BOARD MEETING DATE: June 2, 2023 AGENDA NO. 28

PROPOSAL: Presentation on Monitoring and Analysis Tools for Measuring Air Pollution and Virtual Laboratory Tour

SYNOPSIS: Staff will provide a presentation on current Monitoring and Analysis tools and capabilities to measure air quality in the South Coast Air Basin, including advanced methods for identifying air pollution sources and characterizing their emissions. The presentation will be followed by a virtual tour of South Coast AQMD Laboratory highlighting some of the essential work to support the air monitoring network, regulatory compliance, special investigations, and environmental justice community air monitoring efforts.

COMMITTEE: No Committee Review

Please click here to view the Virtual Laboratory Tour.

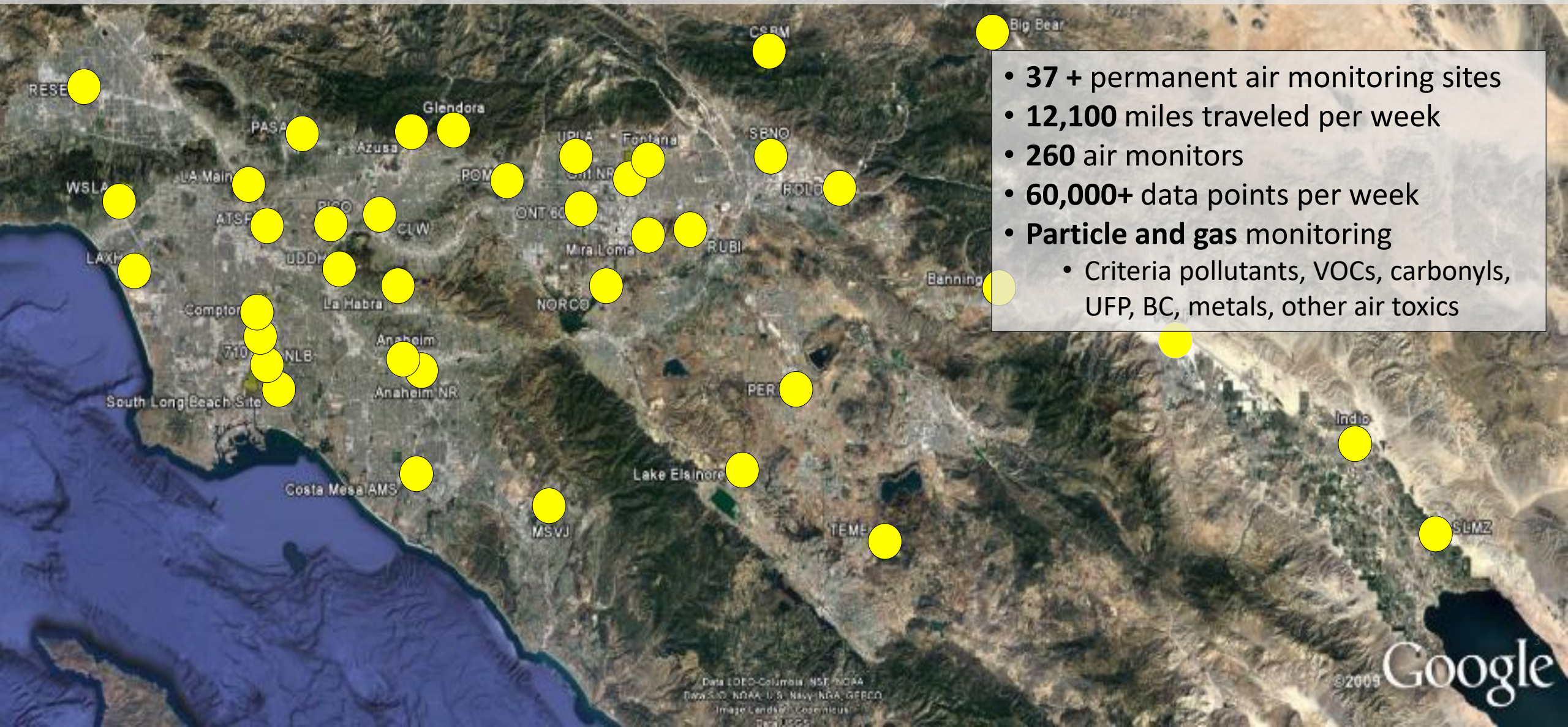
Monitoring and Analysis Tools for Measuring Air Pollution

Board Meeting
June 2, 2023

Background

- South Coast AQMD's Monitoring and Analysis Division:
  - Operates and maintains the largest air monitoring network in the nation to satisfy state and federal program requirements
  - Conducts community and episodic air monitoring to address specific concerns
  - Provides air measurement information to the public
  - Provides technical support for rule development, permit processing, compliance and community capacity building

South Coast AQMD Air Monitoring Network



- **37 +** permanent air monitoring sites
- **12,100** miles traveled per week
- **260** air monitors
- **60,000+** data points per week
- **Particle and gas** monitoring
  - Criteria pollutants, VOCs, carbonyls, UFP, BC, metals, other air toxics

Major Federal Air Monitoring Programs

Criteria Pollutants

- Ozone – 29 monitors
- Carbon Monoxide – 23 monitors
- Nitrogen Dioxide – 27 monitors
- Sulfur Dioxide – 4 monitors
- PM10 – 22 monitors
- PM2.5 – 27 monitors
- Lead (Pb) – 11 monitors

Collaborative Efforts

- Federal Program - 32 monitors
- RadNet – 2 monitors
- Chemical Speciation Network (CSN) – 2 monitors

PAMS

- Photochemical Assessment Monitoring Stations (PAMS)
- Measurement of NO2, Ozone, VOCs, carbonyls and meteorological data

NATTS

- National Air Toxics Trends Stations (NATTS)
- Measurement of 20 air toxic pollutants including carbonyls, VOCs, Metals and PAHs

Traditional Air Monitoring Techniques

Integrated Sampling

Continuous Monitoring

Air Monitoring Network

Sampling Filters and Gases

- Strengths
  - Very accurate, precise and reliable
  - Certified by the U.S. EPA
  - Consistent use across air monitoring networks
  - Ideal for long term monitoring
  - Produce defensible and actionable data
- Limitations
  - Appropriate siting is difficult in urban areas
  - Periodic calibration and maintenance
  - Require use of air filters, standard gases and other consumables
  - Laboratory analysis needed for filters, canister and other integrated samples

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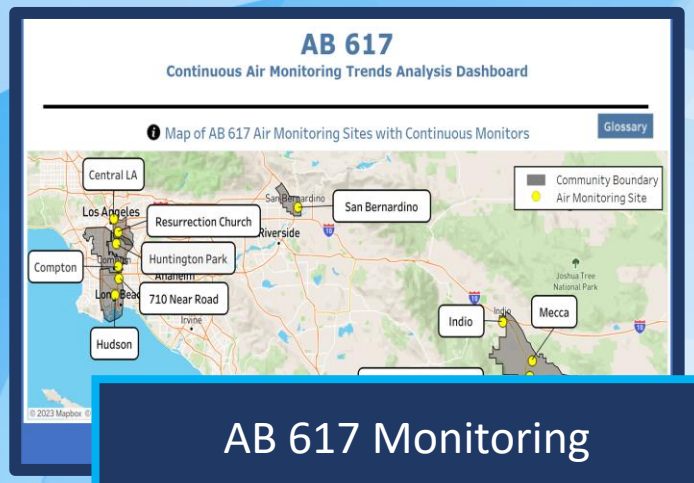
Other Key Air Monitoring Programs



AB 617 Monitoring

Special Monitoring

Incident and Wildfire Response

Refinery Fenceline Monitoring

Community Monitoring

Source Testing

Need for Advanced Air Monitoring Techniques and Strategies

Enhance earlier detection of air quality issues

Reduce overall sampling and analysis time

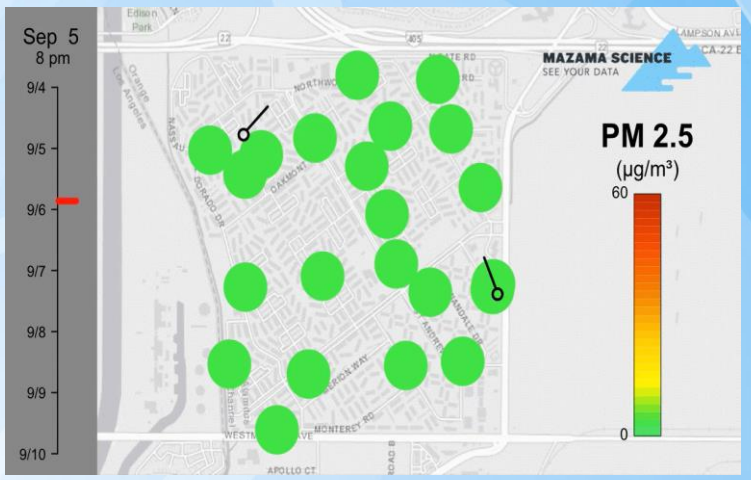
Pioneer monitoring techniques for challenging pollutants

Identify “low-cost” air monitoring approaches

Advanced Air Monitoring Techniques and Strategies

Advanced Monitoring Tools

Air Quality Sensors



Portable and Mobile Monitoring

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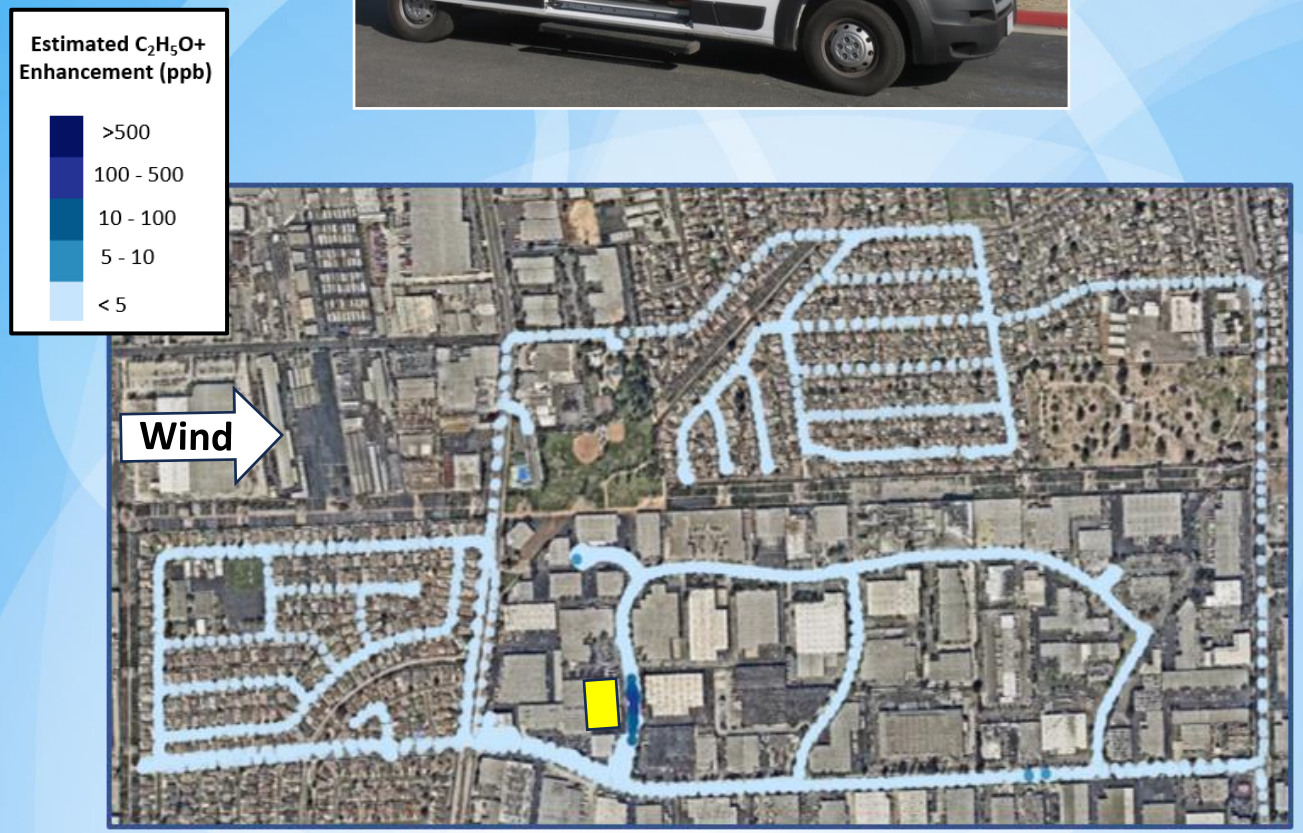
Mobile Monitoring: Strengths and Limitations



- Strengths
  - Survey large areas and locations that are difficult to access
  - Allow to quickly identify hotspots
  - No siting requirements
  - Can be deployed quickly
- Limitations
  - Instantaneous measurements
  - Must follow-up with more accurate monitoring techniques
  - High capital cost
  - Require specialized personnel
  - Often using advanced and research grade instruments (no certification)

South Coast AQMD Mobile Monitoring Platforms

Diesel PM Mobile Platform

PM, PN, BC, NOx

Truck Traffic

Railyards

Multi-Metal Mobile Platform

Particulate Metals

Metal-Processing Facilities

Auto Body Shops

Optical Remote Sensing Platform

BTEX, Total Alkanes, SO_2, HCHO, CH4

Refineries

Oil Wells

PTR-MS Mobile Platform

VOCs

Sterilization Facilities

Rendering Plants

Auto Body Shops

Sensor Testing Platform

Reference Instruments

Mobile Testing of Air Quality Sensors

Mobile Monitoring For Ethylene Oxide (EtO) Investigations

Mobile Monitoring

Canister Sampling

Fixed Monitoring

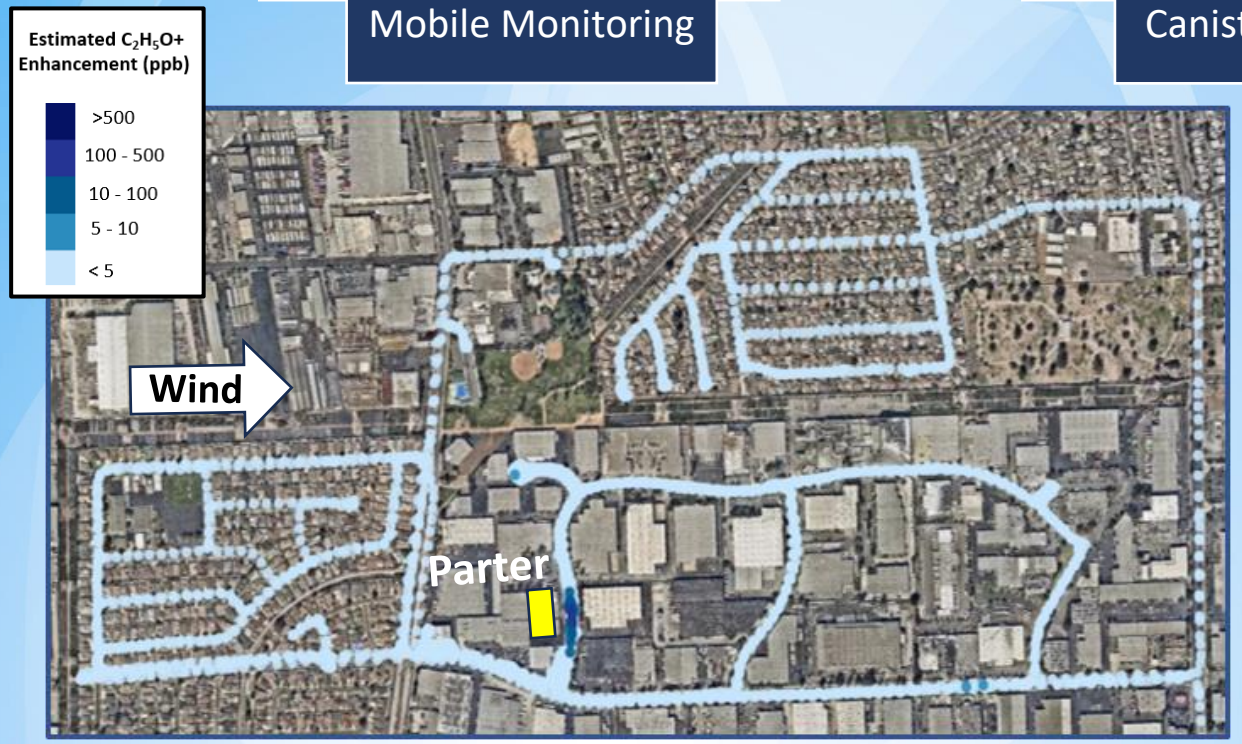
- Proton Transfer Reaction – Mass Spectrometer (PTR-MS) Mobile Platform
  - Real-time detection of Volatile Organic Compound (VOC) signals, including EtO
- If enhanced EtO-related signals are detected
  - Canister samples collected to confirm EtO with laboratory analysis
  - Based on canister sample result, can initiate fixed monitoring

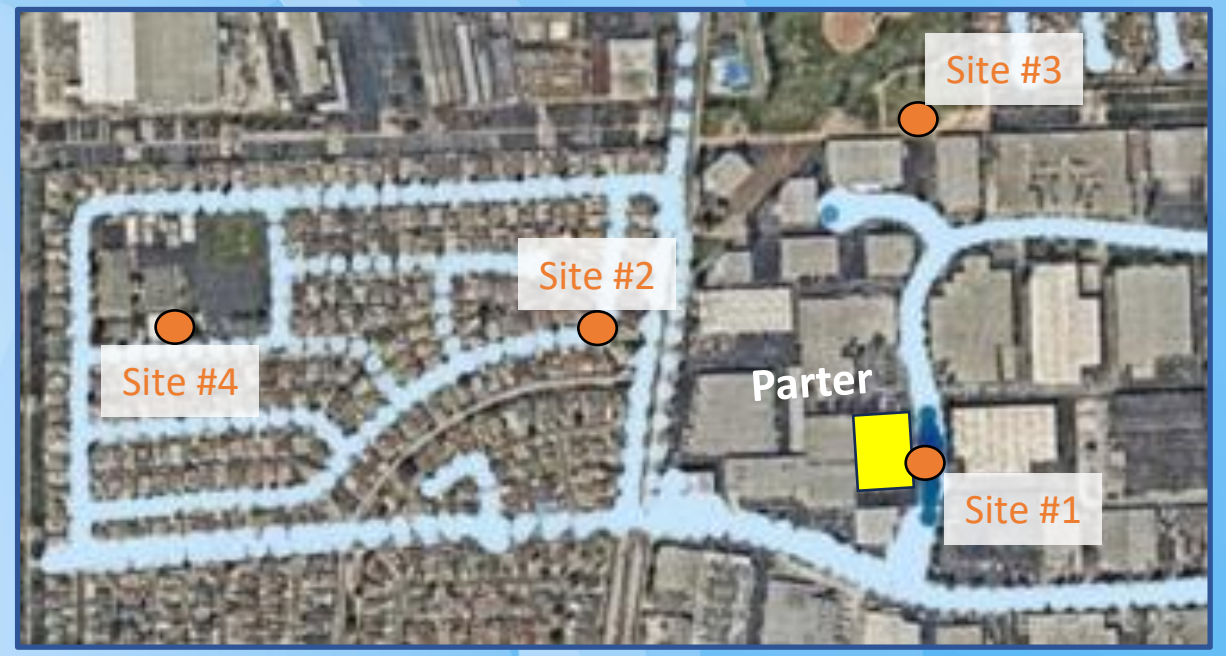
Mobile Monitoring For Ethylene Oxide (EtO) Investigations

Mobile Monitoring

Canister Sampling

Fixed Monitoring





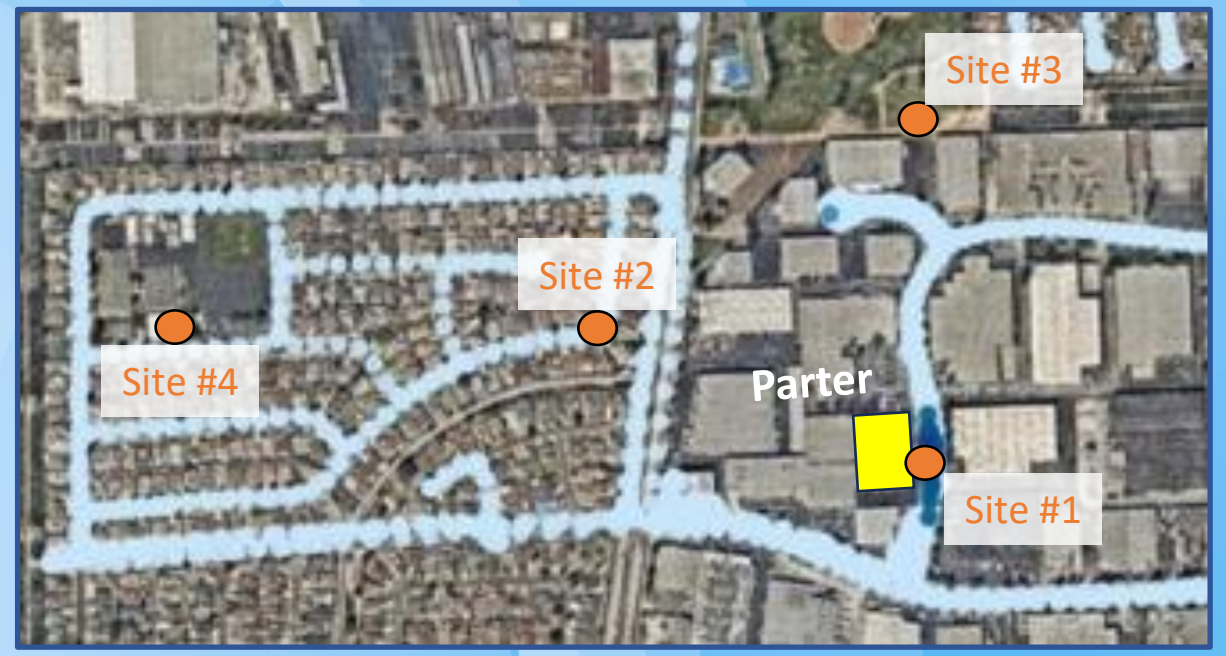
Mobile Monitoring For Ethylene Oxide (EtO) Investigations

Mobile Monitoring

Canister Sampling

Fixed Monitoring

- Fixed monitoring relies on canister sampling followed by laboratory analysis
  - Accurate, reliable but time consuming; only provides 24-hour averaged data
- Exploring the use of continuous EtO monitors
  - Minutes to hourly data but higher detection limit and uncertainty; not an approved method



Mobile Monitoring At And Near Oil Wells (AB 617)

Mobile Monitoring

FLIR Camera

Fixed Monitoring

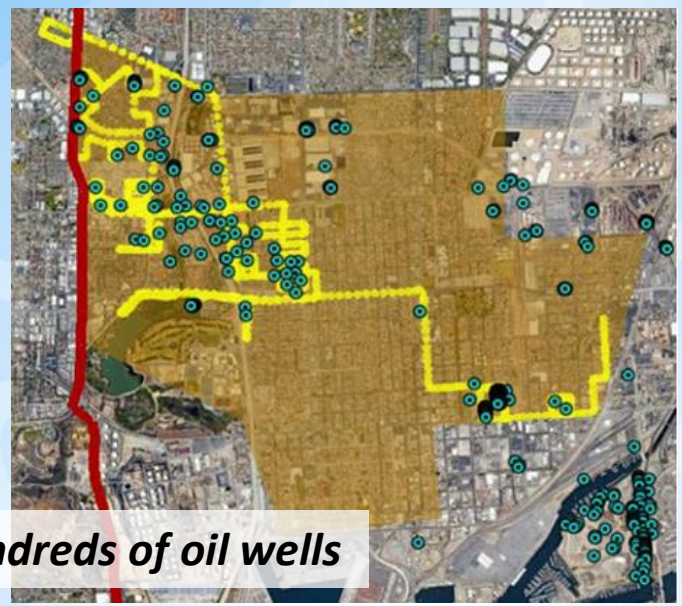
- Optical Remote Sensing (ORS) Mobile Platform
  - Real-time detection of Benzene, Toluene, Ethylbenzene, Xylenes (BTEX) and other VOCs
- If enhanced BTEX or VOCs are detected
  - Forward Looking InfraRed Camera (FLIR) and other portable instruments used to confirm emission(s) and identify source(s)
  - If confirmed, Compliance and Enforcement staff initiates an inspection

Mobile Monitoring At And Near Oil Wells (AB 617)

Mobile Monitoring

FLIR Camera

Fixed Monitoring



Hundreds of oil wells

Air Quality Sensor Performance Evaluation Center (AQ-SPEC)

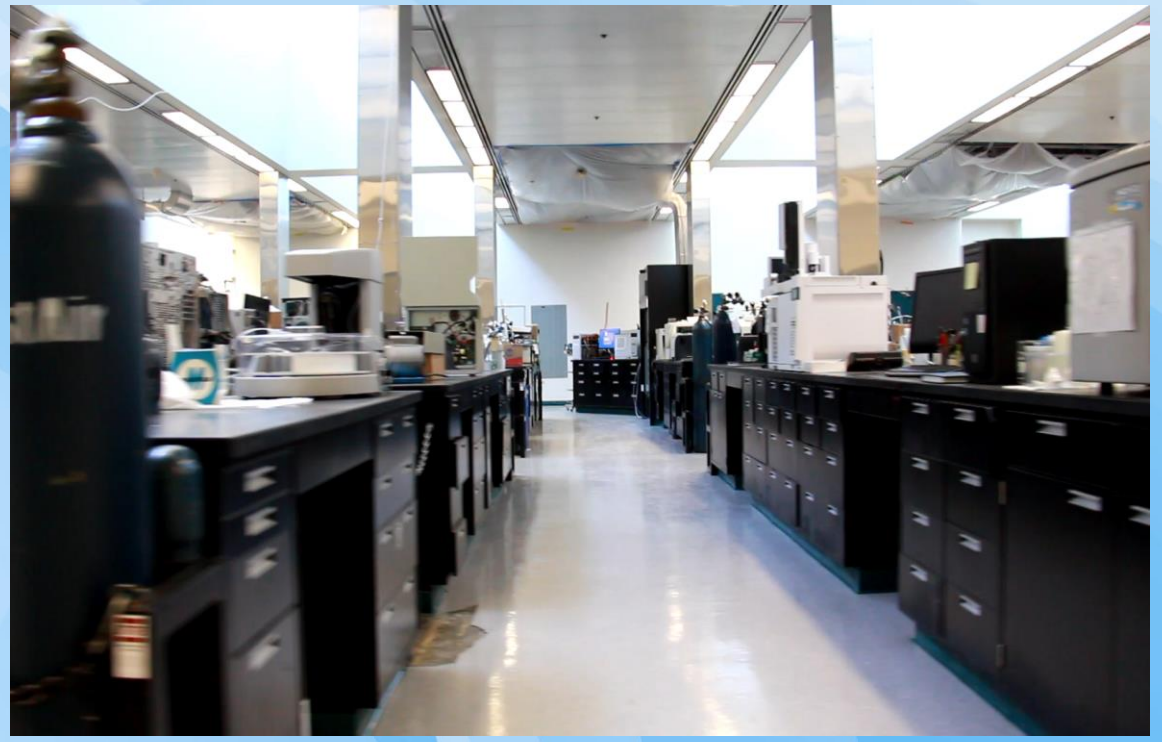
- International renowned program for field and laboratory evaluation of air quality sensors
  - **Over 210 sensors tested**
- Sensor network development and deployment in communities
  - **More than 500 sensors deployed**
- Development of educational and visualization tools
  - **Air sensor toolbox for communities**
- Upcoming sensor library program in AB 617 communities

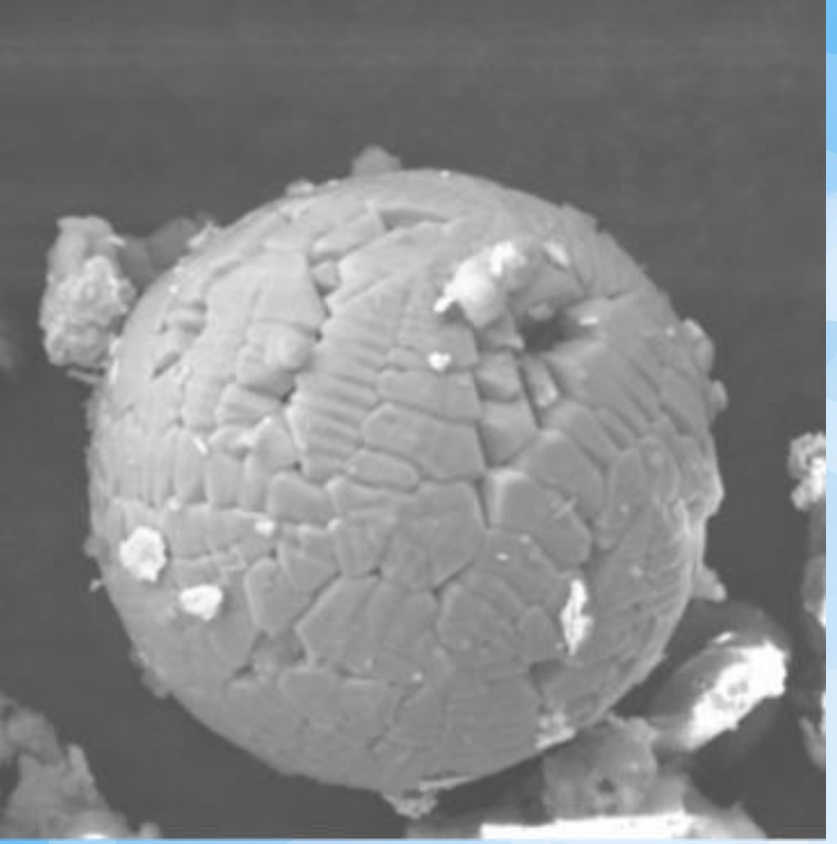
www.aqmd.gov/aq-spec

South Coast AQMD

Laboratory

- Full-scale state of the art laboratory for regulatory sample analysis
  - ~ 10,000 VOC samples
  - ~ 1,200 microscopy/asbestos
  - ~ 1,000 compliance samples
  - Over 12,000 particulate filters
- Audited by U.S. EPA & CARB
- Annual accreditation by National Voluntary Laboratory Accreditation Program (NVLAP) for asbestos





Laboratory (cont.)

- Ambient sample analysis
  - Particulate matter (mass & speciation)
  - Gaseous (VOCs)
  - Microscopic identification of particles
  - Toxics (metals and organics)

Concluding Remarks

- South Coast AQMD is leading the nation in testing, developing and adopting hybrid approaches that leverage the strengths of traditional and modern air monitoring techniques and strategies
  - Advanced monitoring methods: great screening tool to identify emission sources faster and more efficiently
  - Integrated sampling followed by laboratory analysis: indispensable to produce defensible and actionable data
- South Coast AQMD's Laboratory represents the "Gold Standard" for measuring a wide range of criteria and air toxic pollutants