

Final Report

HARC Project H-8B

**Effect of Hotsoak and Diurnal Emissions
Spatial Allocation Methodology On Predicted Ozone Levels**

Prepared for

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EXECUTIVE SUMMARY

Emission inventories are a major factor influencing the pollutant concentrations as predicted by photochemical models. Except for the Dallas/Fort-Worth (DFW) area, the emission inventories for Texas have historically been developed such that the on-road evaporative hydrocarbon emissions have been spatially allocated based upon link vehicle miles traveled (VMT) data. This tends to concentrate these emissions in urban areas where most of the travel network VMT occurs and within these, frequently to specific grid cells containing major freeways and arterials. This may lead to concentration spikes that are not reflective of actual conditions. On the other hand, inventories for the DFW non-attainment area State Implementation Plan, as developed by the North Central Texas Council of Governments, utilized a more detailed zone-based approach, in which evaporative hotsoak and diurnal emissions were spatially allocated to trip ends. The zone-based approach is more realistic because hotsoak and diurnal emissions occur when the vehicle is parked. EPA's latest on-road mobile emission factor model, MOBILE6, shows evaporative emissions increasing in significance as exhaust emissions are being reduced over time. Thus the ratio of evaporative to exhaust emissions using MOBILE6 is higher than using MOBILE5 in future year modeling. The objective of this project was to determine the impacts upon modeling results associated with the two spatial allocation approaches for hotsoak and diurnal emissions, including the effects of recent updates in the emissions modeling tool, MOBILE.

To perform assessments of the impact of allocation methodology and model updates, the existing 1995 DFW SIP episodic modeling inventory, adjusted to 2007 levels, was selected. The 2007 inventory was then modified to yield MOBILE5- and MOBILE6-based inventories with the hotsoak and diurnal portions spatially allocated through both link- and zone-based approaches. Each of these inventories was then input into the CAMx photochemical model for the 1995 DFW SIP ozone episode.

The modeling results were interpreted to assess whether the refinements in emissions methodology are a significant improvement, what magnitude impacts are to be expected and under what conditions the impacts will be most significant. A summary of the results is presented here:

- The zone-based allocation methodology resulted in higher emissions concentrations. The explanation for this that the zone-based emissions were originally concentrated in a handful of travel analysis zones (TAZs) which are not significantly larger than a 4km grid cell. Thus, when these emissions were summed throughout a county and redistributed over the entire travel network spanning a large number of grid cells the net result is dispersion of the emissions.
- Differences in modeled maximum daily ozone concentrations between the two allocation methodologies were small, on the order of tenths of a ppb. The differences for the MOBILE6-based scenarios were larger than the MOBILE5-based scenarios consistent with MOBILE6 having a higher ratio of evaporative to exhaust VOC emissions than MOBILE5.
- In most instances, the choice of allocation methodology did not change the location of the maximum ozone. The only exception was the first episode day (during which the

largest differences in daily maxima occurred). However, results from the first day of an ozone model run normally are not considered reliable because of the influence of the initial condition assumptions.

- The peak ozone for the episode did not change significantly from 124 ppb under any scenario, i.e., link or zone-based evaporative emissions with MOBILE5 or MOBILE6.

From these findings, it is concluded that the modeled impacts depend upon the relative contribution of affected emissions, the size and location of zones used to allocate hotsoak and diurnal emissions, and the sensitivity of local ozone levels to VOC versus NO_x. In the absence of strong synergies between these aspects, significant impacts on modeled ozone levels from the choice of allocation methodology are unlikely.