

AQRP Monthly Technical Report

PROJECT TITLE	MOVES-Based NO _x Analyses for Urban Case Studies in Texas	PROJECT #	16-010
PROJECT PARTICIPANTS	Sonoma Technology, Inc. (STI)	DATE SUBMITTED	March 8, 2017
REPORTING PERIOD	From: February 1, 2017 To: February 28, 2017	REPORT #	5

A Financial Status Report (FSR) and Invoice will be submitted separately from each of the Project Participants reflecting charges for this Reporting Period. I understand that the FSR and Invoice are due to the AQRP by the 15th of the month following the reporting period shown above.

Detailed Accomplishments by Task

During this reporting period, the STI team continued work on Task 1 Emissions Reconciliation Analyses and started planning for Task 2 MOVES Sensitivity Analyses. The team continued processing the ambient pollutant concentration data to calculate CO/NO_x concentration ratios for three monitoring sites in Houston, Fort Worth, and El Paso. The team also conducted MOVES modeling runs using data collected from TCEQ (Texas Commission on Environmental Quality) to develop emissions-based CO/NO_x ratios.

Preliminary Analysis

The project team continued work to analyze ambient CO/NO_x ratios for each monitoring site. As discussed in the 2012 journal paper authored by Wallace et al. (published in Atmospheric Environment 63, 289-297), average CO-to-NO_x ratios from ambient measurements can be developed by plotting CO and NO_x concentrations and determining the slope of a linear regression line. The team used this approach to conduct the preliminary analysis of ambient-based CO to NO_x ratios. As shown in Figure 1, with the 2015 CO and NO_x downwind measurement data collected from the Houston near-road site, the intercept of the regression line ($b = 251$ ppb) reflects a nominal background CO for the analyzed morning peak time period (6:00 to 9:00 AM) and is comparable to the average concentrations observed from the selected background site (208 ppb). The slope of the regression line ($m = 7.03$, with a standard error of 0.17) reflects an average ambient-based CO to NO_x ratio.

The team calculated Δ CO values by subtracting the estimated intercept from the downwind ambient CO concentrations, and then developed histogram and boxplots with distribution and descriptive statistics of Δ CO/NO_x ratios (see Figures 2 and 3 for examples with the Houston site data). The annual arithmetic mean of Δ CO/NO_x ratio (8.37) is generally comparable to the slope of the regression line (7.03).

The team also conducted modeling runs in MOVES2014a to develop emissions estimates and calculate emission-based CO-to-NO_x ratios. For example, for the Houston study area, MOVES2014a was used to estimate morning peak hours (6:00 to 9:00 AM) in analysis year 2015, based on local inputs collected from TCEQ, Houston-Galveston Area Council (HGAC). Travel activity data with vehicle miles distribution by vehicle type, obtained from the Texas Department of Transportation (TXDOT), were also used in the MOVES runs. CO, NO, NO₂ running exhaust emissions were estimated and then converted to molar unit to calculate emission-based CO-to-NO_x ratios. For the Houston case, preliminary results showed that the MOVES emission-based CO-to-NO_x ratios are 4.95, 3.92, and 5.98 for annual, winter, and summer seasons. These emission-based ratios are generally lower than the ambient-based ratios.

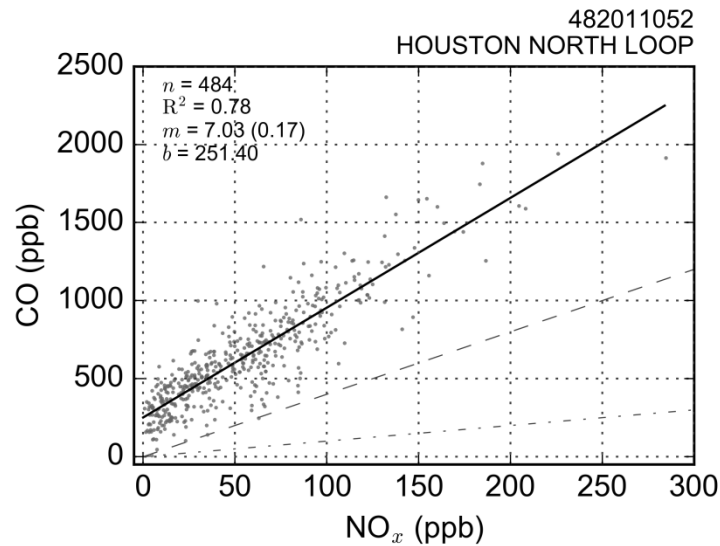


Figure 1. Sample plot of linear regression of ambient CO and NO_x concentrations for the Houston site. Total sample size is 484 (hourly concentration measurements collected at the monitoring site downwind from the roadway); dashed lines showed 4:1 and 1:1 ratios as reference.

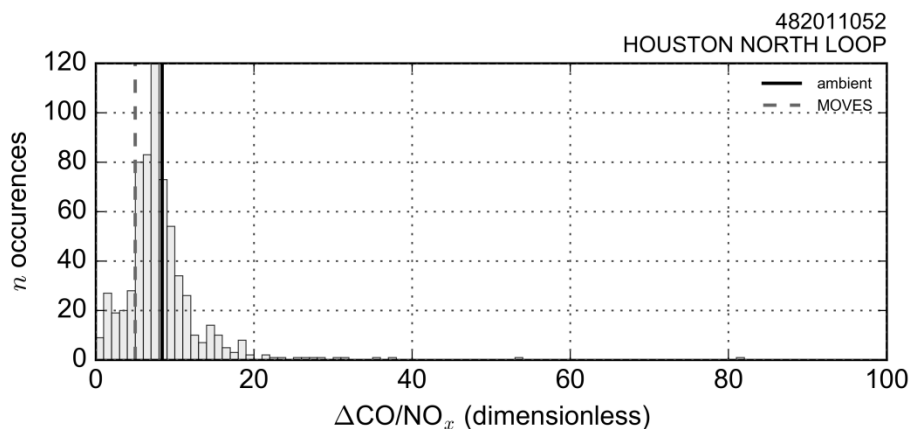


Figure 2. Sample histogram of ambient-based and MOVES-based CO to NO_x ratios for the Houston site. The solid line represents arithmetic mean of ambient-based CO-to-NO_x ratio (8.37); the dashed line represents an average MOVES emission-based CO-to-NO_x ratio (4.95).

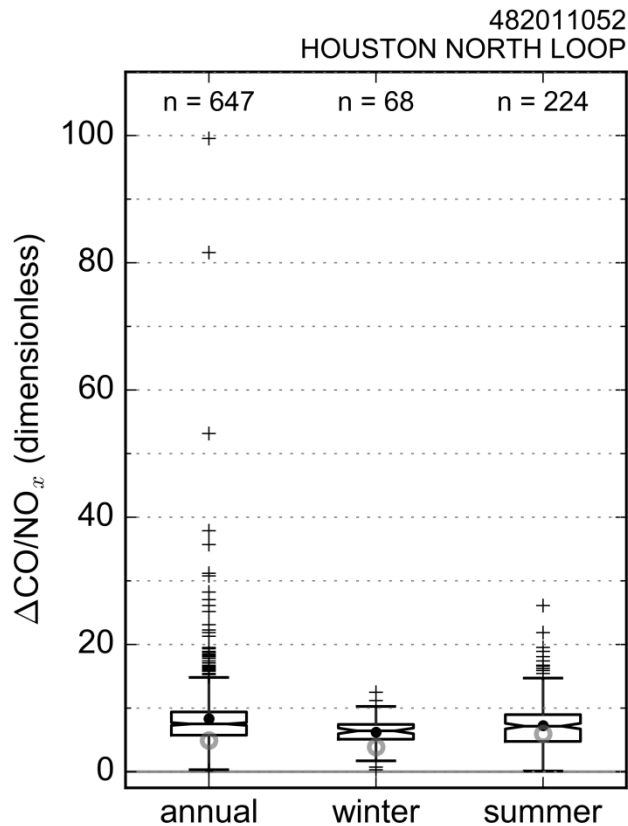


Figure 3. Sample boxplot of ambient-based and MOVES-based CO-to-NO_x ratios for the Houston site. Solid dots represent average CO-to-NO_x ratios for annual, winter (December, January, and February), and summer (June, July, and August) seasons. Gray circles represent average MOVES emission-based CO-to-NO_x ratios for annual (4.95), winter (January, 3.92), and summer (July, 5.98) seasons.

Data Collected

No new data were collected during this reporting period. The team did not get response from El Paso MPO and have no access to additional local MOVES data; therefore, the MOVES modeling input data for the El Paso area provided in the TCEQ dataset are being used for this reconciliation analysis.

Identify Problems or Issues Encountered and Proposed Solutions or Adjustments

As discussed in the January 2017 progress report, the team continued to follow the analysis strategy with matching up the data periods and modeling assumption years as best as possible. No additional problems or issues were encountered during the reporting period.

Goals and Anticipated Issues for the Succeeding Reporting Period

The STI team continued work on the planned emissions reconciliation analysis and completed the preliminary near-road monitoring data processing and MOVES modeling runs under Task 1. The team is preparing data tables and figures to summarize preliminary results of ambient-based vs. emissions-based ratios. The team has also started planning for the MOVES sensitivity analysis. No significant issues are expected in the next reporting period.

Detailed Analysis of the Progress of the Task Order to Date

The completion of each project task and the project deliverables are expected to follow the schedule from the work plan and quality assurance project plan.

Do you have any publications related to this project currently under development? If so, please provide a working title, and the journals you plan to submit to.

Yes No

Do you have any publications related to this project currently under review by a journal? If so, what is the working title and the journal name? Have you sent a copy of the article to your AQRP Project Manager and your TCEQ Liaison?

Yes No

Do you have any bibliographic publications related to this project that have been published? If so, please list the reference information. List all items for the lifetime of the project.

Yes No

Do you have any presentations related to this project currently under development? If so, please provide working title, and the conference you plan to present it (this does not include presentations for the AQRP Workshop).

Yes No

Do you have any presentations related to this project that have been published? If so, please list reference information. List all items for the lifetime of the project.

Yes No

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