

**PART C**

**PUBLIC COMMENTS AND ARB/OEHHA STAFF RESPONSES TO  
PART A AND PART B  
OF THE PROPOSED IDENTIFICATION OF DIESEL EXHAUST  
AS A TOXIC AIR CONTAMINANT REPORT**

*AS APPROVED BY THE SCIENTIFIC REVIEW PANEL  
ON APRIL 22, 1998*

Prepared by the Staffs of the Air Resources Board and the  
Office of Environmental Health Hazard Assessment

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## **Part C**

### **Summary of Comments Received and our Responses on the February 1998 SRP Version of the Diesel Exhaust Part A Report**

#### **Public Comments in Support of the Diesel Exhaust Identification**

Steve Soriano, March 27, 1998

Robert McCoy, April 5, 1998

Madyln Creekmore for the GreenBelt Committee, April 8, 1998

Mary Barnish, April 10, 1998

South Coast Water Management Project, April 10, 1998

Donald B. Brown, April 23, 1998

Mary J. Landers, April 24, 1998

Sonia Sperling, April 24, 1998

Dr. Michael G. Gruning, April 30, 1998

**1. Comment:** Commentors support the ARB's proposal to list diesel exhaust as a TAC.

**Response:** We acknowledge your comment.

## **American Trucking Association**

Allen R. Schaeffer, April 11, 1998

**1. Comment:** The proposed listing of whole diesel exhaust as a TAC is misguided. The logic to listing an entire mixture without proper identification of the compound(s) that are alleged to cause an increased risk thoroughly fails to consider the ramifications of the listing and the control strategies (risk management) that would evolve from such a listing.

**Response:** Under state law, the Air Resources Board is to identify a substance as a toxic air contaminant if it determines the substance is “an air pollutant which may cause or contribute to an increase in mortality or and increase in serious illness, or which may pose a present or potential hazard to human health (Health and Safety Code section 39655).” Under this same law, an air contaminant means “any discharge, release, or other propagation into the atmosphere and includes, but is not limited to, smoke, charred paper, dust, soot, grime, carbon, fumes, odor, particulate matter, acids, or any combination thereof (Health and Safety Code section 39013).” The ARB has already identified groups of substances such as chlorinated dioxins and dibenzofurans as well as several other groups of substances that are listed as TACs by the ARB and hazardous air pollutants by the U.S. EPA (Part A, Chapter III, Section C, Table III-1).

In our review of diesel exhaust, we are examining the overall toxicity of the exhaust. The reason we are doing this is because the exposure experienced in most health studies, particularly the human studies, has been to the overall exhaust. The International Agency for Research on Cancer, the National Institute for Occupational Safety and Health, and the United States Environmental Protection Agency have also evaluated diesel exhaust in this way. Until more research is done to identify specific causes of toxicity in diesel exhaust, we believe this approach provides the best public health protection.

We have also made it clear that our exposure analysis is based primarily on exposures to diesel exhaust particulate matter in the Executive Summary (pages ES-7, ES-11, and ES-12) and in Part A (Chapter I, Chapter IV, Section C, and Chapter V, Section A).

**2. Comment:** ATA is concerned that the Scientific Review Panel (SRP) and OEHHA are moving forward irrespective of current science, without regard for industry-raised concerns and questions about the supporting science for listing diesel exhaust. Changes addressed in their comments are needed to have a scientifically defensible document.

**Response:** The SRP and OEHHA are proceeding based upon sound scientific knowledge, methods, and practices. Overall, by statute, the ARB and the OEHHA are responsible for protection of public health in California. Implementation of this charge follows a set procedure of checks and balances, using the best science available in a full and open public process. The OEHHA staff has implemented the statutory requirements appropriately in providing a written document for public and peer review that has been subjected to three comment periods, three workshops, and two scientific meetings. This is consistent with procedures used by reputed

scientific journals that publish scientific analyses. The March 11, 1998, SRP meeting provided a record of key scientists' dialogue on the science. The OEHHA has also provided in written form, for review and criticism from any interested party, descriptions of studies, references made, conclusions drawn, and indicated where uncertainty exists. Ultimately, the SRP determines if the OEHHA relied on sound science. National and international scientific organizations such as the World Health Organization, National Institute of Occupational Safety and Health, and the International Agency for Research on Cancer have reached conclusions similar to those expressed in the draft report. The SRP receives information throughout the process and may comment at any time, as well as to provide guidance to the staff based on their area of expertise.

**3. Comment:** The Legislature has granted authority to the Scientific Review Panel to make findings and recommendations on individual elements, chemicals or compounds, not for mixtures as found in diesel exhaust.

**Response:** See response to comment #1.

**4. Comment:** Why is the combustion product from diesel exhaust markedly different from other combustion products? The approach focuses on a source as opposed to individual substances within the complex mixture.

**Response:** This comment is beyond the scope of the State's program to identify potential air toxics as toxic air contaminants. See response to American Trucking Associations comment #1, April 11, 1998.

**5. Comment:** The chemical composition of diesel exhaust is 99.9 percent oxygen, nitrogen, carbon dioxide, and water vapor. Indeed, even if diesel exhaust evolved to be 100 percent oxygen, nitrogen, and water vapor and carbon dioxide, it would still be diesel exhaust, and would be toxic under ARB/OEHHA's proposal. A listing as whole diesel exhaust fails to consider the ramifications and impacts on risk management decisions.

**Response:** In the February 1998 draft report we added language to the report to enhance our discussion on the composition of diesel exhaust and to acknowledge that the primary gaseous components of the exhaust are carbon dioxide, water vapor, nitrogen, and oxygen in the Executive Summary (page ES-6) and in Part A (Chapter I and Chapter III, Sections A and C). The report specifically focuses on exposures to fine diesel exhaust particulate matter because of its measurability and its potential for carrying many toxic components of the exhaust. However, the exposure actually experienced in most health studies, particularly the human studies, has been to the overall exhaust. Until more research is done to identify the specific causes of toxicity in diesel exhaust, the identification of whole diesel exhaust is consistent with the basis of health studies.

**6. Comment:** The OEHHA draft fails to account for the use of new engine technology and reformulated fuels in California.

**Response:** The exposure assessment portion of the report is written by the ARB, and thus, the ARB will respond to this comment. The final draft report incorporates the findings presented in the CE-CERT report. In addition, our exposure analysis includes estimates of future exposures and has been adjusted to account for the emission reductions expected from adopted engine emission standards and fuel reformulation.

**7. Comment:** To what extent have members of the Scientific Review Panel become contributing authors of the revised draft report as opposed to “independent” peer reviewers?

**Response:** Members of the SRP are free to comment or provide guidance to staff throughout the process based on their area of expertise.

## **Asphalt Pavement Association**

Stephen P. Piatek, April 10, 1998

**1. Comment:** APA believes that the listing of diesel exhaust as a TAC could have a significant impact on our members because of the potential Proposition 65 litigation.

**Response:** The ARB's identification of diesel exhaust as a toxic air contaminant would not create any new liabilities for industry. Diesel exhaust was listed in 1990 as a chemical known to the State to cause cancer pursuant to the Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65). This listing was in large part based on the International Agency for Research on Cancer (IARC) finding that diesel exhaust is a probable human carcinogen. This longstanding Proposition 65 listing of diesel exhaust is the basis of some lawsuits against diesel fleet operators, largely because of public notice failures. These Proposition 65-based lawsuits allege that fleet operators failed to warn the public of significant diesel exhaust exposures and seek penalties for this alleged failure. Lawsuits have already been filed and prosecuted in the absence of a TAC listing for diesel exhaust.

**2. Comment:** APA believes that ARB should not identify whole diesel exhaust as a TAC, and should focus on specific chemicals which cause the toxicity.

**Response:** See response to American Trucking Association's comment #1, April 11, 1998.

**3. Comment:** OEHHA's use of 30-year old epidemiological data creates a fatal flaw in OEHHA's analysis. The composition of the fuel and the technology advancements of today's engines is fundamentally different from diesel fuel and engines 30 years ago.

**Response:** OEHHA's assessment of carcinogenic risk from exposures to diesel exhaust accounted for the higher exposures as a result of older engines and fuels. ARB's exposure assessment has been adjusted to account for the emission reductions expected from current and future engine emission standards and reformulated fuel regulations.

**4. Comment:** The listing of diesel exhaust based upon its carbon content, rather than specific chemicals is unscientific and inappropriate. The engines and fuel have changed substantially the combustion characteristics of "old diesel fuel." The listing of generic diesel exhaust as a TAC is tantamount in banning diesel engines, because the only method to eliminate diesel exhaust is to eliminate diesel engines.

**Response:** In our review of diesel exhaust, we are examining the overall toxicity of the exhaust. The reason we are doing this is because the exposure experienced in most health studies, particularly the human studies, has been to the overall exhaust. The International Agency for Research on Cancer, the National Institute for Occupational Safety and Health, and the United States Environmental Protection Agency have also evaluated diesel exhaust in this way. Until

more research is done to identify specific causes of toxicity in diesel exhaust, we believe this approach provides the best public health protection.

We have funded a study with the College of Engineering, Center for Environmental Research and Technology, at the University of California, Riverside (CE-CERT), to characterize the differences in chemical composition of diesel exhausts from using “old” pre-1993 (before Federal and State diesel fuel reformulation regulations were implemented) diesel fuel and from “new” post-1993 diesel fuels. The results indicate that although there are reductions in mass emissions from some of the exhaust components, the chemical compound speciation profile is similar. The final draft report incorporates the findings presented in the CE-CERT report. In addition, our exposure analysis includes estimates of future exposures and does account for emission reductions achieved by adopted engine emission standards and fuel reformulations.

If identified as a TAC, a report will be done to evaluate the need for additional controls to reduce the risks from exposures to diesel exhaust. A ban on diesel engines and fuels is not an option we would consider.

To ensure full opportunity for public consultation and participation in the needs assessment process, the ARB staff intends to create a diesel exhaust risk management working group (working group). Invitations to participate would be sent to interested industries, associations, environmental groups, other governmental agencies such as the U.S. EPA and air districts, and other interested parties.

The working group would advise the ARB staff and serve as a forum for on-going communication, cooperation, and coordination in the identification of additional opportunities to reduce further emissions from diesel engines. Meetings of the group would be publicly noticed and the meetings would be open to all. We intend to hold an initial organizational meeting of the working group this fall.

**5. Comment:** Overall, the APA believes listing diesel exhaust as a TAC will have a negative effect on California’s economy, provide little environmental benefit, cause litigation, and in addition, believes the evaluation is fundamentally flawed.

**Response:** The identification of diesel exhaust as a TAC would not require any action or requirement for any private person or business. The identification of a substance is a listing process; no controls are proposed. If diesel exhaust is identified as a TAC, it would then enter the risk management phase. In the risk management phase, the need and appropriate degree of control for diesel exhaust is considered including all costs of compliance. Public outreach is an essential element in the development of a control plan and any control measures. In the course of this assessment, the ARB works with local districts and holds numerous public workshops and individual meetings with industry representatives and other interested parties in an open public process.



C-ARB-7

## **Association of American Railroads**

Michael J. Rush, March 30, 1998

**1. Comment:** The ARB draft report is written from a biased perspective, “aimed at establishing a foundation to support a preconceived conclusion about the health effects of diesel exhaust.” The agencies refuse to recognize the evidence does not support the conclusion the agencies strive for. The OEHHA and ARB are not compelled to quantify the risk and should not proceed with a risk assessment. AAR is deeply disturbed by the impression that ARB is an advocate for a preordained result which AAR feels is inappropriate for a government agency.

**Response:** See response to American Trucking Association, comment No. 2, April 11, 1998.

## California Chamber of Commerce

Kelly Jensen, April 13, 1998

**1. Comment:** The Chamber requests that the SRP recommendation afford the greatest latitude to the policy making body, the ARB, and suggests that making no recommendation as to the risk assessment may best accomplish this.

**Response:** State law requires the SRP to review the scientific procedures and methods used to support the data, the data itself, and the conclusions and assessments on which the report is based. The SRP is required to determine whether the risk assessment meets certain statutory requirements. This would include, according to State law, the range of risks resulting from current or anticipated exposure that OEHH shall determine in cases where there is no threshold of significant adverse health effects.

**2. Comment:** The Chamber questions if listing diesel exhaust as a TAC will lead to more Proposition 65 lawsuits if a risk factor greater than one in 100,000 is recommended.

**Response:** See response to comment # 1 from the Asphalt Pavement Association, April 10, 1998.

**3. Comment:** The Chamber suggests that “the SRP should wait until the Federal Environmental Protection Agency takes final action and completes its risk assessment process regarding the relationship between diesel exhaust and lung cancer.”

**Response:** Diesel exhaust was entered into the identification process in 1989. We’ve followed the process outlined in the law, and therefore, there is no need to wait for the federal government. The Health and Safety Code Section 39650(e) clearly states that while absolute and undisputed scientific evidence may not be available to determine the exact nature and extent of risk from toxic air contaminants, it is necessary to take action to protect public health. Also, see response to the American Trucking Association’s comment #2, April 11, 1998.

## **California Trucking Association**

Stephanie R. Williams, March 20, 1998

**1. Comment:** The California Trucking Association requested a 30-day extension to the March 30, 1998, comment deadline, and asks that the next meeting with the Scientific Review Panel be held at a facility with ample parking for owners and employees of minority business enterprises.

**Response:** The close of the comment period for the draft SRP version of the report was March 30, 1998. We also had indicated we would accept public comments on the discussions held at the March 11, 1998, SRP meeting up to Monday, April 13, 1998. Due to some confusion and misunderstanding over these deadlines, we also extended the deadline to comment on the report to April 13, 1998. The transcript from the March 11, 1998, meeting was made available to review for a reasonable amount of time; because of this, an extension beyond the April 13, 1998, wasn't provided. Even with the extension to April 13, 1998, time was allowed for the all of the comments to be considered by the SRP prior to its April 22, 1998, meeting.

The diesel report has been under development for nine years, with three public comment periods and four public briefings. It contains an extensive discussion of the science, and summarizes and responds to all comments submitted during each comment period. All comments received during the current comment period will be treated in the same manner. The current revised draft report and comment period is in response to comments received on the previous draft report.

The next SRP meeting, scheduled for April 22, 1998, is being held at the South San Francisco Convention Center in Burlingame, California. This location provides plenty of parking and is located close to the airport to allow those traveling by plane easy access. There is no permit parking for this location. If there are special requests, such as those requiring assistance because of a disability, the ARB has, and will continue, to accommodate any special needs.

## **California Trucking Association**

Stephanie Williams, April 13, 1998

**1. Comment:** The carcinogenic compounds allegedly found in diesel exhaust are not documented by their % volume in the fuel and especially the percent of exhaust emitted into the ambient air. It is important to quantify the exposure from these chemicals as well as whether a threshold was calculated for each of the chemicals.

**Response:** See response to American Trucking Association's comment #1, April 11, 1998.

**2. Comment:** "The most controversial portion of the Draft Report is the meta-analysis, prepared under contract by Dr. A.H. Smith, a UC professor on the staff of UC Berkeley, School of Public Health."

**Response:** Dr. A.H. Smith did not prepare the meta-analysis referred to in the comment.

**3. Comment:** Overall, the California Trucking Association asserts that the OEHHA has been guilty of omitting studies, circumventing the independence of outside researchers, reaching fallacious conclusions, and altered and exaggerated data.

**Response:** See American Trucking Associations: Response to Comment # 2, April 11, 1998.

**4. Comment:** Although OEHHA has printed throughout the Draft Report "Do not quote or cite", OEHHA refers to other documents and conversations that are not public information.

**Response:** We use the term "Do not quote or cite" because the document has not been officially approved by the Scientific Review Panel or the Air Resources Board. This is standard procedure. All documents are part of the public record. Reference to telephone conversations is also standard depiction of such communications, and maintaining written record of conversations is also standard procedure.

**5. Comment:** The Legislature has granted authority to the Scientific Review Panel to make findings and recommendations on individual elements, chemicals or compounds. The OEHHA and the SRP assert that they have authority to recommend whole diesel exhaust for listing as a TAC although it is a mixture of discrete substances. The SRP has not complied with the directive.

**Response:** See response to American Trucking Association comment #1, April 11, 1998.

**6. Comment:** CTA asserts the immediate result of listing diesel exhaust as a TAC will be a massive number of tort toxic battery suits filed against diesel users.

**Response:** See response to comment #1 from the Asphalt Pavement Association, April 10, 1998.

## **Caufield Enterprises**

Jack Caufield, April 17, 1998

**1. Comment:** Based on discussions with ARB and OEHHA staff, it is apparent that their report is based on data from railroad workers. Railroad diesel has different product specifications than non-railroad diesel. Therefore, the railroad workers, specifically, may have been exposed to different compounds and compound concentrations compared to people exposed to non-railroad diesel exhaust.

**Response:** Even though there is limited data on the exhaust emissions from engines in the 1950's, we believe that the constituent make-up of the exhausts from older diesel engines and newer diesel engines is similar. That is, although the exhaust emissions have decreased in mass, the exhaust composition remains a complex mixture of inorganic and organic compounds. To test this, we have funded a study with the College of Engineering, Center for Environmental Research and Technology, at the University of California, Riverside, to characterize the differences in chemical composition of diesel exhausts from using "old" pre-1993 (before Federal and State diesel fuel reformulation regulations were implemented) diesel fuel and from "new" post-1993 diesel fuels.

The results indicate that although there are reductions in mass emissions from some components of the exhaust, the chemical compound speciation profile is similar. A comparison of the milligram to milligram per cubic meter emission profiles using the three different fuels showed the presence of the same toxic substances, and a similar distribution of toxic substances, but with a few substances showing much different emission rates. The low aromatic and alternative fuels resulted in lower emission rates for some particle- and vapor-phase PAHs including anthracene, benz[a]anthracene, dibenzo[a,h]pyrene, naphthalene, and biphenyl. In addition, higher mutagenic activity was observed in both the particle- and vapor-phase collected from pre-October 1993 fuel than from the low aromatic and alternative formulation fuels. However, the differences are not statistically significant.

In addition, OEHHA's assessment of carcinogenic risk from exposures to diesel exhaust accounted for the higher exposures as a result of older engines and fuels. ARB's exposure assessment also accounted for emission reductions to be achieved by adopted engine emissions standards and reformulated fuel.

## **Chemical Industry Institute of Toxicology**

Roger O. McClellan, D.V.M., April 17, 1998

**1. Comment:** Page ES-6. This section of the report should make specific note of the improvements in engine design and fuel quality that have led to marked reductions in the diesel exhaust particulate mass emitted in the non-carbonaceous fraction. Moreover, it should be noted that the vast majority of the health research done on diesel exhaust was carried out with emissions from engines that are now outmoded.

**Response:** Early in the Executive Summary, and in response to previous comments on this point, we note on page ES-4 that in the case of diesel exhaust, there have been several regulations enacted that have resulted or will result in significant reductions in emissions of pollutants such as NO<sub>x</sub>, SO<sub>x</sub>, and particulate matter from diesel engines. See response to the American Trucking Association's comment #6, April 10, 1998.

**2. Comment:** ES-7. I was surprised that the report did not note diesel-electric locomotives as mobile sources.

**Response:** The category "trains" is included in our mobile source inventory (and is listed on ES-7) and includes diesel-electric locomotives.

**3. Comment:** ES-9. This section of the report does note the substantial impact of new engine technology and improved fuel quality in reducing emissions. However, this needs to be referenced earlier in the Executive Summary and given the context as noted above.

**Response:** See response to comment #1.



## **Communities for a Better Environment**

Greg Karros, March 27, 1998

**1. Comment:** The science supports ARB's proposal to identify diesel exhaust as a toxic air contaminant. However, we would like to know how ARB will address the findings that dioxin compounds are present in diesel exhaust, handle multi-pathways of dioxins, new research to determine atmospheric contributions of dioxins, and how the risk management of dioxins via diesel exhaust risk management will be handled.

**Response:** We acknowledge your comment. The diesel exhaust identification report focuses on the exposure and health effects associated with whole diesel exhaust, and does not make any quantitative estimates on the presence of dioxins or any other individual component in diesel exhaust. While we acknowledge that dioxins are present in diesel exhaust, there are limited data in which to determine its contribution to the ambient atmosphere. Our report does not consider the effects of exposure from non-inhalation pathways. In order to assess non-inhalation pathways, component and site-specific data are needed. Since the specific parameters for diesel exhaust are not known for these pathways, a multi-pathway assessment for diesel exhaust exposure was not done. If diesel exhaust is identified by the ARB to be a toxic air contaminant, it will enter into the risk management phase, where the need for and degree of control will be evaluated. Dioxins only as a component of the overall mix of compounds found in whole diesel exhaust will be considered in this assessment. We will look for opportunities to further study the diesel exhaust inter-media transfer factors and mechanisms.

## **Detroit Diesel Corporation**

John W. Duerr, March 30, 1998

**1. Comment:** ARB's listing of whole diesel exhaust as a TAC is inappropriate. The intent and legitimate purpose of the Health and Safety Code was to designate a substance as a toxic air contaminant. Diesel exhaust is a complex mixture of several substances.

**Response:** See response to American Trucking Association's comment #1, April 11, 1998.

**2. Comment:** While diesel exhaust is a highly complex and variable mixture, it is known that under almost all operating conditions, over 99.9 percent of the exhaust mass is composed of carbon dioxide, water vapor, nitrogen, and oxygen. They are not toxic and quite apart from being "air contaminants," they are the very chemical species that make up our air. To list whole diesel exhaust as a TAC when it is known that over 99.9 percent of the composition is non-toxic makes no sense.

**Response:** See response to American Trucking Association's comment #5, April 11, 1998.

**3. Comment:** The studies relied upon by the OEHHA are a number of years old and involved exposures to diesel exhaust with compositions which are quite different than the exhausts of diesel engines which are being produced today. By all accounts, diesel exhaust is much cleaner and more benign than it was ten or even five years ago. The draft report's attempt to extrapolate the conclusions of the old studies to include exhaust from current and even future diesel engines is an unwarranted over-generalization which does not come close to meeting the regulatory standard of being "based on sound scientific knowledge, methods or practices."

**Response:** We acknowledge in our report that there has been progress in reducing emissions of diesel PM in our report. Our exposure analysis took into account the effects of past, present, and future emissions based on regulations adopted by the ARB as well as the technological advances that have been made. The characterization of risk as presented in our report considers these exposure benefits in determining the population's estimated lifetime range of risks to exposure to diesel exhaust. We believe that the conclusions in our report on the evaluation of the exposure and health effects are based on the best available scientific data and risk assessment methods and practices. The process used in California to identify a substance as a TAC involves extensive outreach including numerous public comment periods, workshops, meetings with affected industries, a review by the independent Scientific Review Panel (SRP), and consideration by the Board at a public hearing. Diesel exhaust entered the TAC identification program in 1989. Since that time, there has been three public comment periods, three workshops, a conference, and two updates at public meetings with the SRP.

**4. Comment:** The draft report proposes to single out diesel exhaust for listing as a TAC while ignoring the exhaust from all other combustion sources. This raises serious equity and air quality issues, since the same substances present in diesel exhaust may be present in the exhausts of other

combustion sources such as gasoline engines, alternative fuel engines, home heating, electrical power generating plants, turbine engines, or waste incineration facilities. Unless specific toxic components can be identified which are unique to diesel exhaust emissions, it is inappropriate to single out diesel-fueled engine exhaust as a TAC. Listing diesel exhaust as a TAC would not only inequitably harm diesel engine manufacturers and users, but because of potential diesel regulations, would shift to other power sources which may increase exposures to certain toxic species.

**Response:** Diesel exhaust was entered into the toxic air contaminant program as a priority in 1989 because of its widespread exposure in California and potential health effects. We will continue to prioritize and update the candidate list of TACs in consultation with OEHHA to determine whether other substances should be entered into the TAC Program. We are currently working on a list update. One public comment period has been held. We are currently preparing a draft report to be released this summer which nominates other substances for possible further review in the Program.

If identified as a TAC, a needs assessment report will be done to evaluate the need for additional controls to reduce the risks from exposures to diesel exhaust. A ban on diesel engines and fuels is not an option we would consider.

**5. Comment:** There is no need to list diesel exhaust as a TAC. As noted in a previous comment, 99.9 percent of diesel exhaust is made up of non-toxic species (see comment 1). Virtually all of the remaining 0.1 percent is made up of the four criteria pollutants which are already highly controlled by the ARB. The draft report also lists 40 substances in the exhaust that have already been identified as TACs, and thus gives the ARB authority to control these toxic substances to the lowest level achievable based on best available control technology. What additional authority does ARB need to ensure adequate public protection from possible toxic effects of diesel exhaust?

**Response:** See response to American Trucking Association's comment #1, April 11, 1998.

**6. Comment:** The draft report and a TAC listing of diesel exhaust will serve no legitimate regulatory purpose. A TAC listing of whole diesel exhaust would, therefore, require ARB to implement control measures applicable to whole diesel exhaust if ARB were to determine that reductions in exposure are needed. Since there are no technical options for reducing exposure to whole diesel exhaust, the only action the Board could take would be to limit or prohibit the use of diesel engines.

**Response:** See the response to the Asphalt Pavement Association's comment #5, April 10, 1998, and the response to comment #5 from the Gillig Corporation, April 8, 1998.

**7. Comment:** The draft report provides no useful guidance to regulators or industry. The draft report provides no new scientific evidence or insight about the specific components of diesel exhaust that may be responsible for the health effects which OEHHA alleges. Without such guidance, regulators and industry, have no basis for determining what additional species should be

regulated.

**Response:** The draft report provides scientific evidence which supports the basis for listing whole diesel exhaust as a toxic air contaminant. Also, see response to the Asphalt Pavement Association's comment #5, April 10, 1998.

**8. Comment:** A listing of diesel exhaust may do irreparable harm to Detroit Diesel and the whole engine industry if regulatory actions are taken to ban or limit the use of diesel engines. In addition, the listing of diesel exhaust as a TAC may unnecessarily alarm the public and lead to unjustified anti-diesel public sentiment or legal pressures to ban engines.

**Response:** Our goal is to factually describe the nature and extent of the potential adverse health effects associated with exposure to diesel exhaust. Also, see response to the Asphalt Pavement Association's comment #5, April 10, 1998.

## **Engine Manufacturers Association**

Peter A. Valberg and Ann Y. Watson, March 27, 1998

**1. Comment:** The Executive Summary should include a pie chart that clearly shows that diesel exhaust represents 3 and 7.6 percent of all  $PM_{10}$  and  $PM_{2.5}$  sources, respectively, in California.

**Response:** We will add language to the Executive Summary that says diesel exhaust sources account for approximately 3 and 8 percent of the total  $PM_{10}$  and  $PM_{2.5}$  inventory, respectively.

## **Engine Manufacturers Association**

Glenn F. Keller, March 27, 1998

**1. Comment:** The ARB should not list whole diesel exhaust as a TAC. The Executive Summary states that the first step in the AB 1807 identification process is to determine if a substance is toxic. Diesel exhaust is not a substance, but rather a complex mixture of substances, many of which are non-toxic. We recommend that you be consistent through both Parts A and B of the report in clarifying that diesel exhaust particulate matter is the constituent of concern in your TAC analysis.

**Response:** See response to American Trucking Association's comment #1, April 11, 1998.

**2. Comment:** EMA provides a number of clarifying comments to the Executive Summary and Part A.

**Response:** We have reviewed all of your comments and plan to make some changes to the report. However, we do not plan to change the report in response to the following comments because we believe what is currently in the report is accurate:

- Page Executive Summary (ES)-6: the quantification of benzene, formaldehyde etc. as being necessary for valid TAC evaluation.
- Page ES-6: the discussion on bioavailability of 3-nitrobenzanthrones
- Page ES-6: not all of the particles are retained in the lung
- Page ES-8: requirement to reduce SO<sub>x</sub> emissions
- Page ES-9: "roadside testing of heavy-duty on-road vehicles for excessive emissions of smoke"
- Page ES-9: include mention of non-road and small engine applications
- Page ES-12: removing other routes of exposure
- Part A, pages A-1, A-5, and A-6: add bar or pie chart depicting fractions of diesel exhaust
- Part A, page A-33: PM<sub>2.5</sub> standards

## **Engine Manufacturers Association**

Tim French, March 27, 1998

**1. Comment:** EMA requests a 30-day extension to the comment period to allow review of the March 11, 1998, public meeting transcript (convened by the SRP).

**Response:** See response to comment #1 from the California Trucking Association, March 20, 1998.

**2. Comment:** EMA was disappointed with the draft because their previous concerns and questions were not materially addressed, and OEHHA used overstated findings and summarization in pursuit of a singular hypothesis as opposed to stating an unbiased account of what the scientific data actually portrays. The February 1998 draft report does not fairly present the best available scientific evidence or sound scientific knowledge as required by the enabling legislation, and should be amended as detailed in the comments. The report can threaten the viability of diesel power both in California and nationally with severe economic repercussions.

**Response:** See response to comment #2 from the American Trucking Association, April 11, 1998, and the response to comment #5 from the Asphalt Pavement Association, April 10, 1998.

**3. Comment:** The report pushes listing of whole diesel exhaust as a TAC. This would be misguided and of no use to regulators or industry.

**Response:** See response to American Trucking Association's comment #1, April 11, 1998 and Detroit Diesel Corporation's comment #7, March 30, 1998.

**4. Comment:** In Section 7.0, Quantitative Risk Assessment, page 7-15, the last paragraph basically states OEHHA does not believe the results of Heinrich et al., 1995; Nikula et al., 1995; 1997, without offering peer reviewed opposing results, thus making the OEHHA comments a matter of speculation. The draft document should be based on current understanding of the scientific community, not speculation.

**Response:** OEHHA makes several observations of this study based upon sound risk assessment principles. See response to comment #2 from the American Trucking Association, April 11, 1998.

**5. Comment:** EMA members are concerned that OEHHA is not objective in considering the full body of evidence relating to potential health effects that might or might not be related to real-world ambient exposures to emissions from today's diesel engines. Until further revised the report remains inherently defective as an attempted justification for the proposed listing of diesel exhaust as a TAC.

**Response:** See response to comment #2 and #6 from the American Trucking Association, April 11, 1998.

**6. Comment:** EMA asks what can regulators and industry do to reduce diesel exhaust except to ban or phase-out diesel engines. Diesel exhaust is an ever-changing complex mixture depending in part on engine type, fuel type, application and operating conditions. To be of use, a TAC listing must identify the specific substance supposedly associated with an adverse health effect, rather than a source (diesel engines). Then industry and regulators can strive to reduce those specific constituents. “Within California, combustion soot from gasoline, heating oil, coal, charcoal, tobacco smoke, wood and cooking is ubiquitous.” To justify a TAC listing, OEHHA needs to explain why diesel exhaust is markedly different, informing the public of the true composition of the combustion products at issue.

**Response:** We disagree. Under Health and Safety Code section 39655, it is appropriate to list chemicals or groups of chemicals as TACs. Any air pollutant that meets the definition as specified in Health and Safety Code section 39655 may be listed as a TAC. If diesel exhaust is listed as a TAC by the ARB, it will enter the risk management phase of the program, where the sources and exposures to diesel exhaust will be evaluated. Also, see response to the American Trucking Association’s comment #1 and the response to the Asphalt Pavement Association’s comment #5, April 10, 1998.

**7. Comment:** Circumstances suggest that the Bhatia report, funded by the California EPA, and co-authored by Dr. Allen Smith, who is also a co-author of OEHHA’s Revised Draft Report, is not an “independent” study as described. EMA requests all references to the Bhatia analysis be stricken from the report. “To what extent have members of the Scientific Review Panel become contributing authors of the Revised Draft Report as opposed to “independent” peer reviewers (see e.g., Transcript of 10/16/97 SRP Meeting, pp.75, 112-114 and 119-121)?” Other reviews and critiques were ignored, such as Dr. Silverman of NCI, commenting in the same issue of Epidemiology where the Bhatia analysis appeared. OEHHA has been selective in reporting data concerning causation, excluding contrary findings and opinions, serving to misinform policy makers, regulators, and the public.

**Response:** Dr. A.H. Smith did not prepare the meta-analysis. Members of the SRP are free to comment or provide guidance to staff throughout the process based on their area of expertise. Also, see response to the American Trucking Association’s comment #2, April 11, 1998.

**8. Comment:** EMA urges that the substance of EMA’s comments be included in the report to reflect an even-handed and careful approach to the uncertain health effects issues. The OEHHA report reads like a one-sided position paper against continued use of diesel technology in California.

**Response:** See response to comment #2 from the American Trucking Association, April 11, 1998, and the response to comment #5 from the Asphalt Pavement Association,



April 10, 1998.

**9. Comment:** EMA urges OEHHA and ARB to help in obtaining new data, and to discontinue use of old studies scientifically insufficient for causal conclusions or quantification of weak associations.

**Response:** We don't agree that current studies are scientifically insufficient for causal conclusions or quantification of weak associations. Diesel exhaust has been extensively studied, and we believe the available scientific information is adequate for the ARB to make a decision on listing this substance as a TAC. Our TAC identification process ensures full public participation, in which EMA has been a participant, and an independent review by the Scientific Review Panel. We encourage EMA to proceed in obtaining new data that would reduce the uncertainties in the current diesel exhaust risk quantification, and we are more than willing to participate in an appropriate manner. Should new scientific data become available, the TAC program contains a re-review process where a party could petition the ARB to reevaluate the original risk assessment based on new scientific information.

## **Gillig Corporation**

Charles E. Koske, April 8, 1998

**1. Comment:** A primary concern is an apparent lack of understanding at the ARB that diesel is not a chemical. Diesel is a form of engine design that uses the heat of highly compressed air to ignite a fuel mixture. As such, the classification of diesel exhaust as anything is a serious technical error.

**Response:** See response to comment #1 from the American Trucking Association, April 11, 1998.

**2. Comment:** The State of California has classified many chemical substances as toxic. Never before has such a broad brush composition been labeled as toxic. Gillig is curious about the motives behind the approach. Gillig also feels the public is best served by identifying the species or substances found in diesel exhaust that are specifically toxic.

**Response:** We agree to the first part of your comment. The State of California has identified 19 substances as TACs under AB 1807 process and 189 hazardous air pollutants under AB 2728. However, included in the list of chemicals identified as TACs by the ARB, there are several groups of compounds that have been labeled as TACs (e.g. chlorinated dioxins and dibenzo furans and nickel (metallic nickel and inorganic nickel compounds).

**3. Comment:** Given that diesel is an engine design type and fuels vary from bunker oil in ocean going ships to methanol, how does the ARB intend to identify the various diesel exhausts?

**Response:** ARB defines diesel exhaust as the exhausts emitted from diesel engines burning diesel fuel. Diesel fuel can be distillate #1-4. Other fuels such as methanol are not diesel fuels.

**4. Comment:** Many of the cited technical reports are very old and use out of date engine and fuel technology. None of the information is relevant to 1998 emission standards with catalytic convertors for urban bus requirements. Are the toxic compounds researchers are concerned about found in these current specification vehicles?

**Response:** This comment does not pertain to the diesel exhaust draft report. However, we are pleased to respond to your comment. ARB's exposure assessment includes an assessment of diesel exhaust concentrations based on adopted current and future diesel engine exhaust controls. There are no chemically speciated data available that we are aware of on 1998 diesel bus engine exhaust.

**5. Comment:** Does the State of California have plans to eliminate old uncontrolled diesel vehicles or require mandatory upgrades as on Federal transit buses?

**Response:** This report does not address the need for, or contain any assessment of, or

recommendations for, control measures to reduce exposure to diesel exhaust. If diesel exhaust is identified as a TAC, it will enter the risk management phase where a needs analysis would be conducted to determine if any regulatory action is necessary. Public outreach is an essential element in the development of a needs assessment and any control measures. In the course of this assessment, the ARB works with local districts and holds numerous public workshops and individual meetings in a open public process than provides many opportunities for interested parties to participate.

## **Glenn Hachadorian, SDW Product Management**

March 27, 1998

**1. Comment:** CARB should designate diesel exhaust as a TAC and regulate each of the component carcinogens within diesel exhaust in addition to total diesel exhaust levels. Designation as a TAC is long overdue. CARB should pursue control of diesel engine emissions as vigilantly as gasoline engine emissions in fairness to the average California driver. Diesel powered engines have escaped responsibility to help in the cleanup of California's air. Fuel reformulation and new vehicle regulations have had limited success. Effective regulations and monitoring of diesel engines, including retrofit of older engines are needed.

**Response:** We acknowledge your comment.

## **Kings County Farm Bureau**

George L. Longfellow, March 19, 1998

**1. Comment:** We oppose the proposed identification of diesel exhaust until such time as the necessary studies can be performed using current engines burning CARB diesel fuel. Our recommendation would be to delay any findings until the release of the studies referenced in the Part A-Exposure Assessment portion of the proposal are complete.

**Response:** The study you refer to, Evaluation of Factors that Affect Diesel Exhaust Toxicity, done by the College of Engineering-Center for Environmental Research and Technology (CE-CERT), at the University of California, Riverside, was approved at ARB's Research Screening Committee meeting on April 3, 1998. We have incorporated the results into the SRP approved version of the report.

**Latham & Watkins**

Richard W. Raushenbush, March 30, 1998

(On behalf of Navistar International Transportation Corporation)

**1. Comment:** “In proposing to identify ‘diesel exhaust’ as a toxic air contaminant, OEHHA has ignored the Legislature’s admonition to identify particular substances that are toxic air contaminants under the statute.”

**Response:** See response to the American Trucking Association’s comment #1, April 11, 1998.

## **Dr. Judith A. MacGregor Ph.D., DABT**

March 25, 1998

**1. Comment:** Dr. MacGregor indicates that while it is not unreasonable to consider the listing of a complex mixture, it is much more difficult to derive a potency value for a mixture than for a specific substance. If the potency value is to be derived from exposures to the mixture, then either one must be reasonably certain that the biological potency (on a weight basis) is constant, or it must be possible to relate the potency to the composition of the mixture. In the case of diesel exhaust, neither of these requirements is met due to the following reasons: 1) there are several different types of diesel fuel for use in different types of engines; 2) refining technology, processes, catalysts, and crude sources have changed over the last 50 years of manufacturing diesel fuel; and 3) even if one assumed that potency was constant for all types of diesel exhaust over the past 50 years, it cannot be assumed to remain a constant in the future.

**Response:** The range of potency estimates presented by the OEHHA, are derived from a variety of occupational studies which include a wide range of exposure estimates. Even though there is limited data on the exhaust emissions from engines in the 1950's, we believe that the constituent make-up of the exhausts from older diesel engines and newer diesel engines is similar. That is, although the exhaust emissions have decreased in mass, the exhaust composition remains a complex mixture of inorganic and organic compounds. To test this, we funded a study with the College of Engineering, Center for Environmental Research and Technology, at the University of California, Riverside, to characterize the differences in chemical composition of diesel exhausts from using "old" pre-1993 (before Federal and State diesel fuel reformulation regulations were implemented) diesel fuel and from "new" post-1993 diesel fuels.

The results indicate that although there are reductions in mass emissions from some components of the exhaust, the chemical compound speciation profile is similar. A comparison of the milligram to milligram per cubic meter emission profiles using the three different fuels showed the presence of the same toxic substances, and a similar distribution of toxic substances, but with a few substances showing much different emission rates. The low aromatic and alternative fuels resulted in lower emission rates for some particle- and vapor-phase PAHs including anthracene, benz[a]anthracene, dibenzo[a,h]pyrene, naphthalene, and biphenyl. In addition, higher mutagenic activity was observed in both the particle- and vapor-phase collected from pre-October 1993 fuel than from the low aromatic and alternative formulation fuels. However, the differences are not statistically significant.

In addition, the exposure calculations for Californians presented in the Part A report include the benefits from current and future regulations which include engine technology improvements and fuel reformulations (see Part A, Chapter III).

## **Mercedes Benz of North America**

Patrick M. Raher, Hogan & Hartson, L.L.P., March 12 and 16, 1998

**1. Comment:** On behalf of Mercedes Benz a 45-day comment period is requested that could close on May 15, 1998.

**Response:** See response to comment #1 from the California Trucking Association, March 20, 1998.

**2. Comment:** Requests that ARB provide Dr. Kenny Crump with information on how ARB completed certain steps in the new analysis of the Garshick data. Failure to provide the basis for the revisions and allow time for review denies affected parties' rights. A list of the missing information will be provided by March 15, 1998.

**Response:** OEHHA provided the requested information to Dr. Crump in mid-March.

## **Mercedes Benz of North America**

Patrick M. Raher, Hogan & Hartson L.L.P., March 30, 1998

**1. Comment:** "Mercedes Benz is greatly concerned both with the process used to develop the latest risk assessment analysis as well as the lack of scientific support for the conclusions CARB/OEHHA have drawn with respect to the alleged health effects of diesel exhaust." The short 30-day comment period is even more troubling because the agency has not provided its full analysis on the record to permit effective comment.

Mercedes-Benz disagrees that the current risk assessment analysis presents current health effects data objectively. Also, Mercedes-Benz believes in its current form this risk assessment analysis is a graphic example of an agency ignoring sound science in policy making. Diesel exhaust can be listed as a TAC without such an analysis while the most recent data and scientific community comments are addressed in an open peer review process as promised. "Thus, CARB/OEHHA is needlessly undermining the validity of this process and its conclusions." The current draft buries objections to methods, findings and conclusions in an appendix as an afterthought. Arguments of respected scientists should be included in the summary with agency rebuttal and not buried in an appendix. The document is misleading in its representations of the strengths of its findings, and leads the reader to erroneously believe issues have been addressed fully. The Garshick data cannot be used to derive a unit risk factor and doing so is a significant scientific and public policy error. Mercedes-Benz requests that CARB reject the report and a full scientific peer review be undertaken to complete the analysis in an open scientifically sound manner.

**Response:** See response to American Trucking Associations comment #2, April 11, 1998. In addition, we extended the end of the comment period to April 13, 1998. The requested information was provided to Dr. Crump in mid-March.



## **Mercedes Benz of North America**

Patrick M. Rahe, Hogan & Hartson L.L.P., April 13, 1998

**1. Comment:** Mercedes Benz urges the Agency to follow its stated goal of developing sound science on which to base policy decisions and to revise the documents before presentation to the Scientific Review Panel.

**Response:** See response to American Trucking Association's comment No. 2, April 11, 1998.

**Natural Resources Defense Council**

Janet Hathaway, March 30, 1998

**1. Comment:** NRDC continues to support the listing of diesel exhaust as a toxic air contaminant. A dispassionate examination of the voluminous scientific evidence linking diesel exhaust with lung cancer leads to only one conclusion: diesel exhaust is ‘an air pollutant which may cause or contribute to an increase in mortality or in serious illness, or which may pose a present or potential hazard to human health.’

**Response:** We acknowledge your comment.

**2. Comment:** NRDC continues to be concerned that ARB’s assessment may significantly underestimate exposure to diesel exhaust. NRDC is concerned by ARB’s paucity of data on the range of exposures Californian’s experience. ARB should continue to gather data on “diesel hot spots” and should incorporate more realistic exposures - not just averages - in future risk assessments.

**Response:** If diesel exhaust is identified by the ARB as a TAC, it will enter the risk management phase of the program. In this phase, we would gather additional data on “hot spot” sources and assess the need for further measures to reduce Californian’s diesel exhaust exposure.

## **San Francisco Bay Regional Water Quality Control Board**

Ron Gervason, March 30, 1998

**1. Comment:** In general, we support the proposed listing of diesel exhaust as a toxic air contaminant. The ARB should address the lack of assessment of non-inhalation exposure pathways, specifically fish and consumption of water, in the report. The toxics of most concern are chlorinated dibenzo-p-dioxins and dibenzofurans, but we are also concerned about the high levels of mercury and polycyclic aromatic hydrocarbons in Bay Area environment. The ARB should state more definitively their intent to conduct and fund research to address exposures from non-inhalation pathways.

**Response:** We acknowledge your comment. Currently, there are no data that show the effects of exposure to diesel exhaust from non-inhalation (multi-) pathways. In order to assess non-inhalation pathways, substance and site specific data are needed. While diesel exhaust emissions contain dioxins and furans, mercury, and PAH, we do not know the levels at which these substances enter into non-inhalation exposure pathways. If diesel exhaust is listed by the ARB as a toxic air contaminant, it will enter into the risk management phase, where the need for and degree of control will be evaluated. We will look for opportunities to further study the diesel exhaust inter-media transfer factors and mechanisms.

## Western States Petroleum Association

Jeff Sickenger, March 30, 1998

**1. Comment:** Although more realistic than in the June 1994 draft, the spatial patterns of diesel exhaust concentrations estimated by CARB continue to be implausible, suggesting that exposure may still be misestimated. The spatial distributions for areas such as Napa, Santa Clarita, and at the base of the San Gabriel Mountains appear to be unrealistic. Spatial patterns should more closely resemble carbon monoxide patterns. Secondary organics should be subtracted from the analysis.

**Response:** WSPA provides comments on limitations that may be present in ARB's approach to estimate outdoor levels of  $PM_{10}$  due to primary emissions of diesel exhaust. Upon closer review of our analysis, we agree that in certain areas, such as those mentioned by WSPA (Napa, Santa Clarita, and the San Gabriel Mountains), that we would expect levels to be lower comparative to levels in other areas. As stated by WSPA, the expected levels of  $PM_{10}$  may perhaps more closely resemble the response from other motor vehicle pollutants such as carbon monoxide.

WSPA proposes a possible explanation for ARB's results suggesting that secondary organics or our method of estimating other secondary  $PM_{10}$  may be responsible for our limitations.

Although we recognize WSPA's argument, these areas are locations with lower population density. These areas do not significantly contribute to the estimated outdoor population weighted average concentration of  $PM_{10}$  due to directly emitted diesel exhaust emissions as do areas with much higher population densities such as San Francisco and downtown Los Angeles. Therefore we believe the limitations mentioned by WSPA will have a small contribution in the calculated air basin-wide and state-wide population weighted average outdoor  $PM_{10}$  estimates due to directly emitted diesel exhaust.

For the AB 1807 Toxic Identification Program we are asked to estimate how many people are exposed to diesel exhaust. These proposed changes to our approach do not change the major contributing factors in calculating the population weighted average.

If diesel exhaust is identified as a Toxic Air Contaminant, we would refine our estimate of outdoor levels of PM due to diesel exhaust in the risk management phase.

**2. Comment:** Additional adjustment of  $PM_{10}$  indoor exposure levels may be warranted. The ratio used by CARB to calculate indoor/outdoor differences of exposure (0.67) is higher than it should be. Based on several studies a more appropriate ratio of 0.5 should be used.

**Response:** We did not calculate or use an indoor-outdoor air concentration ratio in the report; the 2/3 ratio used by CARB is the ratio of the estimated 1990 indoor average exposure concentration (a time-weighted value) to the population-weighted average ambient concentration.

We used this 2/3 ratio only to project the average indoor air exposure concentrations for the population for the years 1995, 2000, and 2010. The Executive Summary and the Part A reports did not clearly explain this. Both the Executive Summary and the Part A report will be edited to clarify these calculations.

As discussed in Appendix D, we considered information from the indoor studies discussed in Chapter V, Section G of the Part A report in conjunction with a number of larger, more recent studies in estimating penetration factors for diesel exhaust particles. The studies actually used in our modeling effort are listed in tables C3 and C5 of Appendix D; those tables were inadvertently omitted from the February 23, 1998 version of the Part A report but were contained in the May 1997 report. Estimates from the Lewis, 1991 paper were not used to calculate the penetration factor for California residences because it was a wintertime study of only 10 homes in Boise, Idaho, and the homes had average air exchange rates of only 0.2 to 0.8, which are very low. Penetration factor and air exchange rate are closely inter-related; we used the larger, more recent studies listed in Table C3 to develop our residential penetration factor estimates because those studies include a wider, more representative range of measurements.

WSPA's comment brought to our attention the need to update Section G, Chapter V of the Part A report to include the more recent studies used in our exposure estimation, and we have done so.

**3. Comment:** A more complete characterization of uncertainty is needed, particularly for 1995, 2000, and 2010 exposure estimates. For example, CARB should include uncertainty estimates in many of the other parameters in their estimation methodology (e.g. emissions inventories, adjustment methodology for secondary particulates, chemical mass balance modeling, and variation across different receptor modeling studies). At a minimum, CARB should report confidence intervals for 1995, 2000, and 2010 exposures.

**Response:** We believe we have provided a complete characterization of uncertainty in our exposure assessment. In a study of this magnitude, people will be exposed to levels much higher and much lower than the estimated mean.

Extending the variability in the estimate due to the variability in the ambient measurements to the years 1995, 2000, and 2010 is not justified since these estimates are based on linear relationships with emission inventory estimates.

The indoor and total exposure estimates for 1995, 2000 and 2010 are approximations based on the assumption that the 1990 ratios of the estimated average indoor and total air exposure concentrations relative to the population-weighted average ambient levels do not change notably. Because of likely changes in demographics, activity patterns, and the geographical distribution of the population for the years 1995, 2000 and 2010, this assumption becomes less valid as one projects farther into the future. Applying the same linear adjustment factors to the measures of

uncertainty as applied to the estimated mean would imply a false sense of accuracy. Such a linear adjustment factor applied to the standard deviation leads to smaller confidence bounds in future years, even though it is clear that, realistically, the uncertainty in the estimates for future years would be greater than for the base year.

**4. Comment:** Additional research is needed in a number of areas throughout the report.

**Response:** While we acknowledge throughout the report, that more research could be done in areas such as more recent monitoring and modeling studies, and exhaust measurements from a variety of engines and sources, we feel the draft report contains sufficient scientific information and analysis to proceed with the identification of diesel exhaust as a TAC.

**5. Comment:** CARB should explicitly state that the statewide population-weighted average exposure to diesel exhaust  $PM_{10}$  is greater than the estimated average exposure in 14 of 15 air basins statewide.

**Response:** We have added a sentence to the Part A report in Chapter V, Section C which clarifies that the population-weighted average concentration represents, on average, the concentrations experienced by most Californians.

**6. Comment:** The tabulation of statewide emissions of  $PM_{10}$  and  $PM_{2.5}$  appears to need correction (Tables IV-1 and IV-2, pp. A-23 and A-24).

**Response:** We agree and will update the emission estimates in the next revision to the report.

**7. Comment:** Results from San Joaquin Valley receptor modeling may not be the most appropriate surrogate for estimating diesel exhaust  $PM_{10}$  in most areas of the State.

**Response:** Of the three special studies utilized to estimate the population weighted average concentration of  $PM_{10}$  due to diesel exhaust emissions, the San Joaquin Valley Study was used as a surrogate for those regions of the state, as identified in Part A, where a special study was not available. The study for San Jose was not considered as a surrogate because it only captured winter-time data. Of the two remaining studies, the SJV Study was used because the data collected was more recent (1988-89 as opposed the 1986 data collected for the South Coast Air Basin Study).

An alternative approach could have been to use all three studies as surrogates and the variability and differences could have been included in an uncertainty analysis, as suggested by WSPA. However it is not likely that such an approach would change the state-wide population weighted average because the population base in South Coast, San Francisco, and San Joaquin Valley Air Basin compose 71 percent of the state's population. (These three air basins do not

require surrogates.)

Again as previously stated, if diesel exhaust is identified as a toxic air contaminant and enters the risk management phase, this uncertainty and variability could be included. In addition, it is possible that additional data may be available to better characterize current outdoor levels of PM<sub>10</sub> due to diesel exhaust emissions. There are two large scale PM studies that are in the planning phase that may provide data to revise our estimates of outdoor levels of diesel exhaust. The Central California Study is scheduled for completion in the year 2000 and for South Coast Air Basin a study is being prepared for the year 1998-99. In addition, the 2000 census is forthcoming. Depending on the timing, these data may be available to revise our analysis if necessary.

**8. Comment:** Higher concentrations inside a vehicle or near a roadway may not affect total exposure as much as suggested by CARB. CARB asserts that their exposure analysis underestimates diesel exhaust concentrations inside vehicles and near roadways considerably. Even if exposures inside vehicles were to increase by three fold, there would only be a 16 percent change in CARB's exposure estimate.

**Response:** It is not clear exactly what calculation was used to generate the estimated increase of 16 percent, and it is not clear whether that estimate applies to the "statewide population-weighted average concentration" as indicated or to the estimated average total air exposure concentration. However, using the assumption suggested by WSPA that levels inside vehicles and along roadways are three times greater than ambient levels away from roadways (which is reasonable in light of the limited data available), we developed rough estimations of the percent increase in average estimated total air exposure concentration, which is the exposure estimate of greatest interest for estimating risk. We estimated an increase in the average total air exposure concentration of 24 percent for adults and 16 percent for children.

Regardless of the explicit size of the increase in exposure, there will be different effects on various subgroups of the population. While some groups of people will have only a slight increase in exposure, others who spend an above average time in on-road vehicles will have a much higher estimated exposure. Increasing the expected average air exposure concentration by 16-24 percent would result in a parallel increase in risk. We acknowledge that this is not "considerable" relative to an "orders of magnitude" framework; nonetheless it represents a substantial effect on the health of the high exposure population.

*Rough Calculation:*

This calculation cannot be conducted explicitly here because combining the air concentrations for the different microenvironments with the activity pattern data requires the use of the CPIEM model and a substantial amount of effort. However, to develop a rough approximation, the average exposure concentrations were used as average air concentrations, and the adult and children's estimates were derived separately because they spend different amounts of time in the

different environments of interest.

Using the 1990 average exposure concentration estimates ( $\mu\text{g}/\text{m}^3$ ):

Indoor concentration = 2.0, Outdoor Concentration = 3.0,

In-vehicle and in-transit concentration =  $3.0*3=9$ .

Percent time spent in microenvironments:

	<i>Indoors</i>	<i>Inside vehicles or outdoors in transit</i>	<i>Outdoors, not in transit</i>
<i>Adults</i>	87	8	5
<i>Children</i>	86	5	9

*Adults*  $(.87*2.0 + .05*3.0 + .08*3.0*3)/2.1 = 2.61/2.1 = 1.24$  or 24% increase.

*Kids*  $(.86*2.0 + .09*3.0 + .05*3.0*3)/2.1 = 2.44/2.1 = 1.16$  or 16% increase.