Ports and Goods Movement:
Air Quality Impacts and Solutions

New Jersey Clean Air Council
Improving Air Quality at Our Ports and Airports
April 9, 2008

Peter Greenwald
Senior Policy Advisor
South Coast Air Quality Management District

AQMD

South Coast Air Quality Management District

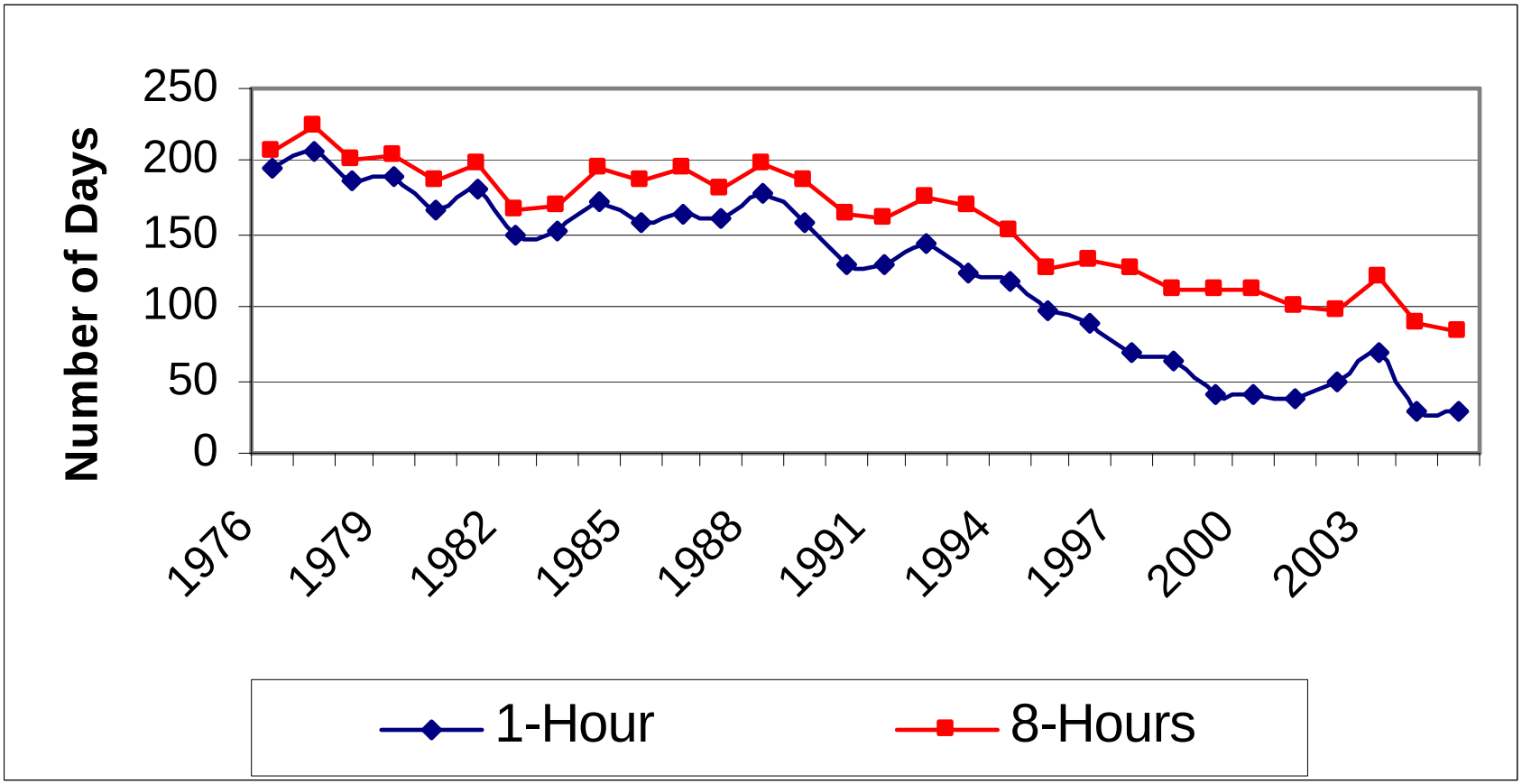
The South Coast Air Quality Management District includes all of Orange County and portions of Los Angeles, San Bernardino and Riverside Counties, an area of 10,743 square miles with 16 million people and 10 million vehicles.

Key Pollutants and Federal Attainment Deadlines in South Coast Air Basin

- $PM_{2.5}$ (Annual) 2015
- $PM_{2.5}$ (24 Hour) 2020
- Ozone (8 Hour) 2024

Air Quality Trends

Annual Days Exceeding Ozone Standards



USC Children's Health Study

***New England Journal of Medicine*, Sept 2004**

- Lower lung-function growth rate associated with PM_{10}, $PM_{2.5}$, NO_2 and acid vapor
- "By age 18, lungs of many children growing up in smoggy areas are underdeveloped and will likely never recover"
- Pollutants of harm "derive from vehicle-related emissions and combustion of fossil fuels"

"When we began the study 10 years ago, we had no idea we would find effects on the lung this serious."

— John Peters, M.D., study senior author

Health Impacts of PM 2.5 Particulate Pollution in South Coast Basin

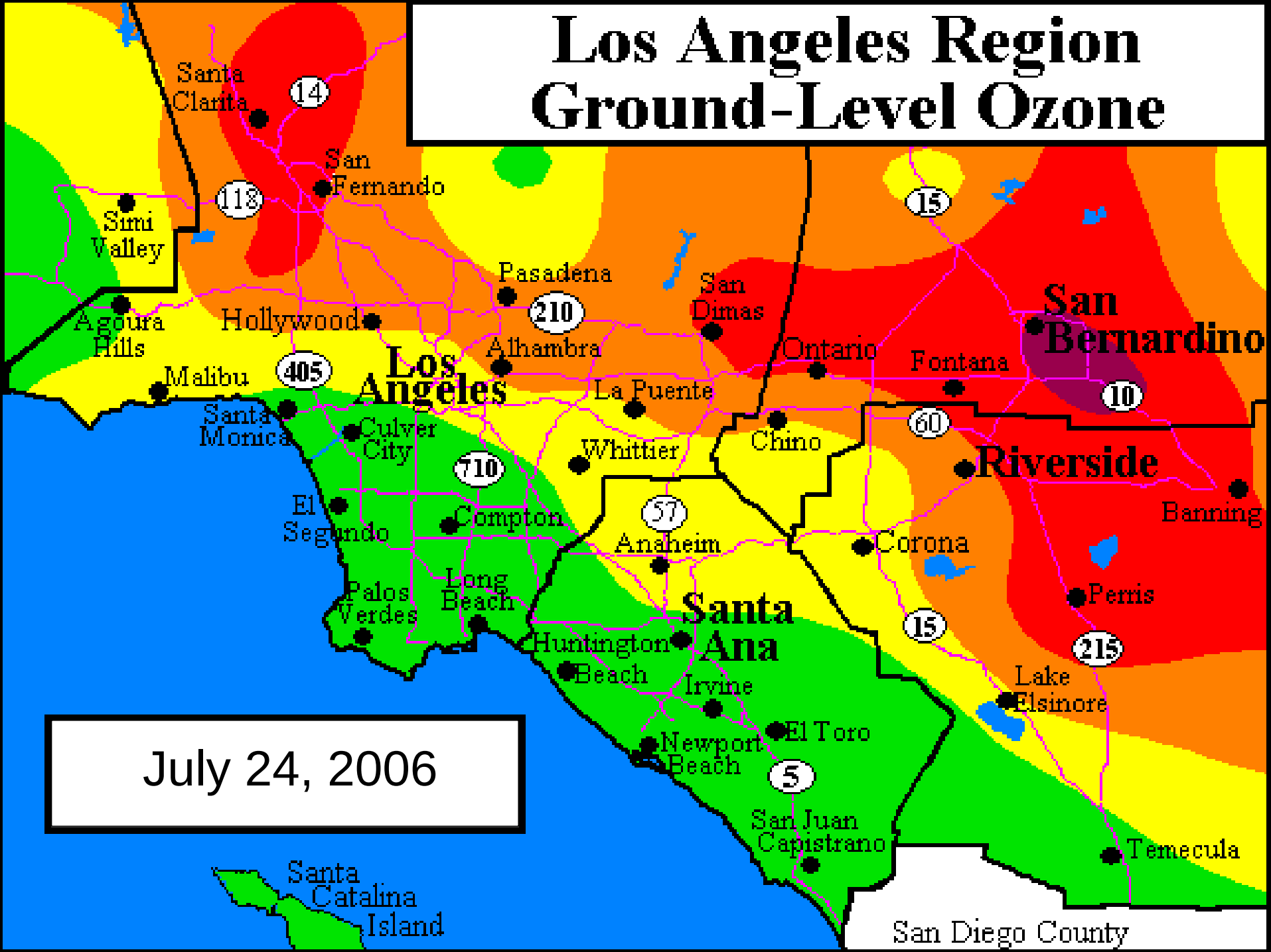
5,400 Premature Deaths *per year*

"Exposures to air pollution can shorten life by about 14 years for people who die prematurely"
— CARB 2007

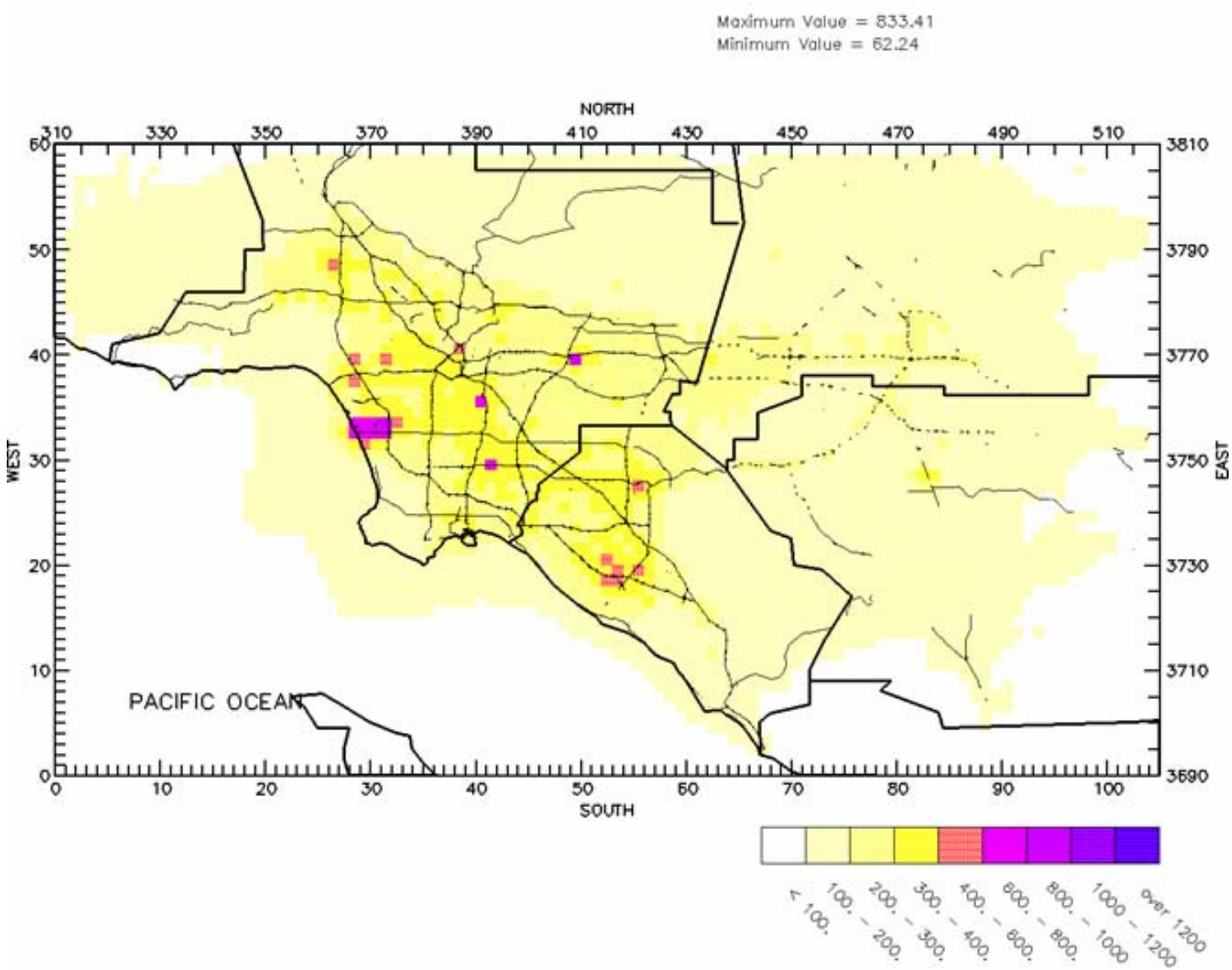
Source: California Air Resources Board, 2007; 1999-2000 Air Quality Data

Other Health Impacts
In South Coast Air Basin
(Annual)

- 980,000 Lost Work Days
- 2,400 Hospitalizations
- 140,000 Asthma & Lower Respiratory Symptoms
- 5,000,000 Minor Restricted Activity Days

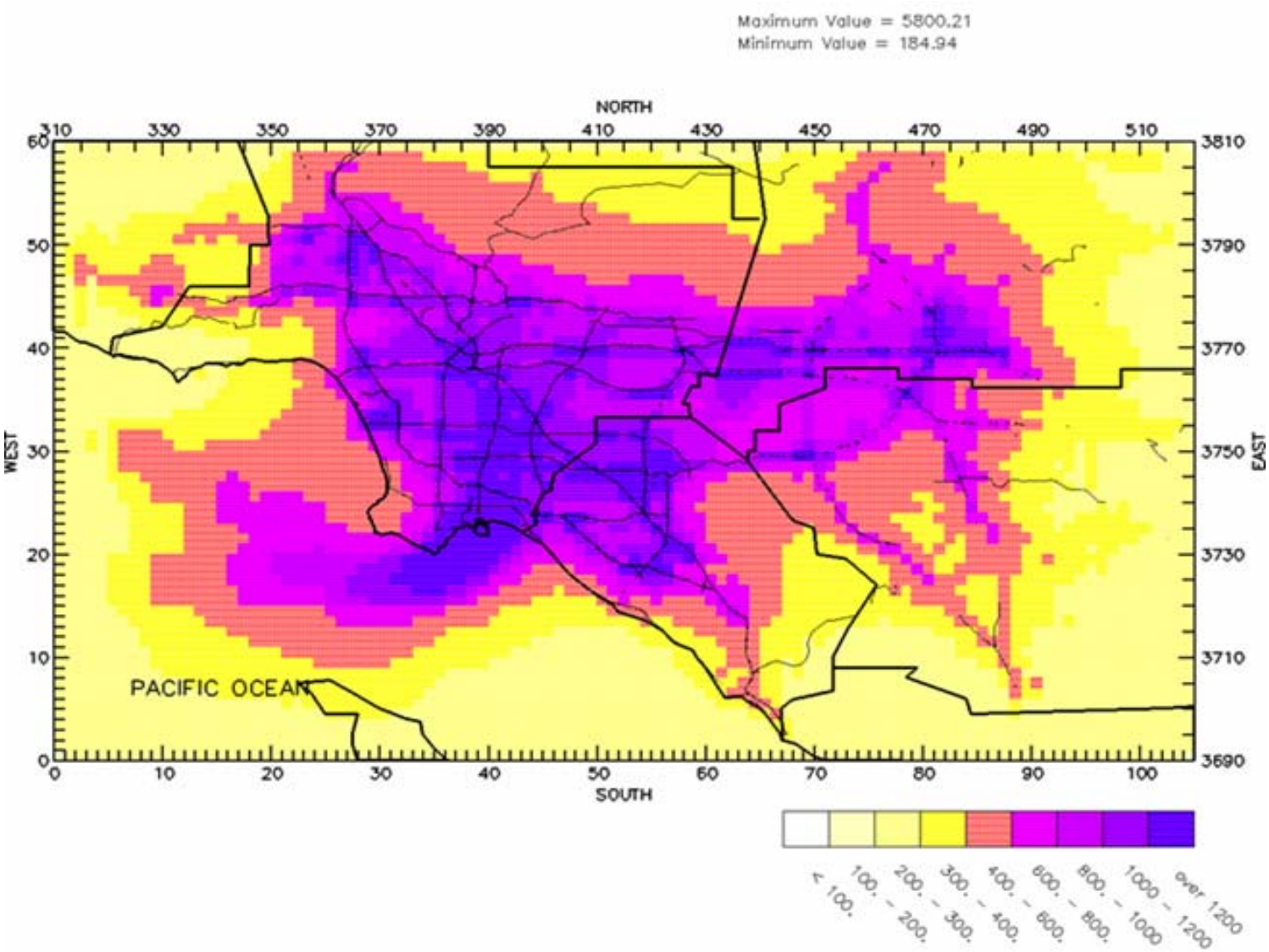

Los Angeles Region
Ground-Level Ozone
Santa Clarita
14
San Fernando
118
Simi Valley
Agoura Hills
Malibu
Hollywood
405
Pasadena
210
Alhambra
Los Angeles
Santa Monica
Culver City
710
El Segundo
Compton
Palos Verdes
Long Beach
La Puente
Whittier
San Dimas
Ontario
Fontana
15
San Bernardino
10
60
Chino
Riverside
Banning
57
Anaheim
Corona
Perris
Santa Ana
Huntington Beach
Irvine
Lake Elsinore
215
El Toro
Newport Beach
5
San Juan Capistrano
Temecula
Santa Catalina Island
San Diego County
July 24, 2006

Modeled Cancer Risk Excluding Diesel



Source: SCAQMD Multiple Air Toxics Exposure Study II

Modeled Cancer Risk With Diesel

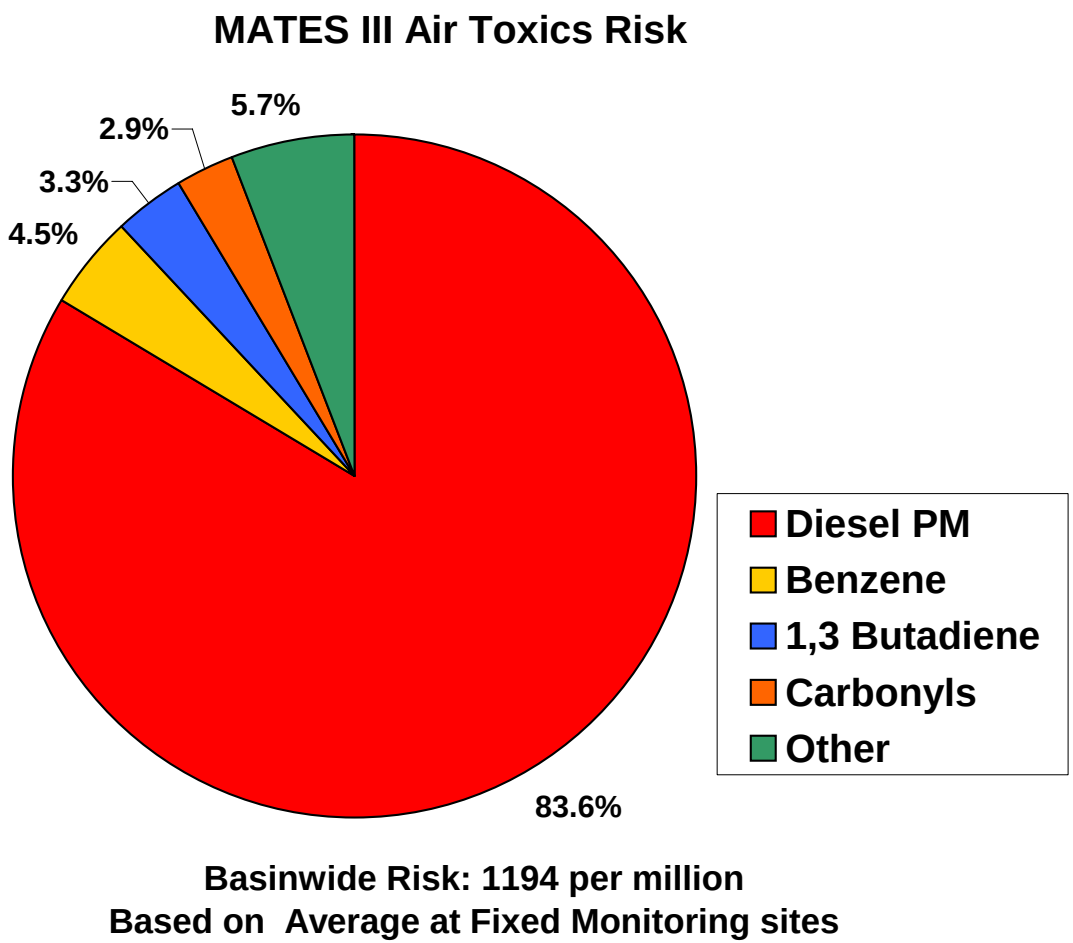


Source: SCAQMD Multiple Air Toxics Exposure Study II

MATES III (2008)

- **Basin-wide lifetime risk 1,200 in a million, primarily from diesel**
- **Risks near ports up to 2,800 in a million**

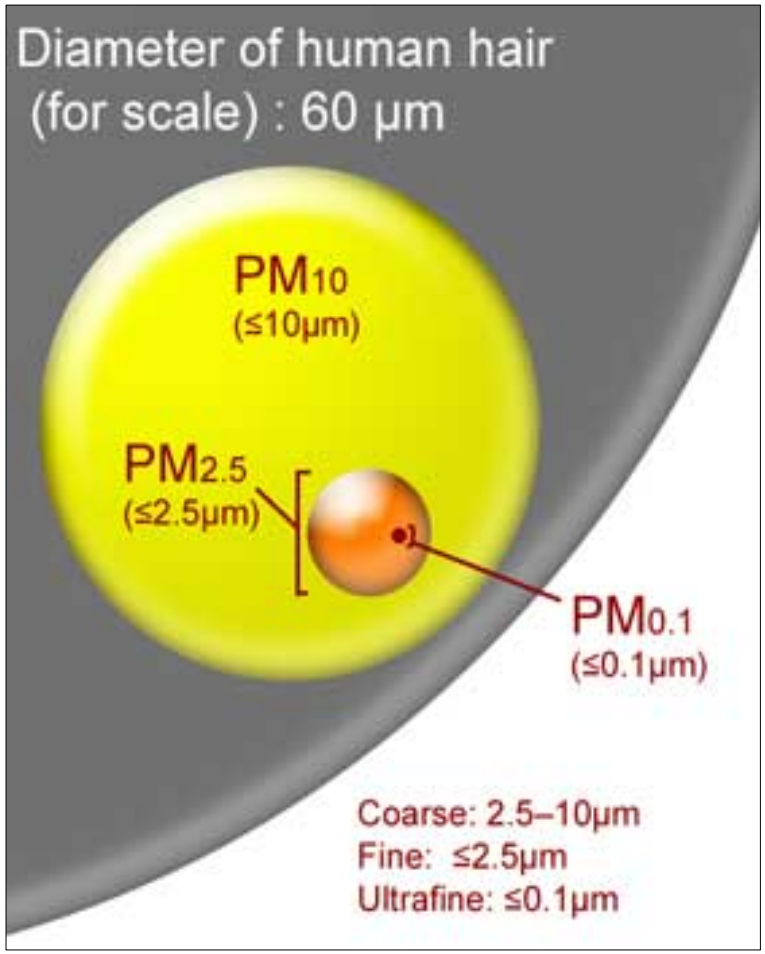
- ***Perspective*: SCAQMD rules generally limit stationary sources to 1 to 25 in a million**



Basinwide Risk: 1194 per million
Based on Average at Fixed Monitoring sites

Source: Draft 2008 SCAQMD Multiple Air Toxics Exposure Study III

Particulate Matter Sizes



Ultra-fine Particle Counts in Southern California

Per Cubic Centimeter

Area	Particle Count
Coastal area	600-2,000
Office Spaces	500-2,000
Urban air	10,000 - 40,000
Freeways	40,000 - > 1,000,000

Westerdahl, 2004

Key Air Quality Challenges

- “Easy” reductions achieved
- New ozone & 24 hour PM 2.5 standards
- Growth in goods movement . . .

Goods Movement

Ports of Los Angeles and Long Beach

- Nation’s highest volume container cargo port complex
- Majority of imported containers destined out of Southern California
- >40 % of nation’s containerized imports arrive here
- Cargo tripled in recent years and will double in next decade


HARD HAT AREA
MAERSK


TH 11
RAIL ONLY
K LINE


APL
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BRAN 6249


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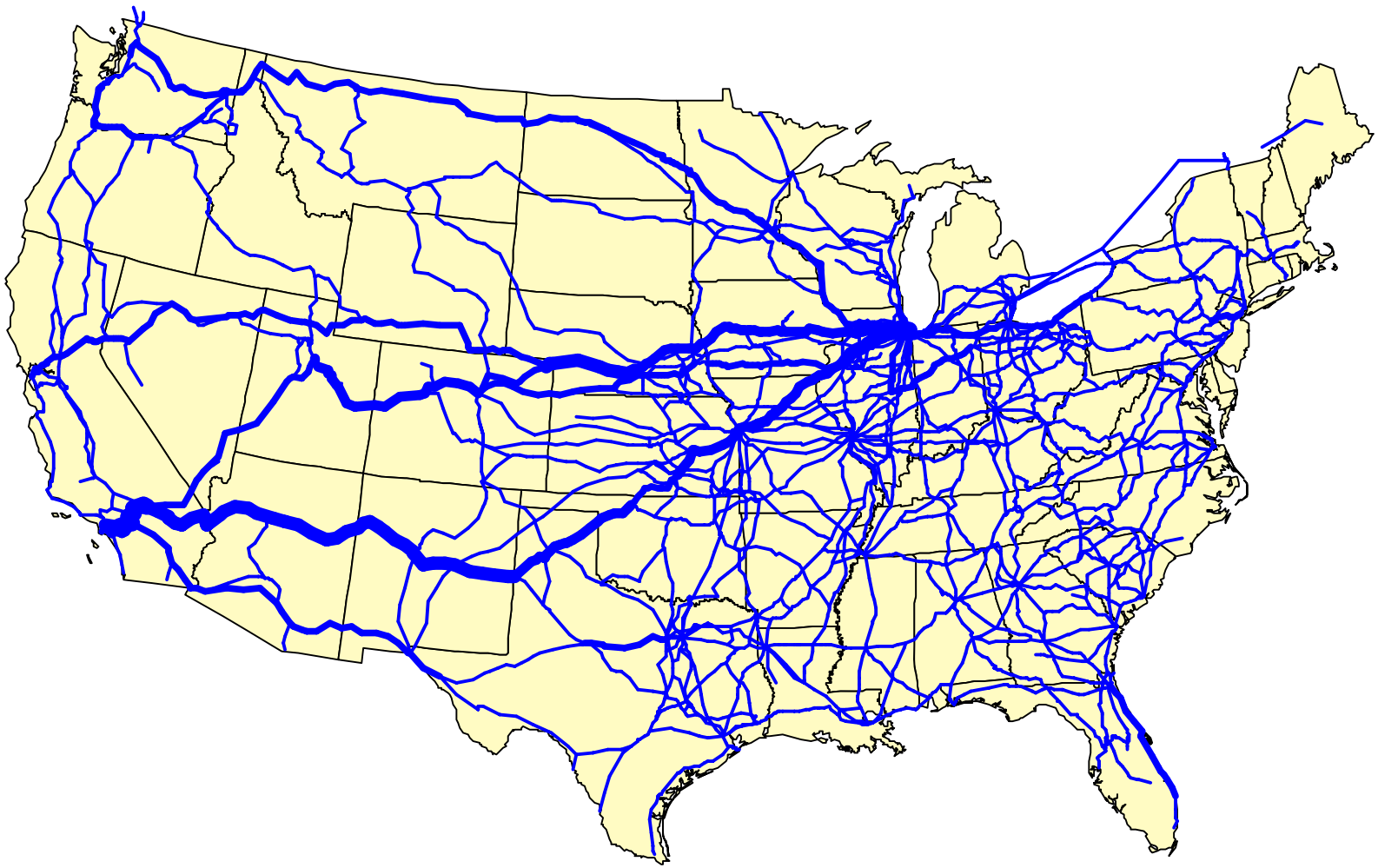
J.B. HUNT


Pacific Coast Hwy
1
SOUTH
EXIT
ONLY

Rail Intermodal Flows

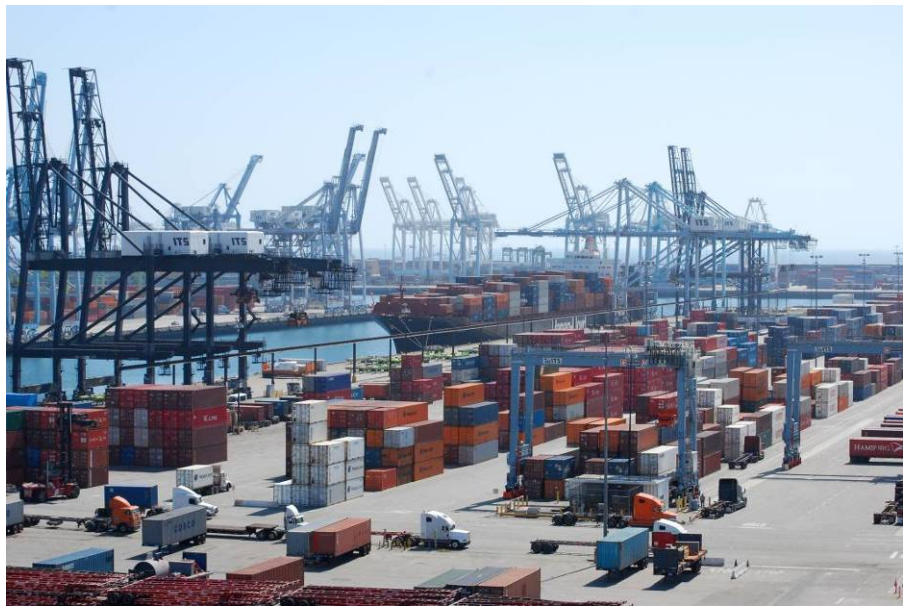


Key Goods Movement Pollutants

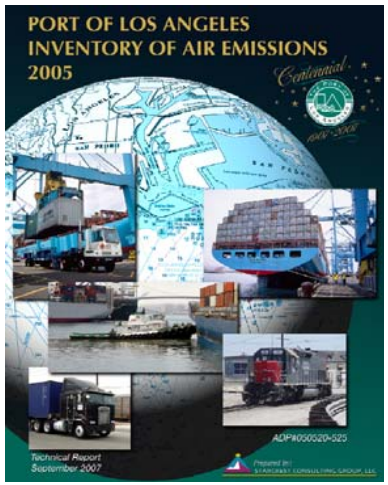
Diesel Particulates (PM & toxic)

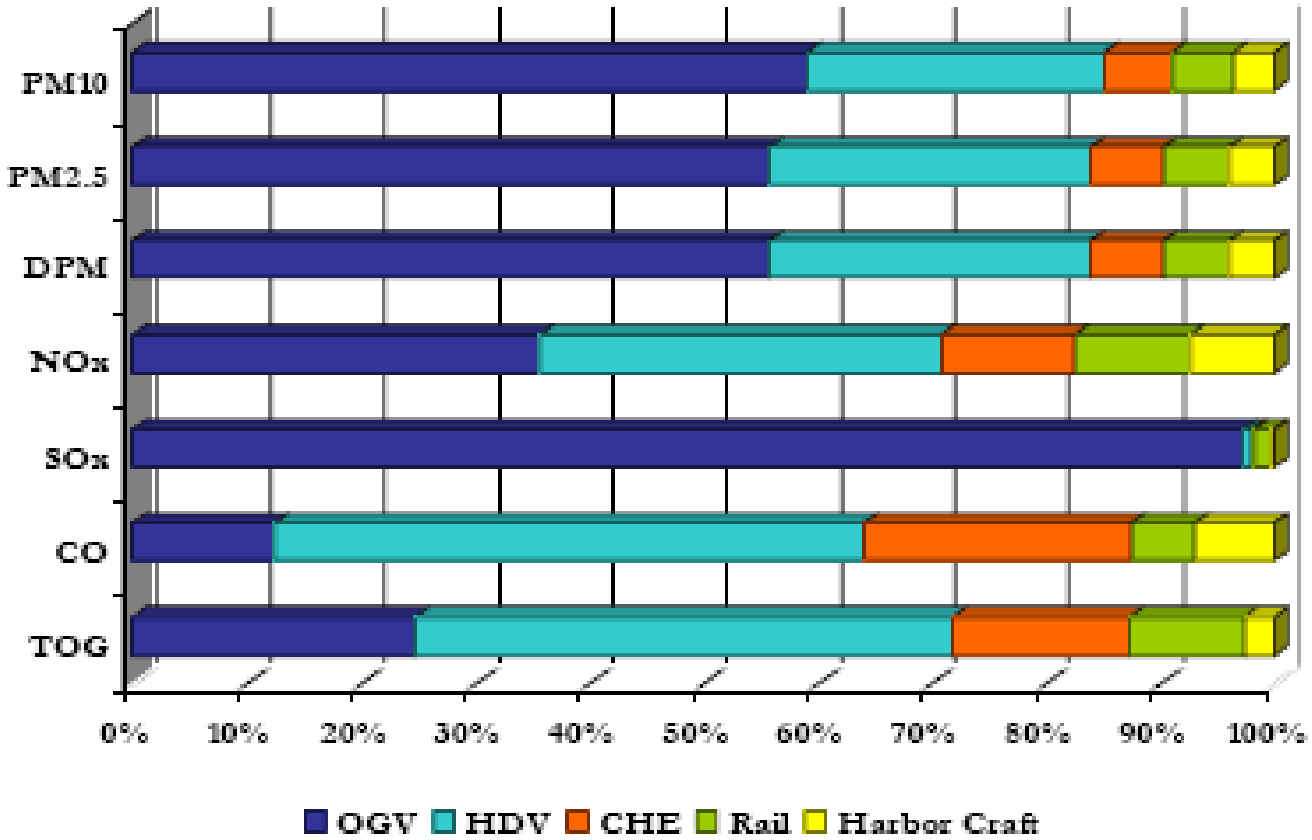
SOx (PM precursor)

NOx (PM & ozone precursor)



Port of Los Angeles
2005 Emissions Inventory
Source Category Distribution

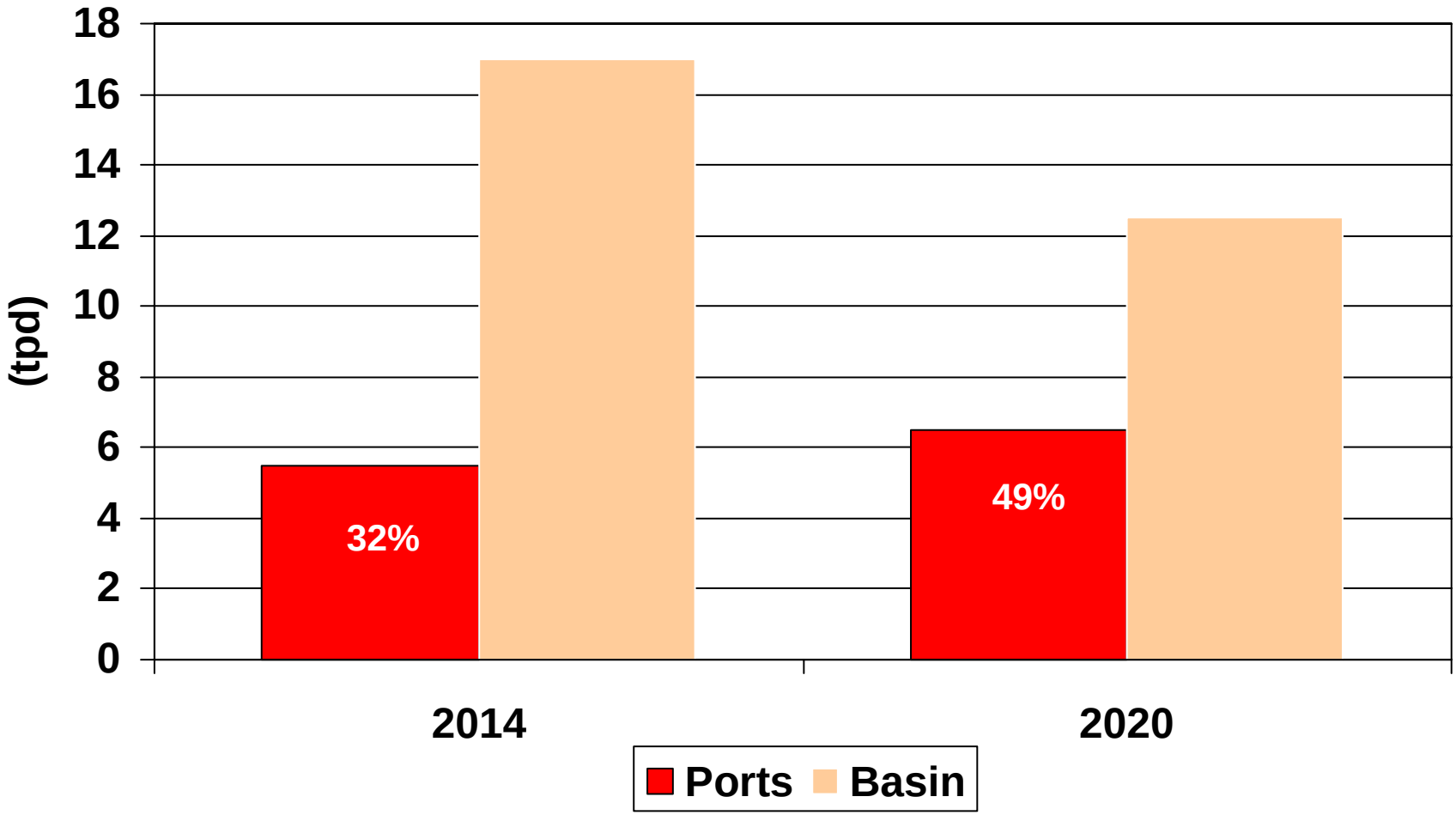




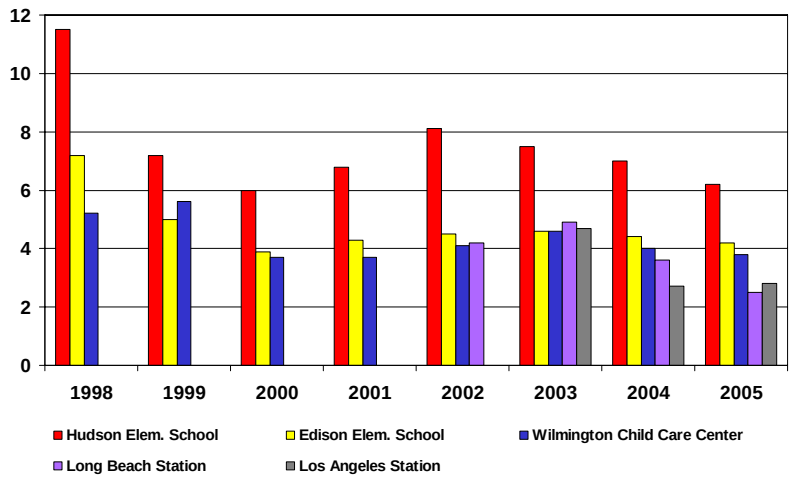
Diesel Particulate Matter

Diesel Particulates

Contribution of Port-Related Sources to Regional Diesel PM10



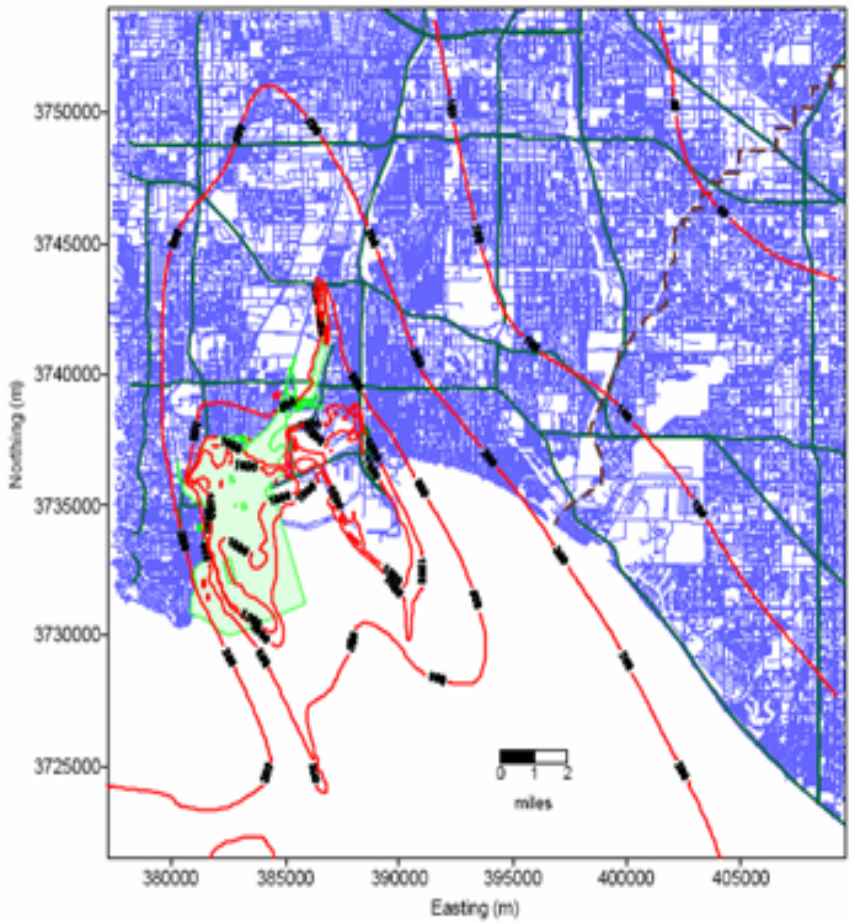
Diesel Particulate Matter:
Proximity Matters



CARB Health Risk Assessments

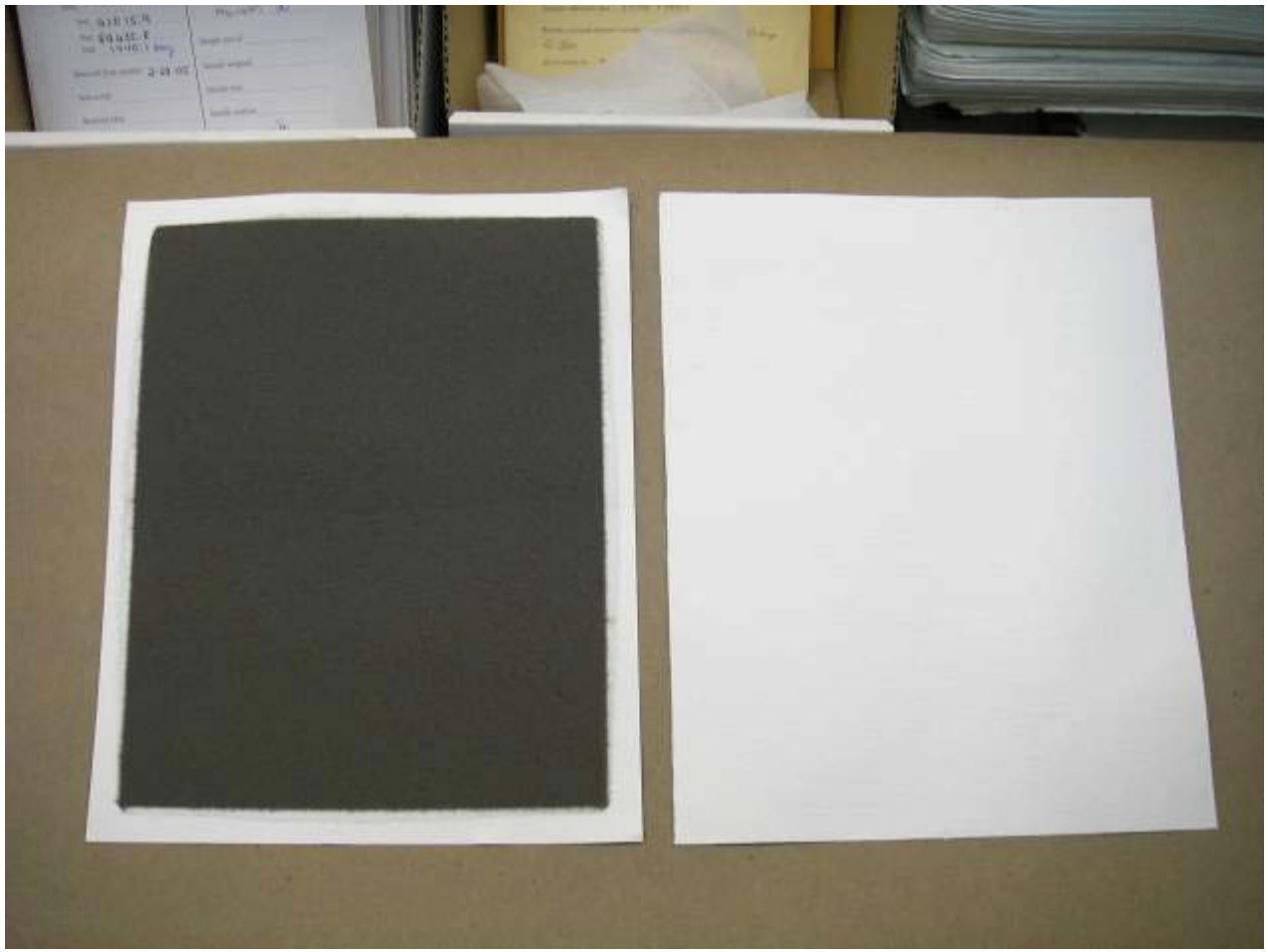
- Commerce Railyard
  - 82,200 persons exposed @ > 100 in a million
  - In some areas risk exceeds 600 in a million
- Ports of Los Angeles & Long Beach
  - 1,135,000 persons exposed @ > 100 in a million
  - 53,000 persons @ > 500 in a million

Figure 1
Estimated Diesel PM Cancer Risk from POLA and POLB

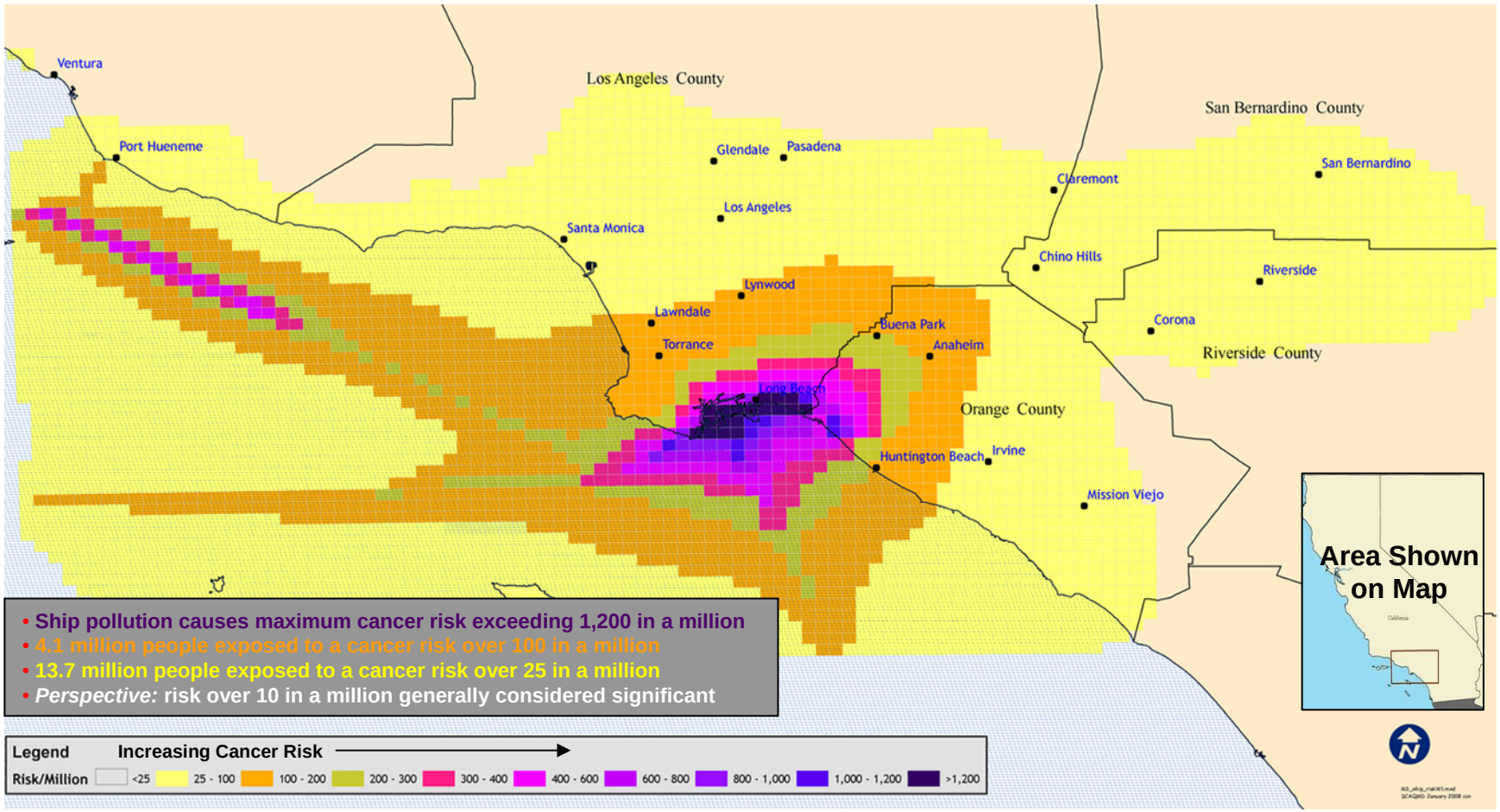


Particulate Filters

From SCAQMD Long Beach Monitor



Cancer Risk From Oceangoing Vessel Emissions in Southern California



Source: SCAQMD MATES III Study (2008)

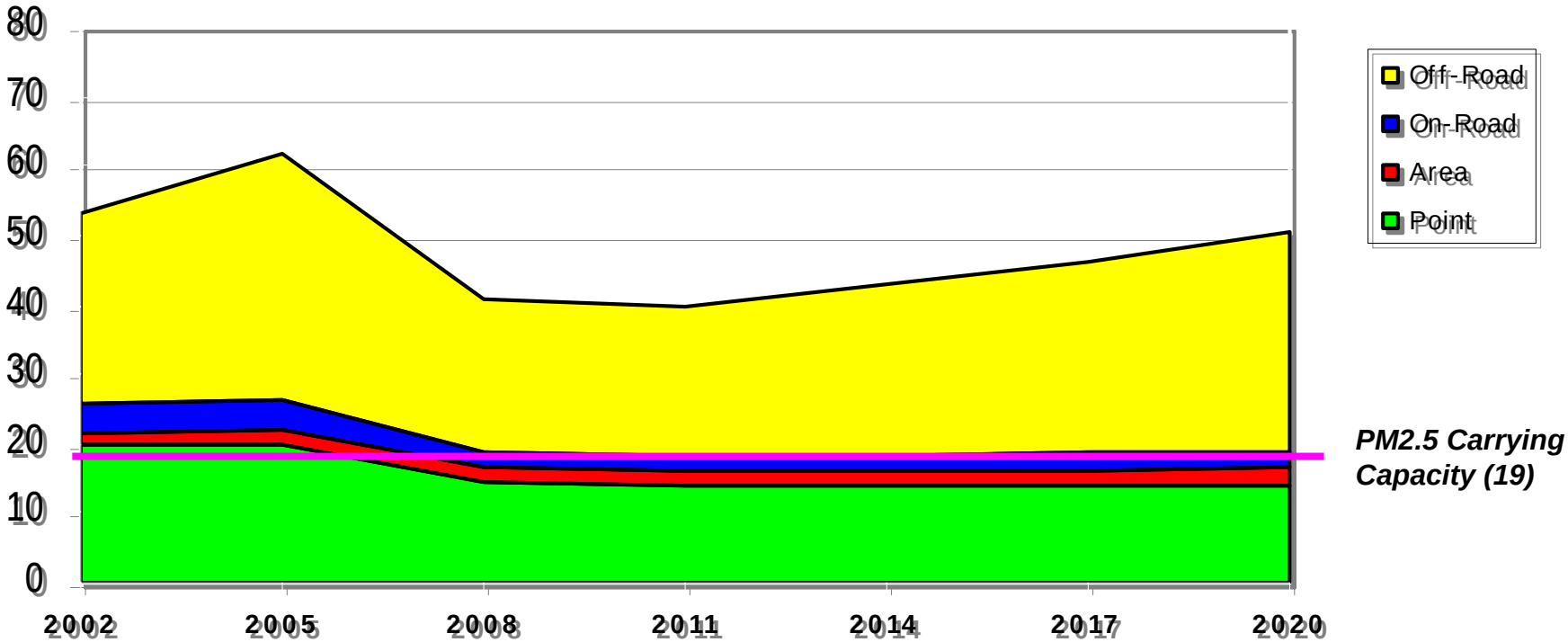
Cumulative Impacts

Sulfur Oxides

Sulfur Oxides

Emissions Trend in South Coast By Source Category

Assuming benefit of CARB auxiliary engine rule now in litigation

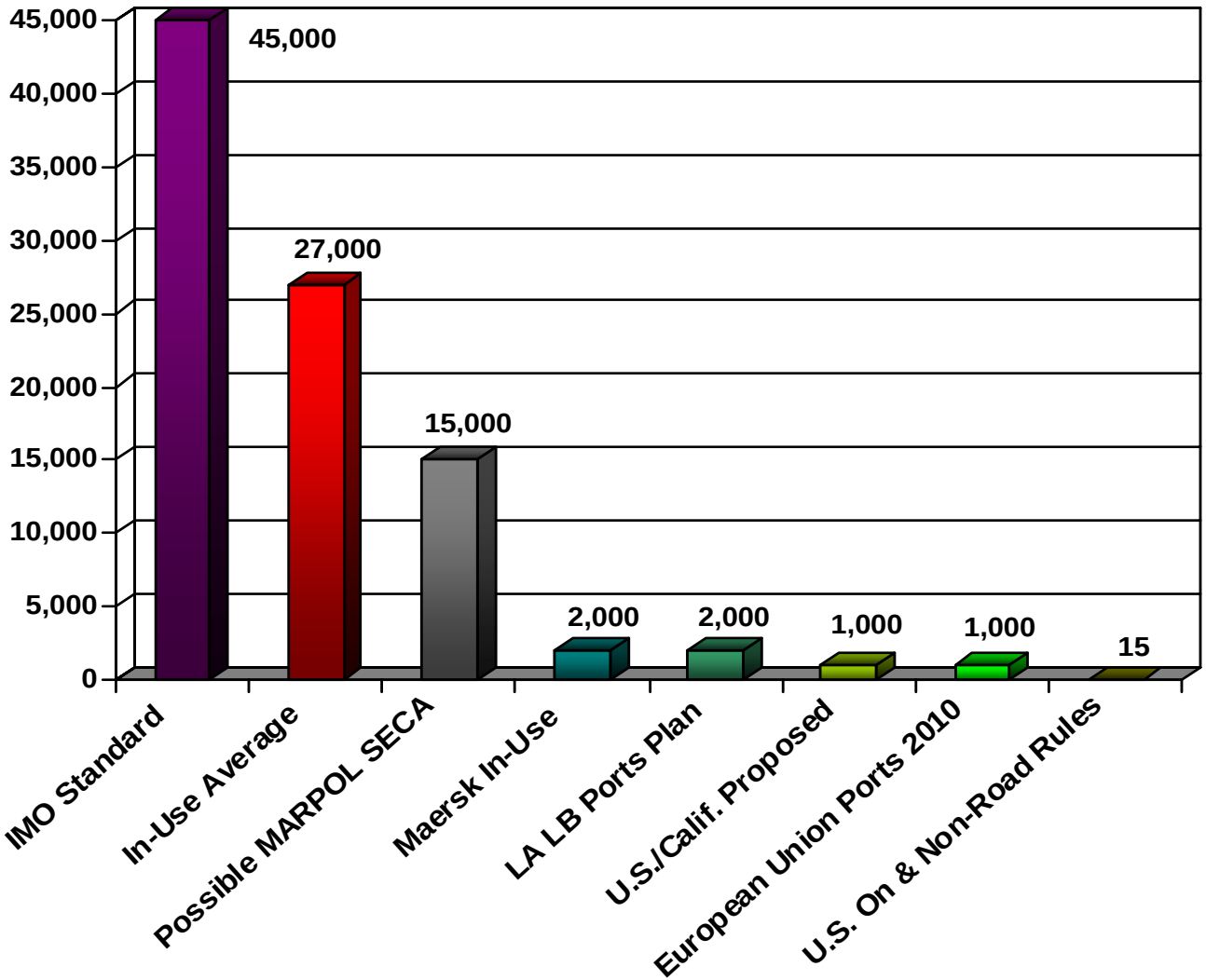


Without CARB auxiliary engine rule, oceangoing vessels will create ~ 70% of SOx in 2015

Source: 2007 South Coast Air Quality Management Plan

Comparison of Fuel Sulfur Content

Parts Per Million



Source: San Pedro Bay Ports Clean Air Action Plan; European Union Directive 2005/33/EC; U.S. Proposal to IMO, Revision of MARPOL Annex VI, NOx Tech. Code and Related Guidelines; CARB Emission Reduction Plan for Ports and Goods Movement; 2007 SCAQMD Air Quality Management Plan

SCAQMD Analysis:
Health Benefits of Controlling Emissions from Oceangoing Marine Vessels per SIP for South Coast

- Over 700 premature deaths prevented annually
  - over one-third of health benefit of *entire* annual PM 2.5 SIP
- Major portion of benefit: low sulfur fuels

http://epa.gov/OMS/regs/nonroad/marine/ci/mvbenefits20071018-b.pdf

Nitrogen Oxides

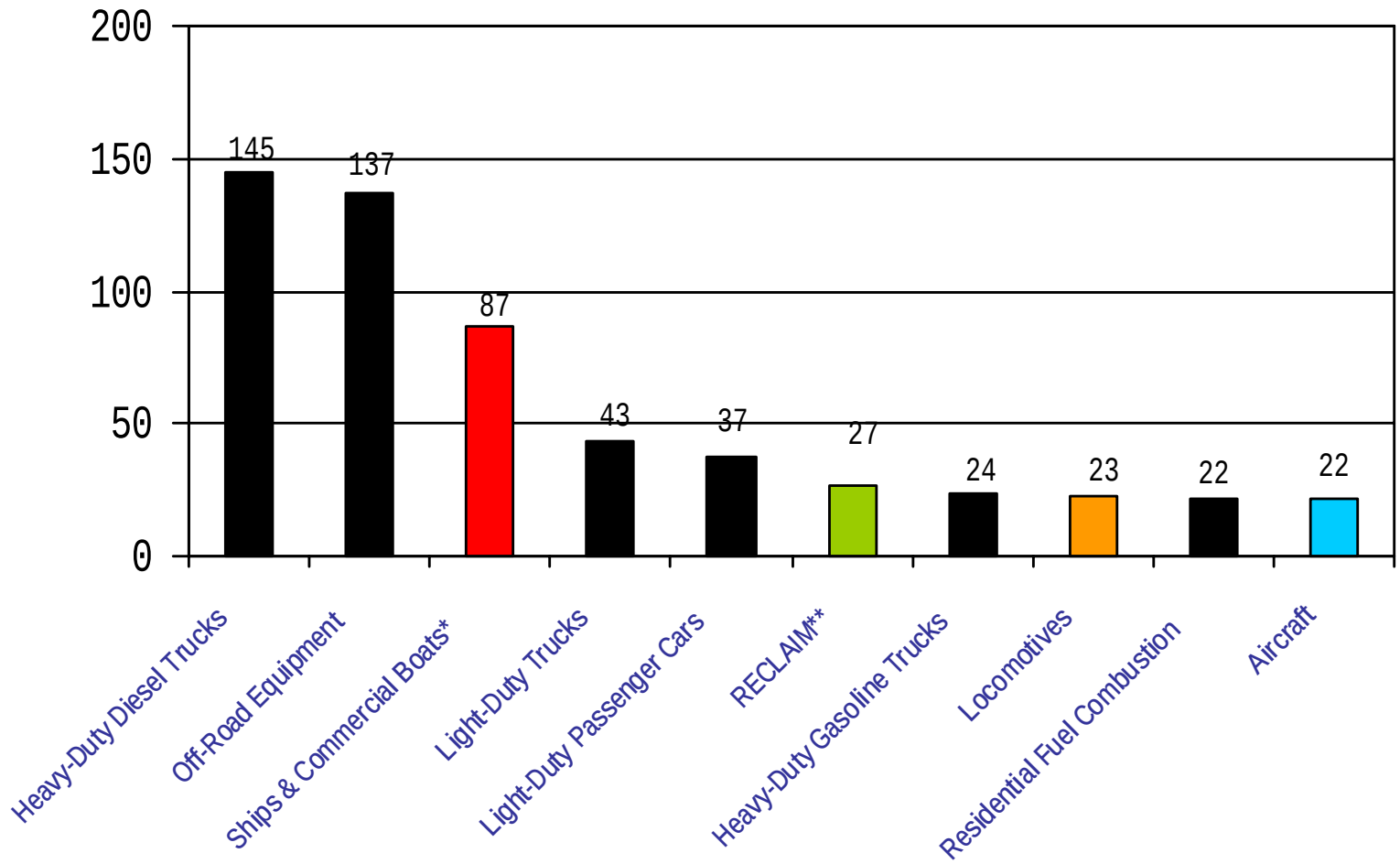
NOx "Baseline" Emissions and Federal 8-Hour Ozone Carrying Capacity

Including Benefits of All Rules Adopted to Date

(tons per day)

Carrying Capacity - 114 ***2023 Int'l Goods Movement - 137*** ***2023 "Black Box" - 190***

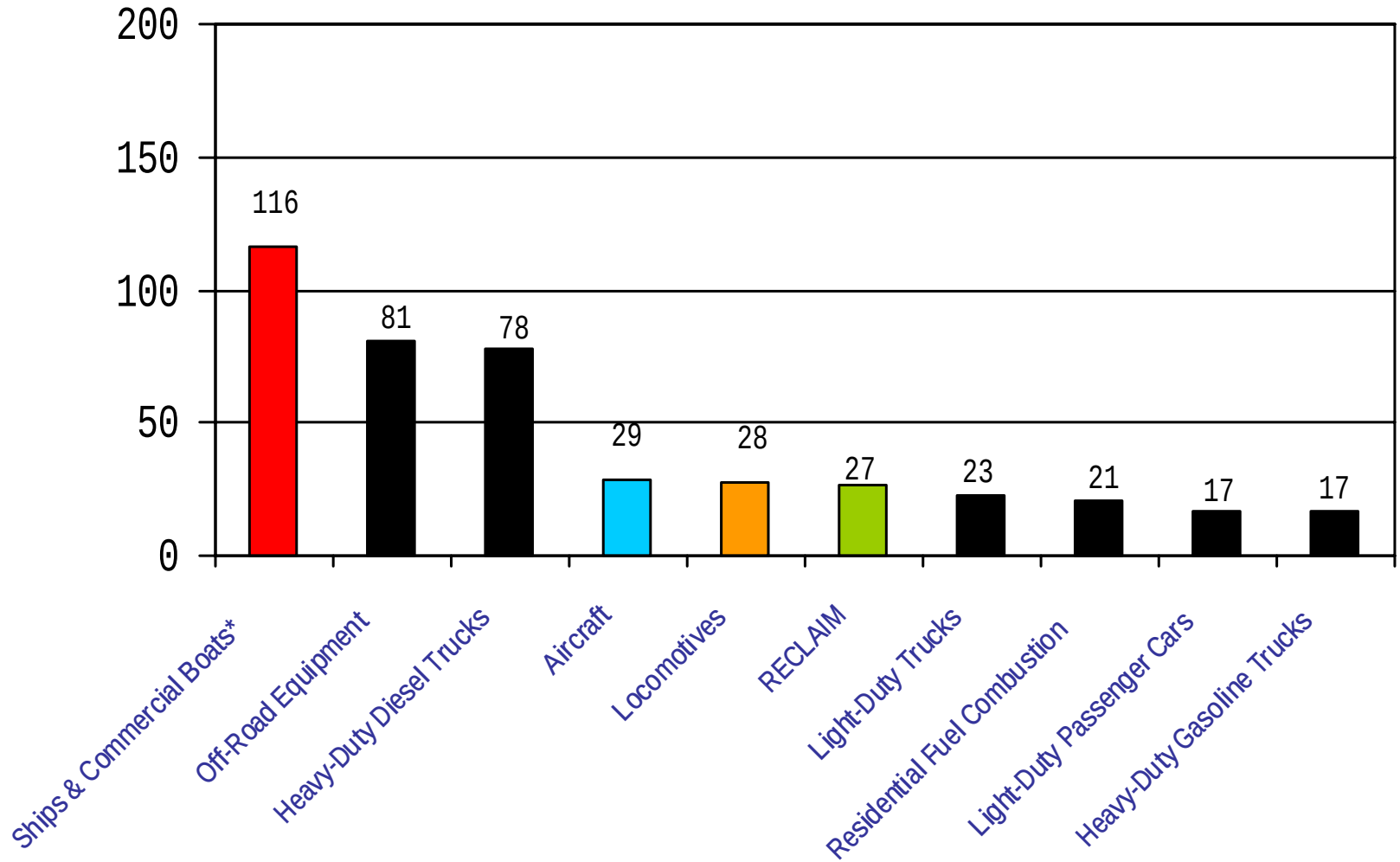
2014 NOx Top Ten Source Categories



* Oceangoing vessels = 72
**RECLAIM: 320 largest stationary sources, including all refineries and power plants

Source: 2007 South Coast Air Quality Management Plan

2023 NOx Top Ten Source Categories

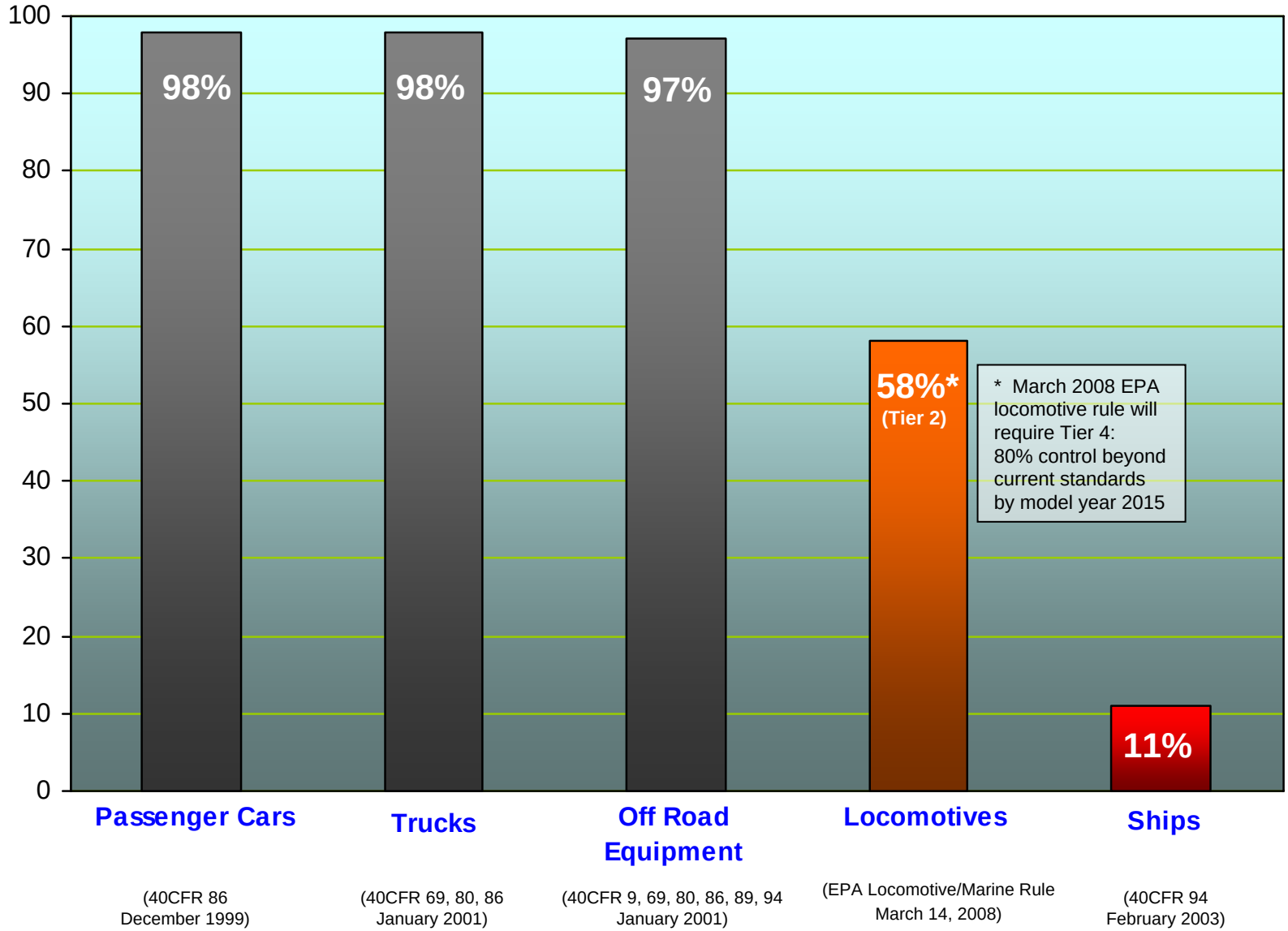


* Oceangoing vessels = 103

Source: 2007 South Coast Air Quality Management Plan

Percentage of Pollution Control

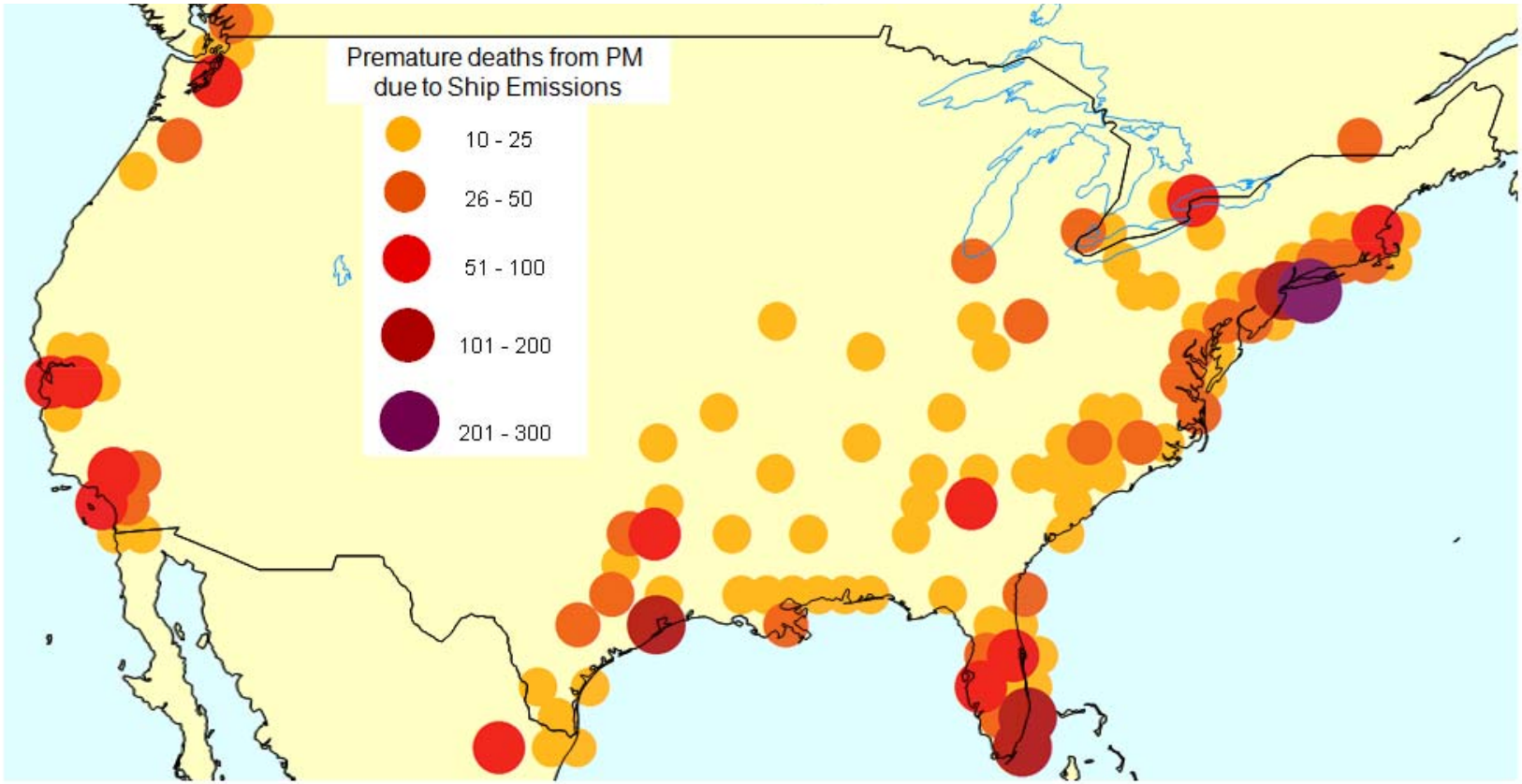
Adopted NOx Standards for New Units



A National Problem

Health Impacts from Ships are a Nationwide Problem

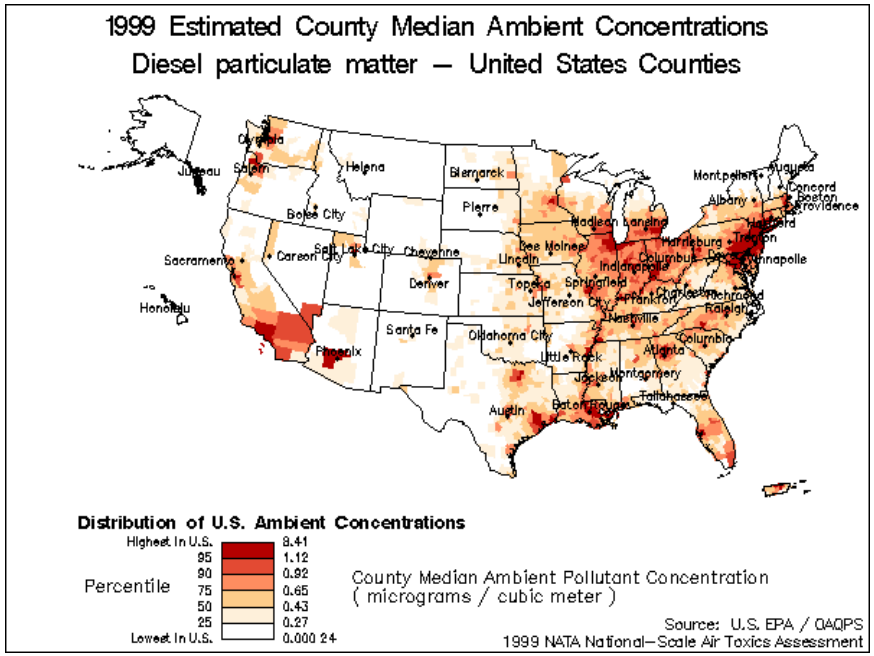
At least 2,000 to 5,000 Premature Deaths Per Year in the Continental U.S. are Caused by Particulate Pollution from Oceangoing Vessels

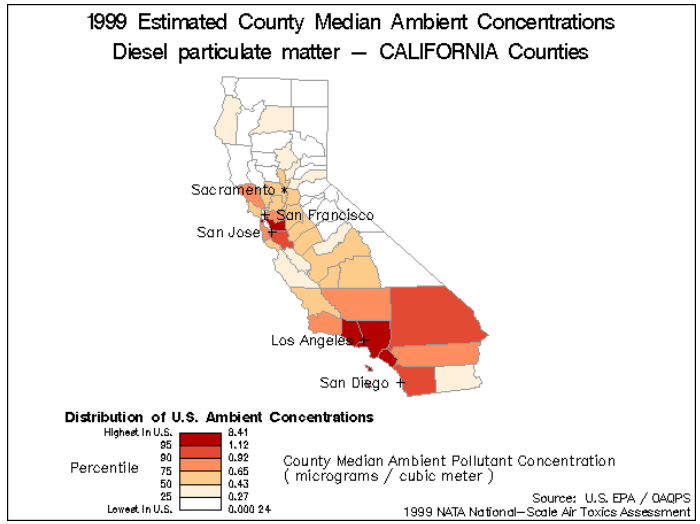


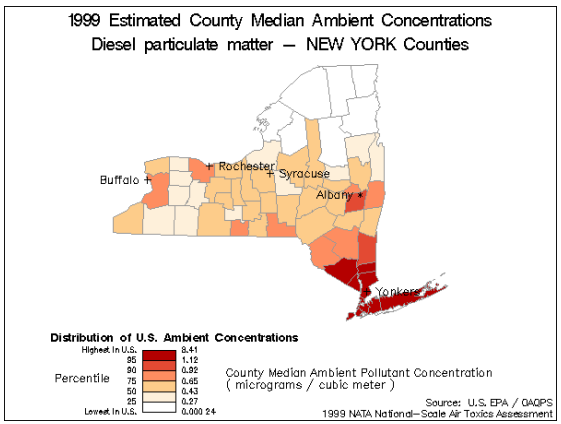
Cleaner marine fuels would reduce nationwide health impacts by ~ 60 %

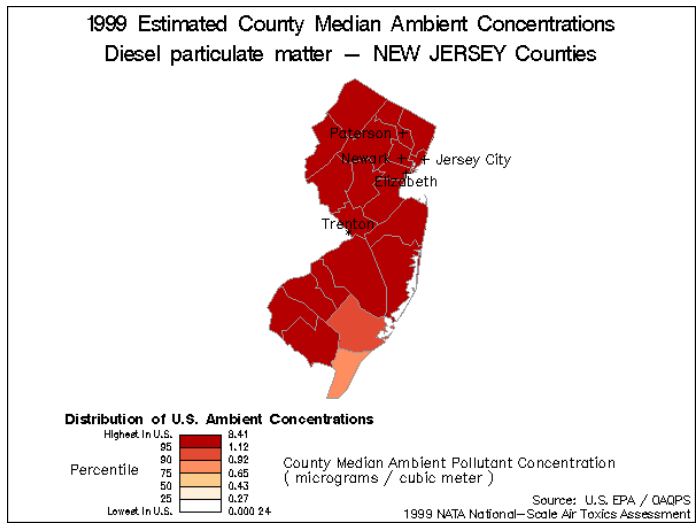
Source: Corbett, J. J.; Winebrake, J. J.; Green, E. H.; Kasibhatla, P.; Eyring, V.; Lauer, A., Mortality from Ship Emissions: A Global Assessment. *Environmental Science & Technology* 2007, *41*, (24), 8512–8518

Relatively High Diesel PM
in Many Areas Involved in Goods Movement









Source: USEPA1999 Modeled Ambient Concentration Maps

Control Actions

International Maritime Organization

- Current standards are weak, e.g. 45,000 ppm sulfur fuel
- April 2007 US Proposal to IMO
  - Fuel: 1,000 ppm sulfur limit or alternative control in Sulfur Emission Control Areas (2011)
  - New ships: 15-25% NOx control (2011); additional 80% NOx control (2016)
  - Retrofit some ships: 20% NOx control
- Last Friday April 4:
  - IMO Marine Environment Protection Committee proposal similar to U.S. proposal but 1,000 ppm fuel delayed to 2015
  - Action in October?

USEPA Rules: Oceangoing Vessels

- Merely adopted IMO standards
- Not applicable to foreign flags: ~ 90% of emissions
- Commitment to adopt more stringent rules by April 2007 delayed to December 2009

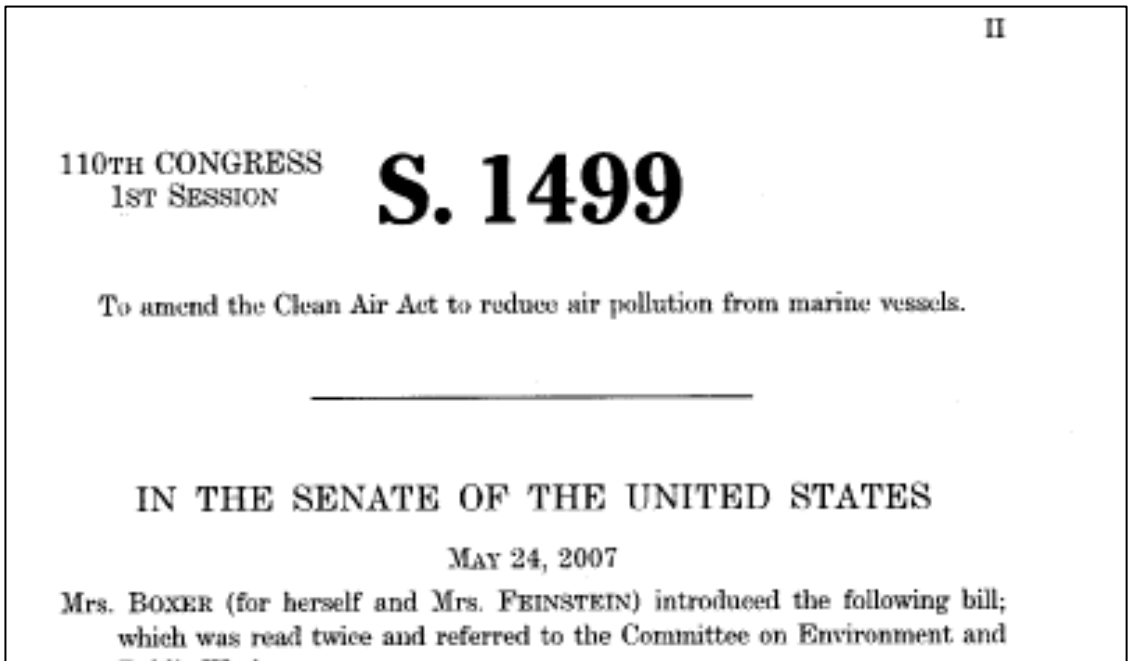
S 1499; HR 2548

Marine Vessel Emission Reductions Act of 2007

Would require EPA to adopt rules that –

- limit fuel sulfur content
- set emissions standards

for domestic and foreign-flagged vessels



II

110TH CONGRESS
1ST SESSION

S. 1499

To amend the Clean Air Act to reduce air pollution from marine vessels.

IN THE SENATE OF THE UNITED STATES

MAY 24, 2007

Mrs. BOXER (for herself and Mrs. FEINSTEIN) introduced the following bill; which was read twice and referred to the Committee on Environment and

USEPA Rules: Locomotives

- Only 58% NOx control from MY 2005 “Tier II” locomotives; similar or level of PM control
- 85 - 90% control is feasible
  - diesel particulate filters being applied to locomotives in Europe
- EPA 2008 Locomotive Rule
  - Deadlines for advanced control: model year 2015 for Tier 4 PM & NOx

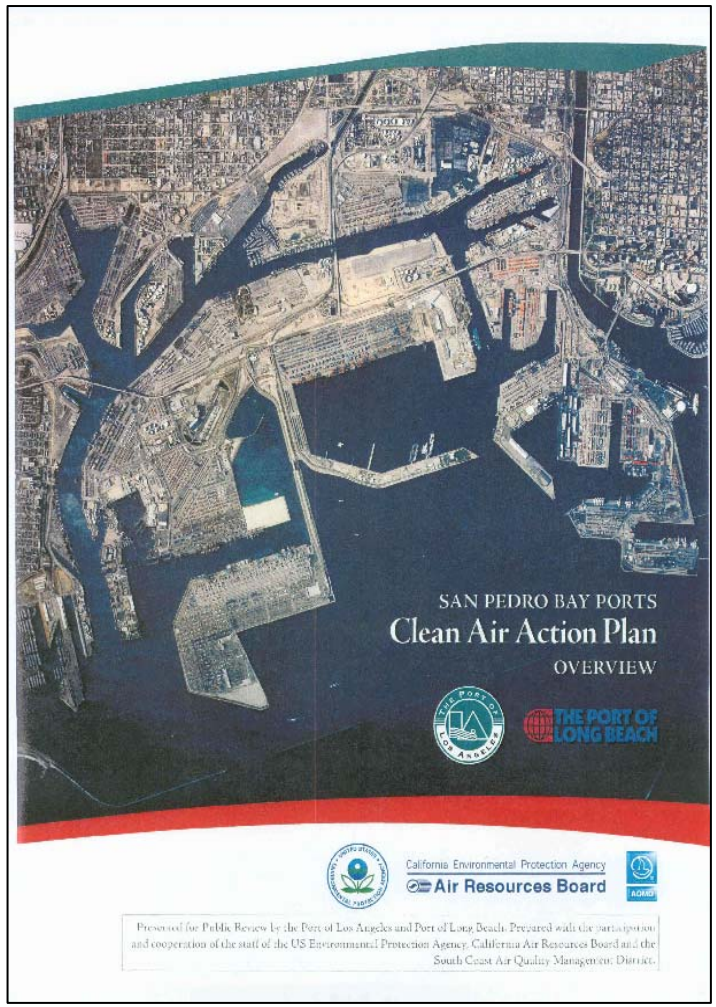
State & Local

- Authority Issues
- CARB
  - *Emission Reduction Plan &* Rules, e.g. --
    - Shore Power/at dock reductions (50% by 2014, 80% by 2020)
    - Truck Replacement/Retrofit
    - Marine Auxiliary Engine Rule -- In litigation
  - Locomotive MOUs
- SCAQMD
  - Railyard Risk Assessment & Idling Rules -- In litigation
  - 2007 Air Quality Management Plan -- Relies on control of goods movement

CEQA and NEPA

- China Shipping Litigation
  - Challenge to terminal project
  - Settlement requires “cold ironing” and other controls

San Pedro Bay Ports Clean Air Action Plan

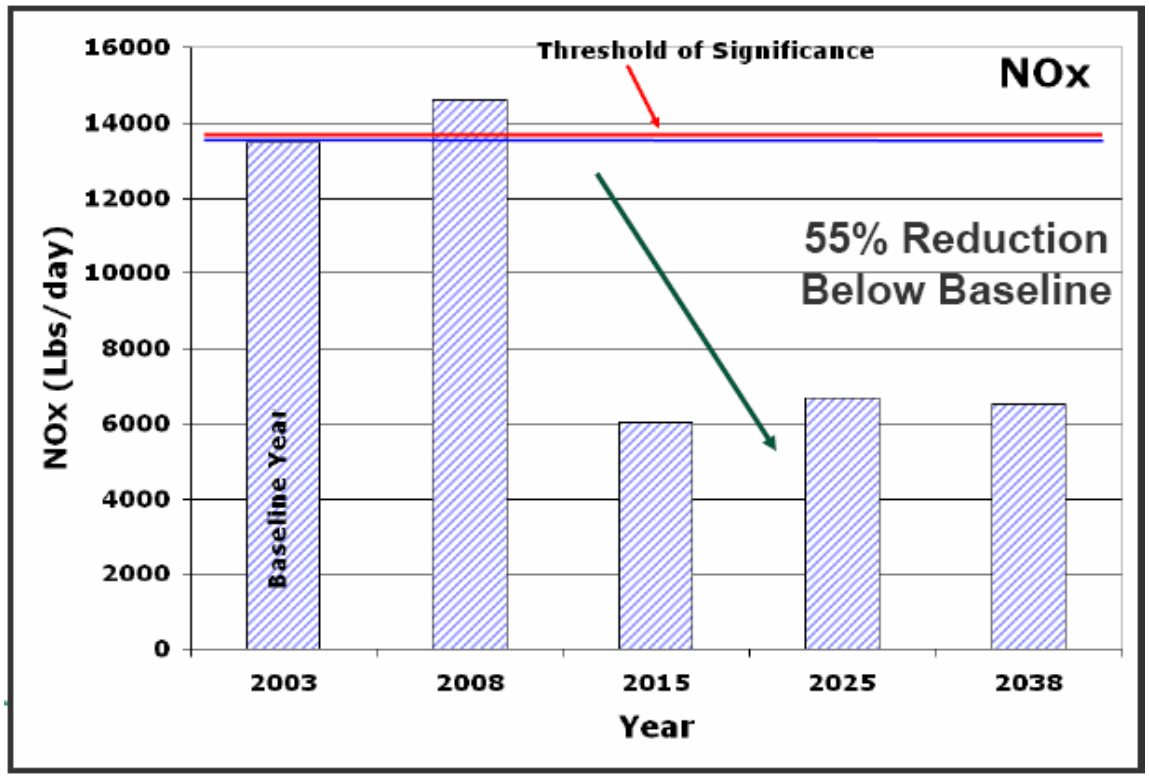


Example Control Measures

- Ocean Going Vessels
  - Low-Sulfur Fuels
  - Shore Power
  - NOx Controls
- Cargo Handling Equipment
  - Replacement & Retrofit
  - Alt fuels
- Trucks
  - Replacement/Retrofit
  - Alt fuels
- Rail
  - Multi-Engine, Hybrids, Aftertreatment, Alt Fuel

Control Approach:

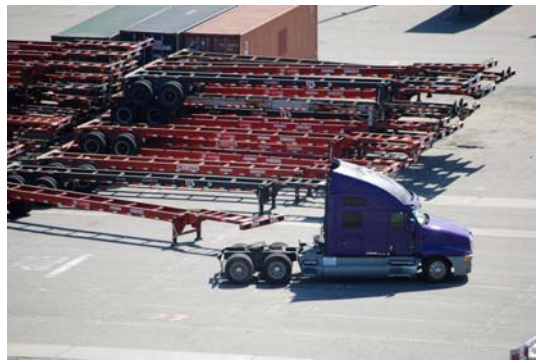
Marine Terminal Leases & Project Approvals



Source: Port of Los Angeles

Control Approach:
Port-Wide Programs

- Clean Truck Program
  - Progressive ban for ~ 16,800 drayage trucks
    - Pre 2007 trucks banned by 2012
  - 50% of replacements alt fuels
  - Funding: $35 per TEU Container Fee
    - Total Cost ~ $2 billion
    - Monetized health benefits ~ $5 billion
- Main Engine Low Sulfur Fuel Incentive
  - One year program
  - Pays cost differential for 2,000 ppm sulfur main engine fuel



Control Approach:

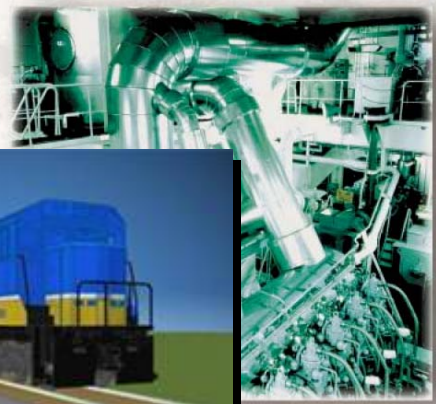
Technology Advancement

Example: Electric Truck Development

- Development of low-speed full electric tow tractor to dray containers to near-dock railyard
  - Port/SCAQMD funded project

Key Message:

Solutions are available . . .



Some Recommendations

- Ensure policymakers and public are informed about air quality issues
- Advocate for sufficient federal and international actions
- Use all available state and local authority
- Fund programs to accelerate fleet turnover & provide incentives for early control
- Financially support technology demonstration programs
- Appropriate infrastructure types & location
  - e.g. on-dock railyards, buffer zones, electrification

Take Away Messages:

- **The health impacts are severe**
- **Solutions are available**
- **All levels of government must act**


Thank You!