Bus Program. One that permits the use of all available technologies provided they meet uniform emission standards. PR1195 currently will force school districts to divert millions of dollars away from the classroom and into the training and on going higher maintenance and operating costs. PR1195 will deprive school districts of the flexibility to make the most practical, cost-effective transportation decisions to meet their specific needs. The rule will effectively ban clean diesel as a school bus option for the future, despite the fact that it delivers air quality benefits comparable to those of CNG at a fraction of the cost. The rule will unnecessarily promote under-evaluated CNG technology,

which could put our school children at increased risk to their health and safety. Because availability of adequate public funding for the enormous costs associated with supporting CNG bus fleets is at best uncertain and at worst highly unlikely, schools will be forced to choose between books and buses.

Response 32: AQMD has the authority to adopt a rule that would require certain fleet operators to use clean-fueled vehicles. AQMD does not have the authority to establish vehicle or engine specific emission standards. The proposed rule does not effectively ban clean diesel as a school bus option for the future since the rule could be amended subsequent to adoption if clean diesel engine technology is established as providing equal or better clean air benefits as corresponding natural gas engine technology. Currently, it has been well established that natural gas engine technology is cleaner than corresponding diesel technology; nevertheless, AQMD staff will continue to monitor this situation. With regard to potential financial impacts of the proposed rule, staff believes that current and potential future funding availability, as well as the financial exemption provision in the proposed rule will minimize or eliminate a school district choice between books and buses.

Comment 33: Several amendments are necessary to make the PR1195 a truly effective one. First, make the rule effective immediately upon adoption by the board since funds are limited and the rule must take full advantage of all available funding sources. Second, identify and commit to specific, additional sources of funding for alternative-fuel school buses. Unfortunately, available sources of funding are limited and may not be renewed in future years. AQMD staff, for example, could allocate a certain percentage of the fines or penalty money collected every year to help subsidize the incremental costs of new alternative-fueled school buses. Staff should memorialize this commitment in resolution language that accompanies the rule. Third, eliminate exemption when no refueling station is available within 5-miles of a storage or maintenance facility. Modular CNG refueling units could be purchased or leased to at a fraction of the cost of a permanent refueling station. Moreover, these units could be paid for out of the money from funding programs. Fourth, limit the fleets that can take advantage of the funding contingency for used bus purchase. School districts should be required to apply for funding to cover the incremental cost of a new alternative-fueled school bus over a used diesel one. In addition, the funding contingency for used bus purchase should apply to school districts that traditionally purchase used buses.

Response 33: Staff has revised the rule proposal to begin implementation upon adoption of the rule. Relative to seeking additional funding, staff agrees that additional funding will be needed and would seek additional funding. Relative to the five mile refueling station exemption, it is staff's that while

many school bus fleets could utilize the modular system or a slow-fill system, some school districts operate their buses during the school day and would require having faster fill units. As such, staff believes that the five mile exemption is still needed. Lastly, relative to used school buses, it is not clear that every school district follows a historic trend of purchasing only new or used school buses. Many school district purchase school buses based on available funds and may purchase new buses if their budgets allow for such purchase or used school buses if their financial resources are limited.

Comment 34: PR 1995 should be revised to allow the private school contractors to purchase or lease alternative-fueled buses or diesel buses equipped with particulate trap. The private contractors would also commit to installing particulate filter trap on existing 1990 or newer buses if funding is available. PR1195 should provides exemption which cover emergencies and unforeseen circumstances which may cause a school district to contract for additional bus services on short notice. In those instances, if buses must be added to a fleet, the added buses must be equipped with traps within nine months of purchase or lease. The rule should also exempt purchases already executed as of the effective date of the rule. Lastly, the rule should provide exemption that the purchase or merger of one or more existing fleets not trigger the requirements of section (d)) for buses that are already operating in the District. PR1195, if adopted as proposed, will have a very significant negative financial impact on the private school bus contractors. Compliance with the rule, overtime, drive private contractors out of business due to higher cost of providing transportation, since the private contractors do not have the same access to state funding as public schools. With limited funds available for education, school districts may be forced to choose the lowest cost proposal.

Response 34: Staff appreciates the comments from the private school bus transportation contractors and understands that the private contractors operate differently from public school districts. Staff has been in discussions with private school transportation contractors and is proposing that for a limited time, private school transportation contractors be able to purchase diesel-powered school buses with approved control devices if 15 percent of the existing fleet is retrofitted with approved control devices on a yearly basis.

Comment 35: The PR1195 contains unlawful requirements and other limitations relating to the control of emissions from new and used motor vehicles and motor vehicle engines that the AQMD is proposing in violation of controlling federal law. The proposed rule is in clear violation of sections 177 and 209 of the CAA, as well as the Supremacy Clause of the United State Constitution.

Response 35: AQMD staff disagrees with this comment. PR1195 is not a rule setting motor vehicle emission standards as contemplated by the Clean Air Act's preemption provision, but is a requirement that fleet purchase cleaner vehicles than they may have otherwise purchased in the absence of the proposed rule. Staff believes that such fleet requirements are consistent with Clean Air Act.

Comment 36: PR1195 should contain a listing of medium-duty Type A and B buses that meet the Tier II ULEV emission limits. There is also no information provided on the cost of complying medium-duty school buses and there is little information on the age distribution of medium-duty buses in the school fleets as there is for heavy-duty vehicles, or their rate of turnover. Such information is needed to estimate the emission benefits and the cost of the program.

Response 36: Based on industry input, Collins is making a gasoline powered ULEV certified Type A bus commercially available. Staff anticipates that additional rule compliant Type A school buses will be made available as manufacturers are required to reduce engine emissions resulting from compliance with ARB's Low-Emission Vehicle Regulation.. Staff is assuming no additional costs associated with medium-duty Types A and B, since conventional ULEV certified gasoline vehicles are allowed to be rule compliant. Based on industry input we assume the 10 years life-time for medium-duty buses. In actual practice the life of these buses varies based on the individual's district vehicle replacement program

Comment 37: The staff report needs to be amended to subtract emission benefits attributable to the Lower Emission School Bus and Carl Moyer Programs. These programs are state-funded programs with implementation plans that have been approved by the CARB. A designated amount of money from these funds will be available to school bus fleets in the District regardless of this proposed rule. The district has had to agree to spend them in accordance with guidelines developed by the state.

Response 37: See response to comment 17:

Comment 38: The staff report needs to be amended to make a more realistic assumption of the emission limits for CNG powered buses purchased with other incentive funds. There are not enough Low Emission School Bus Program (LESBP) funds to pay for all buses purchased each year in the District. Buses that are not provided with LESBP funds do not have to meet the 2.5 g/bhp-hr NOx limit. In fact, one of the most popular CNG bus engines – a John Deere 8.1L was certified at 3.2 g/bhp-hr NOx and 0.07 g/bhp-hr of PM. Therefore, it is inappropriate to assume that CNG powered buses would all meet 2.5 g/bhp-hr NOx limit.

Response 38: The Commentor is mistaken in the certification levels for the John Deere 8.1L engine. Based on industry input, the most popular CNG school bus engine is the John Deere 8.1L that was certified to the 2.6 g/bhp-hr NOx emission standard with PM emissions at 0.05 g/bhp-hr and not the emissions levels provided by the Commentor. Within the same engine family, the John Deere 8.1L is certified at 2.2 g/bhp-hr NOx and 0.02 g/bhp-hr PM emission levels. Staff believes engine manufacturers will focus their future marketing efforts on CNG buses equipped with engines certified to optional NOx emission standards since potential customers are using funds that may require these lower-emitting bus engines. With regard to funding, staff believes that the LESBP in combination with other funding sources could potentially supply nearly all funding necessary for PR 1195 rule implementation. One of staff's ongoing goals as part of fleet rule implementation is to maintain current funding levels at a minimum, and hopefully increase these levels to satisfy current and future fleet rule compliance costs.

Comment 39: The cleaner diesel buses would be purchased regardless of the proposed rule and should be subtracted from the estimated annual turnover of school buses that are effected by this rule. The diesel powered buses purchased under the LESBP have to meet 3.0 g/bhp-hr NOx limit instead of 4.0 assumed in the report for the period of 2001 – 9/2002. In addition, the report ignores the $8 million the AQMD will request to retrofit diesel buses with filter traps. These reductions from retrofits will occur with or without the proposal, and need to be included in the baseline to calculate the emission benefits of the proposed rule. Likewise, the report must be revised to reflect the future EPA lower emission standards for PM and NOx. The PM emission standards for heavy-duty diesel engines would be 0.01 g/bhp-hr in 2006. The staff report should include the emission benefit derived from the purchase of used diesel bus.

Response 39: Staff has determined that it would be inappropriate at this time to decrease PR1195 emission benefits resulting from fleet purchases of school buses powered by diesel engines meeting a 3.0 g/bhp-hr NOx limit since there will be diesel-powered school buses certified above 3.0 g/bhp-hr NOx levels and natural gas emission characteristics will likely improve significantly over the next couple of years.. Staff acknowledges, however, that the emission benefits could be lower given the purchase of the 3.0 g/bhp-hr buses.. With regard to the retrofit funding component of the LESBP, this applies to existing diesel buses, and would therefore not affect the emission reductions being produced by PR1195's requirement that new bus purchases be alternative fueled. Finally, since the EPA 2006 NOx and PM heavy-duty engine standards have been adopted, the adopted standards have been incorporated in the emission benefit calculation for PR1195.

Comment 40: The staff report should include the CARB diesel control plan in their assessment. The report needs to be revised to provide a range of emission benefits dependent on the amount of external funds just as it does for the rule's cost and cost effectiveness. The emission benefits calculated for this rule assumes there will be sufficient funding to fully offset the incremental purchase cost of alternative buses for the next 10-20 years. This is an overly optimistic assumption.

Response 40: Staff does not believe that it is appropriate to include the CARB diesel control plan in the PR1195 emission reduction assessment since the control measures contained in the plan have not been adopted into regulation. The emission benefits estimated for PR1195 represent the maximum potential emission benefits. See response to comment 38.

Comment 41: In discussing the air toxic emission benefits of the proposed rule, AQMD staff is not properly informing the Board as to degree on uncertainly surrounding the air toxic risk/emission benefits of the rule.

Response 41: Staff disagrees with this comment. As part of the AQMD Governing Board's directive to staff to develop a procedure to demonstrate toxic equivalency between future diesel technologies compared to alternative-fueled engines, the Governing Board recognized that there are uncertainties associated with the toxic risk calculations. In addition, the Governing Board recently approved the funding for further studies of the potential toxicity of "treated" diesel based on comments received.

Comment 42: Higher electrical and natural gas costs need to be reflected in the staff report. Similarly, the cost of clean diesel and conventional diesel should be updated. The staff report must itemize the additional costs to school district that purchases a CNG powered fleet of buses. In addition, the rule's cost effectiveness needs to incorporate the impact on medium-duty buses and used buses.

Response 42: AQMD staff acknowledges this comment and has incorporated increased in fuel prices in cost effectiveness calculation, relative to fuel cost assumptions contained in the original socioeconomic report for the Proposed Rule 1190 Series. The additional costs of purchasing a CNG powered school bus compared with a conventional diesel powered school bus has been incorporated in the Economic Assessment section of the staff report.

Comment 43: AQMD staff should develop a table that estimates the funds currently available for school buses under each listed funding source, and present what, if any limitations exist for their use. The staff report should clarify how this rule will be implemented in conjunction with the expenditure of these funds.

Response 43: The PR1195 staff report includes the list of all the funds that are available for the fleet operators to use. The amount of these funds is also specified in the report. AQMD expects to receive $16.6 million for school bus replacements, $5.5 million, of which is allocated for green diesel school buses. AQMD provides additional $1.66 million for alternative fuel. Only public schools may apply for funding. Other funds such as Carl Moyer funds, Local Government Subvention Funds, California Energy Commission, Air Quality Investment Program, and few more funds are available for private schools and private contractors to use. The rule implementation procedures and guidelines are currently being developed.

Comment 44: The issue of CNG tank inspections and replacement must be further examined before this rule is finalized.

Response 44: AQMD staff does not believe that delaying the adoption of the rule is necessary. Based on discussions with the Los Angeles County Metropolitan Transportation Authority (MTA) who currently operate over 1000 CNG transit buses, MTA engineers and their consultants have reports that conservatively calculate a 50 year life cycle. Their cycle means going up and down from 1,500 psi to 5,000 psi. MTA tanks go from 1,800 psi to 4,200 psi. The MTA believes the life cycle of their tanks will be longer than their consultant's calculation because the pressure range is narrower. See response to comment 20.

Comment 45: The examples of engines and vehicle model availability should be expanded to include the emission certification levels for each of these vehicles and, if available, the sales volumes. In addition, the table needs to be modified to include medium-duty school buses.

Response 45: Staff provided the list for illustrative purposes only. As engine manufacturers produce new alternative-fueled engines for certification, these engines would be considered rule compliant and the vehicle manufacturer can choose any of these engines to build school buses. In reality, many school bus manufacturers and vendors have current knowledge on the most recently certified engines.

Comment 46: AQMD staff should revise Section (d) Fleet Requirements: Paragraph (d)(1)(B) requires all new Type B, C, or D school buses that are heavy-duty vehicles to be alternative-fueled buses. Paragraph (d)(1)(A) effectively mandates the purchase of CNG powered medium-duty buses as well. Given an equal amount of funding, clean diesel technology would provide greater NOx and PM emission reductions than CNG buses. The rule should be revised by deleting the current requirement (d)(1)(A) and (B) and require (A) "*School buses that would otherwise qualify for funding under the state of California's Lower Emission School Bus Program.*" Likewise Paragraph (d)(2)(B) requires all purchases of used school buses to be either an alternative-fueled bus or a diesel bus that is

repowered with an alternative-fueled engine. The paragraph (2)(B) should read "*For Type B, C, or D school buses that are considered heavy-duty vehicles, buses must be either alternative-fueled, or if diesel powered must be equipped with an approved control device prior to operation*."

Response 46: Based on CARB-certified emissions levels for various alternative-fueled engines that are used in school bus applications, almost all of the alternative-fueled engines meet CARB's optional low-NOx heavy-duty exhaust emission standards at this time. It is the AQMD staff's understanding that there are no clean diesel technology certified to any of the optional low-NOx standards. The AQMD Governing Board provided criteria for future diesel technologies to demonstrate that the diesel emission levels would be equivalent to alternative-fuel technologies. If such a demonstration is made, staff would amend the rule to allow for such technologies.

Comment 47: The PR1195 is designed to "reduce the exposure of school children to both cancer causing and smog forming pollution". The objectives of the PR1195 will be enhanced by allowing dual-fueled buses that use biodiesel to satisfy the requirements of a "rule compliant" bus. It should also permit existing buses to use biodiesel in blends of 20% biodiesel (B-20) and be a "rule compliant" bus, where the incremental cost for acquisition, conversion or retrofit renders compliance infeasible, as long as the NOx emissions do not exceed the EPA's heavy-duty engine certification standards.

Response 47: AQMD staff appreciates the comment. Based on current information, the use of bio-diesel in a conventional diesel engine results in reduction of hydrocarbons and particulate mater emissions. However, there is a potential increase in nitrogen oxide emissions. In addition, there is no assurance that bio-diesel will be used at all times. An enforceable mechanism must be developed to ensure that the fuel will be used at all times. In subsequent discussions with producers of bio-diesel, staff believes that this technology may be of benefit as the fuels are certified by CARB to not cause emission increases. Staff will continue to work with producers as further emission tests using bio-diesel are conducted.

Comment 48: The PR1195 is overly cumbersome and will result in additional administrative time and resources being spent to comply with the proposed rule. For example, the proposed rule does not clearly define what constitutes an acceptable alternative-fuel refueling station. The existence of such a station is no guarantee that districts will be able to utilize station facilities and equipment. As a result, district officials will be forced to spend additional time making sure they have access and availability to nearby station.

Response 48: AQMD staff disagrees with this comment. Compliance with the PR1195 may create additional costs such as operating cost, maintenance, facility upgrades. But it would not create any extra cost to the fleet operators to figure out whether or not they have access and availability to nearby fueling station. The fleet operator may obtain the access and availability to nearby station by calling an alternative-fuel supplier.

Comment 49: PR1195 staff report fails to include several school districts and school buses that are reflected in State records. The AQMD survey has missed over 20 school districts. In Los Angeles County, there are 17 school districts with the total of 1,107 buses (as listed). In Orange County, there are 3 school districts with total of 195 buses (as listed). Based on these discrepancies, AQMD staff should examine its inventory of existing school buses and make any necessary adjustments in the analysis contained in the draft staff report.

Response 49: AQMD staff believes that the data provided by the Commentor is dated. Staff conducted a comprehensive survey to identify the number of school buses operating in the District. None of the school districts listed were missed from the inventory. From the 17 school districts located in Los Angeles County, three school districts are located outside of AQMD jurisdiction, twelve school districts are contracting with private contractors, and three school districts (William S. Hart, Newhall, and Saugus) own their own buses but contract with private contractors to operate their buses are already included in the revised staff report. All three school districts located in Orange County are contracting with private contractors.

Comment 50: The proposed rule should be delayed until the results of the ongoing comparison toxicity testing of diesel and CNG exhaust are available.

Response 50: Staff does not believe that the proposed rule should be delayed for the purposes of obtaining results from the current diesel and CNG exhaust toxicity testing program. This program will not result in definitive conclusions of the relative toxicity between diesel and natural gas powered engines. Rather, this program's goal is the development of a test protocol that could be used by engine manufacturers to show toxic equivalency between diesel and corresponding natural gas powered engines and to provide qualitative data on comparative toxicity.

Comment 51: The proposed rule exemption provision is inadequate since it only addresses the incremental cost of alternatively fueled school buses and ignores costs for providing alternative fuel refueling, upgrading existing maintenance facilities, new driver or mechanic training, and increased operating costs.

Response 51: To address this concern, the proposed rule language has been modified to allow for an exemption to the alternative fuel purchasing requirement for school district fleets if refueling infrastructure and facility modification costs exceed $13,000 until April 1, 2003, and then $8,000 per alternative-fueled school bus. Also, see response to Comments 4, 5, 9, and 16.

Comment 52: The staff report needs to include a listing of compliant medium-duty engine/vehicles that meet ULEV emission limits. Limited information indicates that currently available CNG powered medium-duty buses cost over 50 percent more than a diesel powered bus, which could have a significant impact on the ability of schools to purchase such buses. The staff report needs to include the age distribution of medium-duty buses in school bus fleets as this information is necessary to estimate the emission benefits and cost of the program.

Response 52: Appendix D has been revised and now provides some example rule-compliant medium-duty vehicles. See also response to Comment 36.

Comment 53: The emission benefit calculations must be revised to incorporate the U.S. EPA adopted 0.01 g/bhp-hr PM standard for 2006 as well as the more stringent standard for NOx.

Response 53: The staff report has been revised to incorporate the newly adopted U.S. EPA emission standards for heavy-duty engines. These include a 0.01 g/bhp-hr PM standard for the 2007 and subsequent model year and a 0.02 g/bhp-hr NOx standard to be phased-in between 2007 and 2010.

Comment 54: The staff report needs to identify emission benefits from the used bus purchase requirements.

Response 54: Since the incentive funding available for school bus purchases by school districts targets new buses, staff believes that the purchases of used buses for rule compliance purposes would be minimal and have not been quantified. Also, see response to Comment 39.

Comment 55: The staff report needs to be revised to provide a range of emission benefits dependent on the amount of external funds just as it does for the rule's cost and cost effectiveness.

Response 55: Staff has revised the discussion on emissions benefits to indicate that the emission benefits are at their greatest when all vehicles are compliant with the purchase requirements. Due to the many exemptions that are provided in the proposed rule, staff could not estimate a lower emission benefit level of the proposed rule. Also, see response to Comment 40.

Comment 56: The staff report must itemize the additional costs to a school district that purchases a CNG powered fleet of buses. These include additional CNG

bus operational costs, infrastructure costs, maintenance facility costs, and mechanic or driver training costs.

Response 56: Based on industry input as well as advancements in alternative-fuel school bus engine technology, staff does not believe that alternative-fuel school bus engines will have significantly greater operational costs than corresponding diesel engines. Also, see response to Comments 2, 9, 16, 19 and 51.

Comment 57: The rule's cost and cost-effectiveness needs to incorporate the impact on medium-duty buses and used buses.

Response 57: Staff does not believe that there will be a significant cost impact associated with the purchase of rule compliant medium-duty buses. A rule compliant gasoline powered medium-duty bus model is available which actually costs approximately $4,000 less than the corresponding diesel model. Furthermore, staff believes that additional rule compliant gasoline-powered medium-duty buses will be available in the near future.

Comment 58: District staff should develop a table that estimates the funds currently available for school buses under each listed funding source, and present what, if any limitations exist for their use.

Response 58: The revised staff report contains information on funding available as of the date of this document. Also, see response to Comment 43.

Comment 59: The staff report should clarify how the rule will be implemented in conjunction with the expenditure of these funds.

Response 59: Since the implementation date for the proposed rule and the LESBP are approximately the same, the proposed rule provides an impetus for school districts to apply for funding that would pay the additional costs associated with purchase of natural gas buses- the cleanest school bus technology available.

Comment 60: The proposed exemption for private school transportation contractors should not include a sunset date, requirements to demonstrate that external funding is not available, and retrofits of existing vehicles be covered at the expense of the contractor. As a proposed alternative, the private contractors are willing to increase the percentage of school bus retrofits to 20 percent if external funding is available.

Response 60: Staff believes a sunset date is appropriate since there are plans on the state and federal levels to retrofit heavy-duty vehicles including school buses. When such regulations are adopted, voluntary retrofits would not provide additional emission benefits. In addition, staff believes that private school transportation contractors should continue to seek funding for alternative-

fuel school buses where possible to further reduce oxides of nitrogen emissions beyond that of the cleanest diesel technology. Lastly, the alternative proposal to raise the percentage of existing school buses subject to retrofitting if external funds are available does not provide any additional benefits since it would be contingent on external funding. The proposed rule provides that if additional funding is available, contractors should proceed to retrofit more than 15 percent. Staff believes that there will be sufficient external funding beyond the fiscal budget of contractors to offset the cost of retrofitting existing school buses. The AQMD is committed to seeking and securing external funding to assist school bus fleet operators with retrofitting existing school buses. Currently, there are funds available to retrofit about 1,000 existing school buses. In addition, there are discussions of allocating funds from other programs such as MSRC or allocation of state funds that would occur over the next few years.

Comment 61: Alternative proposals were submitted to the allow for the purchase of intermediate school buses as defined in the Statewide Lower-Emission School Bus Program in lieu of compliance with the purchase of alternative-fueled school buses. In addition, alternative proposal for the number of diesel-powered school buses needed for field trips were provided.

Response 61: The alternative compliance would circumvent the current rule proposal to purchase cleaner alternative-fueled school buses without a demonstration that external funding for the alternative-fueled school buses is not available to the school bus fleet operator. In addition, beginning October 2002, the intermediate diesel bus nitrogen oxide emission level would be higher than the emission standards that new diesel engines will be meeting in that timeframe. Relative to the alternative proposal regarding field trips, staff believes that the proposal as written would allow operators to purchase diesel-powered school buses at any given time.

PRELIMINARY DRAFT FINDINGS AND COMPARATIVE ANALYSIS

Proposed Rule 1195 is part of the AQMD's strategy to attain federal and state ambient air quality standards. Long-term air quality benefits are expected from attaining and maintaining the ambient air quality standards for particulate matter, nitrogen dioxide, and ozone. Improved air quality will ultimately reduce negative public health impacts from these criteria pollutants and toxic air contaminants.

Proposed Rule 1195 is technologically feasible and cost-effective when funds from various incentives programs are made available, while reducing particulate matter and nitrogen dioxide emissions from diesel-powered vehicles; and the proposed rule addresses concerns raised by the public, wherever possible. Therefore, staff recommends the adoption of Proposed Rule 1195.

These findings are being made in compliance with state law requirements.

Draft Findings Required by the California Health and Safety Code

Health and Safety Code (HSC) Section 40727 requires the AQMD to adopt written findings of necessity, authority, clarity, consistency, non-duplication, and reference.

Necessity - The emission reductions associated with Proposed Rule 1195 are needed for the following reasons:

a) State and federal health-based ambient air quality standards for particulate matter and ozone are regularly and significantly violated in the South Coast Air Basin. The reduction of particulate matter and nitrogen dioxide emissions from diesel powered school buses through the implementation of Proposed Rule 1195 is needed to meet federal and state air quality standards.

b) By exceeding state and federal air quality standards, the health of people within the South Coast Air Basin is impaired.

c) By exceeding state and federal air quality standards, the quality of life is reduced in the South Coast Air Basin in numerous respects.

d) The California Clean Air Act (HSC Section 40910 et seq.) requires that the air districts make every effort to attain federal and state ambient air quality standards as soon as practicable. Proposed Rule 1195 makes progress toward that goal. Section 40919 requires air districts to include measures in their plans to achieve the use of a significant number of low-emission vehicles in fleets.

e) About 71 percent of cancer risk from air toxins is attributed to diesel particulate emissions, which would be reduced by the proposed rule.

Authority - The AQMD Board obtains its authority to adopt, amend, or repeal rules and regulations from HSC Sections 40000, 40001, 40440, 40441, 40447.5, 40463, 40702, 40725 through 40728, and 40910 through 40920.5, inclusive.

Clarity - The AQMD Board determines that Proposed Rule 1195 is written or displayed so that its meaning can be easily understood by persons directly affected by it.

Consistency - The AQMD Board determines that Proposed Rule 1195 is in harmony with, and not in conflict with or contradictory to, existing federal or state statutes, court decisions, or regulations.

Non-Duplication - Proposed Rule 1195 does not impose the same requirements as any existing state or federal regulation and is necessary and proper to execute the powers and duties granted to, and imposed upon, the AQMD.

Reference - In adopting this proposed rule, the Board references the following statutes which the AQMD hereby implements, interprets, or makes specific: HSC Sections 40001 (rules to achieve ambient air quality standards), 40440(a) (rules to carry out AQMP), and 40447.5(a) (rules to require fleets of 15 or more vehicles operating substantially in the AQMD to

purchase vehicles powered by methanol or other equivalently clean-burning alternative fuel when adding or replacing vehicles), and 40919(a)(4) (measures to achieve the use of a significant number of low-emission motor vehicles by operators of motor vehicle fleets).

Draft Comparative Analysis

Health and Safety Code Section 40727.2 requires a written comparison of a proposed rule with existing federal and local regulations imposed on the same source. Based on available information, there are no State or local air pollution regulations or monitoring/ recordkeeping/reporting requirements regarding jurisdiction procurement of alternative-fuel vehicles. However, some jurisdictions subject to the EPAct may elect to purchase alternative-fueled heavy-duty vehicles as credit towards meeting the light- and medium-duty alternative-fuel vehicle requirements and would potentially have some recordkeeping requirements.

APPENDIX A

PROPOSED RULE LANGUAGE

PROPOSED RULE 1195 IS PROVIDED IN AN EARLIER PART OF THE BOARD PACKAGE AND WILL GBE INSERTED HERE UPON ADOPTION BY THE AQMD GOVERNING BOARD

APPENDIX B

SCHOOL BUS POPULATION PROFILE

SUMMARY OF SCHOOL BUSES OPERATED BY THE SCHOOL DISTRICTS, PRIVATE CONTRACTORS, AND PRIVATE SCHOOLS

Table 1. Overall Summary of Number of Buses Owned by School Districts, Contractors, and Private Schools

SCHOOL DISTRICTS, CONTRACTORS & PRIVATE SCHOOLS	TOTAL		SCHOOL BUSES BY FUEL TYPE							
	with < 15	with ≥ 15	Unspecified	Gasoline	Diesel	Meth	LPG	CNG	LNG	EV
School Operated Buses	174	3,791	0	432	3,416	3	0	111	0	3
Contractors	3	4,891	0	46	4,846	0	0	2	0	0
Private Schools	445	113	3	294	258	0	0	3	0	0
Total	**622**	**8,795**	**3**	**772**	**8,520**	**3**	**0**	**116**	**0**	**3**

Table 2. Summary of Buses Owned by School District in Each County

SCHOOL DISTRICTS	TOTAL		SCHOOL BUSES BY FUEL TYPE							
	with < 15	with ≥ 15	Unspecified	Gasoline	Diesel	Meth	LPG	CNG	LNG	EV
LA County	90	2,087	0	200	1,890	3	0	83	0	1
Orange County	68	919	0	162	824	0	0	0	0	1
San Bernardino County	2	402	0	38	352	0	0	14	0	0
Riverside County	14	383	0	32	350	0	0	14	0	1
Total	**174**	**3,791**	**0**	**432**	**3,416**	**3**	**0**	**111**	**0**	**3**

School Bus Population for Each School District

Table 3. School Bus Population Owned by School Districts in Los Angeles County

SCHOOL DISTRICTS	TOTAL		SCHOOL BUSES BY FUEL TYPE							
	with < 15	with ≥ 15	Unspecified	Gasoline	Diesel	Meth	LPG	CNG	LNG	EV
ABC		42		18	24			0		
Alhambra City		24		8	16			0		
Arcadia		17		2	15			0		
Azusa		19		4	15			0		
Baldwin Park		20		3	17			0		
Bassett	8			1	7			0		
Bell Flower	12			2	10			0		
Bonita		23		2	21			0		
Castaic	13			3	10			0		
Compton		52		5	47			0		
Covina-Valley		30		13	12			5		
Culver City	6			2	4			0		
Downy		36		6	30			0		
El Monte		15		7	8			0		
Gorman	1			0	1			0		
Hacienda La Puente		36		11	25			0		
Hughes-Elizabeth	7			0	7			0		
Inglewood	7			0	7			0		
Long Beach		30		2	28			0		
Los Angeles		1318		37	1247			34		
Lynwood	8			3	5			0		
Monrovia	13			1	12			0		
Montebello		16		0	0			16		
Mountain View		16		1	14			1		
Norwalk-La Mirada		53		21	32			0		
Pomona Unified	3			0	3			0		
Pupil Transportation		105		22	71			12		
Rowland		33		0	30	3		0		
Santa Monica-Malibu		23		1	20			2		
Saugus		20		0	20			0		
Sulphur Springs		22		3	19			0		
Torrance		32		6	19			7		
Walnut Valley		30		2	21			6		1
West Covina	12			2	10					
Williams S. Hart U.H.S.D		75		12	63					
Total:	**90**	**2,087**	**0**	**200**	**1,890**	**3**	**0**	**83**	**0**	**1**

Table 4. School Bus Population Owned by School Districts in Orange County

SCHOOL DISTRICTS	TOTAL		SCHOOL BUSES BY FUEL TYPE							
	with < 15	with ≥ 15	Unspecified	Gasoline	Diesel	Meth	LPG	CNG	LNG	EV
Anaheim		68		0	68			0		
Anaheim City School Dist.		89		4	85			0		
Brea Olinda	14			5	9			0		
Buena Park		23		4	19			0		
Capistrano		165		21	143			0		1
Centralia	12			7	5			0		
Cypress	8			6	2			0		
Fountain Valley	12			5	7			0		
Fullerton		23		14	9			0		
Fullerton Joint		42		0	42			0		
Garden Grove		107		12	95			0		
Huntington Beach		22		4	18			0		
Irvine	5			5	0			0		
La Habra		20		4	16			0		
Laguna Beach		16		0	16			0		
Los Alamitos		16		4	12			0		
Magnolia	11			1	10			0		
Newport-Mesa		63		2	61			0		
Ocean View		39		23	16			0		
Orange		52		1	51			0		
PlacentiaYorbaLinda		69		14	55			0		
Saddleback Valley		88		18	70			0		
Savanna	6			2	4			0		
Westminister		17		6	11			0		
Total:	**68**	**919**	**0**	**162**	**824**	**0**	**0**	**0**	**0**	**1**

Table 5. School Bus Population Owned by School Districts in San Bernardino County

SCHOOL DISTRICTS	TOTAL		SCHOOL BUSES BY FUEL TYPE							
	with < 15	with ≥ 15	Unspecified	Gasoline	Diesel	Meth	LPG	CNG	LNG	EV
Alta Loma		21		8	10			3		
Bear Valley		19		1	18			0		
Chaffy Joint		38		0	35			3		
Chino Valley		51		8	41			2		
Colton Joint		No Resp.								
Etiwanda		21		1	20			0		
Fontana		55		5	50			0		
Ontario-Montclair		47		5	36			6		
Mt Baldy School District	2			1	1					
Redlands		64		7	57			0		
Rialto		37		0	37			0		
Rim of the World		31		2	29			0		
Upland		18		0	18			0		
Total:	**2**	**402**	**0**	**38**	**352**	**0**	**0**	**14**	**0**	**0**

Table 6. School Bus Population Owned by School Districts in Riverside County

SCHOOL DISTRICTS	TOTAL		SCHOOL BUSES BY FUEL TYPE							
	with < 15	with ≥ 15	Unspecified	Gasoline	Diesel	Meth	LPG	CNG	LNG	EV
Banning		15		1	13			1		
Beaumont		36		1	34					1
Coachella Valley Unified		59			59					
Desert center	4				4					
Desert Sands		66			53			13		
Hemet		61		2	59					
Jurupa		55		20	35					
Lake Elsinore		No Resp								
Menifee Union		20		2	18					
Moreno Valley		No Resp								
Murietta Valley		29			29					
San Jacinto	10				10					
Temecula Valley		42		6	36					
Total:	**14**	**383**	**0**	**32**	**350**	**0**	**0**	**14**	**0**	**1**

Table 7. School Bus Population Owned by Contractors

CONTRACTORS	TOTAL		SCHOOL BUSES BY FUEL TYPE							
	with < 15	with ≥ 15	Unspecified	Gasoline	Diesel	Meth	LPG	CNG	LNG	EV
Laidlaw		2,752		31	2,719			2		
Embree		219		0	219			0		
Durham		995		3	992			0		
Atlantic Express		427		0	427			0		
Cardinal Transp.		212		0	212			0		
Certified		31		0	31			0		
STA	3			1	2			0		
Tumbleweed Day Camp	0	66		11	55					
First Student Services		120		0	120			0		
R & D Transportation		69		0	69			0		
A & B		No Resp.								
Yucaipa Bus Service		No Resp.								
Kids on the Move		No Resp.								
Total:	**3**	**4,759**	**0**	**46**	**4,846**	**0**	**0**	**2**	**0**	**0**

Table 8. School Bus Population Owned by Private Schools

PRIVATE SCHOOLS	TOTAL		SCHOOL BUSES BY FUEL TYPE							
	with < 15	with ≥ 15	Unspecified	Gasoline	Diesel	Meth	LPG	CNG	LNG	EV
Almansor Education Center	4			4						
Ambassadors for Chris.	4				4					
Arrowhead Christian Acad.	1				1					
Barbara Dawson School	10			10						
Bellflower Christian School	13			4	9					
Bethel Christian Center	3				3					
Bloomington Christian	2				2					
Brethren Elementary/J	2			2						
Bright Beginnings Preschol	1				1					
Buddha's Light HIS LAI S	2			2						
C.A.N.O. Headstart	2				2					
Cal. Dept. of Develop.	9			7	2					
Cal. Touch of Class	6				6					
Cal. School for the Deaf	3				3					
Calmount School	3			3						
Calvary Baptist La Verne	1			1						
Calvary Chapel of Costa M.	4				4					
Calvary Cross Chapel	1			1						
Cathedral High School	1			1						
Charles Drew Postgraduate	9			6	3					
Child Education Center	4			4						
Child Help-USA-Headstart	2				2					
Children Discovery Center	1			1						
Children Academic Lrn.Cntr	1			1						
Children Discovery Center	1				1					
Chinese Zion Baptist Ch.	1		1							
Christian Chapel School	1			1						
CHS Pasadena Headstart	3				3					
City of Carson	7			2	3			2		
City of Commerce	1			1						
City of Downey Senior	7				7					
City of La Mirada	0	16		16						
City of South El Monte	2			2						
Cornerstone Academy	1				1					
Corona Christian Church	1				1					
Coutin School	3			3						
Crescent Ave. Church of	2			2						
Crossroads School	2				2					
Damien High School	1				1					
Darrell E. Grangaard	1				1					
David S Yee	2			1	1					
Delphi Academy	3				3					
Dubnoff Center Child	2			2						
East Gate Christian School	1			1						
East Hills Baptist Church	2			2						
Eko Center	6			4	2					
El Segundo Church of	2			2						

Eras Center	0	17		4	12			1		

Table 8 (Cont.). School Bus Population Owned by Private Schools

PRIVATE SCHOOLS	TOTAL		SCHOOL BUSES BY FUEL TYPE							
	with < 15	with ≥ 15	Unspecified	Gasoline	Diesel	Meth	LPG	CNG	LNG	EV
Evangelical Release Time	1				1					
Fairmont Private School	0	27		9	18					
Faith Baptist Church of Can	14			6	8					
Faith Comm Church of Naz	2			2						
Faith Lutheran High Sch	1				1					
First Baptist Christian Sch	5			3	2					
First Baptist Sch of Monteb	2			1	1					
First Presbyterian Church	2			2						
First Southern Baptist	1			1						
Fontana Christian School	1				1					
Foothill Christian School	1				1					
Foundation For Early Child	1			1						
Funseekers	4				4					
Gless Ranch Inc.	3			3						
Grace Lutheran Church	1				1					
Greater Long Beach	2			1	1					
Halsey Schools Inc.	1			1						
Harold L. Kent	3				3					
Harvard Place Day School	1			1						
Harvard-Westlake Schlool	3				3					
Hebrew Academy	9			7	2					
Heschel Day School	2			2						
Hollywood-Los Feliz Jewish	2			2						
Immanuel Baptist Church	3			3						
Independence Christian Sc	1				1					
Jewish Community Center	2			2						
Jewish Community Long	2			2						
Kare Youth League	12				12					
Kids Klub of Pasadena	2			2						
Kidsville USA	2			2						
Kinder Care Riverside	1			1						
Kindercare	1			1						
Kindercare Highland	1			1						
Kindercare learning center	1			1						
Kindercare Moreno Valley	2			2						
Kindercare Rancho	1			1						
Kindercare Redlands	2			2						
Kings Schools	1				1					
Kirkwood Educational Cent	1			1						
La Gina Easley-A6581599	1				1					
La Tijera United Methodist	1			1						
Life Changing Ministries	1			1						
Linden Center	6			6						
Linfield School	2			1	1					
Living Stream Christian Sch	1				1					
Loma Linda Academy	1				1					

Los Angeles Lutheran High	3			2	1					

Table 8 (Cont.). School Bus Population Owned by Private Schools

PRIVATE SCHOOLS	TOTAL		SCHOOL BUSES BY FUEL TYPE							
	with < 15	with ≥ 15	Unspecified	Gasoline	Diesel	Meth	LPG	CNG	LNG	EV
Los Angeles Sightseeing	8		1		7					
Los Angeles Union SDA	2			2						
Maranatha High School	3			2	1					
Marta – Big Bear	3			3						
Maywood Pilgrim Christian	1			1						
Mesa Grande Junior Acd	1				1					
Miracle Missionary Baptist	1			1						
Morengo Band of Mission	2				2					
New Harvest Community	1			1						
Noli Indian School	3				3					
North Valley Jewish Comm	2			2						
Oakridge Private School	1				1					
Oakwood School	3			2	1					
Ofman Learning Center	3			1	2					
Ontario Christian School	11			4	7					
Orange Christian Assembly	1			1						
Pacific Christian High Sch	3			2	1					
Parkhill School	7			5	2					
Pasadena Christian School	2				2					
Pincrest Schools Inc.	7			2	5					
Protrav Services Inc.	13			1	12					
Redlands Harvest	7			7						
Redlands Jr. Academy	1				1					
Riverside Christian Schl	2				2					
Riverside County Christian	4			1	3					
Rossier Educational Asses	0	19		19						
Ryder/Ate Inc.	1			1						
San Fernando Valley Acad	1			1						
San Fernando Valley Com	1				1					
San Pedro Academy	2			1	1					
Sandoval Poultry	2			2						
Santa Monica Montessori	2			1	1					
Sierra Canyon Day School	9			8	1					
South Pasadena Senior	1			1						
St. Andrews Presbyterian	2			1	1					
St Margarets School	1				1					
St. Pauls Lutheran Church	1				1					
Stoneybrooke Christian Sch	2			1	1					
Straight Way School-Islam	1			1						
Sunrise Child Development	1			1						
Sunshine Day Camp	7			7						
Temple Christian Church S	1			1						
The Oriental Mission Chr	1			1						
Tobinworld	0	17			17					
Together We Grow	2			2						
Toibb Pacific Hebrew Acd	1				1					

Tom Sawyer Camps Inc.	1			1						
TSI	8		1	7						

Table 8 (Cont.). School Bus Population Owned by Private Schools

PRIVATE SCHOOLS	TOTAL		SCHOOL BUSES BY FUEL TYPE							
	with < 15	with ≥ 15	Unspecified	Gasoline	Diesel	Meth	LPG	CNG	LNG	EV
	0									
Tutor Time Child Care	2			2						
Twin Pines Ranch	1				1					
University Children's Center	2			2						
Upland Church of Nazarene	2			1	1					
Valley Cities Jewish Comm	1			1						
Valley School of Ind. Train	6			5	1					
Vantastic	4			4						
Victor Valley Christian Sch	1				1					
Victory Baptist Chruch OR	2				2					
Villa Park Orchards Assoc	6			6						
Village Christian Schools		17		4	13					
Wasburn & Sons	2			2						
Western Christian Schools	3				3					
Westview School	10			6	4					
Whittier Christian High Sch	3			1	2					
Whittier Village Children's	1			1						
Windward School Inc.	2				2					
Woodcrest Schools Inc.	1				1					
Yucaipia Christian School	1				1					
Zion Lutheran Schools	1				1					
Total:	**445**	**168**	**3**	**294**	**258**	**0**	**0**	**3**	**0**	**0**

SUMMARY OF SCHOOL BUSES OPERATED BY THE SCHOOL DISTRICTS, PRIVATE CONTRACTORS, AND PRIVATE SCHOOLS
(Based on the Model Year)

Table 9. Overall Summary of Number of Buses Owned by School Districts, Contractors, and Private Schools

SCHOOL DISTRICTS, CONTRACTORS & PRIVATE SCHOOLS	TOTAL		SCHOOL BUSES MODEL YEAR		
	with < 15	with ≥ 15	87 & Newer	78 to 86	77 & Older
School Operated Buses	174	3,791	2,221	1,408	336
Contractors	3	4,930	4595	319	19
Private Schools	445	113	357	162	39
Total	**622**	**8,834**	**7,173**	**1,889**	**394**

Table 10. Summary of Buses Owned by School District in Each County

SCHOOL DISTRICTS	TOTAL		SCHOOL BUSES MODEL YEAR		
	with < 15	with ≥ 15	87 & Newer	78 to 86	77 & Older
LA County	90	2,087	989	978	210
Orange County	68	919	700	226	61
San Bernardino County	2	402	274	94	36
Riverside County	14	383	258	110	29
Total	**174**	**3,791**	**2,221**	**1,408**	**336**

School Bus Population for Each School District

Table 11. School Bus Population Owned by School Districts in Los Angeles County

SCHOOL DISTRICTS	TOTAL		SCHOOL BUSES MODEL YEAR		
	with < 15	with ≥ 15	87 & Newer	78 to 86	77 & Older
ABC		42	17	16	9
Alhambra City		24	7	6	11
Arcadia		17	9	4	4
Azusa		19	6	5	8
Baldwin Park		20	13	7	0
Bassett	8		4	3	1
Bell Flower	12		3	9	0
Bonita		23	6	10	7
Castaic	13		4	6	3
Compton		52	41	6	5
Covina-Valley		30	16	9	5
Culver City	6		5	1	0
Downy		36	17	16	3
El Monte		15	8	6	1
Gorman	1		1	0	0
Hacienda La Puente		36	18	18	0
Hughes-Elizabeth	7		6	0	1
Inglewood	7		6	0	1
Long Beach		30	20	10	0
Los Angeles		1318	439	752	127
Lynwood	8		5	3	0
Monrovia	13		4	8	1
Montebello		16	16	0	0
Mountain View		16	12	4	0
Pomona Unified	3		2	1	
Pupil Transportation		105	94	11	0
Norwalk-La Mirada		53	26	15	12
Rowland		33	25	8	0
Santa Monica-Malibu		23	17	6	0
Saugus		20	16	4	0
Sulphur Springs		22	16	5	1
Torrance		32	26	5	1
Walnut Valley		30	20	8	2
West Covina	12		4	2	6
Williams S. Hart U.H.S		75	60	14	1
Total	**90**	**2,087**	**989**	**978**	**210**

Table 12. School Bus Population Owned by School Districts in Orange County

SCHOOL DISTRICTS	TOTAL		SCHOOL BUSES MODEL YEAR		
	with < 15	with ≥ 15	87 & Newer	78 to 86	77 & Older
Anaheim		68	46	21	1
Anaheim City Schl Dist.		89	86	3	
Brea Olinda	14		3	11	0
Buena Park		23	16	6	1
Capistrano		165	128	29	8
Centralia	12		6	4	2
Cypress	8		4	4	0
Fountain Valley	12		6	5	1
Fullerton		23	2	19	2
Fullerton Joint		42	27	14	1
Garden Grove		107	61	25	21
Huntington Beach		22	13	2	7
Irvine	5		2	3	0
La Habra		20	10	10	0
Laguna Beach		16	16	0	0
Los Alamitos		16	7	6	3
Magnolia	11		9	2	0
Newport-Mesa		63	49	7	7
Ocean View		39	18	17	4
Orange		52	52	0	0
PlacentiaYorbaLinda		69	63	4	2
Saddleback Valley		88	64	24	0
Savanna	6		4	2	0
Westminister		17	8	8	1
Total	**68**	**919**	**700**	**226**	**61**

Table 13. School Bus Population Owned by School Districts in San Bernardino County

SCHOOL DISTRICTS	TOTAL		SCHOOL BUSES MODEL YEAR		
	with < 15	with ≥ 15	87 & Newer	78 to 86	77 & Older
Alta Loma		21	13	5	3
Bear Valley		19	14	3	2
Chaffy Joint		38	28	10	0
Chino Valley		51	23	22	6
Colton Joint		No Resp.	No Resp		
Etiwanda		21	19	2	0
Fontana		55	21	17	17
Mt Baldy	2		1	1	
Ontario-Montclair		47	39	8	0
Redlands		64	53	11	0
Rialto		37	37	0	0
Rim of the World		31	13	11	7
Upland		18	13	4	1
Total	**2**	**402**	**274**	**94**	**36**

Table 14. School Bus Population Owned by School Districts in Riverside County

SCHOOL DISTRICTS	TOTAL		SCHOOL BUSES MODEL YEAR		
	with < 15	with ≥ 15	87 & Newer	78 to 86	77 & Older
Banning		15	7	6	2
Beaumont		36	31	1	4
Coachella Valley		59	43	15	1
Desert center	4		1	2	1
Desert Sands		66	53	8	5
Hemet		61	37	22	2
Jurupa		55	11	35	9
Lake Elsinore		No Resp	No Resp.		
Menifee Union		20	11	7	2
Moreno Valley		No Resp	No Resp		
Murietta Valley		29	29	0	0
San Jacinto	10		6	4	0
Temecula Valley		42	29	10	3
Total	**14**	**383**	**258**	**110**	**29**

Table 15. School Bus Population Owned by Contractors

CONTRACTORS	TOTAL		SCHOOL BUSES MODEL YEAR		
	with < 15	with ≥ 15	87 & Newer	78 to 86	77 & Older
Laidlaw		2,752	2,518	218	16
Embree		219	185	34	0
Durham		995	959	36	0
Atlantic Express		427	422	5	0
Cardinal Transp.		212	208	4	0
Certified		31	23	7	1
					0
STA	3		2	1	0
Tumbleweed Day Camp	0	66	66		
First Student Services		120	120	0	0
R & D Transportation		69	64	3	2
A & B		No Resp.	No Resp		
Yucaipa Bus Service		No Resp.	No Resp		
Kids on the Move		No Resp.	No Resp		
Total	**3**	**4,891**	**4,567**	**308**	**19**

Table 16. School Bus Population Owned by Private Schools

PRIVATE SCHOOLS	TOTAL		SCHOOL BUSES MODEL YEAR		
	with < 15	with ≥ 15	87 & Newer	78 to 86	77 & Older
Almansor Education Center	4		4		
Ambassadors for Chris.	4		1	2	1
Arrowhead Christian Acad.	1			1	
Barbara Dawson School	10		10		
Bellflower Christian School	13		11	2	
Bethel Christian Center	3		3		
Bloomington Christian	2				2
Brethren Elementary/J	2				2
Bright Beginnings Preschol	1		1		
Buddha's Light HIS LAI S	2		2		
C.A.N.O. Headstart	2		2		
Cal. Dept. of Develop.	9		2	7	
Cal. Touch of Class	6			6	
Cal. School for the Deaf	3		2	1	
Calmount School	3		3		
Calvary Baptist La Verne	1				1
Calvary Chapel of Costa M.	4		3	1	
Calvary Cross Chapel	1			1	
Cathedral High School	1				1
Charles Drew Postgraduate	9		6	3	
Child Education Center	4		4		
Child Help-USA-Headstart	2		2		
Children Discovery Center	1		1		
Children Academic Lrn.Cntr	1		1		
Children Discovery Center	1		1		
Chinese Zion Baptist Ch.	1		1		
Christian Chapel School	1		1		
CHS Pasadena Headstart	3		3		
City of Carson	7		4	3	
City of Commerce	1			1	
City of Downey Senior	7		7		
City of La Mirada	0	16	16		
City of South El Monte	2		2		
Cornerstone Academy	1			1	
Corona Christian Church	1			1	
Coutin School	3		3		
Crescent Ave. Church of	2				2
Crossroads School	2		2		
Damien High School	1			1	
Darrell E. Grangaard	1			1	
David S Yee	2		1	1	
Delphi Academy	3		1	2	
Dubnoff Center Child	2		2		
East Gate Christian School	1		1		
East Hills Baptist Church	2			2	

Table 16 (Cont.) : School Bus Population Owned by Private Schools

PRIVATE SCHOOLS	TOTAL		SCHOOL BUSES MODEL YEAR		
	with < 15	with ≥ 15	87 & Newer	78 to 86	77 & Older
Eko Center	6		3	3	
El Segundo Church of	2		2		
Eras Center	0	17	16	1	
Evangelical Release Time	1				1
Fairmont Private School	0	27	19	7	1
Faith Baptist Church of Can	14		2	6	6
Faith Comm Church of Naz	2		2		
Faith Lutheran High Sch	1		1		
First Baptist Christian Sch	5		2	3	
First Baptist Sch of Monteb	2		1	1	
First Presbyterian Church	2		2		
First Southern Baptist	1				1
Fontana Christian School	1			1	
Foothill Christian School	1		1		
Foundation For Early Child	1		1		
Funseekers	4		2	2	
Gless Ranch Inc.	3		3		
Grace Lutheran Church	1				1
Greater Long Beach	2				2
Halsey Schools Inc.	1		1		
Harold L. Kent	3			2	1
Harvard Place Day School	1		1		
Harvard-Westlake Schlool	3		2	1	
Hebrew Academy	9			9	
Heschel Day School	2		2		
Hollywood-Los Feliz Jewish	2		2		
Immanuel Baptist Church	3		2	1	
Independence Christian Sc	1			1	
Jewish Community Center	2			2	
Jewish Community Long	2		2		
Kare Youth League	12		8	4	
Kids Klub of Pasadena	2		2		
Kidsville USA	2			2	
Kinder Care Riverside	1		1		
Kindercare	1		1		
Kindercare Highland	1		1		
Kindercare learning center	1		1		
Kindercare Moreno Valley	2		2		
Kindercare Rancho	1		1		
Kindercare Redlands	2		2		
Kings Schools	1		1		
Kirkwood Educational Cent	1				1
La Gina Easley-A6581599	1				1
La Tijera United Methodist	1		1		
Life Changing Ministries	1		1		
Linden Center	6		6		

Table 16 (Cont.). School Bus Population Owned by Private Schools

PRIVATE SCHOOLS	TOTAL		SCHOOL BUSES MODEL YEAR		
	with < 15	with ≥ 15	87 & Newer	78 to 86	77 & Older
Linfield School	2		1	1	
Living Stream Christian Sch	1			1	
Loma Linda Academy	1				1
Los Angeles Lutheran High	3			3	
Los Angeles Sightseeing	8		5	3	
Los Angeles Union SDA	2				2
Maranatha High School	3			2	1
Marta – Big Bear	3		3		
Maywood Pilgrim Christian	1			1	
Mesa Grande Junior Acd	1		1		
Miracle Missionary Baptist	1		1		
Morengo Band of Mission	2		2		
New Harvest Community	1		1		
Noli Indian School	3		2	1	
North Valley Jewish Comm	2		2		
Oakridge Private School	1				1
Oakwood School	3		2	1	
Ofman Learning Center	3		3		
Ontario Christian School	11		6	5	
Orange Christian Assembly	1			1	
Pacific Christian High Sch	3			3	
Parkhill School	7		4	3	
Pasadena Christian School	2		1	1	
Pincrest Schools Inc.	7		4	3	
Protrav Services Inc.	13		13		
Redlands Harvest	7		7		
Redlands Jr. Academy	1		1		
Riverside Christian Schl	2		2		
Riverside County Christian	4		2		2
Rossier Educational Asses	0	19	9	10	
Ryder/Ate Inc.	1		1		
San Fernando Valley Acad	1			1	
San Fernando Valley Com	1		1		
San Pedro Academy	2			2	
Sandoval Poultry	2		1	1	
Santa Monica Montessori	2		2		
Sierra Canyon Day School	9		4	5	
South Pasadena Senior	1		1		
St. Andrews Presbyterian	2		2		
St Margarets School	1		1		
St. Pauls Lutheran Church	1			1	
Stoneybrooke Christian Sch	2		1	1	
Straight Way School-Islam	1			1	
Sunrise Child Development	1			1	
Sunshine Day Camp	7		7		
Temple Christian Church S	1			1	

Table 16 (Cont.). School Bus Population Owned by Private Schools

PRIVATE SCHOOLS	TOTAL		SCHOOL BUSES MODEL YEAR		
	with < 15	with ≥ 15	87 & Newer	78 to 86	77 & Older
The Oriental Mission Chr	1		1		
Tobinworld	0	17	17		
Together We Grow	2		2		
Toibb Pacific Hebrew Acd	1		1		
Tom Sawyer Camps Inc.	1		1		
TSI	8		8		
	0				
Tutor Time Child Care	2		2		
Twin Pines Ranch	1		1		
University Children's Center	2		1	1	
Upland Church of Nazarene	2		1	1	
Valley Cities Jewish Comm	1		1		
Valley School of Ind. Train	6			6	
Vantastic	4		4		
Victor Valley Christian Sch	1		1		
Victory Baptist Chruch OR	2		1	1	
Villa Park Orchards Assoc	6			6	
Village Christian Schools		17	8	5	4
Wasburn & Sons	2		2		
Western Christian Schools	3				3
Westview School	10		10		
Whittier Christian High Sch	3			2	1
Whittier Village Children's	1			1	
Windward School Inc.	2		1	1	
Woodcrest Schools Inc.	1		1		
Yucaipia Christian School	1			1	
Zion Lutheran Schools	1			1	
Total	**445**	**113**	**357**	**162**	**39**

APPENDIX C

EMISSION REDUCTION CALCULATIONS

NOx and PM Emission Reductions For C and D Bus Types
(Based on Current Standards)
SCHOOL DISTRICTS & PRIVATE SCHOOLS WITH 15 OR MORE BUSES

Total Number of diesel school Buses (Types C&D):	2336
School Bus Lifetime (years):	20
Total miles traveled per year:	13,798
Diesel fuel consumption (miles/gal):	7.42
Diesel bhp-hr / gallon of fuel used:	18.5
Total fuel used (gallon/yr) :	1859.57

NOx & PM Ems (tons/yr) = No. of buses x (Ems. Std.g/bhp-hr /454 g/lb) x (18.5 bhp-hr/gallon x fuel usage gallon/yr) / 2000 lb/ton

Table C-1A, Cumulative NOx & PM Emission Reductions Over 20 Years For School District & private schools Buses

	Annual Fleet Turn Over		Diesel [1]		CNG [2]		Δ Standards		Δ Emissions		Cumulative Emission reductions	
Calendar Year	Yearly	Cumu-latively	Emission Standrads NOx (g/bhp-hr)	Emission Standrads PM (g/bhp-hr)	Emission Standrads NOx (g/bhp-hr)	Emission Standrads PM (g/bhp-hr)	NOx (g/bhp-hr)	PM (g/bhp-hr)	NOx (tons/yr)	PM (tons/yr)	NOx (tons/yr)	PM (tons/yr)
2001 - 2002	117	117	4.0	0.1	2.5	0.03	1.5	0.07	6.64	0.31	6.64	0.31
2002 - 2003	117	234	4.0	0.1	2.5	0.03	1.3	0.07	5.64	0.31	12.28	0.62
2003 - 2004	117	350	2.0	0.1	1.4	0.03	0.6	0.07	2.66	0.31	14.94	0.93
2004 - 2005	117	467	2.0	0.1	1.4	0.03	0.6	0.07	2.66	0.31	17.59	1.24
2005 - 2006	117	584	2.0	0.1	1.4	0.03	0.6	0.07	2.66	0.31	20.25	1.55
2006 - 2007	117	701	2.0	0.1	1.4	0.03	0.6	0.07	2.66	0.31	22.90	1.86
2007 - 2008	117	818	1.1	0.01	1.1	0.01	0.0	0.00	0.00	0.00	22.90	1.86
2008 - 2009	117	934	1.1	0.01	1.1	0.01	0.0	0.00	0.00	0.00	22.90	1.86
2009 - 2010	117	1051	1.1	0.01	1.1	0.01	0.0	0.00	0.00	0.00	22.90	1.86
2010- 2011	**117**	**1168**	**0.2**	**0.01**	**0.2**	**0.01**	**0.0**	**0.00**	**0.00**	**0.00**	**22.90**	**1.86**
2011 - 2012	117	1285	0.2	0.01	0.2	0.01	0.0	0.00	0.00	0.00	22.90	1.86
2012 - 2013	117	1402	0.2	0.01	0.2	0.01	0.0	0.00	0.00	0.00	22.90	1.86
2013 - 2014	117	1518	0.2	0.01	0.2	0.01	0.0	0.00	0.00	0.00	22.90	1.86
2014 - 2015	117	1635	0.2	0.01	0.2	0.01	0.0	0.00	0.00	0.00	22.90	1.86
2015 - 2016	117	1752	0.2	0.01	0.2	0.01	0.0	0.00	0.00	0.00	22.90	1.86
2016 - 2017	117	1869	0.2	0.01	0.2	0.01	0.0	0.00	0.00	0.00	22.90	1.86
2017 - 2018	117	1986	0.2	0.01	0.2	0.01	0.0	0.00	0.00	0.00	22.90	1.86
2018 - 2019	117	2102	0.2	0.01	0.2	0.01	0.0	0.00	0.00	0.00	22.90	1.86
2019 - 2020	117	2219	0.2	0.01	0.2	0.01	0.0	0.00	0.00	0.00	22.90	1.86
2020 - 2021	117	2336	0.2	0.01	0.2	0.01	0.0	0.00	0.00	0.00	22.90	1.86
Annual Average:											20.76	1.63

[1] ARB's emission standards for heavy duty engines

[2] ARB's emission standards for Urban Transit Bus

NOx and PM Emission Reductions For C and D Bus Types
(Based on Current Standards)
CONTRACTORS WITH 15 OR MORE BUSES

Total Number of diesel school Buses (Types C&D):	2188
School Bus Lifetime (years):	10
Total miles traveled per year:	17,034
Diesel fuel consumption (miles/gal):	8.14
Diesel bhp-hr / gallon of fuel used:	18.5
Total fuel used (gallon/yr) :	2092.63

NOx & PM Ems (tons/yr) = No. of buses x (Ems. Std.g/bhp-hr /454 g/lb) x (18.5 bhp-hr/gallon x fuel usage gallon/yr) / 2000 lb/ton

Table C-1B, Cumulative NOx & PM Emission Reductions Over 10 Years For Contract Buses

	Annual Fleet Turn Over		Diesel [1]		CNG [2]		Δ Standards		Δ Emissions		Cumulative Emission reductions	
Calendar Year	Yearly	Cumu-latively	Emission Standrads NOx (g/bhp-hr)	Emission Standrads PM (g/bhp-hr)	Emission Standrads NOx (g/bhp-hr)	Emission Standrads PM (g/bhp-hr)	NOx (g/bhp-hr)	PM (g/bhp-hr)	NOx (tons/yr)	PM (tons/yr)	NOx (tons/yr)	PM (tons/yr)
2001 - 2002	219	219	4.0	0.1	2.5	0.03	1.5	0.07	13.99	0.65	13.99	0.65
2002 - 2003	219	438	4.0	0.1	2.5	0.03	*1.3*	*0.07*	*11.89*	*0.65*	*25.89*	*1.31*
2003 - 2004	219	656	2.0	0.1	1.4	0.03	0.6	0.07	5.60	0.65	31.48	1.96
2004 - 2005	219	875	2.0	0.1	1.4	0.03	0.6	0.07	5.60	0.65	37.08	2.61
2005 - 2006	219	1094	2.0	0.1	1.4	0.03	0.6	0.07	5.60	0.65	42.68	3.27
2006 - 2007	219	1313	2.0	0.1	1.4	0.03	0.6	0.07	5.60	0.65	48.28	3.92
2007 - 2008	219	1532	1.1	0.01	1.1	0.01	0.0	0.00	0.00	0.00	48.28	3.92
2008 - 2009	219	1750	1.1	0.01	1.1	0.01	0.0	0.00	0.00	0.00	48.28	3.92
2009 - 2010	219	1969	1.1	0.01	1.1	0.01	0.0	0.00	0.00	0.00	48.28	3.92
2010 - 2011	**219**	**2188**	**0.2**	**0.01**	**0.2**	**0.01**	**0.0**	**0.00**	**0.00**	**0.00**	**48.28**	**3.92**
Annual Average:											39.25	2.94

[1] **ARB's emission standards for heavy duty engines**

[2] **ARB's emission standards for Urban Transit Bus**

	NOx	PM
Annual Average reductions from school districts buses within the first 10 years:	18.62	1.39
Annual Average reductions from contract buses within the first 10 years:	39.25	2.94
Annual Average reductions from both districts & contract buses within the first 10 years:	**57.87**	**4.33**

NOx and PM Emission Reductions Per Bus
(CNG Path)

SCHOOL DISTRICTS WITH 15 OR MORE BUSES

Total miles traveled per year: 13,798
Diesel fuel consumption (miles/gal): 7.42
Diesel bhp-hr / gallon of fuel used: 18.5
Total fuel used (gallon/yr) : 1859.57

Table C-3A, NOx & PM Emission Reductions Over 20 Years For School District Buses

Calendar Year	Diesel [1] Emission Standrads		CNG [2] Emission Standrads		Δ Standards		Δ Emissions		Cumulative Emission reductions	
	NOx (g/bhp-hr)	PM (g/bhp-hr)	NOx (g/bhp-hr)	PM (g/bhp-hr)	NOx (g/bhp-hr)	PM (g/bhp-hr)	NOx (tons/yr)	PM (tons/yr)	NOx (tons/yr)	PM (tons/yr)
2001 - 2002	4.0	0.1	2.5	0.03	1.5	0.07	0.06	0.003	0.06	0.003
2002 - 2003	4.0	0.1	2.5	0.03	1.3	0.07	0.05	0.003	0.11	0.01
2003 - 2004	2.0	0.1	1.4	0.03	0.6	0.07	0.02	0.003	0.13	0.01
2004 - 2005	2.0	0.1	1.4	0.03	0.6	0.07	0.02	0.003	0.15	0.01
2005 - 2006	2.0	0.1	1.4	0.03	0.6	0.07	0.02	0.003	0.17	0.01
2006 - 2007	2.0	0.1	1.4	0.03	0.6	0.07	0.02	0.003	0.20	0.02
2007 - 2008	1.1	0.01	1.1	0.01	0.0	0.00	0.00	0.000	0.20	0.02
2008 - 2009	1.1	0.01	1.1	0.01	0.0	0.00	0.00	0.000	0.20	0.02
2009 - 2010	1.1	0.01	1.1	0.01	0.0	0.00	0.00	0.000	0.20	0.02
2010- 2011	**0.2**	**0.01**	**0.2**	**0.01**	**0.0**	**0.00**	0.00	0.000	**0.20**	**0.02**
2011 - 2012	0.2	0.01	0.2	0.01	0.0	0.00	0.00	0.000	0.20	0.02
2012 - 2013	0.2	0.01	0.2	0.01	0.0	0.00	0.00	0.000	0.20	0.02
2013 - 2014	0.2	0.01	0.2	0.01	0.0	0.00	0.00	0.000	0.20	0.02
2014 - 2015	0.2	0.01	0.2	0.01	0.0	0.00	0.00	0.000	0.20	0.02
2015 - 2016	0.2	0.01	0.2	0.01	0.0	0.00	0.00	0.000	0.20	0.02
2016 - 2017	0.2	0.01	0.2	0.01	0.0	0.00	0.00	0.000	0.20	0.02
2017 - 2018	0.2	0.01	0.2	0.01	0.0	0.00	0.00	0.000	0.20	0.02
2018 - 2019	0.2	0.01	0.2	0.01	0.0	0.00	0.00	0.000	0.20	0.02
2019 - 2020	0.2	0.01	0.2	0.01	0.0	0.00	0.00	0.000	0.20	0.02
2020 - 2021	0.2	0.01	0.2	0.01	0.0	0.00	0.00	0.000	0.20	0.02
Annual Average:									0.18	0.01

[1] ARB's emission standards for heavy duty engines

[2] ARB's emission standards for Urban Transit Bus

	NOx	PM
Annual Average reductions within the first 10 years:	0.16	0.01

NOx and HC Emission Reductions For A and B Bus Types
(Based on Gasoline to ULEV)
SCHOOL DISTRICTS & PRIVATE SCHOOLS WITH 15 OR MORE BUSES

Total Number of gasoline school Buses (Types A+B): 378
Total number of buses with chassis certified: 168
Total number of buses with engine certified: 210
School Bus Lifetime (years): 10
Total miles traveled per year: 11,395
Total emission reduction credits: 60%

NOx/ HC Stds For Chassis Certified (g/mile) = *33% x (phase-in %* MDV3 LEV NOx/HC std+phase-in % * MDV3 ULEV NOx/HC std)+*
33% x (phase-in %* MDV4 LEV NOx/HC std+phase-in % * MDV4 ULEV NOx/HC std)+
33% x (phase-in %* MDV5 LEV NOx/HC std+phase-in % * MDV5 ULEVNOx/HC std)

Δ Standards: (No. of chassis certified buses/Useful life) *(chassis Ems stds - Chassis ULEV Ems Stds) +
(No. of engine certified buses/Useful life) * (Engine Ems Stds - Engine ULEV Ems Stds) * 2.5 conversion factor

NOx & HC Ems (tons/yr) = 60%* (Delta Ems. Std.g/mile / 454 g/lb) * (total annual miles travelled) / 2000 lb/ton, OR

Table C-4A, Cumulative NOx & HC Emission Reductions Over 10 Years for Gasoline School Buses Operated by School Districts & Private Schools

	Annual Fleet Turn Over		Diesel/Gasoline [1] Chassis Certified		ULEV [2] (Chassis Certified)		Diesel/Gasoline [1] Engine Certified		ULEV [2] (Engine Certified)		Δ Standards [3]		Δ Emissions (60%)		Cumulative Emission reductions	
Calendar Year	Yearly	Cumulatively	Emission Standards		Emission Standards		Emission Standards		Emission Standards		NOx (g/mile)	HC (g/mile)	NOx (tons/yr)	HC (tons/yr)	NOx (tons/yr)	HC (tons/yr)
			NOx (g/mile)	HC (g/mile)	NOx (g/mile)	HC (g/mile)	NOx (g/bhp-hr)	HC (g/bhp-hr)	NOx (g/bhp-hr)	HC (g/bhp-hr)						
2001 - 2002	38	38	0.76	0.22	0.76	0.14	3.4	0.5	2.0	0.5	73.5	1.3	0.55	0.01	0.55	0.01
2002 - 2003	38	76	0.76	0.21	0.76	0.14	2.5	0.5	2.0	0.5	26.3	1.1	0.20	0.01	0.75	0.02
2003 - 2004	38	113	0.76	0.20	0.76	0.14	2.5	0.5	2.0	0.5	26.3	1.0	0.20	0.01	0.95	0.03
2004 - 2005	38	151	0.76	0.18	0.76	0.14	2.0	0.5	2.0	0.5	0.0	0.6	0.00	0.00	0.95	0.03
2005 - 2006	38	189	0.76	0.18	0.76	0.14	2.0	0.5	2.0	0.5	0.0	0.6	0.00	0.00	0.95	0.04
2006 - 2007	38	227	0.76	0.18	0.76	0.14	2.0	0.5	2.0	0.5	0.0	0.6	0.00	0.00	0.95	0.04
2007 - 2008	38	265	0.76	0.18	0.76	0.14	2.0	0.5	2.0	0.5	0.0	0.6	0.00	0.00	0.95	0.04
2008 - 2009	38	302	0.76	0.18	0.76	0.14	2.0	0.5	2.0	0.5	0.0	0.6	0.00	0.00	0.95	0.05
2009 - 2010	38	340	0.76	0.18	0.76	0.14	2.0	0.5	2.0	0.5	0.0	0.6	0.00	0.00	0.95	0.05
2010- 2011	**38**	**378**	**0.76**	**0.18**	**0.76**	**0.14**	**2.0**	**0.5**	**2.0**	**0.5**	**0.0**	**0.6**	**0.00**	**0.00**	**0.95**	**0.06**
Annual Average:															0.89	0.04

[1] **ARB's emission standards for medium duty LEV and ULEV vehicles based on following assumptions:**

Chassis Certified

Vehicle types (33% MDV3, 33% MDV4, and 33% MDV5)
Chasis Certified phase-in % : Year 2001 (80% LEV and 20% ULEV) ; Year 2002 (70% LEV and 30% ULEV)
Year 2003 (60% LEV and 40% ULEV) ; Year 2004 and after (40% LEV and 60% ULEV)

Engine Certified

Ems stds for NOx/HC are based on model years (100% tier 1 for year 2001, 100% LEV for year 2002, and 100% ULEV for year 2003 and after

[2] **ARB's emission standards for medium-duty ULEV vehicles**

[3] **Engine Certified standards are converted from g/bhp-hr to g/miles by multiplying the standards by 2.5 conversion factor**

NOx and HC Emission Reductions For A and B Bus Types
(Based on Gasoline to ULEV)

CONTRACTORS WITH 15 OR MORE BUSES

Total Number of gasoline school Buses (Types A+B): 38
Total number of buses with chassis certified: 12
Total number of buses with engine certified: 26
School Bus Lifetime (years): 10
Total miles traveled per year (miles/yr): 14,994
Total emission reduction credits: 60%

NOx/ HC Stds For Chassis Certified (g/mile) = *33% x (phase-in %* MDV3 LEV NOx/HC std+phase-in % * MDV3 ULEV NOx/HC std)+*
33% x (phase-in %* MDV4 LEV NOx/HC std+phase-in % * MDV4 ULEV NOx/HC std)+
33% x (phase-in %* MDV5 LEV NOx/HC std+phase-in % * MDV5 ULEVNOx/HC std)

Δ Standards: (No. of chassis certified buses/Useful life) *(chassis Ems stds - Chassis ULEV Ems Stds) +
(No. of engine certified buses/Useful life) * (Engine Ems Stds - Engine ULEV Ems Stds) * 2.5 conversion factor

NOx & HC Ems (tons/yr) = 60%* (Delta Ems. Std.g/mile / 454 g/lb) * (total annual miles travelled) / 2000 lb/ton, OR

Table C-4B, Cumulative NOx & HC Emission Reductions Over 10 Years for Gasoline School Buses Operated by Contractors

	Annual Fleet Turn Over		Diesel/Gasoline [1] Chassis Certified		ULEV [2] (Chassis Certified)		Diesel/Gasoline [1] Engine Certified		ULEV [2] (Engine Certified)		Δ Standards [3]		Δ Emissions (60%)		Cumulative Emission reductions	
Calendar Year	Yearly	Cumulatively	Emission Standards NOx (g/mile)	Emission Standards HC (g/mile)	Emission Standards NOx (g/mile)	Emission Standards HC (g/mile)	Emission Standards NOx (g/bhp-hr)	Emission Standards HC (g/bhp-hr)	Emission Standards NOx (g/bhp-hr)	Emission Standards HC (g/bhp-hr)	NOx (g/mile)	HC (g/mile)	NOx (tons/yr)	HC (tons/yr)	NOx (tons/yr)	HC (tons/yr)
2001 - 2002	4	4	0.76	0.22	0.76	0.14	3.4	0.5	2.0	0.5	9.1	0.1	0.09	0.001	0.09	0.001
2002 - 2003	4	8	0.76	0.21	0.76	0.14	2.5	0.5	2.0	0.5	3.3	0.1	0.03	0.001	0.12	0.002
2003 - 2004	4	11	0.76	0.20	0.76	0.14	2.5	0.5	2.0	0.5	3.3	0.1	0.03	0.001	0.15	0.002
2004 - 2005	4	15	0.76	0.18	0.76	0.14	2.0	0.5	2.0	0.5	0.0	0.0	0.00	0.000	0.15	0.003
2005 - 2006	4	19	0.76	0.18	0.76	0.14	2.0	0.5	2.0	0.5	0.0	0.0	0.00	0.000	0.15	0.003
2006 - 2007	4	23	0.76	0.18	0.76	0.14	2.0	0.5	2.0	0.5	0.0	0.0	0.00	0.000	0.15	0.004
2007 - 2008	4	27	0.76	0.18	0.76	0.14	2.0	0.5	2.0	0.5	0.0	0.0	0.00	0.000	0.15	0.004
2008 - 2009	4	30	0.76	0.18	0.76	0.14	2.0	0.5	2.0	0.5	0.0	0.0	0.00	0.000	0.15	0.005
2009 - 2010	4	34	0.76	0.18	0.76	0.14	2.0	0.5	2.0	0.5	0.0	0.0	0.00	0.000	0.15	0.005
2010- 2011	4	**38**	**0.76**	**0.18**	**0.76**	**0.14**	**2.0**	**0.5**	**2.0**	**0.5**	**0.0**	**0.0**	**0.00**	**0.000**	**0.15**	**0.006**
Annual Average:															0.14	0.003

	Gasoline to ULEV		Diesel to ULEV		Total	
	NOx	HC	NOx	HC	NOx	HC
Annual Average reductions from school districts buses within the first 10 years:	0.89	0.037	4.18	0.05	5.07	0.09
Annual Average reductions from contract buses within the first 10 years:	0.14	0.003	12.50	0.22	12.64	0.23
Annual Average reductions from both districts & contract buses within the first 10 years:	**1.03**	**0.040**	**16.68**	**0.27**	**17.71**	**0.32**

NOx and HC Emission Reductions For A and B Bus Types
(Based on Diesel toULEV)

SCHOOL DISTRICTS & PRIVATE SCHOOLS WITH 15 OR MORE BUSES

Total Number of diesel school Buses (Types A+B): 1013
` Total number of buses with chassis certified: 198
Total number of buses with engine certified: 815
School Bus Lifetime (years): 10
Total miles traveled per year: 13,798
Total emission reduction credits: 60%

NOx/ HC Stds For Chassis Certified (g/mile) = *33% x (phase-in %* MDV3 LEV NOx/HC std+phase-in % * MDV3 ULEV NOx/HC std)+*
33% x (phase-in %* MDV4 LEV NOx/HC std+phase-in % * MDV4 ULEV NOx/HC std)+
33% x (phase-in %* MDV5 LEV NOx/HC std+phase-in % * MDV5 ULEVNOx/HC std)

Δ Standards: (No. of chassis certified buses/Useful life) *(chassis Ems stds - Chassis ULEV Ems Stds) +
(No. of engine certified buses/Useful life) * (Engine Ems Stds - Engine ULEV Ems Stds) * 2.5 conversion factor

NOx & HC Ems (tons/yr) = 60% * (Delta Ems. Std.g/mile / 454 g/lb) * (total annual miles travelled) / 2000 lb/ton, OR

Table C-5A, Cumulative NOx & HC Emission Reductions Over 10 Years for Diesel School Buses Operated by School Districts & Private Schools

	Annual Fleet Turn Over		Diesel/Gasoline [1] Chassis Certified		ULEV [2] (Chassis Certified)		Diesel/Gasoline [1] Engine Certified		ULEV [2] (Engine Certified)		Δ Standards [3]		Δ Emissions (60%)		Cumulative Emission reductions	
Calendar Year	Yearly	Cumulatively	Emission Standards		Emission Standards		Emission Standards		Emission Standards							
			NOx (g/mile)	HC (g/mile)	NOx (g/mile)	HC (g/mile)	NOx (g/bhp-hr)	HC (g/bhp-hr)	NOx (g/bhp-hr)	HC (g/bhp-hr)	NOx (g/mile)	HC (g/mile)	NOx (tons/yr)	HC (tons/yr)	NOx (tons/yr)	HC (tons/yr)
2001 - 2002	101	101	0.76	0.22	0.76	0.14	3.4	0.5	2.0	0.5	285.3	1.5	2.60	0.01	2.60	0.01
2002 - 2003	101	203	0.76	0.21	0.76	0.14	2.5	0.5	2.0	0.5	101.9	1.3	0.93	0.01	3.53	0.03
2003 - 2004	101	304	0.76	0.20	0.76	0.14	2.5	0.5	2.0	0.5	101.9	1.1	0.93	0.01	4.46	0.04
2004 - 2005	101	405	0.76	0.18	0.76	0.14	2.0	0.5	2.0	0.5	0.0	0.8	0.00	0.01	4.46	0.04
2005 - 2006	101	507	0.76	0.18	0.76	0.14	2.0	0.5	2.0	0.5	0.0	0.8	0.00	0.01	4.46	0.05
2006 - 2007	101	608	0.76	0.18	0.76	0.14	2.0	0.5	2.0	0.5	0.0	0.8	0.00	0.01	4.46	0.06
2007 - 2008	101	709	0.76	0.18	0.76	0.14	2.0	0.5	2.0	0.5	0.0	0.8	0.00	0.01	4.46	0.06
2008 - 2009	101	810	0.76	0.18	0.76	0.14	2.0	0.5	2.0	0.5	0.0	0.8	0.00	0.01	4.46	0.07
2009 - 2010	101	912	0.76	0.18	0.76	0.14	2.0	0.5	2.0	0.5	0.0	0.8	0.00	0.01	4.46	0.08
2010- 2011	**101**	**1013**	**0.76**	**0.18**	**0.76**	**0.14**	**2.0**	**0.5**	**2.0**	**0.5**	**0.0**	**0.8**	**0.00**	**0.01**	**4.46**	**0.08**
Annual Average:															4.18	0.05

[1] **ARB's emission standards for medium duty LEV and ULEV vehicles based on following assumptions:**

Chassis Certified

Vehicle types (33% MDV3, 33% MDV4, and 33% MDV5)
Chasis Certified phase-in % : Year 2001 (80% LEV and 20% ULEV) ; Year 2002 (70% LEV and 30% ULEV)
Year 2003 (60% LEV and 40% ULEV) ; Year 2004 and after (40% LEV and 60% ULEV)

Engine Certified

Ems stds for NOx/HC are based on model years (100% tier 1 for year 2001, 100% LEV for year 2002, and 100% ULEV for year 2003 and after

[2] **ARB's emission standards for medium-duty ULEV vehicles**

[3] **Engine Certified standards are converted from g/bhp-hr to g/miles by multiplying the standards by 2.5 conversion factor**

NOx and HC Emission Reductions For A and B Bus Types
(Based on Diesel to ULEV)

CONTRACTORS WITH 15 OR MORE BUSES

Total Number of diesel school Buses (Types A+B): 2656
Total number of buses with chassis certified: 682
Total number of buses with engine certified: 1974
School Bus Lifetime (years): 10
Total miles traveled per year (miles/yr): 17,034
Total emission reduction credits: 60%

NOx/ HC Stds For Chassis Certified (g/mile) = *33% x (phase-in %* MDV3 LEV NOx/HC std+phase-in % * MDV3 ULEV NOx/HC std)+*
33% x (phase-in %* MDV4 LEV NOx/HC std+phase-in % * MDV4 ULEV NOx/HC std)+
33% x (phase-in %* MDV5 LEV NOx/HC std+phase-in % * MDV5 ULEVNOx/HC std)

ΔStandards: (No. of chassis certified buses/Useful life) *(chassis Ems stds - Chassis ULEV Ems Stds) +
(No. of engine certified buses/Useful life) * (Engine Ems Stds - Engine ULEV Ems Stds) * 2.5 conversion factor

NOx & HC Ems (tons/yr) = 60% * (Delta Ems. Std.g/mile / 454 g/lb) * (total annual miles travelled) / 2000 lb/ton, OR

Table C-5B, Cumulative NOx & HC Emission Reductions Over 10 Years for Diesel School Buses Operated by Contractors

	Annual Fleet Turn Over		Diesel/Gasoline [1] Chassis Certified		ULEV [2] (Chassis Certified)		Diesel/Gasoline [1] Engine Certified		ULEV [2] (Engine Certified)		Δ Standards		Δ Emissions (60%)		Cumulative Emission reductions	
Calendar Year	Yearly	Cumulatively	Emission Standards NOx (g/mile)	Emission Standards HC (g/mile)	Emission Standards NOx (g/mile)	Emission Standards HC (g/mile)	Emission Standards NOx (g/bhp-hr)	Emission Standards HC (g/bhp-hr)	Emission Standards NOx (g/bhp-hr)	Emission Standards HC (g/bhp-hr)	NOx (g/mile)	HC (g/mile)	NOx (tons/yr)	HC (tons/yr)	NOx (tons/yr)	HC (tons/yr)
2001 - 2002	266	266	0.76	0.22	0.76	0.14	3.4	0.5	2.0	0.5	690.9	5.2	7.78	0.059	7.78	0.059
2002 - 2003	266	531	0.76	0.21	0.76	0.14	2.5	0.5	2.0	0.5	246.8	4.6	2.78	0.051	10.55	0.110
2003 - 2004	266	797	0.76	0.20	0.76	0.14	2.5	0.5	2.0	0.5	246.8	3.9	2.78	0.044	13.33	0.154
2004 - 2005	266	1062	0.76	0.18	0.76	0.14	2.0	0.5	2.0	0.5	0.0	2.6	0.00	0.029	13.33	0.184
2005 - 2006	266	1328	0.76	0.18	0.76	0.14	2.0	0.5	2.0	0.5	0.0	2.6	0.00	0.03	13.33	0.213
2006 - 2007	266	1594	0.76	0.18	0.76	0.14	2.0	0.5	2.0	0.5	0.0	2.6	0.00	0.03	13.33	0.242
2007 - 2008	266	1859	0.76	0.18	0.76	0.14	2.0	0.5	2.0	0.5	0.0	2.6	0.00	0.03	13.33	0.272
2008 - 2009	266	2125	0.76	0.18	0.76	0.14	2.0	0.5	2.0	0.5	0.0	2.6	0.00	0.03	13.33	0.301
2009 - 2010	266	2390	0.76	0.18	0.76	0.14	2.0	0.5	2.0	0.5	0.0	2.6	0.00	0.03	13.33	0.331
2010- 2011	266	**2656**	**0.76**	**0.18**	**0.76**	**0.14**	**2.0**	**0.5**	**2.0**	**0.5**	**0.0**	**2.6**	**0.00**	**0.03**	**13.33**	**0.360**
Annual Average:															12.50	0.223

	Diesel to ULEV		Gasoline to ULEV		Total	
	NOx	HC	NOx	HC	NOx	HC
Annual Average reductions from school districts buses within the first 10 years:	4.18	0.05	0.89	0.037	5.07	0.09
Annual Average reductions from contract buses within the first 10 years:	12.50	0.22	0.14	0.003	12.64	0.23
Annual Average reductions from both districts & contract buses within the first 10 years:	**16.68**	**0.27**	**1.03**	**0.040**	**17.71**	**0.32**

NOx and PM Emission Reductions For A and B Bus Types
(Based on Diesel to ULEV)

SCHOOL DISTRICTS & PRIVATE SCHOOLS WITH 50 OR MORE BUSES

Total Number of diesel school Buses (Types A+B): 1013
Total number of buses with chassis certified: 198
Total number of buses with engine certified: 815
School Bus Lifetime (years): 10
Total miles traveled per year: 13,798
Total emission reduction credits: 60%

NOx/ PM Stds For Chassis Certified (g/mile) = *33% x (phase-in %* MDV3 LEV NOx/PM std+phase-in % * MDV3 ULEV NOx/PM std)+*
33% x (phase-in %* MDV4 LEV NOx/PM std+phase-in % * MDV4 ULEV NOx/PM std)+
33% x (phase-in %* MDV5 LEV NOx/PM std+phase-in % * MDV5 ULEVNOx/PM std)

1 Standards: (No. of chassis certified buses/Useful life) *(chassis Ems stds - Chassis ULEV Ems Stds) +
(No. of engine certified buses/Useful life) * (Engine Ems Stds - Engine ULEV Ems Stds) * 2.5 conversion factor

NOx & PM Ems (tons/yr) = 60% * (Delta Ems. Std.g/mile / 454 g/lb) * (total annual miles travelled) / 2000 lb/ton, OR

Table C-6A, Cumulative NOx & PM Emission Reductions Over 10 Years for Diesel School Buses Operated by School Districts & Private Schools

	Annual Fleet Turn Over		Diesel/Gasoline [1] Chassis Certified		ULEV [2] (Chassis Certified)		Diesel/Gasoline [1] Engine Certified		ULEV [2] (Engine Certified)		ΔStandards [3]		Δ Emissions (60%)		Cumulative Emission reductions	
Calendar Year	Yearly	Cumu-latively	Emission Standards		Emission Standards		Emission Standards		Emission Standards		NOx (g/mile)	PM (g/mile)	NOx (tons/yr)	PM (tons/yr)	NOx (tons/yr)	PM (tons/yr)
			NOx (g/mile)	PM (g/mile)	NOx (g/mile)	PM (g/mile)	NOx (g/bhp-hr)	PM (g/bhp-hr)	NOx (g/bhp-hr)	PM (g/bhp-hr)						
2001 - 2002	101	101	0.76	0.11	0.76	0.06	3.4	0.10	2.0	0.10	285.3	1.0	2.60	0.01	2.60	0.01
2002 - 2003	101	203	0.76	0.10	0.76	0.06	2.5	0.10	2.0	0.10	101.9	0.8	0.93	0.01	3.53	0.02
2003 - 2004	101	304	0.76	0.10	0.76	0.06	2.5	0.10	2.0	0.10	101.9	0.7	0.93	0.01	4.46	0.02
2004 - 2005	101	405	0.76	0.08	0.76	0.06	2.0	0.10	2.0	0.10	0.0	0.5	0.00	0.00	4.46	0.03
2005 - 2006	101	507	0.76	0.08	0.76	0.06	2.0	0.10	2.0	0.10	0.0	0.5	0.00	0.00	4.46	0.03
2006 - 2007	101	608	0.76	0.08	0.76	0.06	2.0	0.10	2.0	0.10	0.0	0.5	0.00	0.00	4.46	0.04
2007 - 2008	101	709	0.76	0.08	0.76	0.06	2.0	0.10	2.0	0.10	0.0	0.5	0.00	0.00	4.46	0.04
2008 - 2009	101	810	0.76	0.08	0.76	0.06	2.0	0.10	2.0	0.10	0.0	0.5	0.00	0.00	4.46	0.04
2009 - 2010	101	912	0.76	0.08	0.76	0.06	2.0	0.10	2.0	0.10	0.0	0.5	0.00	0.00	4.46	0.05
2010- 2011	**101**	**1013**	**0.76**	**0.08**	**0.76**	**0.06**	**2.0**	**0.10**	**2.0**	**0.10**	**0.0**	**0.5**	**0.00**	**0.00**	**4.46**	**0.05**
Annual Average:															4.18	0.03

[1] **ARB's emission standards for medium duty LEV and ULEV vehicles based on following assumptions:**

Chassis Certified

Vehicle types (33% MDV3, 33% MDV4, and 33% MDV5)
Chasis Certified phase-in % : Year 2001 (80% LEV and 20% ULEV) ; Year 2002 (70% LEV and 30% ULEV)
Year 2003 (60% LEV and 40% ULEV) ; Year 2004 and after (40% LEV and 60% ULEV)

Engine Certified

Ems stds for NOx/PM are based on model years (100% tier 1 for year 2001, 100% LEV for year 2002, and 100% ULEV for year 2003 and after

[2] **ARB's emission standards for medium-duty ULEV vehicles**

[3] **Engine Certified standards are converted from g/bhp-hr to g/miles by multiplying the standards by 2.5 conversion factor**

NOx and PM Emission Reductions For A and B Bus Types
(Based on Diesel to ULEV)
CONTRACTORS WITH 50 OR MORE BUSES

Total Number of diesel school Buses (Types A+B): 2656
Total number of buses with chassis certified: 682
Total number of buses with engine certified: 1974
School Bus Lifetime (years): 10
Total miles traveled per year (miles/yr): 17,034
Total emission reduction credits: 60%

NOx/ PM Stds For Chassis Certified (g/mile) = *33% x (phase-in %* MDV3 LEV NOx/PM std+phase-in % * MDV3 ULEV NOx/PM std)+*
33% x (phase-in %* MDV4 LEV NOx/PM std+phase-in % * MDV4 ULEV NOx/PM std)+
33% x (phase-in %* MDV5 LEV NOx/PM std+phase-in % * MDV5 ULEVNOx/PM std)

1 Standards: (No. of chassis certified buses/Useful life) *(chassis Ems stds - Chassis ULEV Ems Stds) +
(No. of engine certified buses/Useful life) * (Engine Ems Stds - Engine ULEV Ems Stds) * 2.5 conversion factor

NOx & PM Ems (tons/yr) = 60% * (Delta Ems. Std.g/mile / 454 g/lb) * (total annual miles travelled) / 2000 lb/ton, OR

Table C-6B, Cumulative NOx & PM Emission Reductions Over 10 Years for Diesel School Buses Operated by Contractors

	Annual Fleet Turn Over		Diesel/Gasoline [1] Chassis Certified		ULEV [2] (Chassis Certified)		Diesel/Gasoline [1] Engine Certified		ULEV [2] (Engine Certified)		Δ Standards		Δ Emissions (60%)		Cumulative Emission reductions	
Calendar Year	Yearly	Cumu-latively	Emission Standards		Emission Standards		Emission Standards		Emission Standards		NOx (g/mile)	PM (g/mile)	NOx (tons/yr)	PM (tons/yr)	NOx (tons/yr)	PM (tons/yr)
			NOx (g/mile)	PM (g/mile)	NOx (g/mile)	PM (g/mile)	NOx (g/bhp-hr)	PM (g/bhp-hr)	NOx (g/bhp-hr)	PM (g/bhp-hr)						
2001 - 2002	266	266	0.76	0.11	0.76	0.06	3.4	0.10	2.0	0.10	690.9	3.3	7.78	0.037	7.78	0.037
2002 - 2003	266	531	0.76	0.10	0.76	0.06	2.5	0.10	2.0	0.10	246.8	2.8	2.78	0.032	10.55	0.069
2003 - 2004	266	797	0.76	0.10	0.76	0.06	2.5	0.10	2.0	0.10	246.8	2.4	2.78	0.027	13.33	0.097
2004 - 2005	266	1062	0.76	0.08	0.76	0.06	2.0	0.10	2.0	0.10	0.0	1.6	0.00	0.018	13.33	0.115
2005 - 2006	266	1328	0.76	0.08	0.76	0.06	2.0	0.10	2.0	0.10	0.0	1.6	0.00	0.02	13.33	0.133
2006 - 2007	266	1594	0.76	0.08	0.76	0.06	2.0	0.10	2.0	0.10	0.0	1.6	0.00	0.02	13.33	0.151
2007 - 2008	266	1859	0.76	0.08	0.76	0.06	2.0	0.10	2.0	0.10	0.0	1.6	0.00	0.02	13.33	0.169
2008 - 2009	266	2125	0.76	0.08	0.76	0.06	2.0	0.10	2.0	0.10	0.0	1.6	0.00	0.02	13.33	0.188
2009 - 2010	266	2390	0.76	0.08	0.76	0.06	2.0	0.10	2.0	0.10	0.0	1.6	0.00	0.02	13.33	0.206
2010- 2011	266	**2656**	**0.76**	**0.08**	**0.76**	**0.06**	**2.0**	**0.10**	**2.0**	**0.10**	**0.0**	**1.6**	**0.00**	**0.02**	**13.33**	**0.224**
Annual Average:															12.50	0.139

	Diesel to ULEV			Gasoline to ULEV		Total		
	NOx	PM	HC	NOx	HC	NOx	PM	HC
Annual Ave. reductions from school districts buses within the first 10 years:	4.18	0.033	0.05	0.89	0.037	5.07	0.033	0.089
Annual Ave. reductions from contract buses within the first 10 years:	12.50	0.139	0.22	0.14	0.003	12.64	0.139	0.226
Ann. Ave. red. from both districts & contract buses within the first 10 years:	**16.68**	**0.172**	**0.27**	**1.03**	**0.040**	**17.71**	**0.172**	**0.315**

This appendix has been deleted since proposed future emission standards have been adopted by the U.S. EPA

APPENDIX D

EXAMPLE OF ENGINE AND VEHICLE MODEL AVAILABILITY FOR MODEL YEAR 2000

ENGINE AND VEHICLE MODEL AVAILABILITY

Followings are examples of heavy-duty CNG fueled school buses available for model year 2000.

~~Manufacturer~~	~~Engine~~	~~Horse-power~~	~~Max Torque~~	~~Estimated Incremental Cost New~~	~~Length~~	~~Passenger~~
~~Blue Bird~~	~~Cummins 5.9~~	~~230~~	~~500~~	~~25,000-30,000~~	~~27-34~~	~~54-72~~
~~Blue Bird~~	~~John Deere 8.1L~~	~~250~~	~~800~~	~~36,000~~	~~35-40~~	~~66-84~~
~~Thomas Built ER~~	~~John Deere 8.1L~~	~~250~~	~~800~~	~~35,000-38,000~~	~~40~~	~~84~~
~~Thomas Built ER~~	~~Cummins 8.3L~~	~~250~~	~~660~~	~~30,000~~	~~40~~	~~84~~

Original Equipment Manufacturer	Engine	Horsepower	Max. Torque (ft-lb)	Incremental Cost	Length	Passengers
Bluebird	John Deere 8.1L	250	800	30,000	40	84
Bluebird	John Deere 6.8L	225	640	27,000	27 - 35	54 - 78
Bluebird	Cummins 5.9L	230	500	25,000 to 30,000	27 - 37	54 - 72
ThomasBuilt	John Deere 8.1L	250	800	35,000	40	84
ThomasBuilt	Cummins 8.3L	250	750	40,000	40	84
ThomasBuilt	John Deere 8.1L	250	800	35,000	36	72 - 78
ThomasBuilt	John Deere 8.1L	250	800	35,000	32	54 - 66

Medium-Duty School Buses

Original Equipment Manufacturer	Engine	Fuel Type	Incremental Cost	Maximun Passengers
U.S. Bus	GM 5.7L	CNG	17,900	22
Bluebird	Ford 5.4L	CNG	15,000	20
ThomasBuilt	Ford 5.4L	CNG	15,000	20
Collins	Ford 5.4L	Gasoline	(4,000)	18