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.
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
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\textsubscript{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)
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
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
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 45° 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\textsubscript{x} and CO
  • Insights on inputs and model performance
  • Different source mix for NO\textsubscript{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
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.
NO\textsubscript{x} is generally over-predicted in the summer and underpredicted in winter.

Uncertainty in truck volumes and their speed profiles
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