

LOOP 202
South Mountain
Freeway Study

Citizens Advisory Team
Air Quality Meeting

South Mountain Community College

Student Union

April 22, 2013

6 - 8 PM

Agenda

- ▶ Welcome and introductions
- ▶ SMCAT Operating Agreement review
- ▶ Air quality panel presentations and discussion
- ▶ Questions
- ▶ Update on upcoming study milestones
- ▶ Adjourn

Welcome and Introductions

- ▶ Facilitators
- ▶ Arizona Department of Transportation
- ▶ Federal Highway Administration
- ▶ Study team members

SMCAT Membership

Organization Name	Representative Name
Ahwatukee Foothills Chamber of Commerce	Karen Starbowski
Ahwatukee Village Planning Committee	Melanie Beauchamp
Arlington Estates HOA	Camilo Acosta
AZ Forward	Diane Brossart / TBD
AZ Public Health Association	Al Brown
Calabria HOA	Mike Buzinski
City of Avondale	Bryan Kilgore
Cottonfields / Bougainvillea Community HOA	Timothy Stone
Estrella Village Planning Committee	Peggy Eastburn
Foothills Club West HOA	Michael Hinz
Foothills Reserve HOA	Derrick Denis
Gila River Indian Community - District 4	LaQuinta Allison
Kyrene Elementary District	Jeremy Calles
Lakewood HOA	Chris Boettcher
Laveen Citizens for Responsible Development	Laurie Prendergast
Laveen Village Planning Committee	Wes Lines
Maricopa County Farm Bureau	Clayton Danzeisen
Mountain Park Ranch HOA	Jim Welch
Pecos Road/I-10 Landowners Association	Nathaniel Percharo
Phoenix Mountains Preservation Council	Michael Goodman
Sierra Club	Sandy Bahr
Silverado Ranch	Eric Baim
South Mountain Village Planning Committee	Tamala Daniels
Southwest Valley Chamber of Commerce	Woody Thomas
The Foothills HOA	Chad Blostone

SMCAT Purpose Statement

The South Mountain Citizens Advisory Team (SMCAT) will **provide a forum for communication** between the Arizona Department of Transportation (ADOT), Federal Highway Administration (FHWA) and the local community regarding the proposed South Mountain Freeway.

The SMCAT is a **voluntary advisory team, not a decision-making body**, and it will not be responsible for decisions made by the State of Arizona or the FHWA. The SMCAT **will meet regularly to review project status and provide input on issues** that are relevant to the project.

The single purpose of the SMCAT is to provide a **Build** or **No-Build** recommendation for the South Mountain Freeway.

SMCAT Meeting Protocol

- ▶ Welcome and introductions
- ▶ Establish a quorum
- ▶ Agenda
- ▶ Timekeeping process
- ▶ Standards for behavior notification
- ▶ “Discussion, debate, recommend” process
- ▶ Welcome visitors
- ▶ Parking lot issues
- ▶ Breaks

SMCAT Behavior

- ▶ SMCAT members are expected to treat each other with mutual courtesy, respect and dignity.
- ▶ Since the SMCAT is a voluntary advisory team, it is important that individual SMCAT members abide by accepted standards of behavior.
- ▶ Unacceptable or disruptive behavior will not be tolerated and will be grounds for exclusion from further participation in SMCAT activities.
- ▶ Any SMCAT member who acts disrespectfully toward other members, disrupts the SMCAT process or is unable to attend meetings on a consistent basis may be required by the third party facilitator, the ADOT public involvement team or a majority of the other SMCAT members, to leave or resign from the SMCAT.

Session Feedback Forms

SMCAT Members: Please complete **both sides** of the Session Feedback forms and return them before you leave.

Thank You

Overview of NEPA Air Quality Analysis for Highway Projects

Jeff Houk
FHWA Resource Center

April 22, 2013

NEPA Air Guidance

The National Environmental Policy Act is a procedural law and doesn't include specific requirements for AQ analysis

FHWA's 1987 NEPA Technical Advisory includes requirement for carbon monoxide analysis of EIS projects

FHWA issued Interim Mobile Source Air Toxics Guidance in 2006, updated in 2009 and 2012

NEPA Air Quality Analysis

Possible components (not all are completed for every project):

- Information on the NAAQS (table)
- Description of existing air quality
- Status of State Implementation Plans for the area
- Description of meteorology
- Comparison of corridor emissions for no-action and build alternatives (qualitative, or quantitative “burden” analysis)
- Hotspot modeling/project-level conformity (CO and/or PM, qualitative or quantitative)
- Qualitative or quantitative analysis of air toxics
- Qualitative or quantitative analysis of GHGs
- Cumulative/indirect effects analysis
- Mitigation

Project-Level Transportation Conformity Requirements

Project Level Conformity

- **The Clean Air Act prohibits the Federal government from approving or funding any activity (including transportation projects) which does not conform to an implementation plan.**
- **Conformity applies in nonattainment and maintenance areas for *criteria* (NAAQS) pollutants: CO, PM, ozone, NO₂**
- **Federal actions cannot:**
 - Cause a new air quality violation
 - Worsen an existing violation
 - Delay attainment of the standards

When Are Project-Level Conformity Determinations Required?

Prior to the first time a Federal project is adopted, accepted, approved, or funded

- Examples include:
 - NEPA Decision Document (CE, FONSI, ROD)
 - Right-of-Way Acquisition
 - Construction Authorization

Typically, project-level conformity is completed as part of the NEPA process (prior to adoption of CE, FONSI, ROD)

General Requirements for Project-level Conformity Determinations

- Use latest planning assumptions
- Use latest emissions model
- Interagency consultation
- Be part of a currently conforming long-range plan and TIP
- Include a hotspot analysis for any applicable pollutants (CO, PM)
- Comply with PM control measures in the applicable state implementation plan

Hot-Spot Analysis for Conformity

Required for all Federal nonexempt projects in CO, PM2.5 and PM10 nonattainment and maintenance areas

Can be qualitative or quantitative (modeling) depending on type and timing of project

In quantitative analysis, MOBILE6 or MOVES emissions models used to estimate roadway emissions, and CAL3QHCR or AERMOD dispersion modeling used to estimate concentrations

Newest EPA/DOT guidance issued December 2010; defined grace period for use of MOVES

What projects are subject to CO hotspot analysis?

Modeling required for:

Projects that impact a location identified in the SIP as a site of actual or possible violations

Projects that affect intersections that are or will be LOS D or worse

Projects affecting one of the 3 worst intersections in the area in terms of traffic volume or LOS

Qualitative analysis required for all other projects

What projects are subject to PM hotspot analysis?

Projects of Air Quality Concern are...

- (i) New highway projects that have a significant number of diesel vehicles, or expanded highways with a significant increase in diesel vehicles;
- (ii) Projects affecting intersections at LOS D, E, or F with a significant number of diesel vehicles, or those that will change to LOS D, E, or F because of increased traffic volume from a significant number of diesel vehicles related to the project;
- (iii) New bus and rail terminals and transfer points that have a significant number of diesel vehicles congregating at a single location;
- (iv) Expanded bus and rail terminals and transfer points that significantly increase the number of diesel vehicles congregating at a single location; and
- (v) Projects in or affecting locations, areas, or categories of sites which are identified in the PM₁₀ or PM_{2.5} applicable implementation plan or implementation plan submission as appropriate, as sites of violation or possible violation

Mobile Source Air Toxics (MSATs)



FHWA MSAT Guidance Approach

FHWA has developed a tiered approach for analyzing MSATs in NEPA documents:

- No analysis for projects with no potential for meaningful MSAT effects;
- Qualitative analysis for projects with low potential MSAT effects; or
- Quantitative analysis to differentiate alternatives for projects with higher potential MSAT effects.

Screening Thresholds for Higher Impact Projects

Quantitative emissions analysis is required for projects that

- 1) Involve new or additional capacity on roadways where the traffic volume will be 140,000-150,000 AADT (or higher) in the design year, or
- 2) Create or significantly alter an intermodal freight facility that generates high levels of diesel particulate emissions in a single location

AND

are in proximity to populated areas, or, in rural areas, in proximity to vulnerable populations (near schools, nursing homes, hospitals)

Climate Change/Greenhouse Gas Emissions

GHG Emissions Analysis in NEPA

Increasing level of interest/NEPA comments from public and EPA

CEQ issued draft guidance for federal agencies; final guidance still in progress

FHWA does not have formal guidance; some states have state-level guidance

Emissions can be estimated, but climate *impacts* are global, not measurable; FHWA's preference is to address at a regional or statewide level

Some FHWA NEPA documents include comparative information

Table showing statewide and project emissions potential compared to global totals

	Global CO ₂ emissions, MMT	Nevada motor vehicle CO ₂ emissions, MMT	Nevada motor vehicle emissions, % of global total	Project study area VMT, % of statewide VMT	Percent change in statewide VMT due to project
Current Conditions (2010)	29,670	10.3	0.0348%		(None)
Future Projection (2040)	45,500	11.9	0.0261%		

Regional Air Quality Planning and Transportation Conformity

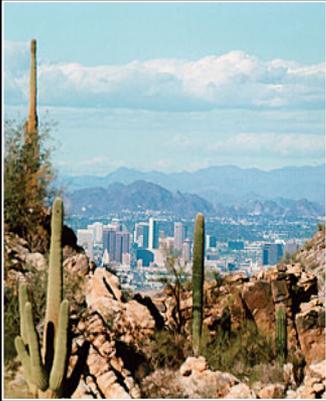


South Mountain Citizens Advisory Team
April 22, 2013

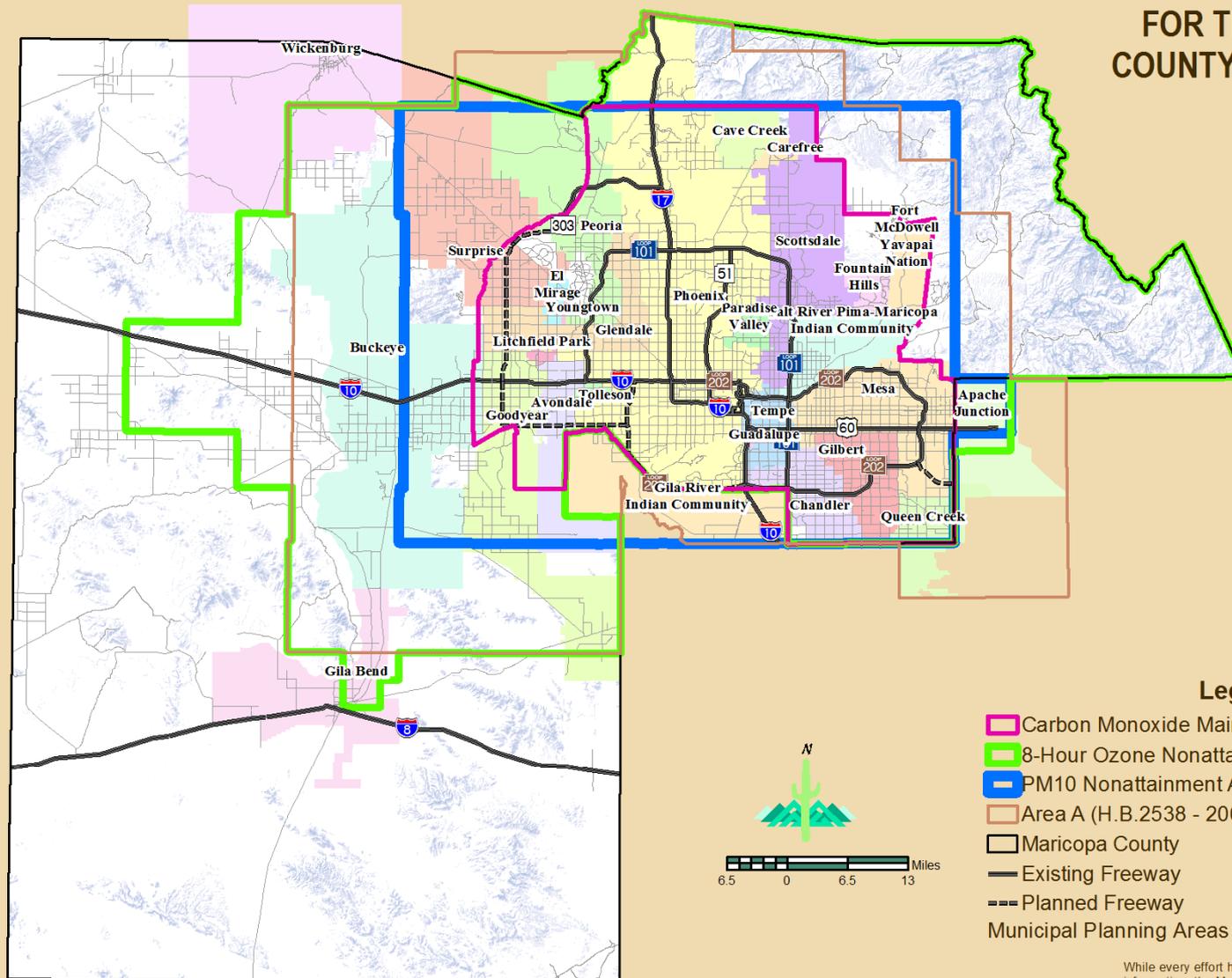
Role of MAG in Air Quality

ENVIRONMENTAL PROGRAMS

- **Regional Air Quality Planning Agency for the Maricopa Area** (Clean Air Act Section 174, Arizona Law)
- **Prepares Regional Air Quality Plans** for carbon monoxide, ozone, and PM-10 particulate pollution in a cooperative effort among:
 - Arizona Department of Environmental Quality
 - Arizona Department of Transportation
 - Maricopa County Air Quality Department
- **Utilizes latest state-of-the-art EPA approved models**
- **Conducts transportation conformity on the MAG Transportation Improvement Program and Regional Transportation Plan**

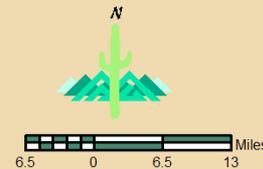


AIR QUALITY NONATTAINMENT AND MAINTENANCE AREAS FOR THE MARICOPA COUNTY AREA, ARIZONA



Legend

- Carbon Monoxide Maintenance Area
- 8-Hour Ozone Nonattainment Area (May 21, 2012)
- PM10 Nonattainment Area
- Area A (H.B.2538 - 2001)
- Maricopa County
- Existing Freeway
- Planned Freeway
- Municipal Planning Areas (2012) shaded



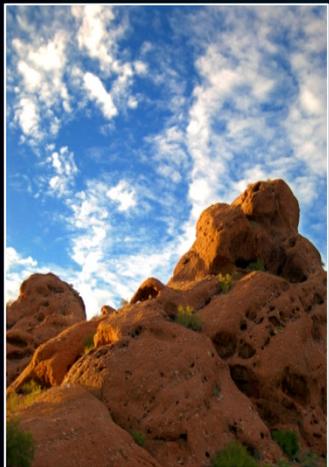
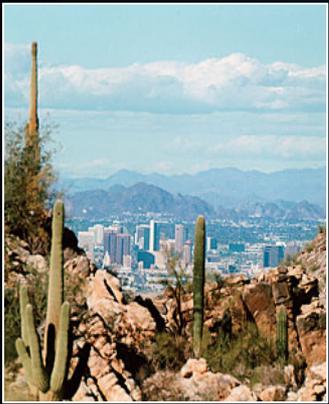
While every effort has been made to ensure the accuracy of this information, the Maricopa Association of Governments makes no warranty, expressed or implied, as to its accuracy and expressly disclaims liability for the accuracy thereof.



ENVIRONMENTAL
PROGRAMS

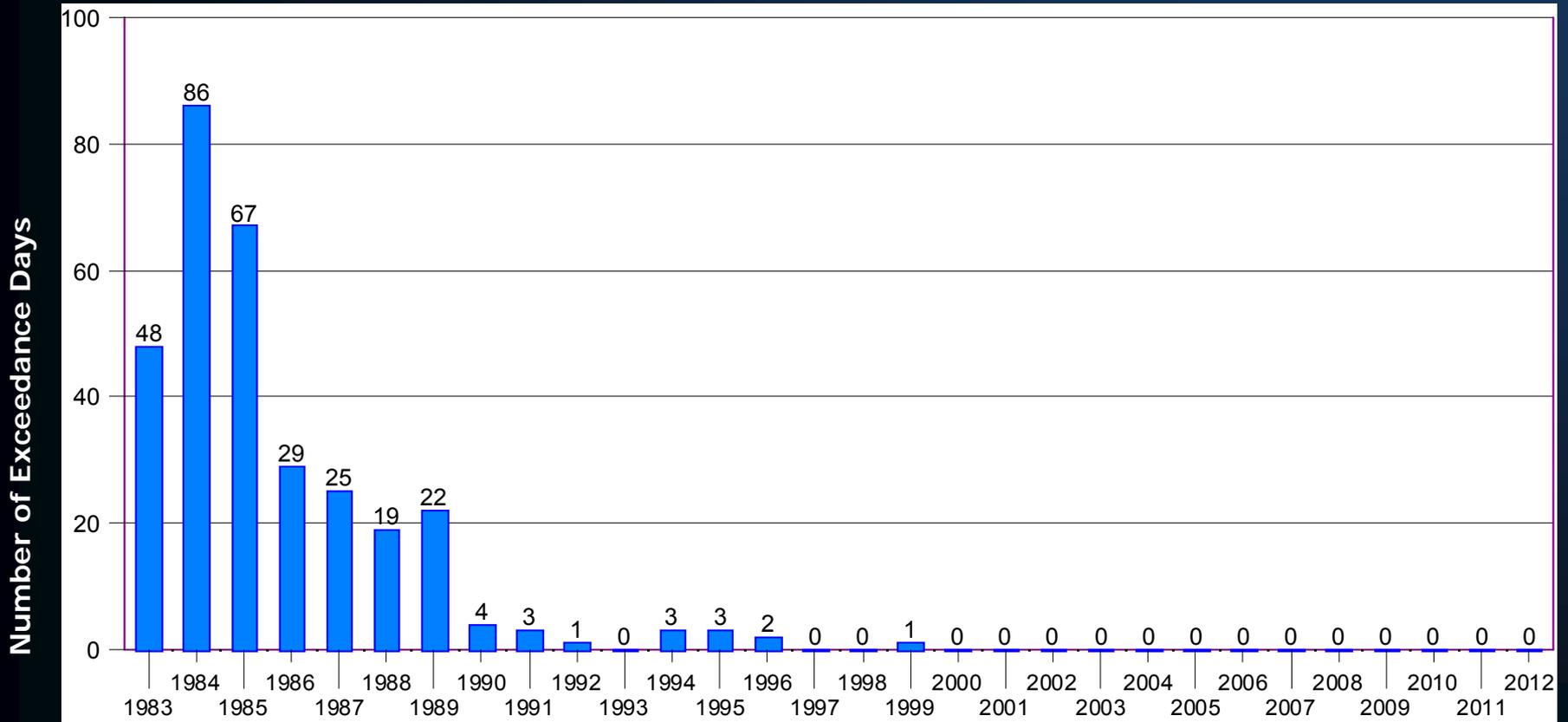
Carbon Monoxide

- No violations of the 1-hour standard since 1984 and 8-hour standard since 1996
- On April 8, 2005, EPA redesignated the Maricopa County Nonattainment Area to attainment status since the standards have been met
- MAG 2013 Carbon Monoxide Maintenance Plan demonstrates that the standards will continue to be met through 2025



Carbon Monoxide Monitoring Data

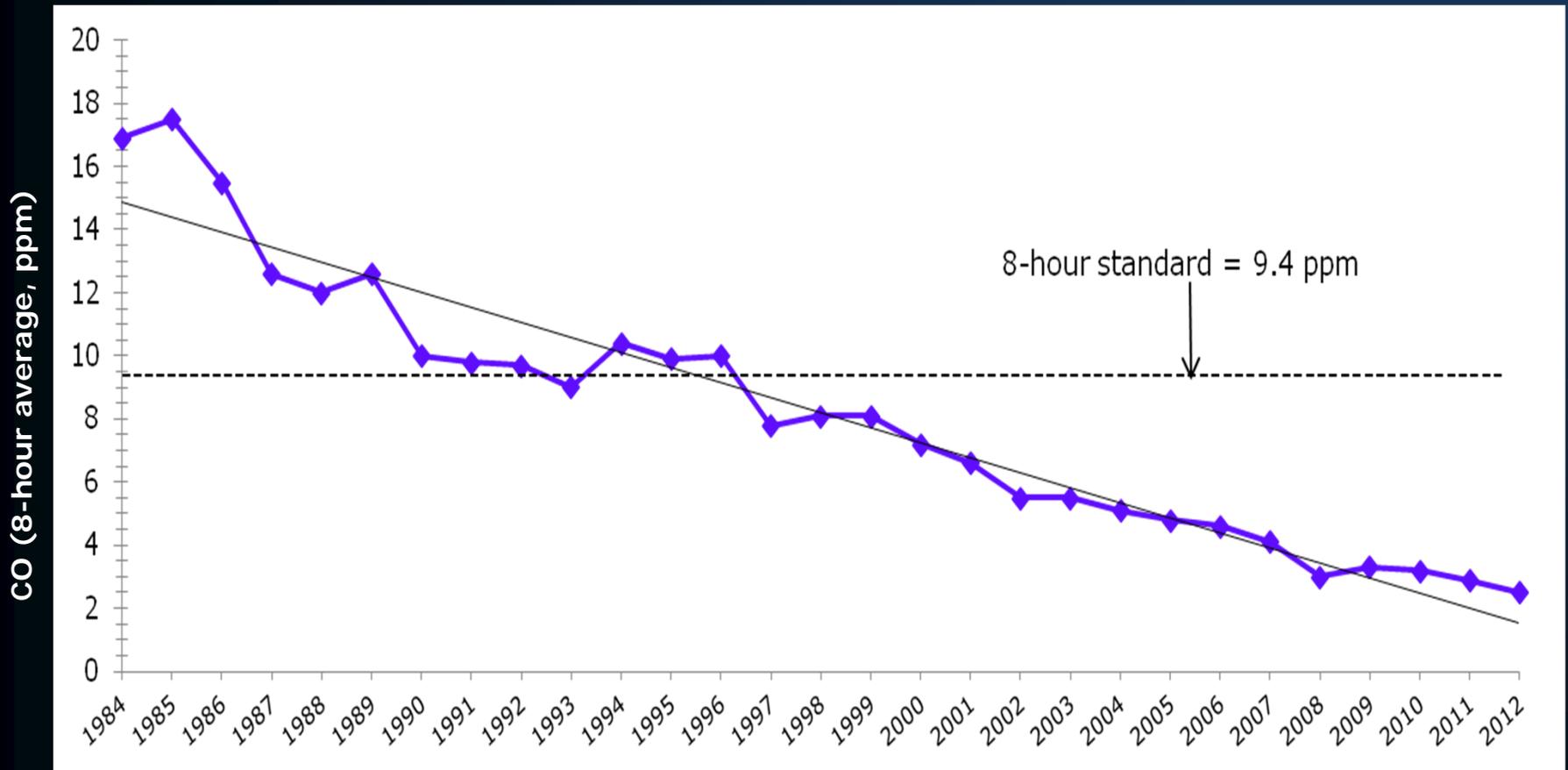
Number of Eight-Hour Carbon Monoxide Exceedance Days in the Maricopa County Maintenance Area



Sources: 1983-1998: Revised MAG 1999 Serious Area Carbon Monoxide Plan for the Maricopa County Nonattainment Area, March 2001;
1999-2012: EPA Air Quality System.

Carbon Monoxide Monitoring Data

2nd Highest Eight-Hour Carbon Monoxide Concentrations in the Maricopa County Maintenance Area

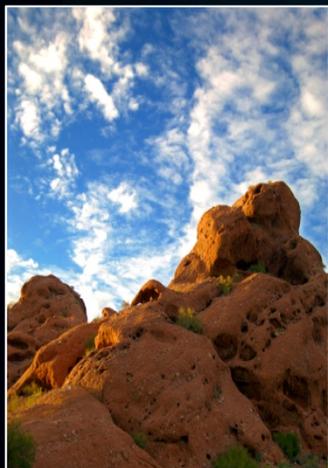
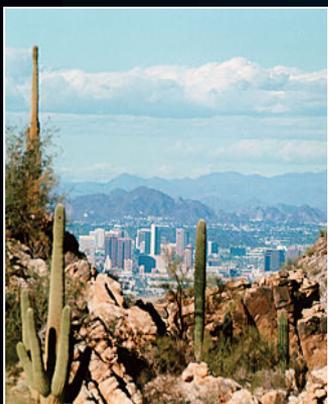


Notes:

- The eight-hour carbon monoxide standard allows no more than one exceedance of the 9 ppm standard at the same monitor per year.
- Due to mathematical rounding, values greater than or equal to 9.5 ppm are necessary to exceed the standard.
- Source: EPA Air Quality System.

Ozone

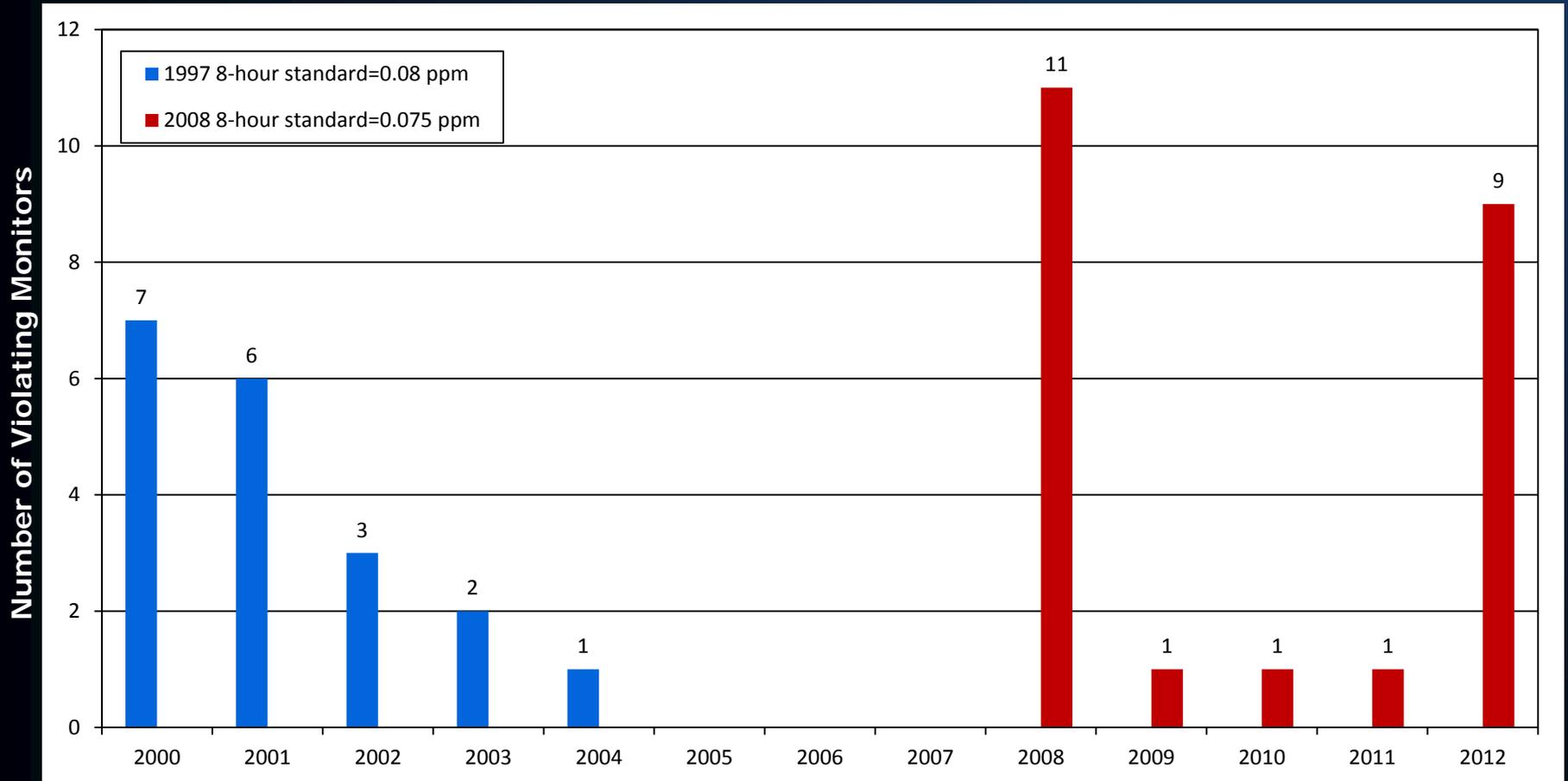
ENVIRONMENTAL PROGRAMS



- No violations of the 1-hour ozone standard since 1996
- In June 2005, EPA redesignated the Maricopa County Nonattainment Area to attainment status for the 1-hour standard
- No violations of the 8-hour standard of 0.08 parts per million (ppm) since 2004
- MAG 2009 Eight-Hour Ozone Maintenance Plan demonstrates that the standard of 0.08 ppm will continue to be met through 2025
- The new lower 8-hour ozone standard of 0.075 ppm has not been met. The region has a December 31, 2015 attainment date.

Eight-Hour Ozone Monitoring Data

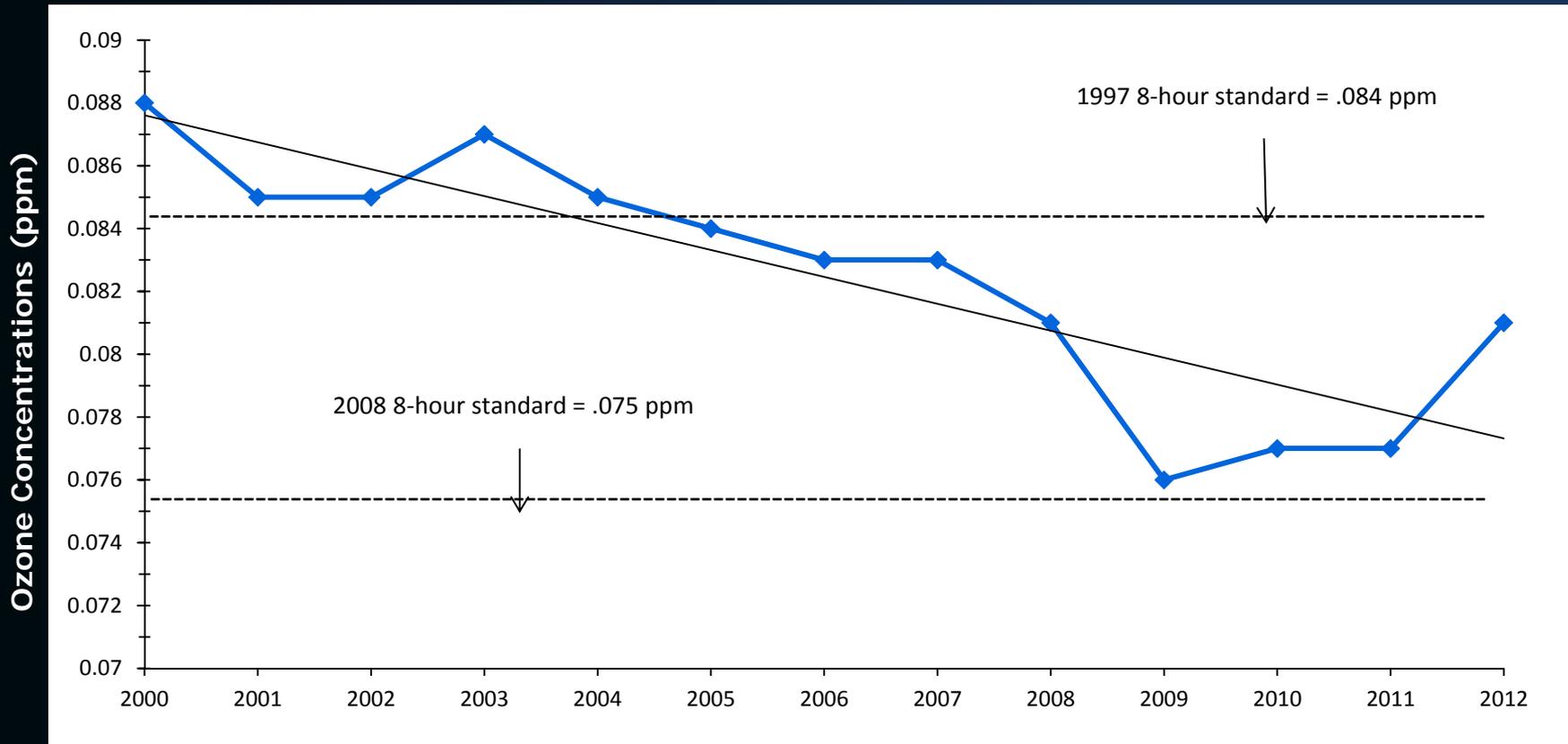
Number of Monitors Violating the Eight-Hour Ozone Standards in the Maricopa County Nonattainment Area



Sources: Maricopa County Air Quality Monitoring Data; EPA Air Quality System.

Eight-Hour Ozone Monitoring Data

Highest 3-Year Average of the 4th Highest 8-Hour Ozone Concentration in the Maricopa County Nonattainment Area



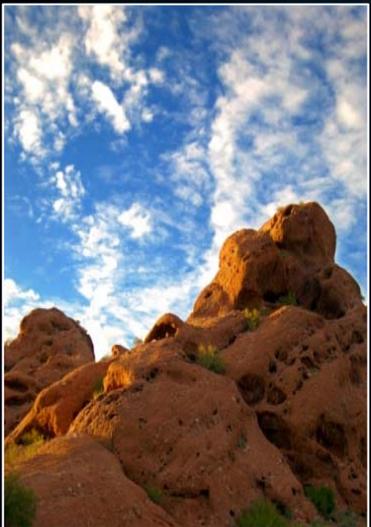
- Notes:
- To attain the eight-hour ozone standard, the 3 year average of the 4th highest daily maximum 8-hour concentration at each monitor per year must not exceed the standard.
 - Due to mathematical rounding, values greater than or equal to .085 ppm are necessary to exceed the .08 ppm eight-hour ozone standard.
 - Sources: 2000-2008: MAG Eight-Hour Ozone Redesignation Request and Maintenance Plan for the Maricopa Nonattainment Area, February 2009; 2009-2012: EPA Air Quality System.



ENVIRONMENTAL
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PM-10 Particulate Matter

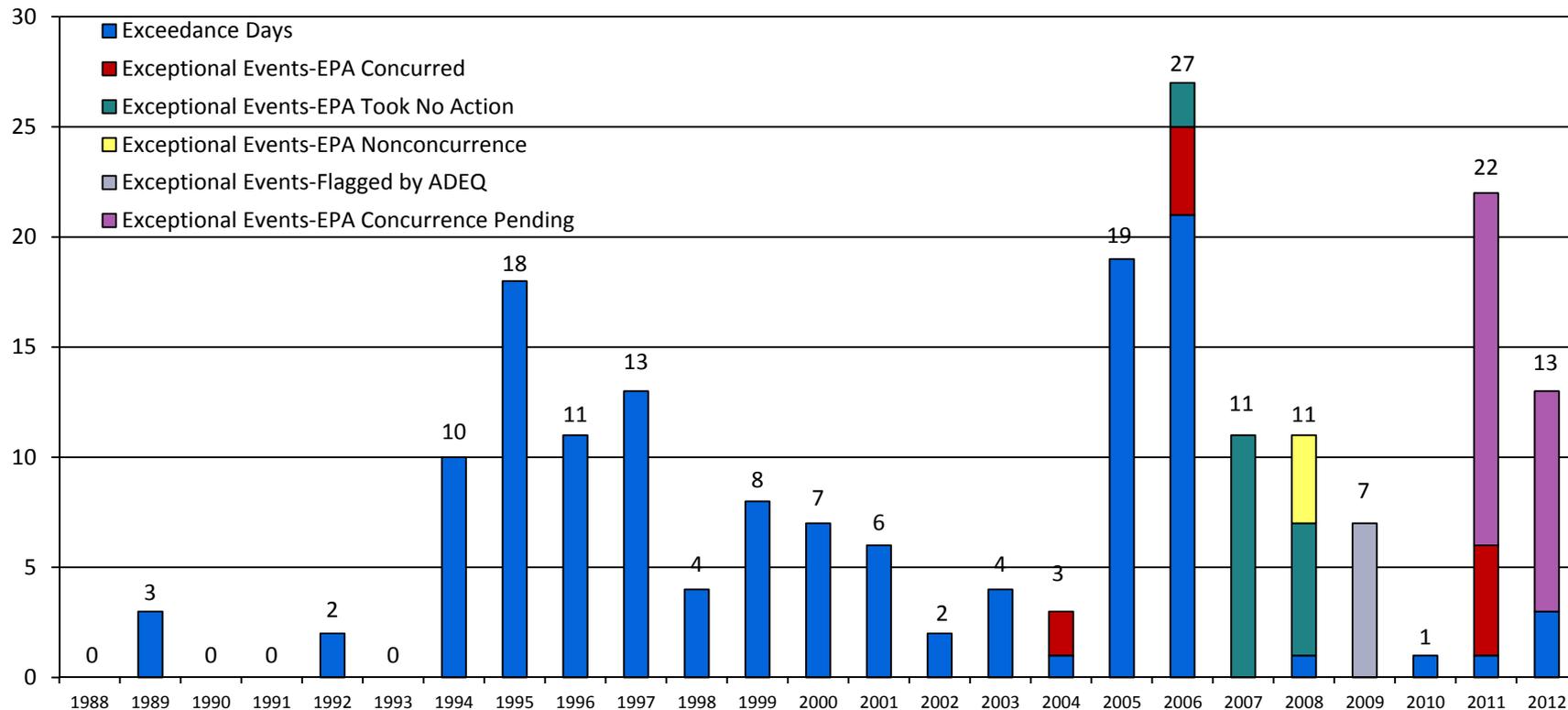
- No violations of the 24-hour PM-10 standard during stagnant conditions since 2007
- No violations of the standard in 2010, 2011, and 2012, pending EPA concurrence with the exceptional events documentation submitted by the Arizona Department of Environmental Quality
- MAG 2012 Five Percent Plan for PM-10 demonstrates that the standard of 150 micrograms per cubic meter will be met by December 31, 2012 during high wind conditions



PM-10 Monitoring Data

Number of 24-Hour PM-10 Exceedance Days in Maricopa County and the PM-10 Nonattainment Area

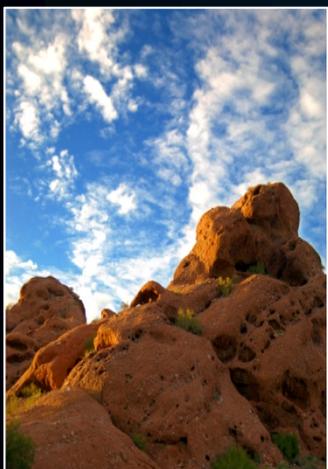
Number of Exceedance Days



- Notes:
- To attain the 24-hour PM-10 standard, there can be no more than 3 exceedances of 154 micrograms per cubic meter over a 3 year period per monitor.
 - The Arizona Department of Environmental Quality began flagging exceptional events in 2004.
 - On July 19, 2007, the exceedance at the Buckeye monitor was not associated with the exceptional event that also occurred on that day.
 - Sources: 1988-1997: Revised MAG 1999 Serious Area Particulate Plan for PM-10 for the Maricopa County Nonattainment Area, February 2000; 1998-2012: EPA Air Quality System.

Motor Vehicle Emissions

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PROGRAMS



- **The Maricopa County 2011 Periodic Emissions Inventory indicates that motor vehicle exhaust contributes the following shares of total emissions:**
 - **Carbon Monoxide - 66%**
 - **Volatile Organic Compounds – 13%**
 - **Nitrogen Oxides – 62%**
 - **Particulates (PM-10) – 6%**



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Key Transportation Control Measures in MAG Air Quality Plans

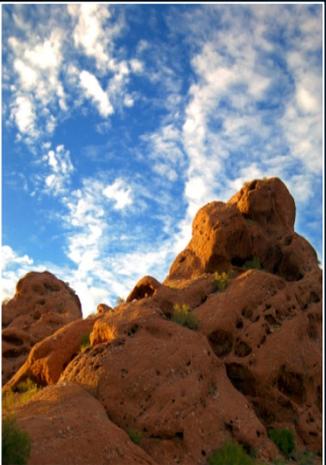
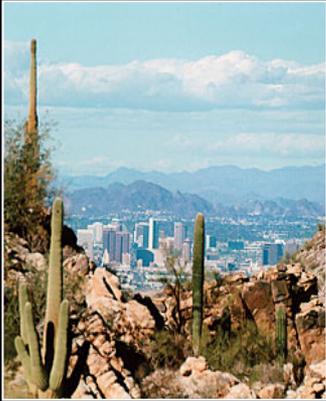
- EPA Tier 2 Motor Vehicle Emissions Standards for Passenger Cars and Trucks and Gasoline Sulfur Control Requirements (2004)
- EPA Heavy-Duty Engine and Vehicle Standards and Highway Diesel Sulfur Control Requirements (2006, 2007)
- Arizona Clean Burning Fuels Program
- Arizona Vehicle Emissions Testing Program
- Traffic Synchronization
- Reducing Traffic Congestion at Major Intersections
- Intelligent Transportation Systems
- Expansion of Public Transportation Systems
- Regional Trip Reduction Program



**ENVIRONMENTAL
PROGRAMS**

Key Transportation Control Measures in MAG Air Quality Plans (continued)

- **Employer Rideshare Program Incentives**
- **State Travel Reduction Program**
- **Park and Ride Lots**
- **Preferential Parking for Carpools and Vanpools**
- **Bicycle and Pedestrian Travel**
- **Vanpools**
- **Telecommuting, Teleworking, and Teleconferencing**
- **PM-10 Certified Street Sweepers**
- **Paving Unpaved Roads**
- **Lower Speed Limits on Unpaved Roads**



Transportation Conformity

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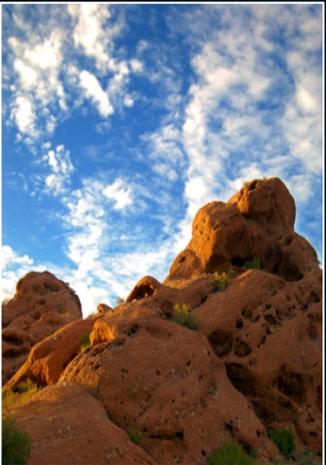
- **Transportation and air quality are linked**
- **Clean Air Act requires transportation plans, programs and projects to conform to the purpose of the air quality plans**
- **Ensures that transportation activities do not cause violations of the air quality standards**
- **Air quality plans set motor vehicle emissions budgets**



Conformity Requirements

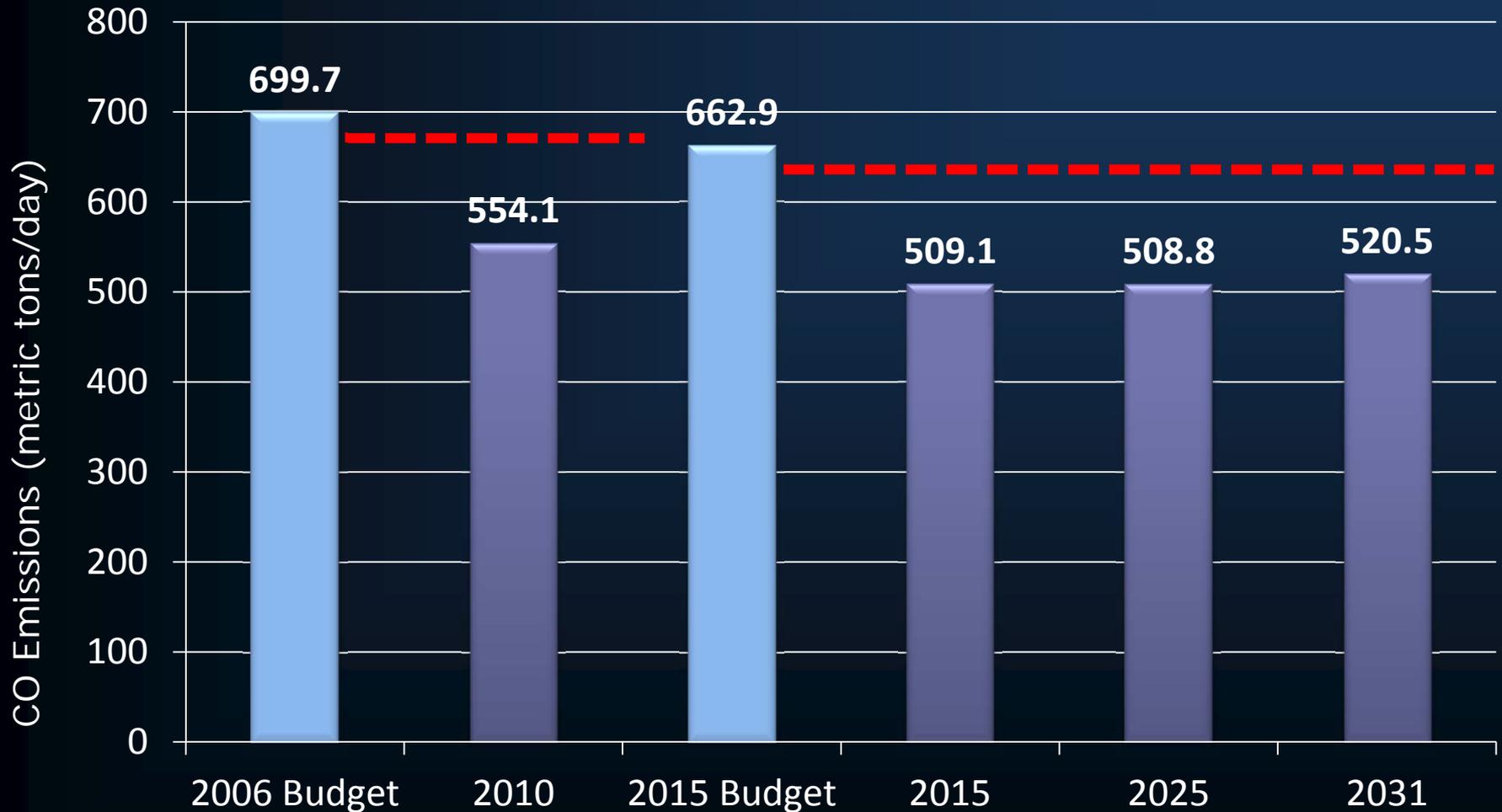
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- **The Transportation Improvement Program and Regional Transportation Plan must pass the conformity emissions tests**
- **Latest planning assumptions and emissions models**
- **Timely implementation of transportation control measures**
- **Consultation**



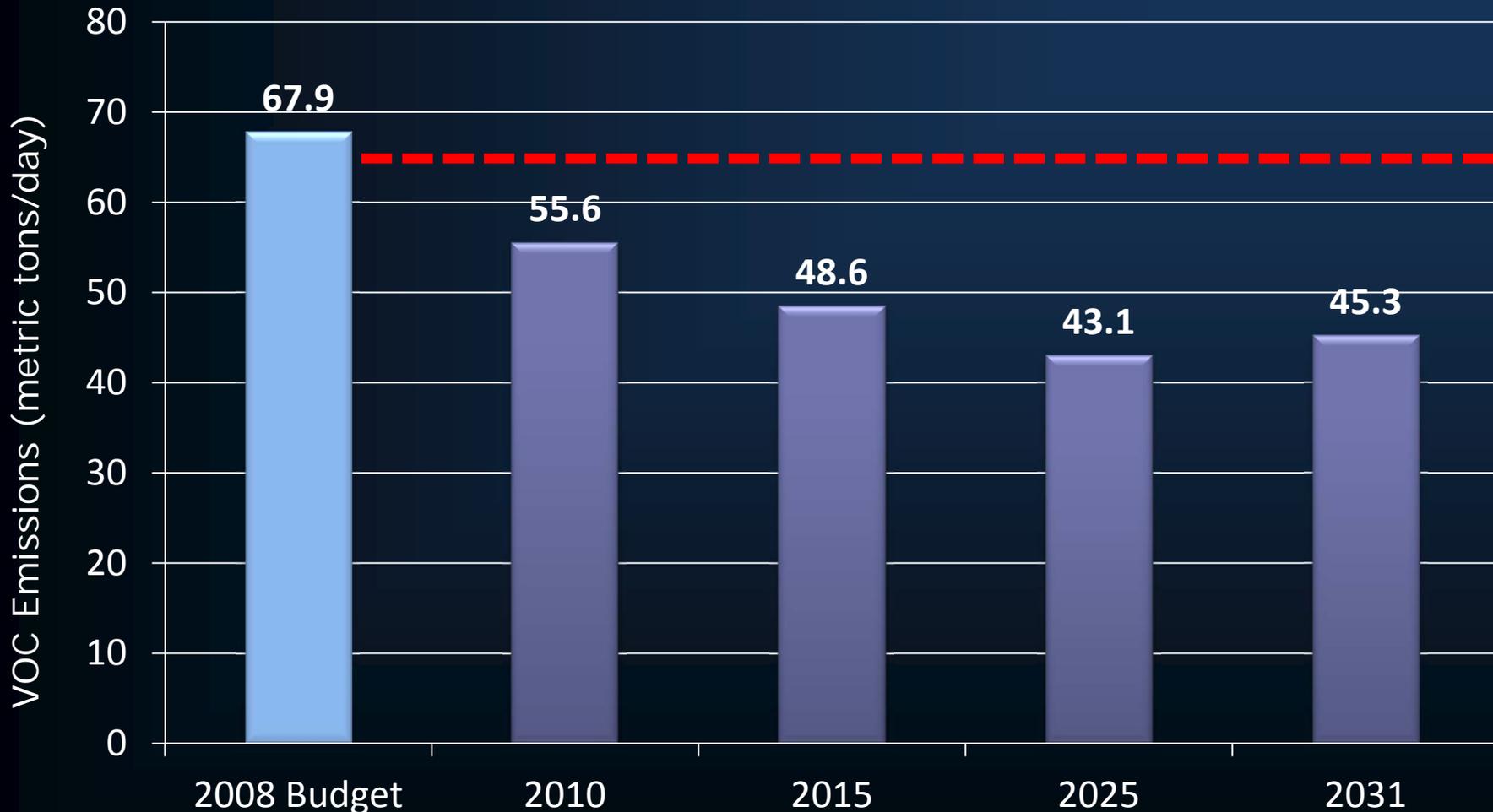
Carbon Monoxide Results for Conformity Budget Test – August 2012

Friday in December: Episode Day Conditions



Eight-Hour Ozone: Volatile Organic Compounds (VOC) Results for Conformity Budget Test – August 2012

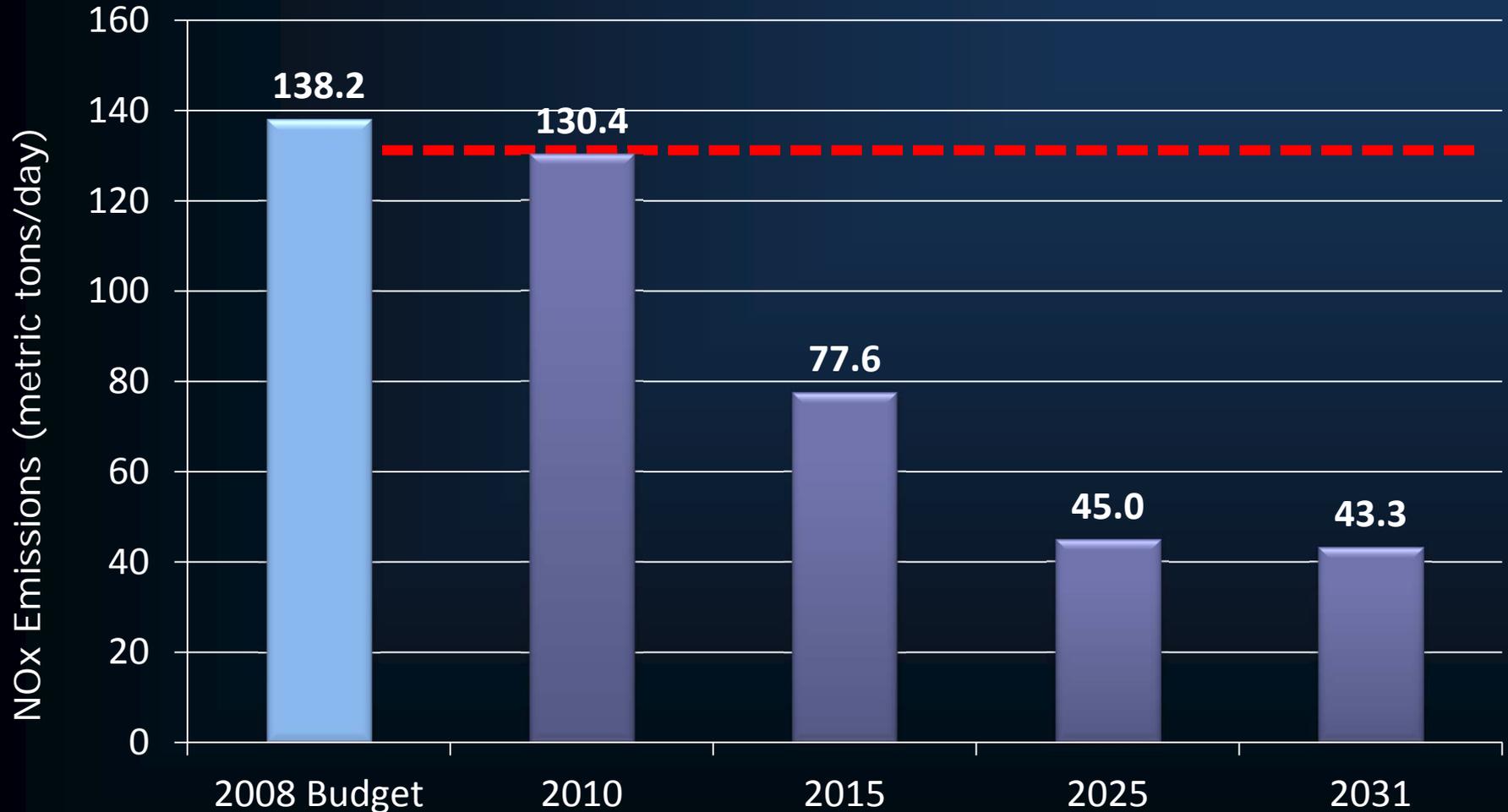
Thursday in June: Episode Day Conditions



August 2012 Conformity Determination on Amended FY 2011-2015 MAG Transportation Improvement Program and Regional Transportation Plan 2010 Update

Eight-Hour Ozone: Nitrogen Oxides (NOx) Results for Conformity Budget Test – August 2012

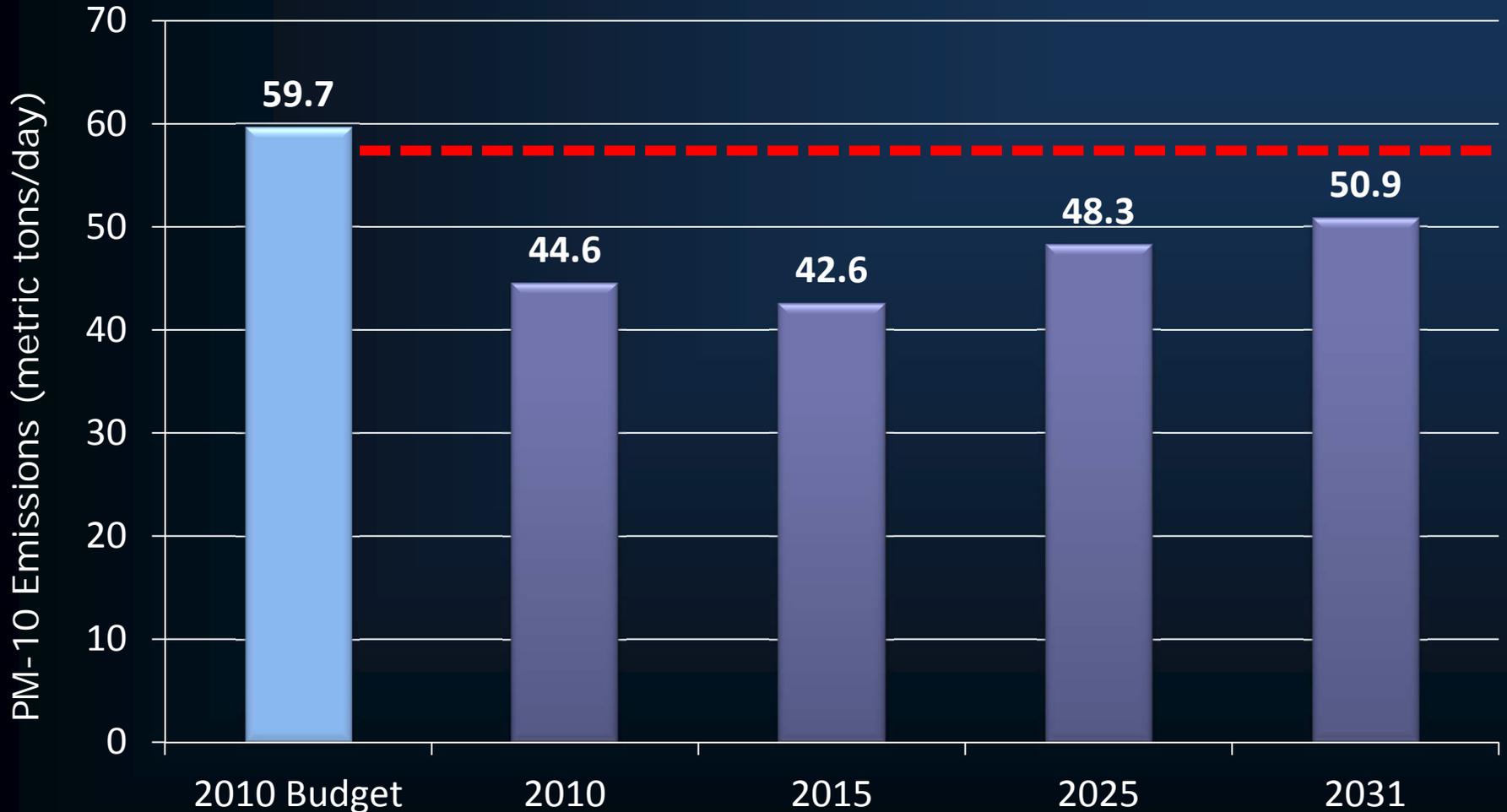
Thursday in June: Episode Day Conditions



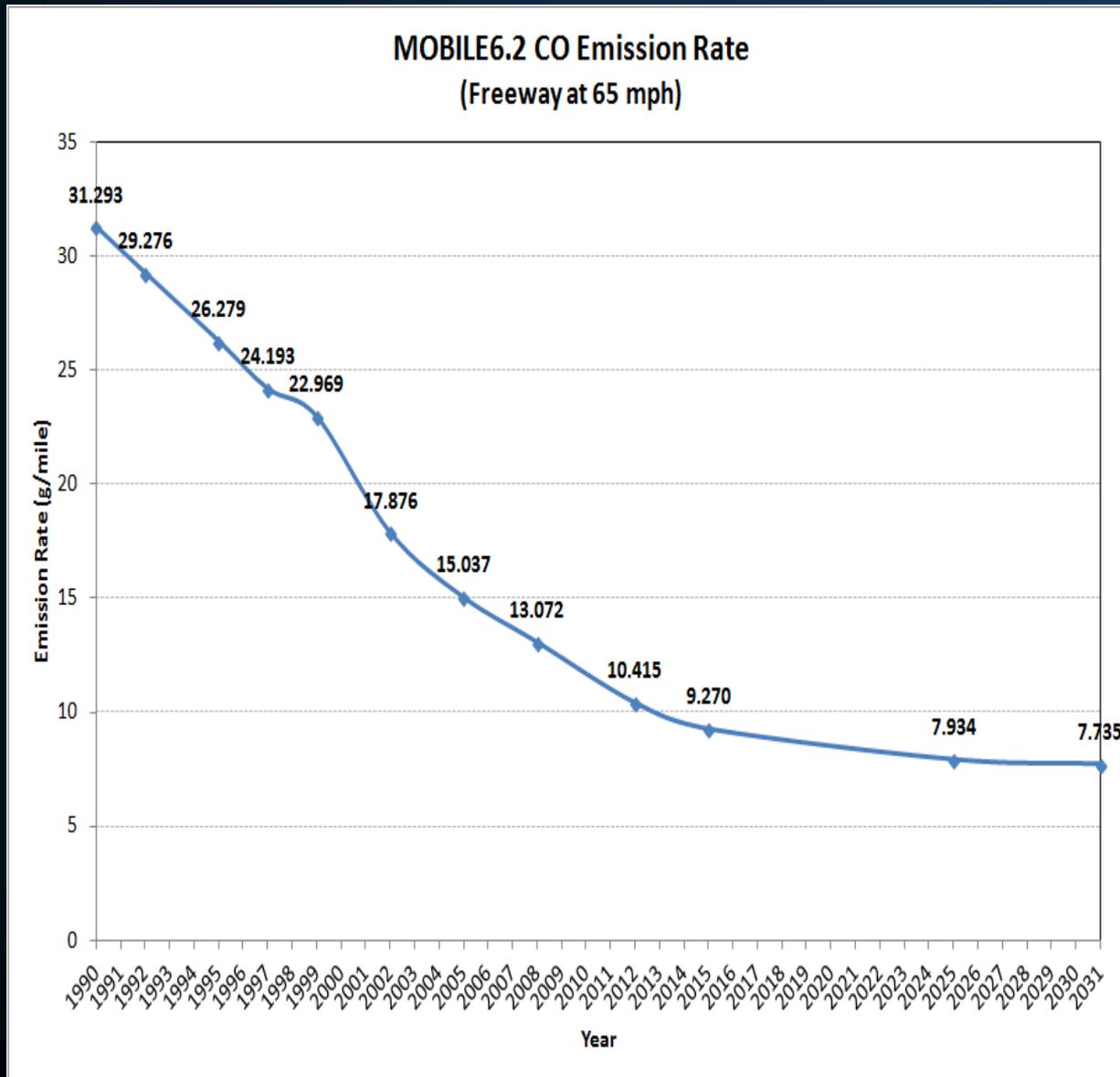
August 2012 Conformity Determination on Amended FY 2011-2015 MAG Transportation Improvement Program and
Regional Transportation Plan 2010 Update

PM-10 Results for Conformity Budget Test – August 2012

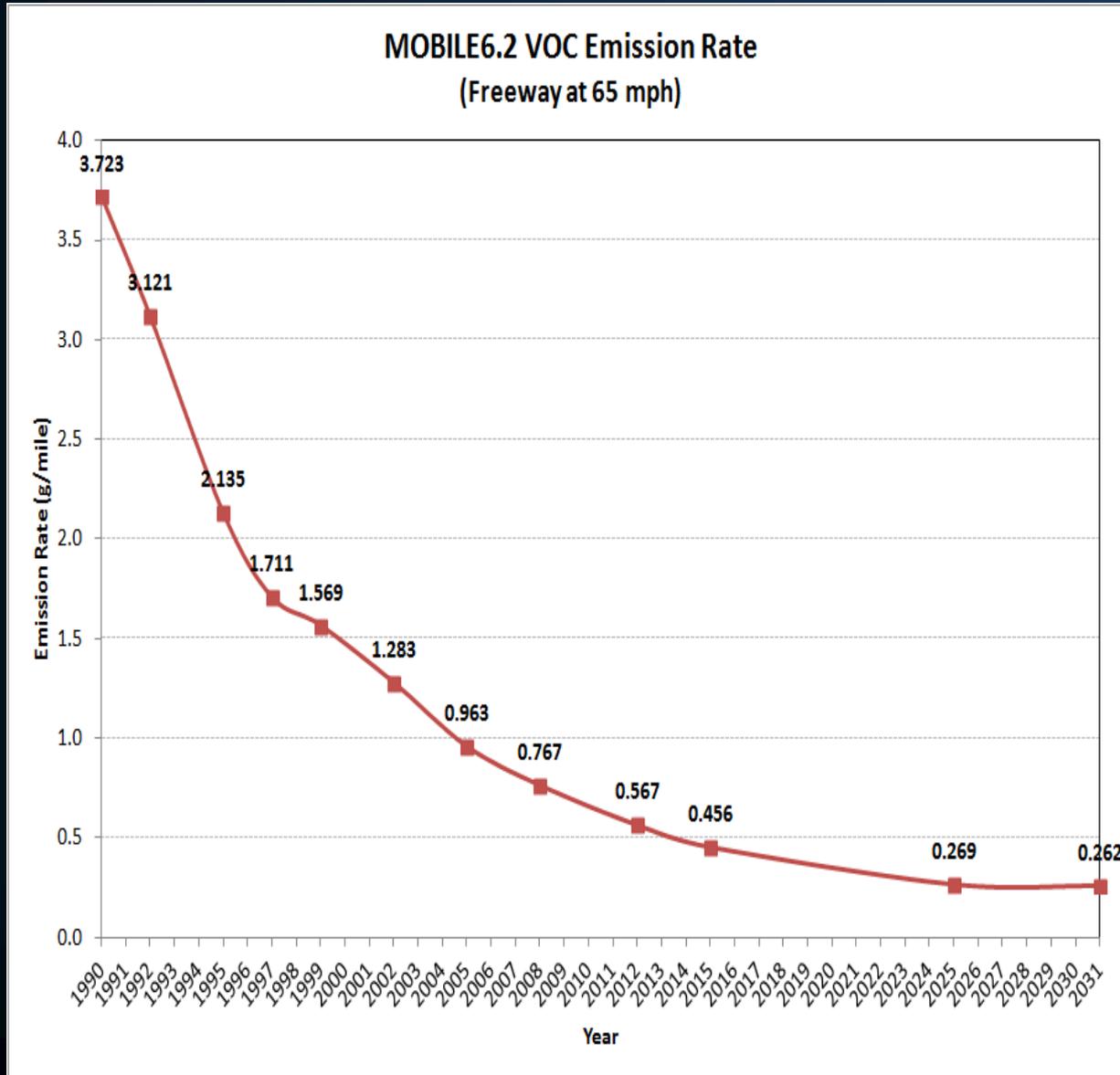
Annual Average Day Conditions



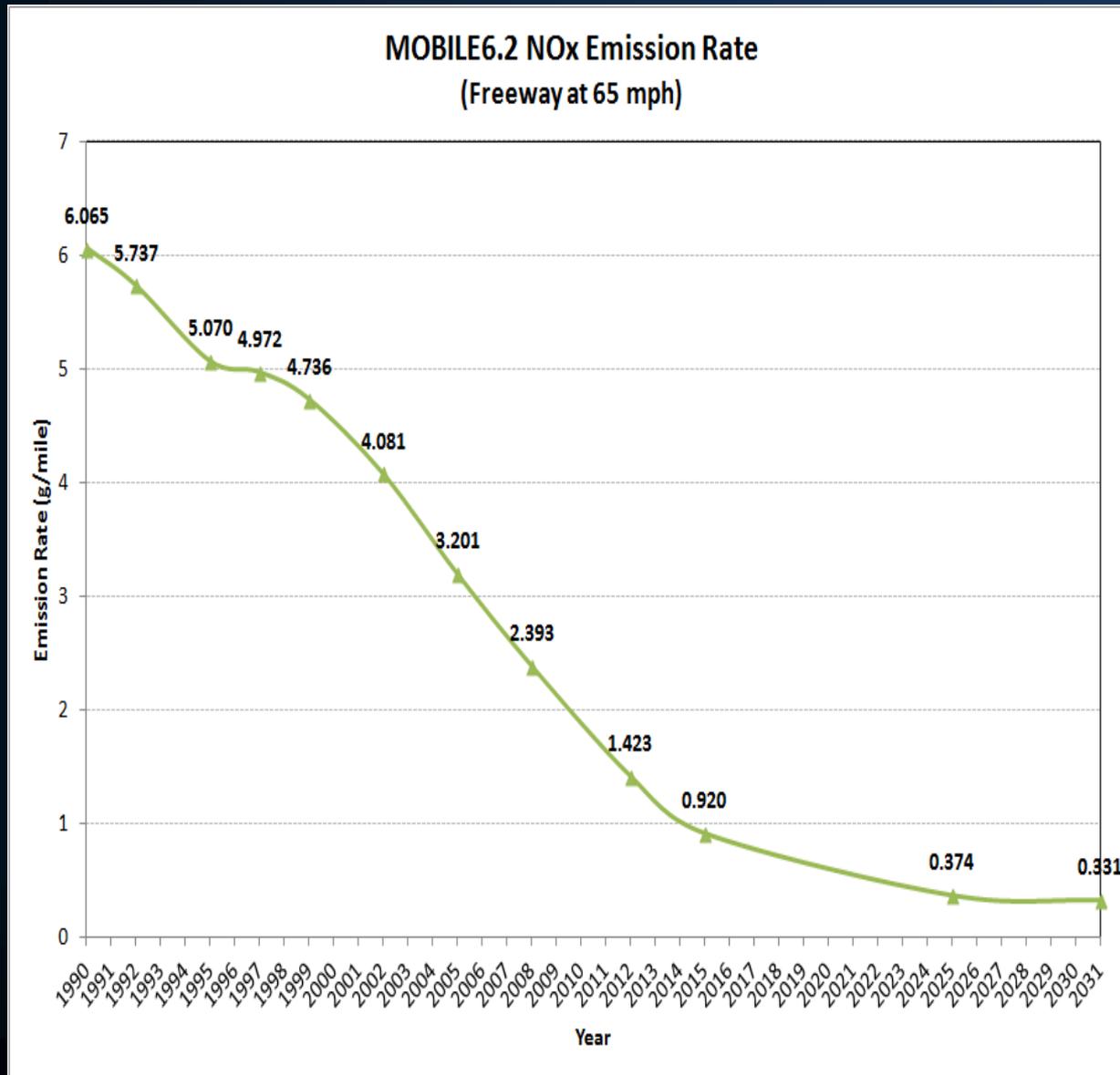
Trend in Motor Vehicle Exhaust Emission Rates for Carbon Monoxide (CO)



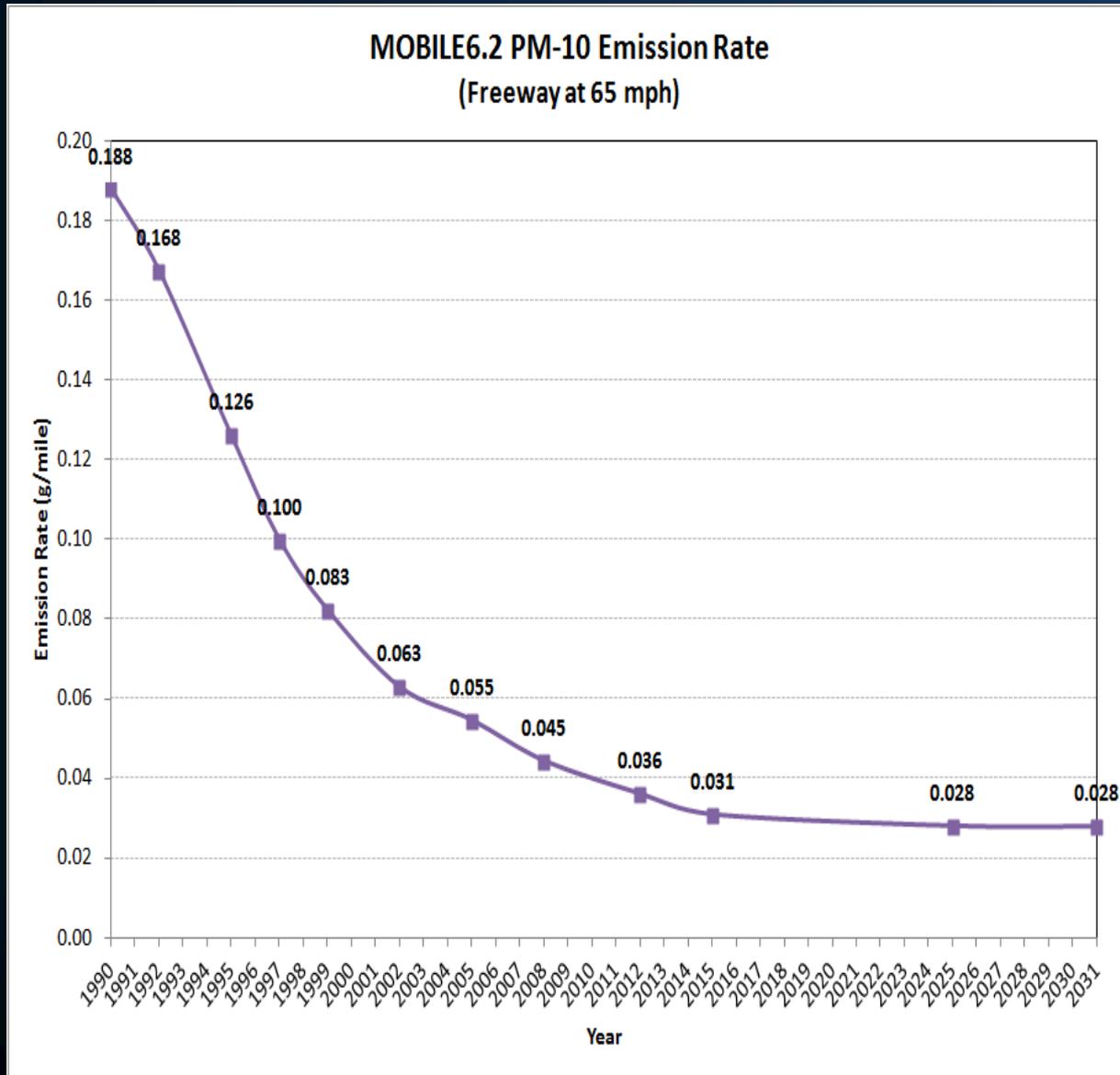
Trend in Motor Vehicle Exhaust Emission Rates for Volatile Organic Compounds (VOC)



Trend in Motor Vehicle Exhaust Emission Rates for Nitrogen Oxides (NOx)



Trend in Motor Vehicle Exhaust, Tire Wear and Brake Wear Emission Rates for Particulates (PM-10)



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Reductions in Vehicle Emissions 1990-2012

- Between 1990 and 2012, vehicle exhaust emission rates declined by the following percentages:
 - Carbon Monoxide – 67%
 - Volatile Organic Compounds – 85%
 - Nitrogen Oxides – 77%
 - Particulates (PM-10) – 81%





**MARICOPA
ASSOCIATION of
GOVERNMENTS**



**For more information contact:
Lindy Bauer
(602) 254-6300**

Mobile Source Air Toxics (MSATs)

The 1990 Clean Air Act Amendments mandate EPA to regulate 188 hazardous air pollutants (HAPs)

In 2001 and 2007 rulemakings, EPA identified a subset of these that come from mobile sources (MSATs)

7 pollutants account for most of the adverse health effects:

Benzene

1,3-Butadiene

Diesel Particulate Matter

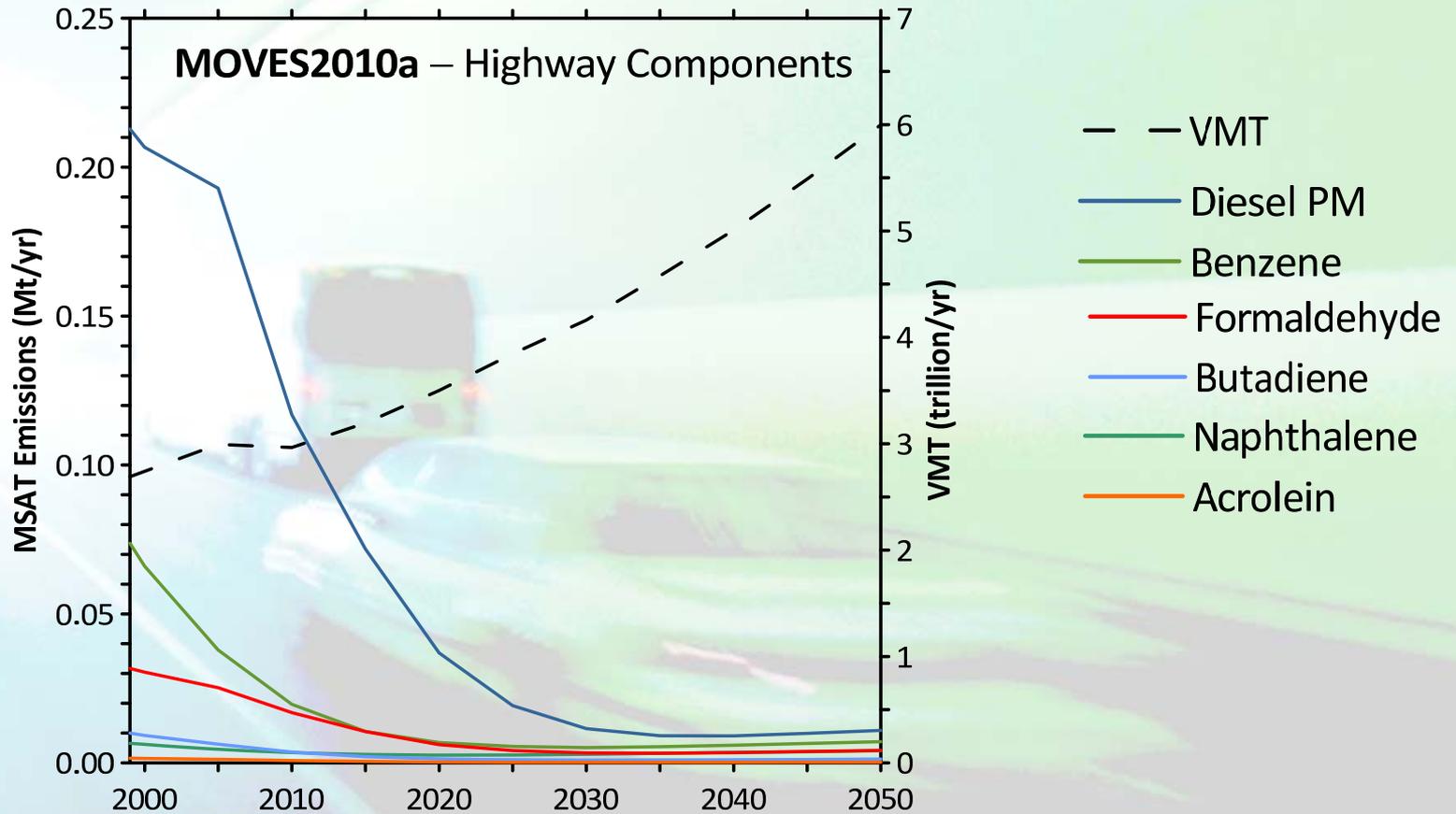
Polycyclic Organic Matter

Naphthalene

Formaldehyde

Acrolein

MSATs: MOVES2010 Trends



Why are emissions going down?

New car, truck and bus standards

Tighter CO, HC, NOx and PM limits

New cold-start standards for CO and HC

Longer useful life requirements/warranties

On-board diagnostic systems

New technologies (e.g., PM filters/traps, on-board vapor recovery)

New fuel requirements

Sulfur and benzene limits

Fuel volatility limits, reformulated fuels

Ethanol blending requirements, biodiesel

Upcoming Tier 3 Standards

Pollutant	% Reduction—2017	% Reduction--2030
NOx	8%	28%
VOC	3%	23%
CO	4%	30%
Direct PM _{2.5}	0.1%	10%
SO ₂	51%	51%
Benzene	4%	36%
1,3-Butadiene	5%	37%
Formaldehyde	3%	12%
Acetaldehyde	3%	26%
Acrolein	1%	15%

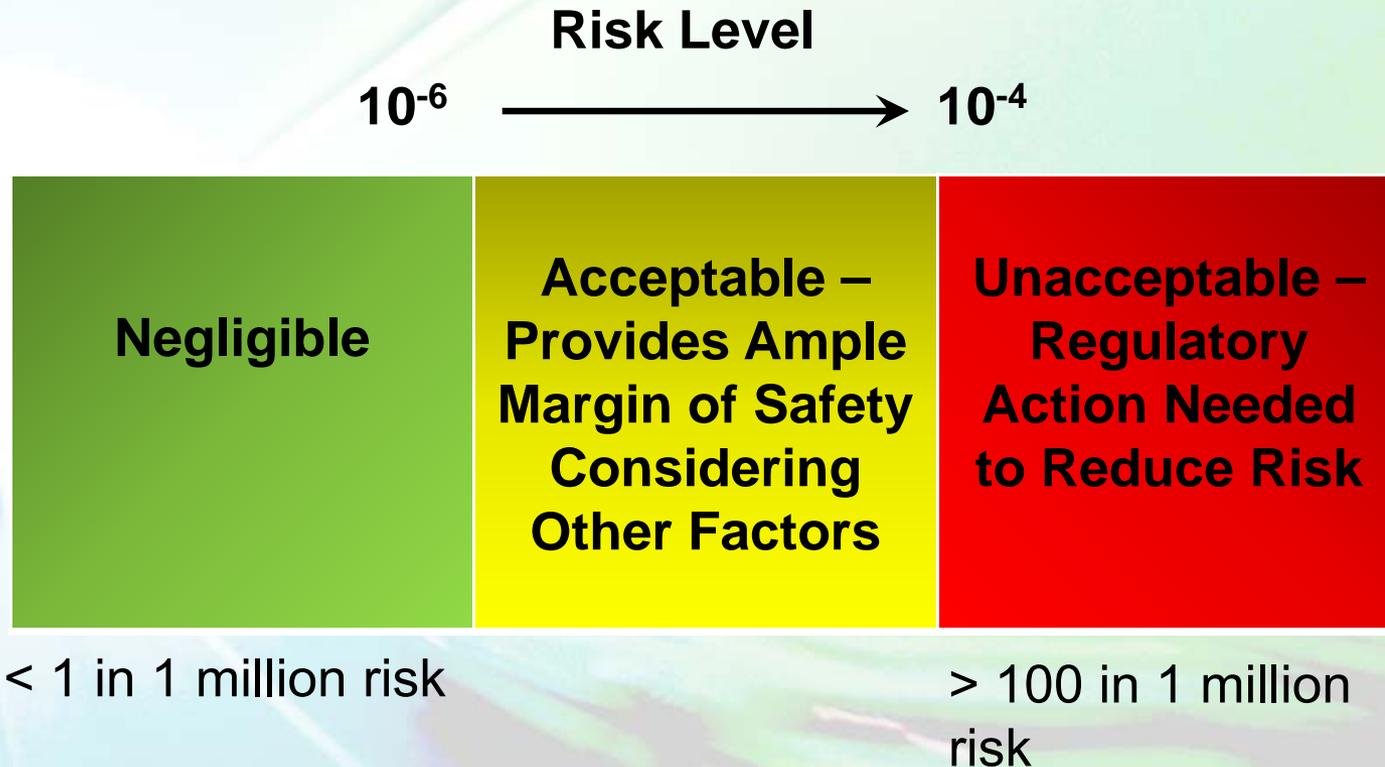
Diesel Particulate Matter (DPM)

EPA has classified diesel exhaust as a probable human carcinogen, but has not adopted a risk estimate (California has); occupational studies show conflicting outcomes

In addition to new emissions standards, EPA has promoted and funded retrofit programs to clean up older vehicles, non-road equipment (e.g., construction equipment) and locomotives

DPM shows the largest decrease of all the MSATs; total emissions have dropped by half just since 2005

EPA's Risk Management Framework



Source: Part V of EPA's *Risk Assessment and Modeling - Air Toxics Risk Assessment Reference Library, Volume 1*, www.epa.gov/ttn/fera/data/risk/vol_1/chapter_27.pdf

Risk Assessment: Transportation Examples

**China Basin (US Army COE) estimated cancer risk
at ~ 8.5 per million for highways near port**

**Schuyler Heim Bridge (Alameda Corridor Transportation
Authority) estimated cancer risk
at ~ 10-20 per million (with 30-40,000 trucks per day)**

**92-97% of risk comes from DPM risk estimate adopted by CA
OEHHA *but not used by EPA*: without DPM, overall risk
would be near or below 1 per million**

Guam Haul Road

DOD conducted MSAT risk assessment for Guam roadways as part of EIS to relocate 8000 Marines from Okinawa

Analyzed cancer risk for MSATs at 8 locations with traffic volumes up to ~ 180,000 ADT; assumed fixed 2014 and fixed 2030 emissions over 30 years; actual receptor sites and sidewalk receptors modeled

Actual receptors:

All locations < 2/million cancer risk (<1/million with 2030 emissions)

Sidewalks:

All locations < 4/million cancer risk

Even these low risks based on conservative assumptions:

Fixed near-term emissions rates: ignore recent and upcoming EPA regulations, fleet turnover (scrappage of old cars and purchase of new ones)

Fixed long-term exposure:

China Basin: 24 hours a day, 365 days a year, for 70 years

Schuyler Heim: 24/350/70 (also assumed people would have their home windows open)

Guam Haul Road: 24/365/30 (even on sidewalks)

Comparative Risk

Source	Estimated risk (per million)
Lifetime injury accident risk	707,500
Lifetime cancer risk (all causes)	336,000
Lifetime fatal accident risk	10,500
Radon	2,000
NATA 2009 (all HAPs, all sources)	~50
EPA 2007 MSAT rule residual risk	5
Guam Haul Road	1-2
Schuyler Heim, China Basin projects	~1

Near-road Impacts of Vehicle Emissions: Examples of Impacts and Mitigation

Presented by:
Paul T. Roberts, Ph.D.
Sonoma Technology, Inc.
Petaluma, CA

Presented to:
South Mountain Citizens Advisory Team
Phoenix, AZ
April 22, 2013



Sonoma Technology, Inc.

Air Quality Research and Innovative Solutions

Field Study of PM_{2.5} Emissions From an ADOT Road-Widening Project

Project goals

Improve understanding of

- Construction equipment activity and emissions, especially for PM
- Near-road pollutant concentrations resulting from various construction phases
- Opportunities for cost-effective mitigation strategies

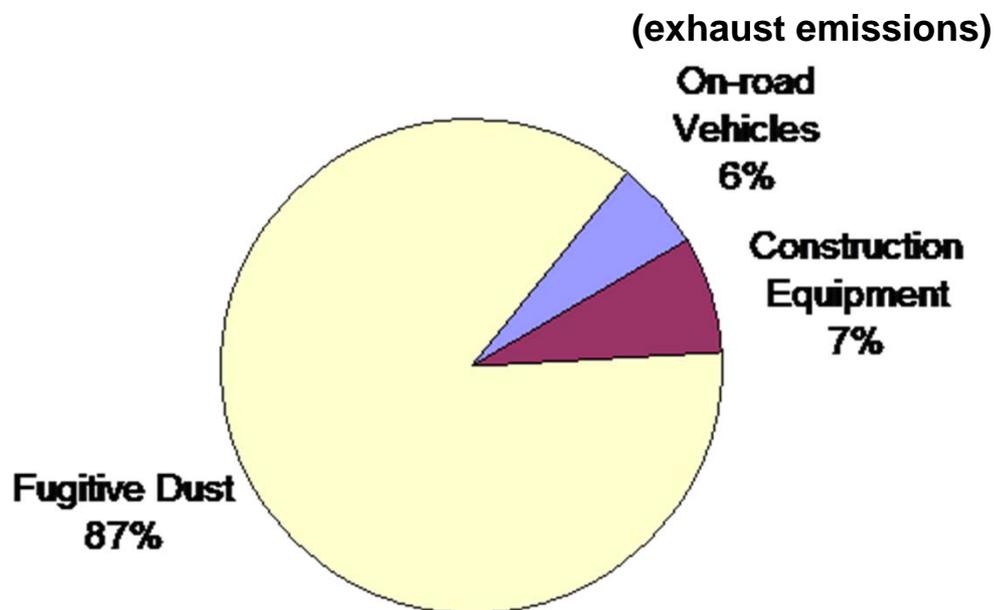


Selected construction project

- *Located in a rural part of southern Arizona*
- *Involves widening of State Road 92 from two to five lanes*
- *Spans a 4-mile stretch of SR 92*

PM₁₀ Emissions: Roadway Construction

- For PM₁₀, construction-related fugitive dust overwhelmed other source categories
- 80% of fugitive dust emissions were associated with the roadway excavation phase
- Emissions estimates for re-entrained road dust did not correlate with real-world air quality data



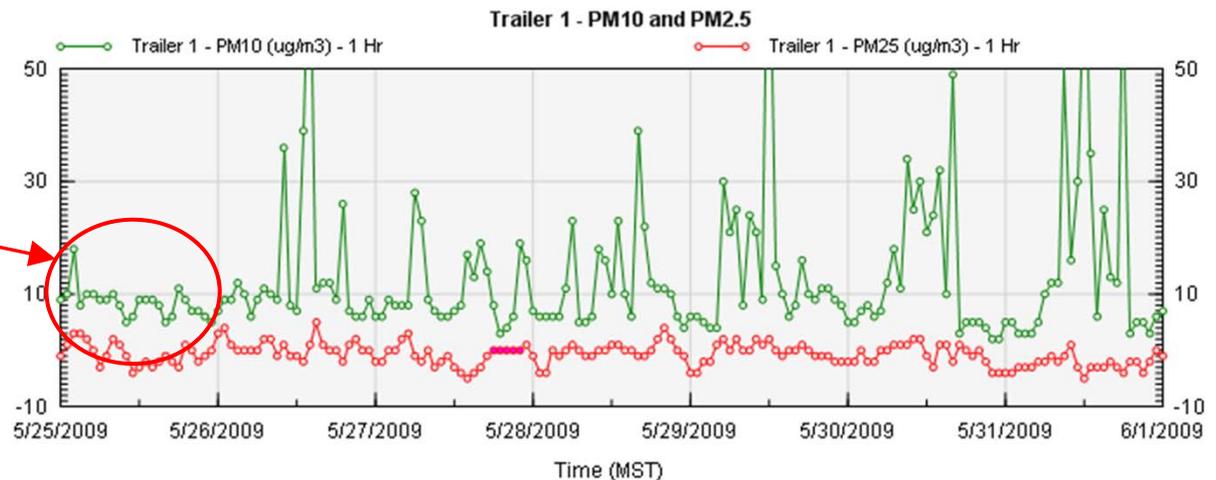
2009 PM₁₀ Emissions

7,488 kg (8.3 tons)

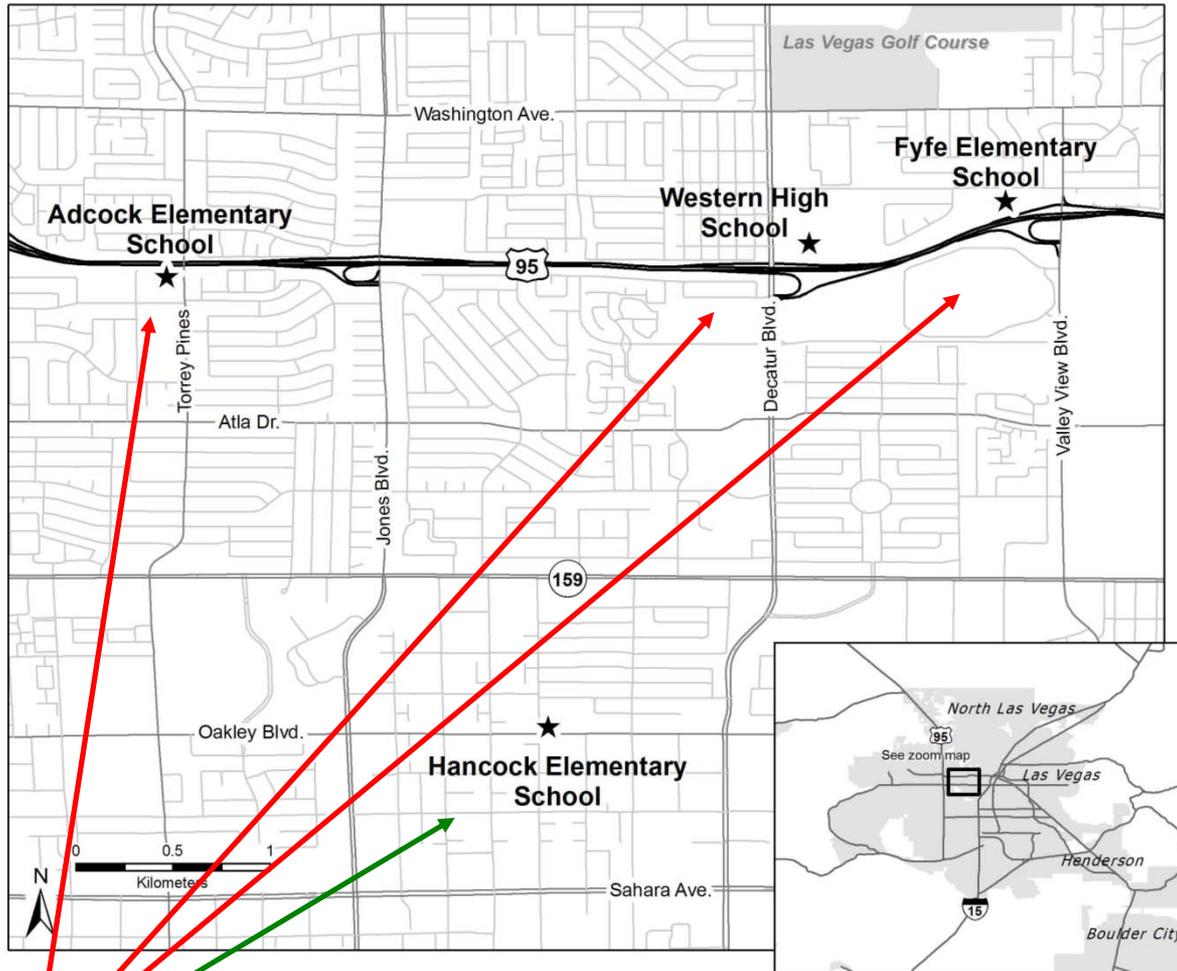
PM Concentrations During Construction: May 25-31 case study

- Construction resulted in high 24-hr PM₁₀ concentrations (29 $\mu\text{g}/\text{m}^3$ max during case study); construction impacts on PM_{2.5} concentrations were far less pronounced
- NO_x-related concentrations increased during daylight hours, but max NO₂ concentrations < 10 ppb

No PM₁₀ impacts on Labor Day, when construction was halted (but on-road traffic only 23% lower than an average weekday).



STI 2007-2008 Field Study: US 95



School-specific ambient air sampling, distance from freeway sound wall:

Adcock: 17 m

Fyfe: 18 m

Western: 136 m

Hancock: 2400 m

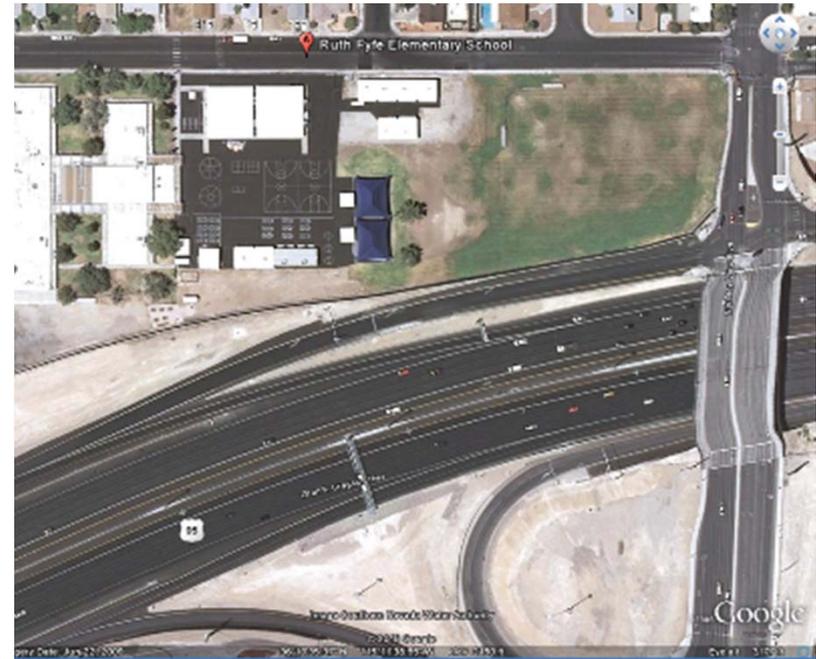
Source: Roberts et al., 2010. "Near-Roadway Mobile-Source Air Toxics (MSATs) Exposures Along U.S. 95 in Las Vegas, Nevada."

Landmark Litigation: US 95 Road Widening (Sierra Club vs. FHWA)

Before widening



After widening



Fyfe Elementary School next to US 95 in Las Vegas.
Settlement agreement resulted in near-road
monitoring and in-school mitigation.

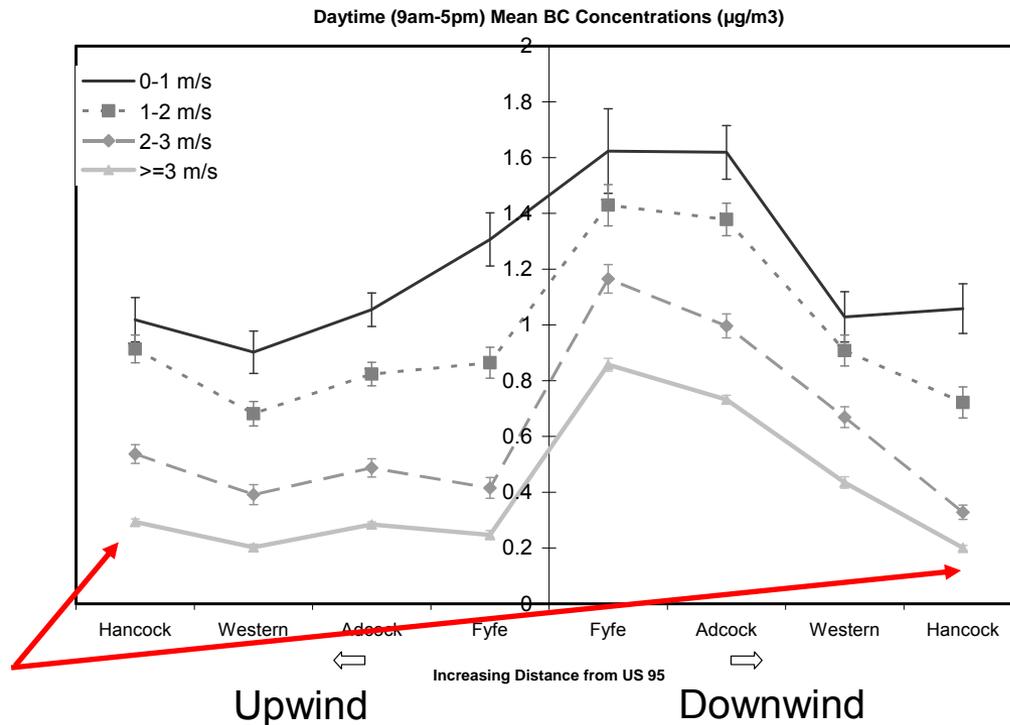
STI US 95 Field Study: Data

Downwind BC Gradients Influenced by Wind Speed

Distance from wall:

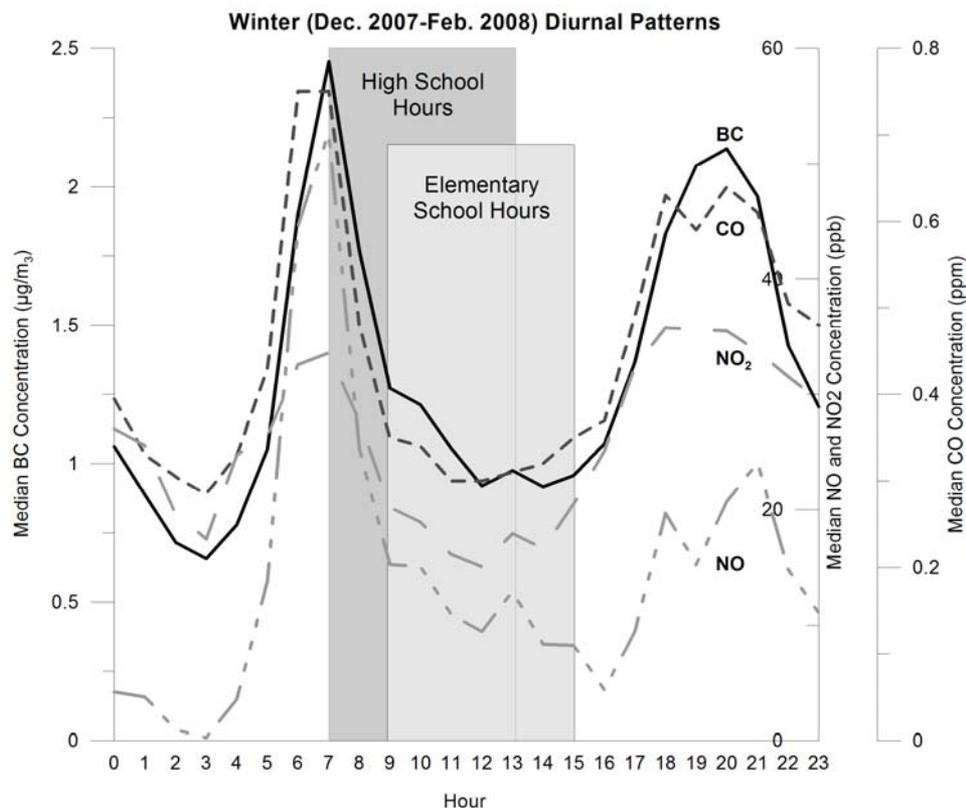
Adcock: 17 m
Fyfe: 18 m
Western: 136 m
Hancock: 2400 m

Note upwind vs.
downwind impacts



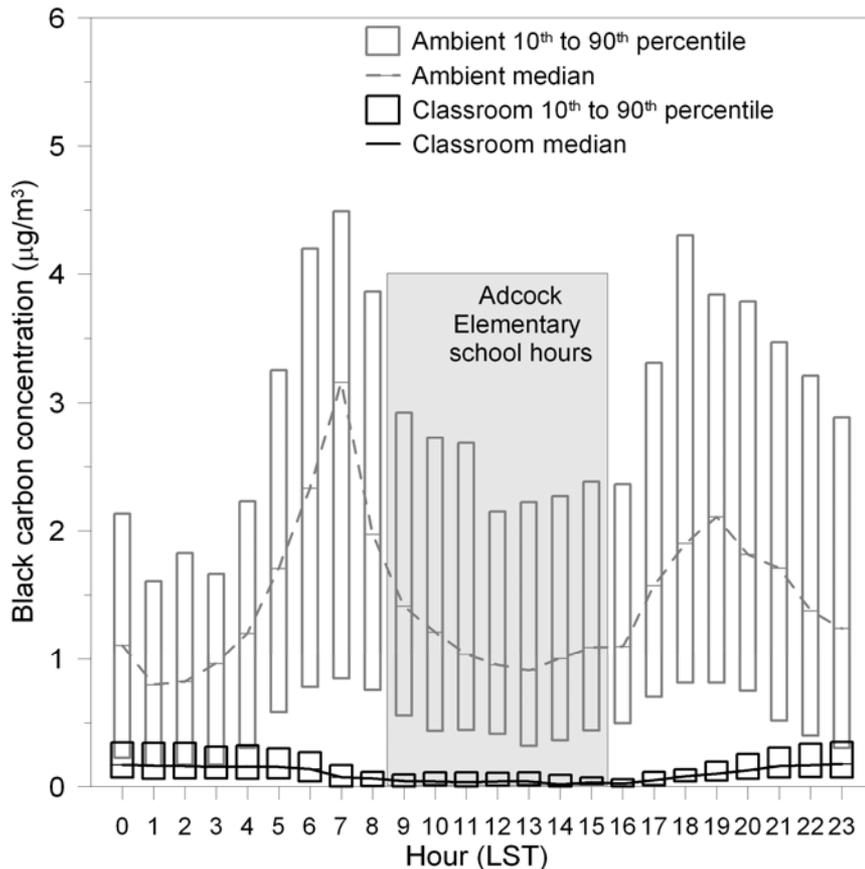
Concentration gradient in near-roadway concentrations of BC ($\mu\text{g}/\text{m}^3$) as a function of wind speed.

Diurnal Pattern of Pollution Is an Important Consideration for Exposure and Mitigation

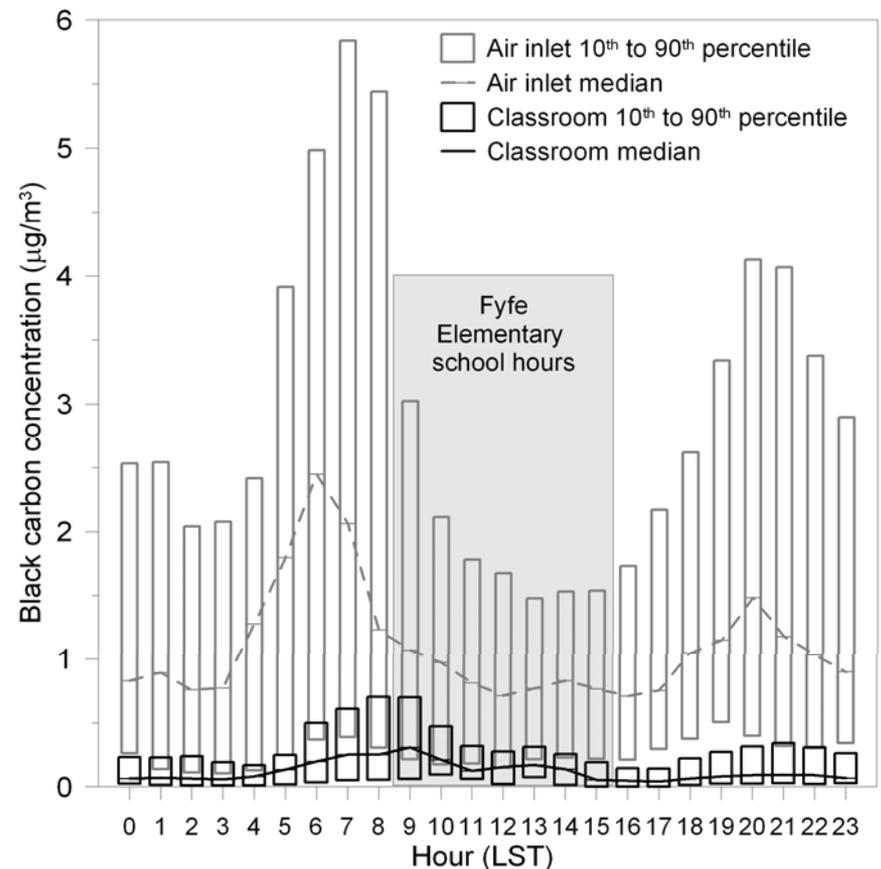


Median concentrations by hour of BC ($\mu\text{g}/\text{m}^3$), CO (ppm), NO (ppb), and NO₂ (ppb) at Fyfe Elementary School (Las Vegas, NV) on weekdays in winter (December 2007 to February 2008).

BC Distributions Outdoors and in a Classroom: Significant BC Removal at Adcock and Fyfe



Effective filter efficiency: original system about 66%; improved system about 97%.



Effective filter efficiency: original system about 50%; improved system about 72%.

Teacher often left door open to outside.

Possible Near-Road Mitigation Approaches

- Examples from US 95 Study:
 - Moved some uses farther away from US 95
 - Filtration added to HVAC systems at schools (for PM: very successful; for VOC: less so)
 - Bus retrofit program
 - Bus idling education (for school and County bus drivers)
 - Investigate time shifting of playground use

Health effects of air pollution in metropolitan Phoenix

Peter Hyde, Arizona State University
for
South Mountain Citizens Advisory Team
Air Quality Panel Discussion
22 April 2013

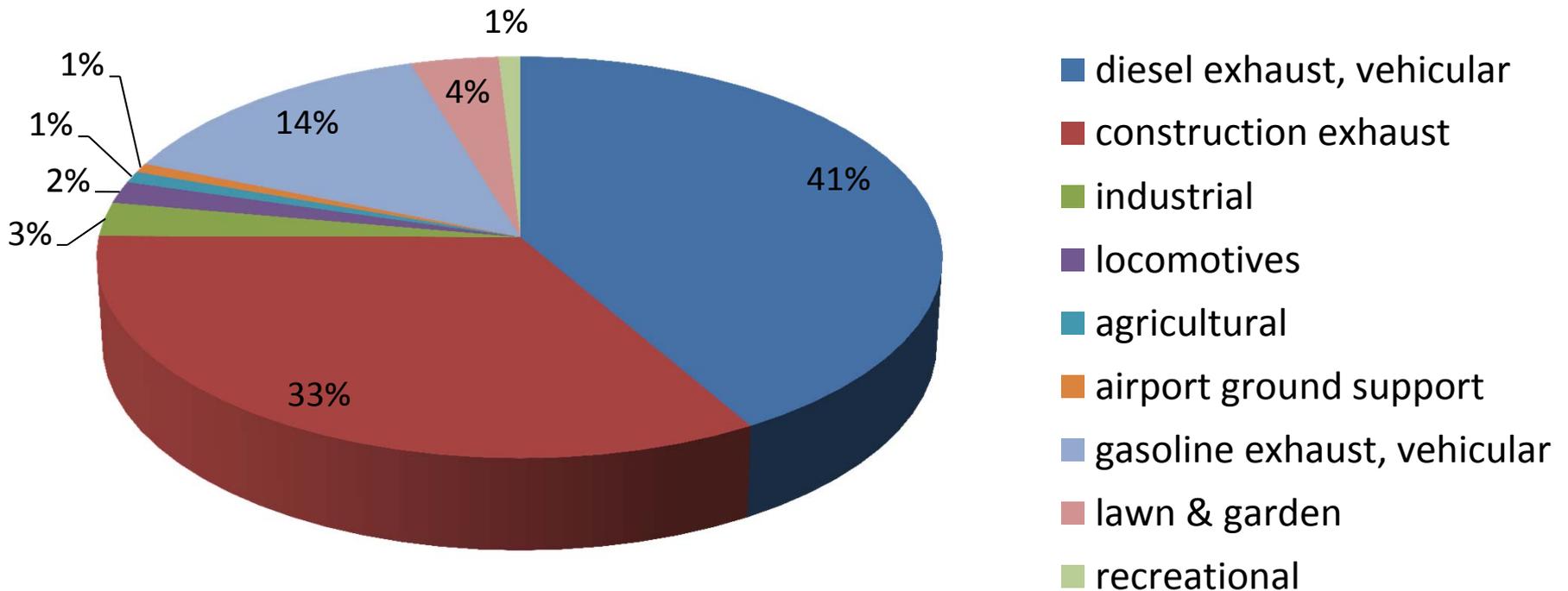
Contact information

- Peter Hyde
- School for Engineering of Matter, Transport and Energy, Arizona State University
- peter.hyde@asu.edu
- 602 451 3487

Studies on the health effects of air pollution in metropolitan Phoenix

- Phoenix, Arizona Air Toxics Assessment – Final Comprehensive Report, for the Joint Air Toxics Assessment Project, 2011
- Children’s Health Project: Linking Asthma to PM₁₀ in Central Phoenix – a report to the Arizona Department of Environmental Quality, 2009
- “In the long term, bad air hurts all”, *Arizona Republic*, 1 February 2012

Particulate elemental carbon emissions, greater Phoenix, from gasoline and diesel fuels

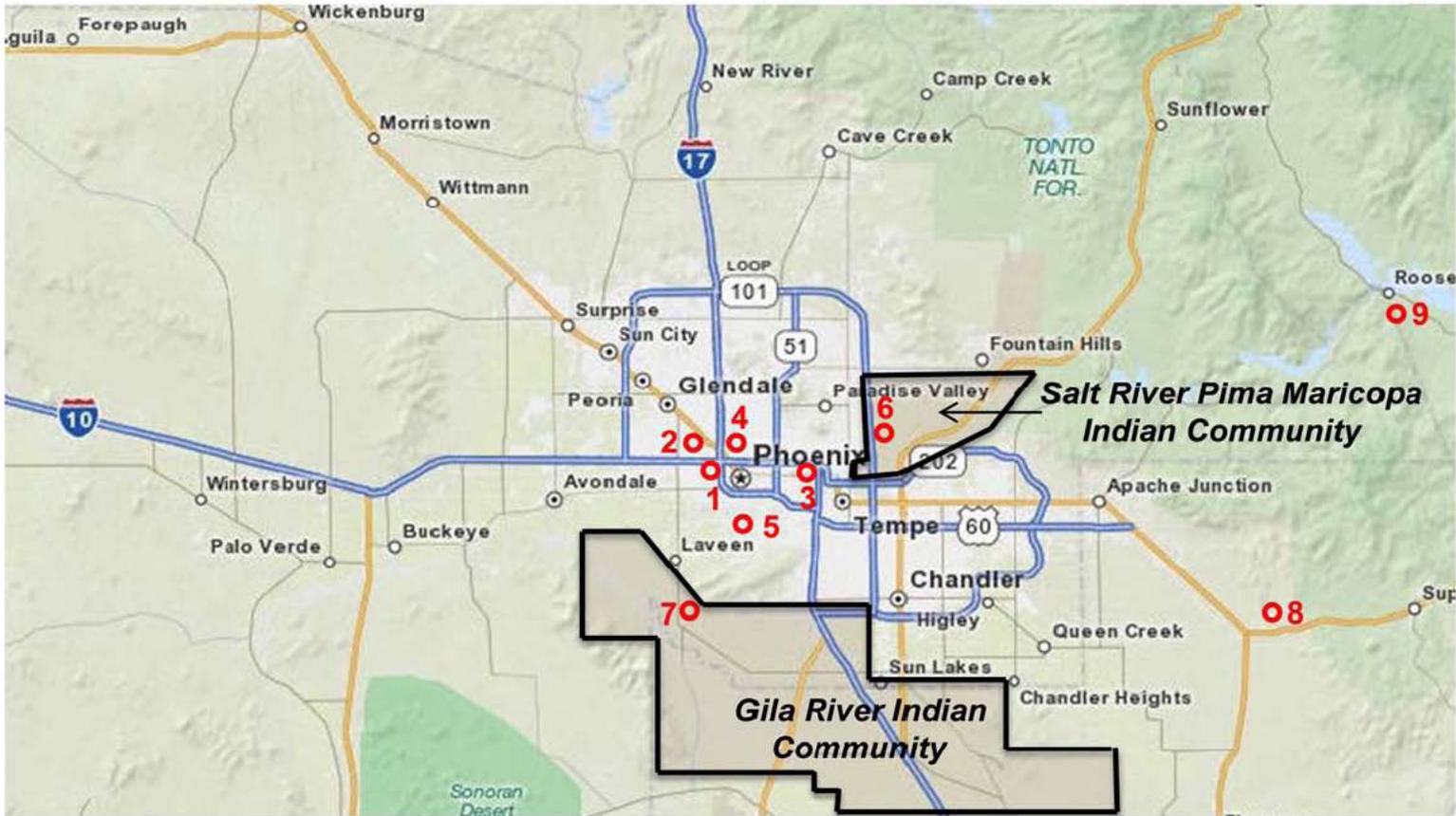


Considering gas and diesel combustion together,
diesel combustion ----- 81% of EC emissions
gasoline combustion -- 19%

Phoenix Metropolitan

Road map – Phoenix Metropolitan

34°02'N



33°00'N

113°20'W

15 miles

111°30'W

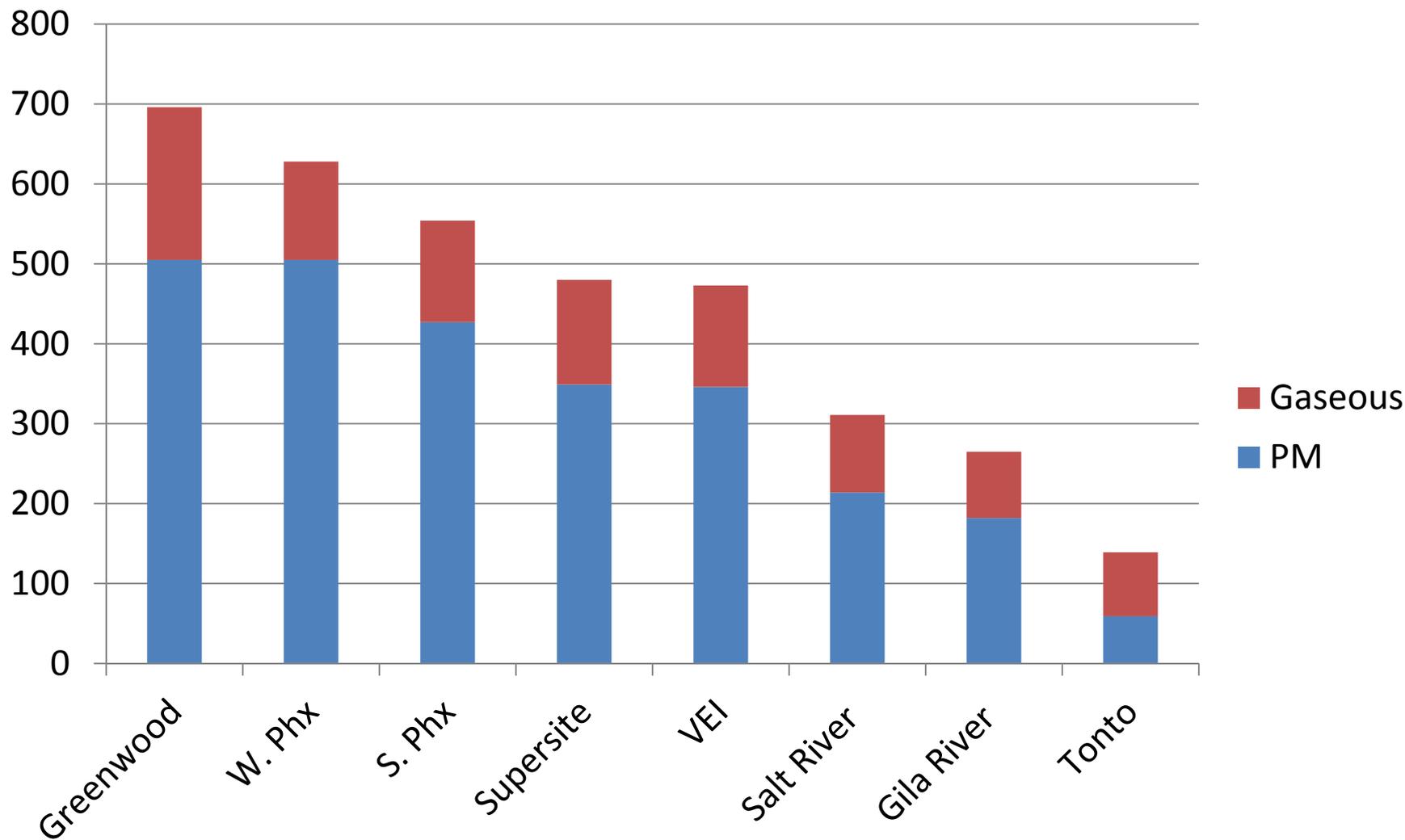
Air toxics monitoring sites: Joint Air Toxics Assessment Project

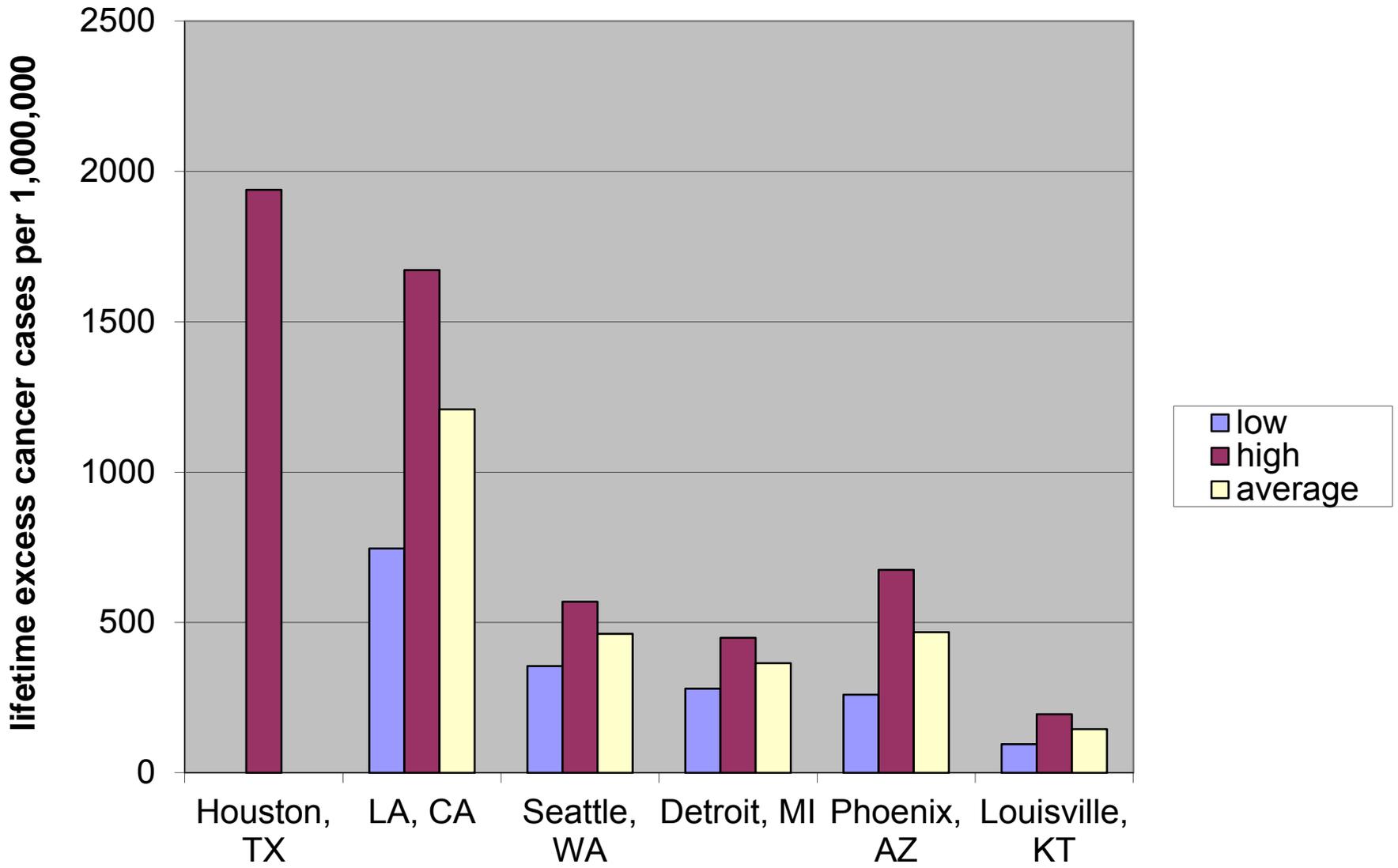
Air toxics monitoring sites

(CC = central city)

#	Name	Major Cross Streets	Remarks
1	Greenwood	I-10/27 th Ave	CC, freeway corridor
2	W. Phoenix	Thomas Rd./39 th Ave.	CC, neighborhood
3	VEI	McDowell Rd./40 th Street	CC, near 202 freeway
4	Supersite	Camelback Rd./15 th Ave.	CC, neighborhood
5	S. Phoenix	Broadway Rd./Central Ave.	CC, neighborhood
6	Salt River	Osborne Rd./Alma School Rd.	Urban perimeter (east)
7	Gila River	Pecos Rd. alignment/51 st Ave.	Urban perimeter (south-central)
8	Queen Valley	30 mi E of Apache Jct.	Background, 57 mi ESE of CC
9	Tonto Nat. Mon.	SR 88/turn-off to monument	Background, 57 mi ENE of CC

Excess Lifetime Cancer Cases per One Million Population from Air Toxics – All Sources





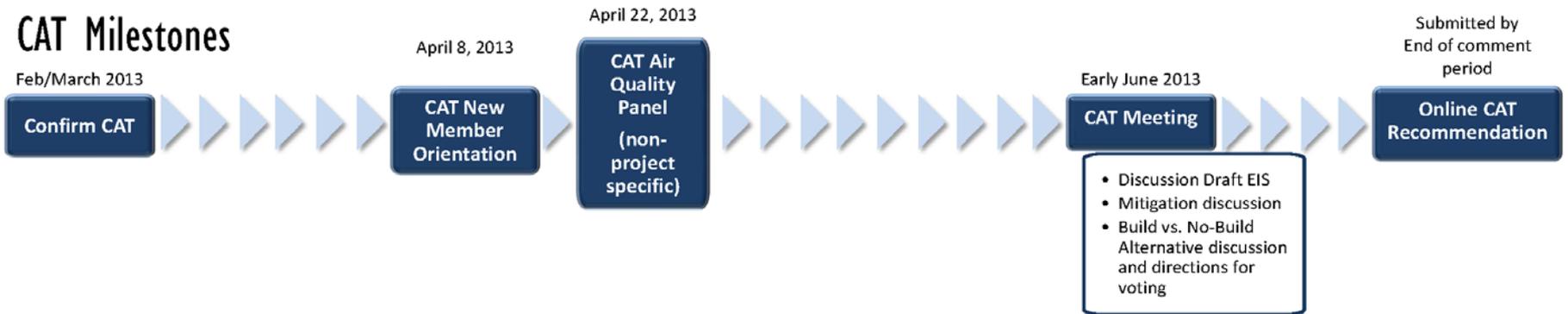
Thank you for your attention.

Upcoming Study Milestones

Draft EIS Milestones



CAT Milestones



PI Milestones

