

**LOCATION:**

California Department of Transportation  
111 Grand Avenue  
1st Floor, Auditorium  
Oakland, California 94612

**Public Meeting Agenda**

This facility is accessible by public transit. For transit information, go to website <http://www.bart.gov/index.asp> (This facility is accessible to persons with disabilities.)

**TO SUBMIT WRITTEN COMMENTS ON AN AGENDA ITEM IN ADVANCE OF THE MEETING GO TO:**

<http://www.arb.ca.gov/lispub/comm/bclist.php>

**April 24, 2008**

**9:00 a.m.**

**Item #**

**08-4-1: Health Update: Effects on the Heart from Particulate Matter Exposure and a Possible Role of Genetics**

*Staff will update the Board on the findings of a study that investigated the linkage between fine particle-associated heart function abnormalities and a gene involved in iron metabolism. The results suggest that people who have a variant form of this gene are at least partially protected against fine particle-induced heart function changes compared to people who have the non-variant form of the gene, indicating a possible role of genetics in sensitivity to particulate matter.*

**08-4-2: Public Meeting to Consider a Research Proposal**

*Lifecycle Analysis of High- Global Warming Potential Greenhouse Gas Destruction," \$300,000, RFP No. 07-330.*

**08-4-3: Public Meeting to Consider the Appointments to the Research Screening Committee**

*The Board's legislatively mandated Research Screening Committee consists of scientists, engineers, and others knowledgeable, technically qualified, and experienced in air pollution problems. The Committee meets approximately four times a year to review proposed and completed research projects. ARB staff will propose two new members be appointed to the Committee.*

**08-4-4: Presentation on the Bay Area Air Quality Management District's Climate Protection Program**

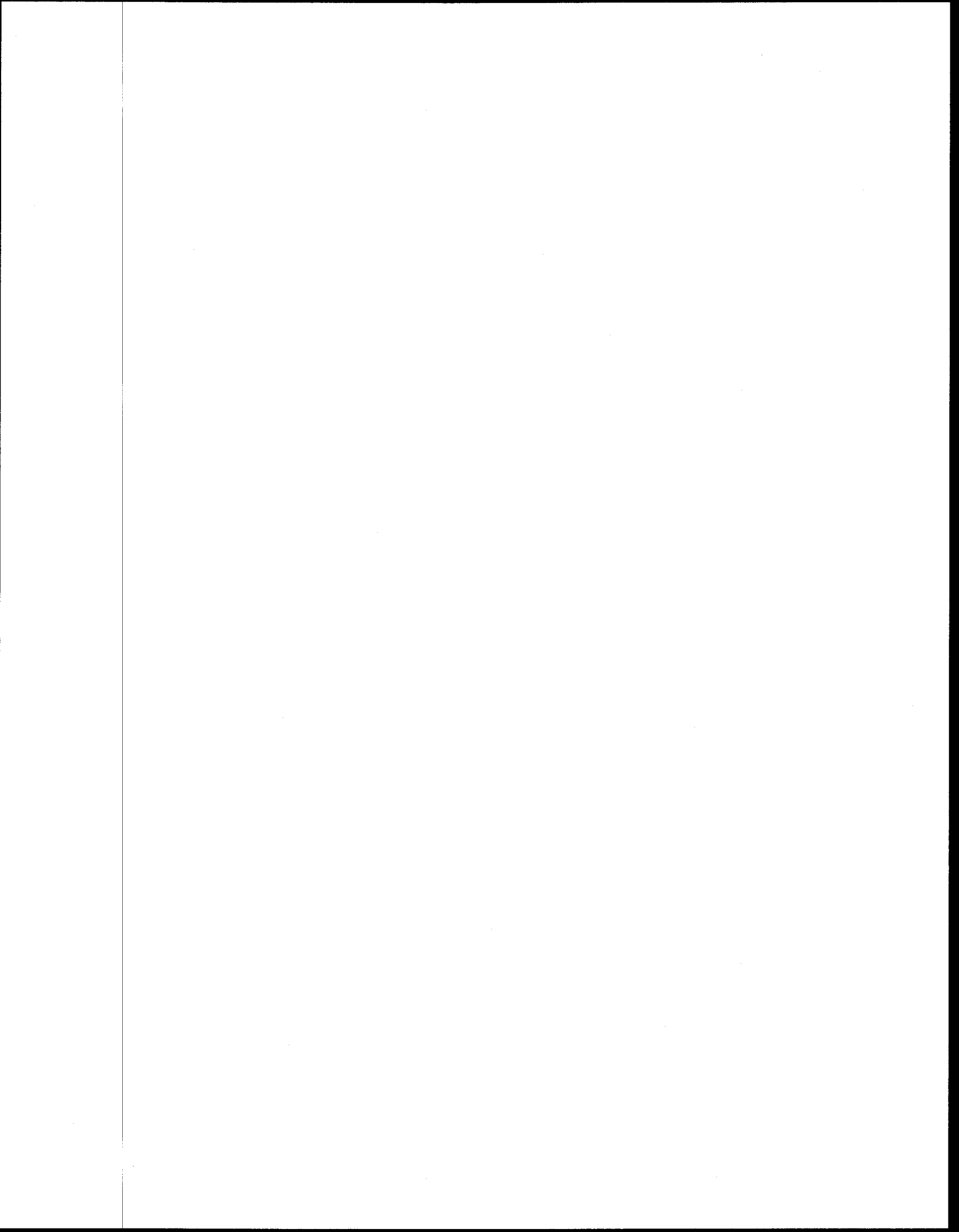
*On June 1, 2005, the Bay Area Air Quality Management District initiated a climate protection program. Jean Roggenkamp, Deputy Air Pollution Control Officer, will be presenting on the Bay Area climate protection activities, including efforts such as the \$3 million grant program, 4th and 5th grade curriculum, greenhouse gas regional emission inventory, ICLEI-BAAQMD workshop series, and the greenhouse gas reduction technology study.*

**08-4-5: Report to the Board on AB 32 Implementation Update on Electricity and Natural Gas Sector**

*ARB staff will provide an update on climate change activities in the electricity and energy sector.*

**08-4-6: Report to the Board on Health Risk Assessment for the Port of Oakland and West Oakland Community**

*The staff will present the results of the comprehensive West Oakland health risk assessment, including the Port of Oakland and surrounding community in West Oakland.*



**08-4-7: Update the Board on the Air Resources Boards' 2006 of the Emission Reduction Plan for Ports and Goods Movement in California**

Staff will provide an update on progress made in implementing the Emission Reduction Plan for Ports and Goods Movement in California (Plan) including: rulemakings, enforcement, technological development, public outreach, additional risk assessments and challenges faced.

**08-4-8: Public Hearing to Consider Approval of Modified Transportation Conformity Budget Contained in the 2007 Air Quality Management Plan for Attaining the Federal 8-Hour Ozone and PM 2.5 Standard in the South Coast Air Basin**

The Board will consider revisions to the conformity budgets for the South Coast Air Basin. The proposed revisions are intended to address concerns raised by the U.S. Environmental Protection Agency, and are being considered by the Board at the request of the Southern California Association of Governments and the South Coast Air Quality Management District.

**08-4-9: Update the Board on the Status of the 8-Hour Ozone Plan**

Staff will update the Board on the status of the federal 8-hour ozone attainment demonstration plans being prepared for the Western Mojave Desert, Ventura County, and the Sacramento Metropolitan Ozone Nonattainment Areas.

**08-4-10: Report to the Board on an Update on the 2005 ARB/Railroad Statewide Agreement**

Staff will provide an update to the Board on the implementation efforts for the Statewide Rail Yard Agreement. The last update was provided at the July 27, 2007, ARB meeting.

**CLOSED SESSION – LITIGATION**

The Board will hold a closed session as authorized by Government Code section 11126(e) to confer with, and receive advice from, its legal counsel regarding the following pending litigation:

*East Yard Communities for Environmental Justice (East Yard Communities) v. ARB, Case No. CASE NO. 2:08-CV-00473-R.*

*Central Valley Chrysler-Jeep, Inc. et al. v. Goldstene, U.S. District Court (E.D. Cal. - Fresno), No. 1:04-CV-06663-AWI-GWA.*

*Fresno Dodge, Inc. et al. v. California Air Resources Board and Witherspoon, Superior Court of California (Fresno County), Case No. 04CE CG03498.*

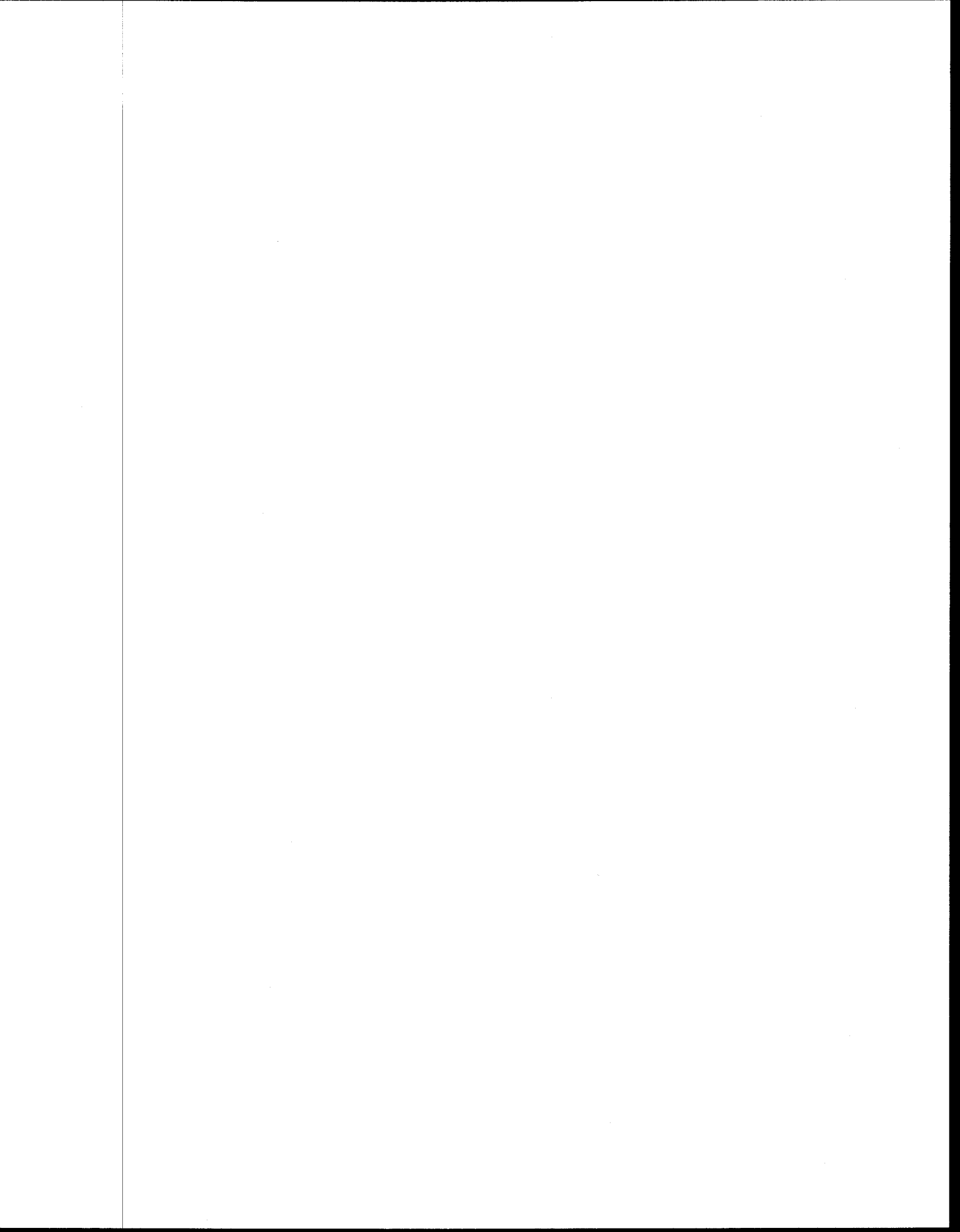
*General Motors Corp. et al. v. California Air Resources Board and Witherspoon, Superior Court of California (Fresno County), Case No. 05CE CG02787.*

*State of California by and through Arnold Schwarzenegger, Governor of the State of California, and the California Air Resources Board v. U.S. Environmental Protection Agency and Stephen L. Johnson, Administrator, U.S. Court of Appeals (D.C. Cir.), Case No. 07-1457, filed November 8, 2007.*

*State of California by and through Arnold Schwarzenegger, Governor of the State of California, and the California Air Resources Board v. U.S. Environmental Protection Agency and Stephen L. Johnson, Administrator, U.S. District Court (D.C.) Case No. 07-CV-o2024-RCL, filed November 8, 2007.*

*State of California by and through Arnold Schwarzenegger, Governor, and the California Air Resources Board v. U.S. Environmental Protection Agency, and Stephen L. Johnson, Administrator, U.S. Court of Appeals (9th Cir.) Case No. 08-70011, filed January 2, 2008.*

*Green Mountain Chrysler-Plymouth-Dodge-Jeep, et al. v. Crombie, 508 F.Supp.2d 295, U.S. District Court Vermont (2007), appeal to 2nd Circuit Court of Appeals pending, Docket Nos. 07-4342-cv(L) and 07-4360-cv(CON).*



**OPPORTUNITY FOR MEMBERS OF THE BOARD TO COMMENT ON MATTERS OF INTEREST.**

*Board members may identify matters they would like to have noticed for consideration at future meetings and comment on topics of interest; no formal action on these topics will be taken without further notice.*

**OPEN SESSION TO PROVIDE AN OPPORTUNITY FOR MEMBERS OF THE PUBLIC TO ADDRESS THE BOARD ON SUBJECT MATTERS WITHIN THE JURISDICTION OF THE BOARD.**

*Although no formal Board action may be taken, the Board is allowing an opportunity to interested members of the public to address the Board on items of interest that are within the Board's jurisdiction, but that do not specifically appear on the agenda. Each person will be allowed a maximum of three minutes to ensure that everyone has a chance to speak.*

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<http://www.arb.ca.gov/lispub/comm/bclist.php>

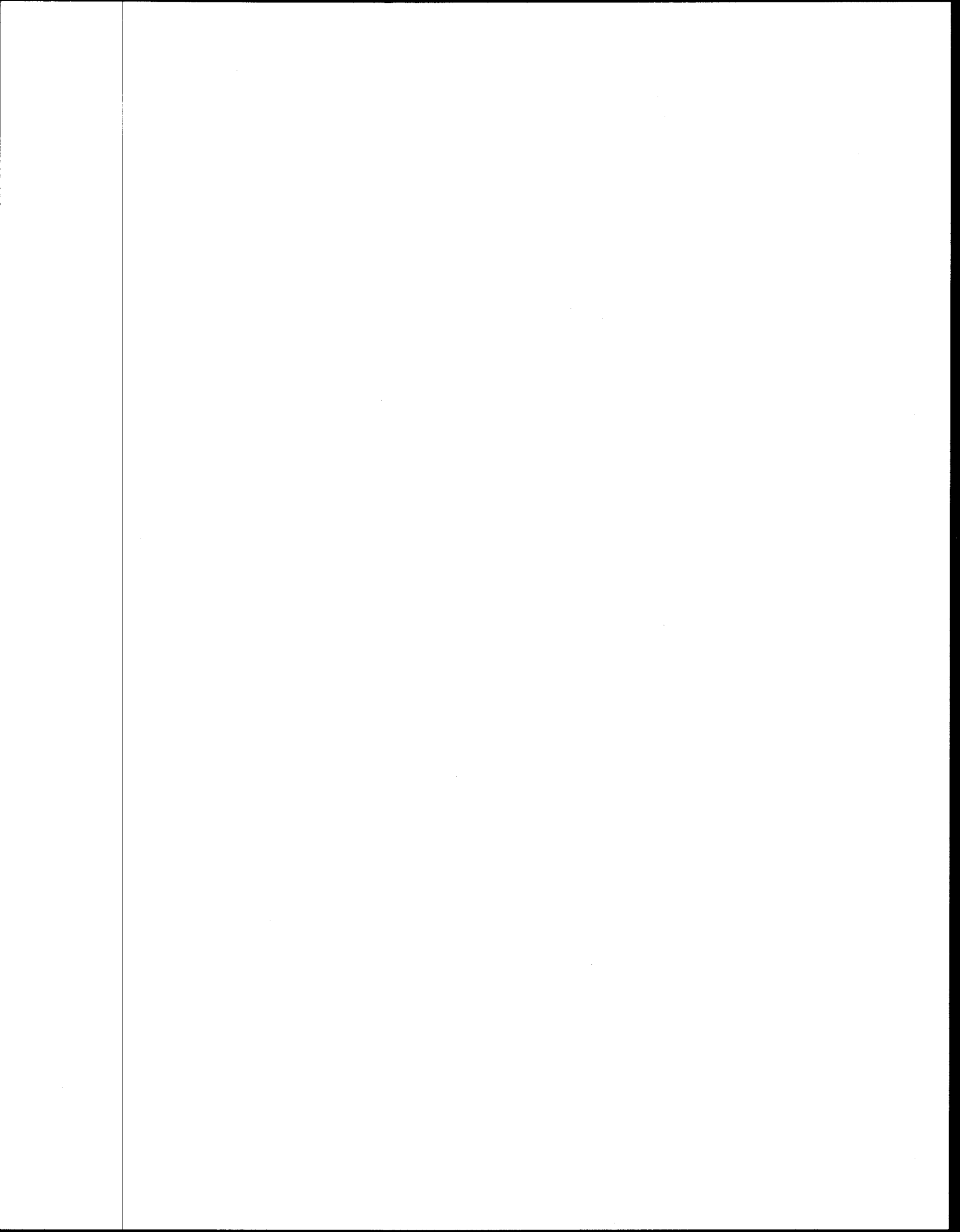
**IF YOU HAVE ANY QUESTIONS,  
PLEASE CONTACT THE CLERK OF THE BOARD  
1001 I Street, 23<sup>rd</sup> Floor, Sacramento, CA 95814**

**(916) 322-5594  
FAX: (916) 322-3928  
ARB Homepage: [www.arb.ca.gov](http://www.arb.ca.gov)**

***To request special accommodation or language needs, please contact the following:***

- For individuals with sensory disabilities, this document is available in Braille, large print, audiocassette or computer disk. Please contact ARB's Disability Coordinator at 916-323-4916 by voice or through the California Relay Services at 711, to place your request for disability services.
- If you are a person with limited English and would like to request interpreter services to be available at the Board meeting, please contact ARB's Bilingual Manager at 916-323-7053.

**THE AGENDA ITEMS LISTED ABOVE MAY BE CONSIDERED IN A DIFFERENT ORDER AT THE BOARD MEETING.**



**PUBLIC MEETING AGENDA**

**LOCATION:**

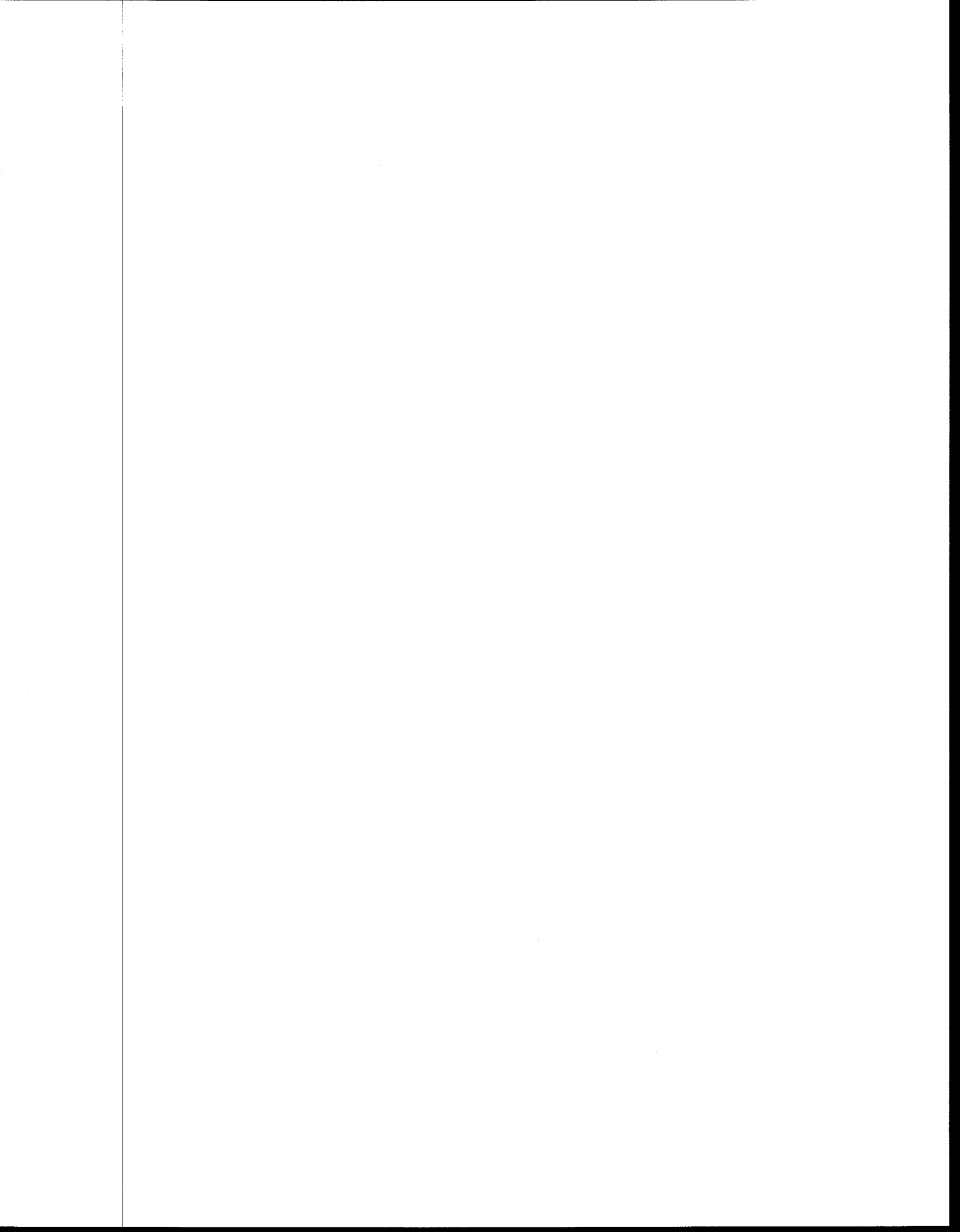
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**April 24, 2008  
9:00 a.m.**

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## CALIFORNIA AIR RESOURCES BOARD

### NOTICE OF PUBLIC MEETING TO CONSIDER A HEALTH RISK ASSESSMENT FOR THE PORT OF OAKLAND AND WEST OAKLAND COMMUNITY

The Air Resources Board (the Board or ARB) will conduct a public meeting at the time and place noted below to consider a staff presentation on the Diesel Particulate Matter Health Risk Assessment for the Port of Oakland and West Oakland Community.

DATE: April 24, 2008

TIME: 9:00 a.m.

PLACE: California Department of Transportation  
111 Grand Avenue  
1st Floor, Auditorium  
Oakland, California 94612

This item will be considered at a one-day meeting of the Board, which will commence at 9:00 a.m., April 24, 2008. Please consult the agenda for the meeting, which will be available at least 10 days before April 24, 2008, to determine the order of agenda items.

For individuals with sensory disabilities, this document is available in Braille, large print, audiocassette or computer disk. Please contact ARB's Disability Coordinator at 916-323-4916 by voice or through the California Relay Services at 711, to place your request for disability services. If you are a person with limited English and would like to request interpreter services, please contact ARB's Bilingual Manager at 916-323-7053.

This presentation will provide the preliminary summary of results of the diesel particulate (diesel PM) health risk assessment that was conducted in cooperation with the Bay Area Air Quality Management District, the Maritime Port of Oakland, and the Union Pacific Railroad. The purpose of the study was to better understand the emissions impacts and the potential public health risk from exposures to diesel PM due to activities at the Maritime Port of Oakland and other significant sources of diesel exhaust in and near the West Oakland community and to provide information to help evaluate the effectiveness of possible mitigation measures.

ARB staff will present an oral report at the meeting. This presentation will describe the study design, explain results of the study, provide key findings, and discuss projected future emissions and risk levels with implementation of adopted and planned regulations. Documents related to this presentation are available at <http://www.arb.ca.gov/ch/communities/ra/westoakland/westoakland.htm>.



Interested members of the public may also present comments orally or in writing at the meeting, and in writing or by email before the meeting. To be considered by the Board, written comments and email submissions not physically submitted at the meeting must be received **no later than 12:00 noon, April 23, 2008**, and addressed to the following:

Postal mail: Clerk of the Board, Air Resources Board  
1001 I Street, Sacramento, California 95814

Electronic submittal: <http://www.arb.ca.gov/lispub/comm/bclist.php>

Facsimile submittal: (916) 322-3928

Please note that under the California Public Records Act (Government Code section 6250 et seq.), your written and oral comments, attachments, and associated contact information (e.g., your address, phone, email, etc.) become part of the public record and can be released to the public upon request. Additionally, this information may become available via Google, Yahoo, and other search engines.

The Board requests, but does not require 30 copies of any written submission. Also, the ARB requests that written and email statements be filed at least 10 days prior to the meeting so that ARB staff and Board members have time to fully consider each comment. Further inquiries regarding this matter should be directed to Dan Donohoue, Chief, Emissions Assessment Branch, (916) 322-6023 or [ddonohou@arb.ca.gov](mailto:ddonohou@arb.ca.gov).

CALIFORNIA AIR RESOURCES BOARD



James N. Goldstene  
Executive Officer

Date: April 8, 2008

*The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demand and cut your energy costs, see our Web-site at [www.arb.ca.gov](http://www.arb.ca.gov)*



DRAFT

**DIESEL PARTICULATE MATTER HEALTH RISK ASSESSMENT  
FOR THE WEST OAKLAND COMMUNITY**

**Preliminary Summary of Results**



**March 19, 2008  
State of California  
AIR RESOURCES BOARD**

**California Environmental Protection Agency**

 **Air Resources Board**

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**DIESEL PARTICULATE MATTER HEALTH RISK ASSESSMENT  
FOR THE WEST OAKLAND COMMUNITY  
Preliminary Summary of Results**

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Regulatory Support Section (PTSD)

**Acknowledgements**

Air Resources Board staff extends its appreciation to representatives of the Port of Oakland, Environ Corporation, and the Bay Area Air Quality Management District for providing assistance with preparation of the emissions inventory data and spatial allocation of emissions.

The staff of the Air Resources Board has prepared this report. Publication does not signify that the contents reflect the views and policies of the Air Resources Board.

**DIESEL PARTICULATE MATTER HEALTH RISK ASSESSMENT  
FOR THE WEST OAKLAND COMMUNITY  
Preliminary Summary of Results**

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## I. INTRODUCTION, KEY FINDINGS, and RECOMMENDATIONS

### A. Introduction

The California Air Resources Board (ARB or Board) conducted a health risk assessment (HRA or study) to help understand the emissions impacts and the potential public health risk from exposures to diesel particulate matter (diesel PM) due to activities at the Maritime Port of Oakland and other significant sources of diesel exhaust in and near the West Oakland community. The West Oakland community is located in Oakland, California and is bounded by the Maritime Port of Oakland (the Port), the Union Pacific Railyard, and the I-580, I-880, and I-980 freeways. Approximately 22,000 people reside in West Oakland and, as trade through the Port has increased, many residents have voiced concerns about the health impacts from exposures to diesel exhaust. An aerial photograph of the West Oakland community is provided in Figure 1.

**Figure 1: Aerial Map of the West Oakland Community**



This study was a cooperative effort between the ARB and the Bay Area Air Quality Management District (BAAQMD). Both the Port and the Union Pacific (UP) Railroad assisted by providing information on their local marine and rail operations located near the West Oakland community. The study was designed to enhance our understanding of diesel PM emission impacts by evaluating the current and future contributions of diesel PM emissions from sources at the Port, the Union Pacific Railyard, local freeways

and other sources of diesel PM near the West Oakland community on the potential health impacts for people living in the West Oakland community. This information will assist in the efforts underway to reduce diesel PM emissions by helping to identify the sources that have the greatest impact on potential cancer risks to nearby residents and by providing a tool that will allow evaluation of the impacts of measures adopted, planned, and under development that are designed to reduce diesel PM emissions. In addition, the information from this study is being used to satisfy Union Pacific Railroad and ARB's commitment under the Statewide Railroad Agreement (CARB, 2005) wherein health risk assessments are required for each major railyard. This HRA fulfills that commitment for the Union Pacific Railroad's Oakland Railyard.

This report provides a preliminary summary of the results from the study in a less technical and more easily understood format. A more comprehensive and technical report that provides a description of the supporting technical basis for the study and a more comprehensive summary of the results is also under development and will be available in June 2008 at <http://www.arb.ca.gov/ch/communities/ra/westoakland/westoakland.htm>. We do not expect the final comprehensive report to impact the findings in this preliminary summary report.

## **B. Key Findings**

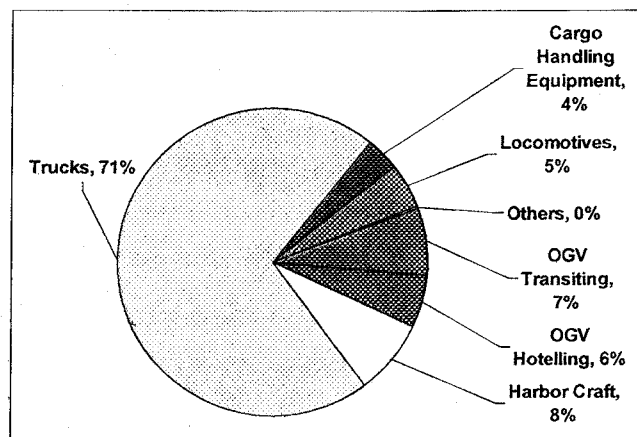
The ARB conducted a HRA to help understand the emissions impacts and the potential public health risk from exposures to diesel PM associated with activities at the Port, the UP Railyard, and other significant sources of diesel exhaust in and near the West Oakland community. The impacts from diesel PM emissions on the West Oakland community as well as on the broader regional San Francisco Bay Area were evaluated. As will be described later in this report, the diesel PM emission sources were allocated to three Parts. Part I included the diesel PM emissions from Port operations; Part II encompassed activities at the UP Railyard; and Part III included other diesel PM emissions from activities not included either in Part I or Part II such as ocean-going vessels (OGV) destined for San Francisco Bay ports other than the Port of Oakland, on-road heavy-duty trucks not transporting goods to and from the Port, harbor craft such as the commercial ferries used to transport passengers across the bay, and local distribution centers in and near the West Oakland community.

The key findings that can be drawn from the study are:

- The West Oakland community is exposed to diesel PM ambient concentrations that are almost three times the average background diesel PM ambient concentrations in the BAAQMD.
- The estimated lifetime potential cancer risk for residents of West Oakland from exposure to diesel PM emissions is about 1,200 excess cancers per million. This estimate assumes residents are exposed to the year 2005 levels of diesel PM emissions (Port and UP operations, and non-Port/non-UP marine and land-based diesel sources) continuously for 70 years.

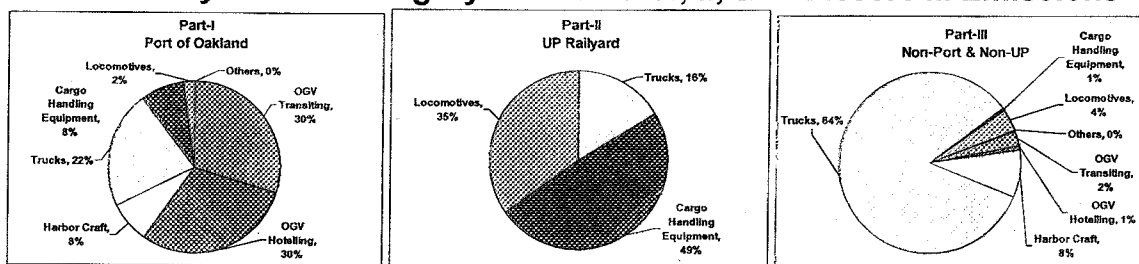
- The potential health risks in the West Oakland community from exposures to diesel PM emissions are of significant concern. Diesel PM emissions from Port operations result in an estimated lifetime potential cancer risk of 200 excess cancers per million in the West Oakland. Diesel PM emissions from the UP Railyard result in potential cancer risks of about 40 excess cancers per million and emissions from non-Port and non-UP sources about 950 excess cancers per million.
- As shown in Figure 2, the emissions from on-road heavy-duty trucks result in the largest contribution to the overall potential cancer risks levels in the West Oakland community, followed by OGV (combined transiting, maneuvering, anchoring, and hotelling emissions), harbor craft, locomotives, and cargo handling equipment.

**Figure 2: Percent Contribution to the West Oakland Community Potential Cancer Risk by Source Category for the Combined Part I, II, & III Diesel PM Emissions**



- The contribution to the potential cancer risk in the West Oakland community from the different Parts varies. As shown in Figure 3, for the Port diesel PM emission sources, the OGV transiting (includes maneuvering and anchoring) and hotelling emissions are responsible for the largest contribution to the potential cancer risks in the West Oakland community followed by on-road trucks and cargo handling equipment. Cargo handling equipment at the UP Railyard is responsible for the largest contribution from the UP activities followed by locomotives. For the Part III sources, those sources in or near the West Oakland community that are not associated with either the Port or the UP Railyard, the on-road trucks are responsible for over 80 percent of the contribution to the potential cancer risks in the West Oakland community.

**Figure 3: Percent Contribution to the West Oakland Community Potential Cancer Risk by Source Category for the Part I, II, & III Diesel PM Emissions**



- The impact of emissions on potential cancer risk also varies by source category. With respect to activities at the Port of Oakland, reducing truck emissions will have the greatest impact on reducing potential cancer risk in the West Oakland community, followed by locomotive, then OGV emissions.
- On a regional basis, diesel PM emissions from Port operations impact a very large area, about 550,000 acres. More than 3 million people live in this area and as a result of the diesel PM emissions from the Port, have potential elevated cancer risks of more than 10 chances in a million. Overall, the Port emissions result in a regional population-weighted potential cancer risk of about 27 in a million. OGV emissions are the largest contributor to the regional risk due to Port-related activities, responsible for about 85 percent of overall average potential cancer risks.
- On a regional basis, diesel PM emissions also result in non-cancer health impacts. Due to diesel PM from Port operations, there are an estimated 18 premature deaths per year, 8 hospital admissions for respiratory and cardiovascular problems, about 290 cases of asthma-related and other lower respiratory symptoms, and 15,000 minor restricted activity days.
- Diesel PM emissions and the associated cancer and non-cancer health risk will be reduced in the West Oakland community by about 80 percent by 2015 due to ARB's regulatory actions. However, even with these actions, the remaining cancer risk will be greater than 200 in a million in the West Oakland community.
- Additional actions are needed in the near-term to accelerate emission reductions and to reduce the health impacts from diesel PM emissions in the West Oakland community and the region as a whole. Actions are also necessary to help offset growth and further reduce risk levels in future years.

### **C. Recommendations**

The findings described above demonstrate that people living in the West Oakland community are exposed to unhealthy levels of diesel PM emissions and that these emissions will decline as adopted and planned regulatory programs are implemented. However, even with the benefits from these regulatory programs, the residual risks are unacceptable and much more needs to be done to ensure that the potential cancer risks are reduced quickly and that programs are developed to offset the expected growth in emissions as global trade expands. Achieving emission reductions from the myriad of diesel PM emission sources is a challenging task and success depends on collective and innovative efforts at the community, local, State, federal and International levels. It

is not possible to meet this challenge alone. There also isn't one approach that can be used to reduce emissions from the ships, locomotives, trucks, and other diesel-fueled vehicles and equipment. A variety of strategies are needed including regulatory efforts, voluntary and incentive programs, careful land-use decisions and cooperative agreements.

With that in mind, as well as the accomplishments to date in the efforts to reduce diesel PM, we have several recommendations to take under consideration including:

- Maximize emissions and risk reduction as quickly and early as possible  
As this risk assessment shows, current health risks in the West Oakland community and the Bay Area region as a whole are too high. While ARB has a regulatory program in place, further efforts are needed to achieve additional emissions reductions.
  - The ARB, BAAQMD, the Port and its tenants, UP, and the community should work cooperatively to identify, prioritize, and implement actions beyond those identified in the Statewide Goods Movement Emission Reduction Plan to reduce diesel PM and other air emissions as quickly as possible.
  - The ARB, BAAQMD, the Port and its tenants, UP, and the community should work cooperatively to encourage and support national and international efforts to reduce emissions from ocean-going vessels as well as national efforts to reduce emissions from locomotives.
- Build and leverage funding sources to ease transition to clean technologies  
Regulatory programs designed to reduce emissions from trucks, ocean-going vessels, commercial harbor craft, and cargo handling equipment are expensive. The State has established funding opportunities which need to be utilized to their fullest extent to help ease the transition. The Port of Oakland should work in concert with ARB, the BAAQMD, and other stakeholders to identify additional funding opportunities.
  - The Port should work with the ARB, the BAAQMD, and the terminal operators to secure any incentive funding that may be available through the Carl Moyer Memorial Air Quality Standards Attainment Program.
  - The Port should work with the ARB, the BAAQMD, the terminal operators, and trucking companies to take advantage of the Proposition 1B Goods Movement Emission Reduction Program funds. These funds directly support early and accelerated diesel PM emission reduction programs and can help ease the transition into compliance with adopted and proposed ARB regulations.
  - The Ports of Los Angeles and Long Beach are implementing an Infrastructure Cargo Fee designed to provide a large supplemental funding source for infrastructure and air quality improvements. The Port of Oakland should consider such a program or similar mechanism to ensure sufficient funding is available to meet air quality goals.

- Ensure successful implementation of ARB regulations

Achieving successful implementation of ARB regulations in the Bay Area will achieve major emissions reductions in the West Oakland community. Achieving these goals requires ARB, the Port of Oakland, UP, BNSF, and private industry to work together and cooperate to ensure emissions reductions are achieved. Specific initiatives include the following:

- The BAAQMD, the Port and its tenants, UP, and the community should actively work to support the adoption of the proposed regulations "*Fuel Sulfur and Other In-Use Operational Requirements for Main Propulsion Diesel Engines and Auxiliary Boilers Operated on Ocean-Going Vessels Within California Waters And 24 Nautical Miles of the California Baseline*" and "*Regulation to Reduce Emissions of Diesel Particulate Matter, Oxides of Nitrogen and Other Criteria Pollutants, and Greenhouse Gases from In-Use Heavy-Duty Diesel-fueled Vehicles.*" These proposed regulations are scheduled for ARB consideration in 2008 and are critical to reducing diesel PM emissions not only throughout the State but also in the West Oakland community.
- The Port should work with the terminal operators, the local electrical utilities, and vessel operators to comply with ARB's regulation to reduce hotelling emissions. This may include the installation of shore power infrastructure to support cold-ironing for ships that visit the Port, negotiating with the local electrical utilities for reduced tariffs, and encourage vessel modifications to reduce emissions.
- The Port of Oakland should continue to work closely with ARB staff on the registration requirements, funding issues, and development of a plan to meet the regulatory requirements for the Drayage Truck regulation.
- UP Railroad should continue to aggressively work to fulfill commitments made in the 2005 ARB/Railroad State Wide Agreement "*Particulate Emissions Reduction Program at California Rail Yards.*" Key elements for the agreement between the ARB and the Railroads (UP and BNSF) include the identification and implementation of future feasible mitigation measures based on the results of the railyard HRA.

- Continue to study trucking operations at the Port and in West Oakland

As discussed in this assessment, emissions estimates representing trucks are uncertain. We propose additional actions be taken to better understand the impact of drayage trucks on a regional basis, and both drayage and other trucks on the West Oakland community.

- The BAAQMD should continue working with the community and the Port to implement its studies of trucking operations in the West Oakland community
- The Port of Oakland should conduct a port truck survey and origin/destination study that investigates where Port truck trips begin, how

Port trucks travel through the local community, and where Port trucks ultimately deliver their cargo.

The BAAQMD and ARB should consider revisiting findings from this risk assessment if new information about trucking operations in West Oakland deviates significantly from findings developed in this assessment.

## II. BACKGROUND AND STUDY OVERVIEW

Diesel engines emit a complex mixture of air pollutants, composed of gaseous and solid material. The visible emissions in diesel exhaust are known as particulate matter or PM, which includes carbon particles or "soot." In 1998, following a 10-year scientific assessment process, ARB identified diesel PM as a toxic air contaminant based on its potential to cause cancer and other health problems, including respiratory illnesses, and increased risk of heart disease. Subsequent to this action, research has shown that diesel PM also contributes to premature deaths (ARB, 2002). Health risks from diesel PM are highest in areas of concentrated emissions, such as near ports, railyards, freeways, or warehouse distribution centers. Exposure to diesel PM is a health hazard, particularly to children whose lungs are still developing and the elderly who may have other serious health problems.

Diesel PM is a significant component of particulate matter in many cities. Diesel PM is composed of carbonaceous particles (soot) and particles that can form from nitrogen oxides (NO<sub>x</sub>) and oxides of sulfur (SO<sub>x</sub>) emitted by diesel engines. The health impacts of particulate matter (PM<sub>10</sub> and PM<sub>2.5</sub>) have been studied in epidemiological studies conducted in many different cities. These studies have found an increase of one to two percent in daily mortality associated with each 10 µg/m<sup>3</sup> increase in PM<sub>10</sub> exposure. The most vulnerable subpopulations are those with preexisting respiratory or cardiovascular disease, especially the elderly. In addition, increased hospital admissions and illnesses from respiratory disease have been associated with particulate matter exposure in adults and children. Numerous epidemiological studies have also found an association between exposures to diesel PM and an increased risk of lung cancer.

Health risk assessments are a useful tool for comparing the potential health impacts of various sources of air pollution. In a risk assessment, the amount of diesel PM emitted from each source (e.g., truck or ship) is estimated. An air modeling computer program uses local meteorological data (e. g. wind speed and direction) to estimate the annual average ground level concentrations of diesel PM in the communities around the facility. The increased risk of developing lung cancer from exposure to a particular level of diesel PM can be estimated using the Office of Environmental Health Hazard Assessment's (OEHHA) cancer potency factor for diesel PM. The non-cancer health impacts of diesel PM exposure can also be quantified if the expected concentrations of a pollutant are high enough and there is enough population exposed to predict a result.

*A risk assessment is a tool used to evaluate the potential for a chemical or pollutant to cause cancer and other illnesses.*

*For cancer health effects, the risk is expressed as the number of chances in a population of a million people who might be expected to get cancer over a 70-year lifetime. The number may be stated as "10 in a million" or "10 chances per million". Often, scientific notation is used and you may see it expressed as  $1 \times 10^{-5}$  or  $10^{-5}$ . Therefore, if you have a potential cancer risk of 10 in a million, that means if one million people were exposed to a certain level of a pollutant or chemical there is a chance that 10 of them may develop cancer over their 70-year lifetime. This would be 10 new cases of cancer above the expected rate of cancer in the population. The expected rate of cancer for all causes, including smoking, is about 200,000 to 250,000 chances in a million (one in four to five people).*

These non-cancer impacts include premature death, hospital admissions, respiratory illnesses/asthma, and lost school/work days. However, the cancer health impacts have more commonly been used as the yardstick with which to compare the impacts of various diesel sources. Risk assessments have various uncertainties in the methodology and risk assessments are therefore deliberately designed so that risks are not under predicted. Risk assessments are best understood as a tool for comparing risks from various sources, usually for purposes of prioritizing risk reduction, rather than as a literal prediction of the incidence of disease in the exposed population.

#### **A. West Oakland Community Health Risk Assessment Study Overview**

West Oakland is bounded to the west and southwest by the Maritime Port of Oakland, the Union Pacific Railyard, and the I-880 freeway. The I-580 freeway traverses along the northern edge of the neighborhood, the I-980 freeway to the east and the I-880 freeway to the south. West Oakland covers about a three square mile area and is a diverse neighborhood. It is not uncommon to find light industrial, commercial, and residential areas intermixed within the same block. As mentioned earlier, to investigate the potential health impacts from exposures to diesel PM emissions, a health risk assessment was conducted. Below we provide brief summaries of the key elements for the HRA.

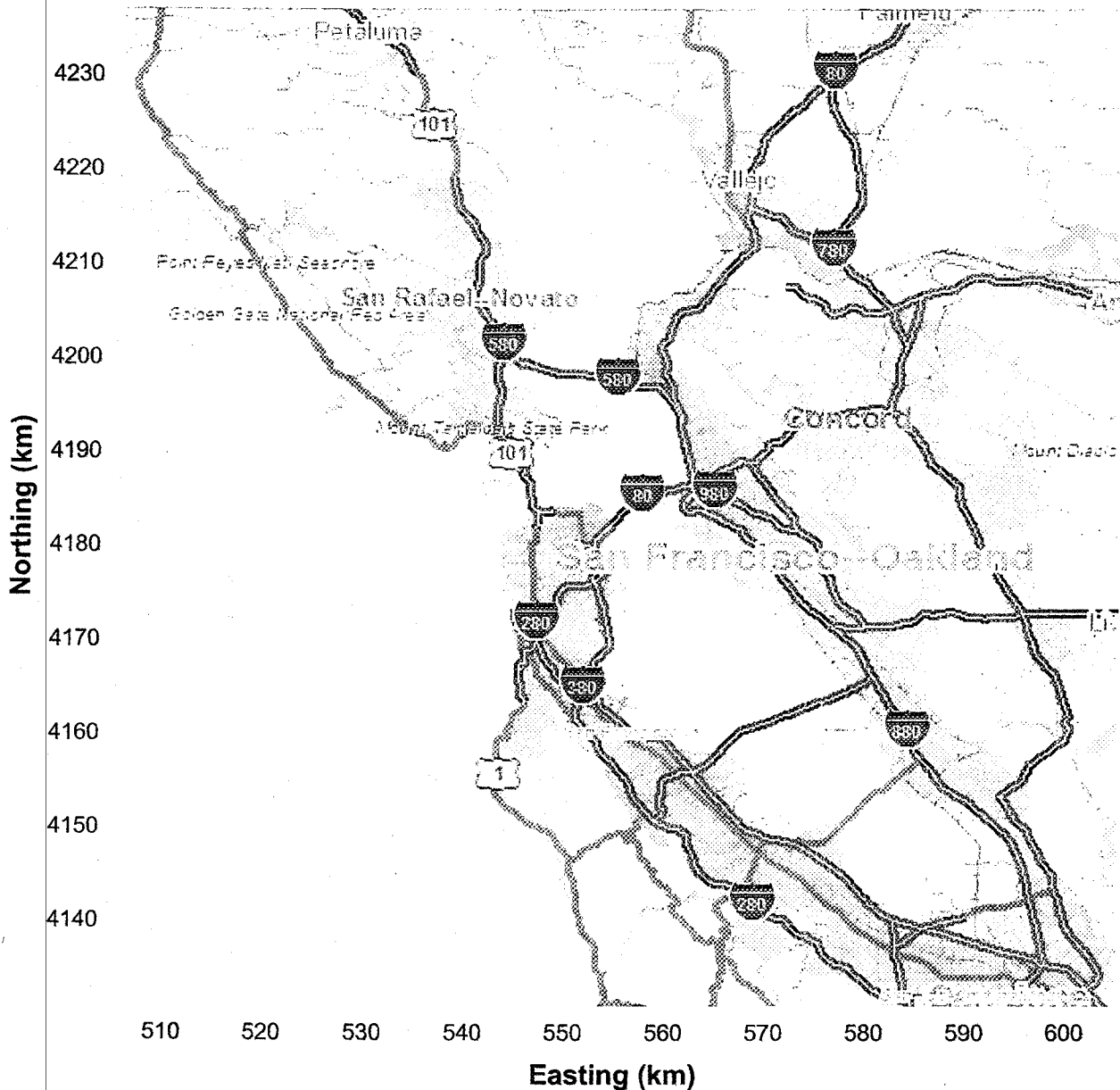
##### **Study (Modeling) Domain**

The study or modeling domain is the area in which the concentrations of diesel PM emissions in the atmosphere are to be determined. In this study, the modeling domain includes the Port, the ocean to the west of the Golden Gate Bridge out to the outer buoys, the inner bay waterway between Golden Gate Bridge and the Port, and the nearby communities. The size of the modeling domain was selected to ensure that the modeling effort would take into consideration all the diesel PM emissions. These emissions include all of the ship travel routes in the nearby ocean and the inner waterways to and from the Port, the Port property, and other land-based areas that could result in diesel PM emissions that would be expected to have risks level of 10 per million or greater. The modeling domain for the study is shown in Figure 4. It covers a 100 kilometer (km) by 100 km area (about 3,800 square miles).

For computer modeling purposes, the domain needs to be broken up into smaller areas referred to as grid cells. Selection of grid cell size reflected a compromise between the desire to define meteorological and geophysical variations on a very small scale, and the computer time and resources necessary to run the model. Given the complex terrain (sea-land, rolling mountains, etc.), non-uniform land-use characteristics, and the water bodies large enough to cause strong local-scale flows, we decided to use a grid cell size of 500 meters (m) x 500 m (about a third of a mile by a third of a mile) for the modeling effort. To provide a more detailed estimate of localized impacts of the emissions on the nearby community of the Port (West Oakland community), we used a grid cell size of 250 m x 250 m for the areas bordering the Port.

The meteorological grid was defined by 10 vertical layers. Cell heights were set at 20, 60, 80, 100, 300, 600, 1000, 1500, 2200, and 3000 meters above-ground level (AGL).

**Figure 4: Modeling Domain for the West Oakland Community Health Risk Assessment**



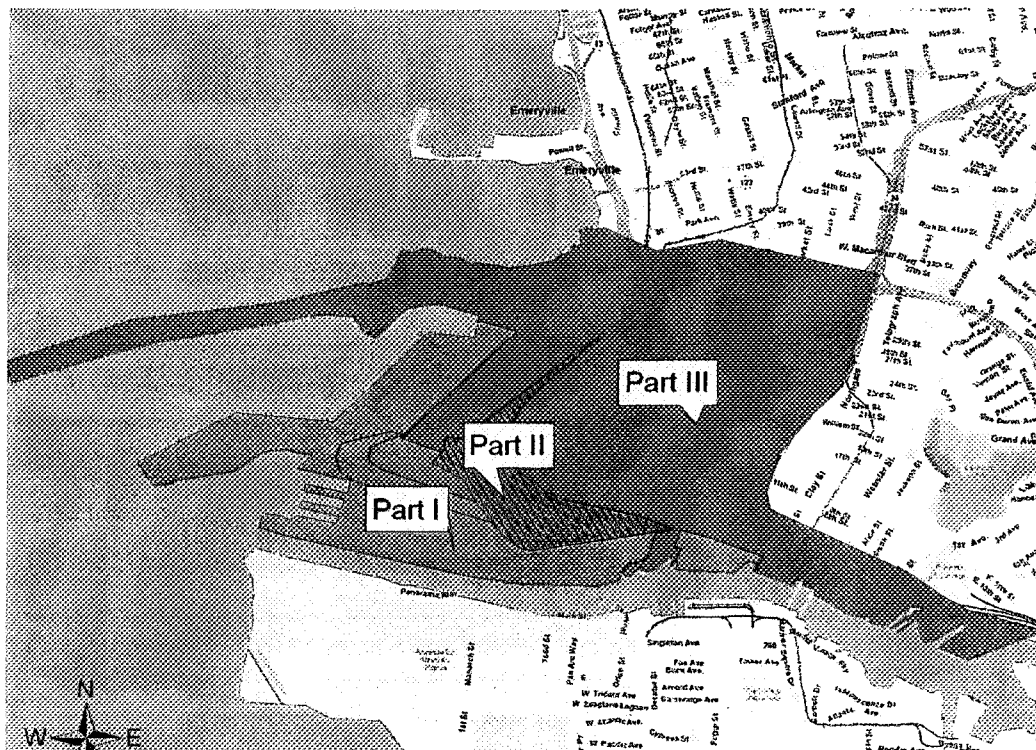
#### Air Pollutants Evaluated

The study focused on the impacts from diesel PM. As mentioned earlier, diesel PM is a toxic air contaminant and exposure to diesel PM emissions can result in serious health impacts. Previous studies have shown that diesel PM is responsible for over 70 percent of the potential cancer risk from all toxic air contaminants in California. (DDRP, 2000) Because the health impacts from diesel PM are so large and exceed the health impacts from other air toxics on a community and regional basis, we limited the study to diesel PM emissions and did not evaluate the impact of other toxic air contaminants on West Oakland of the region.

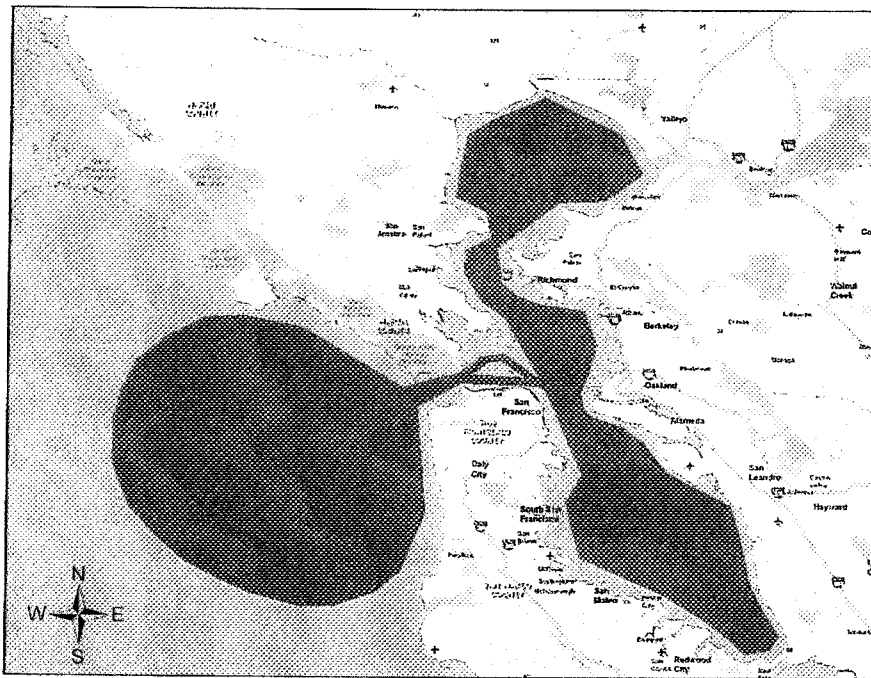
### Sources and Locations of Diesel PM Investigated

There are many sources of diesel PM emissions within the study domain. Diesel PM emission inventories were prepared for all local sources of diesel PM that were expected to impact the West Oakland community. To help manage the development of the emissions inventory and to interpret the results, the study domain was segregated into three parts. Part I included the diesel PM activities associated with the Maritime Port of Oakland. Part II addressed diesel PM sources at the Union Pacific (UP) Railyard. Part III examined the other sources of diesel PM in the Bay (over-water) and those located in and near the West Oakland community. Both Parts I and III included emission sources that were located overwater such as ships, ferries and tug boats. Figures 5 and 6 provide aerial overviews of the land-based portions and the water-based regions for Parts I, II, and III. These are the areas in which we estimated the diesel PM emissions.

**Figure 5: Land-based Emissions Domain for Parts I, II, and III**



**Figure 6: Overwater-based Emissions Domain for Parts I and III**



In each area, there were a wide variety of operations and activities that resulted in emissions of diesel PM. In Table 1 below, we provide a summary of the various diesel PM emission sources inventoried in each Part.

**Table 1: Sources of Diesel PM Evaluated in the HRA**

Area	Description	Emission Sources Inventoried
Part I	Maritime Port of Oakland	ocean-going vessels, commercial harbor craft, cargo handling equipment, port drayage trucks operating on Port property, in West Oakland and on local freeways, on-port locomotives
Part II	Union Pacific Railyard	locomotives, cargo handling equipment, truck refrigeration units and reefer cars, drayage trucks
Part III	Non-port and non-Union Pacific Railyard areas in and adjacent to the West Oakland Community	on-road trucks, ocean-going vessels,* commercial harbor craft, cargo handling equipment, locomotives, Amtrak Maintenance facility, major construction projects, stationary point sources, truck-based businesses and distribution centers

\* Included in Part III were only ocean-going vessels destined for ports in the Bay Area other than the Port of Oakland

### 2005 Baseline Emissions Inventory

We compiled a 2005 baseline emissions inventory representing emission sources in Part I, Part II, and Part III. Part I emissions inventories were developed by the Port of Oakland and reviewed by ARB and BAAQMD staff. Part II emissions inventories were developed by Union Pacific and reviewed by ARB staff. Part III emissions inventories were developed by ARB, Port, and BAAQMD staff. Because inventories were categorized into different Parts, we took care to ensure each Part was distinct so as to avoid double-counting of emissions. Table 2 provides summary emissions estimates by source category and Part. As shown in Table 2, the emissions of diesel PM from Port-related activities were estimated to be approximately 265 per year for the Port (Part I), 11 tons per year for the Union Pacific Railyard activities (Part II), and about 570 tons per year for the other sources (Part III). All combined, it was estimated that there were approximately 845 tons of diesel PM emissions in 2005 from the combined activities. A more detailed summary for the Parts I, II, and III emissions inventory is provided in Appendix A. In addition, the Part I inventory prepared for the Port by Environ International Corporation (Environ) can be found at <http://www.portoakland.com/environm/airEmissions.asp>. Additional information on the Part II inventory is provided in Appendix C and the details on the Part III inventory can be found in Appendix D.

It should be noted that the emissions totals for the various categories presented in Table 2 may be slightly different than the emissions presented in Appendix A. The emission inventory in Table 2 is the inventory used in the dispersion modeling. It differs slightly from the Appendix A inventory because, in some cases such as for Part III ocean-going vessels, the emissions inventory presented in Appendix A included emissions that were outside of the model domain. In addition, the Part I (port) heavy-duty diesel truck inventory used in the modeling exercise is different than that published in the Part I inventory prepared by the Environ for Port. The approximately 20 tons per year (T/Y) reported in Table 2 for Part I trucks includes approximately 2.8 T/Y emissions from port-truck activities on nearby freeways that was not included in the inventory prepared for the Port. It also includes on-site truck emissions from the Oakland Maritime Support Services (OMSS) facility (1.4 T/Y).

**Table 2: Summary of Modeled 2005 Diesel PM Emissions for the West Oakland HRA**

Source Category	Port of Oakland (Part I)	Union Pacific Railyard (Part II)	Non-Port & Non-UP (Part III)	Combined
2005 Diesel PM Emissions Tons/Year				
Ocean-going Vessels	209	-	218	428
Cargo Handling Equipment	21	2.2	4.3	27
Heavy-duty diesel trucks	20	1.9	90	112
Commercial Harbor Craft	13	-	238	251
Locomotives	2.0	3.9	1.3	7.2
TRUs & Reefer Cars	-	3.2	-	3.2
Amtrak Maintenance Facility	-	-	3.4	3.4
Major Construction Projects	-	-	13	13
Stationary Point Sources	-	-	0.2	0.2
Total	265	11	568	845

Notes: Modeled emissions are different than emissions reported in Appendix A and D due to the size of the modeling domain being slightly smaller than the overall region in which emissions were estimated. For Part III, the "Major Construction Projects" includes community construction projects. Approximately 10% or 1.2T/Y of the 13 T/Y is due to emissions from construction projects on Port property. Part III trucks include on-road truck emissions from activities at distribution centers.

The emission inventory presented in Table 2 represents the most comprehensive inventory of diesel PM emissions in the West Oakland area that has been done. The inventory was compiled from ARB developed category-specific emissions inventory models, and additional data where necessary to allocate emissions spatially within the modeling domain. The inventory was reviewed by several organizations within ARB, and by the BAAQMD and the Port. Overall, there is general agreement that the inventory represents the best information available on each category of emissions source, and the magnitude of emissions in the modeling domain.

However, early on in the inventory development process, ARB staff realized that information on trucking activity, both associated with the Port of Oakland and trucking operations in the West Oakland community as a whole, was quite limited. For example, we have very limited information on the origin and destination of port truck trips both within and outside of the West Oakland community, and we have limited information on the intensity of non-port related trucking operations within the West Oakland community. We believe these data limitations have led to a potential overestimate of overall trucking emissions within the modeling domain and a potential underestimate of the overall fraction of trucking emissions that are attributable to the Port of Oakland. The implications of this are discussed later in this document.

Because of these data limitations, ARB staff has worked with BAAQMD staff in their development and implementation of new studies focused on improving the quantification of Port and non-Port trucking operations in the West Oakland community. These studies are necessary, and will provide information that can be used in the future to update and refine truck inventory estimates provided in this report. ARB staff has