ARB Harbor Communities Monitoring Projects and Other Air Sampling in the Ports Region

Community Meeting

Jan. 10, 2007

Wilmington Senior Center

Presenters

6:15 Scott Fruin (CARB): overview of Harbor Communities Monitoring, AQMD monitoring

6:30 Akula Venkatram (UC Riverside): results from tracer gas study of pollution dispersion in Wilmington

7:00 Kathleen Kozawa (CARB/UCLA): preliminary findings from mobile platform sampling

7:20 Katharine Moore (USC): particle counter network

7:30 Eric Fujita (DRI): passive sampler network

7:40 Scott Fruin (CARB): status of other ambient sampling by AQMD and ports and summary

7: 45 Questions

Non-CARB Studies in Ports Area

- **AQMD**
  - *Ambient monitoring, 7 sites*
    - **Continuous criteria pollutants (PM, CO, NOx, etc.)**
    - **Every 3rd day: PM2.5 and PM10 elemental and organic carbon, metals, ions; speciated volatile organic compounds (VOCs)**
- **Ports of LA, LB**
  - *Ambient monitoring, 6 sites*
  - *Reduced version of AQMD monitoring w/o VOCs, w/ polycyclic aromatic hydrocarbons*
- **UCLA / UCTC Traffic Count Study**
  - *Traffic counts by vehicle type on arterial and surface streets*

CARB Planning Division Projects "LAG / ChERRP"

- **Container storage yards**

  Survey of operations and evaluation of impacts

- **Inventory enhancements and evaluation of cumulative impacts**

  Multi-media source and emissions mapping; impacts modeling in COMET, new modeling tool

- **Reduce local diesel truck emission**

  Education to community and drivers regarding idling regulations and retrofit grant programs

CARB Research Division Projects "Harbor Communities Monitoring" (HCM)

- **Electric vehicle platform with real-time instruments**
- **Passive monitor network**
- **Particle counter network**

Overall HCM Goal

To develop improved technical tools for assessing pollutant concentration variability and hot spots in California communities

Specific Goals of Combined HCM Projects and Coordination

- **Testing of low-cost passive monitors; testing of mobile monitoring approaches**

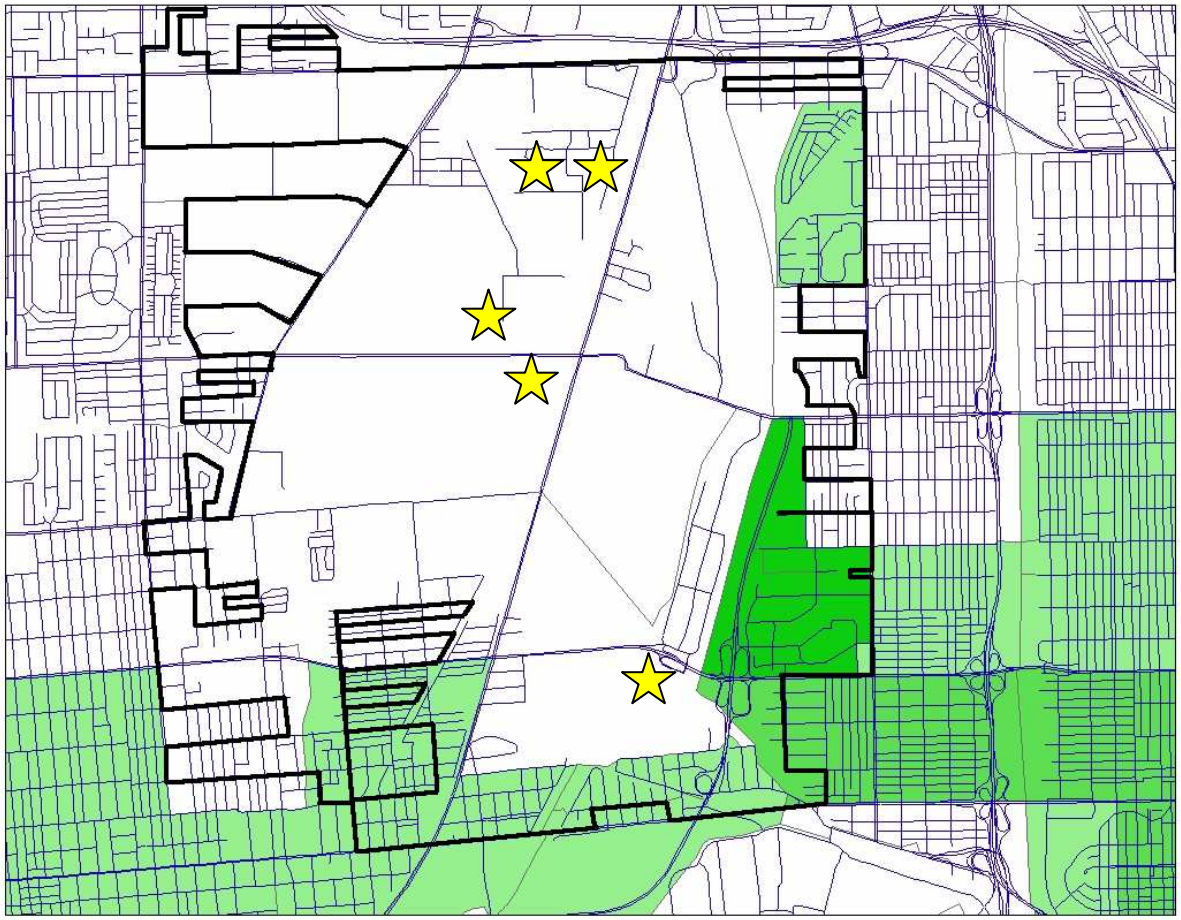
- **Determine:**
  - *The relative importance of regional sources vs local vs sources in immediate proximity, especially in areas of high concentration*
  - *What are the most important sources, and what is the area of their impact on air quality?*

Mobile Platform Monitoring

(Kathleen Kozawa, Scott Fruin, Arthur Winer)

- Can cover large areas in short time
- Can effectively measure gradients and find high concentrations

“Residential” Route 1 (~30 miles)



= Low Income Areas = Petroleum Refinery

The Passive Sampler Network: "Saturation Monitoring"

(Eric Fujita, Desert Research Institute)

Affordable samplers to "saturate" an entire neighborhood

- *Community sampling: 24 locations for four weeks each season*
- *Test to see if:*
  - **useful for community groups to test the air in their neighborhoods?**
  - **useful for providing spatial information?**

The Particle Counter Network
(Katharine Moore, Constantinos Sioutas, USC)

- **A network of 12-13 particle counters to measure ambient particle number**
  - *Particle number dominated by "ultrafine" particles (<0.1µm)*
  - *Ultrafine particles are a good indicator of combustion*
  - *Goals include determining local vs regional source contributions, weather influences, seasonal influences, etc.*

Important Dates

- **DRI Saturation Monitoring**
  - *Pilot: Aug. 2006, N. Long Beach*
  - *Main study: Feb. 2007 goal*
  - *Four seasons, 2x2 weeks*
  - *Public results late 2008*
- **Mobile Platform**
  - *Pilot: Aug. (Sacramento), Oct. (Wilmington)*
  - *Main study begins Feb. 2007*
  - *Two seasons, 4 to 6 weeks each, and two seasons concurrent with DRI*
  - *Public results mid 2008*
- **Ultrafine Network**
  - *Main study begins Feb. 2007*
  - *One year, 2x3 months in Ports area*
  - *Public results early 2008*

Wilmington Tracer Studies

Professor Akula Venkatram

20 to 30 minutes

Mobile Monitoring Platform

Kathleen Kozawa
ARB Research Division/UCLA
Dr. Scott Fruin
ARB Research Division
Professor Arthur Winer
UCLA School of Public Health

Objectives

- Use real-time instruments on a mobile platform to measure pollution concentrations with spatial and temporal resolution
- Resolve the relative importance of sources to exposure (local point sources versus traffic-generated emissions versus transported regional background pollution) for health-based Target Compounds

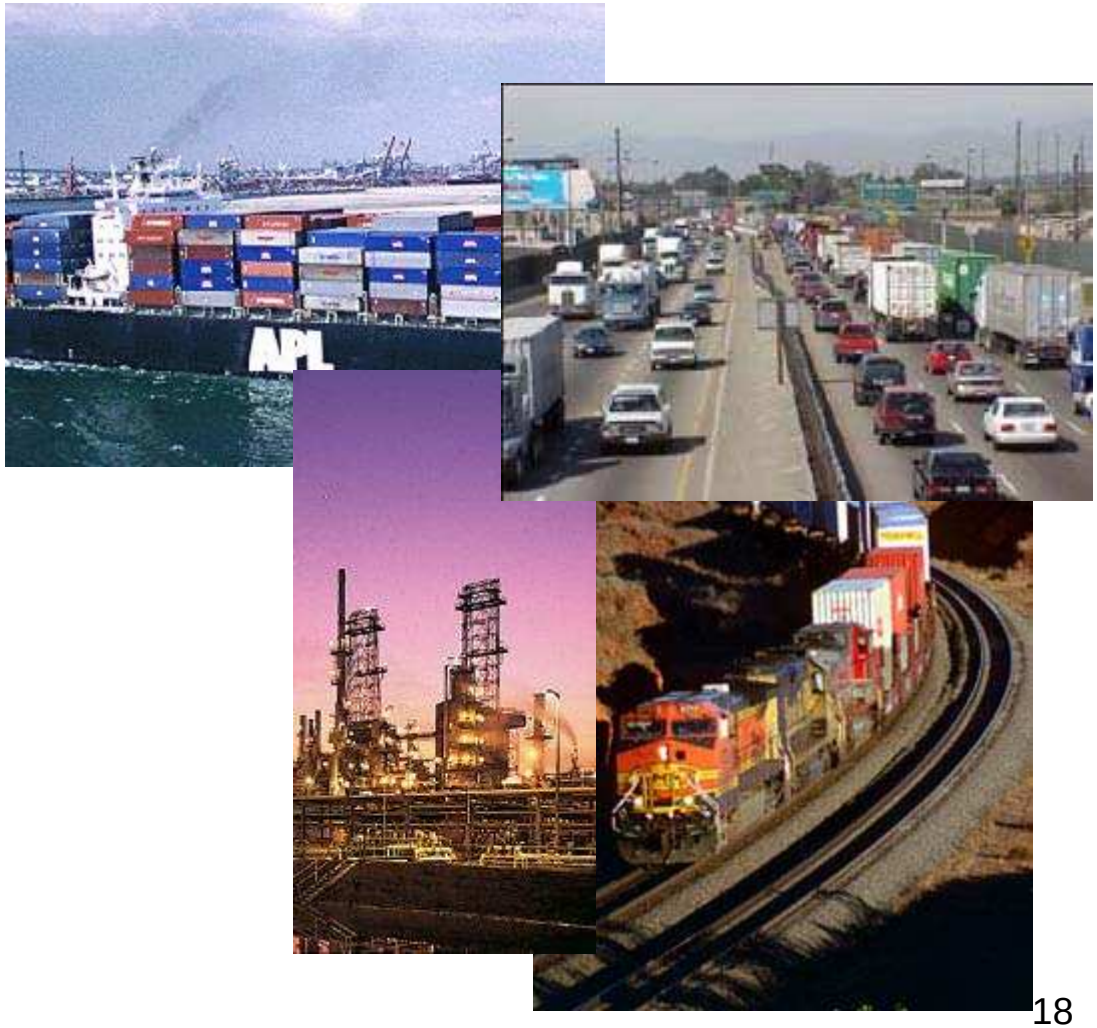
Mobile Platform

Mobile Platform

- Toyota RAV4 EV
- Measurements
  - Particle Number and Size Distribution
  - Black Carbon
  - Particle Bound Polycyclic Aromatic Hydrocarbons
  - PM2.5/PM10
  - NOx
  - CO/CO_2
  - Meteorology (wind speed and direction)
  - Total VOCs
  - Speciated VOCs (Portable GC)-*(*not available for pilot study)
  - Location (GPS-Garmin)
  - Noise measurements *(data not available for pilot study)*

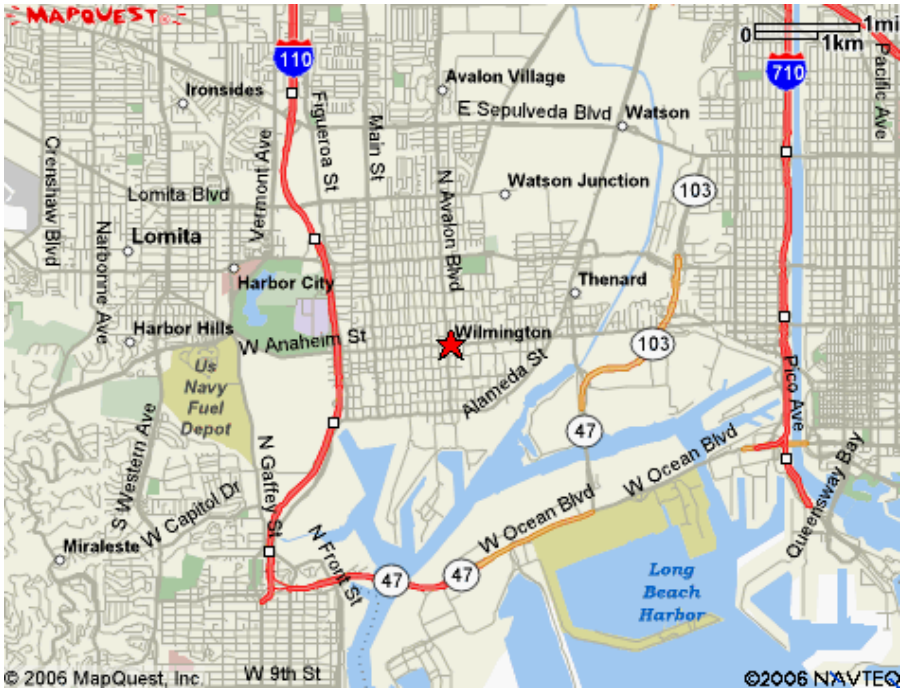
Source Basis for Sample Routes

1. Port
2. Freeway
3. Residential
4. Railyard
5. Arterial

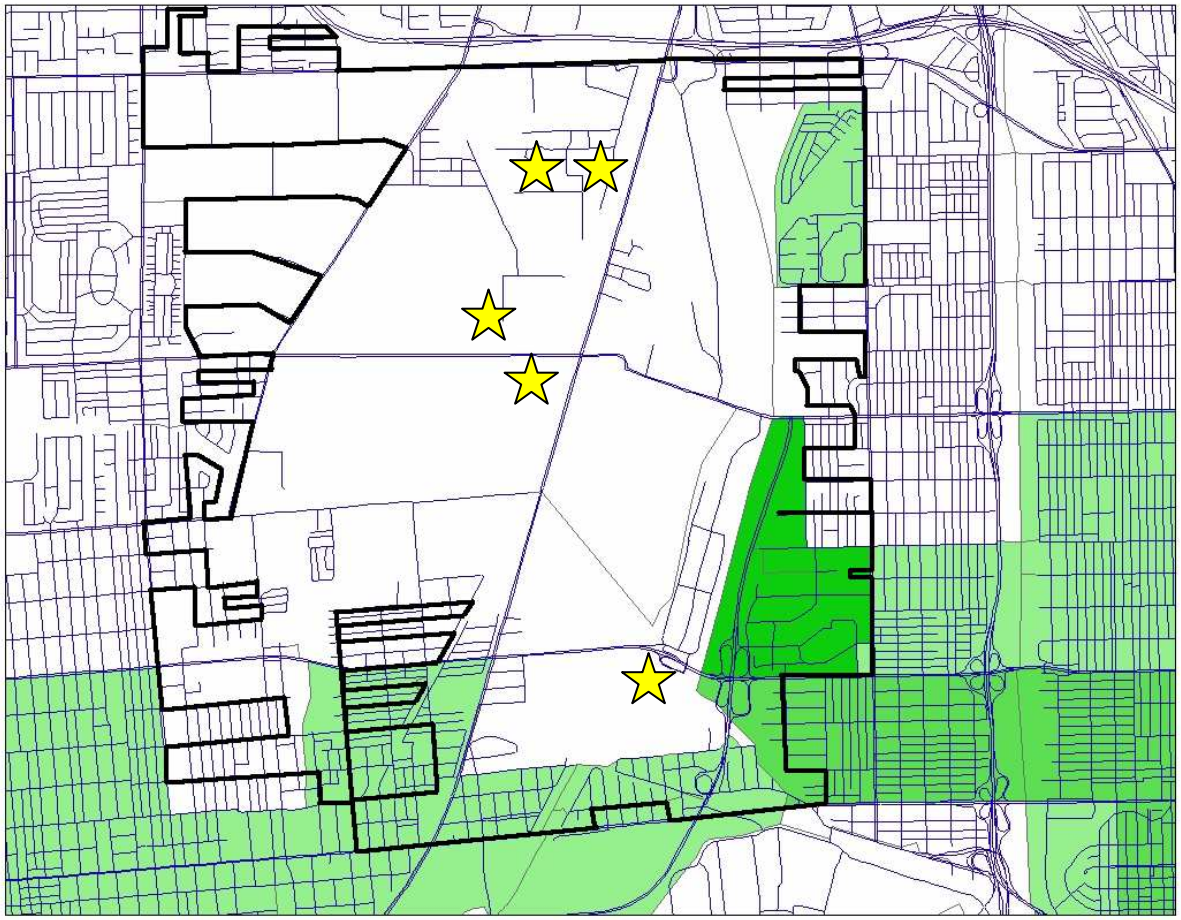


Route Selection

- Factors Considered
  - Low income neighborhoods
  - Source locations, prevailing winds
  - Impacts predicted from dispersion modeling
  - Vehicle range, road availability and access



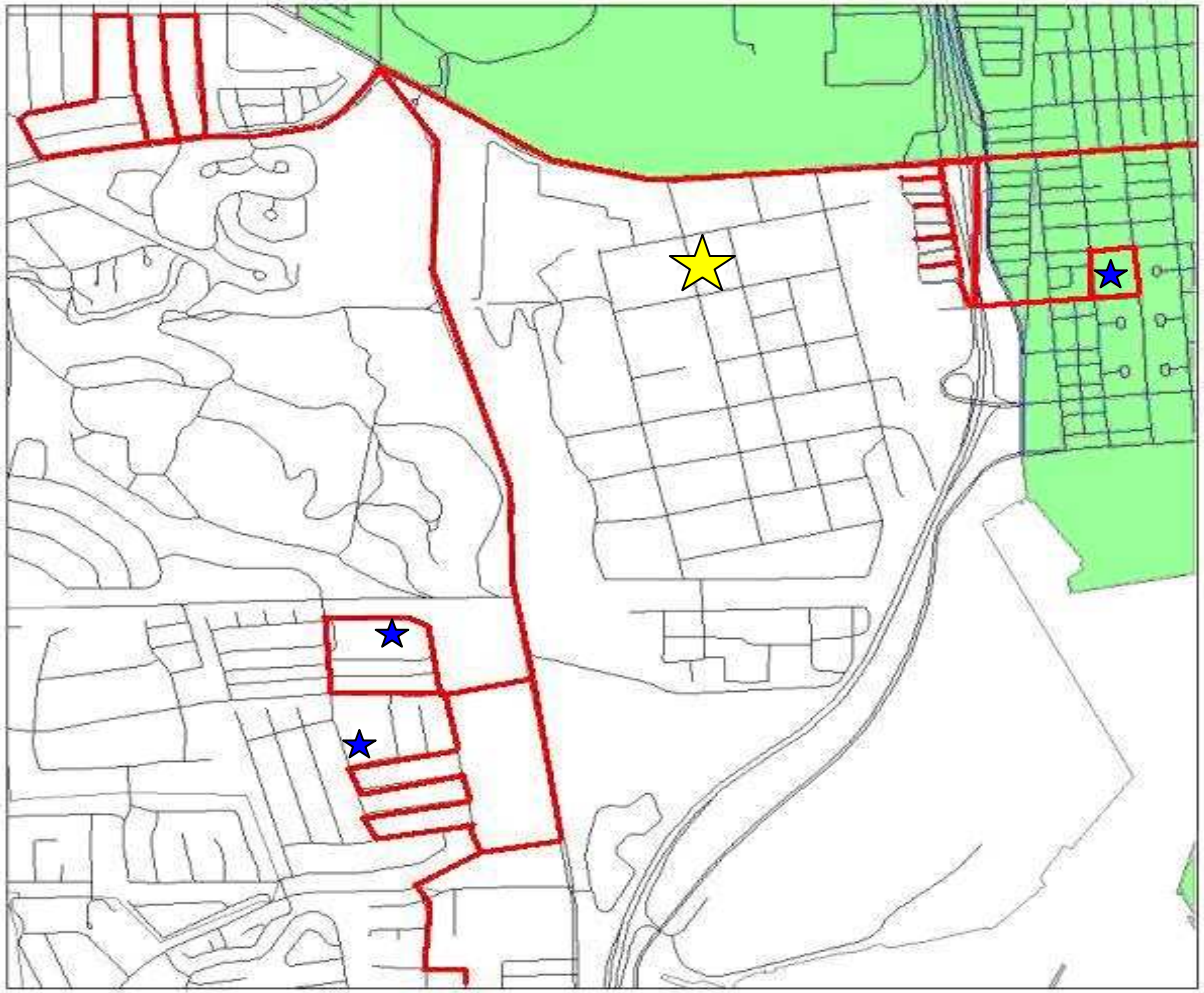
“Residential” Route 1 (~30 miles)



= Low Income Areas = Petroleum Refinery

“Residential” Route 2

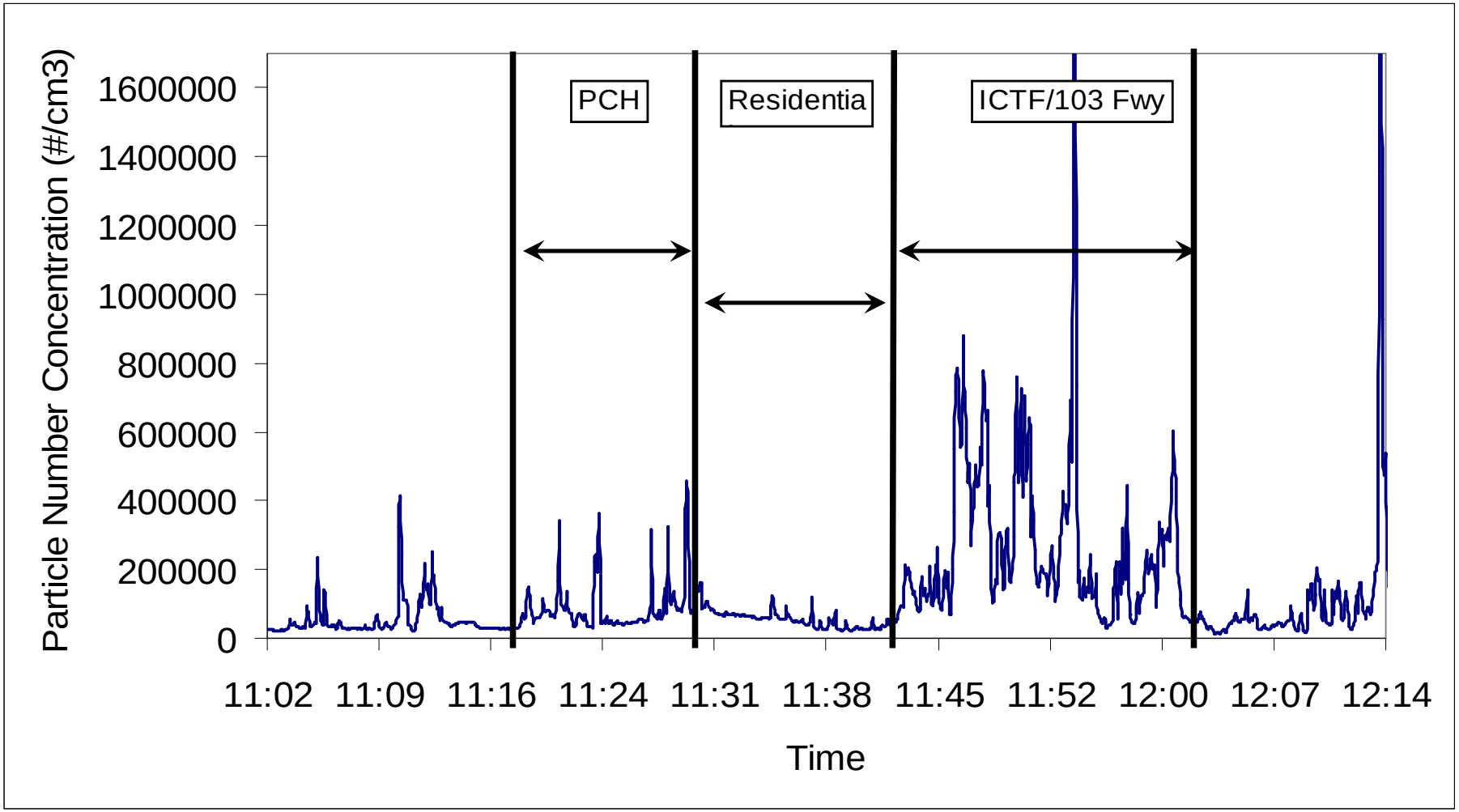
Refinery Route 2



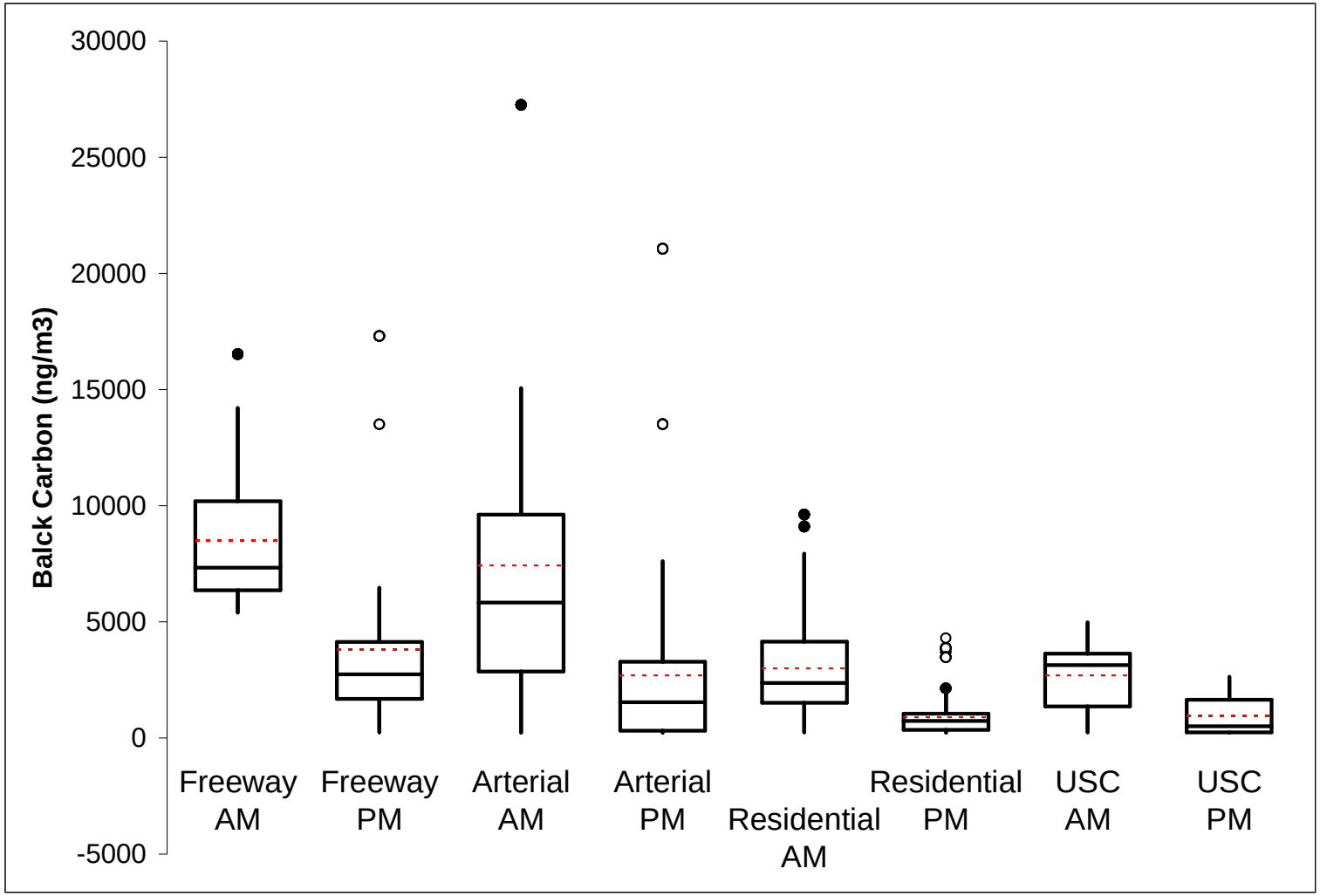
Preliminary Results

- **Elevated concentrations near vehicles**
- **Road type matters most**
- **Time of day matters (wind speed)**
- **Location matters (wind direction, etc.)**

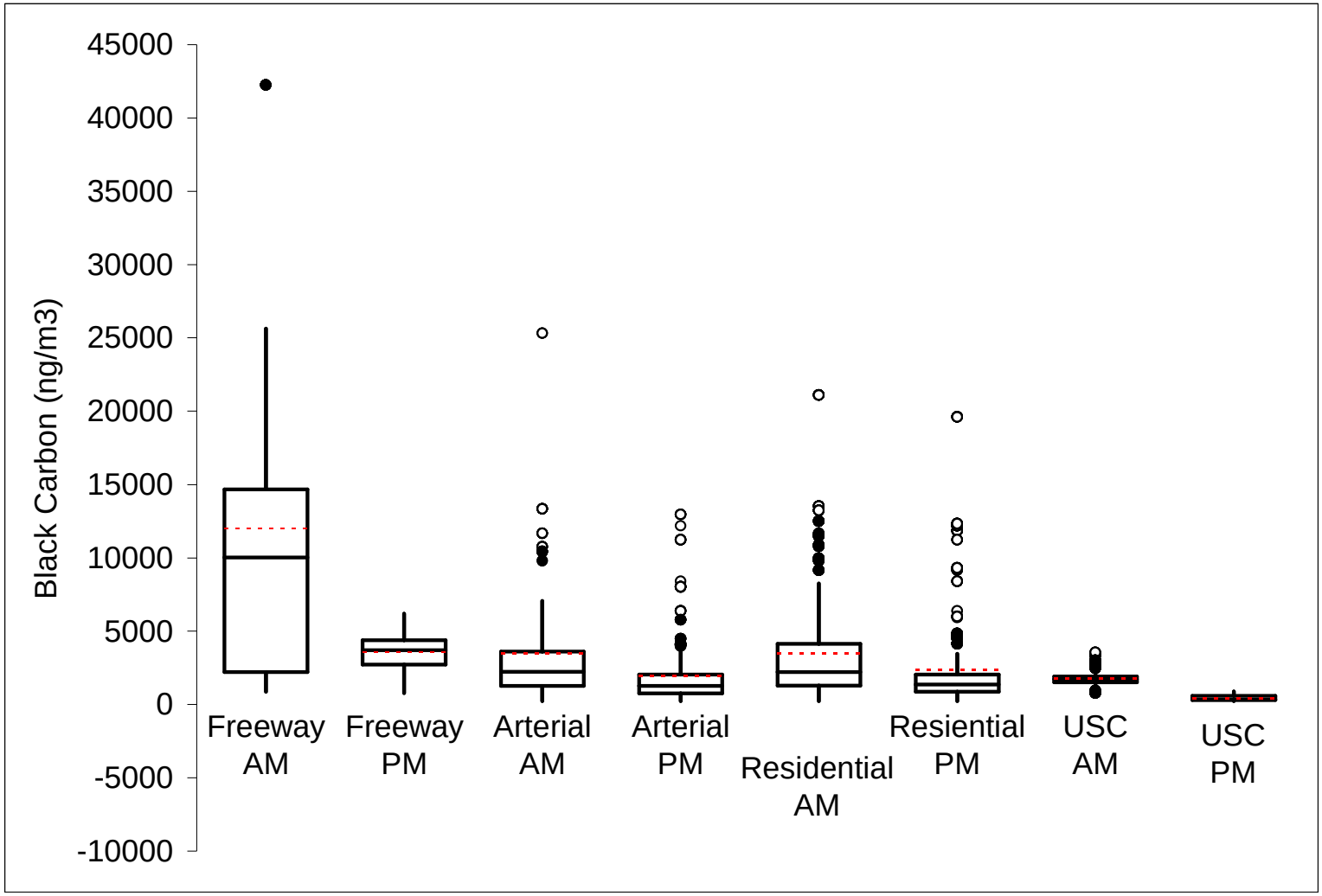
Concentrations During a Run



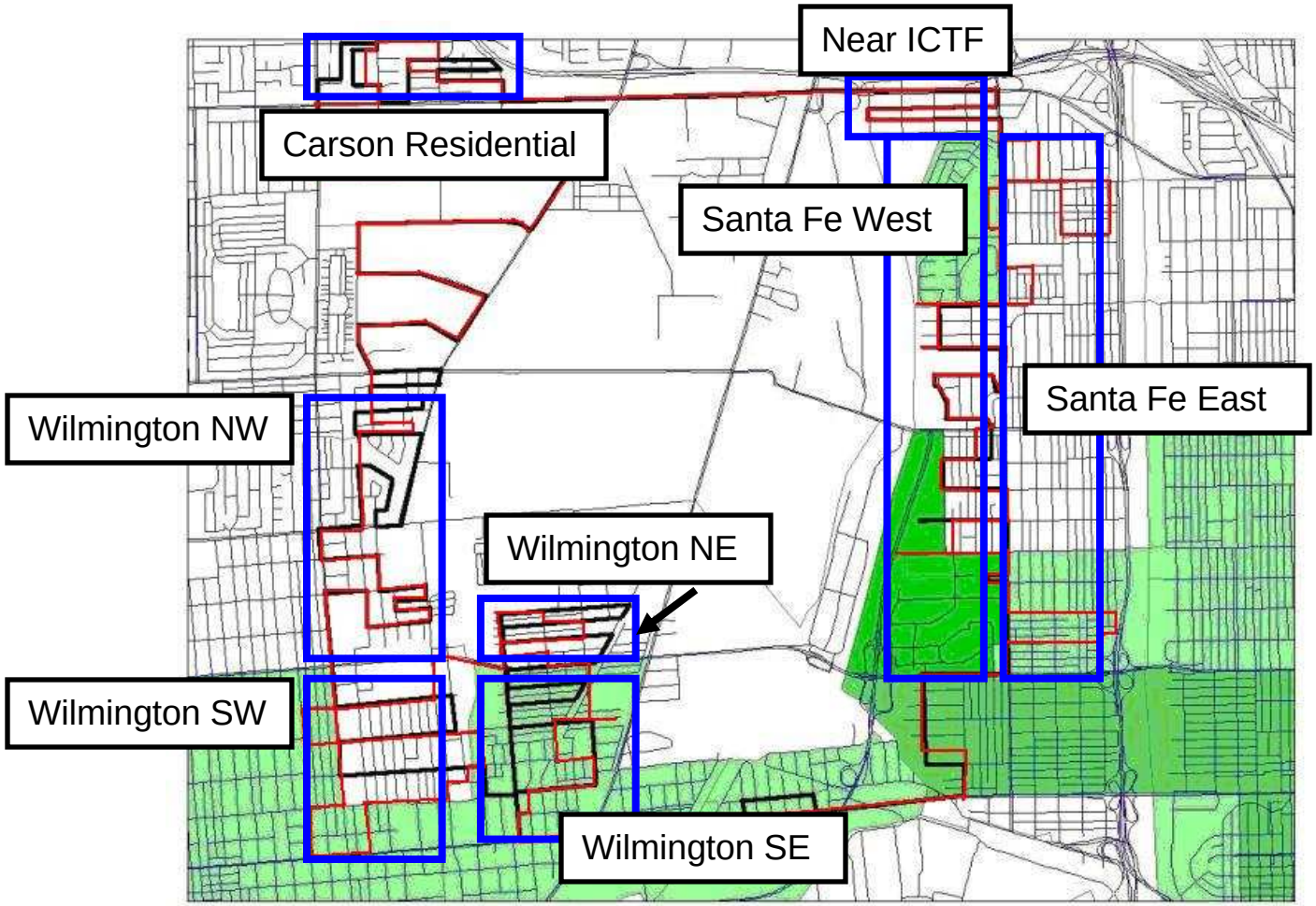
Time of Day and Road Type Sample Day: October 14



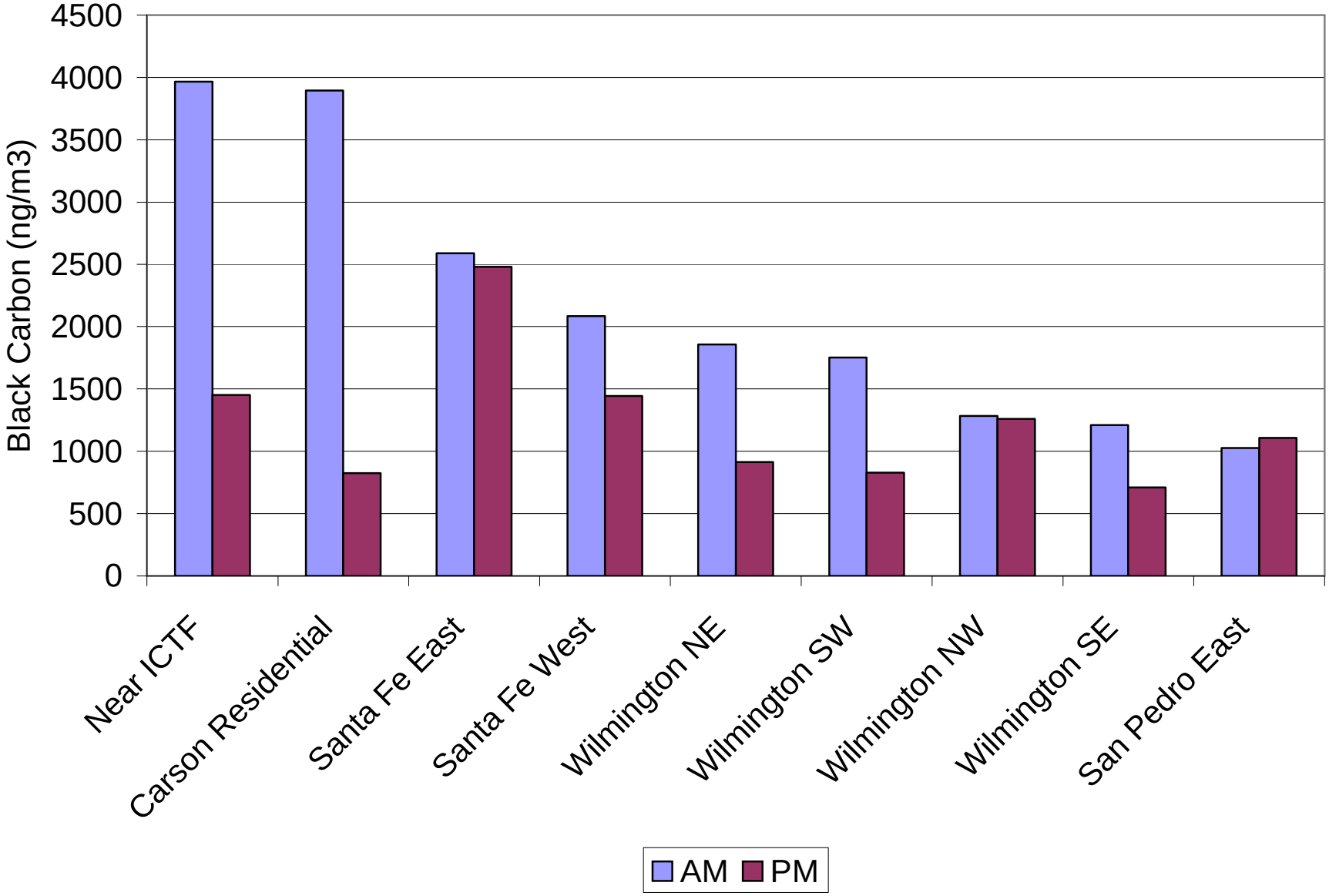
Time of Day and Road Type Sample Day: Oct. 10



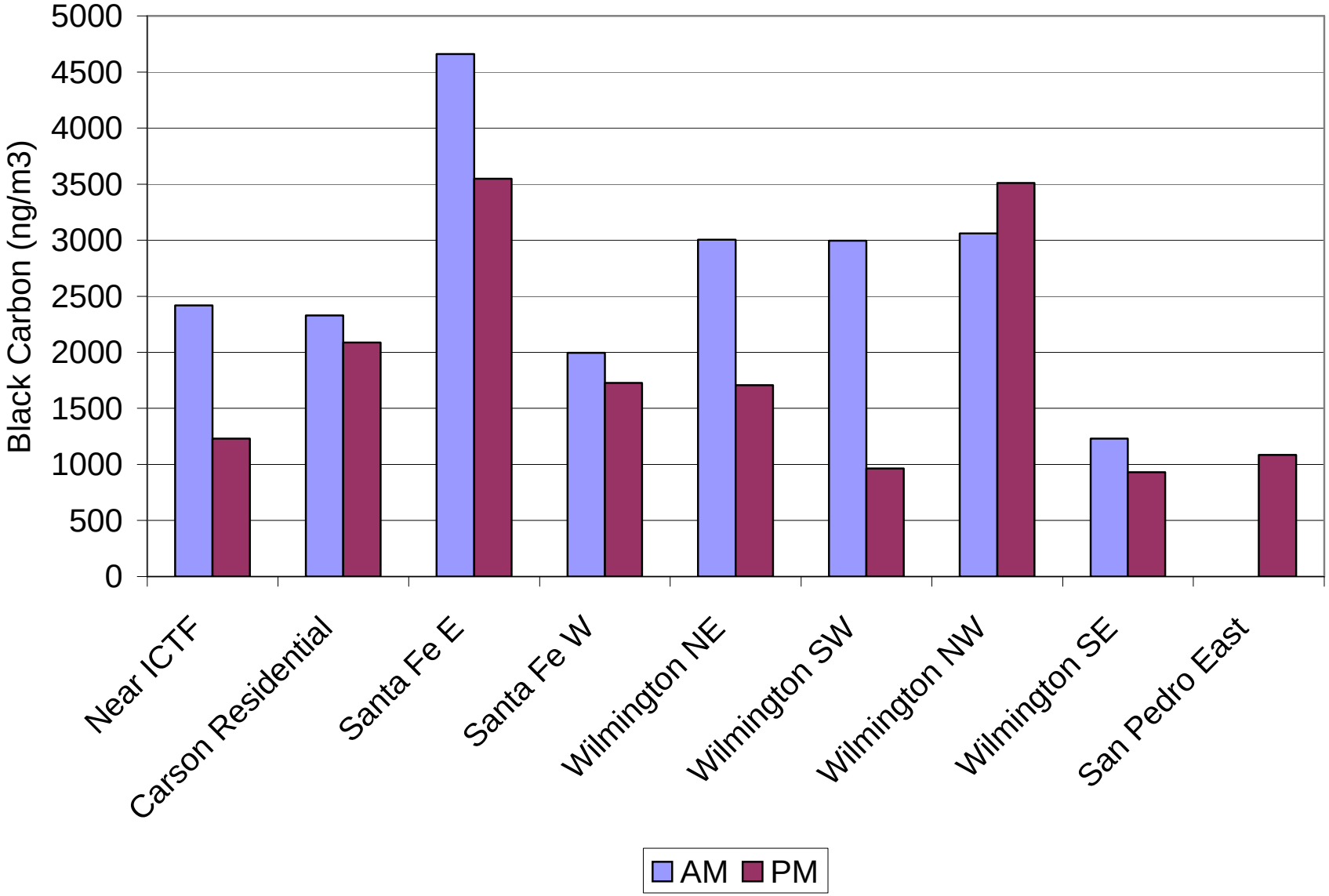
Residential 1 Route: Effect of Location



Residential Location Oct 11, 2006



Residential Location Oct 10, 2006



The Particle Counter Network

"Fine-scale Spatial and Temporal Variability in Particle Number Concentrations within Communities"

Dr. Katharine Moore

Professor Constantinos Sioutas

University of Southern California

Department of Civil and Environmental Engineering

Study Objectives

1. **Measure the ambient particle number concentrations in 2 communities**
   - *1st community – Harbor Communities Area*
     - ***San Pedro, Wilmington, West Long Beach***
     - ***Many sources***
   - *2nd community – Riverside (2008), inland "receptor" area where particles arrive from a distance*
2. **Determine regional vs. local contributions to particle number levels.**

Study Objectives

3. Examine effects of season and location (daily patterns, source vs. receptor; winter vs summer).

4. Assess the accuracy of using single central site monitoring to estimate human exposure to ultrafine particle numbers.

Overall Study Plan

- **12 - 13 CPCs (Condensation Particle Counters) inside enclosures with weather stations deployed within a community for saturation monitoring**
- **Harbor Communities Monitoring (HCM) Campaign**
  - *Winter & Summer (three months each)*
  - *Tentative start for the Winter campaign – February, 2007*

USC Equipment

Free-standing weather-proof shelter with tripod on top (for weather station)

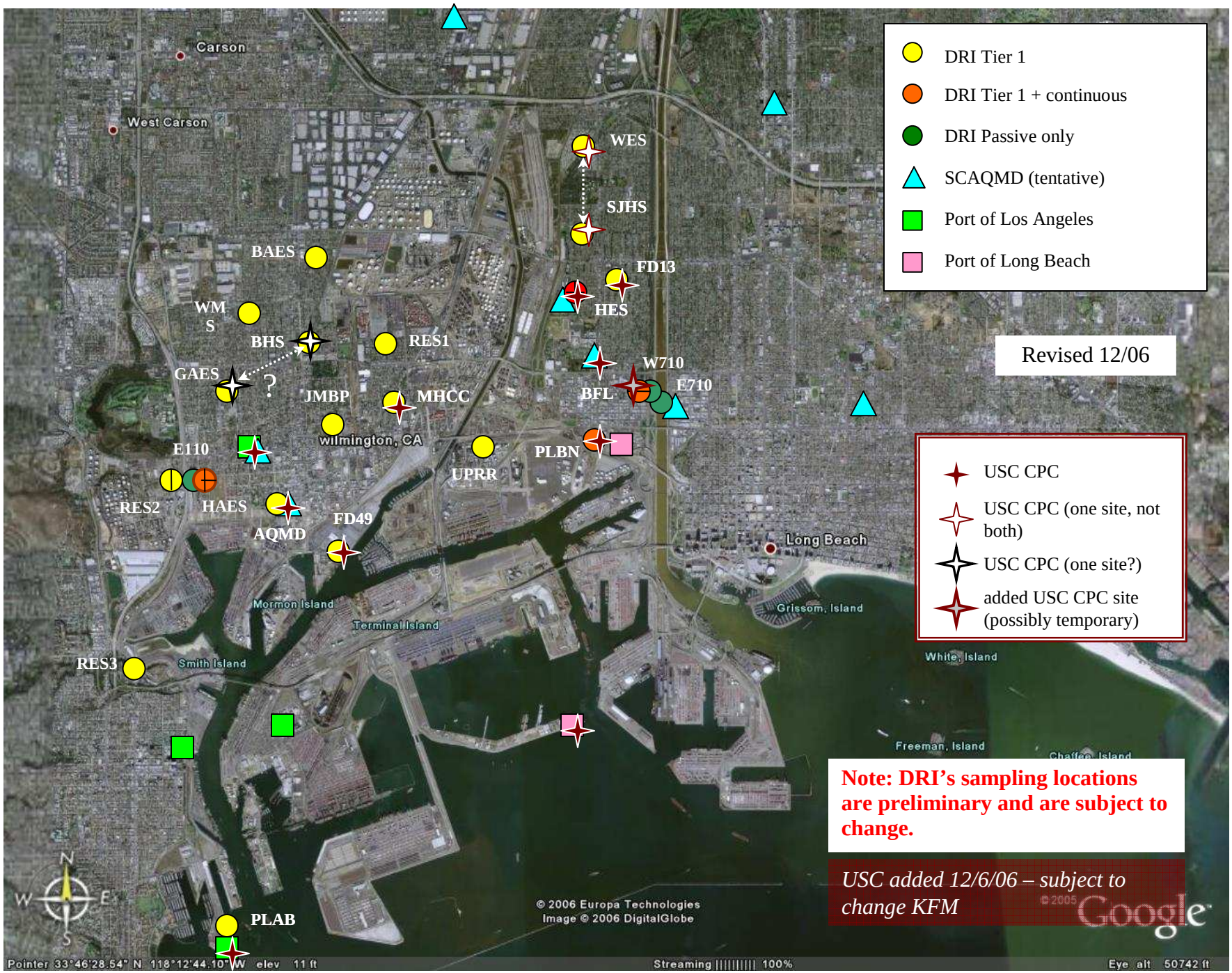
Particle counter (CPC)

Overall Study Plan

- **Coordination with other HCM projects**
  - *DRI Air Toxics*
  - *UCLA/ARB Mobile Monitoring*
- **Coordination with other Air Quality Projects in the community**
  - *SCAQMD Clean Port Air Quality Initiative*
  - *Port of Los Angeles monitoring*
  - *Port of Long Beach monitoring*

Current Project Status

- **Equipment received/projected to be received by end of January 2007**
  - *Counters re-calibrated and undergoing performance evaluation at USC*
- **Working with the Port of Long Beach, the Port of Los Angeles, SCAQMD, LAUSD, LAFD, LBUSD, the City of Long Beach, ARB, DRI and community leaders to arrange sampling sites in the San Pedro/Wilmington/West Long Beach area**
- **Volunteers still needed!**


DRI Tier 1
DRI Tier 1 + continuous
DRI Passive only
SCAQMD (tentative)
Port of Los Angeles
Port of Long Beach
Revised 12/06
USC CPC
USC CPC (one site, not both)
USC CPC (one site?)
added USC CPC site (possibly temporary)
Note: DRI's sampling locations are preliminary and are subject to change.
USC added 12/6/06 – subject to change KFM
Carson
West Carson
WES
SJHS
FD13
HES
BAES
WMS
BHS
RES1
GAES
?
JMBP
MHCC
W710
E710
BFL
Wilmington, CA
E110
PLBN
UPRR
RES2
HAES
AQMD
FD49
Long Beach
Mormon Island
Terminal Island
Grissom, Island
White, Island
RES3
Smith Island
Freeman, Island
Chaffee, Island
PLAB
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Pointer 33°46'28.54" N 118°12'44.10" W elev 11 ft
Streaming 100%
Eye alt 50742 ft

Individual Site Requirements

- **Adequate coverage of Harbor Communities**
- **Similar siting requirements to DRI passive sampling:**
  - *Continuous electric power*
  - *Access once or twice per week for data collection and instrument inspection*
  - *Security*

Other USC Air Quality Monitoring Plans

- USC / Southern California Particle Center is currently planning two studies in the Harbor Communities Area for 2007
  - *Winter and summer*
  - *Intensive monitoring of air quality for 1 – 2 months each in coordination with SCAQMD*
    - Includes chemical characterization of ultrafine particles and toxicological evaluation of samples
    - Will attempt to identify chemical “tracers” of port activities

Harbor Community Monitoring Study
Saturation Monitoring of Air Toxics

Professor Eric Fujita, David Campbell,
Brooks Mason, and Dr. Barbara Zielinska

Division of Atmospheric Sciences
Desert Research Institute
Nevada System of Higher Education
Reno, Nevada

Community Meeting
Wilmington Senior Center
January 10, 2007

Saturation Monitoring

Objective:

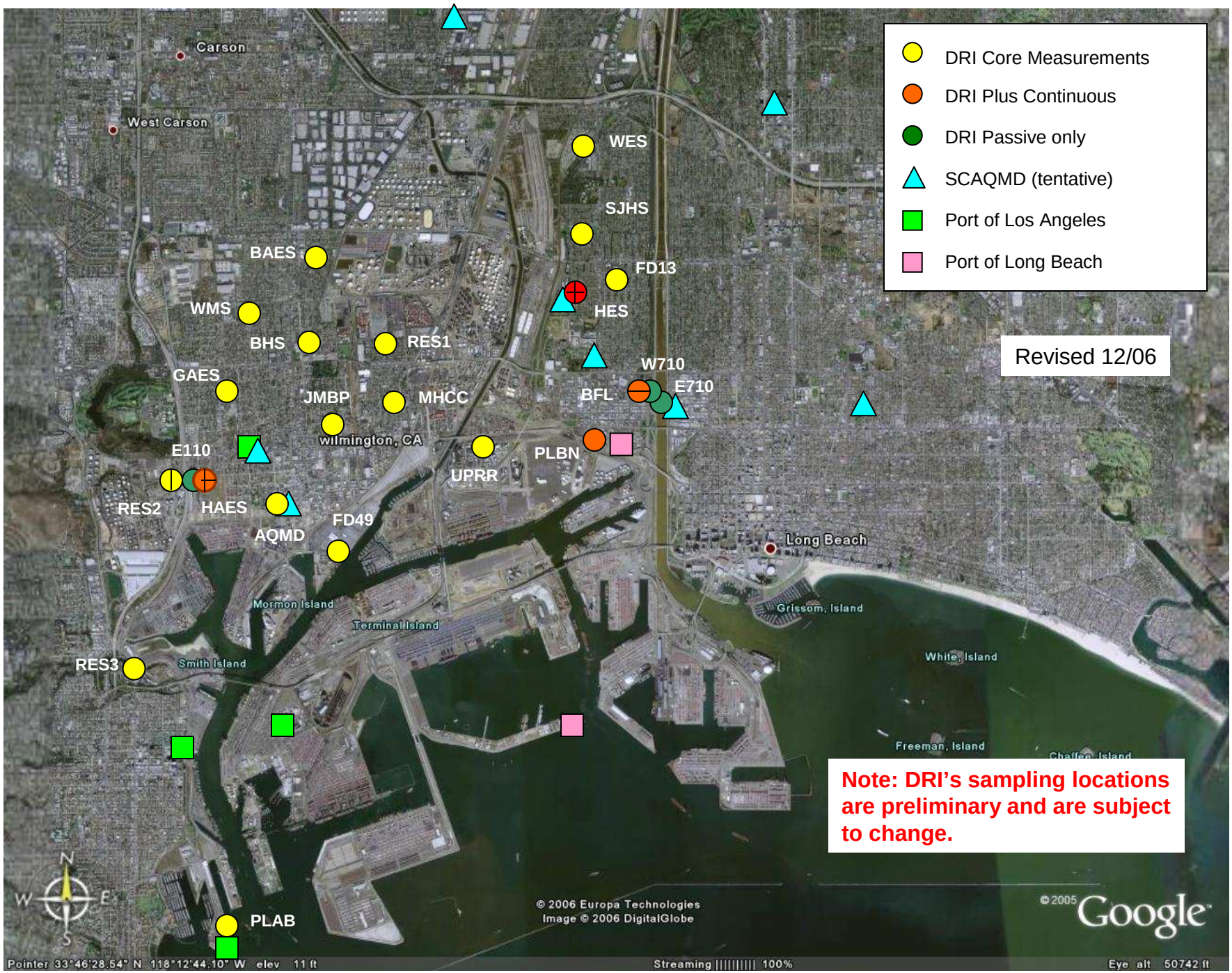
To test whether affordable, non-pump driven "passive" samplers are sensitive and accurate enough for community level use

- Can they detect gradients?
- Can they accurately predict yearly averages from small sets of one or two-week samples?

AirMetric Minivol Aerosol Sampler
(20” long by 7” in diameter)

Ogawa passive samplers for NOx and SO2
(thumb size in protective cup shield)

Radiello passive samplers for VOC, aldehydes and H2S
(size of a roll of pennies)


DRI Core Measurements
DRI Plus Continuous
DRI Passive only
SCAQMD (tentative)
Port of Los Angeles
Port of Long Beach
Revised 12/06
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Saturation Monitoring Sampling Sites

7-day integrated samples for 4 weeks in 4 seasons

- Core Network – Passive NOx, SO_2, VOC[1], aldehydes[2], and mini-volume sampling $PM_{2.5}$ mass, OC and EC at 20 sites.
- Add passive NO_2 at 3 core sites (*vehicle dominated locations*).
- Add passive H_2S at 3 core sites (*near refinery and neighborhood background*).
- Add temperature and RH at 5 core sites.
- Passive Only - NO2, NOx, VOC and aldehydes at additional 3 sites

7-day + Continuous measurements and QA

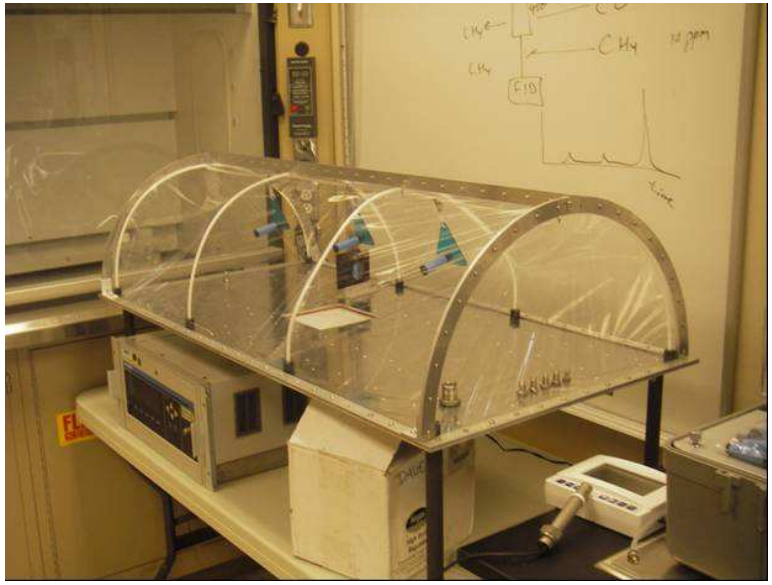
- Surrogate of BTEX by portable photoionization detector, $PM_{2.5}$ mass by nephelometer and BC by photoacoustic instrument at 4 core sites.
- Carbon monoxide with portable monitors at 2 core sites.
- QA measurements at 1 core site collocated with SCAQMD. Two additional sets of all passive samples for four weeks in winter and summer. Also canister and DNPH samples.

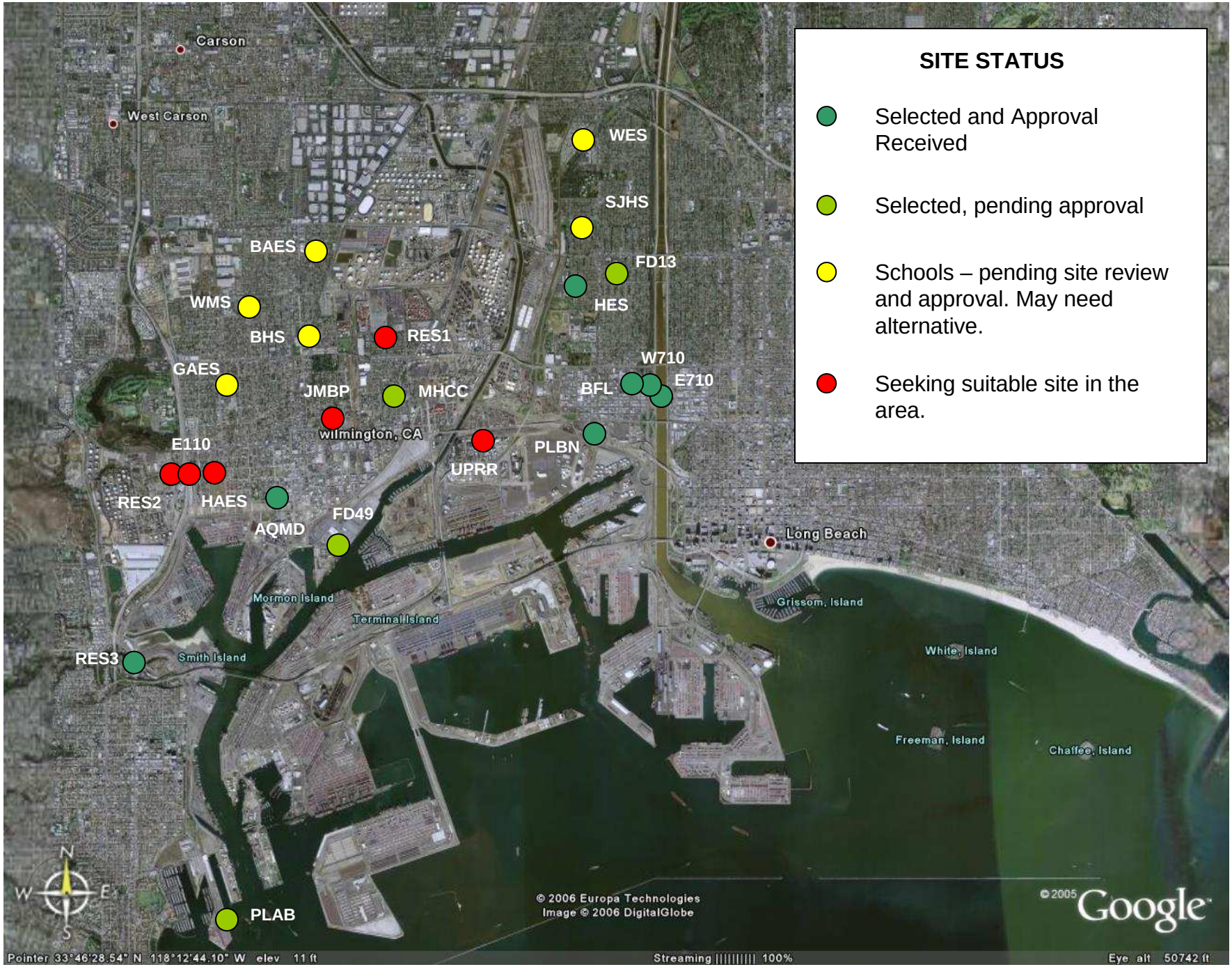
[1] benzene, toluene, ethylbenzene, xylenes and 1,3-butadiene

[2] formaldehyde, acetaldehyde and acrolein

Initial Results from Laboratory and Field Evaluations of the Passive Samplers

- The following passive samplers demonstrated good replicate precision:
  - Ogawa NO_2 and NOx.
  - Ogawa SO2.
  - Radiello Formaldehyde.
  - Radiello Acetaldehyde.
- Ambient concentrations (Long Beach) were too low to evaluate the following:
  - Radiello Hydrogen sulfide
  - Radiello Acrolein
- Still being evaluated:
  - Radiello Benzene, toluene, ethylbenzene xylenes.
  - Radiello 1,3 butadiene




SITE STATUS
Selected and Approval Received
Selected, pending approval
Schools – pending site review and approval. May need alternative.
Seeking suitable site in the area.
Carson
West Carson
WES
SJHS
BAES
FD13
HES
WMS
BHS
RES1
W710
E710
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South Coast AQMD Port-Community Air Monitoring Program

Dr. Phil Fine

South Coast Air Quality Management District

Overview

- Part of the
  AQMD Clean Port Initiative
- Technical Working Group Consisting of Ports, CARB,
  U.S. EPA, Community Representatives, Labor, Industry, and Academia
- 18-Month Air Monitoring Program Beginning 2007
- Includes special, shorter-term focused studies

Pollutants To Be Measured

Gas-Phase Air Toxics		
Benzene	Carbon Tetrachloride	Chloroform
1,3-Butadiene	Propylene Dichloride	Trichloroethylene, TCE
Methylene Chloride	Tetrachloroethylene (Perc)	Acetaldehyde
Vinyl Chloride	Formaldehyde	Methyl Bromide

Particle-Phase Species		
PM2.5 (24-hour)	PM10 (24-hour)	PM2.5 (1-hour)
Total Carbon	Organic Carbon	Elemental Carbon
Nitrate	Sulfate	Ammonium
Vanadium	Other Metals	Ultrafine Particles

Criteria Pollutants		
Ozone	VOC	NOx
SOx	CO	

Sampling Locations

- AQMD Sites
- AQMD Site (PM only)
- Port of LA Sites
- Port of LB Sites

Port Results

http://www.portoflosangeles.org/environment_aqm_results.htm

- Port of LA: year-long graphs (05, 06) at bottom of page
- PM2.5, PM10, elemental carbon (EC)
  - Higher EC Sept. thru Feb.
  - Higher PM2.5 Oct. thru Feb., but relatively “flatter” than EC
  - No obviously visible trends, but data are highly variable

- http://polb.airsis.com/HistoricalDetail.aspx
- PoLB, data from Sept. 2006

Summary

- Many new air quality studies beginning early 2007
- CARB Research studies—”Harbor Communities Monitoring”
  - New technologies to better measure air at community level between the fixed-site monitors
    - Mobile platform
    - Passive sampler network
    - Particle counter network
- Still need volunteers

Volunteers Needed

- Still need 6 to 11 sites
- About one-year duration

  Will cover electricity costs
- If interested, please contact:
  - Katharine Moore at 213-821-5960 katharim@usc.edu or
  - Eric Fujita at 775-674-7084

    ericf@dri.edu

Sampling Site Requirements

- Location for neighborhood scale site
  - At least one block away from major streets
  - At least 500 meters from freeways and stationary sources (e.g., gas stations and auto body shops).
  - At least 200 meters from construction activity involving use of land moving equipment.
  - Avoid smaller sources within 25 meters (e.g., idling vehicles, lawn and garden equipment, wood burning, paints and solvents, etc.)
- Secure area with small amount of electrical power
  - Backyard of private residence or locked fenced area.
  - Flat roof of one-story public or commercial building.
- At least 270 degrees of unrestricted air flow around sampler
  - Samplers will be located 2 to 15 meters above ground level and 20 meters from the edges of trees.

For More Information

- Web Site: http://www.arb.ca.gov/research/mobile/hcm/hcm.htm
- For information about:
  - Harbor Communities Monitoring

    Leon Dolislager 916-323-1533 Ldolisla@arb.ca.gov
  - Mobile Platform

    Kathleen Kozawa 916-323-2999 kkozawa@arb.ca.gov
  - Passive network

    Eric Fujita 775-674-7084 ericf@dri.edu
  - Particle counter network

    Katharine Moore 213-821-5960 katharim@usc.edu