Advanced Emission Monitoring in SCAQMD

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What is South Coast Air Quality Management District?

- Local Air Pollution Control Agency in Southern California (All of Orange & Metropolitan Parts of Los Angeles, Riverside & San Bernardino Counties)
- Population of 16.4 million (about half of California State's population)
- Area of 10,743 mi^2
- Regulate 27,000 facilities and process 8,000 permits/yr
- **Worst air quality in the U.S. (Ozone & PM 2.5)**

Monitoring Approaches

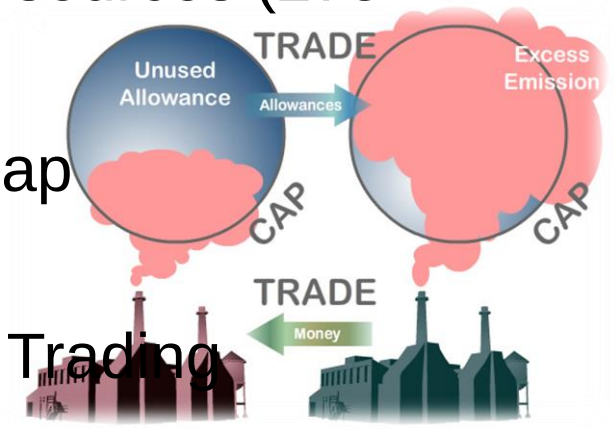
- REgional CLean Air Incentive Markets (RECLAIM – Regulation XX)
- Control of Emissions from Refinery Flares (Rule 1118)
- Hydrogen Fluoride Detection & Alarm System (Rule 1410)
- Emission Standards for toxics from Lead-Acid Battery Recycling Facilities (Rule 1420.1)
- Ambient Monitoring / MATES
- Emergency Response Progra
- Upcoming New Technologies

RECLAIM

REgional CLean Air Incentives Market

RECLAIM

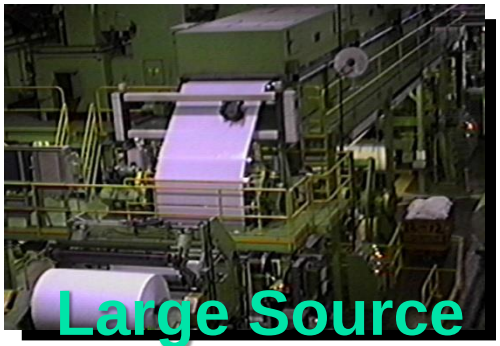
- RECLAIM is a cap and trade program adopted in October 1993; with implementation started in January 1994
- RECLAIM's objective is to meet emission reduction requirements and enhance emission monitoring while providing additional flexibility to lower compliance cost
- The largest NOx and SOx stationary sources (275 facilities)
- Facility declining annual emissions caps
- Reduce emissions or buy RECLAIM Trading Credits (RTCs)



Emission Monitoring & Reporting

Monitored by CEMS

DAILY



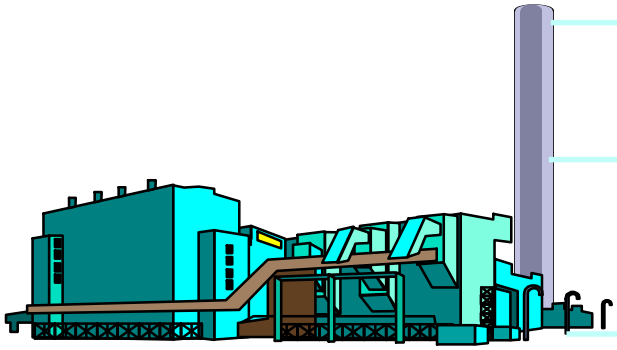
MONTHLY

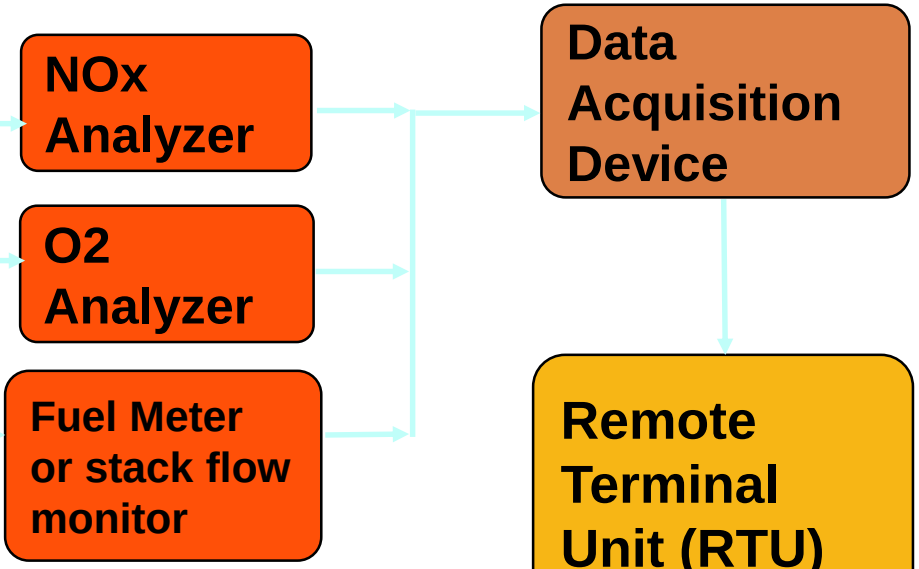
QUARTERLY

Continuous Emission Monitoring Systems

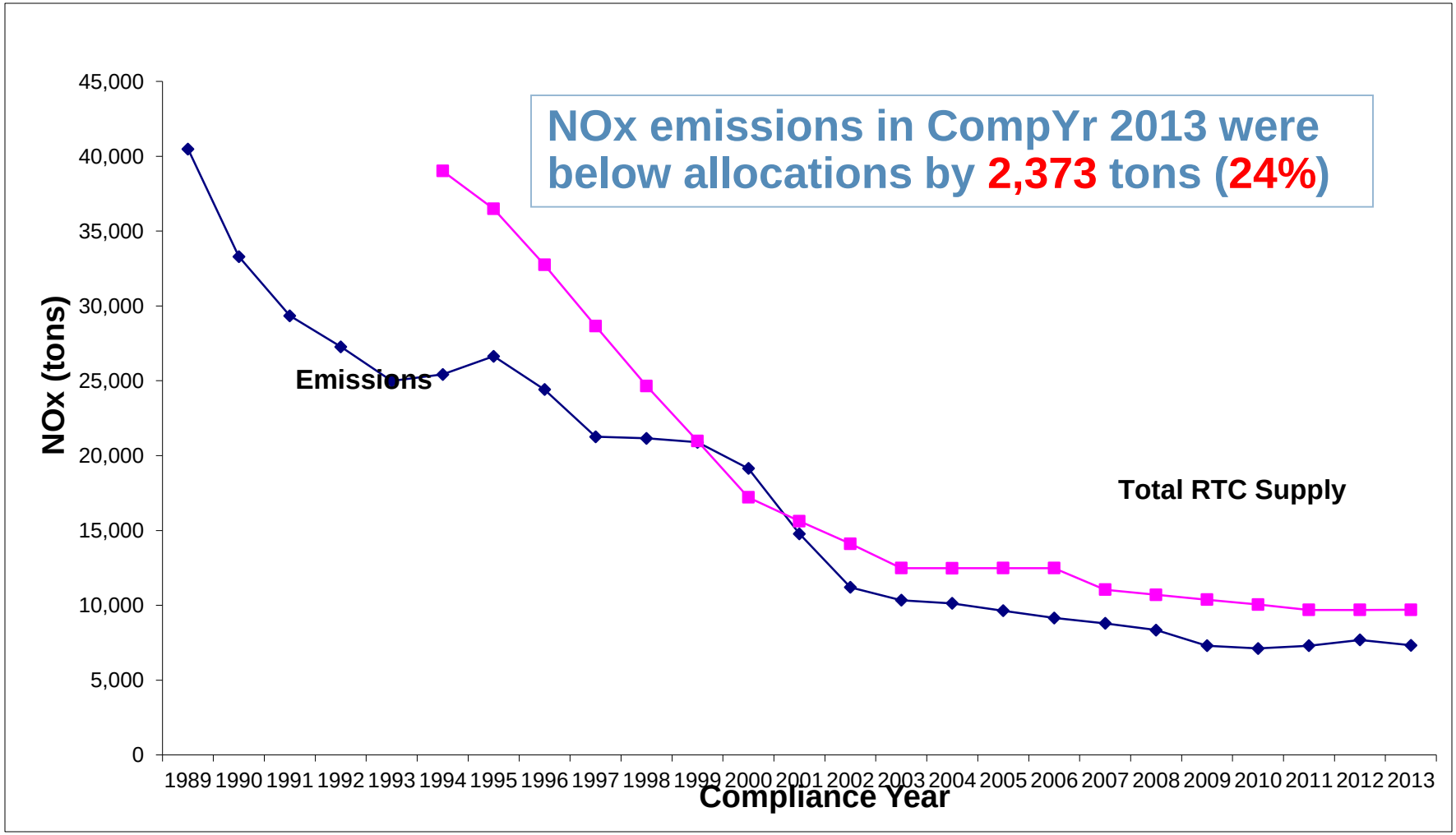
In Compliance Year 2013, CEMS were used to measure:

- 79% of all NOx emissions
- 97% of all SOx emissions

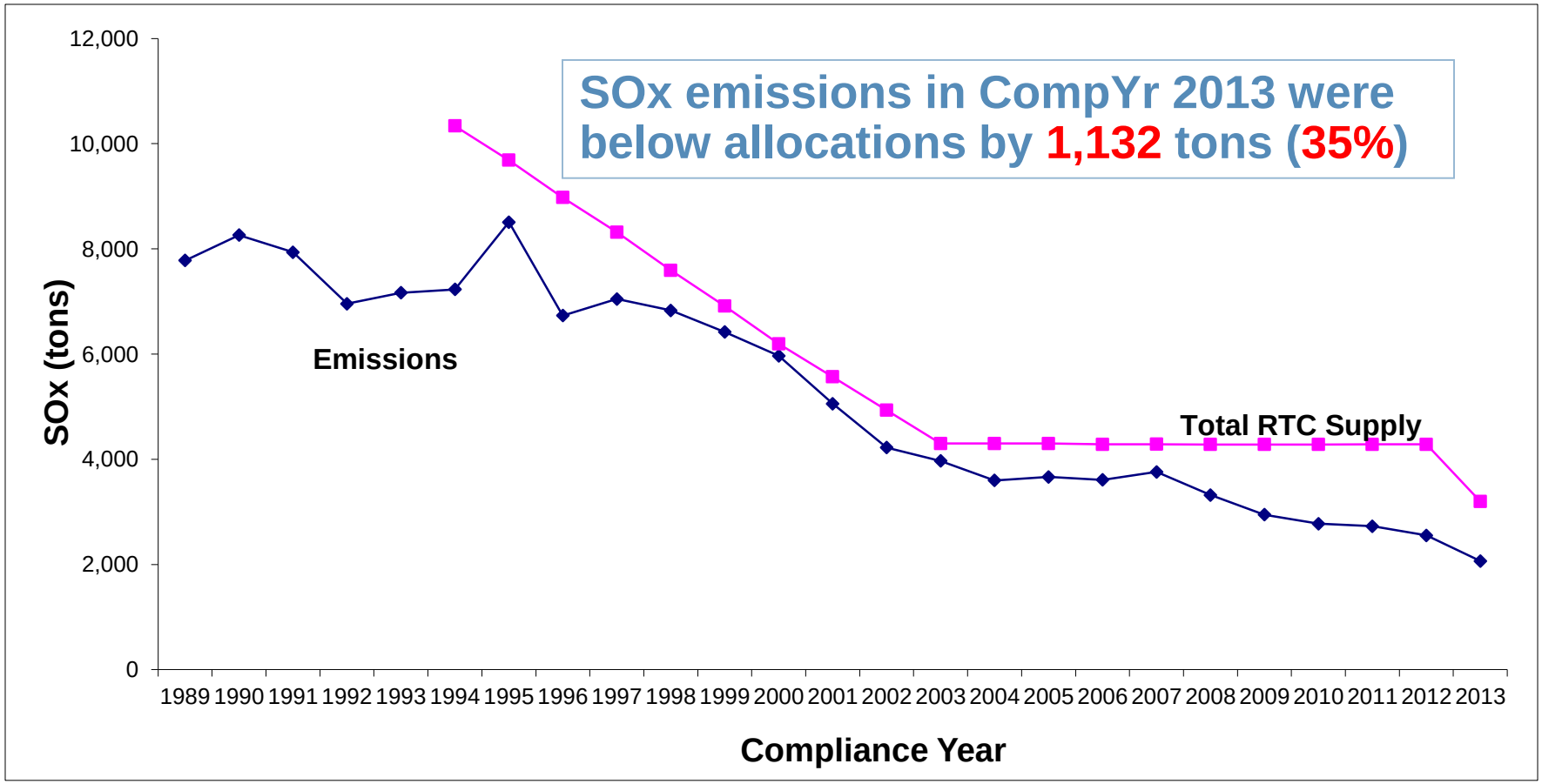




RECLAIM NOx Emissions vs. Allocations Trends



RECLAIM SOx Emissions vs. Allocations Trends



CONTROL OF EMISSIONS FROM REFINERY FLARES

(Rule 1118)

Rule 1118: Control of Emissions from Refinery Flares

- Adopted 1998
  - Monitoring
- Amended 2005
  - Enhanced continuous monitoring plan (flow, sulfur, and higher heating value)
  - Minimize flaring: allowed only under certain circumstances
  - Reporting of flaring events and emissions
  - Performance targets with declining caps for SOx emissions
  - Flare Minimization Plan and mitigation fee if target exceeded

Continuous Monitoring

Minimum 1 data point per minute:

- Vent gas flow rate to flare (minimum velocity: 1 ft/sec)
- Vent gas composition (sulfur and heat content)
- Pilot light on/off
- Purge gas volume to flare
- Visual flare image with video cameras

Flare Event Notifications

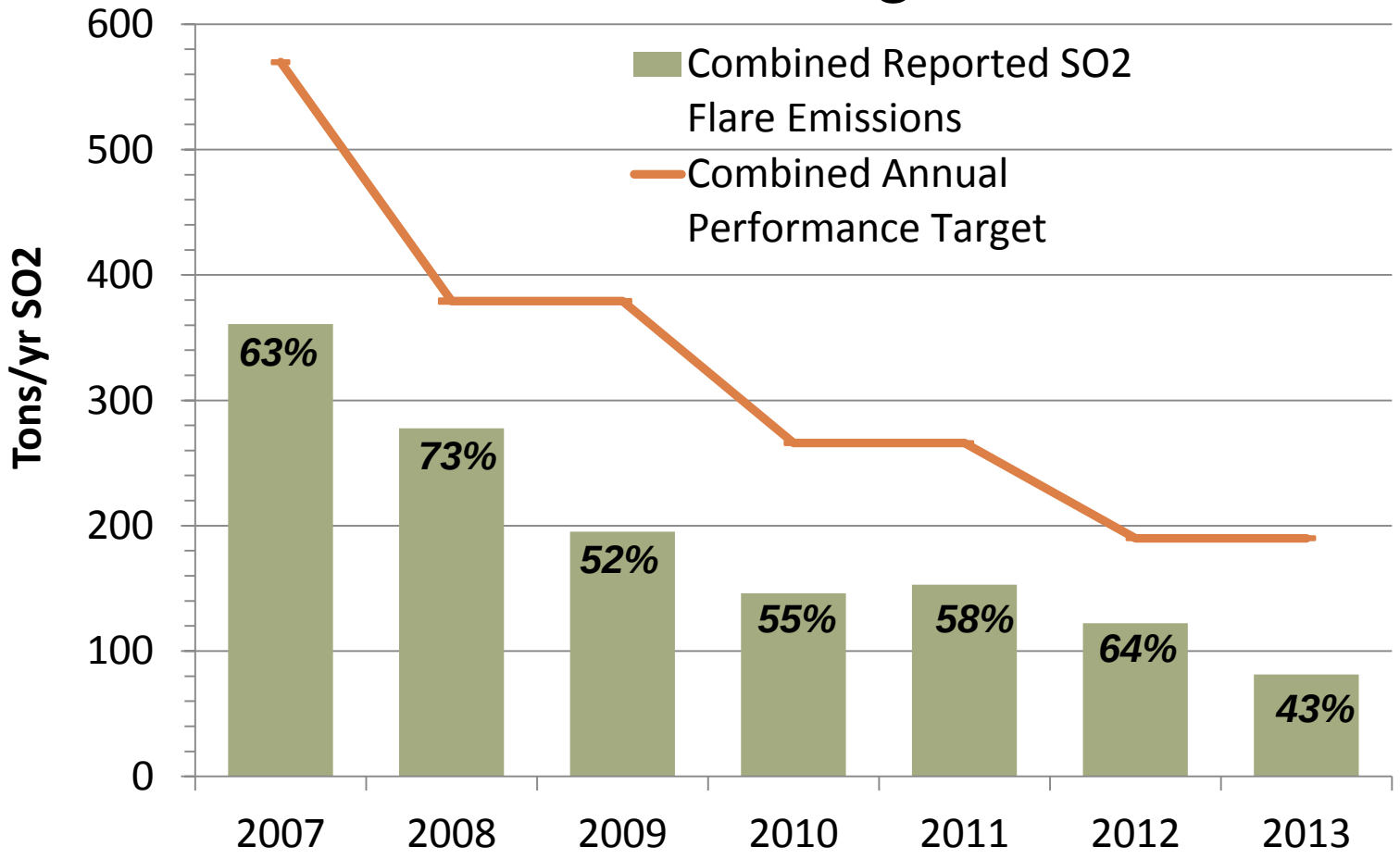
- Notifications by refineries
  - before event or within 1 hour of start
- Notification to public and interested parties
  - List-serve sign up for individual refinery
  - Subscribers notified by automatic e-mails upon notification by refineries.

Flare Emissions Reporting

- Quarterly reports identify:
  - Emissions and causes for each event
  - Monitoring system downtime
- Reported emissions available online at http://www.aqmd.gov/home/regulations/compliance/r1118/flare-operator-information/
- Almost all emissions from all events (including emergencies) are counted toward the annual target

Overall Flare Emission Trend

All refinery flare emissions were 43% of Rule 1118 Performance Target for 2013



HYDROGEN FLUORIDE DETECTION & ALARM SYSTEM

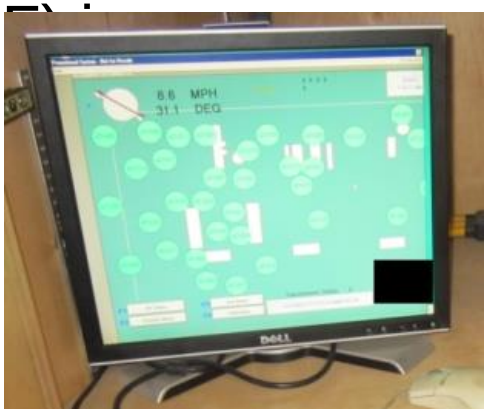
(Rule 1410)

Rule 1410 – Hydrogen Fluoride (HF) Storage and Use

- Adopted in 1991; suspended in 1992 due to a law suit challenging environmental documents (CEQA)
- Required phase out the use of concentrated HF
- In late 1980's, four refineries and one chemical plant used concentrated HF
- Two refineries and one chemical plant shut down since
- Two refineries converted to Modified Hydrogen Fluoride (MHF) and still maintain the HF

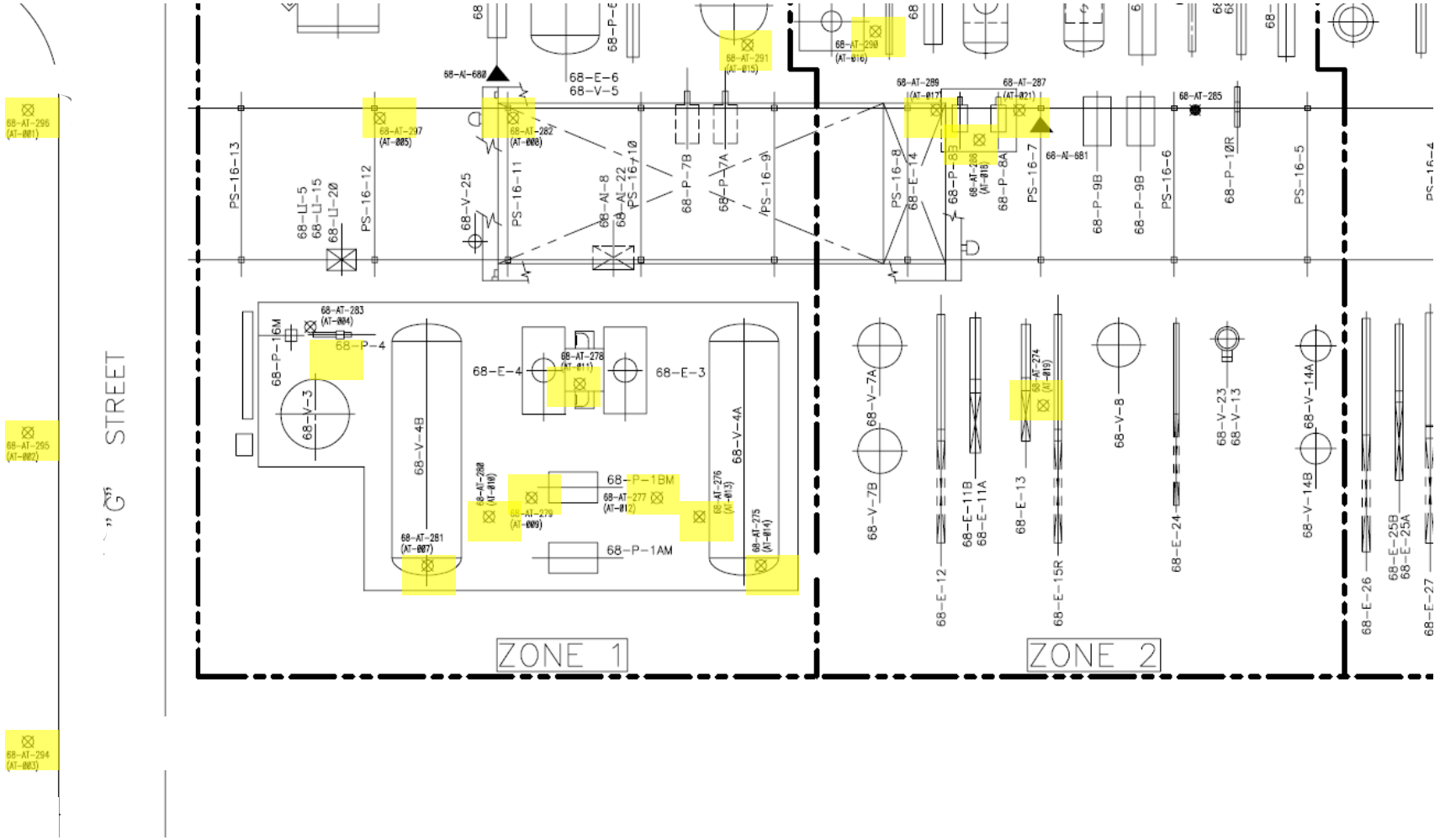
Alarm and Notification of Atmospheric HF Detection

- Automatic atmospheric detection and alarm systems in areas where Hydrogen Fluoride (HF) is
  - Loaded and unloaded
  - Transferred
  - Stored
  - Processed



- Alarms triggered at set threshold
- Alarms directly linked to SCAQMD HF Central Station
- Follow-up telephone call upon alarm for verification and further detailed information

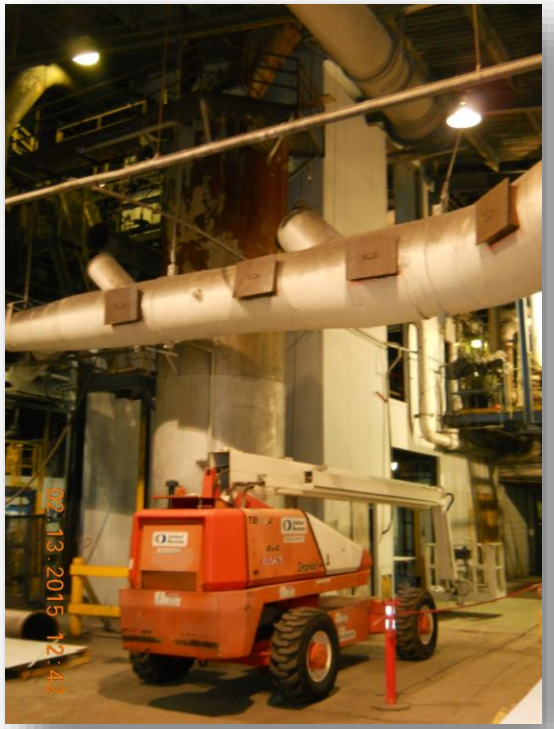
Sensors Location Around HF Units



EMISSION STANDARDS FOR LEAD AND OTHER TOXICS FROM LEAD ACID BATTERY RECYCLING FACILITIES (RULE 1420.1)

Most Stringent Rule in U.S. for Lead Ambient & Emission Standards

- Adopted November 5, 2010:
  - Ambient standards (averaged over 30 days)
    - Prior to 1/1/2012: 1.5 µg/m^3
    - After 1/1/2012: 0.15 µg/m^3
  - Total point sources: 0.045 lb/hr
  - Single point source: 0.01 lb/hr
- Amended March 6, 2015:
  - Ambient Standards (averaged over 30 days)
    - January through December 2016: 0.11 µg/m^3
    - On and after 1/1/2017: 0.10 µg/m^3
  - Total point sources: 0.023 lb/hr after 12/31/2015

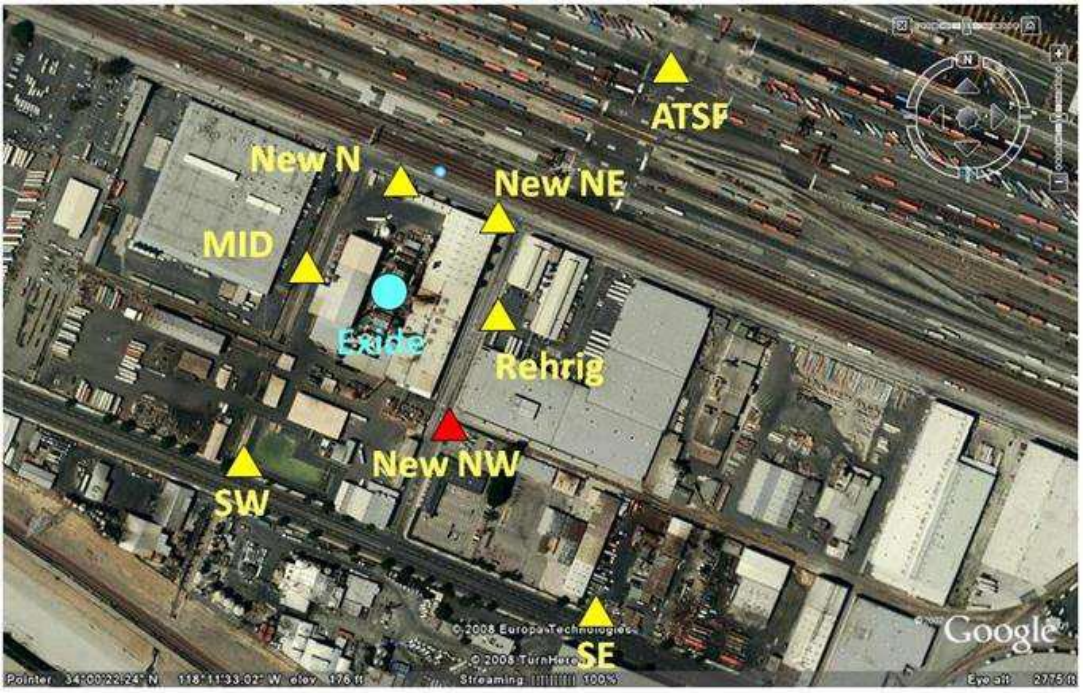


Other Standards of Rule 1420.1

Amended January 10, 2014:

- Arsenic:
  - Ambient standards: 10 ng/m^3 (averaged over 24 hours)
  - Total point sources:
    - On and after 3/11/2014: 0.00285 lb/hr
    - After 1/1/2015: 0.0014 lb/hr
- Benzene:
  - Total point sources: 0.0514 lb/hr
- 1,3-Butadiene
  - Total point sources: 0.0342 lb/hr

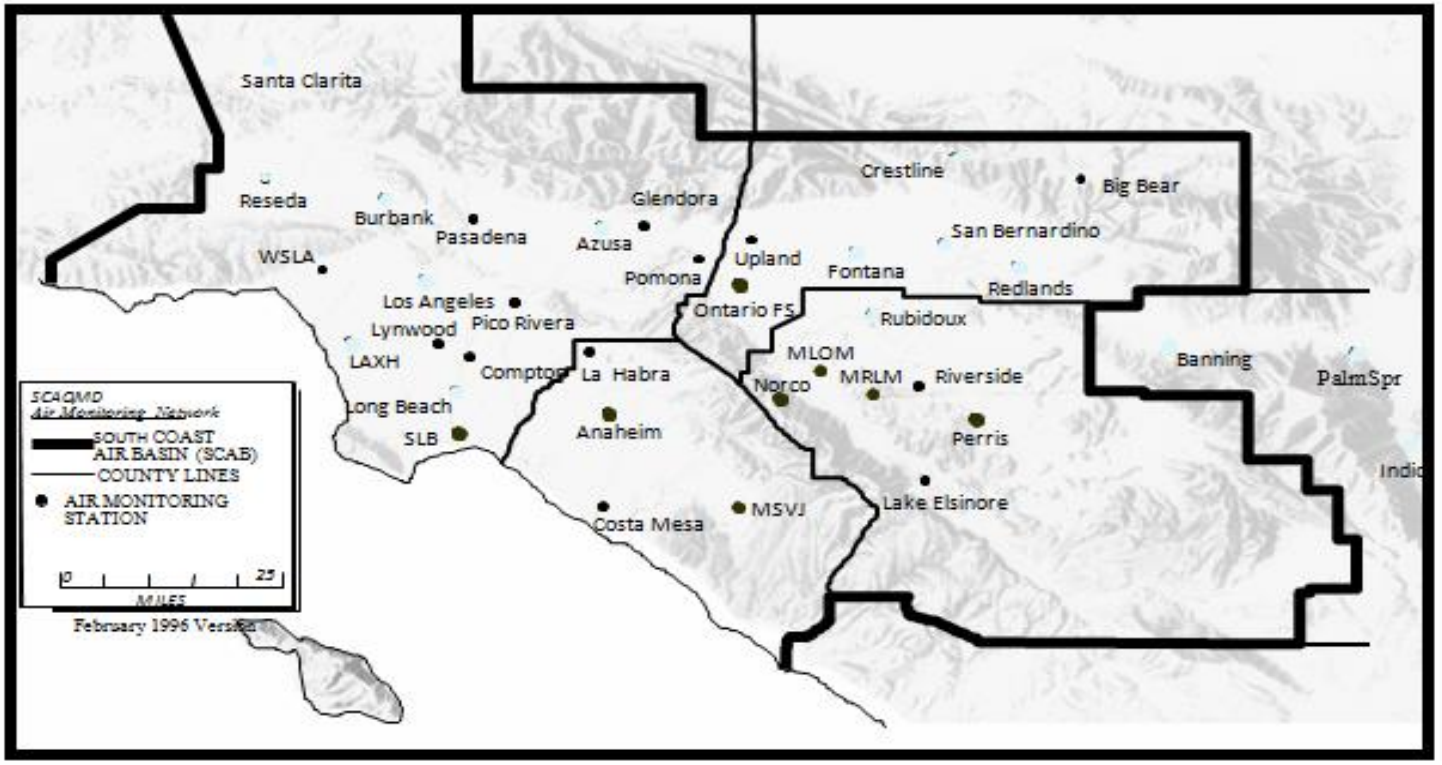
Sampler Locations near Exide



Active Temporary Site No Longer Operating

Ambient Monitoring & Multiple Air Toxics Exposure Study (MATES) IV

SCAQMD Fixed Monitoring Stations



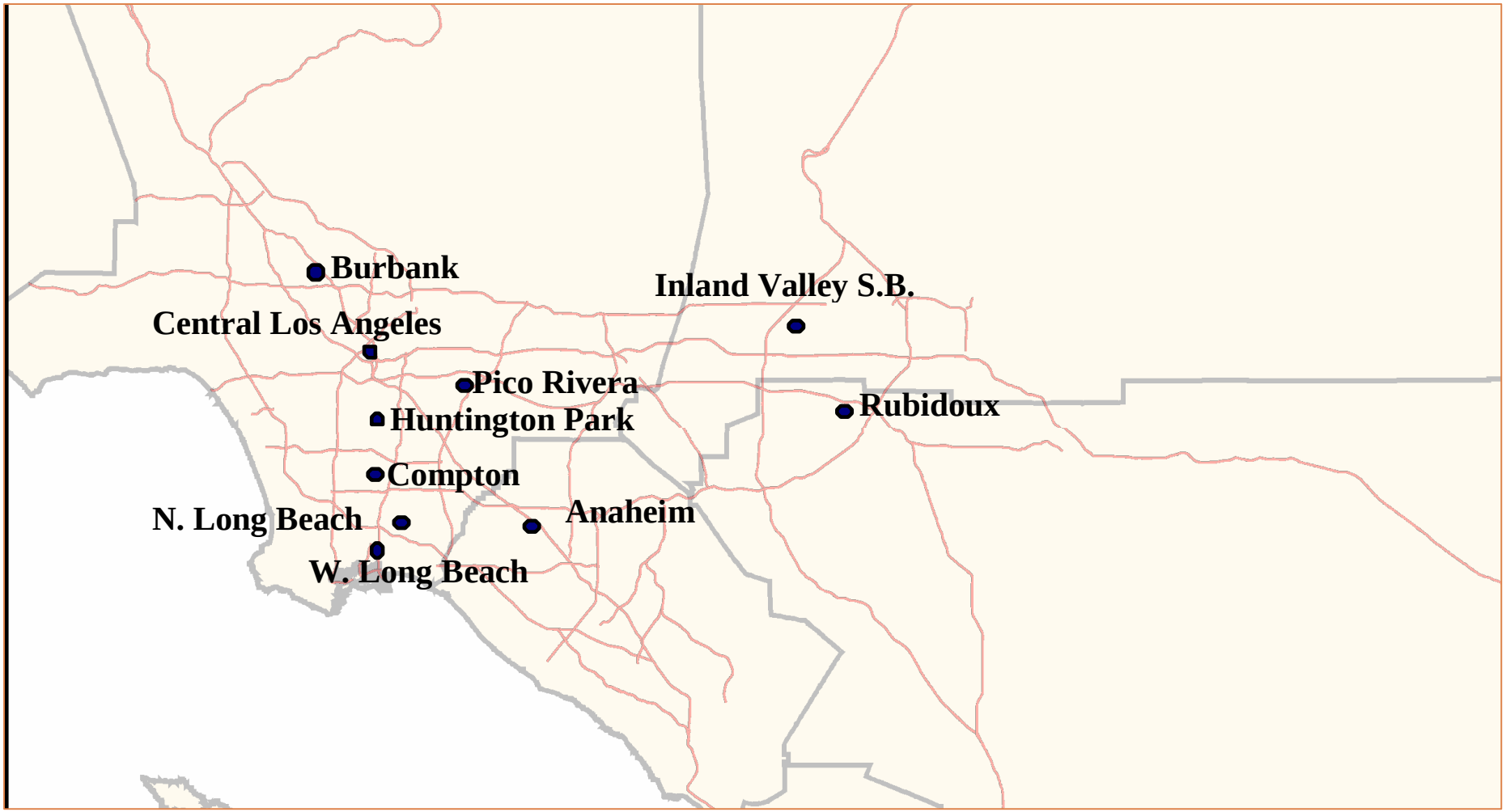
- Provide routine year round pollutant measurements of ambient air including PM, air toxics, and specific criteria pollutants
- Can provide information comparisons to typical pollutant concentrations to assess potential impacts of incident

MATES Background/Purpose

- Most Comprehensive Air Toxics Studies in the U.S.
- MATES I: 1987
- MATES II: 1998-99
- MATES III: 2004-2006
- MATES IV: 2012-2013
- Provide the public with information on toxic exposure and risk
- Evaluate progress in reducing air toxics exposure
- Provide direction to future toxics control programs

SCAQMD MATES IV Monitoring Sites

10 sites, every 6th day, July 2012 – June 2013



Substances Measured

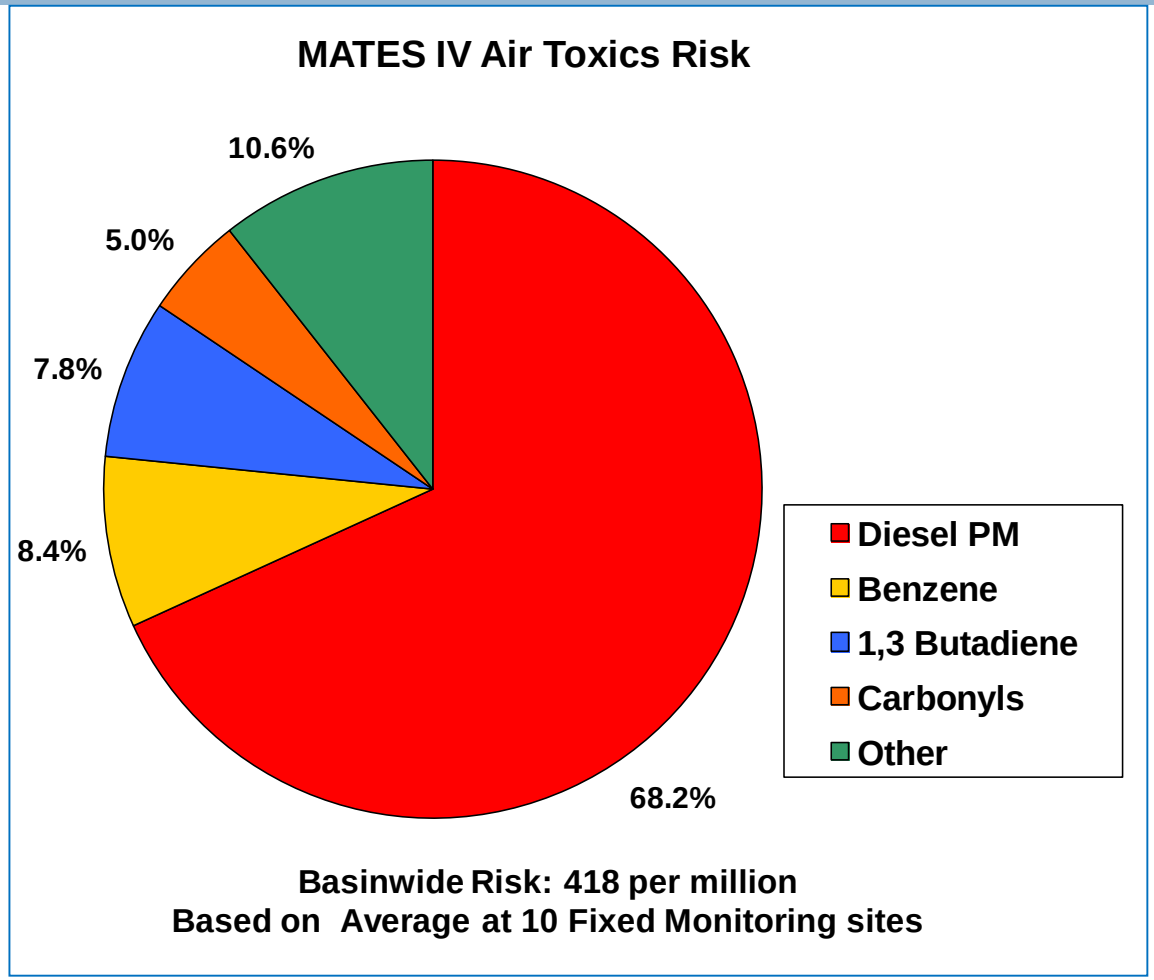
Acetaldehyde	Dichloroethane	Organic Carbon (OC)
Acetone	Elemental Carbon (EC)	PAHs
Arsenic	Ethyl Benzene	Perchloroethylene
Benzene	Formaldehyde	$PM_{2.5}$
Black Carbon (BC)	Hexavalent Chromium	PM_{10}
1,3-Butadiene	Lead	Selenium
Cadmium	Manganese	Styrene
Carbon Tetrachloride	Methylene Chloride	Toluene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

Summary of Major MATES IV Findings

- Cancer Risk has decreased more than 50% between MATES III (2005) and MATES IV (2012)
  - Monitoring, inventory, and modeling approaches all produce similar results
- While Diesel PM exposure decreased by ~70%, it still dominates the overall cancer risk from air toxics
- Highest risk areas near ports and transportation corridors
- Risk from other air toxics continue to decline, with limited exceptions
- Ultrafine Particle measurements show higher levels in areas with higher population and traffic density

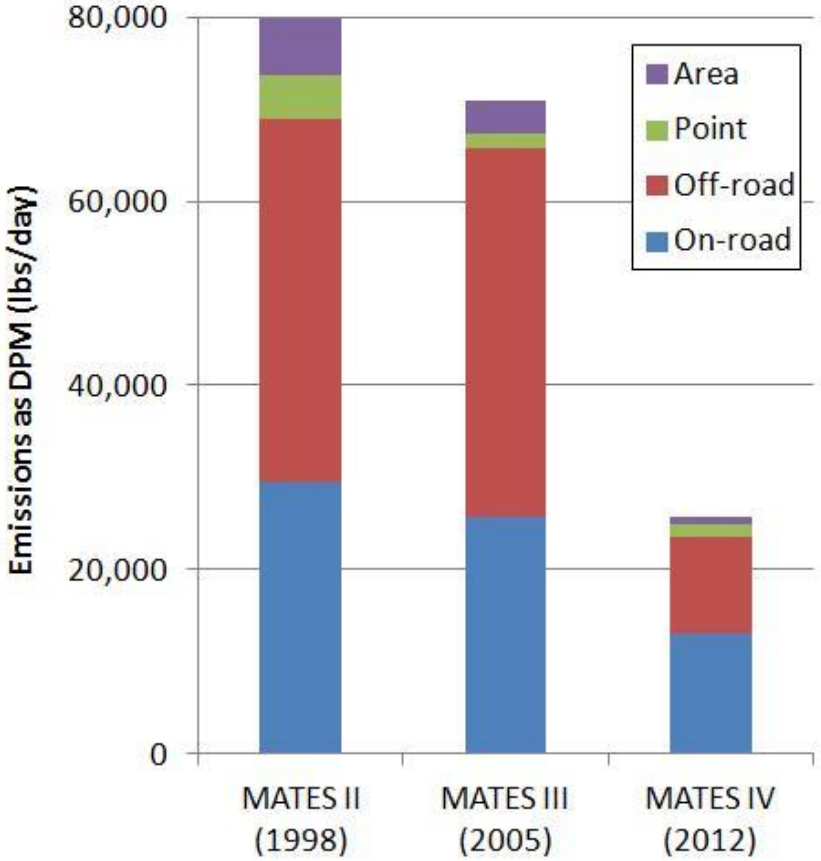
MATES IV Monitored Air Toxics Risk

- Estimated basin wide lifetime air toxics risk 418 per million
- 65% overall risk reduction from MATES III based on monitoring
- Mobile sources account for 90% of air toxics risk
- Diesel accounts for 68% of air toxics risk



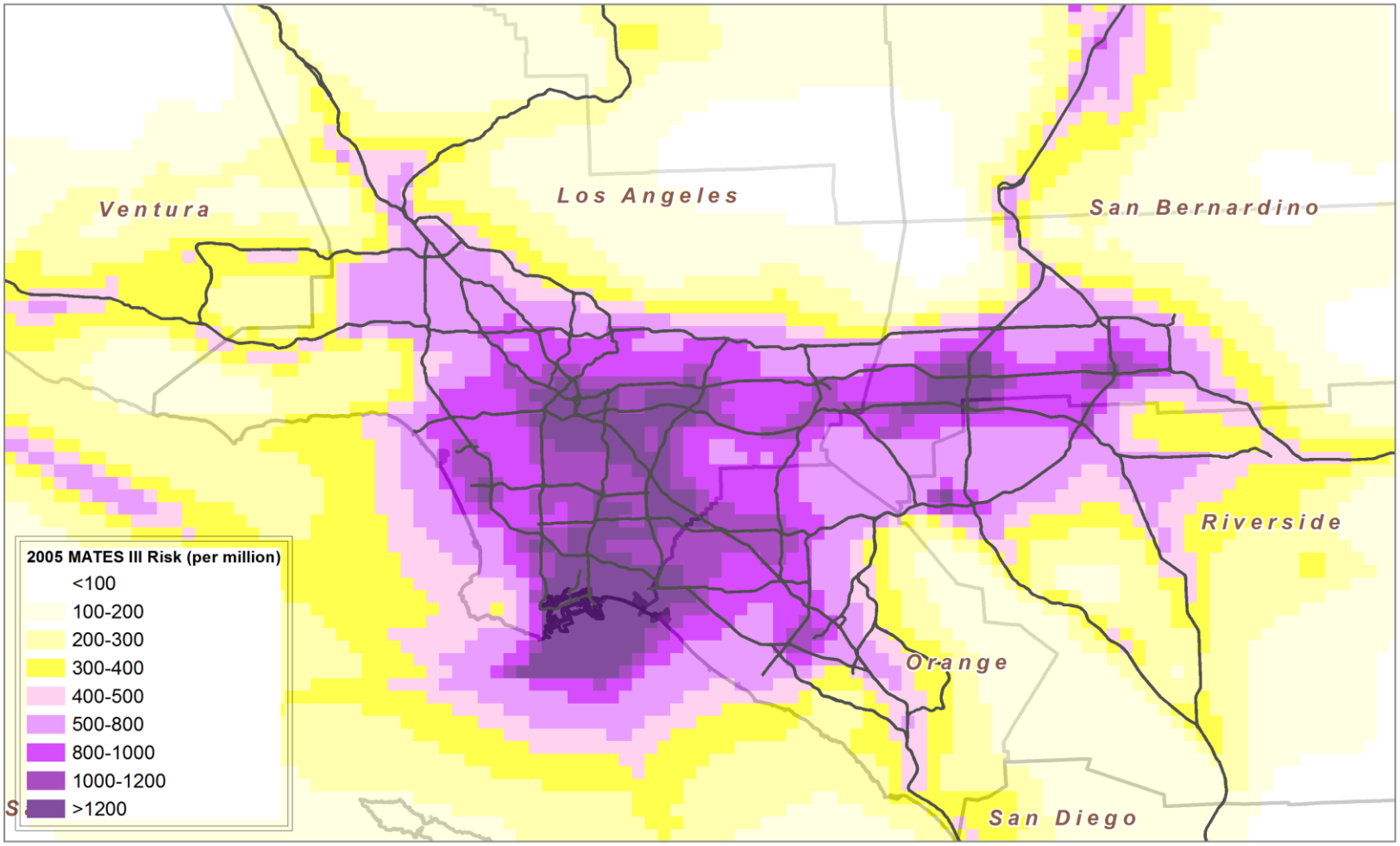
MATES IV Inventory-Based Risk Reductions

(potency weighted)

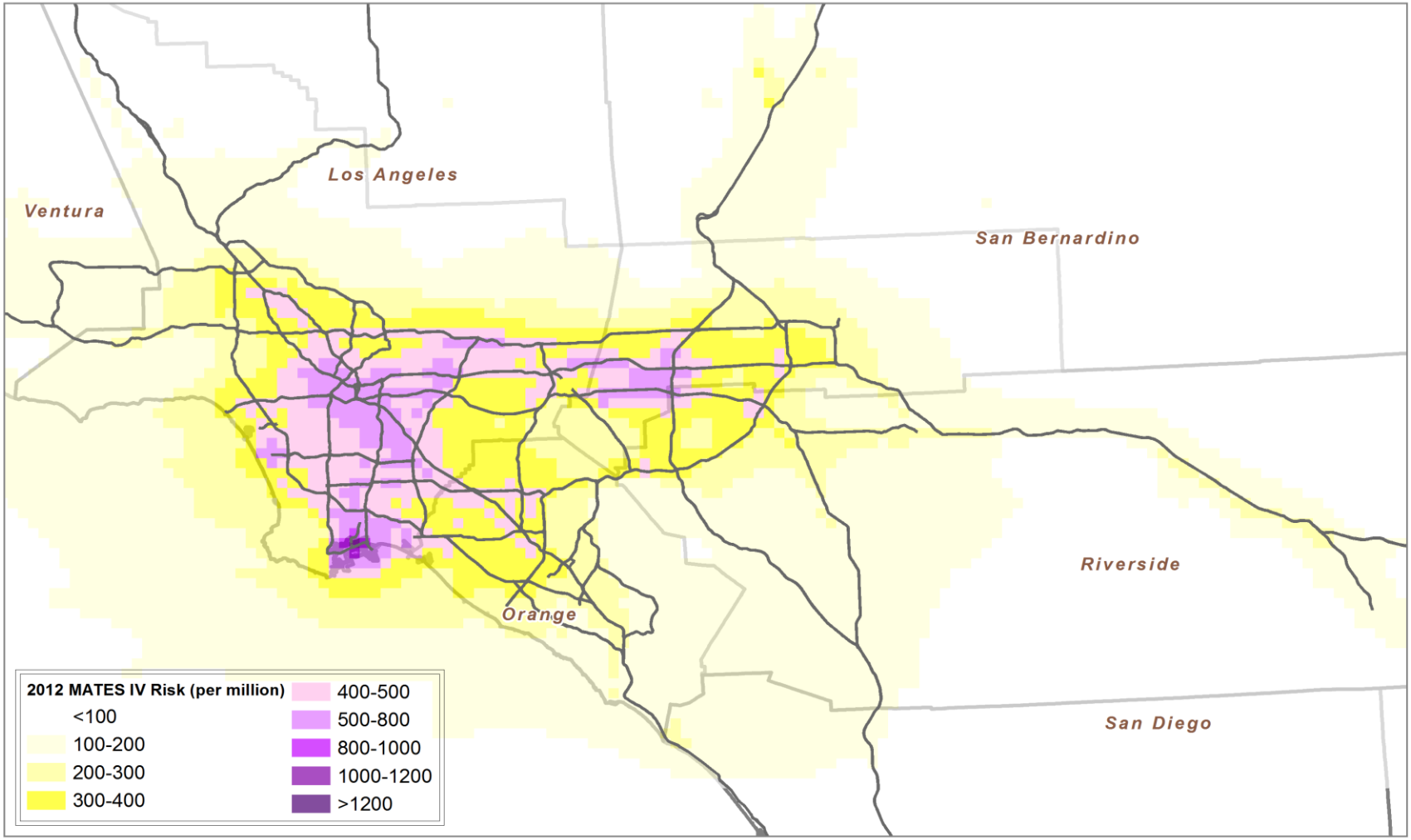


Category	Change from MATES III (%)	Change from MATES II (%)
Area	-77.5	-87.0
Point	-20.8	-72.8
Off-road	-73.5	-73.2
On-road	-49.4	-55.7

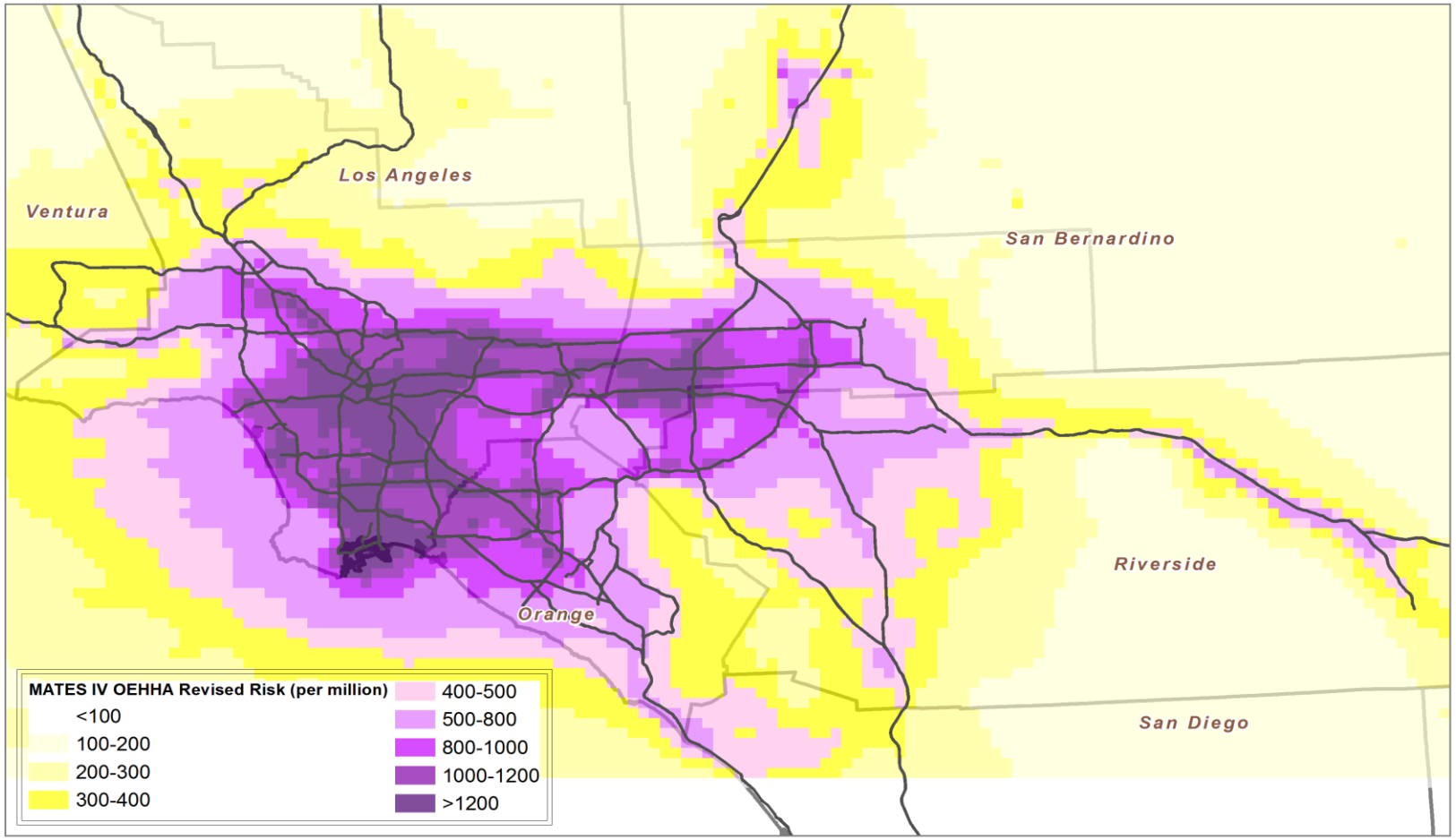
MATES III Modeled Air Toxics Risk



MATES IV Modeled Air Toxics Risk



MATES IV Modeled Risk with Proposed OEHHA Methodology



Inhalation Risks go up by factor of about 2.7

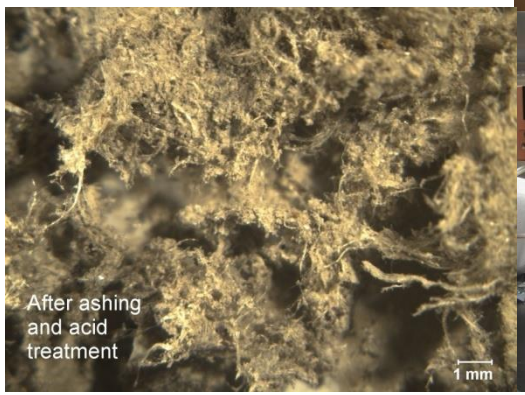
SCAQMD EMERGENCY RESPONSE PROGRAM

Incident Response

- Established since 1985
- Activation:
  - Notification from Cal Emergency Management Agency, Cal EPA, Local Emergency Response Agencies (Fire Departments / CHP)
  - SCAQMD Management in response to significant incidents
    - Air quality complaints
    - Facility or Media Reports
- Provides specialized technical sup within the Incident Command Syst
  - Air quality sampling and analysis
  - Facility Information
  - Air Pollution Modeling support

Short Term Response: Grab Samples

- Capture representative samples (solid, liquid, gas) at perimeter and potentially impacted communities
- Return to laboratory for chemical analysis
  - VOCs - Summa Canisters
  - PM – Bulk Container
  - Metals –Bulk Samples
  - Speciated Sulfur –Tedlar Bags
  - Microscopy - Plates



Short Term Response: Continuous Perimeter Monitoring

- Fills gaps in air monitoring network / locations potentially impacted by events
- Real time or near real time VOC, PM and H2S measurements
- GPS/Mapping/ Communication Capability
- Variety of Technologies
  - GC/MS, FLIR, TVA, H2S Analyzer, Xray , Aethalometer, Condensation Particle Counter, Dustrak, eBAM

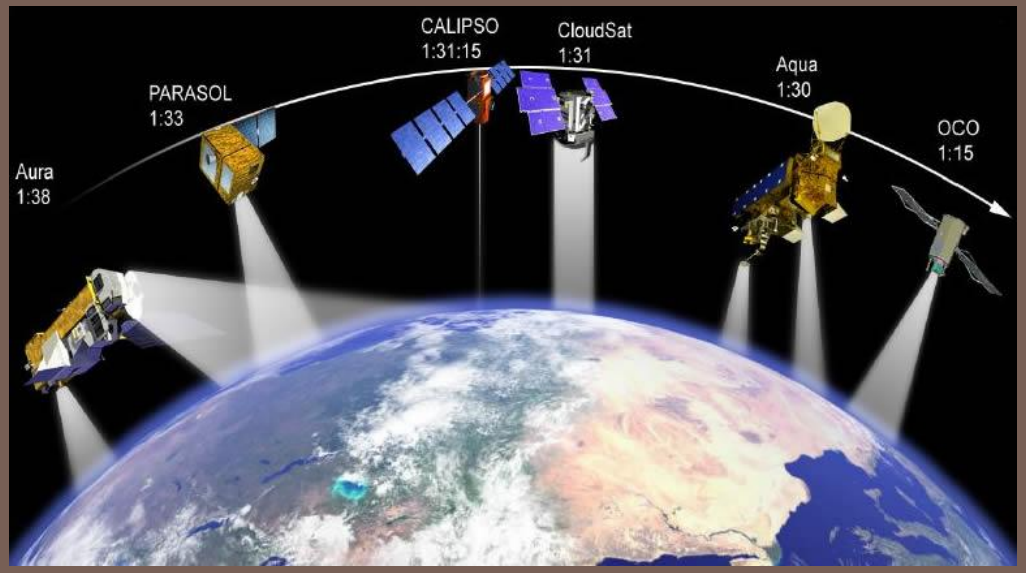
Portable GC/MS

H2S Monitor

eBAM

Longer Term Response: Mobile Platforms

- Rack mountable devices
- Real time monitoring of particulate and gaseous pollutants, air toxics, and total non-methane organics
- When measurements reach a certain threshold concentration, canister sample collected for subsequent laboratory analysis



South Coast AQMD

UPCOMING NEW TECHNOLOGIES

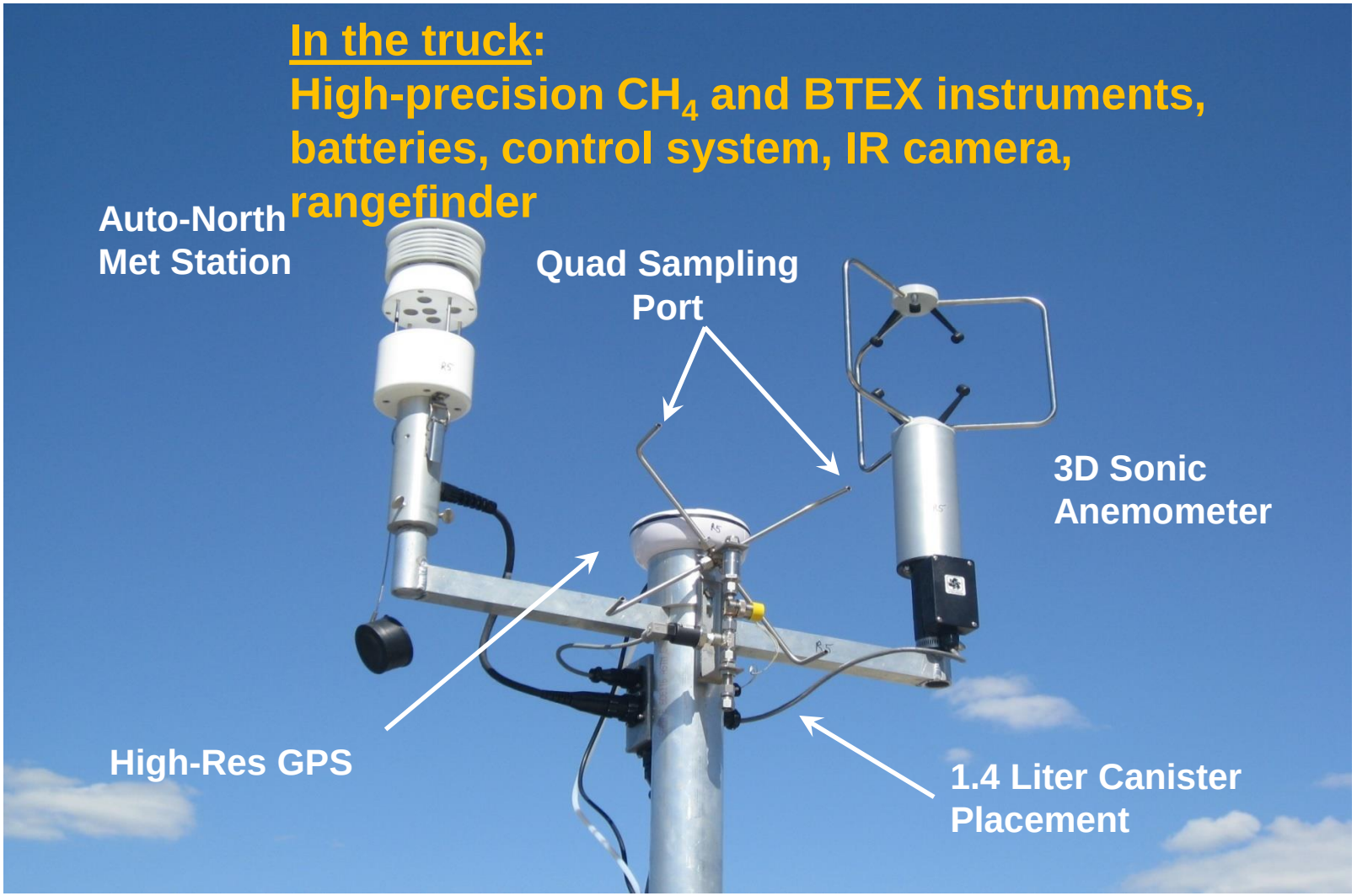
Geospatial Measurement of Air Pollution (GMAP)

U.S. EPA
National Enforcement Investigation Center (NEIC)

GMAP Vehicle

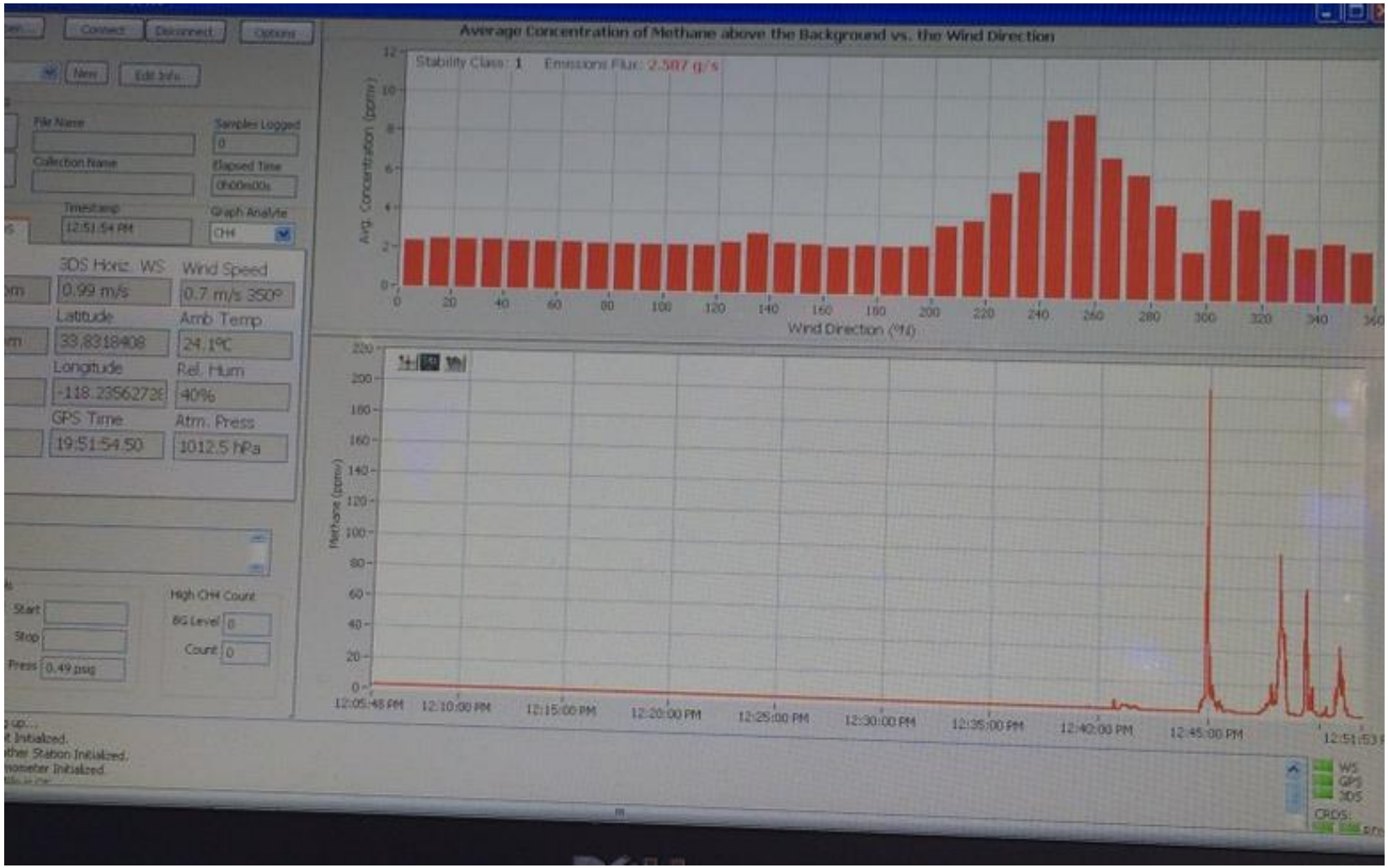
- Utilizes a vehicle equipped with measurement technology to:
  - Identify sources of air pollution from a distance
  - Quantify the observed emissions (modeled rates)
  - Map/visualize the results

GMAP REQ Measurement Equipment



GMAP – Benzene at a Tank Farm

GMAP – Methane at an LNG Fueling Station

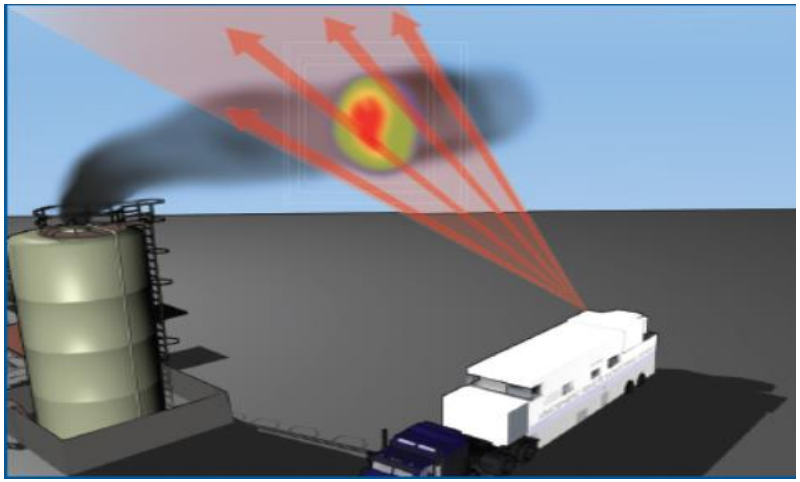


Upcoming New Technologies: Optical Remote Sensing

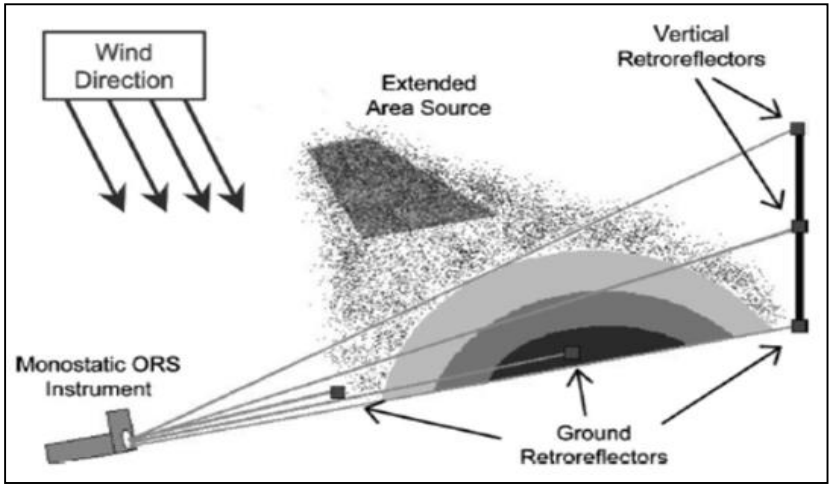
- Upcoming SCAQMD projects using optical remote sensing (ORS) methods to characterize/quantify fugitive and stack emissions from large refineries, small point sources, and marine vessels($1.1 million)

Solar Occultation Flux

Differential Absorption Lidar



Fourier transform infrared spectroscopy



Upcoming New Technologies: Optical Remote Sensing

- Multiple incident response applications, including: flare emissions characterization, leak detection, community alert, wildfire measurements, and more




Low Cost Air Pollution Sensors

- Potential to augment current ambient air monitoring capabilities that mostly rely on more sophisticated and expensive methods
- Advantages
  - Low Cost
  - Portability
  - Real-time
  - Increased spatial resolution
- Challenges
  - Accuracy, precision, uncertainty
  - Calibration / Resolution
  - Comparability
  - Data interpretation/analysis
  - Overall data quality

VS

Air Quality Sensor Performance Evaluation Center (AQ-SPEC)

- Main Goals & Objectives
  - Characterize sensor performance (i.e. field and lab testing)
  - Provide guidance and clarity for ever-evolving sensor technology and data interpretation
  - Catalyze successful evolution and use of sensor technology
  - Minimize confusion
- SCAQMD funded $852,000
- Sensor Selection Criteria
  - Potential near-term use
  - Real or near real time
  - Criteria pollutants and air toxics
  - Turnkey products first
  - Price range:
    - < ~$2,000 (purchase)
    - > ~$2,000 (lease/borrow)

Landtec (multi-gas)

Aeroqual (Ozone)

Shinyei ($PM_{2.5}$)

RTI (prototype)

Dylos ($PM_{2.5}$)

SmartCitizens (multi-gas)

Upcoming Electric Response Vehicle

- Quick response, non polluting (e.g. electric) mobile platform
- Mobile (on- and off-road) measurements of particle and gaseous pollutants
- Near real time instrumentation:
  - Federal Equivalent Methods
  - Air quality sensors (AQ-SPEC approved)
  - GPS and Met Data

Example of on-road PM measurements