

**EXCERPTS FOR SEPTEMBER 14, 2006  
COMMUNITY MEETING IN WEST OAKLAND**

**Emission Reduction Plan  
for Ports and Goods Movement  
in California**

**Approved: April 20, 2006**

California Environmental Protection Agency



**Air Resources Board**

[this page intentionally left blank]

State of California  
California Environmental Protection Agency  
AIR RESOURCES BOARD

**DOCUMENT AVAILABILITY**

Electronic copies of this document, the April Board meeting notice, and related materials can be found at: <http://www.arb.ca.gov/planning/gmerp/gmerp.htm>. Alternatively, paper copies may be obtained from the Board's Public Information Office, 1001 I Street, 1<sup>st</sup> Floor, Visitors and Environmental Services Center, Sacramento, California, 95814, (916) 322-2990.

If you are a person with a disability and desire to obtain this document in an alternative format, please contact the Americans with Disabilities Act Coordinator at (916) 323-4916, or TDD (916) 324-9531, or (800) 700-8326 for TDD calls from outside the Sacramento area.

**DISCLAIMER**

This report has been reviewed by the staff of the Air Resources Board and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the Air Resources Board, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

# AIR RESOURCES BOARD STAFF

## PROJECT LEADERS

Michael H. Scheible, Deputy Executive Officer  
Lynn Terry, Deputy Executive Officer  
Bart Croes, Division Chief, Research Division  
Robert D. Fletcher, P.E., Division Chief, Stationary Source Division  
Linda Murchison, Ph.D., Division Chief, Planning and Technical Support Division  
Cynthia Marvin, Assistant Division Chief, Planning and Technical Support Division  
Michael Benjamin, D.Env., Branch Chief, Mobile Source Analysis Branch  
Richard Bode, Branch Chief, Health and Exposure Assessment Branch  
Dan Donohoue, Branch Chief, Emissions Assessment Branch  
Sylvia Oey, Manager, Southern California Liaison Section  
Todd Sax, D.Env., Manager, Regulatory Support Section  
Linda Tombras Smith, Ph.D., Manager, Health and Ecosystems Assessment Section  
Doug Thompson, Manager, Motor Vehicle Assessments Section  
Erik White, Manager, Technical Analysis Section

## KEY CONTRIBUTORS

Andy Alexis	Nehzat Motallebi, Ph.D.
Corey Bock	Carol McLaughlin
Pam Burmich	Jamesine Rogers
William Dean, Ph.D.	Kirk Rosenkranz
Pingkuan Di, Ph.,D., P.E.	Rajinder Sahota
Fereduin Feizollahi	Carol Sutkus
Annette Hebert	Jon Taylor, P.E.
Harold Holmes	Hien Tran
Kathy Jaw, Ph.D.	Jeff Weir
Karen Khamou	Kellie Williams
Kyriacos Kyriacou	Walter Wong
Paul Milkey	Seungju Yoon, Ph.D.

We would also like to recognize the many other managers and staff throughout the Air Resources Board who shared their expertise on this plan. While too numerous to list individually, their contributions were vital to the final product.

## QUESTIONS

*Plan:*  
Cynthia Marvin  
(916) 322-7236  
[cmarvin@arb.ca.gov](mailto:cmarvin@arb.ca.gov)

*Process:*  
Sylvia Oey  
(916) 322-8279  
[soey@arb.ca.gov](mailto:soey@arb.ca.gov)

*Health:*  
Linda Smith, Ph.D.  
(916) 327-8225  
[lsmith@arb.ca.gov](mailto:lsmith@arb.ca.gov)

# TABLE OF CONTENTS

WHAT'S NEW IN THIS PLAN .....	What's New-1
EXECUTIVE SUMMARY.....	ES-1
I. PUBLIC HEALTH IMPACTS.....	1
A. Particulate Matter and Ozone Health Impacts .....	1
B. Community Health .....	7
C. Health Risk Assessments for Diesel Particulate Matter .....	7
D. Health-Related Costs.....	10
II. EMISSION INVENTORY .....	12
A. Introduction .....	12
B. Summary of Emission Inventory Revisions.....	16
C. Projecting Growth .....	17
D. Statewide Emissions Summary .....	19
E. Emission Summary for Selected Regions.....	24
F. Emission Estimation Methods by Sector.....	25
G. Future Refinements .....	35
III. EMISSION REDUCTION STRATEGIES .....	36
A. Background.....	36
B. Ships.....	41
C. Commercial Harbor Craft .....	58
D. Cargo Handling Equipment.....	68
E. Trucks .....	79
F. Locomotives.....	95
G. Operational Efficiencies .....	106
H. Land Use Decision-Making.....	109
I. Project and Community Specific Mitigation.....	110
J. Port Programs to Reduce Emissions .....	111
K. Summary of Strategies .....	114
IV. BENEFITS AND COSTS .....	122
A. Summary of Benefits.....	122
B. Costs to Implement Plan Strategies.....	129
C. Economic Impacts .....	131
V. FUNDING NEEDS.....	135
A. Regulations Versus Incentives.....	135
B. Federal Funding.....	137
C. User Fees .....	137
D. Other Market-Based Approaches .....	138

**TABLE OF CONTENTS**  
(continued)

VI. FEDERAL RESPONSIBILITY.....139

    A. Accelerated Regulation .....140

    B. Leadership on International Emission Sources .....140

    C. Sulfur Emission Control Area Designation .....140

    D. Incentive Funding .....141

APPENDICES

A. Quantification of the Health Impacts and Economic Valuation of  
Air Pollution from Ports and Goods Movement in California..... A-1

B. Regional Analyses..... B-1

C. Diesel PM Risk Reduction Methodology..... C-1

D. International Goods Movement ..... D-1

E. Comparison of Plan to Port of Los Angeles No Net Increase Measures E-1

F. List of Public and Peer Review Comments ..... F-1

G. Maritime Goods Movement Coalition Proposal .....G-1

TECHNICAL SUPPLEMENTS

The following supporting documents are available on our website at:

<http://www.arb.ca.gov/planning/gmerp/gmerp.htm>

- Technical Supplement on Quantification of the Health and Economic Impacts of Air Pollution from Ports and Goods Movement in California
- Technical Supplement on Emission Inventory

## Executive Summary

Air pollution from international trade and all goods movement in California is a major public health concern at both regional and community levels. These activities are a key contributor to the State's economic vitality, but this prosperity comes at a price. Goods movement is now the dominant contributor to transportation emissions in the State. The staff of the Air Resources Board (ARB or Board) has developed this proposed plan to identify and initiate specific actions necessary to reduce these emissions and protect public health.

This plan updates our December 2005 draft plan in several important ways. Most significantly, the plan now includes domestic as well as international goods movement, the strategies would meet the 85% diesel particulate matter (PM) risk reduction target, the port truck strategy has been further developed, and the health analysis is updated. The impacts of the expanded scope and refined analyses are summarized in the "What's New" section of the plan and reflected throughout the document.

The emission reduction plan is part of the broader Goods Movement Action Plan being jointly carried out by the California Environmental Protection Agency (Cal/EPA) and the Business, Transportation & Housing Agency (BT&H). Cal/EPA and BT&H's Phase 1 Action Plan released in September 2005 highlighted the air pollution impacts of goods movement and the urgent need to mitigate localized health risks in affected communities. The Phase I Action plan established four specific goals for addressing this problem: reduce emissions to 2001 levels by 2010; continue reducing emissions until attainment of applicable standards is achieved; reduce diesel-related health risks 85% by 2020; and ensure sufficient localized risk reduction in each affected community. The draft Phase II Action Plan (February 2006) retained these goals and explicitly references this plan as a key component.

Successful implementation of the ARB emission reduction plan will depend upon actions at all levels of government and partnership with the private sector. No single entity can solve this problem in isolation. The basic strategies to reduce emissions include regulatory actions, incentive programs, lease agreements, careful land use decisions and voluntary actions. The measures address all significant emission sources involved in international and domestic goods movement including trucks, locomotives, marine vessels, harbor craft, and cargo handling equipment.

Since ARB staff released the draft *Emission Reduction Plan for Ports and International Goods Movement* on December 1, 2005, we have held community meetings, sought scientific peer review of its health risk assessment methodology and conclusions, and reviewed public comments from the general public, affected industries, the Cal/EPA and BT&H Goods Movement Action Plan work groups, local air districts and other stakeholders. ARB's Governing Board will consider approval of this proposed plan at a public meeting on April 20-21, 2006 in Long Beach, California.

Specific actions to reduce goods movement emissions are already underway. Rules for sources under ARB's direct regulatory authority have been adopted and more are on the way. Likewise, the U.S. Environmental Protection Agency (U.S. EPA) is working on national regulations affecting marine vessels, locomotives and harbor craft, scheduled for promulgation this year. Together, ARB staff, U.S. EPA staff and other state representatives are exploring a potential "Sulfur Emission Control Area" (SECA) designation for parts of the U.S. coastline, which would require all visiting vessels to use lower sulfur fuels. A significant amount of existing incentive funds has been applied to goods movement emission sources and ARB has prioritized continued funding on this source of statewide significance. Finally, several local entities are pursuing elements of this emission reduction plan through their own ordinances, regulations, lease agreements, environmental mitigation requirements, and voluntary efforts. Staff expects all of those activities to continue.

### Public Health Assessment

As part of the emission reduction plan, ARB staff estimated the public health impacts of the goods movement system in California. Health impacts of pollutants commonly associated with emissions from goods movement include premature death, cancer risk, respiratory illnesses, and increased risk of heart disease. Particulate matter, primarily from diesel engines, and gases that form ozone and particulate matter in the atmosphere, are key pollutants associated with these health effects. The large body of scientific research on these pollutants forms the basis for air quality standards and risk assessments used in ARB programs.

In the draft plan, ARB staff estimated that emissions from current (2005) ports and international goods movement activities result in approximately 750 premature deaths per year. With the addition of emissions from domestic goods movement, the new estimate of premature deaths for *all* goods movement is 2,400 annually, mostly from particulate pollution. With implementation of the plan, an estimated 820 premature deaths would be avoided in 2020 compared to 500 in the draft plan

Since many communities in California exceed State standards by a large margin, the estimate of premature deaths remaining after plan implementation is still very significant. However, achieving the emission reduction goals of this plan would be a major milestone of progress towards meeting California's stringent State standards. Meeting the 85% risk reduction target for diesel particulates would reduce health risk substantially in the communities most impacted by diesel particulate pollution.

The economic valuation of these health effects is substantial. For example, the standard value of a life ended prematurely is \$7.9 million today, rising to \$8.6 million by 2020. For the 15-year period between 2005 and 2020, staff estimates an aggregate health impact equivalent to approximately \$200 billion in present value dollars. Reducing these health impacts as quickly as possible is essential.

### Emission Inventory

The emissions associated with ports and all goods movement are categorized by source and shown in Table 1 for 2001 and 2020. This plan evaluates the following pollutants: diesel particulate matter (diesel PM), nitrogen oxides (NOx), reactive organic gases (ROG), and sulfur oxides (SOx). For each category, staff estimated 2001 “baseline” emissions, current (2005) levels and future forecasts for 2010, 2015 and 2020. The future forecasts include the benefits of existing requirements and assumed growth rates. Without further action, ship emissions will increase through 2010 and beyond, making this the single most challenging category to address. Truck, rail, cargo handling and harbor craft emissions are expected to decrease continuously from current levels, but not at a rate fast enough to meet public health goals.

**Table 1**  
**2001 and 2020 Statewide Emissions**  
**from Ports and Goods Movement**  
 (tons per day)

Source	Diesel PM		NOx		ROG		SOx	
	2001	2020	2001	2020	2001	2020	2001	2020
Ships	7.8	23.3	95	254	2	7	60	180
Harbor Craft	3.8	1.8	75	39	8	4	<1	<1
Cargo Handling Equipment	0.8	0.2	21	6	3	1	<1	<1
Trucks	37.7	6.2	655	255	56	23	5	1
Transport Refrigeration Units	2.5	0.1	22	28	13	4	<1	<1
Locomotives	4.7	4.5	203	139	12	12	8	<1
<b>Total</b>	<b>57.3</b>	<b>36.1</b>	<b>1071</b>	<b>721</b>	<b>94</b>	<b>51</b>	<b>74</b>	<b>181</b>

The ship inventory (baseline and growth forecast) tracks with the June 2005 Port of Los Angeles report, adjusted to include all other ports in California. The emission inventory includes all ship emissions within 24 nautical miles of shore. Off-shore emissions are most important from the standpoint of regional ozone and fine particulate matter (PM2.5) levels. Dockside emissions are especially important in terms of health risk to nearby communities. Ship emissions estimates for 2020 have slightly increased compared to the draft plan.

Emission estimates and growth factors were calculated separately for harbor craft (tug boats, ferries, fishing boats, other vessels) and cargo handling equipment. The harbor craft inventory has been revised downward since the draft plan to include only the emissions within 24 nautical miles of the California coast and to better reflect fleet turnover to cleaner engines under existing emission standards.

With the expanded scope of the plan, the most significant emission inventory changes are for trucks and locomotives. Adding the domestic component and incorporating the latest testing data increased truck emissions by three to ten-fold (depending on the pollutant and year) compared to the draft plan. Nearly all goods are moved by truck at some point, whether imported through the ports, from other states, Mexico, or Canada, whether generated and consumed within California, or whether generated and exported from California. Locomotive emissions are also significant and growing. Including all rail trips in this plan increased locomotive emissions by a factor of two to three from the draft plan. In addition to statewide emissions estimates, ARB staff has included regional goods movement emissions analyses for South Coast, San Francisco Bay Area, San Joaquin Valley, San Diego, and Sacramento (see Appendix B – Regional Analyses).

### Emission Reduction Targets

As noted above, the Phase I and II Goods Movement Action Plans include goals to reduce goods movement-related emissions over time. This plan defines several additional targets for each emission source category, based on staff's assessment of technological feasibility and probable timing. In every case, the emission reduction targets are inclusive of anticipated growth. When implemented, they will result in a net *decrease* in emissions.

This plan also anticipates what the potential attainment needs of the South Coast air basin will be with respect to the national 8-hour ozone and PM<sub>2.5</sub> standards. For ports and international goods movement sources, the plan seeks to reduce NO<sub>x</sub> emissions by 30% in 2015 beyond current control levels, and an additional 50% beyond current control levels in 2020. These NO<sub>x</sub> targets are based on very preliminary "carrying capacity" estimates that will be refined through modeling as part of the upcoming State Implementation Plan (SIP) process. We did not revise this target with the inclusion of domestic goods movement. The goal in the draft plan was intended to be a preliminary step in the attainment planning process. Once the South Coast region has an ozone attainment target and firm attainment date, the goods movement target can be revisited.

The plan now explicitly recognizes the need for statewide application of the plan strategies, especially in the San Joaquin Valley. A qualitative goal has been added to reflect the need for 2015 and 2020 NO<sub>x</sub> reductions to aid in attainment of federal and State air quality standards. No additional regional targets have been added, but the plan specifies the anticipated reductions from goods movement emission sources in each region. During SIP preparation, final regional reduction targets will be developed, all source categories will be more closely assessed, and a complete list of SIP

measures will be proposed taking into account technological feasibility and cost. This will occur through a public process involving ARB, U.S. EPA, local air districts, metropolitan planning organizations and all other stakeholders. New SIPs for ozone and PM2.5 are due in 2007 and 2008, respectively.

### Emission Reduction Strategies

Expanding the universe of sources to cover ports and all goods movement increases overall emissions of diesel PM, NOx, ROG by two to three-fold in 2001 and 2005. When the new plan strategies would begin implementation by 2010, the gap begins to decrease and continues to do so through 2020. The plan is relatively more effective in reducing total goods movement emissions than the international goods movement portion, primarily due to measures already in place to reduce future truck emissions. The percent emission reduction that this plan would achieve by 2020 is greater for each pollutant than the draft plan -- diesel PM is reduced 79% compared to 44% in the draft plan, while NOx decreases 63% over this time period compared to 55% previously. SOx shows the smallest change (78% reduction now versus 73% before) because both versions of the plan included all ships, with roughly the same uncontrolled emissions in later years. Table 2 shows the emission trend for each pollutant with implementation of the plan strategies.

**Table 2**  
**Statewide**  
**Trends in Emissions from Ports and Goods Movement**  
**with Full Implementation of Plan Strategies**  
(tons per day)

Pollutant	Year					% Reduction 2001-2020
	2001	2005	2010	2015	2020	
Diesel PM	57	53	32	17	12	79%
NOx	1,071	1,080	807	544	393	63%
ROG	94	90	71	50	39	58%
SOx	73	94	42	16	16	78%

Ships are the most challenging emission sources in the goods movement system. The vessels that transport goods in and out of California harbors have little or no emissions control and run on high emitting bunker fuel. Unless that changes, ship emissions will continue to increase as trade expands. Ocean going ships are the only sector that does not meet the 2010 goal for reducing diesel PM, NOx, and ROG emissions back to 2001 levels. Instead, this plan would achieve that goal by 2015. Ships are projected to lower SOx emissions to 2001 levels by 2010 with implementation of a new ARB regulation requiring lower sulfur fuels for auxiliary engines. The plan proposes a mix of strategies for ocean going ships that would reduce projected emissions from this category 50% or more in 2015 and 70% or more in 2020.

Commercial harbor craft were an early focus for ARB and air districts given proximity to coastal communities. More than \$17 million in Carl Moyer Program funds have been used to clean up commercial harbor craft to date. In 2004, ARB adopted a regulation requiring harbor craft to use cleaner diesel fuel statewide starting in 2007. Later this year, ARB will consider a regulation to clean up existing harbor craft propulsion and auxiliary engines via replacement, rebuild, add-on controls, and/or alternative fuels. Shore power for harbor craft is also under consideration. The plan targets a 70% plus reduction in this category by 2020.

Cargo handling equipment poses a major health risk to near-port communities due to the location of the emissions. On December 8, 2005, the Board approved a new regulation to reduce these emissions. The regulation will accelerate the introduction of cleaner technologies beginning in 2007 with increasing benefits in 2010 through 2015. The overall strategy relies on implementation of new engine standards that phase in from 2007-2015. Overall, emissions from cargo handling will continue to decline through 2020 and beyond. The last element of the strategy would be to step up diesel PM control to the 85% level in the future as additional verified retrofit technologies become available. By 2020, emissions from this sector will be reduced by over 80% for the key pollutants.

Trucks are the largest contributor to port-related NOx and the largest on-shore source of diesel PM. Existing regulations are reducing these emissions each year but very significant impacts remain. Cleaning up the older, short-haul truck fleets (including those serving ports), reducing traffic congestion and idling, routing trucks away from neighborhoods, and providing the cleanest diesel fuel are components of the overall truck strategy. Recent ARB actions include anti-idling rules, controls for transport refrigeration units, community-based truck inspections, low sulfur fuel requirements, and reducing excess NOx from 1993-1998 trucks. The primary new strategies in this plan are to apply the best available control technology to the entire truck fleet in private ownership, with a targeted program to modernize the subset of trucks serving ports. The plan targets an 88% reduction in diesel PM, and about a 60% reduction for NOx and ROG by 2020.

Locomotives are subject to existing federal standards and the two memoranda of understanding negotiated with the ARB in 1998 and 2005. The plan proposes new strategies to upgrade engines in switcher locomotives and to retrofit diesel PM controls on existing engines. There are at least two technologies that could provide 95% percent control for diesel PM and over 70% for NOx from switchers by 2010: diesel-electric hybrids and multiple off-road diesel engine configurations. Particulate retrofits have not been used in California rail yards yet but they have been introduced in Europe. Both major railroads are testing locomotives equipped with diesel particulate filters right now. A third element of the strategy relies on U.S. EPA adoption of cleaner new engine standards (Tier 3), more stringent rebuild requirements, and national idling limit devices. ARB staff is recommending federal standards that would achieve 90% control of diesel PM and NOx for new engines. A comprehensive program to bring these

cleaner locomotives to California could convert 90% of the fleet by 2020. The plan targets an 85% reduction or better in PM by 2020 for all pollutants.

The plan includes two additional strategies that are conceptual in nature and would be implemented by other agencies and segments of the goods movement industry. These are improved land use decision-making and site specific mitigation at the project or community level.

In 2005, ARB recognized the importance of land use decision-making with the approval of our guidance document “Air Quality and Land Use Handbook: A Community Health Perspective.” This document recommends that local government consider the health impacts of air pollution in land use permitting and planning processes. A key recommendation is to provide appropriate separation between air pollution sources, like ports and rail yards, and sensitive land uses, like homes and schools.

The other overarching strategy is mitigation tailored to address existing community problems or the impacts of new projects. Environmental review provisions of State and federal law provide the legal framework for development of environmental mitigation where government approvals are required for a new project. For major expansions related to goods movement, development of a community benefits agreement may be a mechanism to address environmental and other community impacts. The concepts outlined in the plan for statewide application -- especially use of cleaner engines and fuels – may be feasible earlier in targeted situations. This provides opportunities for site specific mitigation prior to full implementation of the strategies on a statewide basis. This would help mitigate community impacts as quickly as possible with a priority on the most impacted areas. Mitigation of existing impacts near rail yards is an example of the need to address health risk issues in specific communities as well as on a statewide basis.

With the revised emission inventory and strategies, the plan would reduce combined emissions of the four pollutants by 163 tons per day in 2010; 375 tons per day in 2015; and 530 tons per day in 2020.

The complete list of plan strategies along with implementation timeframes is shown in Table 3.

**Table 3  
List of Strategies to Reduce Emissions from  
Ports and Goods Movement**

Strategy	Status (Adopted or New Strategy)	Implementation Could Begin		
		2006- 2010	2011- 2015	2016- 2020
<b>SHIPS</b>				
Vessel Speed Reduction Agreement for Southern California	2001	✓		
U.S. EPA Main Engine Emission Standards	2003	✓		
U.S. EPA Non-Road Diesel Fuel Rule	2004	✓		
ARB Rule for Ship Auxiliary Engine Fuel	New (2005)	✓		
Cleaner Marine Fuels	New	✓	✓	✓
Emulsified Fuels	New	✓	✓	✓
Expanded Vessel Speed Reduction Programs	New	✓	✓	✓
Engines with Emissions Lower than IMO Standards in New Vessels	New	✓	✓	✓
Dedication of Cleanest Vessels to California Service	New	✓		
Shore Based Electrical Power	New	✓		
Extensive Retrofit of Existing Engines	New		✓	✓
Highly Effective Controls on Main and Existing Engines	New		✓	✓
Sulfur Emission Control Area (SECA) or Alternative	New		✓	
Expanded Use of Cleanest Vessels in California Service	New		✓	
Expanded Shore Power and Alternative Controls	New		✓	
Full Use of Cleanest Vessels in California Service	New			✓
Maximum Use of Shore Power or Alternative Controls	New			✓
<b>COMMERCIAL HARBOR CRAFT</b>				
Incentives for Cleaner Engines	2001-2005	✓		
ARB Low Sulfur Diesel Fuel Rule	2004	✓		
ARB Rule to Clean Up Existing Engines	New	✓		
Shore Based Electrical Power	New	✓		
U.S. EPA or ARB New Engine Emission Standards	New		✓	
<b>CARGO HANDLING EQUIPMENT</b>				
ARB Low Sulfur Diesel Fuel Rule	2003	✓		
ARB/U.S. EPA Tier 4 Emission Standards	2004	✓		
ARB Stationary Diesel Engine Rule	2004	✓		
ARB Portable Diesel Equipment Rule	2004	✓		
Incentives for Cleaner Fuels	2001-2005	✓		

Strategy	Status (Adopted or New Strategy)	Implementation Could Begin		
		2006- 2010	2011- 2015	2016- 2020
<b>CARGO HANDLING EQUIPMENT, continued</b>				
ARB Rule for Diesel Cargo Handling Equipment	New (2005)	✓		
ARB Rule for Gas Industrial Equipment	New	✓		
Upgrade to 85 Percent Diesel PM Control or Better	New		✓	
Zero or Near Zero Emission Equipment	New			✓
<b>TRUCKS</b>				
ARB/U.S. EPA 2007 New Truck Emission Standards	2001	✓		
Vehicle Replacement Incentives	2001-2005	✓		
ARB Low Sulfur Diesel Fuel Rule	2003	✓		
ARB Smoke Inspections for Trucks in Communities	2003	✓		
Community Reporting of Violators	2005	✓		
ARB Truck Idling Limits	2002-2005	✓		
ARB Low NOx Software Upgrade Rule	2005	✓		
ARB International Trucks Rule	New (2006)	✓		
ARB Private Truck Fleets Rule	New	✓	✓	
Port Truck Modernization	New	✓	✓	✓
Enhanced Enforcement of Truck Idling Limits	New	✓		
<b>LOCOMOTIVES</b>				
ARB Low Sulfur Diesel Fuel Rule	2004	✓		
ARB 2005 Agreement with Railroads to Cut PM Statewide	2005	✓		
Idle Enforcement Training	2006	✓		
Upgrade Engines in Switcher Locomotives	New	✓		
Retrofit Diesel PM Control Devices on Existing Engines	New	✓		
Use of Alternative Fuels	New	✓		
More Stringent National Requirements	New		✓	
Concentrate Tier 3 Locomotives in California	New		✓	✓
<b>OPERATIONAL EFFICIENCY</b>				
Efficiency Improvements	New	✓	✓	✓
Transport Mode Shifts	New	✓	✓	✓
<b>LAND USE DECISIONS</b>				
	New	✓	✓	✓
<b>PROJECT AND COMMUNITY SPECIFIC MITIGATION</b>				
	New	✓	✓	✓
<b>PORT PROGRAMS TO REDUCE EMISSIONS</b>				
	Ongoing/New	✓	✓	✓

## Health and Economic Impacts

The strategies outlined in this plan will provide significant statewide health benefits and in the communities adjacent to ports, rail yards, intermodal facilities, distribution centers, and highways. These strategies are projected to reduce health impacts by 50% in 2020 after accounting for growth, as compared to a no further action baseline. Table 4 shows the health benefits in 2020, expressed as the number of cases avoided in that year with the plan strategies. We recognize that the health impacts that would remain after plan implementation are still very significant. But achieving the goals in this plan would clearly advance our efforts to meet California's health protective standards for particulate matter and ozone, as well as cut the health risk from diesel PM in communities highly impacted by goods movement.

**Table 4**  
**Health Benefits<sup>1</sup> of New Plan Strategies in 2020**

<b>Health Outcome</b>	<b>Cases<sup>2</sup> Expected without Plan in 2020</b>	<b>Cases<sup>2</sup> Avoided with Plan in 2020</b>
Premature Death	1,700	820
Hospital Admissions (respiratory causes)	1,500	530
Hospital Admissions (cardiovascular causes)	580	300
Asthma and Other Lower Respiratory Symptoms	42,000	21,000
Acute Bronchitis	3,400	1,800
Work Loss Days	250,000	130,000
Minor Restricted Activity Days	2,800,000	1,200,000
School Absence Days	860,000	270,000

<sup>1</sup> Does not include the reduction in contributions from particle sulfate formed from SO<sub>x</sub> emissions, which is being evaluated with several ongoing emissions, measurement, and modeling studies.

<sup>2</sup> Ranges and uncertainty bounds can be found in Appendix A.

The projected health benefits from the plan strategies also have an economic benefit, as shown in Table 5 below.

**Table 5**  
**Value of Health Benefits from New Plan Strategies in 2020**  
 (present value)

*[corrected]*

Health Outcome	Value in 2020 (in millions)	Uncertainty Range <sup>1</sup> (in millions)
Premature Death	\$3,700	\$850 to \$8,800
Hospital Admissions (respiratory causes)	\$11	\$5 to \$20
Hospital Admissions (cardiovascular causes)	\$8	\$4 to \$15
Asthma and Other Lower Respiratory Symptoms	\$0.2	\$0.06 to \$0.4
Acute Bronchitis	\$0.4	-\$0.1 to \$1
Work Loss Days	\$15	\$10 to \$22
Minor Restricted Activity Days	\$39	\$18 to \$70
School Absence Days	\$16	\$5 to \$32
<b>Total</b>	<b>\$4,000</b>	<b>\$900 to \$9,000</b>

<sup>1</sup> Range reflects statistically combined uncertainty in concentration-response functions and economic values, but not in emissions or exposure estimates.

By 2020, the total cumulative cost to implement the new plan strategies is \$6-10 billion in present value dollars. Table 6 shows the range of cumulative costs.

**Table 6**  
**Cumulative Costs to Implement Plan Strategies**  
 (present value)

Year	Range of Cumulative Cost (in billions)	
	Low End	High End
2007 - 2010	\$2	\$2
2007 - 2015	\$4	\$6
2007 - 2020	\$6	\$10

To derive a benefit-cost ratio, we looked at the cumulative benefits from health effects avoided (including premature death, hospitalization due to respiratory and cardiovascular causes, asthma and other lower respiratory symptoms, and acute bronchitis) and the economic value of those benefits over the 2005-2020 timeframe of the plan, in present value dollars.

**Table 7**  
**Benefit-Cost Ratio for Plan Strategies Through 2020**  
 (present value)

	<b>Cumulative Benefits and Costs</b>
Cumulative Premature Deaths Avoided by Plan Strategies	7,200
Cumulative Economic Value of All Health Effects Avoided	\$34 – \$47 billion
Cumulative Costs to Implement Plan Strategies	\$6 - \$10 billion
<b>Benefit-Cost Ratio</b>	<b>3-8 to 1</b>

Thus, for every \$1 invested to implement these strategies, \$3 to \$8 in economic benefits are realized by avoided health effects. Premature deaths avoided account for over 95 percent of the estimated economic value of all health benefits of the plan.

#### Plan Performance

ARB staff has evaluated whether the emission reduction plan is sufficient to meet the numerical goals set forth in the introduction above.

The first objective is to stop emissions growth. In Southern California, the Board of Harbor Commissioners set a goal of “no net increase” in emissions from the Port of Los Angeles using a 2001 baseline. This plan applies the same goal statewide. Staff calculated the reductions needed to meet the 2010 target on a statewide basis and for local air districts with the greatest port and goods movement activity -- South Coast, San Diego, San Francisco and the San Joaquin Valley. In every case, the 2010 target will be achieved, and in some geographical areas emissions will be reduced well below 2001 levels.

With respect to reducing the statewide health risk of diesel PM from ports and goods movement-related sources 85% by 2020, the plan now meets that goal. Staff estimates that the plan will achieve a 79% mass reduction in goods movement-related diesel PM by that date and a corresponding 86% exposure-weighted risk reduction.

For the South Coast NOx reduction targets, the picture is good. Compared to the 30% reduction target by 2015, the plan provides for 48% control. Similarly, for the 50% reduction target in 2020, the plan provides 67% control.

## Vision for the Future

Meeting the public health challenge posed by goods movement requires a combination of innovative and readily available strategies. Government will do its part but cleaner technology and operational efficiencies must become the industry standard. The draft plan envisions that emissions reductions will be reduced at each step in the goods movement pathway – from ship to shore to truck or locomotive to the final destination. New emission standards for engines, cleaner fuels, performance standards and incentives, fleet upgrades and retrofits are all part of the picture.

Timing is crucial. There is already a public health threat that needs to be abated as quickly as possible while we prepare for even greater growth in international trade. ARB's strategy provides several near-term reductions, with longer term measures to provide a cleaner goods movement system by 2020. Steady progress is also needed. The proposed plan provides for reductions in statewide port and goods movement emissions after accounting for projected growth.

Staff's long term vision is an economically vibrant, environmentally sustainable, non-polluting goods movement industry that enhances the quality of life for all Californians.

## Board Action [updated]

Following public testimony on April 20, 2006 in Long Beach, the Board approved the *Emission Reduction Plan for Ports and Goods Movement in California* as a framework for action to protect the residents of California from the harmful effects of air pollution from goods movement operations.