The Gateway Cities
Air Quality Action Plan

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I-710 Near Roadway Monitored to Modeled Comparison Methodology

Technical and Advisory Roundtables

September 14 & 15, 2011

This AQAP study is not part of the I-710 Corridor Project studies, but upon completion, it will be submitted to Caltrans for review and consideration for use in preparing the I-710 Corridor Project EIR/EIS.

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Made possible with support from

Metro

Outline for Presentation

Objectives of the analysis

Methodology

- Data collection and modeling

Findings

Next Steps

Objective

Assess the representativeness of the I-710 EIR/EIS modeling near-roadway concentrations by:

- Comparing with the monitored data as used in air quality and exposure assessments

I-710 EIR/EIS Modeling Methodology

EIR/EIS of I-710 Corridor Project applied AERMOD

- Modeling domain encompassed 18 miles, divided into four met zones
- 2008 is the baseline year.
- Emissions based on average speeds and average weekday traffic volumes in 2008 (EMFAC2007)

I-710 EIR/EIS Near Roadway Modeling

- Three sets of receptor grids
  - 100m spacing within 500 m of I-710
  - 250 m spacing within 2,500 m of I-710
  - 500 m spacing within 5,000 m of I-710
- Considered appropriate scale for near-roadway modeling assessment for the I-710 EIR/EIS as requested by the CAC and the PC

Adjustment and Limitations for Comparisons to I-710 Modeling

- Emissions for 2009 not 2008
- Four freeway activity levels (6-9am, 10am -2pm, 3pm - 7pm, 7 pm-6am) – output from I-710 Traffic Demand Model
- Closest receptor to I-710 ~ 100-m
- To date only released results of NO_x and CO

SCAQMD Primary Monitoring Dataset

Two intensive monitoring campaigns at sites near I-710

- February – March 2009 (~ 1-mo winter)
- July – August 2009 (~ 1-mo summer)

Three sites near I-710 in North Long Beach

- Nearest downwind of freeway (15-m)
- Further downwind of freeway (80-m)
- Upwind/background site (Del Amo)

Other Monitoring Data Reviewed

Literature search was conducted to identify additional near-roadway monitoring datasets for comparison:

- Kozawa et al (2009) collected measurements using mobile platform in the summer of 2007 in the vicinity of I-710
- Arhami et al (2009) collected PM measurements in the summer of 2007 in communities surrounding I-710
- Moore et al (2009) measured ultrafine number concentrations at sites near I-710

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Modeling Methodology

AERMOD – Air Dispersion Model (same as I-710 EIR/EIS)

- Key inputs: hourly emissions and local meteorology
- Model is only as good as inputs

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Modeling Methodology

Following adjustments to I-710 EIR/EIS modeling-setup for the comparison

- Hourly meteorological data for 2009 was obtained from SCAQMD and AERMOD input files were prepared
- Truck emissions were adjusted to 2009 levels based on monthly TEU activity relative to 2008
- Model receptors at SCAQMD at monitoring sites

Near-Roadway Concentrations Comparison Methodology

- SCAQMD monitoring data was adjusted to represent I-710 contribution by subtracting the urban background concentrations as observed at Del Amo

- Model predictions only compared for hours when the wind direction is within $\pm 45^0$ of perpendicular line between the road and receptors. (i.e. only when the wind direction is such that monitoring sites are downwind of I-710)

Near-Roadway Concentrations Comparison Methodology

Separate comparison for two near-roadway monitoring sites (15m and 80m)

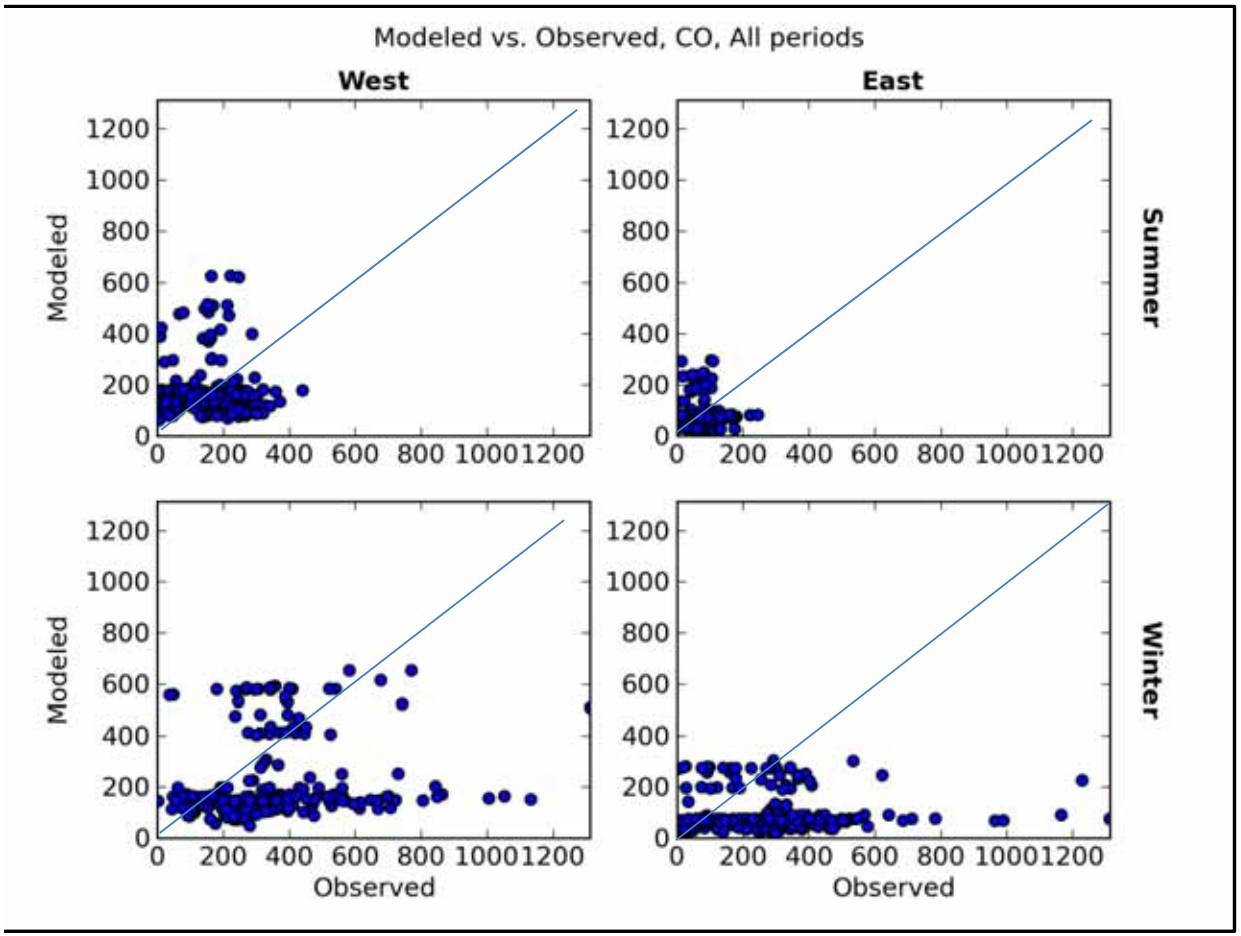
Separate comparison for both NO_x and CO

- Insights on inputs and model performance
- Different source mix for NO_x and CO

Graphical and statistical comparison

- Scatter plots modeled vs. observed concentrations for: intra-day periods, winter/summer and two monitoring sites
- Correlation coefficients – measure of scatter

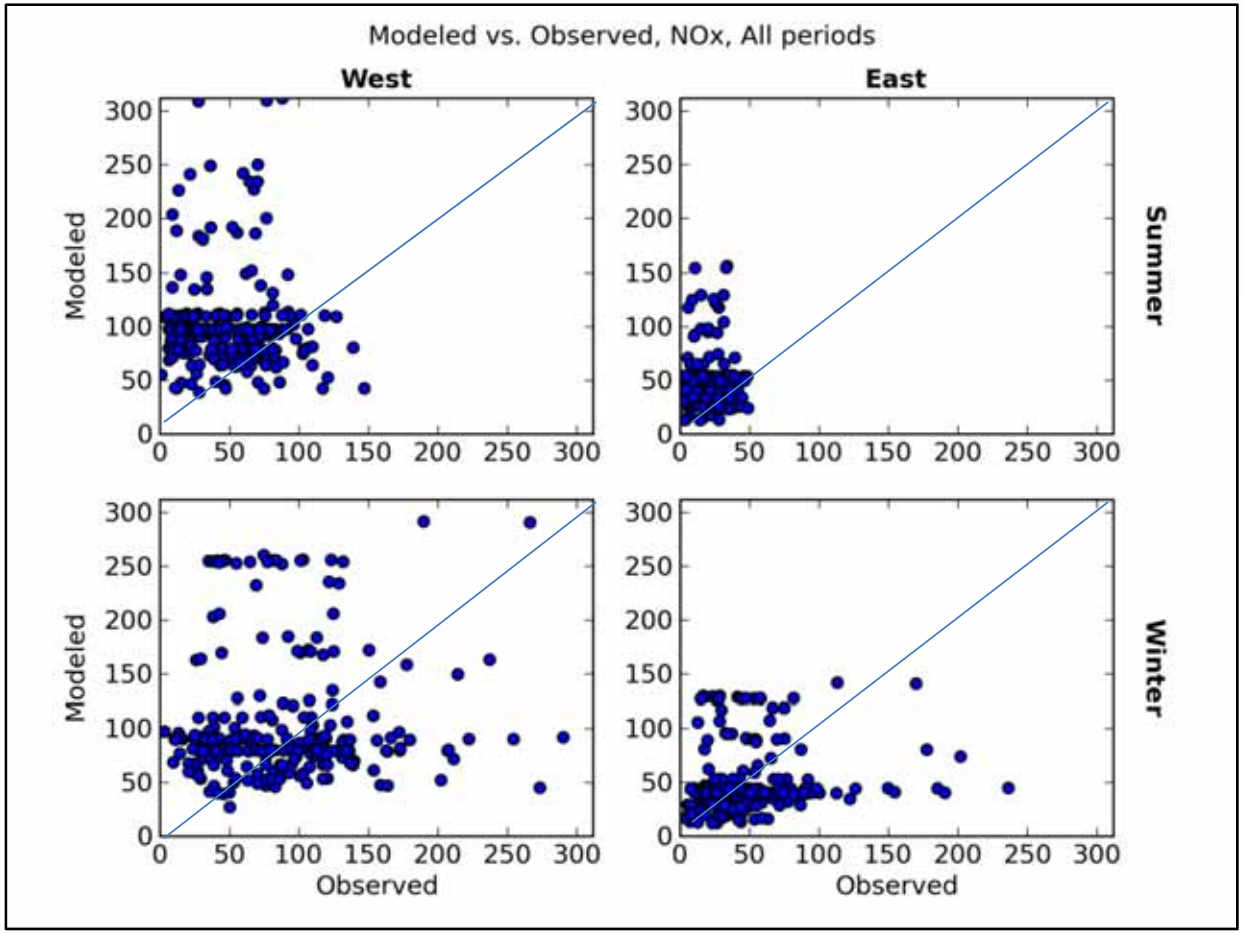
Scatter Plots of Modeled versus Monitored CO (ppb) (paired in time and space)



- CO is generally under-predicted by the model.
- CO is primarily associated with gasoline vehicle emissions.

Under-predictions likely attributed to: hourly traffic volumes, fraction of HHDDT and cars

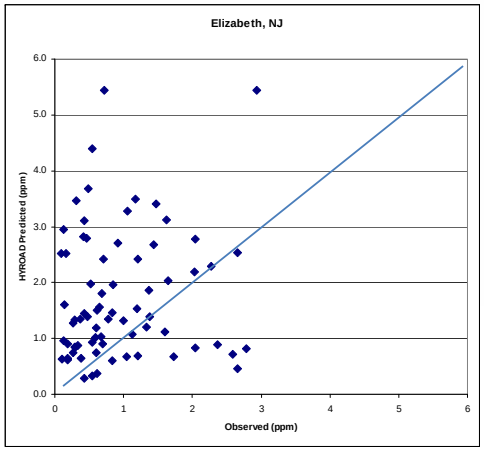
Scatter Plots of Modeled versus Monitored NO_x (ppb) (paired in time and space)

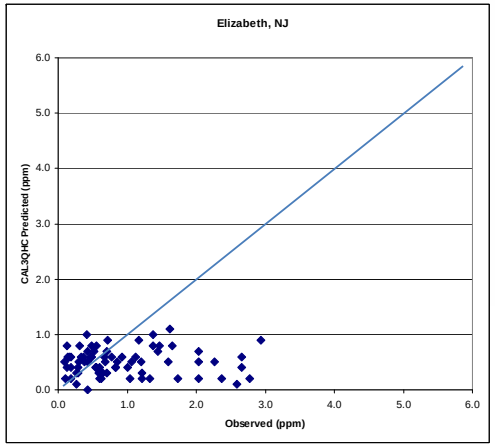


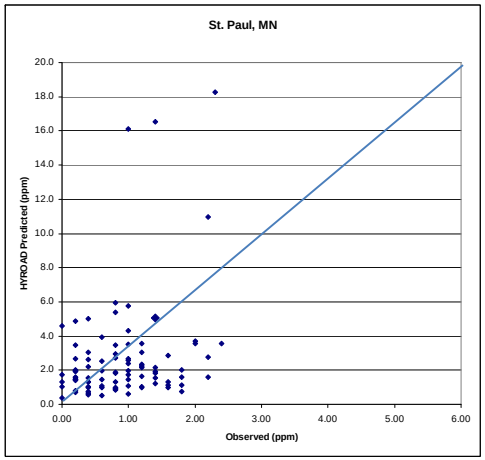
NO_x is generally over-predicted in the summer and underpredicted in winter.

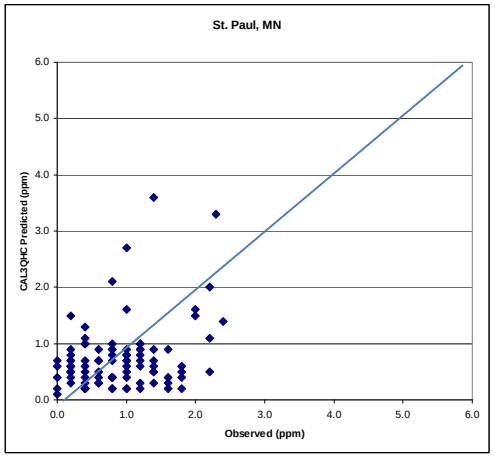
Uncertainty in truck volumes and their speed profiles

Scatter Plots From Similar Monitored to Modeled Comparison Studies









Monitor to Model data is similar to other studies:

In an NCHRP study, two models HYROAD and CAL3QHC also had similar scatter for in comparison with monitored CO data

Key Findings

- In general, model under-predicts CO and over-predicts NOx concentrations.
- Correlation is generally poor between data paired in time and space for predicted and observed concentrations.
- Discrepancies likely from uncertainties in traffic volumes and mix of vehicles and to a lesser degree meteorology.

Possible Next Steps

Present model comparison and discuss uncertainties in model

- On-site speed profile vs. average speed “driving cycle”
- Actual fleet mix (trucks/cars) vs. average weekday fleet
- Actual meteorology vs. N. Long Beach meteorology

Compare with similar type studies

Install permanent monitoring stations along the I-710 as an early action project (traffic volume, met and air quality)

Sensitivity studies on temporal traffic activity profile

Weight in Motion Hourly Profile versus Constant Volume with intra-day Periods