



## **Diesel PM Exposure Assessment Study for the Ports of Los Angeles and Long Beach**

January 30, 2006

Faster Freight – Cleaner Air Conference



California Air Resources Board

1

## **Overview**

- ◆ Background
- ◆ Study Approach
- ◆ Results
- ◆ Conclusions

2

# Background



3

## Ports of Los Angeles and Long Beach

- ◆ Located in San Pedro Bay, about 20 miles south of downtown Los Angeles
- ◆ Operated 24 hours a day, 7 days a week, and 365 days a year
- ◆ Combined: the world's third-busiest ports
- ◆ Significant source of diesel PM in SCAB

4

## Why Are We Concerned About Diesel PM?

- ◆ Diesel PM is a toxic air contaminant and increases risk of:
  - cancer
  - premature deaths, hospital admissions, respiratory diseases
- ◆ Diesel NO<sub>x</sub> and ROG contribute to ozone and PM formation



5

## What is a Health Risk Assessment?

- ◆ Evaluation of the potential for a chemical to cause cancer or other illness
  - uses mathematical models to estimate exposures (risk)
  - risk expressed as number of excess cancers in a population of a million over a 70-year lifetime



6

## Study Objectives

- ◆ Investigate impacts of various emission sources on the nearby communities
- ◆ Prioritize possible mitigation measures to control diesel PM based on magnitude of health risks, and
- ◆ Assist in evaluating the impacts of measures to reduce emissions

7

## Study Approach



8

## Study Approach

- ◆ Estimated diesel PM emissions from all activities within port boundaries and over-water: OGV-Transit, OGV-Hotelling, Harbor Craft, Cargo Handling, In-Port Trucks, In-Port Locomotives
- ◆ Allocated emissions to appropriate areas and time of operation
- ◆ Developed key activity assumptions and data inputs for model

9

## Study Approach (cont.)

- ◆ U.S. EPA ISCST3 model
- ◆ Wilmington Meteorological dataset
- ◆ Urban dispersion for near source risks
- ◆ Modeling Domain: 20 mi x 20 mi
- ◆ Modeling Resolution: 200 m x 200 m

10

## Study Approach (cont.)

- ◆ Followed OEHHA Guidelines for Health Risk Assessments (80th percentile BR, 70-year exposure)
- ◆ Used ARB methodology for non-cancer health impact estimates

11

## Port of LA/LB 2002 Diesel PM Inventory (TPY)

Category	POLA/LB	Percent
OGV-Transit	942	54%
OGV-Hotelling	343	19%
Harbor Craft	244	14%
Cargo Handling	172	10%
In-Port Trucks	41	2%
In-Port Loco	18	1%
Total	1760	100%

12

## Emission Inventory Adjustments

- ◆ Grew POLA emissions inventory to 2002
- ◆ Adjusted ship auxiliary engine emissions
  - Reflect more recent data on fuel use
  - Use more representative emissions factor for auxiliary engines operating on bunker fuel
- ◆ Adjusted cargo handling equipment emissions based on new methodology to develop statewide inventory
- ◆ Developed emissions estimates for POLB ocean-going vessels and harbor craft

13

## Spatial Allocation

<u>Category</u>	<u>In-Port</u>	<u>Out-Port</u>
OGV-Transit	5.0%	95.0%
OGV-Hotelling	100.0%	0.0%
Harbor Craft	37.5%	62.5%
Cargo Handling	100.0%	0.0%
In-Port Trucks	100.0%	0.0%
In-Port Loco	100.0%	0.0%

Note: Out-port emissions do not include regional emissions from trucks and rail activities that occur off port property.

14

# Temporal Allocation

Category	Time Period	Activity Distribution	Hours Per Day
Ocean-Going Vessel	4 am – 8 pm	80%	16
	8 pm – 4 am	20%	8
Hotelling	midnight - midnight	100%	24
Harbor Craft	6 am – 6 pm	80%	12
	6 pm – 6 am	20%	12
Cargo Handling	8 am – 5 pm	80%	9
	5 pm – 3 am	15%	10
	3 am – 8 am	5%	5
Trucks	6 am – 6 pm	80%	12
	6 pm – 6 am	20%	12
Locomotives	midnight - midnight	100%	24

15

## Methodology for Estimating Non-cancer Health Impacts

- ◆ Calculate Diesel PM concentrations in each grid cell using AQ model
- ◆ Calculate the population in each grid cell using GIS (2000 census data)
- ◆ Use C-R function to estimate the change in long-term mortality (Krewski et al, 2000)

16



# Results



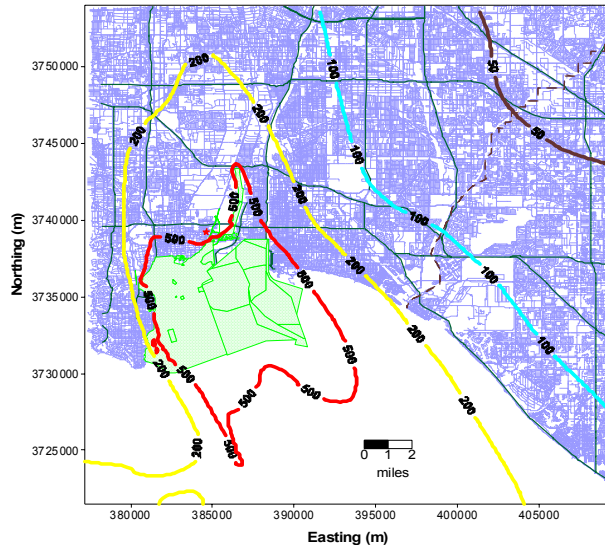
17

## Health Risk Assessment Results

- ◆ Risks are depicted as isopleths overlaid on a regional map
- ◆ Near source risks can be over 500 in a million
- ◆ Elevated concentrations and risks extend over a very large area
- ◆ Individual emission sources have different contributions to the risk levels in the nearby communities

18

## Estimated Cancer Risk from the Ports (for all emissions)



19

## Findings

- ◆ Combined diesel PM emissions: 1,760 TPY
- ◆ Large region impacted by the diesel PM emissions from the Ports
  - Risks > 500 - 2,500 acres and 53,000 people
  - Risks > 200 - 29,000 acres and 411,000 people
  - Risks > 100 - 94,000 acres 1.1 million people
  - Risks > 50 - 160,000 acres and 2 million people

20

## Findings (Cont'd)

- ◆ Noncancer health effects in study area from directly emitted diesel PM
  - 29 premature deaths/year (ages >30)
  - 750 asthma attacks
  - 6,600 days of work loss (ages 18-65)
  - 35,000 minor restricted activity days (ages 18-65)

21

## Area (Acres) Impacted By Emission Sources and Risk Levels

Risk Level	OGV	HOTEL	HARBOR	CARGO	TRUCK	LOCO
> 500	0	0	0	50	50	0
> 200	100	2,000	20	400	200	50
> 100	200	13,000	800	4,000	400	200
> 10	163,000	160,000	125,000	119,000	30,000	11,000

All values have been rounded

22

## Population Affected By Emission Sources and Risk Levels

Risk Level	OGV	HOTEL	HARBOR	CARGO	TRUCK	LOCO
> 500	0	0	0	3,200	200	0
> 200	20	46,000	5,000	11,000	1,800	700
> 100	1,800	222,000	23,000	82,000	8,300	4,300
> 10	1,980,000	1,950,000	1,520,000	1,440,000	423,000	213,000

All values have been rounded

23

## Conclusions

- ◆ Reducing emissions from cargo handling equipment and marine auxiliary engines will provide the most immediate and significant reductions in public exposure to diesel PM in the neighboring communities
- ◆ Additional short-term and long-term mitigation measures are needed



24