Multiple Air Toxics Exposure Study (MATES) III

Revised Draft Report

Public Consultation Meeting

August 26, 2008

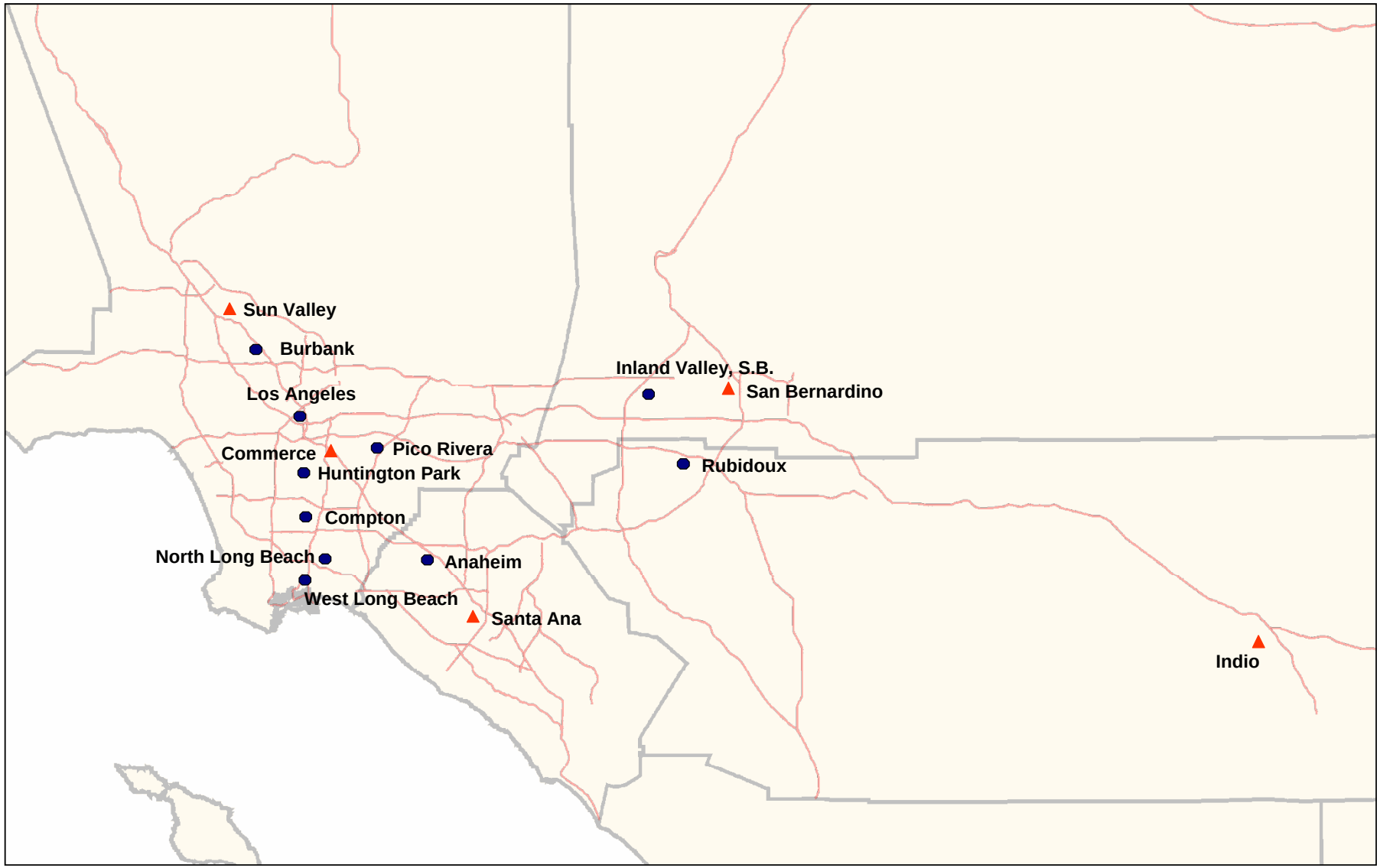
Background

- Multiple Air Toxics Exposure Study (MATES I): 1987
- MATES II: 1998-99
- MATES III: 2004-2006
- Environmental Justice Initiatives
- Focus on toxics exposure and risk
  - PM mortality not included

Key Components

- Monitoring
- Emissions Inventory
- Modeling
- Technical Advisory Group input on study plan

MATES III Monitoring Sites

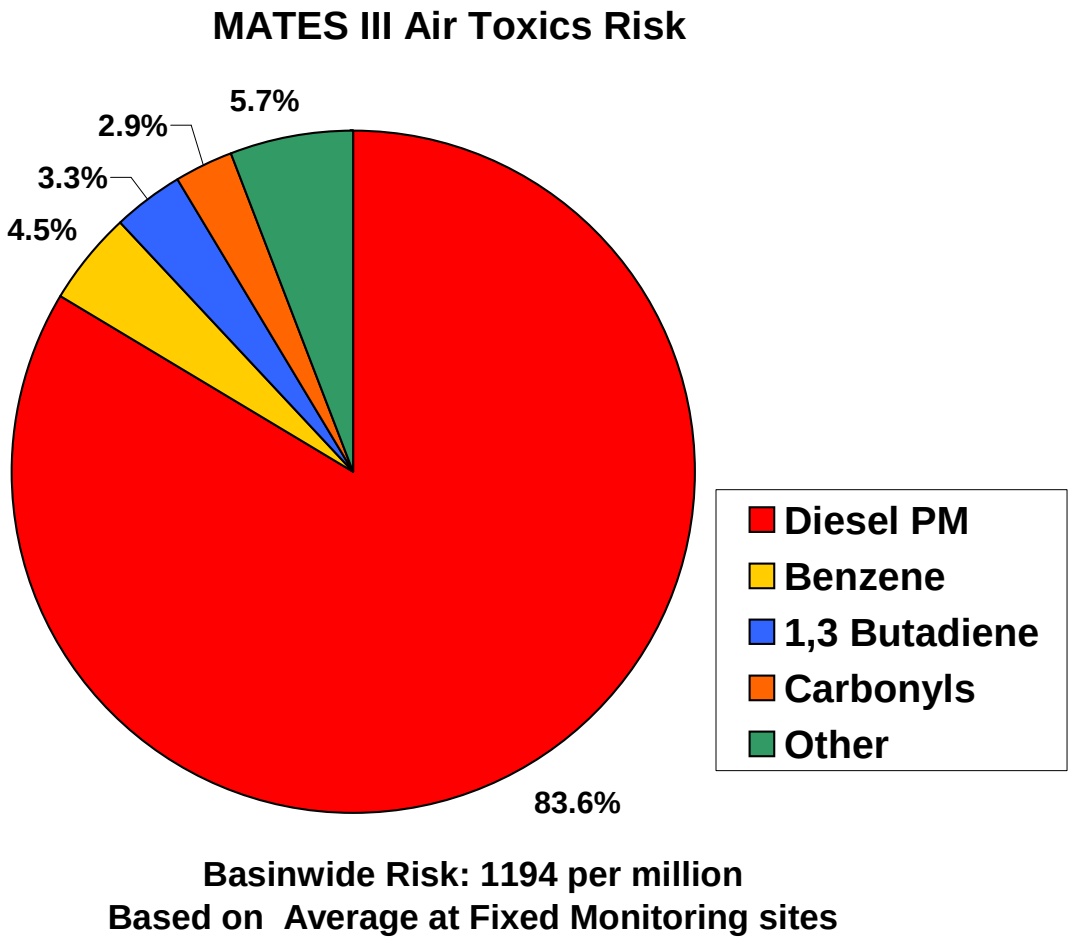


Substances Measured

Benzene	1,3-Butadiene	Carbon Tetrachloride
Chloroform	Dichlorobenzene	Methylene Chloride
MTBE	Perchloroethylene (Tetrachloroethylene)	Dichloroethane
Dibromoethane	Ethyl Benzene	Toluene
Trichloroethylene	Xylene	Styrene
Vinyl Chloride	Acetaldehyde	Formaldehyde
Acetone	Methyl ethyl ketone	
Arsenic	Cadmium	Hexavalent Chromium
Copper	Lead	Manganese
Nickel	Selenium	Zinc
Elemental Carbon	Organic Carbon	Naphthalene
PAHs	PM_{10}	$PM_{2.5}$

MATES III Monitoring

- General trend is down for air toxics levels
- Estimated basin wide lifetime risk 1,200 per million
- Mobile source toxics account for 94% of risk
- Diesel accounts for 84% of air toxics risk
- Non-diesel risk lower by 50%



July 2008 Revisions to Draft

- Introduction
  - Risk estimates discussion added
- Monitoring
  - Hexavalent chromium
  - Data reporting and non detects
- Emissions Inventory
  - Updated ship emissions
  - Updated hexavalent chromium emissions
- Modeling
  - Additional sensitivity analyses – mixing parameters
  - Improved model performance
  - Applied MATES III methods to 1998-99 (MATES II)
- Chemical Mass Balance (CMB) PM Source Apportionment
  - Seasonal analysis added
  - Additional descriptions of source profiles
- Weekend/Weekday – Appendix X added

Comments

- Risk estimates
  - Additional perspective/context
  - Uncertainties in potency estimates for carcinogens
  - More discussion on cancer risk assessment process and uncertainties
  - Additional discussion on other causes of cancer – not all due to air exposures – put air toxics risks in perspective
  - ✓ Included additional discussion in Introduction

  - Used inappropriate risk factors
  - Include adjustment to account for people moving about during day and spending time indoors
  - ✓Used Cal/EPA risk factors
  - ✓Did not include adjustments

Hexavalent Chromium

- Increased levels observed at Rubidoux

✓ Follow-up measurements point to TXI facility as source

✓ Monitoring study data presented to Board

✓ Updates of ongoing measurements posted on AQMD web site

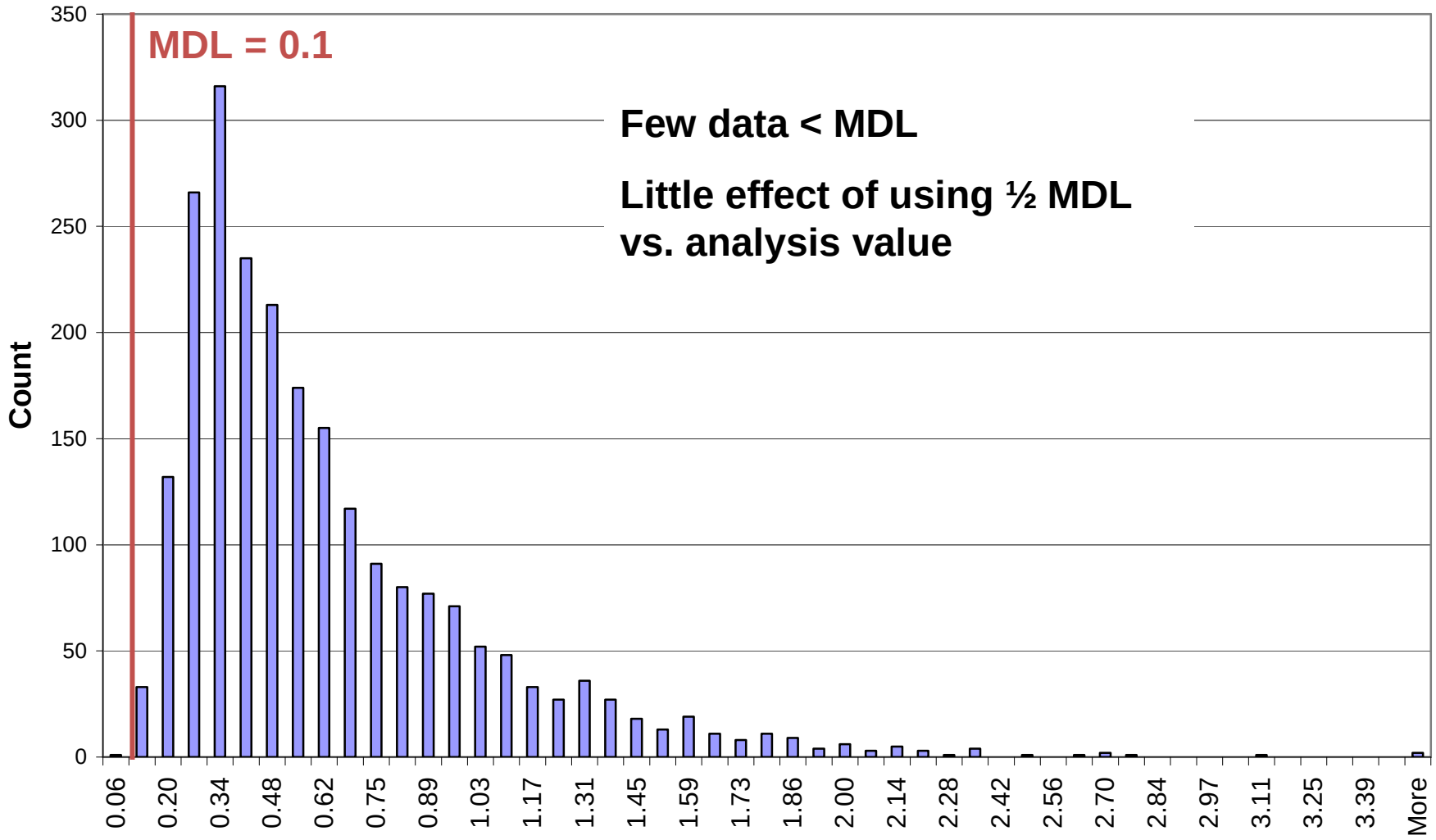
✓ http://www.aqmd.gov/RiversideCement/RiversideCement.html

Comments (cont.)

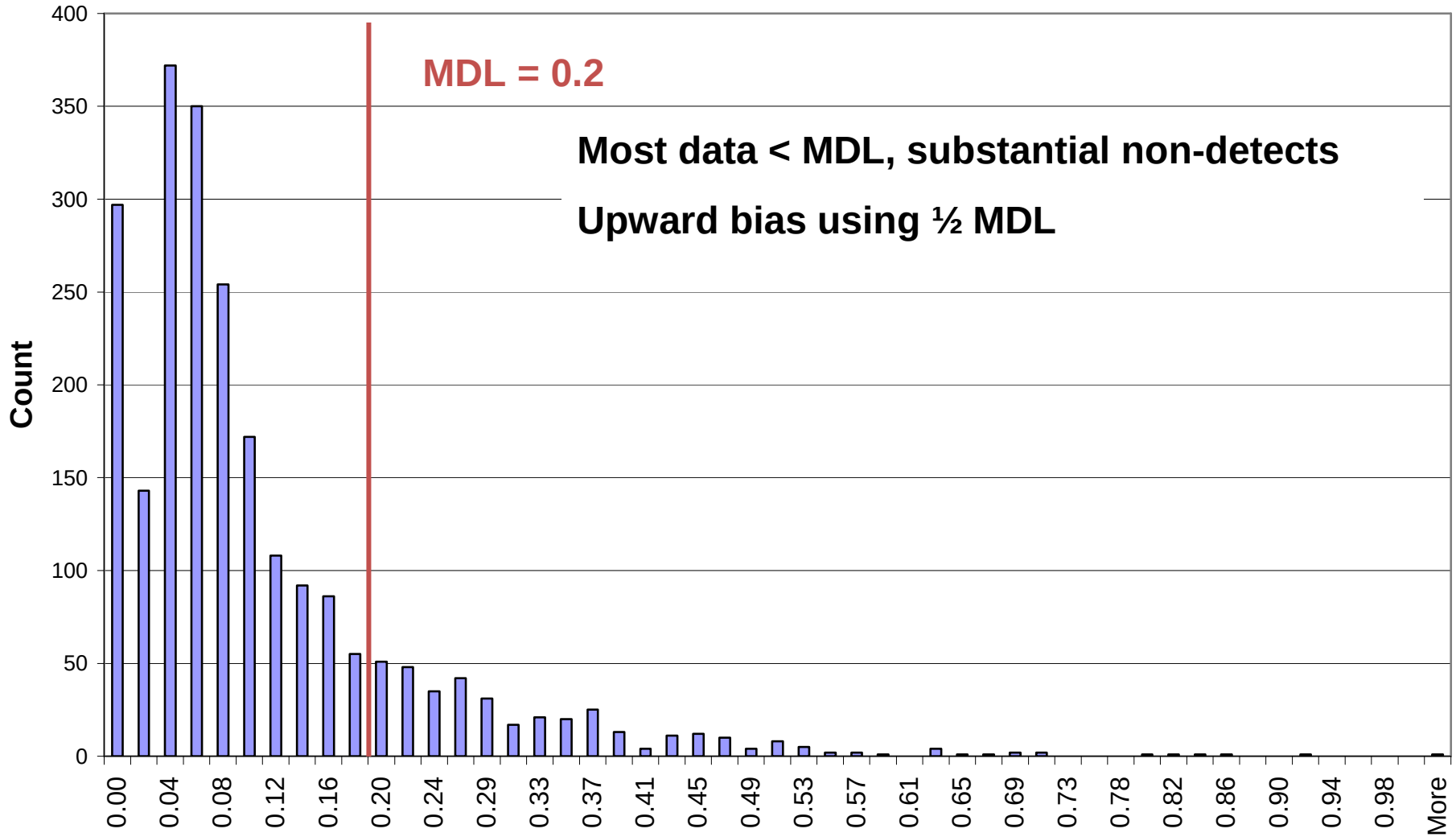
- Effects of data reporting conventions on results
  - Using actual analysis output for analyses below the Method Detection Limit rather than ½ MDL
  - Using zero for non-detects
  - Not consistent with previous studies
  - Treating metals differently than other analytes

  ✓ Additional charts and discussion on effects of data reporting convention

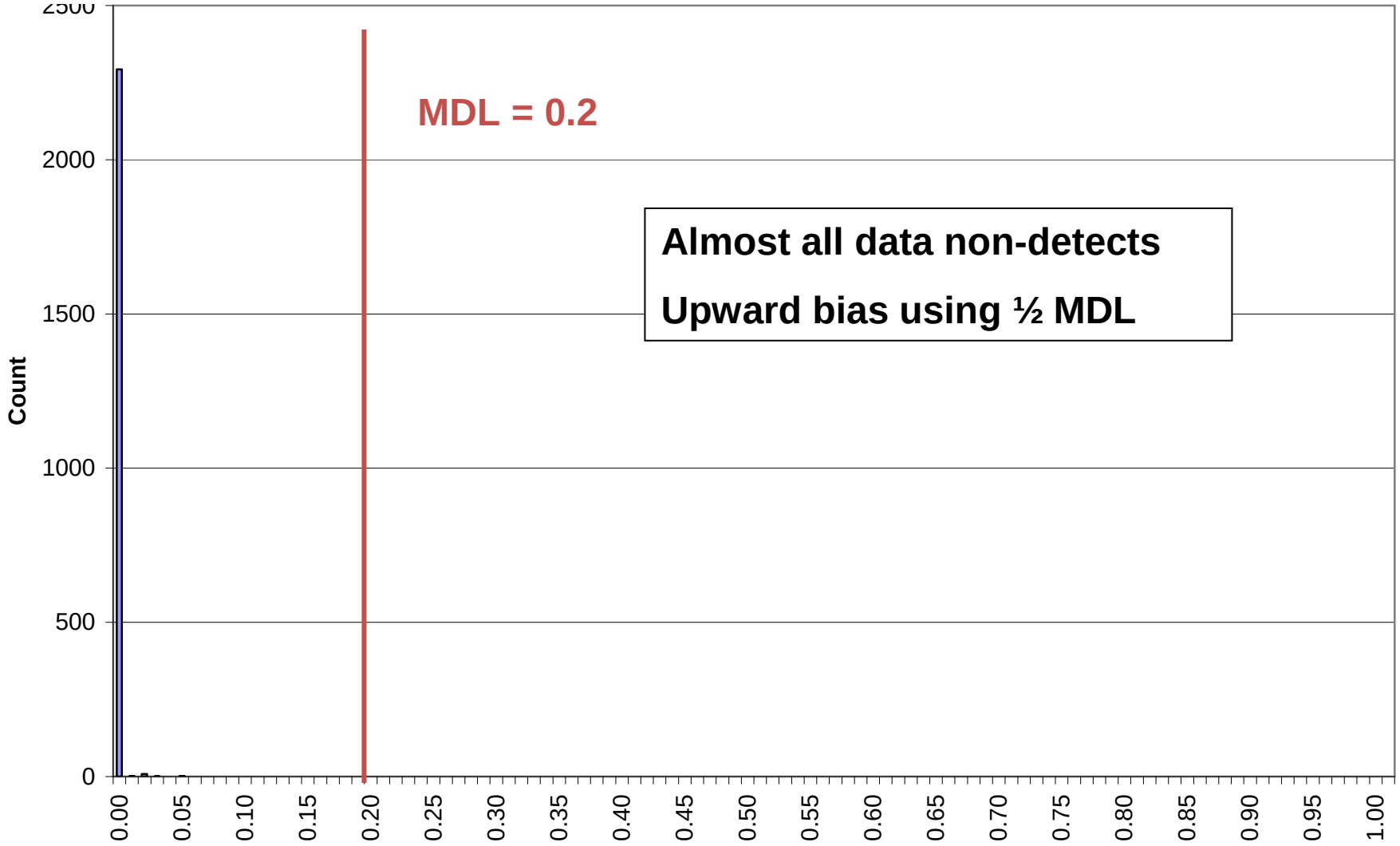
Benzene


MDL = 0.1
Few data < MDL
Little effect of using ½ MDL vs. analysis value
Count
350
300
250
200
150
100
50
0
0.06
0.20
0.34
0.48
0.62
0.75
0.89
1.03
1.17
1.31
1.45
1.59
1.73
1.86
2.00
2.14
2.28
2.42
2.56
2.70
2.84
2.97
3.11
3.25
3.39
More

1,3-Butadiene



Vinyl Chloride

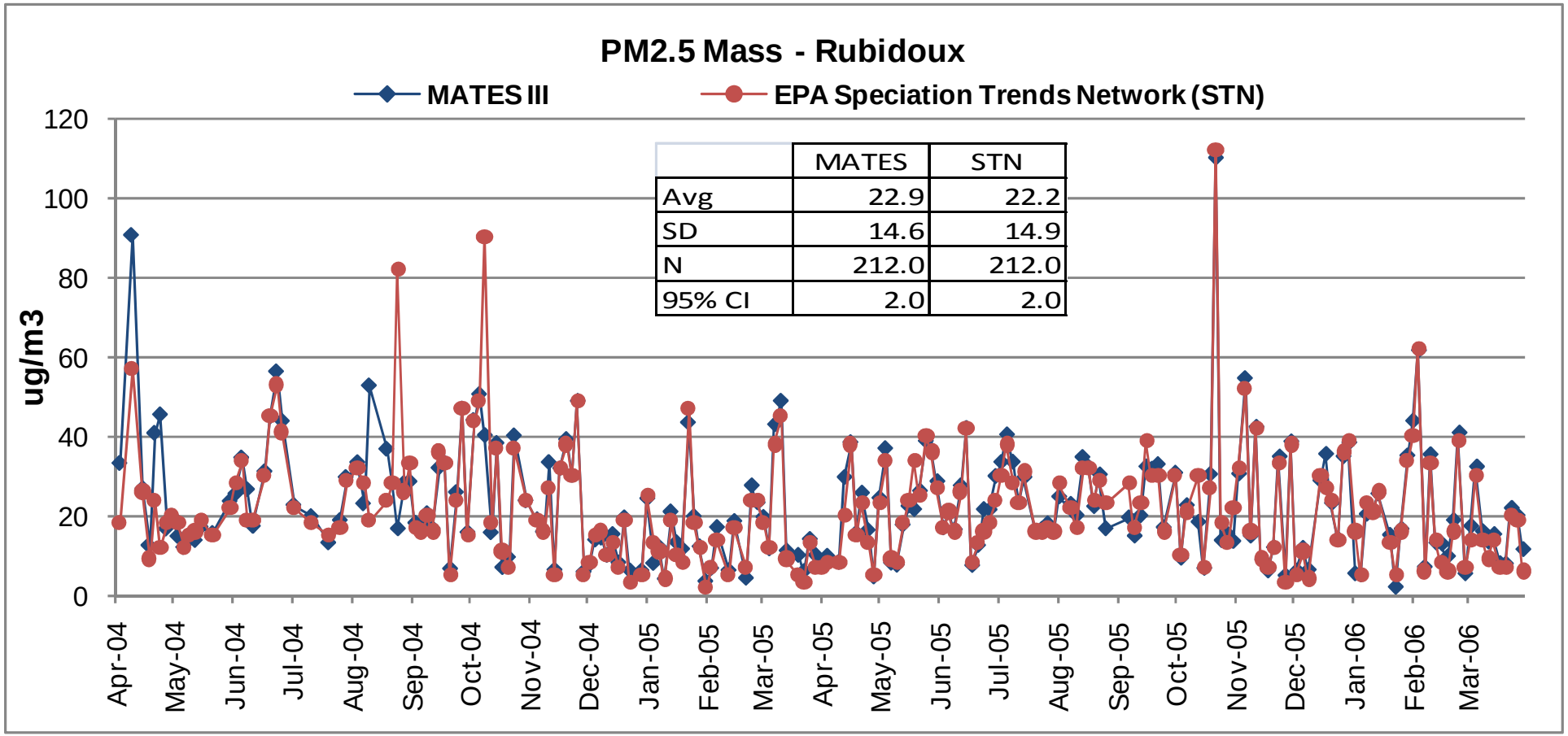


Comments (cont.)

- Monitoring results
  - PM2.5 mass not consistent with CARB data
  - Did not include PM data from other sources

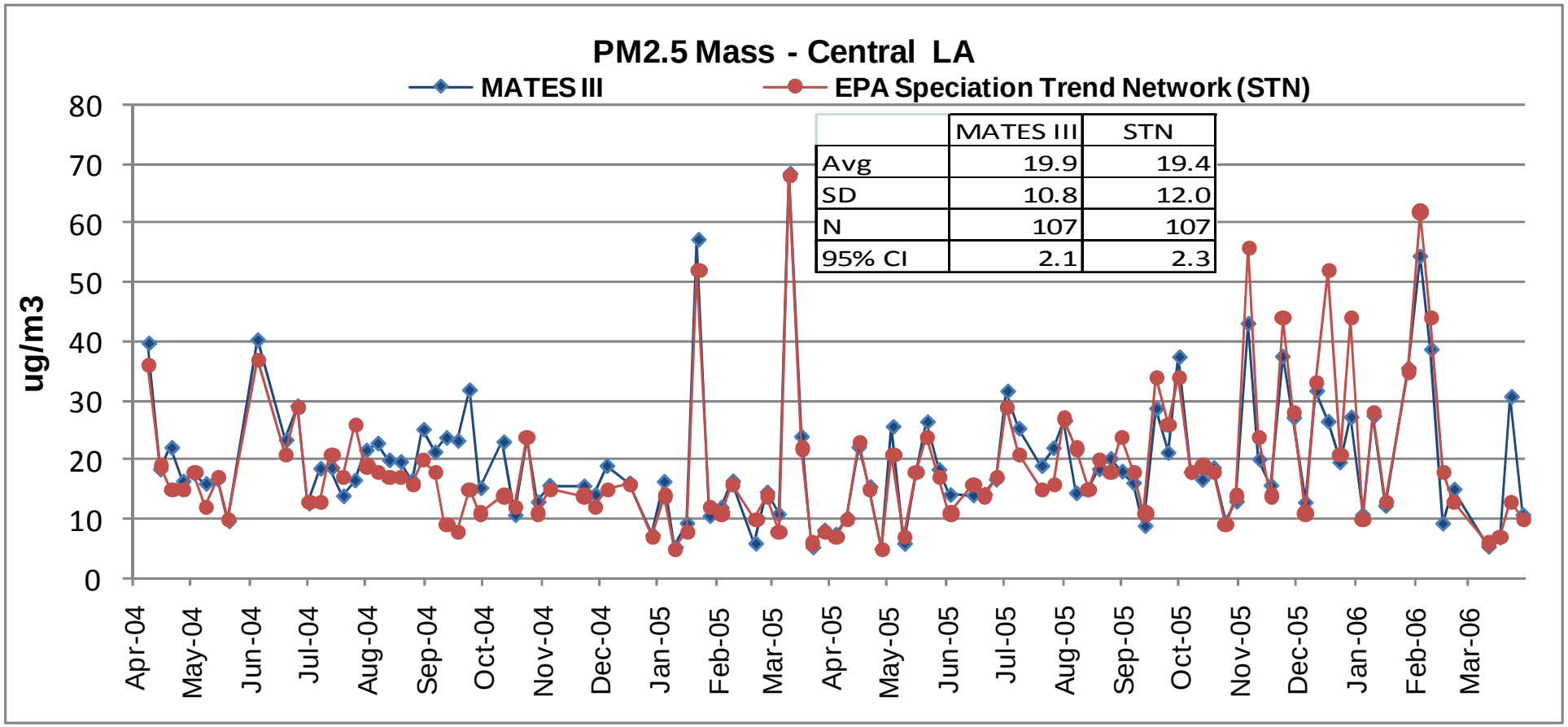
    - ✓ CARB data is from FRM samplers used for standards compliance monitoring
    - ✓ MATES III used samplers (SASS) consistent with EPA Speciation Trends Network (STN)
    - ✓ Two sites have both MATES III and STN samplers and show agreement over MATES III study period
    - ✓ STN samplers give somewhat higher mass readings than the FRM samplers
    - ✓ Other PM data of limited use - does not include speciation for CMB use; sampling time periods differ

MATES III Compared to STN Rubidoux



	MATES	STN
Avg	22.9	22.2
SD	14.6	14.9
N	212.0	212.0
95% CI	2.0	2.0

MATES III Compared to STN
Central Los Angeles



	MATES III	STN
Avg	19.9	19.4
SD	10.8	12.0
N	107	107
95% CI	2.1	2.3

Comments (cont.)

- Emissions Inventory
  - Discrepancies in ship emissions
  - No detail of PM2.5 DPM and EC

  ✓ Updated ship emissions category
    ✓ Small increase in ship DPM emissions
    ✓ Decrease EC fraction in ship PM emissions
  ✓ Added PM 2.5 DPM and EC in emissions tables
  ✓ Added 1998 back-cast emissions table
  ✓ Revised 2005 PM2.5 DPM/EC emissions ratio = 1.95

  ✓ Added CR+6 emissions from mobile sources

Revised DPM Estimates Comparison

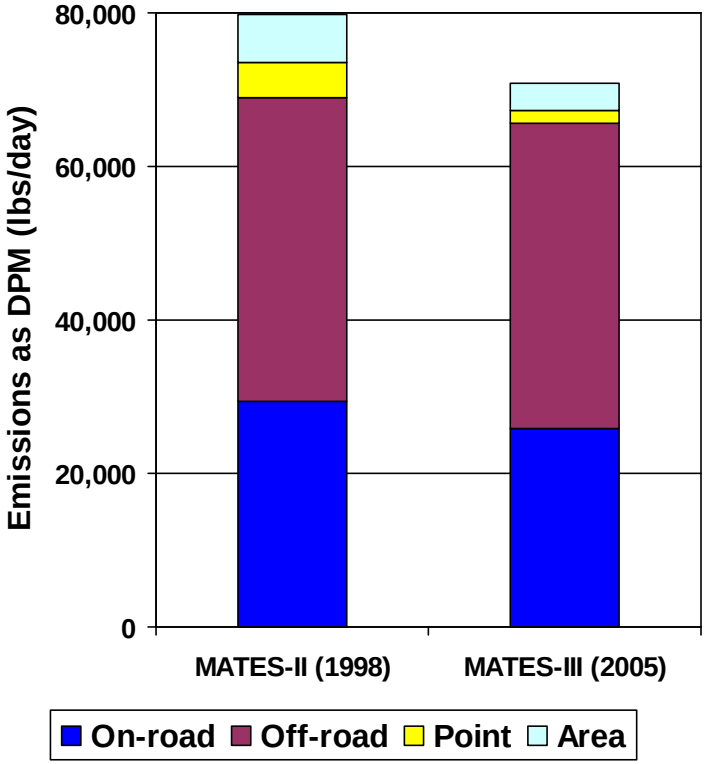
Table 2-4 2005 Emissions of Diesel PM and EC, lbs./day

$PM_{2.5}$ Diesel PM	$PM_{2.5}$ EC	DPM/EC Ratio
55,983	28,761	1.95

Table 2-5 Estimates of Average Diesel PM, μg/m3

Estimation Method	MATES III Year One	MATES III Year Two
MATES II: PM_{10} EC x 1.04	2.18	2.14
2005 Inventory: $PM_{2.5}$ EC x 1.95	3.37	3.70
CMB	2.87 – 3.13	3.52 – 3.84

Potency Weighted Emissions (MATES-II vs. MATES-III)



Source Category	Percent Change
On-road	12% decrease
Off-road	1% increase
Point	66% decrease
Area	42% decrease

Comments (cont.)

- Chemical Mass Balance method
  - Not appropriate to use CMB calculations: estimate of DPM biased high
  - Natural gas not included as a source
    - ✓ Minor source of PM emissions
  - Secondary organics not considered as a source
    - ✓ No speciation profile available; unapportioned mass sometimes considered as secondary organics
  - Calculated (apportioned) mass higher than measured mass
    - ✓ Apportioned mass within 20% of measured mass – generally acceptable CMB model performance
    - ✓ CMB best method available; TAG recommendation

Comments (cont.)

- Modeling
  - Effect of alternate vertical mixing parameters
  - “Apples to apples” comparison with MATES II
  - More detailed maps of modeled air toxics risks with additional risk cut points

CAMx/MM5 Modeling Sensitivity

MATES-III 2005

- ✓ Tested 8 vs. 16 layers - no significant difference
- ✓ Tested different vertical mixing schemes
- ✓ Used alternate shipping emissions profile – lowered EC percentage of PM emissions per comments received (No impact on total diesel PM emissions)

- ✓ Achieved better model fit to monitored EC values

Applied CAMx Model to MATES II

MATES-II: 1998-99

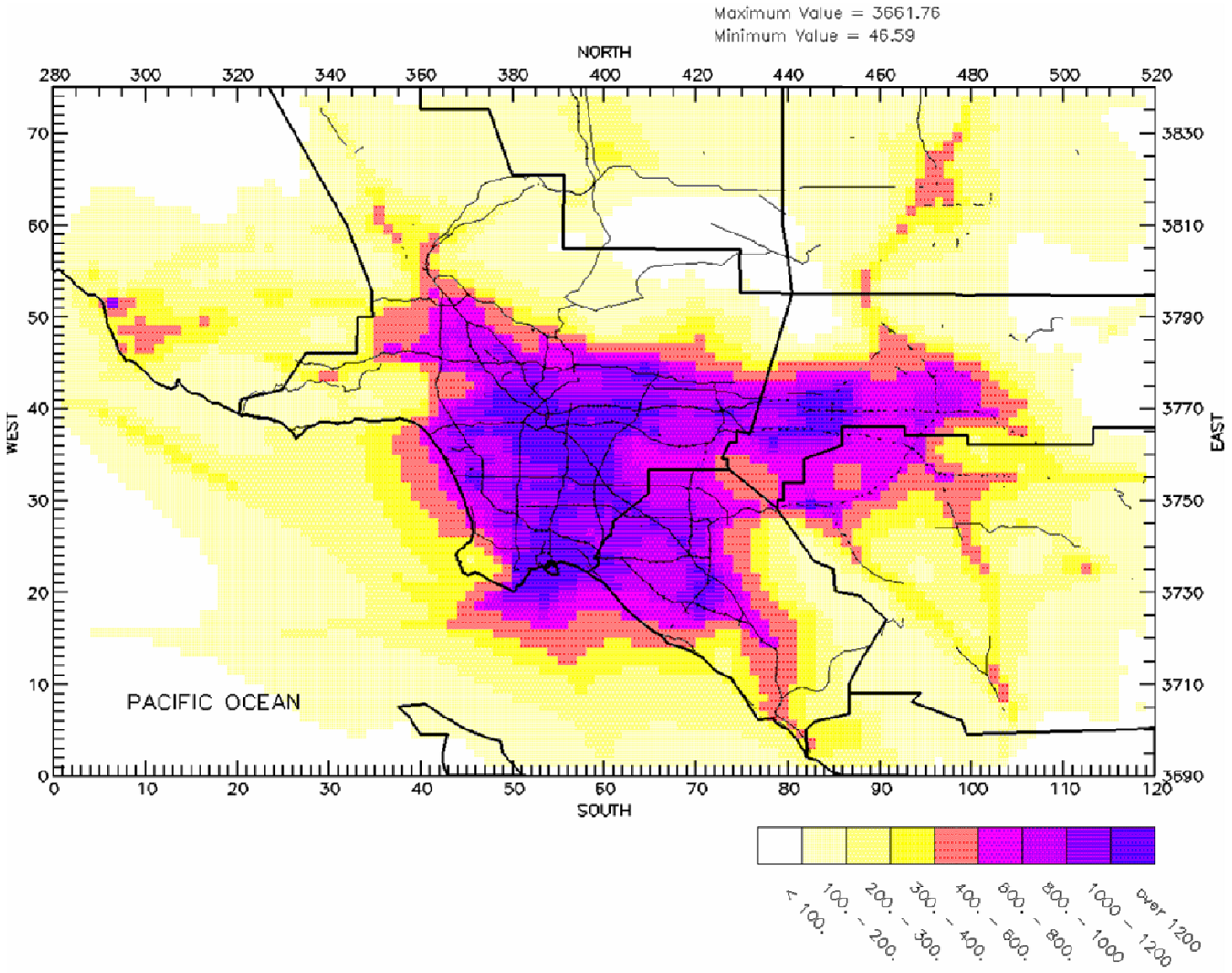
- ✓ Created 1998-99 MM5 meteorological data fields
- ✓ Created comparable CAMx input files (layer structure, mixing & source characteristics)
- ✓ Simulated back cast 1998-99 emissions
- ✓ Risk calculated for 1998 population

Model Risk Update Summary

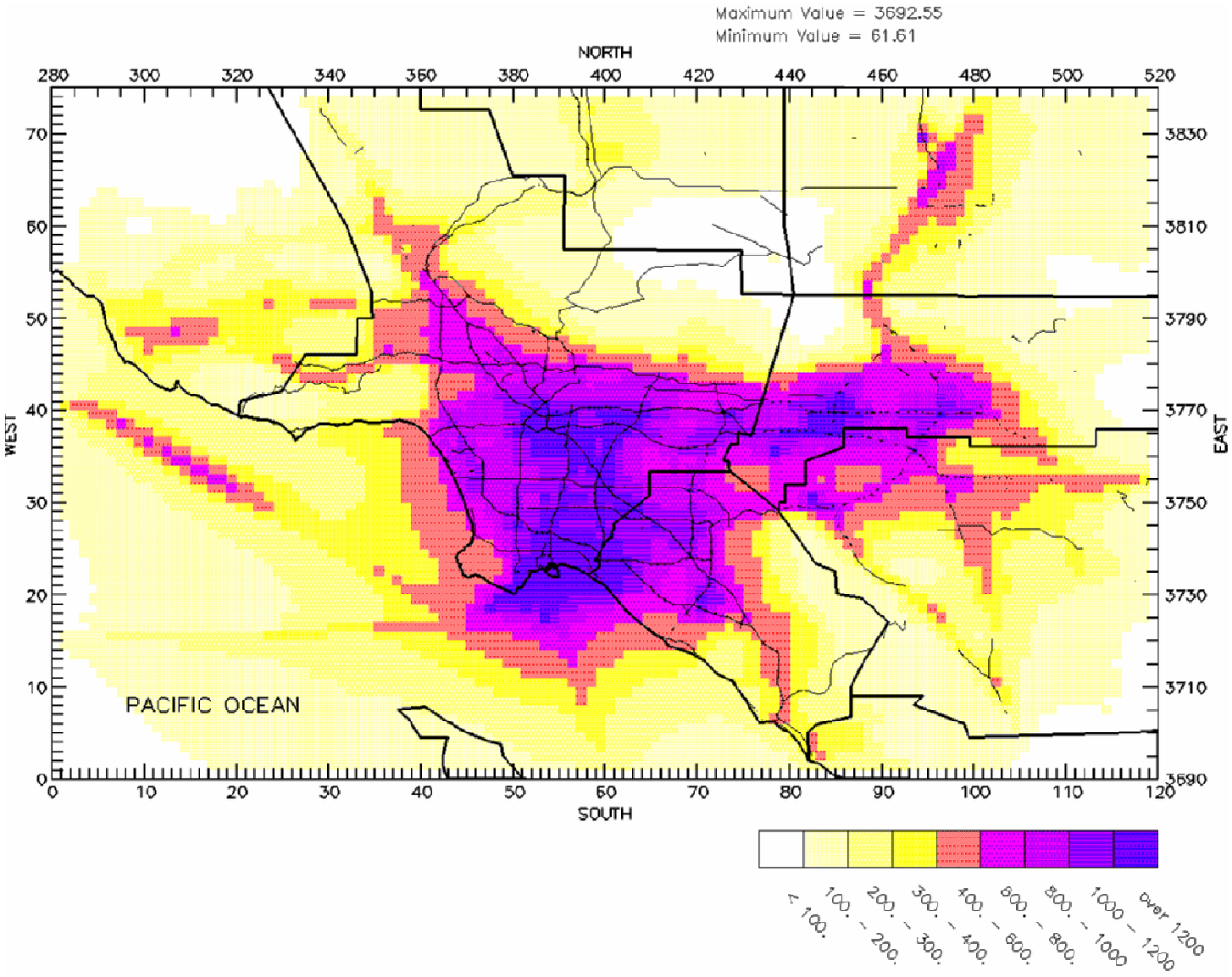
Revised CAMx Results

- ✓ 2005 MATES-III population weighted risk changes from 810 to 853 per million
- ✓ 1998-99 back-cast projection is 931 per million
- ✓ Highest risk grid cells in ports area
- ✓ 8% decrease in basin wide population weighted risk from MATES II to MATES III

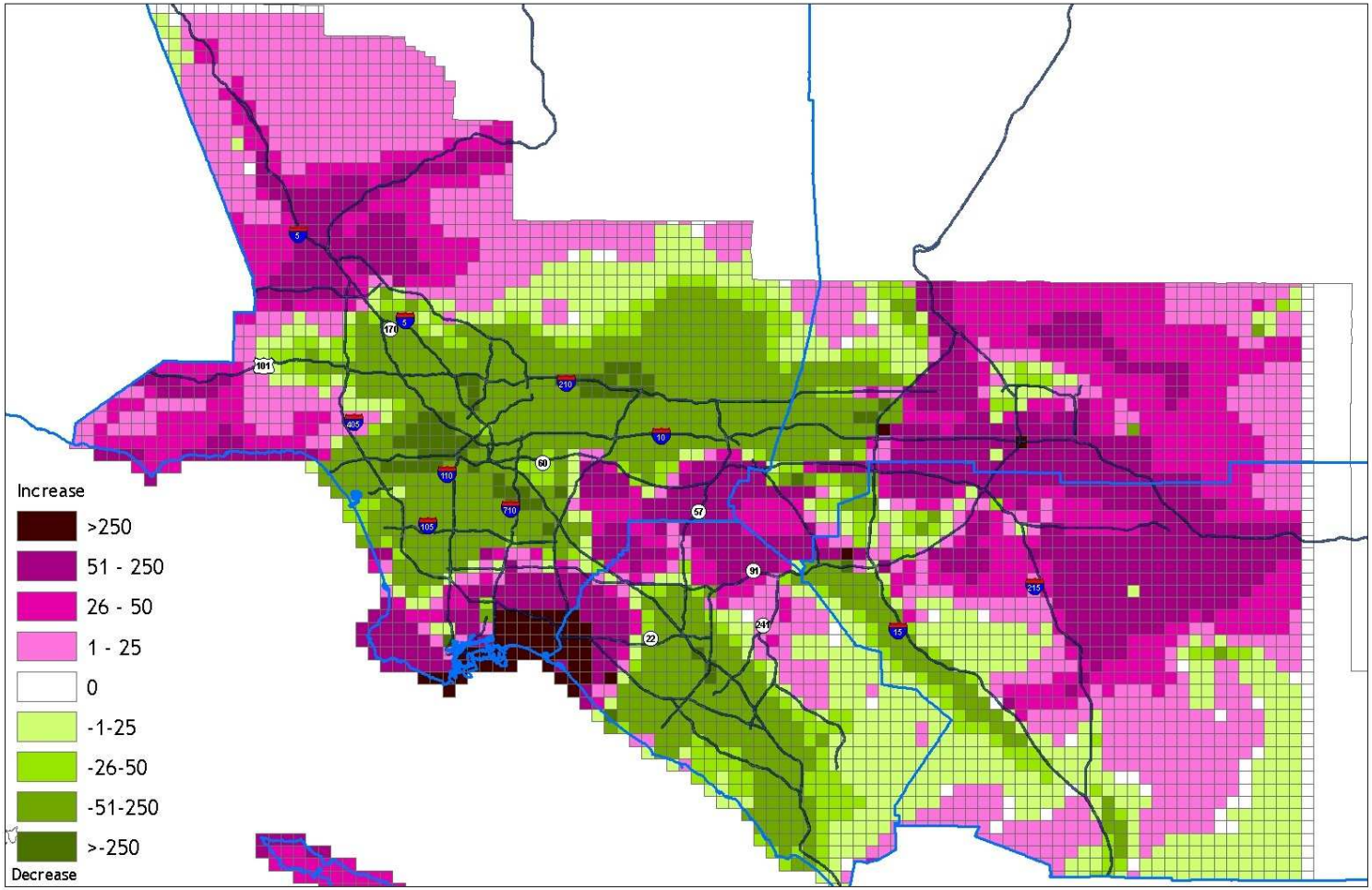
MATES II CAMx Model Estimated Risk



MATES III Model Estimated Risk



Modeled Air Toxics Risk
Difference Between 2005 & 1998 - 99



Change in CAMx RTRAC Air Toxics Simulated Risk (per million) from 1998-99 to 2005 Using Back-Cast 1998 Emissions and 1998-99 MM5 Generated Meteorological Data Fields

County-Wide Population Weighted Risk

Region	MATES III		MATES II*		Percentage Change
	2005 Population	Average Risk (Per Million)	1998 Population	Average Risk (Per Million)	
Los Angeles	9,887,127	951	9,305,726	1047	-9
Orange	2,764,620	781	2,579,794	833	-6
Riverside	1,548,031	485	1,249,554	478	2
San Bernardino	1,462,842	712	1,269,919	725	-2
SCAB	15,662,620	853	14,404,993	931	-8

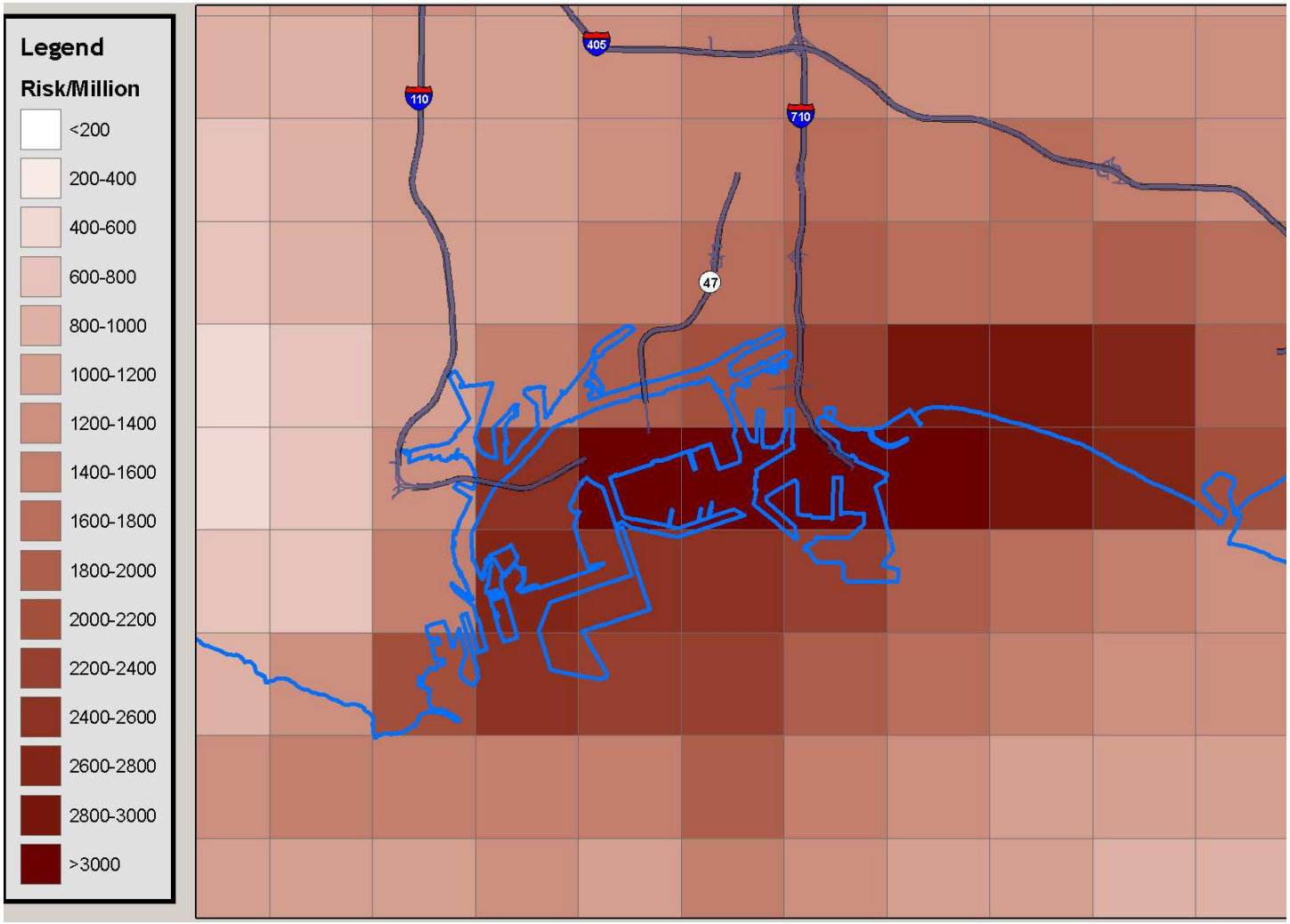
* CAMx RTRAC Simulations

Model Risk Update – Ports Area

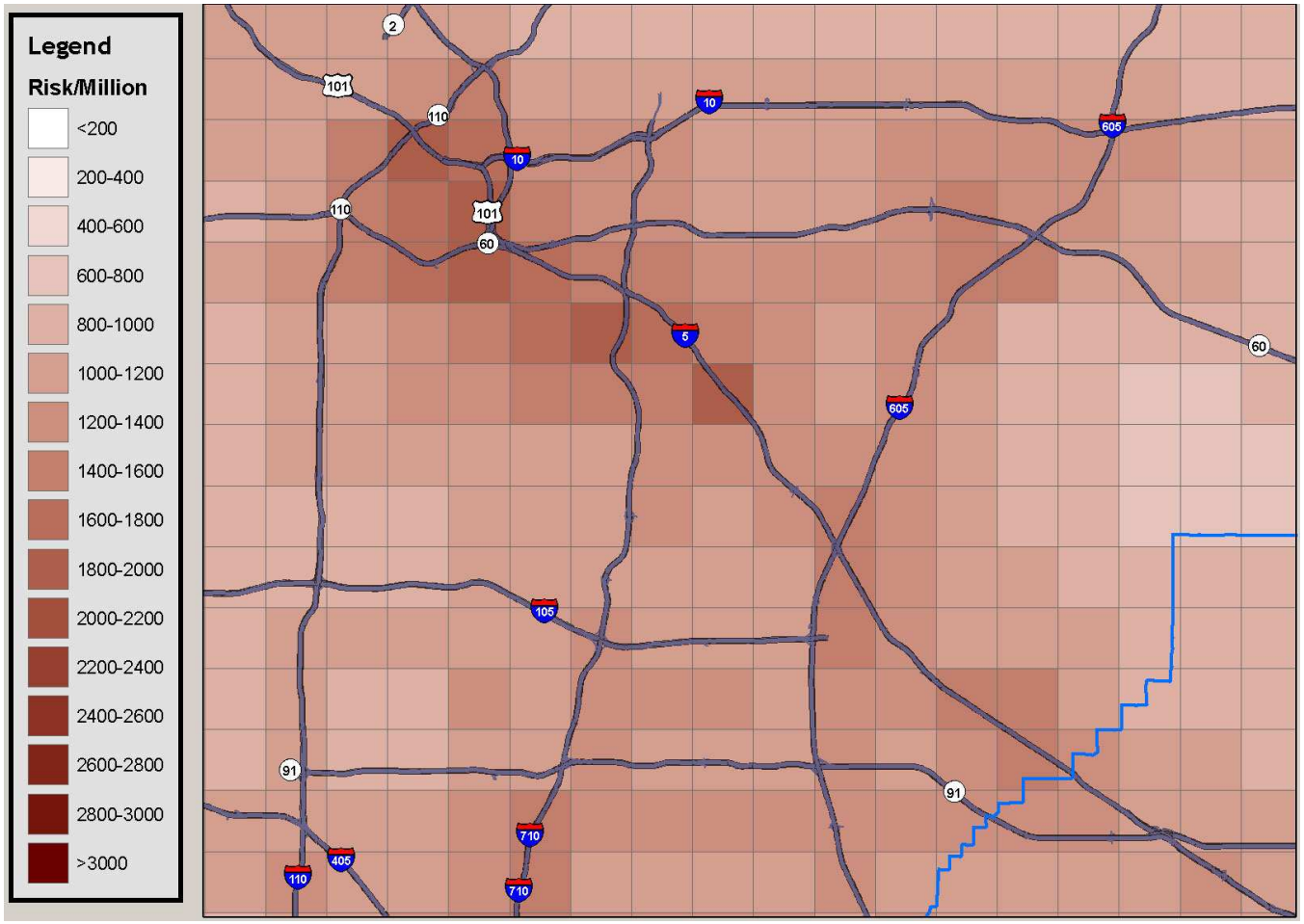
Revised CAMX RTRAC

- Looked at 2005 model results around ports
- Ports area: 10 x10 grid cell area
- Port area shows increased population weighted risk from 1998-99 to 2005:
- 1208 → 1415 per million

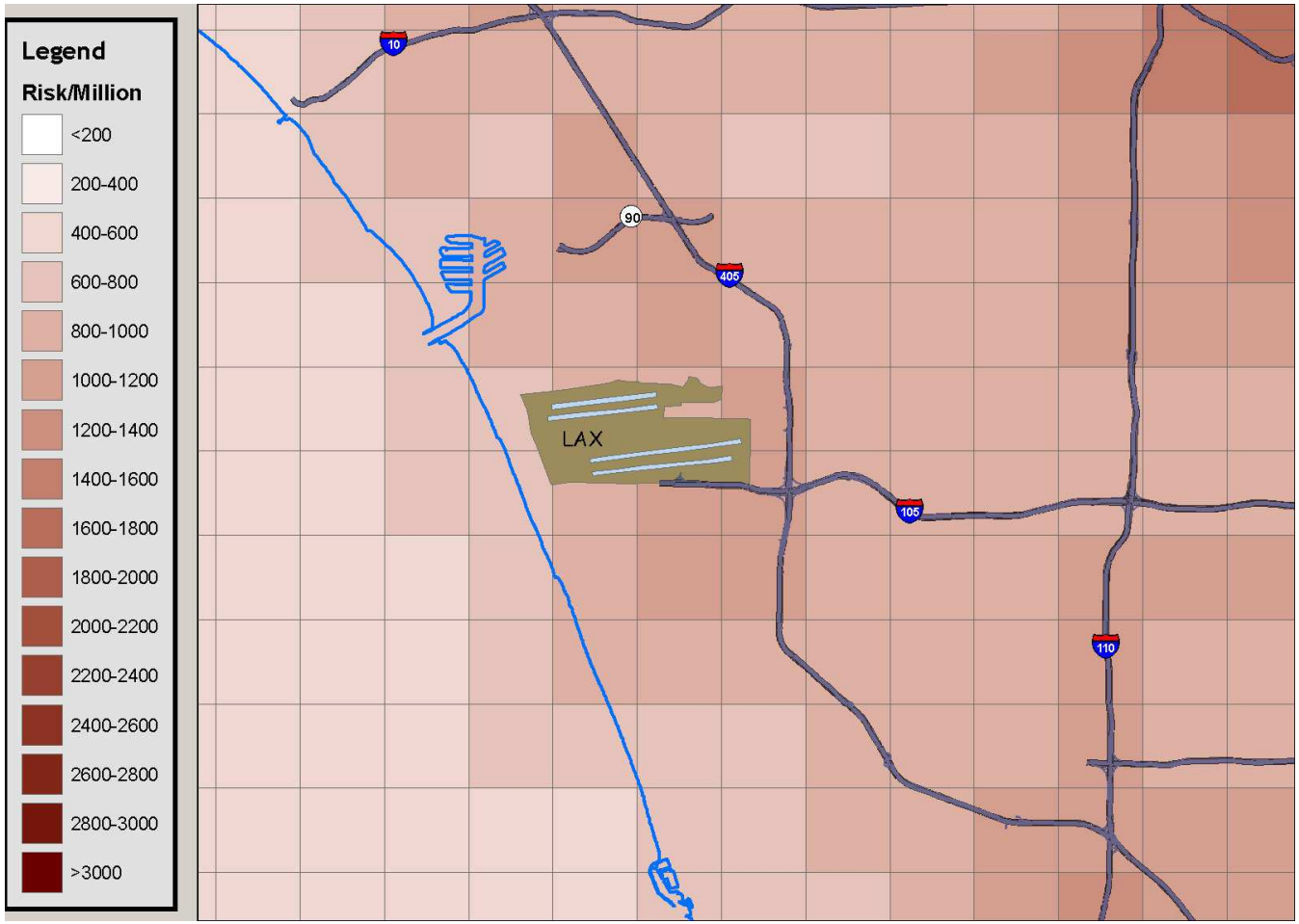
2005 Ports area MATES III Simulated Risk



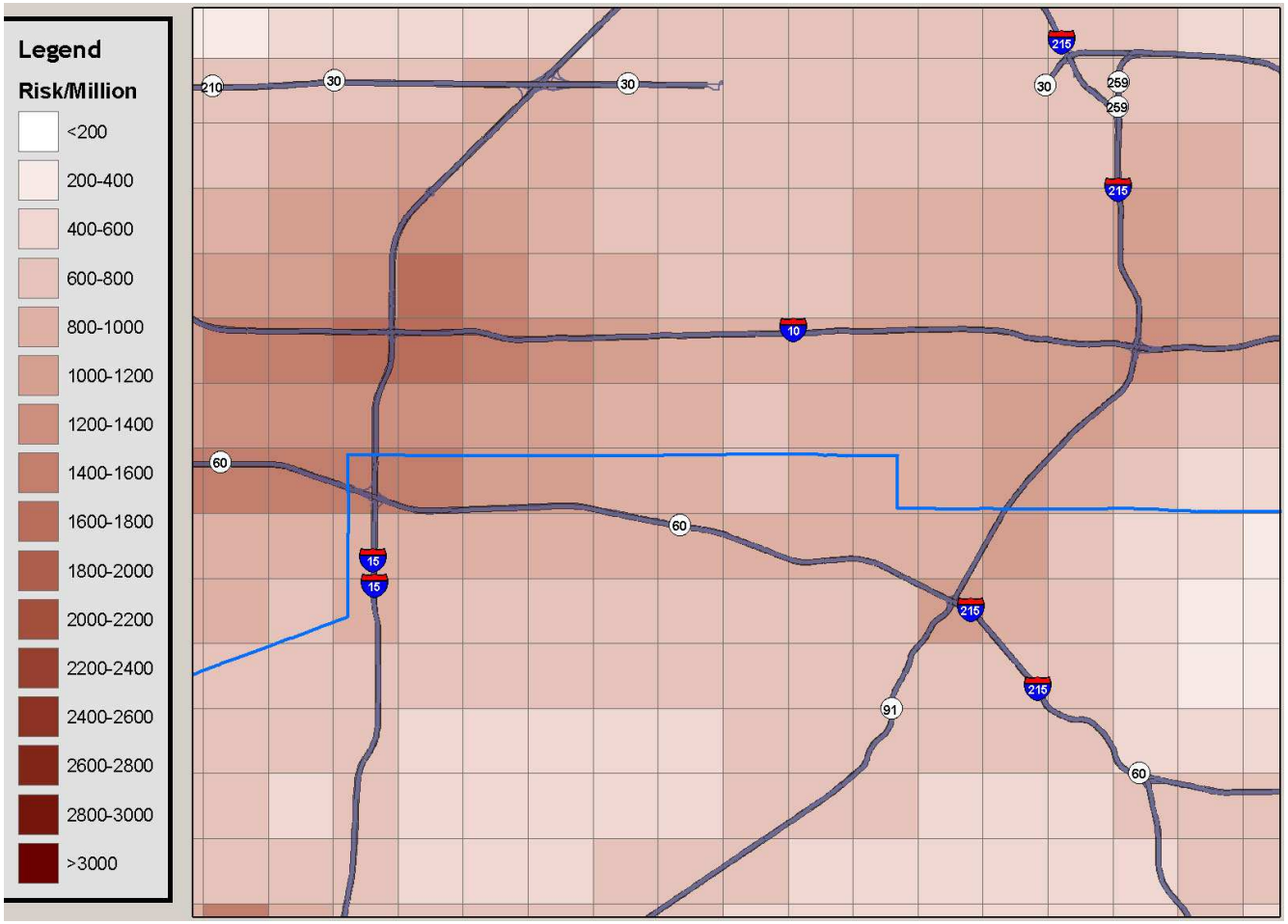
2005 Central Los Angeles MATES III Simulated Risk



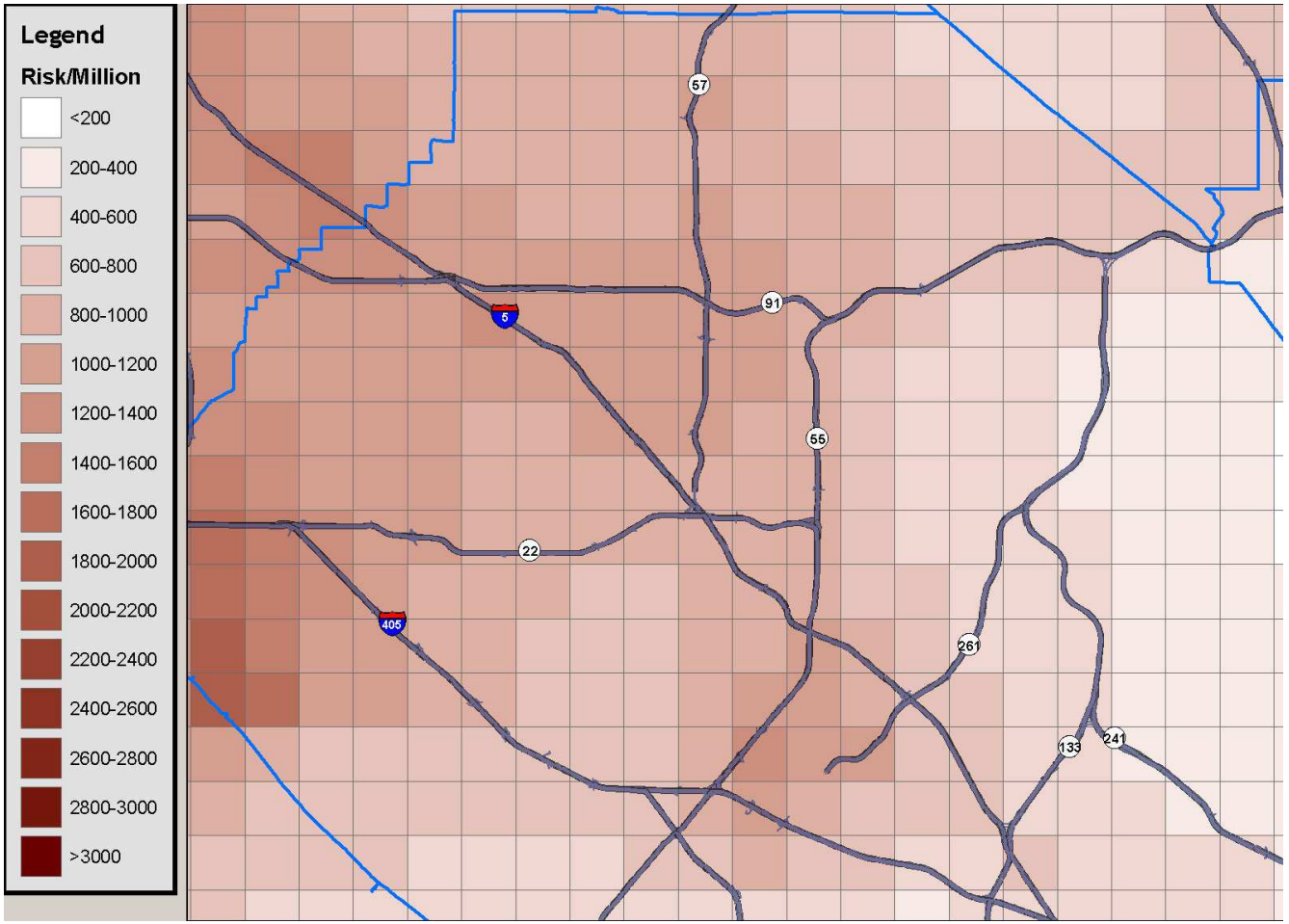
2005 West Los Angeles MATES III Simulated Risk



2005 Mira Loma/Colton MATES III Simulated Risk



2005 Northern Orange County MATES III Simulated Risk



Summary of MATES III Findings Compared to MATES II

- Monitoring
  - 10 site average air toxics risk decrease of 15%
- Emissions Inventory – potency weighted emissions
  - Decrease of 11% basin wide
  - Increase of 48% in ships/commercial boats DPM
- Modeling – population weighted risk
  - Decrease of 8% basin wide
  - Increase of 17% in area near ports

Next Steps

- Complete revisions to report
- Final to Governing Board in September
- Report, appendices and interactive risk map available at: http://www.aqmd.gov/prdas/matesIII/matesIII.html