Texas Transportation Institute

2007 Emissions Inventory Update for the Beaumont/Port Arthur Eight-Hour Ozone Nonattainment Counties

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INTRODUCTION AND TASK SUMMARY

This Technical Note documents the methods the Texas Transportation Institute (TTI) used to develop the Beaumont/Port Arthur ozone nonattainment area (BPA) 2007 future base-case, ozone episode, on-road mobile source modeling emissions inventories (EI), in support of eight-hour ozone standard State Implementation Planning (SIP). This task also includes development of the 2000 ozone episode modeling EIs, which are documented in a separate Technical Note. TTI developed these BPA 2000 and 2007 episodic modeling EIs using the latest models and planning assumptions, as updates to the previous BPA Attainment Demonstration (AD) SIP modeling EIs.

The three BPA counties are: Hardin, Jefferson, and Orange. The forecast periods for the emissions estimates are 17 episode days comprising the following three “mini episodes” within the period August 10, 2000 through September 6, 2000: 1) August 10 through August 13 (four days); 2) August 18 through August 21 (four days); and 3) August 29 through September 6 (nine days). Although the days-of-week are different for these dates in 2007, for modeling purposes the base-year episode date-to-day-of-week correlation was maintained. Emissions of volatile organic compounds (VOC), carbon monoxide (CO), and oxides of nitrogen (NOx) were estimated for each day on an hourly basis. The hourly estimates were computed by travel demand model (TDM) network link with geographical coordinates provided for spatial allocation of emissions estimates. Emissions are categorized by 28 vehicle types and the pertinent pollutant-specific emissions types (sub-components).

Documented within are the methods used for developing EI elements including link-based vehicle miles traveled (VMT) and speed estimates, development of episode period day-of-week-adjusted Highway Performance Monitoring System (HPMS) consistent VMT totals, VMT mix, MOBILE6 (September 2003) emissions factors, and the emissions estimates.

Acknowledgments
Chris Kite, with the Texas Commission on Environmental Quality (TCEQ), and Teresa Qu, P.E., and Martin Boardman, both with TTI, contributed to the development of the MOBILE6 emissions factors inputs. Boardman produced the MOBILE6 model set-ups and developed the emissions factors and Boardman and Qu performed the emissions analyses. The Texas Department of Transportation (TxDOT) provided the BPA travel model data sets (network traffic assignment, intrazonal trips, and zonal radii). Dennis Perkinson, Ph.D., of TTI, developed episode day-of-week VMT adjustment factors, hourly VMT allocation factors and VMT mix. L. D. White, of TTI, post-processed the BPA travel model data sets to develop estimates of link VMT and operational link speeds. Each member of the assigned TTI staff contributed to the quality assurance of the emissions inventory elements. Dr. Perkinson was the principal investigator for this project. This work was performed by TTI under contract to TCEQ. Anusuya Iyer was the TCEQ project technical manager.

Deliverables
Interim deliverables are an informal Technical Note (a narrative in memorandum format that explains the task, the approaches used, and the findings) provided to the Project Manager in WordPerfect 6/7/8 format, and supported by electronic document files. All pertinent data are being submitted in specified electronic format. (There is no FORTRAN source code or executable files developed under this task.) CD-ROM/DVD is used to record the final data and supporting documentation. TTI is providing five copies of the final report. One of the copies is an unbound original suitable for copying. Electronic copies of all materials related to the task report to document results and conclusions (e.g., data, work files, text files, etc.), or developed as work products under this contract are provided as requested by the TCEQ staff.

The detailed 2007 emissions inventory data sets were provided to TCEQ on DVD and CD-ROM. Appendix A lists the data set file names and descriptions contained on the data discs. The data sets provided include:

- network link nodes with corresponding link-emissions estimates for each pollutant sub-component and vehicle type, by county, for each hour of each specified day;
- network node (link endpoint) coordinates for spatially allocating the link-emissions estimates;
- emissions summary files by county and episode day with facility type- and vehicle-type level hourly and 24-hour VMT, VMT mix, average speed, and pollutant composite emissions estimates; and
- MOBILE6 model emissions factor inputs, adjustment factors, and the resulting county level, hourly, day-specific emissions factor tables.

SUMMARY OF VMT AND EMISSIONS

Table 1 summarizes the 24-hour BPA network total VMT, average operational speeds (VMT divided by TDM vehicle hours traveled [VHT] estimates), and emissions for each of the 17 ozone episode analysis days.

Table 1
BPA All Counties 2007 Ozone Episode Day
On-Road Mobile Source VMT, Average Speed (mph), and Emissions (tons per day)

Day	VMT	Speed[1]	VOC	CO	NOx
Thursday, August 10	11,734,089	46.6	9.5	120.5	30.5
Friday, August 11	13,890,653	45.8	11.4	144.0	28.2
Saturday, August 12	11,604,290	46.9	8.6	118.9	19.0
Sunday, August 13	9,595,476	47.2	7.1	99.7	13.5
Friday, August 18	13,890,653	45.8	11.6	145.7	28.7
Saturday, August 19	11,604,290	46.9	8.5	117.7	18.8
Sunday, August 20	9,595,476	47.2	7.2	101.8	13.0
Monday, August 21	11,734,089	46.6	9.5	121.4	30.3
Tuesday, August 29	11,734,089	46.6	9.6	121.7	30.5
Wednesday, August 30	11,734,089	46.6	10.0	123.0	30.9
Thursday, August 31	11,734,089	46.6	10.3	124.5	31.1
Friday, September 01	13,890,653	45.8	11.8	148.5	28.7
Saturday, September 02	11,604,290	46.9	8.8	119.3	18.9
Sunday, September 03	9,595,476	47.2	7.4	103.8	13.1
Monday, September 04[2]	9,595,476	47.2	7.7	103.9	13.4
Tuesday, September 05	11,734,089	46.6	10.2	123.6	31.1
Wednesday, September 06	11,734,089	46.6	9.5	119.3	30.9

[1] Average speed is VMT/VHT.
[2] September 4, Labor Day, emissions estimates were developed using Sunday activity factors based on comparative analysis of Automatic Traffic Recorder (ATR) data and in consultation with TCEQ.

OVERVIEW OF METHODOLOGY

To develop the BPA ozone episode emissions estimates, the directional link-based, hourly methodology was used. The episode day emissions estimates were calculated and recorded by roadway network link for each direction of travel, vehicle class, and hour.

The three main components of the emissions calculations were developed and assigned indexes for network link-level application. These components are: 1) link level, hourly, fleet VMT, and average operational speeds; 2) regional, four period time-of-day, functional classification group-specific, VMT mixes; and 3) hourly emissions factors for each county, vehicle class and drive cycle (road type) tabulated by the 14 MOBILE6 speed bin speeds (2.5 mph and 5 mph to 65 mph in 5 mph increments).

The link VMT/speeds and VMT mix data sets were developed for each of four day types: Weekday (average Monday through Thursday), Friday, Saturday, and Sunday. Based on comparative analysis of ATR data, the Sunday VMT/speed and VMT mix estimates were chosen to represent activity for the September 4 (Monday, Labor Day) episode day.

The emissions factors, post-processed to include the effects of Texas Low Emissions Diesel (TxLED) fuel, were estimated for each episode day. Drive-cycle specificity was applied by allocating the fixed-speed freeway ramp, and speed-sensitive freeway and arterial emissions factors, respectively, to appropriate ramp links, freeway links, and all remaining links. The speed-sensitive emissions factors corresponding to link speeds not represented in the emissions factor tables were calculated by interpolation, except for those link speeds greater than or less than the MOBILE6 speed range, for which the subject bounding speed emissions factors were used.

The emissions inventory components were matched at the link level using the pertinent input data parameter indexes (e.g., county, episode day/day type, hour, facility type, speed). VMT mixes were multiplied by fleet link VMT to produce link VMT estimates by vehicle class. The MOBILE6 emissions factors (grams per mile [g/mi]) for each link were then multiplied by the link VMT estimates to produce the hourly emissions estimates in grams.

This procedure was performed for each analysis day to produce the photochemical model preprocessor-ready, hourly on-road mobile emissions input files with the hourly link emissions estimates in grams by pollutant, emissions type, and vehicle class for each link including the facility type code and the link endpoints (designated by network node numbers for which X-Y coordinates were provided separately). Emissions inventory data were also summarized in tab-delimited summary tables (files).

TTI previously developed a series of computer programs to develop detailed on-road mobile source EIs. These computer programs were used to produce and apply the major EI elements (adjusted operational time-of-day link VMT by vehicle type, operational link speeds and MOBILE6 emissions factors) to calculate the emissions estimates. Appendix B describes these programs and their application.

ESTIMATION OF VMT

VMT by hour is required to produce directional link-based emissions estimates by hour. In addition, the hourly VMT must also be adjusted for HPMS consistency and to estimate the four episode day types (Weekday, Friday, Saturday, and Sunday). The latest available BPA 2007 TDM, the added intrazonal links, and post-processing factors developed from several other data sources were used with the TRANSVMT program to produce this hourly VMT (see Appendix B).

Data Sources

The latest available BPA 2007 TDM (model run date October 24, 2004) was used to estimate the directional link VMT and speeds by hour. Since intrazonal VMT are not accounted for in the TDM, the intrazonal VMT was estimated using the trip matrix and zonal radii. To adjust the VMT for HPMS consistency to episode day-type-specific VMT and allocate it as needed, several other data sources were used.

HPMS VMT estimates are based on traffic count data collected according to a statistical sampling procedure specified by the Federal Highway Administration (FHWA) designed to estimate VMT. A wide range of traffic data is collected under the HPMS program. For the purpose of this study, county total HPMS Annual Average Daily Traffic (AADT) VMT was used to ensure the travel model VMT was consistent with the HPMS VMT estimates. (EPA and FHWA have endorsed HPMS as the appropriate source of VMT and require that VMT used to construct on-road mobile source emissions inventories be consistent with that reported through HPMS.)

ATR vehicle counts are collected by TxDOT at selected locations on a continuous basis throughout Texas. These counts are available by season, month, and weekday, as well as on an annual average daily basis (i.e., AADT). Since they are continuous, they are especially well suited for making seasonal, day-of-week and time-of-day comparisons (e.g., seasonal adjustment and hourly allocation factors), even though there may be relatively few ATR data collection locations in any given area. Multiple years (1999 through 2003) of data from the ATR stations in the BPA counties were grouped for this analysis. These ATR count data were used to produce the episode day-type-specific adjustment factors and the time-of-day (hourly) allocation factors.

VMT Adjustments

The TDM VMT was adjusted for HPMS consistency (using an HPMS factor) and to episode day-type-specific travel (using seasonal adjustment factors). Hourly travel factors were also used to distribute this adjusted VMT over each hour of the day. The VMT factors used for developing the Sunday day type hourly link VMT were also used to develop the September 4 (Monday Labor Day) VMT estimates — this decision was based on comparative analysis of ATR data and consultations with TCEQ staff.

HPMS Adjustment Factors

County-specific HPMS adjustment factors were used to adjust the total VMT (TDM assignment VMT plus intrazonal VMT estimate) for HPMS consistency. These factors were developed using the county-specific total VMT from the 2002 travel model validation (model run October 13,

2004), the 2002 county-level HPMS VMT reported by TxDOT, and county-specific 2001 ATR data (to produce the average non-summer weekday traffic (ANSWT) adjustment factor of the first equation below). The 2001 ATR data was used instead of 2002 because of missing data in Jefferson County for 2002. The formula for the HPMS factor calculation, as applied for each BPA county is:

HPMS VMT (AADT) × ANSWT Adjustment Factor = HPMS VMT (ANSWT)

HPMS VMT (ANSWT) / Model VMT (ANSWT) = HPMS Factor

Applying the ANSWT adjustment to the HPMS AADT VMT (i.e., conversion from AADT to ANSWT) produces seasonal, day-of-week consistency between the TDM VMT and HPMS VMT components of the HPMS factor. The actual values for the county HPMS factors are:

Hardin: 1,431,413.355 × 1.0323127 = 1,477,666.185 (HPMS ANSWT VMT)
1,477,666.185 / 1,601,961.91 = 0.922410312 (HPMS Factor);

Jefferson: 6,705,065.686 × 1.0285808 = 6,896,701.827 (HPMS ANSWT VMT)
6,896,701.827 / 6,588,456.76 = 1.046785625 (HPMS Factor); and

Orange: 2,833,063.158 × 1.0325609 = 2,925,310.244 (HPMS ANSWT VMT)
2,925,310.244 / 2,808,613.05 = 1.041549759 (HPMS Factor).

Seasonal Adjustment Factors

Seasonal adjustment factors were used to adjust the travel model and estimated intrazonal VMT to VMT estimates characteristic of each subject day type (Weekday, Friday, Saturday, or Sunday) within the episode period. The aggregated BPA episode period, multi-year (1999 through 2003) ATR data were used. The area seasonal adjustment factor was produced by dividing the average day-type count by the ANSWT count. Table 2 shows the seasonal adjustment factors.

Table 2
BPA Seasonal Adjustment Factors

Day-of-Week	Seasonal Adjustment Factor
Weekday	0.98718
Friday	1.16861
Saturday	0.97626
Sunday	0.80726

VMT Summary

The total VMT (TDM assignment VMT plus the estimated intrazonal VMT) was adjusted for HPMS consistency (using the HPMS factor) and to episode-day-type specific travel (using the seasonal adjustment factors). For each link in the TDM, the link volume was multiplied by the HPMS factor, the seasonal adjustment factor specific to the required day type and the link's respective length to estimate the link-level, day-type-specific VMT (hourly factors were also used to distribute the resulting VMT over each hour of the day, discussed in a later section). The HPMS, seasonal adjustment, and hourly factors were also multiplied by the estimated intrazonal VMT to obtain the final HPMS-consistent, day-type-specific VMT. Table 3 shows the TDM VMT and the final factored VMT.

Table 3
BPA 2007 VMT Summary

County	TDM[1]	Weekday[2]	Friday	Saturday	Sunday
Jefferson	6,768,713	6,994,554	8,280,058	6,917,182	5,719,751
Orange	3,006,546	3,091,321	3,659,463	3,057,126	2,527,909
Hardin	1,810,061	1,648,214	1,951,133	1,629,982	1,347,817

[1] These are unadjusted 24-hour VMT totals from time-of-day traffic assignments including intrazonal VMT.
[2] Weekday is defined as average Monday through Thursday.

Hourly Travel Factors

The travel demand models used in this analysis are all 24-hour assignments. To obtain the desired results of hourly link VMT and speeds, hourly travel factors were used to distribute the 24-hour assignment VMT across each hour of the day. These factors were developed using multi-year (1999 through 2003) aggregated ATR station data for the entire BPA region. Each factor (i.e., 24, or one for each hour of the day) was then multiplied by the link volume (as well as the other VMT adjustment factors). These adjusted link volumes were then multiplied by their respective link lengths to estimate the link level, episode day-type-specific VMT estimates for each year. These factors were also multiplied by the estimated intrazonal VMT to obtain the final hourly adjusted VMT. Table 4 shows the day-type-specific hourly factors.

Table 4
Hourly VMT Factors

Hour	Weekday	Friday	Saturday	Sunday[1]
12:00 a.m.	0.011219	0.010502	0.020512	0.024383
1:00 a.m.	0.008640	0.008152	0.015455	0.018754
2:00 a.m.	0.007850	0.007339	0.013019	0.015654
3:00 a.m.	0.007445	0.006924	0.009975	0.010895
4:00 a.m.	0.012239	0.010619	0.011827	0.011360
5:00 a.m.	0.026346	0.021186	0.016927	0.013522
6:00 a.m.	0.046590	0.038108	0.023836	0.016401
7:00 a.m.	0.062613	0.054174	0.031732	0.020722
8:00 a.m.	0.052219	0.046663	0.040917	0.027416
9:00 a.m.	0.048104	0.044544	0.049447	0.039589
10:00 a.m.	0.051087	0.048887	0.057869	0.049242
11:00 a.m.	0.055423	0.054076	0.062493	0.055966
12:00 p.m.	0.058788	0.057547	0.064558	0.067643
1:00 p.m.	0.060132	0.058936	0.064373	0.072477
2:00 p.m.	0.061970	0.061744	0.062906	0.072234
3:00 p.m.	0.069737	0.069309	0.064194	0.074269
4:00 p.m.	0.075461	0.075270	0.064069	0.074247
5:00 p.m.	0.079023	0.073305	0.063720	0.074839
6:00 p.m.	0.058052	0.063512	0.061119	0.068229
7:00 p.m.	0.043342	0.053175	0.053991	0.056353
8:00 p.m.	0.036483	0.044020	0.046476	0.047641
9:00 p.m.	0.029751	0.039237	0.042078	0.038578
10:00 p.m.	0.021483	0.029671	0.032533	0.028550
11:00 p.m.	0.016003	0.023100	0.025974	0.021036

[1] Also applied for the Monday, September 4 (Labor Day) episode day.

Time-of-Day Directional Split Factors

The TDMs used in this analysis are also non-directional (i.e., speed and volume are only listed for the link, not in both directions). To obtain the desired result of VMT and speeds by direction, directional split factors were used. These directional split factors were multiplied by the link volume to estimate the volume of travel in each direction, one record containing the estimated volume in the peak (or dominant) direction, and the second record containing the estimated volume in the opposite direction. These directional volume estimates were used not only to estimate the VMT in each direction, but also to estimate the directional speeds (discussed in the next section).

The directional split factors were developed for application by time-of-day period (see Table 5), at the facility type (see Table 6), and area type level (see Table 7).

Table 5
BPA Time-of-Day Travel Periods

Period	Hours
AM Peak	7 a.m. - 8 a.m.
Mid-Day	8 a.m. - 5 p.m.
PM Peak	5 p.m. - 6 p.m.
Overnight	6 p.m. - 7 a.m.

Table 6
BPA Network Facility Types

Facility Type Code	Facility Type Description
1	Radial IH Freeways - Mainlanes Only
2	Radial IH Freeways - Mainlanes and Frontage Roads
3	Circumferential IH Freeways (Loops) - Mainlanes Only
4	Circumferential IH Freeways (Loops) - Mainlanes and Frontage Roads
5	Radial Other Freeways - Mainlanes Only
6	Radial Other Freeways - Mainlanes and Frontage Roads
7	Circumferential Other Freeways (Loops) - Mainlanes Only
8	Circumferential Other Freeways (Loops) - Mainlanes and Frontage Roads
9	Radial Expressways[1]
10	Circumferential Expressways (Loops)[1]
11	Principal Arterial - Divided
12	Principal Arterial - Continuous Left Turn Lane
13	Principal Arterial - Undivided
14	Minor Arterial - Divided
15	Minor Arterial - Continuous Left Turn Lane
16	Minor Arterial - Undivided
17	Collector - Divided
18	Collector - Continuous Left Turn Lane
19	Collector - Undivided
20	Frontage Road
21	Ramp (Between Frontage Road and Mainlanes)
22	Interchange Ramp (Freeway-to-Freeway Interchange Ramps)
39	Centroid Connector[2]

[1] Directional split factors not used - facility types not in any of the models.
[2] Centroid Connectors were listed in the model as facility type 0.

Table 7
BPA Network Area Types

Area Type Code	Area Type Description
1	CBD
2	CBD Fringe
3	Urban
4	Suburban
5	Rural

These time-of-day directional split factors were taken from the Technical Note, *1996 Jefferson, Orange, and Hardin Counties Periodic Emissions Inventory* (TTI, November 26, 1997). These data were provided by TxDOT's Transportation Planning and Programming Division after collaboration with TxDOT's Beaumont District and the Beaumont/Port Arthur Metropolitan Planning Organization. The directional split factors were initially based on functional class and not facility type. A correlation table was developed to relate the functional-class-based directional splits to the facility types listed in the model. Appendix C shows the directional splits and the correlation table relating the functional class descriptions in the original directional split data to the facility types used in the BPA TDM.

ESTIMATION OF LINK SPEEDS

To estimate a link's directional, time-of-day congested speed, a speed model involving the estimated freeflow speed for that link and the estimated directional delay for that link was used. This model was used for each link and direction (after all VMT adjustments were made), based on the link's county-specific area type and facility type combination, for each time period and each direction. The directional congested speed was calculated as follows:

$$Congested\ Speed = \frac{60}{\frac{60}{Freeflow\ Speed} + Delay}$$

Freeflow speed factors were used to convert TDM speeds (which are by definition level of service [LOS] C) to LOS A speeds (freeflow). The freeflow speed factors were calculated by dividing the corresponding freeflow speed (by facility type and area type) by the speed from the speed/capacity lookup table used for the TDM (by facility type and area type). The freeflow speeds were determined using the Highway Capacity Manual (HCM), using suitable assumptions to relate the HCM data to the facility types used in the TDMs. Appendix D shows the freeflow speed factors used for BPA by county-specific, area-type/facility-type combination.

The second component of the speed model used to calculate the congested speed is the estimated directional delay. The directional delay (in minutes per mile) due to congestion was calculated using the following volume/delay equation:

$$Delay = Min\left[A\, e^{B(\frac{V}{C})}, M \right]$$

Where:

Delay = congestion delay (in minutes/mile);
A & B = volume/delay equation coefficients;
M = maximum minutes of delay per mile; and
V/C = time-of-day directional volume-to-capacity (v/c) ratio.

The delay model parameters (A, B, and M) were developed for the Dallas/Fort Worth area and verified by application in other Texas urban areas. Table 8 shows these parameters, followed by Table 9 which lists the facility types used in the TDMs and their facility category (except for centroid connector and intrazonal, which do not use capacity data).

Table 8
Volume/Delay Equation Parameters

Facility Category	A	B	M
High-Capacity Facilities (> 3,400 vehicles per hour [vph], e.g., Interstates and Freeways)	0.015	3.5	5
Low-Capacity Facilities (≤ 3,400 vph, e.g., Arterials, Collectors and Locals)	0.05	3	10

Table 9
Facility Type Categories for Applying Delay Parameters

Category	TDM Facility Type Code	TDM Facility Type Description
High-Capacity	1	Radial IH Freeways - Mainlanes Only
	2	Radial IH Freeways - Mainlanes and Frontage Roads
	3	Circumferential IH Freeways (Loops) - Mainlanes Only
	4	Circumferential IH Freeways (Loops) - Mainlanes and Frontage Roads
	5	Radial Other Freeways - Mainlanes Only
	6	Radial Other Freeways - Mainlanes and Frontage Roads
	7	Circumferential Other Freeways (Loops) - Mainlanes Only
	8	Circumferential Other Freeways (Loops) - Mainlanes and Frontage Roads
Low-Capacity	11	Principal Arterial - Divided
	12	Principal Arterial - Continuous Left Turn Lane
	13	Principal Arterial - Undivided
	14	Minor Arterial - Divided
	15	Minor Arterial - Continuous Left Turn Lane
	16	Minor Arterial - Undivided
	17	Collector - Divided
	18	Collector - Continuous Left Turn Lane
	19	Collector - Undivided
	20	Frontage Road
	21	Ramp (Between Frontage Road and Mainlanes)
	22	Interchange Ramp (Freeway-to-Freeway Interchange Ramps)[1]

[1] For delay parameter purposes, interchange ramps were considered to have characteristics (i.e., link speeds and capacities) closer to the low-capacity category than that of the high-capacity category.

The time-of-day directional v/c ratios were estimated using the directional volume (from the VMT estimation) and the time-of-day directional capacity. However, the 24-hour user equilibrium assignments were performed using nondirectional 24-hour capacities. To estimate the time-of-day directional capacity, the directional split for capacity was assumed at 50-50 and capacity factors were multiplied by the nondirectional capacity for each link. Appendix D summarizes the capacity factors by county-specific area type/facility type combination. Capacity factors were calculated as follows:

$$Capacity\ Factor = \frac{(Hourly\ Capacity\ per\ Lane)(Length\ of\ the\ Time\ Period)}{24\text{-}Hour\ Capacity\ per\ Lane}$$

Capacity data were not used, however, for the centroid connector links and intrazonal links (intrazonal links are developed specifically for air emissions analyses). The centroid connector traffic assignment input speeds were used as the centroid connector operational speeds estimates. Operational speeds for the intrazonal trips category were estimated by zone as the average of the zone's centroid connector speeds.

The hourly and 24-hour VMT weighted speed summaries by county and road type (network facility type) were provided on CD-ROM/DVD (see Appendix A).

ESTIMATION OF VMT MIX

BPA regional VMT mix estimates were developed by three functional classification groups and by four time-of-day periods for each of the four day types (Weekday, Friday, Saturday, and Sunday).

TxDOT classification counts classify vehicles into the standard FHWA vehicle classifications (based on vehicle length/number of axles) using best practice vehicle classification count methods:

- C - Passenger vehicles;
- P - Two-axle, four-tire single-unit trucks;
- B - Buses;
- SU2 - Six-tire, two-axle single-unit vehicles;
- SU3 - Three-axle single-unit vehicles;
- SU4 - Four or more axle single-unit vehicles;
- SE4 - Three or four axle single-trailer vehicles;
- SE5 - Five-axle single-trailer vehicles;
- SE6 - Six or more axle single-trailer vehicles;
- SD5 - Five or less axle multi-trailer vehicles;
- SD6 - Six-axle multi-trailer vehicles; and
- SD7 - Seven or more axle multi-trailer vehicles.

EPA and MOBILE use a different vehicle classification scheme than the FHWA categories. The 28 EPA vehicle categories are defined as a function of gross vehicle weight rating (GVWR) and fuel type (see Table 10). The FHWA axle/vehicle length-based classification categories were converted into the 28 MOBILE GVWR/fuel-type-based categories following the allocation methodology as described in the TTI Technical Report, *VMT Mix Estimation Method Refinement for MOBILE6,* August 2003.

The three-county area (Hardin, Jefferson and Orange) data were aggregated. VMT mix was estimated using the latest available five years of TxDOT vehicle classification data (1999 - 2003) and latest available TxDOT registrations data (2004). Local registrations data were used to separate vehicle categories by fuel type, supplemented with MOBILE6 defaults where necessary. Vehicle classification data are not directly forecast. However, MOBILE6 default values consistent with the analysis year were used.

TxDOT vehicle classification data are only collected for weekdays (Monday through Thursday), consequently other data were used to estimate VMT mix for Fridays, Saturdays, and Sundays. The procedure used to estimate Friday, Saturday, and Sunday VMT mix relied on vehicle classification data collected over several years in urban areas. The ratio of Weekday VMT mix to Friday, Saturday, and Sunday VMT mix was multiplied by the Weekday VMT mix to produce region specific Friday, Saturday, and Sunday VMT mix. (No seasonal changes were assumed.)

Application of the time-of-day functional class group specific VMT mixes by network facility type and hour-of-day is specified in Table 25 (in the Emissions Calculations section). Appendix E shows the estimated VMT mixes for each day type.

ESTIMATION OF EMISSIONS FACTORS

The MOBILE6 model (September 2003) was used to calculate the episode-day emissions factors (in g/mi) of VOC, CO, and NOx. Emissions factors were estimated by speed, emissions type (i.e., emissions factor sub-component), hour, MOBILE6 roadway type (or drive cycle), and average vehicle class fleet (28) for each BPA ozone nonattainment area county and episode day. The diesel vehicle NOx emissions factors in these tables were adjusted (post-processed) to reflect the impact of the TxLED fuel program.

The MOBILE6 model is equipped with national default modeling values for a wide range of conditions that affect emissions factors. Many of the MOBILE6 default modeling parameters may be overridden using particular MOBILE6 commands and their associated inputs/options. Wherever possible, MOBILE6 defaults were replaced by local input values. Such local inputs were developed and used to produce emissions factors characteristic of the 2000 episode-day climatic conditions, and evaluation-specific vehicle fleet estimates, activity, and emissions control programs.

The following sections discuss the MOBILE6 input/output files, summarize the control programs modeled, detail the aggregation level of the MOBILE6 emissions factors used, and describe all of the MOBILE6 commands that may affect emissions factor calculations. Also, the

commands used are identified, development of the locality-specific inputs are explained, and development and use of emissions factor post-processing factors is described.

MOBILE6 Input and Output Files
The MOBILE6 commands and particular model input data are entered in the MOBILE6 command file. Other input parameters (and in some cases, commands) are applied to MOBILE6 from external data files.

The POLFAC62_3 program, a utility for running MOBILE6 (September 2003 release) and processing its by-model-year database output to produce the emissions factor tables input for the emissions calculations (described in Appendix B), was used to run MOBILE6 with the user-input command and external data files to produce the VOC, CO, and NOx emissions factors. RATEADJV62 was used to post-process the POLFAC62_3 emissions factor tables for TxLED effects, discussed later. The final product of the emissions factor modeling is 51 emissions factor files (i.e., one table of hourly emissions factors for each county for each episode day). (A corresponding set of average 24-hour emissions factor tables was also produced, however was not used in the emissions calculations.)

All of the MOBILE6 input files and output files (MOBILE6 emissions factor tables developed with POLFAC62_3 and RATEADJV62) were provided on CD-ROM/DVD (see Appendix A).

Control Programs Modeled
All federal motor vehicle control programs included in MOBILE6 were modeled (this is the MOBILE6 default). Also modeled were the federal programs to offset heavy-duty diesel vehicle (HDDV) defeat device effects — the low-emissions rebuild program, and the HDDV 2004 standard pull-ahead program (this is the MOBILE6 default). The effects of the TxLED fuel program were modeled by post-processing the MOBILE6 emissions factors, discussed later. The new federal motorcycle (MC) exhaust standards (not included in MOBILE6) were not included in the control program modeling.

Aggregation Level of MOBILE6 Emissions Factors
The by-model-year (or age-specific) emissions factors from the MOBILE6 detailed database output were condensed into average fleet emissions factors (i.e., model year composites) by vehicle class. POLFAC62_3 performed this function for each vehicle type by multiplying each of the age-specific emissions factors by their corresponding travel fractions (developed from MOBILE6 output age-specific registration fractions and miles-traveled fractions) and summing the results. Each emissions factor table provides the MOBILE6 emissions factors by:

- 28 vehicle types;
- 4 road types;
- 14 speeds (except for the two MOBILE6 road types, each with one average speed);
- 15 pollutant-specific (VOC, CO, and Nox) emissions types; and
- 24 hourly time periods.

Tables 10 through 12 describe the MOBILE6 vehicle type, emissions type (for VOC, CO, and NOx pollutants), and roadway type classifications. Table 13 and Table 14 show the speeds and the sequence for hourly time periods, respectively.

Table 10 defines the 28 MOBILE6 vehicle types by fuel type (gasoline or diesel) and GVWR category, in the MOBILE6 vehicle class index number sequence.

Table 10
MOBILE6 Vehicle Classifications

Number	Abbreviation	Description
1	LDGV	Light-Duty Gasoline Vehicles (Passenger Cars)
2	LDGT1	Light-Duty Gasoline Trucks 1 (0-6,000 lbs. GVWR, 0-3,750 lbs. LVW)
3	LDGT2	Light-Duty Gasoline Trucks 2 (0-6,000 lbs. GVWR, 3,751-5,750 lbs. LVW)
4	LDGT3	Light-Duty Gasoline Trucks 3 (6,001-8,500 lbs. GVWR, 0-5,750 lbs. ALVW[1])
5	LDGT4	Light-Duty Gasoline Trucks 4 (6,001-8,500 lbs. GVWR, 5,751 lbs. and greater ALVW)
6	HDGV2b	Class 2b Heavy-Duty Gasoline Vehicles (8,501-10,000 lbs. GVWR)
7	HDGV3	Class 3 Heavy-Duty Gasoline Vehicles (10,001-14,000 lbs. GVWR)
8	HDGV4	Class 4 Heavy-Duty Gasoline Vehicles (14,001-16,000 lbs. GVWR)
9	HDGV5	Class 5 Heavy-Duty Gasoline Vehicles (16,001-19,500 lbs. GVWR)
10	HDGV6	Class 6 Heavy-Duty Gasoline Vehicles (19,501-26,000 lbs. GVWR)
11	HDGV7	Class 7 Heavy-Duty Gasoline Vehicles (26,001-33,000 lbs. GVWR)
12	HDGV8a	Class 8a Heavy-Duty Gasoline Vehicles (33,001-60,000 lbs. GVWR)
13	HDGV8b	Class 8b Heavy-Duty Gasoline Vehicles (>60,000 lbs. GVWR)
14	LDDV	Light-Duty Diesel Vehicles (Passenger Cars)
15	LDDT12	Light-Duty Diesel Trucks 1 and 2 (0-6,000 lbs. GVWR)
16	HDDV2b	Class 2b Heavy-Duty Diesel Vehicles (8,501-10,000 lbs. GVWR)
17	HDDV3	Class 3 Heavy-Duty Diesel Vehicles (10,001-14,000 lbs. GVWR)
18	HDDV4	Class 4 Heavy-Duty Diesel Vehicles (14,001-16,000 lbs. GVWR)
19	HDDV5	Class 5 Heavy-Duty Diesel Vehicles (16,001-19,500 lbs. GVWR)
20	HDDV6	Class 6 Heavy-Duty Diesel Vehicles (19,501-26,000 lbs. GVWR)
21	HDDV7	Class 7 Heavy-Duty Diesel Vehicles (26,001-33,000 lbs. GVWR)
22	HDDV8a	Class 8a Heavy-Duty Diesel Vehicles (33,001-60,000 lbs. GVWR)
23	HDDV8b	Class 8b Heavy-Duty Diesel Vehicles (>60,000 lbs. GVWR)
24	MC	Motorcycles (Gasoline)
25	HDGB	Gasoline Buses (School, Transit, and Urban)
26	HDDBT	Diesel Transit and Urban Buses
27	HDDBS	Diesel School Buses
28	LDDT34	Light-Duty Diesel Trucks 3 and 4 (6,001-8,500 lbs. GVWR)

[1] The ALVW is the numerical average of the vehicle curb weight and the GVWR.

Table 11 shows the eight MOBILE6 emissions type classifications (excluding the pollutants which are not pertinent to this application, i.e., particulates and toxics). Expanding these emissions types by individual pollutant produces 12 pollutant-specific emissions types. In addition, POLFAC62_3 emissions factor tables contain pollutant composite emissions factors. Thus, for VOC, CO, and NOx applications, POLFAC62_3 calculates MOBILE6 emissions factors for up to 15 pollutant-specific emissions types. MOBILE6 emissions factors were calculated for all pollutant-specific emissions types except for refueling emissions, which are classified as an area source.

Table 11
MOBILE6 Emission Type Classifications

Number	Abbreviation	Description	Pollutants	Vehicle Classes
1	Running	Exhaust Running Emissions	Hydrocarbon (HC), CO, NOx	All
2	Start	Exhaust Engine Start Emissions (trip start)	HC, CO, NOx	LD plus MC
3	Hot Soak	Evaporative Hot Soak Emissions (trip end)	HC	Gasoline, including MC
4	Diurnal	Evaporative Diurnal Emissions (heat rise)	HC	Gasoline, including MC
5	Resting	Evaporative Resting Loss Emissions (leaks and seepage)	HC	Gasoline, including MC
6	Run Loss	Evaporative Running Loss Emissions	HC	Gasoline, less MC
7	Crankcase	Evaporative Crankcase Emissions (blow-by)	HC	Gasoline, including MC
8	Refueling	Evaporative Refueling Emissions (fuel displacement and spillage)	HC	Gasoline, less MC

MOBILE6 calculates emissions factors reflective of driving cycles observed on four roadway types, as well as emissions factors for those emissions types that are not directly applicable to the driving cycles (e.g., start and the evaporative components excluding running losses). Table 12 shows the driving cycle (or roadway type) descriptions. The fifth category, not actually a road type, is labeled by MOBILE6 as “None.” “None” (roadway type 5), is the index for the emissions types that do not apply to the driving cycles, and thus do not vary by roadway type or speed.

POLFAC62_3, however, categorizes all of the pollutant-specific emissions types by MOBILE6 roadway types one through four — Freeway, Arterial, Local, and Ramp. In POLFAC62_3, the MOBILE6 g/mi emissions factors corresponding to the “None” roadway type are calculated for each of the four actual roadway types. This allocation is performed in POLFAC62_3 so that all emissions, regardless of type, may be spatially allocated by the functional class- (or roadway type) coded network links.

Table 12
MOBILE6 Roadway Classifications

Numbe	Abbreviation	Description
1	Freeway	High-speed, limited-access roadways
2	Arterial	Arterial and collector roadways
3	Local	Urban local roadways
4	Fwy Ramp	Freeway on and off ramps
5	None	Not applicable (for start and some evaporative emissions)

Table 13 shows the 14 speeds for which the MOBILE6 Freeway and Arterial emissions factors are calculated. Later in the emissions estimation process, emissions factors for average operational speeds that are not in the 14 speeds, are estimated by interpolation (except for those speeds outside of the MOBILE6 speed range, in which case the emissions factors corresponding to the appropriate bounding speed are used). The MOBILE6 Local and Ramp road type emissions factors are not speed sensitive and are each characterized by one average speed.

Table 13
Speeds for POLFAC62_3 MOBILE6
Freeway and Arterial Emissions Factors[1]

Number	Speed
1	2.5 mph
2	5 mph
3	10 mph
4	15 mph
5	20 mph
6	25 mph
7	30 mph
8	35 mph
9	40 mph
10	45 mph
11	50 mph
12	55 mph
13	60 mph
14	65 mph

[1] The MOBILE6 Local and Ramp drive cycle emissions factor's fixed speeds are 12.9 and 34.6 mph, respectively.

MOBILE6 uses several hourly input parameters (e.g., hourly temperatures, hourly VMT fractions) to model hourly emissions factors. MOBILE6 requires that hourly input parameters be sequenced starting from the 6 a.m. hour. In some cases, however, particular overnight hours are grouped together as a single time period. Table 14 shows the MOBILE6 sequence for hourly inputs.

Table 14
General Sequence for Calendar Day Hourly[1] Inputs to MOBILE6

Input	Abbreviation	Description
1	6 a.m.	6 a.m. through 6:59 a.m.
2	7 a.m.	7 a.m. through 7:59 a.m.
3	8 a.m	8 a.m. through 8:59 a.m.
4	9 a.m.	9 a.m. through 9:59 a.m.
5	10 a.m.	10 a.m. through 10:59 a.m.
6	11 a.m.	11 a.m. through 11:59 a.m.
7	12 Noon	12 p.m. through 12:59 p.m.
8	1 p.m.	1 p.m. through 1:59 p.m.
9	2 p.m.	2 p.m. through 2:59 p.m.
10	3 p.m.	3 p.m. through 3:59 p.m.
11	4 p.m.	4 p.m. through 4:59 p.m.
12	5 p.m.	5 p.m. through 5:59 p.m.
13	6 p.m.	6 p.m. through 6:59 p.m.
14	7 p.m.	7 p.m. through 7:59 p.m.
15	8 p.m.	8 p.m. through 8:59 p.m.
16	9 p.m.	9 p.m. through 9:59 p.m.
17	10 p.m.	10 p.m. through 10:59 p.m.
18	11 p.m.	11 p.m. through 11:59 p.m.
19	12 Midnight	12 a.m. through 12:59 a.m.
20	1 a.m.	1 a.m. through 1:59 a.m.
21	2 a.m.	2 a.m. through 2:59 a.m.
22	3 a.m.	3 a.m. through 3:59 a.m.
23	4 a.m.	4 a.m. through 4:59 a.m.
24	5 a.m.	5 a.m. through 5:59 a.m.

[1] For some MOBILE6 hourly input parameters, overnight hours are grouped. Hourly inputs are representative of the same day, but are reordered for input to MOBILE6 to start at 6 a.m.

Application of MOBILE6 Commands and Associated Input Parameters

Tables 15 through 21 describe all of the MOBILE6 commands that may affect calculating emissions factors (except for some that affect only output format or content). These tables are: MOBILE6 Pollutants and Emission Rates, MOBILE6 External Conditions, MOBILE6 Vehicle Fleet Characteristics, MOBILE6 Activity, MOBILE6 State Programs, MOBILE6 Fuels, and MOBILE6 Alternative Emissions Regulations and Control Measures. These tables identify the combinations of MOBILE6 commands and parameters used.

Unless otherwise stated, the inputs were used for all counties and episode days. For locality-specific inputs, the source of the data is given. For cases were particular MOBILE6 defaults were used, technical report references (electronic file names available on the EPA MOBILE website [http://www.epa.gov/otaq/models/mobile6/m6tech.htm] were provided.

The procedures used to develop the locality-specific inputs to MOBILE6 and to post-process the emissions factors for LED effects are detailed following the seven MOBILE6 input category tables.

Table 15
MOBILE6 Pollutants and Emission Rates

Command	Function/Description	Input Parameter Source/Value
POLLUTANTS	Defines the basic set of pollutants to report.	NOT APPLIED. (The MOBILE6 default is assumed: HC, CO, NOx.)
PARTICULATES	Enables computation of particulate matter (PM) an related emissions factors.	NOT APPLIED.
PARTICULATE EF	Specifies location of files that contain the particulate emissions factors when PARTICULATES command is used.	NOT APPLIED.
PARTICLE SIZE	Allows user to specify the maximum particulate size cutoff used by MOBILE6.	NOT APPLIED.
EXPRESS HC AS VOC	One of five possible commands that allow the user to specify the particular HC species (non-methane hydrocarbons, non-methane organic gases, total hydrocarbons, total organic gases, and VOC) to report in the exhaust emissions output.	APPLIED for VOC. Only the command is required.
NO REFUELING	Directs MOBILE6 not to calculate refueling emissions factors.	APPLIED. Only the command is required.
AIR TOXICS	Enables the computation of air toxic emissions factors (six explicit pollutants) and specifies which to calculate.	NOT APPLIED.
ADDITIONAL HAPS	Allows entry of emissions factors or air toxic ratios for calculation of additional user-defined air toxic pollutant emissions factors.	NOT APPLIED.
MPG ESTIMATES	Allows entry of alternate fuel economy performance data by vehicle class and model year.	NOT APPLIED. (MOBILE6 default values were assumed.)

Table 16
MOBILE6 External Conditions

Command	Function/Description	Input Parameter Source/Value
CALENDAR YEAR	Identifies calendar year for which emissions factors are to be calculated. (Required to run model).	2007
EVALUATION MONTH	Provides option of calculating January 1 or July 1 emissions factors for calendar year of evaluation.	7 (for July)
MIN/MAX TEMPERATURE	Sets minimum and maximum daily temperatures. (Required to run model if the HOURLY TEMPERATURES command is not used.)	NOT APPLIED. (See HOURLY TEMPERATURES.)
HOURLY TEMPERATURES	Allows temperatures input for each hour of day. (Required to run model if MIN/ MAX TEMPERATURE command is not used.)	County, episode-day-specific, developed by TCEQ (May 2003), based on Central Daylight Time. See Appendix F.
ALTITUDE	Specifies high- or low-altitude for modeling area.	NOT APPLIED. (EPA default, low altitude, was assumed).
ABSOLUTE HUMIDITY	Used to specify daily average humidity (directly affects NOx emissions). MOBILE6 also converts absolute humidity to heat index which affects HC and CO emissions for the portion of the fleet that MOBILE6 determines is using air conditioning.	NOT APPLIED. (See RELATIVE HUMIDITY.)
Environmental Effects on Air Conditioning:	Commands used by MOBILE6 to model the extent of vehicle air-conditioning usage.	
CLOUD COVER	Specifies average percent cloud cover for given day.	NOT APPLIED. (EPA default assumed.)
PEAK SUN	Specifies mid-day hours with peak sun intensity.	NOT APPLIED. (EPA default assumed.)
SUNRISE/SUNSET	Allows user to specify time of sunrise and sunset.	Region-specific values: 7 a.m., 8 p.m. (TCEQ. May, 2003).
RELATIVE HUMIDITY	Specifies use of 24 hourly relative humidity values entered by user. MOBILE6 will perform hour-specific calculations with hourly values rather than use single daily default absolute humidity value.	County, episode-day-specific, developed by TCEQ (May 2003), based on Central Daylight Time. See Appendix F.
BAROMETRIC PRES	Specifies use of user input daily average barometric pressure for use with hourly relative humidity to calculate hourly absolute humidity values.	County and episode-day-specific, developed by TCEQ (May 2003). See Appendix F.

Table 17
MOBILE6 Vehicle Fleet Characteristics

Command	Function/Description	Input Parameter Source/Value
REG DIST	Allows the user to supply registration distributions by age for any of the 16 composite (combined gasoline and diesel) vehicle types.	Locality-Specific/EPA default. TTI developed the age distributions using the latest available (2004) TxDOT mid-year local data and EPA defaults where needed. TxDOT county-level registrations data were applied for LDV, LDT and MC and region-level data were applied for HDV; MOBILE6 defaults were used for buses. See Appendix G.
DIESEL FRACTIONS	Permits user to supply locality-specific diesel fractions for 14 of the 16 composite vehicle categories by age.	Locality-Specific/EPA default. TTI developed the evaluation year-specific diesel fractions using the 2004 mid-year TxDOT registrations data and MOBILE6 defaults where needed. TxDOT statewide fuel-specific registrations were used to develop HDV diesel fractions; MOBILE defaults were used for LDV, LDT, Bus diesel fractions. The latest diesel fractions (2004) were assumed as the values for each future model year up to the year of evaluation (e.g., 2005, 2006, 2007). See Appendix G.
MILE ACCUM RATE	Allows the user to supply the annual mileage accumulation rates by vehicle type and age.	NOT APPLIED. (EPA defaults assumed — see technical report M6FLT.007)
NGV FRACTION	Lets user specify percent of natural gas vehicles (NGV) in the fleet by type and age certified to operate on either compressed or liquefied natural gas.	NOT APPLIED. (The EPA default, zero percent, was assumed.)
NGV EF	Permits the user to enter alternate NGV emissions factors for each of the 28 vehicle types, for running and start emissions.	NOT APPLIED. (The EPA default, none, was assumed.)

Table 18
MOBILE6 Activity

Command	Function/Description	Input Parameter Source/Value
VMT FRACTIONS	Used in MOBILE6 to weight the emissions of various vehicle types into average rates for groupings of vehicle classes.	NOT APPLIED. (EPA default assumed, used for aggregate results which do not apply to this analysis.)
VMT BY FACILITY	VMT fractions by MOBILE6 road type combine the four road type emissions factors into the "all road types" emissions factors.	NOT APPLIED. (EPA default assumed, used for aggregate results with no impact on this analysis.)
VMT BY HOUR	Allows VMT fractions allocation by hour-of-day; applied to convert grams per hour to g/mi, as well as to weight hourly g/mi rates to obtain daily emissions factors.	Region-Specific. There is one distribution for each day type – the same fractions as developed and used to allocate 24-hour link VMT by hour of day. See Table 5.
SPEED VMT	Allows user to allocate VMT by average speed (14 pre-selected: 2.5 and 5 through 65 at 5 mph increments) for arterials and freeways for each hour of the day.	Generic input for all counties. Inputs were set up to calculate emissions factors by 14 MOBILE6 speed bin speed scenarios for MOBILE6 freeway and arterial road types.
AVERAGE SPEED	Allows a single average speed for combined freeways and arterials for the entire day.	NOT APPLIED.
STARTS PER DAY	Lets user specify the average number of engine starts per vehicle per day by vehicle types for weekend days and weekdays.	NOT APPLIED. (MOBILE6 weekday or weekend defaults assumed depending on analysis day — see M6FLT.003.)
START DIST	Allows user to allocate engine starts by hour of the day for weekend days and weekdays.	NOT APPLIED. (MOBILE6 weekday or weekend defaults assumed depending on analysis day — see M6FLT.003.)
SOAK DISTRIBUTION	Allows use of alternate vehicle soak duration distributions for weekend days and weekdays.	NOT APPLIED. (MOBILE6 weekday or weekend defaults assumed depending on analysis day — see M6FLT.003 and 004.)
HOT SOAK ACTIVITY	Allows users to specify a hot soak duration distribution for each of 14 daily time periods for weekend days and for weekdays.	NOT APPLIED. (MOBILE6 weekday or weekend defaults assumed depending on analysis day — see M6FLT.003 and 004.)
DIURN SOAK ACTIVITY	Allows user to set diurnal soak time distributions for each of 18 daily time periods.	NOT APPLIED. (MOBILE6 defaults assumed — see technical report M6FLT.006.)
WE DA TRI LEN DI	Specifies alternate fractions of VMT that occur during trips of various durations at each hour of the average weekday.	NOT APPLIED. (MOBILE6 defaults assumed — see technical report M6FLT.005.)
WE EN TRI LEN DI	Specifies hourly alternate VMT fractions for trips of various lengths for weekend days.	NOT APPLIED. (MOBILE6 weekday defaults assumed — there are no weekend day defaults.)
WE VEH US	Directs MOBILE6 to use weekend activity data for calculating emissions factors.	Applied command for weekend day analyses.

Table 19
MOBILE6 State Programs

Command	Function/Description	Input Parameter Source/Value
STAGE II REFUELING	Allows modeling of at-the-pump refueling emissions.	NOT APPLIED. Accounted for as an area source category.
ANTI-TAMP PROG	Allows user to model impacts of an Anti-Tampering Program (ATP).	NOT APPLIED. (Although Texas administers a statewide ATP, ATP credit is only taken in those counties which also administer and enforce an Inspection and Maintenance [I/M] Program from which the compliance rate may be assumed.)
I/M Commands: I/M PROGRAM I/M MODEL YEARS I/M VEHICLES I/M STRINGENCY I/M COMPLIANCE I/M WAIVER RATES I/M CUTPOINTS I/M EXEMPTION AGE I/M GRACE PERIOD NO I/M TTC CREDITS I/M EFFECTIVENESS I/M DESC FILE	 Required for exhaust/evaporative I/M programs. Required for exhaust/evaporative I/M programs. Required for exhaust/evaporative I/M programs. Required for exhaust. Do not use for evaporative. Required for exhaust. Optional for evaporative. Required for exhaust. Optional for evaporative. Optional for exhaust (but required for IM240). Do not use with evaporative. Optional for both exhaust and evaporative. Optional for both exhaust and evaporative. Optional for exhaust. Do not use with evaporative. Optional for exhaust. Do not use with evaporative. Optional for both.	NOT APPLIED.

Table 20
MOBILE6 Fuels

Command	Function/Description	Input Parameter Source/Value
FUEL PROGRAM	Allows specification of one of four options: 1) Conventional Gasoline East Tier 2 sulfur phase-in schedule (includes Texas); 2) Reformulated Gasoline (RFG); 3) Conventional Gasoline West Tier 2 sulfur geographical phase-in area schedule; or 4) Sulfur content for gasoline after 1999.	Option 1.
SULFUR CONTENT	(or GASOLINE SULFUR) Allows use of alternate sulfur content for conventional gasoline through calendar year 1999.	NOT APPLIED. (See FUEL PROGRAM Option above.)
DIESEL SULFUR	Allows use of average diesel fuel sulfur level for all calendar years. Required if PARTICULATES command is used. No affect on HC, CO, NOx, or air toxics (except if calculated as ratio to PM.	NOT APPLIED.
OXYGENATED FUELS	Allows modeling of oxygenated gasoline effects on exhaust for all gasoline-fueled vehicle types. Not for use with AIR TOXICS command.	NOT APPLIED.
FUEL RVP	Allows user to specify fuel Reid Vapor Pressure (RVP) for area being modeled (required to run model).	Region-specific. Used federal limit, 7.8 psi.
SEASON	Identifies effective season for RFG calculation regardless of month modeled.	NOT APPLIED.
GAS AROMATIC%	Only when AIR TOXICS command is used.	NOT APPLIED.
GAS OLEFIN%	Only when AIR TOXICS command is used.	NOT APPLIED.
GAS BENZENE%	Only when AIR TOXICS command is used.	NOT APPLIED.
E200	Only when AIR TOXICS command is used.	NOT APPLIED.
E300	Only when AIR TOXICS command is used.	NOT APPLIED.
OXYGENATE	Only when AIR TOXICS command is used.	NOT APPLIED.
RVP OXY WAIVER	Only when AIR TOXICS command is used.	NOT APPLIED.

Table 21
MOBILE6 Alternative Emissions Regulations and Control Measures

Command	Function/Description	Input Parameter Source/Value
NO CLEAN AIR ACT	Models vehicle emissions as if the Federal Clean Air Act Amendments of 1990 had not been implemented.	NOT APPLIED.
HDDV NOx Off-Cycle Emissions Effects: NO DEFEAT DEVICE NO NOX PULL AHEAD NO REBUILD REBUILD EFFECTS	 Turns off the effects of the HDD vehicle NOx off-cycle emissions effects (defeat device emissions). Turns off HDD NOx emissions reduction effects of pull-ahead program. Turns off HDD NOx emissions reduction effects of rebuild program. Allows user to change rebuild program effectiveness rate.	 NOT APPLIED (MOBILE6 default, 0.90, is assumed for REBUILD EFFECTS.)
Tier 2 Emission Standards and Fuel Requirements: NO TIER2 T2 EXH PHASE-IN T2 EVAP PHASE-IN T2 CERT	Allow the overriding of the default Tier 2 emissions standards and fuel requirements settings. Disables Tier 2 requirements. Allows alternate Tier 2 exhaust standard phase-in schedules. Allows alternate Tier 2 evaporative standard phase-in schedules. Allows user to specify alternate Tier 2 50,000-mile certification standards.	NOT APPLIED.
94+ LDG IMPLEMENTATON	Allows use of alternate 1994 and later fleet penetration fractions for LDGVs under the Tier 1, National Low-Emissions Vehicle (NLEV) (or California Low-Emissions Vehicle (LEV) 1), and Tier 2 emissions standard programs.	NOT APPLIED.
NO 2007 HDDV RULE	Disables 2007 HDV emissions standards.	NOT APPLIED.

External Conditions — Locality-Specific Inputs to MOBILE6
MOBILE6 local inputs for hourly temperatures, hourly relative humidity, and sunrise and sunset times were developed and used by calendar day based on local (central daylight) time. TCEQ developed these input values (provided May 2003), using 2000 episode day data.

Temperatures (HOURLY TEMPERATURES Command)
TCEQ developed ambient hourly temperatures (degrees Fahrenheit) for input to MOBILE6 by county for each of the analysis days within the August 10, 2000 through September 6, 2000 period. The temperatures are hourly averages from monitoring stations within the BPA counties. TCEQ used monitoring data from the EPA Aerometric Information Retrieval System, the National Weather Service, and the Conrad Blucher Institute weather stations. Each county with more than one monitoring station uses the hourly average temperatures from the monitoring

stations within its border. Counties without monitoring stations, or with stations that did not record particular data parameter values, use average hourly data values from monitoring stations from adjacent counties.

The hourly average temperatures for each calendar day provided by TCEQ were sequenced starting with 6 a.m. through 11:59 p.m. followed by 12 a.m. through 5:59 a.m. of the same calendar day. The temperatures input were for Central Daylight Time (CDT) (local time).

Modeling three counties for 17 days resulted in 51 hourly temperature data sets. Appendix F contains a summary of the temperatures used.

Humidity (RELATIVE HUMIDITY Command)
The RELATIVE HUMIDITY command is used to specify hourly percent relative humidity values for each of the three counties.

TCEQ developed hourly relative humidity input values essentially following the hourly temperature input development procedure and using data available from the stations described in the hourly temperature discussion above. Many of these stations do not record humidity; humidity data from adjacent counties were used for the counties with no humidity data available. Appendix F shows the humidity values used.

Sunrise and Sunset Times (SUNRISE/SUNSET Command)
The SUNRISE/SUNSET Command allows the user to specify the time of sunrise and sunset. TCEQ provided the sunrise and sunset times, which were the same for all counties and days. The times are 7 a.m. and 8 p.m. CDT.

Barometric Pressure (BAROMETRIC PRES Command)
The BAROMETRIC PRES command is used to specify the 24-hour average barometric pressure value (in units of inches of Mercury) by county and episode analysis day.

The daily barometric pressure inputs were developed by TCEQ by averaging the hourly barometric pressure data for each day (based on local time) from the weather stations with available barometric pressure data. As was the case for temperature and humidity inputs for counties without available data, values from adjacent counties were applied. Appendix F shows the barometric pressure input values.

Vehicle Fleet Characteristics
TTI developed the vehicle registration (age) distributions and diesel fractions inputs to MOBILE6 using the latest available (2004) mid-year TxDOT registrations data sets for all evaluation years. MOBILE6 default age distributions and diesel fractions inputs were used for the particular vehicle classes for which the TxDOT registrations data were not available.

The TxDOT data were aggregated at the county level and region level for developing age distributions for light-duty and heavy-duty classes, respectively, and at the state level for developing diesel fractions. These aggregation levels were used to overcome sample size

problems that may occur (especially for rural counties) for particular vehicle classes with minimal registrations.

Vehicle Registration Distributions (REG DIST Command)
The user-supplied vehicle registration distributions input to MOBILE6 are by vehicle age for any of the 16 composite (combined gasoline and diesel) vehicle types, as shown in Table 22. EPA default distributions are internally applied by MOBILE6 for vehicle classes for which the analyst does not provide alternate values.

The input values for each vehicle class are 25 age fractions representing the fraction of vehicles by age for that particular vehicle class as of July of the evaluation year. These age fractions start with the evaluation year as the 1st age fraction and work back in annual increments to end with the 25th fraction, which represents the fraction of vehicles of age 25 years and older. The fractions were calculated as the model-year-specific registrations in a class divided by the total vehicles registered in that class. Table 22 shows the data source and aggregation level by vehicle type.

Table 22
Composite Vehicle Classes and Data Sources for MOBILE6 Age Distributions Input

Number[1]	Abbreviation	Description	Source of Distributions[2]
1	LDV	Light-Duty Vehicles	TxDOT Mid-Year County Registrations
2	LDT1	Light-Duty Trucks 1	TxDOT Mid-Year County Registrations
3	LDT2	Light-Duty Trucks 2	TxDOT Mid-Year County Registrations
4	LDT3	Light-Duty Trucks 3	TxDOT Mid-Year County Registrations
5	LDT4	Light-Duty Trucks 4	TxDOT Mid-Year County Registrations
6	HDV2B	Class 2b Heavy-Duty Vehicles	TxDOT Mid-Year Region Registrations
7	HDV3	Class 3 Heavy-Duty Vehicles	TxDOT Mid-Year Region Registrations
8	HDV4	Class 4 Heavy-Duty Vehicles	TxDOT Mid-Year Region Registrations
9	HDV5	Class 5 Heavy-Duty Vehicles	TxDOT Mid-Year Region Registrations
10	HDV6	Class 6 Heavy-Duty Vehicles	TxDOT Mid-Year Region Registrations
11	HDV7	Class 7 Heavy-Duty Vehicles	TxDOT Mid-Year Region Registrations
12	HDV8A	Class 8a Heavy-Duty Vehicles	TxDOT Mid-Year Region Registrations
13	HDV8B	Class 8b Heavy-Duty Vehicles	TxDOT Mid-Year Region Registrations
14	HDBS	School Buses	MOBILE6 Default
15	HDBT	Transit and Urban Buses	MOBILE6 Default
16	MC	Motorcycles	TxDOT Mid-Year County Registrations

[1] MOBILE6 age distributions input sequence by index number.
[2] TxDOT registrations data are from the mid-year 2004 county registrations data extract.

TTI developed MOBILE6 age distributions fractions input from TxDOT data for all vehicle types except for the two bus categories, for which the MOBILE6 defaults were used (TxDOT data does not specify buses). To develop these distributions, TTI used two county-level data sets provided by TxDOT — one including the combined gasoline- and diesel-powered light-duty vehicle, light-duty truck, and motorcycle registrations, and the other containing the individual gasoline- and individual diesel-powered heavy-duty vehicle registrations by the eight MOBILE6 heavy-duty weight categories. Each data set provides registrations as of the extract date for 26 model years plus a 27th category for vehicles older than the 26th model year.

The mid-year county level registrations data extracts provided by TxDOT are:

- combined gasoline and diesel: LDV, LDT12, LDT34, MC; and
- individual gasoline and individual diesel: HDV2B, HDV3, HDV4, HDV5, HDV6, HDV7, HDV8A, and HDV8B.

The LDT12 and LDT34 classes of the combined gasoline and diesel registrations data set correspond to the MOBILE6 LDT1 and LDT2 classes, and the LDT3 and LDT4 classes, respectively.

The following steps were performed to develop the MOBILE6 registration distributions input for the 14 non-bus vehicle classes:

- individual TxDOT gasoline and diesel registrations were combined for each of the eight HDV subcategories;
- HDV subcategory county-level data were aggregated to the regional level;
- for each of the 12 vehicle classes in the TxDOT data, model year registrations corresponding to vehicles 25 years old and older were summed to form the "25 years old and older" age group;
- registrations were converted from numbers of vehicles registered to fractions registered by age (class registrations for each age divided by class total registrations); and
- age distributions were expanded from 12 to 14 classes by using the LDT12 distributions for both LDT1 and LDT2, and LDT34 distributions for both LDT3 and LDT4.

In some cases the age distributions fractions do not sum to one due to insignificant rounding error. In such cases, MOBILE6 normalizes the age distribution fractions. Appendix G shows the MOBILE6 age distributions. The MOBILE6 age distributions external data input files were provided to TCEQ on CD-ROM/DVD as described in Appendix A.

Diesel Fractions (DIESEL FRACTIONS Command)
The DIESEL FRACTIONS command allows the analyst to specify diesel fractions for 14 of the 16 composite (gasoline and diesel) vehicle categories by model year. MOBILE6 assumes that all urban/transit buses are diesel fueled, and that motorcycles are all gasoline fueled, so these two categories do not require diesel fractions. The diesel fractions represent the portion of diesel vehicles in a composite (gasoline and diesel) vehicle class for each vehicle age. When the analyst enters diesel fractions, all 14 sets of fractions are required. Each set of fractions contains the diesel fractions for 25 model years, starting with the evaluation year as the first model year, and going back in annual increments to the 25th, or earliest model year fraction.

TTI developed the 2007 analysis year diesel fractions input data set for the BPA analysis using a combination of estimated TxDOT statewide diesel fractions (based on the mid-year 2004 registrations data sets) and MOBILE6 default diesel fractions. Table 23 shows the MOBILE6 diesel fractions input sequence and categories with corresponding data sources.

Table 23
Source of Diesel Fractions for Composite Vehicle Types

Number[1]	Abbreviation	Description	Source of Fractions[2]
1	LDV	Light-Duty Vehicles	EPA MOBILE6 Evaluation Year Default
2	LDT1	Light-Duty Trucks 1	EPA MOBILE6 Evaluation Year Default
3	LDT2	Light-Duty Trucks 2	EPA MOBILE6 Evaluation Year Default
4	LDT3	Light-Duty Trucks 3	EPA MOBILE6 Evaluation Year Default
5	LDT4	Light-Duty Trucks 4	EPA MOBILE6 Evaluation Year Default
6	HDV2B	Class 2b Heavy-Duty Vehicles	TxDOT Mid-Year Statewide Registrations
7	HDV3	Class 3 Heavy-Duty Vehicles	TxDOT Mid-Year Statewide Registrations
8	HDV4	Class 4 Heavy-Duty Vehicles	TxDOT Mid-Year Statewide Registrations
9	HDV5	Class 5 Heavy-Duty Vehicles	TxDOT Mid-Year Statewide Registrations
10	HDV6	Class 6 Heavy-Duty Vehicles	TxDOT Mid-Year Statewide Registrations
11	HDV7	Class 7 Heavy-Duty Vehicles	TxDOT Mid-Year Statewide Registrations
12	HDV8A	Class 8a Heavy-Duty Vehicles	TxDOT Mid-Year Statewide Registrations
13	HDV8B	Class 8b Heavy-Duty Vehicles	TxDOT Mid-Year Statewide Registrations
14	HDBS	School Buses	EPA MOBILE6 Evaluation Year Default

[1] MOBILE6 input sequence by index number.
[2] TxDOT registrations data are from the mid-year 2004 county registrations data extract.

The statewide diesel fractions estimates were calculated using individual diesel and gasoline vehicle statewide registrations data for the eight HDV (HDV2b through HDV8b) weight classes. To produce the individual HDV diesel fractions by model year, the model-year-specific individual HDV class diesel registrations were divided by the sum of the gasoline and diesel registrations for that vehicle class and model year. This procedure was performed for each HDV class and model year.

The available by-model-year diesel fractions data (MOBILE6 defaults and Texas statewide fractions) do not completely correlate to each model year required in the 25 model-year input data series specific to the calendar year of evaluation. For example, the MOBILE6 diesel fractions vary by age for model years 1972 through 1996. MOBILE6 thus assumes that the diesel fractions for the 1971 and earlier model years are the same as the 1972 model year diesel fraction, and that the diesel fractions for the 1997 and later model years are the same as the 1996 model year diesel fraction. This concept also was applied to the Texas diesel fractions data (model years 1978 and older to 2004) to complete the model-year series required as input for the

calendar year of evaluation. The model-year fractions extending beyond the earliest required input model year diesel fractions (1983) were dropped from the input data set.

The estimated 2007 evaluation year HDV diesel fractions were combined with the corresponding MOBILE6 default diesel fractions for the remaining vehicle classes (LDV, LDT1, LDT2, LDT3, LDT4, and HDBS) to produce the input data setr. The diesel fractions are inputs to the MOBILE6 command files, which were provided on CD-ROM/DVD (see Appendix A). Appendix G also includes the diesel fractions inputs.

Activity

The locality-specific activity parameters used were fleet hourly VMT fractions. Additionally, generic, hourly fractions of VMT by speed (i.e., the14 MOBILE6 speed bin speeds) for Arterials and Freeways were used for modeling emissions factors by speed, and weekend day hourly vehicle usage rates (MOBILE6 defaults) were used for the Saturday and Sunday episode days.

VMT Fractions (Also Known as VMT Mix)

These sets of fractions (VMT fractions attributable to individual vehicle classes) are an input to MOBILE6. However, the method for this study calls for applying the VMT mix (or mixes) later in the emissions calculation process. VMT mix development was discussed previously in this documentation.

Total VMT by Hour (VMT BY HOUR Command)

Hourly fleet total VMT distributions were input to MOBILE6 using the VMT BY HOUR command. These fractions were used in MOBILE6 to convert the units of the non-travel-related hourly emissions factors (e.g., hot soak, diurnal, start, etc.) to units of g/mi. (The VMT-by-hour fractions were also used to produce daily emissions factors as composites of the hourly emissions factors.)

Development of the hourly VMT fractions for the BPA three-county nonattainment area were previously discussed in the “Hourly Travel Factors” section (see Table 4). These hourly travel fractions, used to distribute 24-hour link VMT by hour-of-day, were also input to MOBILE6, except that the MOBILE6 input sequence starts with the 6 a.m. fraction. The hourly VMT fractions are input to MOBILE6 as an external data file. The data files were provided on CD-ROM/DVD, as described in Appendix A.

VMT Distribution by Average Speed on Freeways and Arterials (SPEED VMT Command)

The VMT distributions by average speed inputs are called by the SPEED VMT command, but are accommodated internally by the POLFAC62_3 program (that is, no user speed input commands or data parameter values are required when producing MOBILE6 emissions factors tables with POLFAC62_3). POLFAC62_3 used the SPEED VMT inputs to produce the individual Freeway and Arterial emissions factors indexed by the 14 MOBILE6 speed bin speeds (see Table 13).

There are 14 scenarios, each with 100 percent of Freeway and Arterial VMT set to one of the 14 MOBILE speed bin speeds. Each scenario produced a set of Arterial and Freeway emissions factors corresponding to one of the 14 speeds.

Weekend Day Vehicle Usage (WE VEH US Command)
MOBILE6 supplies default weekend day hourly vehicle usage rates for start distributions, soak distributions, hot soak activity, and trip length distributions. For Saturday and Sunday day types, the WE VEH US command was used to model the EPA default weekend usage rates for these parameters. MOBILE6 does not contain weekend day trip length distributions, thus the weekday defaults were used for all episode days.

State Programs
There were no MOBILE6 State Programs descriptive inputs (i.e., I/M, ATP, and stage II refueling programs) modeled.

Fuels
User input for fuel effects for modeling BPA 2007 includes only the FUELS PROGRAM and FUEL RVP commands and associated input parameters.

Fuel Program (FUEL PROGRAM Command)
The MOBILE6 FUEL PROGRAM command provides the user four options for modeling fuel effects. The first option, Conventional Gasoline East, which is also the MOBILE6 default, was modeled for all three counties. This option supplies post-1999 gasoline sulfur levels by year under the Tier 2 rule phase-in schedule for most states (including Texas).

Gasoline RVP (FUEL RVP Command)
The federal volatility limit, 7.8 psi, for the BPA counties was used.

MOBILE6 Alternative Emissions Regulations and Control Measures
No alternate user-input values were used within this section of the MOBILE6 model, which includes application of the HDDV NOx off-cycle emissions effects and the effects of the associated NOx off-cycle emissions mitigation programs.

In the late 1980s and most of the 1990s, HDDV engines were built with “defeat devices” allowing in-use engine emissions to be higher than emissions as specified under Federal Test Procedure conditions. MOBILE6 includes estimates of these excess HDDV emissions as well as the emissions offsetting effects of two programs — early pull-ahead of 2004 HDDV emissions standards, and the low emissions rebuilds of existing engines. The MOBILE6 defaults for these mitigation programs were used, to include the 90 percent effectiveness rate for the engines rebuild program.

According to all of the MOBILE6 input parameters and options described above, MOBILE6 input files were set up and run with the POLFAC62_3 program for each county and analysis day. The resulting hourly emissions factors output were then post-processed as described below.

Emissions Factor Post-Processing

MOBILE6 does not allow user-specified alternate diesel fuel input parameters that affect the modeled VOC, CO, and NOx emissions factors. This MOBILE6 model limitation resulted in the emissions factors post-processing requirement for modeling TxLED fuel effects on diesel vehicle NOx emissions factors. No other emissions factor post-processing was required.

To model the impacts of the TxLED Fuel Program, TTI post-processed the MOBILE6 diesel vehicle NOx emissions factors (using the RATEADJV62 utility, which multiplied the emissions factors by the appropriate TxLED factors in the POLFAC62_3 emissions factor tables, see utility description in Appendix B). Table 24 shows the estimated BPA area NOx reductions estimates for 2007 and the corresponding adjustment factors by diesel vehicle type developed by TTI.

Table 24
TxLED Program Effects – Estimated BPA 2007 NOx Benefit and Reduction Factors[1]

Diesel Vehicle Type	NOx Reduction	NOx Adjustment Factor
LDDV	6.10%	0.9390
LDDT12	6.20%	0.9380
LDDT34	5.43%	0.9457
HDDV2B	5.03%	0.9497
HDDV3	5.22%	0.9478
HDDV4	5.43%	0.9457
HDDV5	5.29%	0.9471
HDDV6	5.48%	0.9452
HDDV7	5.87%	0.9413
HDDV8A	5.94%	0.9406
HDDV8B	5.70%	0.943
HDDBT	5.81%	0.9419
HDDBS	5.82%	0.9418

[1] Developed by TTI based on latest BPA age distributions and statewide diesel fraction estimates (using TxDOT mid-year 2004 registrations data) and application of EPA's estimates for TxLED NOx reductions by model year: 4.8 percent for 2002 and newer diesel vehicles, and 6.2 percent for 2001 and older diesel (*Texas Low Emissions Diesel Fuel Benefits*, EPA Memorandum, September 27, 2001).

Development of NOx Post-Processing Factors for TxLED Fuel Effects

TTI developed new BPA 2007 TxLED NOx reduction factors (based on TxDOT mid-year 2004 registrations data) as an update to the previous set of BPA 2007 TxLED reduction factors developed by TCEQ (based on mid-year 2003 registrations data).

TTI used EPA's best estimate of the TxLED fuel NOx benefit by model year (or technology)

group (*Texas Low-Emission Diesel Fuel Benefits*, EPA Memorandum, September 27, 2001) for all diesel vehicle classes:

- 4.8 percent NOx benefit (0.952 reduction factor) for 2002 and newer diesel vehicles; and
- 6.2 percent NOx benefit (0.932 reduction factor) for 2001 and older diesel vehicles.

TTI combined the two EPA model-year-group-specific TxLED factors into a single composite for each diesel vehicle class using estimated relative NOx contributions for the two age groups, particular to each diesel vehicle class. The estimated NOx contribution fraction for each age group was multiplied by the associated age group TxLED reduction factor and the two products were then summed to produce the average vehicle class reduction factor. This was performed for each diesel vehicle class to produce the results in Table 24.

TTI developed the relative NOx contributions by age group as a function of BPA regional 2007 MOBILE6 daily by-model-year NOx emissions factors. The emissions factors were developed using BPA regional age distributions and statewide diesel fractions (based on the 2004 TxDOT mid-year registrations data) and regional fleet activity inputs (speed VMT, VMT by Facility and VMT by hour) consistent with the 2007 BPA weekday link VMT/speed and 2007 weekday VMT mix data sets. Using the MOBILE6 by-model-year output data, the emissions factors were compressed across facility type and emissions type (i.e., exhaust start and running for light-duty), and the model year travel fractions were calculated. Within each age group, the model year-specific travel fractions and compressed NOx emissions factors were then multiplied and summed producing the relative NOx contributions by age group. This procedure was performed for each diesel vehicle class.

For a particular analysis year, the relative NOx contributions by model year group (and thus TxLED factors) vary between vehicle classes mainly depending on the vehicle class age distributions. Since the estimated TxLED NOx reduction is lower for the newer model year vehicles, the composite benefit decreases when the newer age-group relative NOx contribution increases, and visa versa.

Upon completion of this emissions factor post-processing step, the emissions factors were input to the IMPSUM62 program to calculate estimated emissions. The modeled emissions factors were provided to TCEQ on CD-ROM/DVD. See Appendix A for file names and descriptions.

EMISSIONS CALCULATIONS

The main EI components (hourly VMT/speeds, time-of-day VMT mix, and hourly emissions factors) were combined at the link level to produce the link-emissions estimates for each episode day. In addition, hourly and 24-hour EI data summary tables were developed.

Hourly Link Emissions
Episode day emissions estimates were calculated and recorded by directional roadway network and intrazonal link for each vehicle class using IMPSUM62 with the following basic inputs:

- episode-day MOBILE6 emissions factors for each county indexed by pollutant, speed, emissions type, hour, road type, and vehicle type, as developed with POLFAC62_3 (and RATEADJV6);
- indexes associating the MOBILE6 drive-cycle-specific emissions factors with the appropriate facility type codes used in the network links;
- day-type-specific directional link data from the post-processed TDM network assignment results including: county index, facility type index, directional link VMT estimate, directional operational link-speed estimate, link node (end point) numbers, and link distance; and
- day-type-specific VMT mix (to allocate link VMT by each of the 28 vehicle types) by time period and facility type.

The day-type, time-period and functional-class group-specific VMT mixes were matched to their corresponding links (via day-type, facility-type, and hour indexes) and were multiplied by the fleet total link VMT to produce the hourly link VMT by vehicle type. Based on a comparative analysis of ATR data it was determined that the September 4 (Monday, Labor Day) episode day was most like the Sunday day type. The Sunday VMT/speed and VMT mix estimates were thus chosen to represent activity for the Labor Day episode day.

Pollutant emissions factors then were matched with link-level VMT by episode day/day type, county, hour, road type drive cycle, vehicle class, and speed. Drive-cycle specificity was used by allocating the fixed speed freeway ramp, and speed-sensitive freeway and arterial emissions factors, respectively, to appropriate ramp links, freeway links, and all remaining links. The speed-sensitive emissions factors corresponding to link speeds not represented in the emissions factor tables were calculated by interpolation (see example calculation, Appendix B), except for those link speeds greater than or less than the MOBILE6 speed range, for which the subject bounding speed emissions factors were used.

The link VMT were then multiplied by the emissions factors to produce the emissions estimates recorded for each directional link in grams. Each link-emissions record includes the link endpoint codes, facility type code, pollutant label, emissions type (sub-component) label, and emissions estimate for each vehicle class. There are 24 hourly link-emissions data files for each episode day. Data file descriptions are included in Appendix A.

Table 25 shows the BPA TDM network facility type groupings used to allocate the MOBILE6 drive-cycle-specific emissions factors and VMT mix to network links. The four-period, time-of-day VMT mixes by peak and off-peak periods, as shown in the table footer, were used.

Table 25
Functional Group VMT Mix and MOBILE6 Drive Cycle by BPA Network Facility Type

Drive Cycle	Facility Type (Code and Name)	VMT Mix[1]
Freeway	1. Radial IH Freeways - Mainlanes Only	Freeway
	2. Radial IH Freeways - Mainlanes and Frontage Roads	
	3. Circumferential IH Freeways (Loops) - Mainlanes Only	
	4. Circumferential IH Freeways (Loops) - Mainlanes and Frontage Roads	
	5. Radial Other Freeways - Mainlanes Only	
	6. Radial Other Freeways - Mainlanes and Frontage Roads	
	7. Circumferential Other Freeways (Loops) - Mainlanes Only	
	8. Circumferential Other Freeways (Loops) - Mainlanes and Frontage Roads	
	22. Interchange Ramp (Freeway-to-Freeway Interchange Ramps)	
Ramp	21. Ramp (Between Frontage Road and Mainlanes)	Arterial
Arterial	11. Principal Arterial - Divided	
	12. Principal Arterial - Continuous Left Turn Lane	
	13. Principal Arterial - Undivided	
	14. Minor Arterial - Divided	
	15. Minor Arterial - Continuous Left Turn Lane	
	16. Minor Arterial - Undivided	
	20. Frontage Road	
	17. Collector - Divided	Collector
	18. Collector - Continuous Left Turn Lane	
	19. Collector - Undivided	
	39. Centroid Connector[3]	
	40. Intrazonal[2, 3]	

[1] Time-of-day VMT mix estimates are applied to hours as follows: AM Peak - 7 a.m. to 8 a.m.; Mid-Day - 8 a.m. to 5 p.m.; PM Peak - 5 p.m. to 6 p.m.; Overnight - 6 p.m. to 7 a.m.

[2] Special links added for application of the intrazonal VMT estimate.

[3] Emissions estimates for centroid connector and intrazonal links comprise the local road type estimate

Hourly and 24-hour Tabular Emissions Summaries

For each analysis day, by individual county and for all counties, the link-emissions estimates were summed for each hour, and the hourly emissions (via SUMALL62 program) were summed for each day. The resulting composite VOC, CO, and NOx emissions estimates in units of pounds were summarized by road type (BPA network facility type), vehicle type and vehicle type/road type cross classification. VMT mix (for hourly, county tables only), VMT, VHT, and VMT-weighted speeds are included with the emissions summaries. These files (*.LST and the tab delimited version, *.TAB) were provided to TCEQ on CD-ROM/DVD as described in Appendix A.

APPENDIX A
ELECTRONIC SUBMITTAL DATA SET NAMES AND DESCRIPTIONS

BPA 2007 UPDATE EI ELECTRONIC DATA SUBMITTAL FILE DESCRIPTIONS

This appendix describes the BPA 2007 modeling EI update electronic data submittal TTI provided to TCEQ. The 17 days within the following three BPA 2000 "mini-episodes" were modeled: 1) August 10 through 13; 2) August 18 through 21; and 3) August 29 through September 6. The BPA 2007 modeling EI data are contained on one DVD and one CD-ROM:

- One DVD, labeled "BPA 2007 Episode Day (17) Emissions Data" (TTI, 1/7/2005), contains the link emissions data and tabular EI summary files; and
- One CD-ROM, labeled "BPA 2007 Episode Day EI Data" (TTI, 1/7/2005), contains: 1) BPA 2007 travel model network node (link endpoint and zone centroid) coordinates, 2) MOBILE6 input and output files, and 3) this data description.

The link emissions file format and data definitions are shown at the end of this description.

EMISSIONS

There is one ZIP file for each episode day. The following emissions output files (75) are in each ZIP file:

- county-level hourly link-emissions files (72 ASCII files: * .T***hr*** , ***hr*** = 01, 02,.... 24);
- county-level hourly EI data summaries that include VMT mix, VMT, VHT, average speed, and emissions cross-classified by vehicle type and road type; hourly "all counties" and 24-hour county-level and "all counties" EI data summaries including all above data except VMT mix (one ASCII file, .LST extension);
- a tab-delimited version of second bullet above (one ASCII file, .TAB extension); and
- a log of the emissions estimation program runs (one ASCII file with .LOG extension).

ZIP file names and data set file names follow the convention:

ddmmm07bpa.ZIP (episode day emissions output zip file):
ddmmm2007bpa_ems.tab (episode day three-county TAB file);
ddmmm2007bpa_ems.lst (episode day three-county LST file);
ddmmm2007bpa_ems.log (episode day three-county LOG file); and
ddmmm2007***CCCC***_ems.T***hr*** (episode day link-emissions files by county).

Where:

CCCC is the first four letters of the three BPA county names;
ddmmm is the episode day date/month (e.g., 10AUG, 06SEP); and
hr is 01... 24 represents the hours 12 a.m. through 11 p.m, respectively.

COORDINATES

The BPA 2007 travel model network link coordinates file name is "BPA2007Net_coord.txt." The coordinates file contains longitude and latitude in millionths of degrees for the BPA 2007 travel model network nodes (link endpoints and zone centroids for use with the 2007 link emissions estimates). The order of the data is: network node number, longitude, and latitude.

EMISSIONS FACTORS

The compressed file "bpa07M6inout.zip" includes the hourly emissions factor run input/output files and LED post-processing factors used:

- MOBILE6 command input files (51):
  ddmmm2007_***CCCC***.in (input files for producing emissions factors prior to LED adjustment to diesel vehicle NOx emissions factors).

- MOBILE6 external data input files (7):
  *04.rgd (three county-level registration distributions files); and
  *.vhr (four region-level, day-type-specific hourly VMT fraction files).

- MOBILE6 final hourly emissions factor output files (51):
  ddmmm2007***CCCC***.rat (final rate files post-processed for LED).

- LED post-processing NOx adjustment factor file (1):
  LED_bpa2007_nox.fc (file for modeling LED effects for all counties).

- MOBILE6 interim hourly emissions factor output files (51):
  ddmmm2007_***CCCC***_preLED.rat (interim rates output, prior to LED adjustment).

- MOBILE6 daily emissions factor output files[1] (102):
  identical file set/file names as for hourly rate files except with .rtd extension.

- Program run LOG and LST files[2] (34):
  ddmmm2007_bpa_RT.LOG (17 files); and
  ddmmm2007_bpa_RT.LST (17 files).

Where:

CCCC is the first four letters of the BPA county name; and
ddmmm is the episode day date/month (e.g., 10AUG, 06SEP).

[1] MOBILE6 Daily Emissions Factors Files:
The set of 24-hour average emissions factor files (*.rtd) have no impact on the analysis. The "daily all roads" emissions factors (i.e., composites based on MOBILE6 default VMT by facility values) in the *.rtd files are invalid. The individual MOBILE6 road type (Freeway, Arterial, Local, and Ramp) emissions factors are valid.

[2] Emissions Factor Log (*.LOG) and MOBILE6 Descriptive Output (*.LST) files:
The log files recorded the emissions factor (POLFAC62_3) runs (one file with .log extension). The MOBILE6 descriptive output (LST) is a record of MOBILE6 descriptive output for each POLFAC62_3 run/scenario, which lists user inputs to the MOBILE6 scenarios; MOBILE6 descriptive output emissions factors, however, are "daily all road types" values composed using MOBILE6 default "VMT by facility" values, and thus are not valid.

ADDITIONAL MOBILE6 INPUT FILES

TTI developed the BPA 2007 "VMT by facility" and "speed VMT" inputs to MOBILE6 by the four day types (average Monday through Thursday, Friday, Saturday, and Sunday) for each county and the three-county group. These files (included in compressed form on the CD-ROM/DVD along with the rates and network coordinates) were not used in development of the hourly link-emissions estimates, but were produced for use in other applications, for example, that use emissions factors at higher aggregation levels. These input files are based on the BPA 2007 EI link VMT/speeds and VMT mix data. The files (in "bpa07M6VMTdist.zip") are:

- ***GGGG***07***DD***.fvm (16 VMT by facility files, one per county and region, by four day types),
- ***GGGG***07***DD***.svm (16 speed VMT files, one per county and region, by four day types).

Where:

GGGG is the county or region identifier: for counties, the first four letters of the county name, and "BPA" for the 3-county group; and
DD is the day-type identifier: wk, fr, sa, and su.

TDM Network Link Emissions Data File Format

Abbreviation	Columns	Format Type	Description
A Node	1 - 6	I6	A-Node of link
B Node	7 - 12	I6	B-Node of link
FC	13 - 15	I3	Facility Type Code of Link (see subsequent table)
EMISS	17 - 26	A3	“VOC,” or “CO,” or “NOx”
ETYPE	28 - 40	A11	Emissions Sub-Component Type (see second subsequent table)
LDGV	41 - 50	F10.?[1]	LDGV link emissions in grams
LDGT1	51 - 60	F10.?	LDGT1 link emissions in grams
LDGT2	61 - 70	F10.?	LDGT2 link emissions in grams
LDGT3	71 - 80	F10.?	LDGT3 link emissions in grams
LDGT4	81 - 90	F10.?	LDGT4 link emissions in grams
HDGV2B	91 - 100	F10.?	HDGV2B link emissions in grams
HDGV3	101 - 110	F10.?	HDGV3 link emissions in grams
HDGV4	111 - 120	F10.?	HDGV4 link emissions in grams
HDGV5	121 - 130	F10.?	HDGV5 link emissions in grams
HDGV6	131 - 140	F10.?	HDGV6 link emissions in grams
HDGV7	141 - 150	F10.?	HDGV7 link emissions in grams
HDGV8A	151 - 160	F10.?	HDGV8A link emissions in grams
HDGV8B	161 - 170	F10.?	HDGV8B link emissions in grams
LDDV	171 - 180	F10.?	LDDV link emissions in grams
LDDT12	181 - 190	F10.?	LDDT12 link emissions in grams
HDDV2B	191 - 200	F10.?	HDDV2B link emissions in grams
HDDV3	201 - 210	F10.?	HDDV3 link emissions in grams
HDDV4	211 - 220	F10.?	HDDV4 link emissions in grams
HDDV5	221 - 230	F10.?	HDDV5 link emissions in grams
HDDV6	231 - 240	F10.?	HDDV6 link emissions in grams
HDDV7	241 - 250	F10.?	HDDV7 link emissions in grams
HDDV8A	251 - 260	F10.?	HDDV8A link emissions in grams
HDDV8B	261 - 270	F10.?	HDDV8B link emissions in grams
MC	271 - 280	F10.?	MC link emissions in grams
HDGB	281 - 290	F10.?	HDGB link emissions in grams
HDDBT	291 - 300	F10.?	HDDBT link emissions in grams
HDDBS	301 - 310	F10.?	HDDBS link emissions in grams
LDDT34	311 - 320	F10.?	LDDT34 link emissions in grams

[1] The F10? format is either F10.0, F10.1, F10.2, F10.3, or F10.4. The format selected for a field is based on the value of the field.

BPA Network Link-Emissions Facility Type Codes and Names

Facility Type Code	Facility Type and Name
1	Radial IH Freeways - Mainlanes Only
2	Radial IH Freeways - Mainlanes and Frontage Roads
3	Circumferential IH Freeways (Loops) - Mainlanes Only
4	Circumferential IH Freeways (Loops) - Mainlanes and Frontage Roads
5	Radial Other Freeways - Mainlanes Only
6	Radial Other Freeways - Mainlanes and Frontage Roads
7	Circumferential Other Freeways (Loops) - Mainlanes Only
8	Circumferential Other Freeways (Loops) - Mainlanes and Frontage Roads
22	Interchange Ramp (Freeway-to-Freeway Interchange Ramps)
21	Ramp (Between Frontage Road and Mainlanes)
20	Frontage Road
11	Principal Arterial - Divided
12	Principal Arterial - Continuous Left Turn Lane
13	Principal Arterial - Undivided
14	Minor Arterial - Divided
15	Minor Arterial - Continuous Left Turn Lane
16	Minor Arterial - Undivided
17	Collector - Divided
18	Collector - Continuous Left Turn Lane
19	Collector - Undivided
39	Centroid Connector[1]
40	Intrazonal[1,2]

[1] Link EI data for facility type codes 39 and 40 comprise the local road type estimate.
[2] Special links added for application of the intrazonal VMT estimate.

Emissions Sub-Component Type

Sub-Component Abbreviation	Description
COMPOSITE	Total emissions
EXH_RUNNING	Exhaust running emissions
START	Start emissions
Hot_Soak	Hot soak VOC emissions
Diurnal	Diurnal VOC emissions
Rest_Loss	Resting loss VOC emissions
Run_Loss	Running loss VOC emissions
Crankcase	Crankcase VOC emissions
Refueling	Refueling loss VOC emissions

APPENDIX B
EMISSIONS ESTIMATION PROGRAMS

TTI EMISSIONS ESTIMATION PROGRAMS

The following is a summary of the series of programs developed by TTI for developing link-based, time-of-day, on-road mobile source emissions estimates for air quality analyses.

These programs produce emissions factors with the latest version of EPA's MOBILE emissions factor model, and multiply them with travel-model-based activity estimates to produce emissions at user-specified temporal and spatial scales. The location of emissions by grid, or travel network link coordinates, may also be specified.

The emissions estimation programs are: TRANSVMT, M6INPUTBUILD, POLFAC62_3, RATEADJ62, RATEADJV62, IMPSUM62, and SUMALL62. TRANSVMT prepares activity input, M6INPUTBUILD creates hourly VMT, speed VMT, and VMT by facility MOBILE6 input files, POLFAC62_3 prepares emissions factor input, the RATEADJ programs make special adjustments to emissions factors when required, IMPSUM62 calculates emissions by time period, and SUMALL62 summarizes emissions at various levels by 24-hour period.

TRANSVMT

The TRANSVMT program post-processes TDMs to produce time-of-day specific, on-road vehicle, link VMT and speed estimates. The TRANSVMT program processes a TDM traffic assignment by multiplying the link volumes by the appropriate HPMS, seasonal, or other VMT factors. Time-of-day factors are then used to distribute the link VMT to each hour in the day. The Dallas speed model is used to estimate the operational time-of-day links speeds for each direction. Since intrazonal links are not included in the TDM, special intrazonal links are created and the VMT and speeds for these special links are estimated using the intrazonal trips from the trip matrix and the zonal radii. The link VMT and speeds produced by TRANSVMT are subsequently input to the IMPSUM62 program for applying the MOBILE6 emissions factors.

M6INPUTBUILD

The M6INPUTBUILD program post-processes the TRANSVMT program output (hourly link VMT/speed data sets) and VMT mix data sets to produce the MOBILE6 VMT by hour, speed VMT, and VMT by facility input files. The MOBILE6 input files created by this program are in the required format for use in MOBILE6. Although these files are not used in developing the hourly link-based emissions estimates, these files may be used with MOBILE6 to develop aggregate daily emissions factors reflective of the county or regional hourly VMT distributions (by hour, speed and facility type) for various applications.

POLFAC62_3

The POLFAC62_3 program is used to apply the EPA's MOBILE6 program (September 2003 version) to calculate the on-road mobile emissions factors. The MOBILE6 emissions factors may be produced for each of the pollutant-specific emissions types (e.g., depending on the pollutant and vehicle type, the total composite, exhaust running, exhaust start, plus the six sub-component evaporative rates), 28 vehicle types, four MOBILE6 functional classifications (or drive cycles, i.e., Freeway, Arterial/Collector, Local, and Ramp), 14 speeds (i.e., 2.5 mph, and 5 mph through 65 mph at 5 mph increments for Freeway and Arterial functional classifications — MOBILE6 Local and Ramp functional classification rates are single speed only, 12.9 mph, and 34.6 mph,

respectively), and each of the 24 hours of the day. The POLFAC62_3 emissions factors are average vehicle class rates calculated from the MOBILE6 database output by multiplying the by-model-year emissions rates within each vehicle class by its corresponding travel fraction. These emissions factors are produced individually by geographical area (county or county group) and analysis day for the evaluation year. These emissions factors are output to an ASCII file for subsequent input to the IMPSUM62 program. The IMPSUM62 program is then used to multiply the hourly emissions factors by hourly VMT estimates by link. (POLFAC62_3 also optionally produces a set of daily emissions factors.) POLFAC62_3 also calculates the additional pollutant (i.e., particulate matter related pollutants and toxics) emissions factors provided by MOBILE6 (September 2003 version).

RATEADJ62

RATEADJ62 is a special utility program that produces a new set of emissions factors by linearly combining the emissions factors from multiple applications of POLFAC62_3. There is one set of linear factors. Each factor is used for all emissions rates in a single data set.

A practical application of the RATEADJ program is the combining of two sets of emissions factors, where each set has different control program credits, into one set including the combined credits. For example, this program may be used to combine different ATP credits from two separate POLFAC62_3 runs into one set of emissions factors that includes the credits for both ATPs.

RATEADJV62

RATEADJV62 is a special utility program that produces a new set of emissions factors by linearly combining the emissions factors from multiple applications of POLFAC62_3 or RATEADJ62. There is a separate set of factors (that may be different for each pollutant-specific emissions type and vehicle type combination) for each of the input emissions factor data sets.

A practical application of RATEADJV62 is the application of emissions factor credits by individual vehicle class and/or individual pollutant. For example, for analyses requiring the effects of the TxLED Fuel Program in MOBILE6 emissions factors, RATEADJV62 is used to apply reduction factors to only the NOx emissions factors for diesel-fueled vehicle classes only.

IMPSUM62

The IMPSUM62 program multiplies the emissions factors obtained from POLFAC62_3 (or from one of the RATEADJ programs, when used) and VMT mixes (fractions of fleet VMT attributable to each vehicle classification in the study) to the time-of-day fleet VMT and speed estimates to produce emissions by the specified time periods. The five primary inputs to IMPSUM62 are:

- MOBILE6 emissions factors developed with POLFAC62_3 (or a RATEADJ6, if used);
- link-based hourly VMT and speeds developed with the TRANSVMT program. For each link, the following information is input to IMPSUM: county number, roadway type number, VMT on link, operational link-speed estimate, and link distance;
- VMT mix by time period, county, and roadway type;

- X-Y coordinates (optional for gridded emissions); and
- associations of the MOBILE6 drive cycle (Freeway, Arterial, Local, and Ramp) emissions factors (or percentages thereof) to specific travel model functional classifications. These percentages of MOBILE6 drive cycle emissions factor (valid from zero to 100) must sum to 100 percent for each travel model functional classification.

Using these input data, the VMT for each link is stratified by MOBILE6 drive cycle and the 28 vehicle types. The MOBILE6 emissions factors are matched to link VMT by drive cycle, speed, and vehicle type and are interpolated (for the speed that falls between the 14 MOBILE6 speeds, see the MOBILE6 interpolation methodology below) and multiplied by the link VMT to estimate the mobile source emissions for that link. Emissions factors for 65 mph are used for links with speeds greater than 65 mph and emissions factors for 2.5 mph are used for links with speeds lower than 2.5 mph. The emissions for the county and emissions type are reported by both roadway type and vehicle type for each of the episode time periods. A data set is produced for subsequent input to the SUMALL62 program. Also, link emissions may be written by county at the pollutant-specific emissions type sub-component level and 28-vehicle-type level.

A tab-delimited output is optionally produced. This output includes all 28 vehicle types (or eight vehicle types in the compressed format) across a single output line. Each field in the output is separated by a tab character.

Example Emissions Factor Interpolation
To calculate emissions factors for average operational speeds that fall between two of the 14 MOBILE6 speed bin speeds, MOBILE6 interpolates each emissions factor using a factor developed from the inverse link speed and the inverse high and low bounding speed bin speeds (Section 5.3.4, *MOBILE6 User's Guide*, August 2003).

Using the MOBILE6 emissions factors tabulated by the 14 speeds, the IMPSUM62 program uses the MOBILE6 method to interpolate emissions factors as shown in the following example. This example interpolates an emissions factor corresponding to an average speed of 41.2 mph.

The interpolated emissions factor (EF_{Interp}) is expressed as:

$$EF_{Interp}=EF_{LowSpeed} - FAC_{Interp} \times (EF_{LowSpeed} - EF_{HighSpeed})$$

Where:

$EF_{LowSpeed}$ = emissions factor (EF) corresponding to tabulated speed below the average link speed,

$EF_{HighSpeed}$ = EF corresponding to tabulated speed above the average link speed, and

$$FAC_{Interp} = \left(\frac{1}{Speed_{link}} - \frac{1}{Speed_{low}}\right) \Big/ \left(\frac{1}{Speed_{high}} - \frac{1}{Speed_{low}}\right)$$

Given that:

$EF_{LowSpeed}$ = 0.7413 g/mi;
$EF_{HighSpeed}$ = 0.7274 g/mi;
$Speed_{lnk}$ = 41.2 mph;
$Speed_{low}$ = 40 mph; and
$Speed_{high}$ = 45 mph.

$$FAC_{Interp} = \left(\frac{1}{41.2mph} - \frac{1}{40mph}\right) \Big/ \left(\frac{1}{45mph} - \frac{1}{40mph}\right) = \frac{-0.00073}{-0.00278} = 0.26214$$

$$EF_{Interp} = 0.7413 \text{ g/mi} - (0.26214) \times (0.7413 \text{ g/mi} - 0.7274 \text{ g/mi})$$

$$= 0.7377 \text{ g/mi}$$

SUMALL62

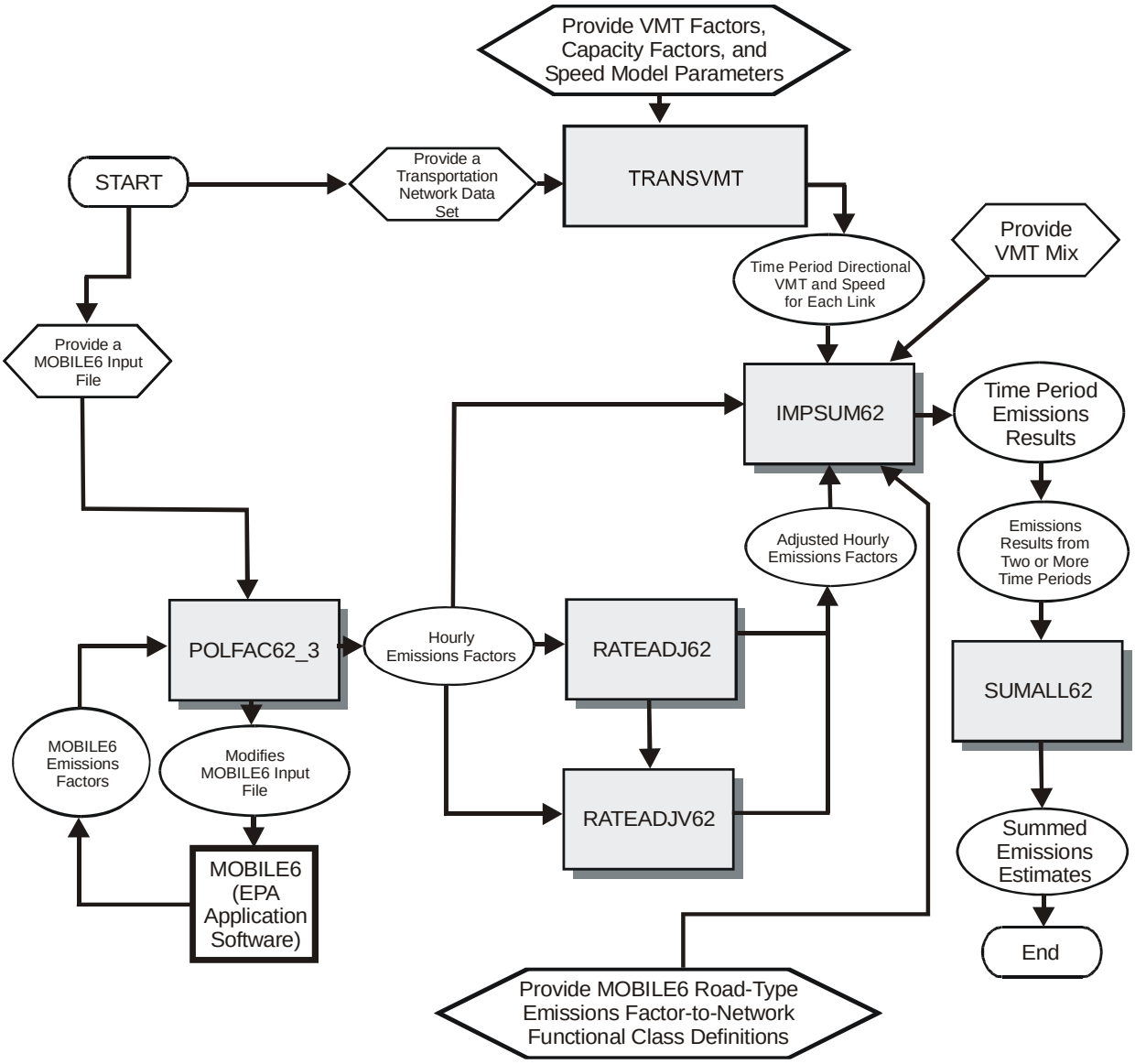
The SUMALL62 program sums the emissions estimates for the time-of-day periods (e.g., 24 periods in the case of hourly analyses) to develop 24-hour emissions estimates. The emissions by pollutant type are reported by roadway type and 28 vehicle types (or optionally condensed to eight vehicle types).

A tab-delimited output is optionally produced. This output includes all 28 vehicle types (or eight vehicle types in the compressed format) across a single output line. Each field in the output is separated by a tab character.

The overall emissions estimate process flow is shown in the diagram below.

General Process Flow

Travel Demand Model Network Link-Based Hourly MOBILE6 Emissions Estimates with Texas Mobile Source Emissions Software



APPENDIX C
DIRECTIONAL SPLIT ESTIMATES

AM Peak-Period Directional Split Estimates for BPA

Area Types	Functional Classification Groups								
	Centroid Connector	IH and Freeway	Principal Arterial Divided	Principal Arterial Undivided	Minor Arterial Divided	Minor Arterial Undivided	Collector	Frontage Road	Ramp
CBD	54.0	50.0	65.0	65.0	58.0	58.0	64.5	50.0	50.0
CBD Fringe	87.0	50.0	60.0	60.0	59.0	59.0	63.0	50.0	50.0
Urban	85.0	60.0	62.0	62.0	58.0	58.0	53.0	60.0	60.0
Suburban	72.0	61.0	65.0	65.0	64.0	64.0	64.5	61.0	61.0
Rural	78.0	70.0	71.0	71.0	68.0	68.0	75.0	70.0	70.0

Mid-Day and Overnight (Off-Peak) Directional Split Estimates for BPA

Area Types	Functional Classification Groups								
	Centroid Connector	IH and Freeway	Principal Arterial Divided	Principal Arterial Undivided	Minor Arterial Divided	Minor Arterial Undivided	Collector	Frontage Road	Ramp
CBD	54.0	51.0	55.0	55.0	55.0	55.0	54.5	51.0	51.0
CBD Fringe	54.0	51.0	54.0	54.0	55.0	55.0	53.0	51.0	51.0
Urban	55.0	53.0	50.0	50.0	52.0	52.0	52.0	53.0	53.0
Suburban	55.0	51.0	57.0	57.0	56.0	56.0	57.0	51.0	51.0
Rural	52.0	53.0	55.0	55.0	58.0	58.0	54.0	53.0	53.0

PM Peak-Period Directional Split Estimates for BPA

Area Types	Functional Classification Groups								
	Centroid Connector	IH and Freeway	Principal Arterial Divided	Principal Arterial Undivided	Minor Arterial Divided	Minor Arterial Undivided	Collector	Frontage Road	Ramp
CBD	55.0	54.0	62.0	62.0	52.0	52.0	57.5	54.0	54.0
CBD Fringe	72.0	54.0	59.0	59.0	53.0	53.0	64.5	54.0	54.0
Urban	72.0	56.0	57.0	57.0	64.0	64.0	68.0	56.0	56.0
Suburban	72.0	67.0	60.0	60.0	65.0	65.0	62.5	67.0	67.0
Rural	71.0	65.0	66.0	66.0	63.0	63.0	70.0	65.0	65.0

Note: Time-of-day directional splits for area type and facility type were provided by TxDOT's Transportation Planning and Programming Division after collaboration with TxDOT's Beaumont/Port Arthur District and the Beaumont/Port Arthur Metropolitan Planning Organization. The tables are taken from TTI report, *1996 Jefferson, Orange, and Hardin Counties Periodic Emission Inventory*, December 3, 1997. The functional classification groups-to-facility type correlation is shown at the end of this appendix.

BPA Network Facility Types Correlated to Functional Classification Groups

Functional Classification Groups	Facility Type Code	Facility Type Name
IH and Freeway	1	Radial IH Freeways - Mainlanes Only
	2	Radial IH Freeways - Mainlanes and Frontage Roads
	3	Circumferential IH Freeways (Loops) - Mainlanes Only
	4	Circumferential IH Freeways (Loops) - Mainlanes and Frontage Roads
	5	Radial Other Freeways - Mainlanes Only
	6	Radial Other Freeways - Mainlanes and Frontage Roads
	7	Circumferential Other Freeways (Loops) - Mainlanes Only
	8	Circumferential Other Freeways (Loops) - Mainlanes and Frontage Roads
	22	Interchange Ramp (Freeway-to-freeway Interchange Ramps)
Principle Arterial Divided	11	Principal Arterial – Divided
Principle Arterial Undivided	12	Principal Arterial - Continuous Left Turn Lane
	13	Principal Arterial – Undivided
Minor Arterial Divided	14	Minor Arterial – Divided
Minor Arterial Undivided	15	Minor Arterial - Continuous Left Turn Lane
	16	Minor Arterial – Undivided
Collector	17	Collector – Divided
	18	Collector - Continuous Left Turn Lane
	19	Collector - Undivided
Frontage Road	20	Frontage Road
Ramp	21	Ramp (Between Frontage Road and Mainlanes)
Centroid Connector	39	Centroid Connector

APPENDIX D
CAPACITY FACTORS AND SPEED FACTORS

BPA TDM Capacity Factors

Facility Type	Area Type				
	CBD	CBD Fringe	Urban	Suburban	Rural
1	0.0938	0.0979	0.0987	0.1121	0.1266
2	0.0938	0.0979	0.0987	0.1121	0.1266
3	0.0938	0.0939	0.0933	0.1032	0.1117
4	0.0938	0.0939	0.0933	0.1032	0.1117
5	0.0938	0.0979	0.0987	0.1121	0.1266
6	0.0938	0.0979	0.0987	0.1121	0.1266
7	0.0938	0.0939	0.0933	0.1032	0.1117
8	0.0938	0.0939	0.0933	0.1032	0.1117
9	0.0918	0.0964	0.1020	0.1204	0.1370
10	0.0918	0.0925	0.0938	0.1060	0.1176
11	0.0733	0.0811	0.0915	0.1133	0.1404
12	0.0733	0.0811	0.0915	0.1133	0.1404
13	0.0746	0.0833	0.0938	0.1184	0.1422
14	0.0846	0.0938	0.1025	0.1273	0.1531
15	0.0846	0.0938	0.1025	0.1273	0.1531
16	0.0847	0.0948	0.1027	0.1225	0.1467
17	0.0800	0.0867	0.0957	0.1163	0.1382
18	0.0800	0.0867	0.0957	0.1163	0.1382
19	0.0875	0.0938	0.1053	0.1324	0.1532
20	0.0846	0.0938	0.1025	0.1273	0.1480
21	0.0733	0.0800	0.0833	0.0933	0.1000
22	0.0733	0.0800	0.0833	0.0933	0.1000

BPA TDM Freeflow (Volume=1) Speed Factors

Facility Type	Area Type				
	CBD	CBD Fringe	Urban	Suburban	Rural
1	1.441300	1.398264	1.278228	1.292247	1.325758
2	1.441300	1.398264	1.278228	1.292247	1.325758
3	1.528202	1.451451	1.346499	1.368997	1.412714
4	1.528202	1.451451	1.346499	1.368997	1.412714
5	1.441300	1.398264	1.278228	1.292247	1.325758
6	1.441300	1.398264	1.278228	1.292247	1.325758
7	1.528202	1.451451	1.346499	1.368997	1.412714
8	1.528202	1.451451	1.346499	1.368997	1.412714
9	1.573427	1.522843	1.321702	1.281753	1.283422
10	1.616960	1.551891	1.355381	1.321163	1.325967
11	1.687764	1.644989	1.383338	1.289324	1.282948
12	1.687764	1.644989	1.383338	1.289324	1.282948
13	1.603376	1.530222	1.383338	1.289324	1.282948
14	1.654064	1.517572	1.274291	1.217532	1.209190
15	1.654064	1.517572	1.274291	1.217532	1.209190
16	1.559546	1.397764	1.274291	1.217532	1.209190
17	1.603421	1.469933	1.204819	1.127714	1.143583
18	1.603421	1.469933	1.204819	1.127714	1.143583
19	1.496526	1.336303	1.204819	1.127714	1.143583
20	1.765225	1.667313	1.368613	1.274210	1.282948
21	1.544572	1.550989	1.368613	1.274210	1.282948
22	1.544572	1.550989	1.368613	1.274210	1.282948

APPENDIX E
2007 BPA VMT MIX BY DAY-TYPE

2007 BPA Weekday VMT Mix

Obs	TP	FC	P_LDGV	P_LDGT1	P_LDGT2	P_LDGT3	P_LDGT4	P_HDGV2b	P_HDGV_3	P_HDGV_4	P_HDGV_5
1	AM_Peak	Art	0.5189938	0.0715915	0.2383230	0.0484906	0.0222996	0.0060715	0.0030064	0.0010559	0.0007039
2	AM_Peak	Col	0.4688565	0.0789743	0.2629000	0.0558525	0.0256851	0.0070441	0.0034880	0.0012251	0.0008167
3	AM_Peak	Fway	0.4861873	0.0642995	0.2140484	0.0424242	0.0195098	0.0065735	0.0032550	0.0011432	0.0007621
4	Mid_Day	Art	0.4989783	0.0693839	0.2309742	0.0471667	0.0216908	0.0084006	0.0041597	0.0014610	0.0009740
5	Mid_Day	Col	0.4682699	0.0781626	0.2601978	0.0552543	0.0254101	0.0077375	0.0038314	0.0013456	0.0008971
6	Mid_Day	Fway	0.4597891	0.0607698	0.2022985	0.0401029	0.0184423	0.0077699	0.0038474	0.0013513	0.0009009
7	Ovr_Nite	Art	0.5233941	0.0729170	0.2427357	0.0493478	0.0226938	0.0049274	0.0024399	0.0008569	0.0005713
8	Ovr_Nite	Col	0.4870053	0.0818270	0.2723962	0.0578633	0.0266098	0.0051512	0.0025507	0.0008959	0.0005972
9	Ovr_Nite	Fway	0.4205097	0.0559635	0.1862984	0.0368690	0.0169551	0.0055933	0.0027696	0.0009727	0.0006485
10	PM_Peak	Art	0.5372894	0.0741431	0.2468171	0.0502933	0.0231286	0.0050854	0.0025181	0.0008844	0.0005896
11	PM_Peak	Col	0.4884100	0.0820731	0.2732157	0.0580377	0.0266900	0.0055222	0.0027344	0.0009604	0.0006403
12	PM_Peak	Fway	0.4895646	0.0649630	0.2162571	0.0428258	0.0196945	0.0054626	0.0027049	0.0009500	0.0006333

Obs	P_HDGV_6	P_HDGV_7	P_HDGV8a	P_HDGV8b	P_LDDV	P_LDDT12	P_HDDV2b	P_HDDV_3	P_HDDV_4	P_HDDV_5
1	0.0023611	0.0006013	0.0008359	0.0000293	0.0005212	0.0000546	0.0141126	0.0046036	0.0022641	0.0018867
2	0.0027394	0.0006976	0.0009698	0.0000340	0.0004709	0.0000602	0.0165987	0.0054146	0.0026629	0.0022191
3	0.0025564	0.0006510	0.0009050	0.0000318	0.0004883	0.0000490	0.0150953	0.0049241	0.0024217	0.0020181
4	0.0032669	0.0008319	0.0011566	0.0000406	0.0005011	0.0000529	0.0195127	0.0063651	0.0031304	0.0026087
5	0.0030090	0.0007663	0.0010653	0.0000374	0.0004704	0.0000596	0.0182541	0.0059545	0.0029285	0.0024404
6	0.0030216	0.0007695	0.0010698	0.0000375	0.0004619	0.0000463	0.0178511	0.0058231	0.0028638	0.0023865
7	0.0019162	0.0004880	0.0006784	0.0000238	0.0005256	0.0000556	0.0114651	0.0037400	0.0018393	0.0015328
8	0.0020032	0.0005101	0.0007092	0.0000249	0.0004891	0.0000624	0.0121460	0.0039621	0.0019486	0.0016238
9	0.0021752	0.0005539	0.0007701	0.0000270	0.0004225	0.0000427	0.0128550	0.0041933	0.0020623	0.0017186
10	0.0019777	0.0005036	0.0007002	0.0000246	0.0005395	0.0000565	0.0118378	0.0038615	0.0018991	0.0015826
11	0.0021475	0.0005469	0.0007603	0.0000267	0.0004905	0.0000626	0.0130494	0.0042568	0.0020935	0.0017446
12	0.0021243	0.0005410	0.0007521	0.0000264	0.0004917	0.0000495	0.0125553	0.0040956	0.0020142	0.0016785

Obs	P_HDDV_6	P_HDDV_7	P_HDDV8a	P_HDDV8b	P_MC	P_HDGB	P_HDDBT	P_HDDBS	P_LDDT34
1	0.0056979	0.0022641	0.0069054	0.0376233	0.0010000	0.0006647	0.0023117	0.0041603	0.0015662
2	0.0067016	0.0026629	0.0081218	0.0278924	0.0010000	0.0014142	0.0049183	0.0088515	0.0017277
3	0.0060946	0.0024217	0.0073862	0.1095061	0.0010000	0.0004509	0.0015681	0.0028222	0.0014067
4	0.0078781	0.0031304	0.0095477	0.0527591	0.0010000	0.0003270	0.0011372	0.0020466	0.0015179
5	0.0073700	0.0029285	0.0089318	0.0353202	0.0010000	0.0006192	0.0021534	0.0038754	0.0017099
6	0.0072073	0.0028638	0.0087347	0.1453900	0.0010000	0.0003606	0.0012540	0.0022569	0.0013294
7	0.0046290	0.0018393	0.0056099	0.0400734	0.0010000	0.0002892	0.0010057	0.0018099	0.0015952
8	0.0049039	0.0019486	0.0059431	0.0228915	0.0010000	0.0002931	0.0010193	0.0018344	0.0017901
9	0.0051901	0.0020623	0.0062900	0.2270541	0.0010000	0.0005382	0.0018718	0.0033688	0.0012243
10	0.0047794	0.0018991	0.0057923	0.0195492	0.0010000	0.0001514	0.0005266	0.0009477	0.0016220
11	0.0052686	0.0020935	0.0063851	0.0176979	0.0010000	0.0002139	0.0007439	0.0013388	0.0017955
12	0.0050691	0.0020142	0.0061434	0.1137781	0.0010000	0.0002971	0.0010332	0.0018594	0.0014212

2007 BPA Friday VMT Mix

Obs	TP	FC	P_LDGV	P_LDGT1	P_LDGT2	P_LDGT3	P_LDGT4	P_HDGV2b	P_HDGV_3	P_HDGV_4	P_HDGV_5
1	AM_Peak	Art	0.5730024	0.0673994	0.2243678	0.0460183	0.0211626	0.0035455	0.0017556	0.0006166	0.0004111
2	AM_Peak	Col	0.5230348	0.0751208	0.2500717	0.0535544	0.0246283	0.0041562	0.0020580	0.0007228	0.0004819
3	AM_Peak	Fway	0.5502291	0.0620473	0.2065510	0.0412674	0.0189778	0.0039346	0.0019483	0.0006843	0.0004562
4	Mid_Day	Art	0.5575654	0.0661090	0.2200723	0.0453018	0.0208332	0.0049649	0.0024584	0.0008635	0.0005756
5	Mid_Day	Col	0.5231613	0.0744595	0.2478705	0.0530599	0.0244009	0.0045721	0.0022640	0.0007951	0.0005301
6	Mid_Day	Fway	0.5291723	0.0596324	0.1985119	0.0396687	0.0182426	0.0047293	0.0023418	0.0008225	0.0005483
7	Ovr_Nite	Art	0.5755663	0.0683754	0.2276167	0.0466462	0.0214514	0.0028660	0.0014192	0.0004984	0.0003323
8	Ovr_Nite	Col	0.5366689	0.0768893	0.2559591	0.0548089	0.0252052	0.0030024	0.0014867	0.0005222	0.0003481
9	Ovr_Nite	Fway	0.4956866	0.0562417	0.1872247	0.0373502	0.0171764	0.0034867	0.0017265	0.0006064	0.0004043
10	PM_Peak	Art	0.5864273	0.0690062	0.2297167	0.0471852	0.0216993	0.0029359	0.0014537	0.0005106	0.0003404
11	PM_Peak	Col	0.5377591	0.0770552	0.2565113	0.0549274	0.0252597	0.0032159	0.0015924	0.0005593	0.0003729
12	PM_Peak	Fway	0.5525747	0.0625209	0.2081275	0.0415473	0.0191065	0.0032610	0.0016147	0.0005671	0.0003781

Obs	P_HDGV_6	P_HDGV_7	P_HDGV8a	P_HDGV8b	P_LDDV	P_LDDT12	P_HDDV2b	P_HDDV_3	P_HDDV_4	P_HDDV_5
1	0.0013788	0.0003511	0.0004882	0.0000171	0.0005736	0.0000515	0.0096572	0.0031502	0.0015493	0.0012911
2	0.0016163	0.0004116	0.0005722	0.0000201	0.0005237	0.0000574	0.0114761	0.0037436	0.0018411	0.0015342
3	0.0015301	0.0003897	0.0005417	0.0000190	0.0005509	0.0000474	0.0105877	0.0034538	0.0016986	0.0014155
4	0.0019308	0.0004917	0.0006836	0.0000240	0.0005582	0.0000505	0.0135135	0.0044081	0.0021679	0.0018066
5	0.0017780	0.0004528	0.0006295	0.0000221	0.0005238	0.0000569	0.0126395	0.0041230	0.0020277	0.0016898
6	0.0018392	0.0004684	0.0006511	0.0000228	0.0005298	0.0000455	0.0127323	0.0041533	0.0020426	0.0017022
7	0.0011146	0.0002838	0.0003946	0.0000138	0.0005762	0.0000522	0.0078144	0.0025491	0.0012536	0.0010447
8	0.0011676	0.0002973	0.0004134	0.0000145	0.0005373	0.0000587	0.0082957	0.0027061	0.0013309	0.0011090
9	0.0013559	0.0003453	0.0004801	0.0000168	0.0004964	0.0000429	0.0093901	0.0030631	0.0015064	0.0012554
10	0.0011417	0.0002907	0.0004042	0.0000142	0.0005870	0.0000527	0.0080082	0.0026123	0.0012847	0.0010706
11	0.0012506	0.0003185	0.0004428	0.0000155	0.0005384	0.0000588	0.0089051	0.0029049	0.0014286	0.0011905
12	0.0012682	0.0003229	0.0004490	0.0000158	0.0005532	0.0000477	0.0087828	0.0028650	0.0014090	0.0011742

Obs	P_HDDV_6	P_HDDV_7	P_HDDV8a	P_HDDV8b	P_MC	P_HDGB	P_HDDBT	P_HDDBS	P_LDDT34
1	0.0038990	0.0015493	0.0047253	0.0257454	0.0010000	0.0003882	0.0015818	0.0028469	0.0014768
2	0.0046334	0.0018411	0.0056153	0.0192844	0.0010000	0.0008344	0.0034004	0.0061198	0.0016460
3	0.0042747	0.0016986	0.0051806	0.0768071	0.0010000	0.0002699	0.0010999	0.0019795	0.0013595
4	0.0054560	0.0021679	0.0066122	0.0365382	0.0010000	0.0001933	0.0007875	0.0014174	0.0014485
5	0.0051031	0.0020277	0.0061846	0.0244564	0.0010000	0.0003659	0.0014910	0.0026834	0.0016315
6	0.0051406	0.0020426	0.0062300	0.1036993	0.0010000	0.0002195	0.0008944	0.0016098	0.0013066
7	0.0031550	0.0012536	0.0038236	0.0273133	0.0010000	0.0001682	0.0006854	0.0012336	0.0014982
8	0.0033493	0.0013309	0.0040591	0.0156348	0.0010000	0.0001708	0.0006961	0.0012529	0.0016847
9	0.0037912	0.0015064	0.0045946	0.1658558	0.0010000	0.0003355	0.0013673	0.0024608	0.0012323
10	0.0032333	0.0012847	0.0039185	0.0132249	0.0010000	0.0000874	0.0003562	0.0006411	0.0015120
11	0.0035954	0.0014286	0.0043573	0.0120773	0.0010000	0.0001246	0.0005077	0.0009136	0.0016884
12	0.0035460	0.0014090	0.0042975	0.0795912	0.0010000	0.0001773	0.0007227	0.0013007	0.0013699

2007 BPA Saturday VMT Mix

Obs	TP	FC	P_LDGV	P_LDGT1	P_LDGT2	P_LDGT3	P_LDGT4	P_HDGV2b	P_HDGV_3	P_HDGV_4	P_HDGV_5
1	AM_Peak	Art	0.6016283	0.0671981	0.2236979	0.0430839	0.0198132	0.0022633	0.0011207	0.0003936	0.0002624
2	AM_Peak	Col	0.5520755	0.0752922	0.2506423	0.0504044	0.0231797	0.0026671	0.0013207	0.0004638	0.0003092
3	AM_Peak	Fway	0.5894113	0.0631118	0.2100948	0.0394166	0.0181267	0.0025624	0.0012688	0.0004456	0.0002971
4	Mid_Day	Art	0.5905595	0.0664891	0.2213376	0.0427848	0.0196756	0.0031971	0.0015831	0.0005560	0.0003707
5	Mid_Day	Col	0.5528745	0.0747192	0.2487349	0.0499991	0.0229933	0.0029376	0.0014546	0.0005109	0.0003406
6	Mid_Day	Fway	0.5745736	0.0614796	0.2046613	0.0384044	0.0176612	0.0031218	0.0015458	0.0005429	0.0003620
7	Ovr_Nite	Art	0.6025982	0.0679773	0.2262915	0.0435477	0.0200264	0.0018243	0.0009034	0.0003173	0.0002115
8	Ovr_Nite	Col	0.5614201	0.0763796	0.2542623	0.0511265	0.0235118	0.0019096	0.0009456	0.0003321	0.0002214
9	Ovr_Nite	Fway	0.5496640	0.0592145	0.1971209	0.0369272	0.0169819	0.0023504	0.0011639	0.0004088	0.0002725
10	PM_Peak	Art	0.6104966	0.0682171	0.2270900	0.0438021	0.0201435	0.0018582	0.0009201	0.0003232	0.0002154
11	PM_Peak	Col	0.5621343	0.0764865	0.2546181	0.0511984	0.0235448	0.0020439	0.0010121	0.0003555	0.0002370
12	PM_Peak	Fway	0.5908204	0.0634752	0.2113045	0.0396101	0.0182156	0.0021198	0.0010496	0.0003687	0.0002458

Obs	P_HDGV_6	P_HDGV_7	P_HDGV8a	P_HDGV8b	P_LDDV	P_LDDT12	P_HDDV2b	P_HDDV_3	P_HDDV_4	P_HDDV_5
1	0.0008802	0.0002241	0.0003116	0.0000109	0.0006029	0.0000512	0.0061641	0.0020108	0.0009889	0.0008241
2	0.0010372	0.0002641	0.0003672	0.0000129	0.0005533	0.0000573	0.0073638	0.0024021	0.0011814	0.0009845
3	0.0009965	0.0002538	0.0003528	0.0000124	0.0005907	0.0000481	0.0068946	0.0022490	0.0011061	0.0009217
4	0.0012433	0.0003166	0.0004402	0.0000154	0.0005918	0.0000506	0.0087011	0.0028383	0.0013959	0.0011633
5	0.0011424	0.0002909	0.0004044	0.0000142	0.0005541	0.0000569	0.0081201	0.0026488	0.0013027	0.0010856
6	0.0012141	0.0003092	0.0004298	0.0000151	0.0005758	0.0000468	0.0084038	0.0027413	0.0013482	0.0011235
7	0.0007095	0.0001807	0.0002512	0.0000088	0.0006039	0.0000518	0.0049737	0.0016224	0.0007979	0.0006649
8	0.0007426	0.0001891	0.0002629	0.0000092	0.0005627	0.0000582	0.0052757	0.0017210	0.0008464	0.0007053
9	0.0009140	0.0002328	0.0003236	0.0000114	0.0005509	0.0000451	0.0063294	0.0020647	0.0010154	0.0008462
10	0.0007226	0.0001840	0.0002558	0.0000090	0.0006118	0.0000519	0.0050683	0.0016533	0.0008131	0.0006776
11	0.0007948	0.0002024	0.0002814	0.0000099	0.0005634	0.0000582	0.0056590	0.0018460	0.0009079	0.0007566
12	0.0008244	0.0002099	0.0002919	0.0000102	0.0005921	0.0000483	0.0057086	0.0018622	0.0009158	0.0007632

Obs	P_HDDV_6	P_HDDV_7	P_HDDV8a	P_HDDV8b	P_MC	P_HDGB	P_HDDBT	P_HDDBS	P_LDDT34
1	0.0024887	0.0009889	0.0030161	0.0164331	0.0010000	0.0002478	0.0010097	0.0018172	0.0014682
2	0.0029731	0.0011814	0.0036032	0.0123742	0.0010000	0.0005355	0.0021819	0.0039269	0.0016451
3	0.0027837	0.0011061	0.0033736	0.0500159	0.0010000	0.0001758	0.0007162	0.0012890	0.0013789
4	0.0035130	0.0013959	0.0042575	0.0235264	0.0010000	0.0001244	0.0005071	0.0009126	0.0014527
5	0.0032784	0.0013027	0.0039732	0.0157117	0.0010000	0.0002351	0.0009579	0.0017239	0.0016325
6	0.0033930	0.0013482	0.0041120	0.0684454	0.0010000	0.0001449	0.0005904	0.0010625	0.0013433
7	0.0020081	0.0007979	0.0024337	0.0173843	0.0010000	0.0001071	0.0004363	0.0007852	0.0014852
8	0.0021300	0.0008464	0.0025814	0.0099431	0.0010000	0.0001086	0.0004427	0.0007968	0.0016688
9	0.0025554	0.0010154	0.0030970	0.1117943	0.0010000	0.0002262	0.0009216	0.0016587	0.0012938
10	0.0020463	0.0008131	0.0024799	0.0083699	0.0010000	0.0000553	0.0002255	0.0004058	0.0014905
11	0.0022848	0.0009079	0.0027690	0.0076749	0.0010000	0.0000792	0.0003226	0.0005806	0.0016711
12	0.0023048	0.0009158	0.0027933	0.0517325	0.0010000	0.0001153	0.0004698	0.0008454	0.0013869

2007 BPA Sunday VMT Mix

Obs	TP	FC	P_LDGV	P_LDGT1	P_LDGT2	P_LDGT3	P_LDGT4	P_HDGV2b	P_HDGV_3	P_HDGV_4	P_HDGV_5
1	AM_Peak	Art	0.5577538	0.0787043	0.2620012	0.0484270	0.0222704	0.0015018	0.0007436	0.0002612	0.0001741
2	AM_Peak	Col	0.5068702	0.0873350	0.2907321	0.0561098	0.0258034	0.0017527	0.0008679	0.0003048	0.0002032
3	AM_Peak	Fway	0.5546020	0.0750223	0.2497438	0.0449665	0.0206790	0.0017257	0.0008545	0.0003001	0.0002001
4	Mid_Day	Art	0.5500743	0.0782407	0.2604578	0.0483173	0.0222199	0.0021314	0.0010554	0.0003707	0.0002471
5	Mid_Day	Col	0.5082733	0.0867845	0.2888994	0.0557318	0.0256296	0.0019330	0.0009571	0.0003362	0.0002241
6	Mid_Day	Fway	0.5451852	0.0736955	0.2453270	0.0441796	0.0203171	0.0021201	0.0010498	0.0003687	0.0002458
7	Ovr_Nite	Art	0.5573752	0.0794351	0.2644337	0.0488365	0.0224586	0.0012078	0.0005980	0.0002100	0.0001400
8	Ovr_Nite	Col	0.5127274	0.0881292	0.2933758	0.0566135	0.0260351	0.0012483	0.0006181	0.0002171	0.0001447
9	Ovr_Nite	Fway	0.5283570	0.0719052	0.2393675	0.0430339	0.0197902	0.0016170	0.0008007	0.0002812	0.0001875
10	PM_Peak	Art	0.5631144	0.0794945	0.2646314	0.0489858	0.0225273	0.0012268	0.0006075	0.0002134	0.0001422
11	PM_Peak	Col	0.5131402	0.0882114	0.2936495	0.0566666	0.0260595	0.0013354	0.0006613	0.0002322	0.0001548
12	PM_Peak	Fway	0.5551915	0.0753545	0.2508497	0.0451275	0.0207530	0.0014257	0.0007060	0.0002479	0.0001653

Obs	P_HDGV_6	P_HDGV_7	P_HDGV8a	P_HDGV8b	P_LDDV	P_LDDT12	P_HDDV2b	P_HDDV_3	P_HDDV_4	P_HDDV_5
1	0.0005840	0.0001487	0.0002068	0.0000073	0.0005601	0.0000597	0.0040905	0.0013343	0.0006562	0.0005469
2	0.0006816	0.0001736	0.0002413	0.0000085	0.0005091	0.0000663	0.0048395	0.0015787	0.0007764	0.0006470
3	0.0006711	0.0001709	0.0002376	0.0000083	0.0005569	0.0000569	0.0046436	0.0015147	0.0007450	0.0006208
4	0.0008289	0.0002111	0.0002935	0.0000103	0.0005524	0.0000594	0.0058012	0.0018924	0.0009307	0.0007756
5	0.0007517	0.0001914	0.0002661	0.0000093	0.0005105	0.0000659	0.0053436	0.0017431	0.0008573	0.0007144
6	0.0008245	0.0002100	0.0002919	0.0000102	0.0005475	0.0000559	0.0057075	0.0018618	0.0009156	0.0007630
7	0.0004697	0.0001196	0.0001663	0.0000058	0.0005597	0.0000603	0.0032930	0.0010742	0.0005283	0.0004402
8	0.0004854	0.0001236	0.0001719	0.0000060	0.0005149	0.0000669	0.0034489	0.0011251	0.0005533	0.0004611
9	0.0006288	0.0001601	0.0002226	0.0000078	0.0005306	0.0000546	0.0043547	0.0014205	0.0006986	0.0005822
10	0.0004771	0.0001215	0.0001689	0.0000059	0.0005655	0.0000603	0.0033463	0.0010916	0.0005368	0.0004474
11	0.0005193	0.0001323	0.0001839	0.0000065	0.0005154	0.0000669	0.0036978	0.0012062	0.0005932	0.0004944
12	0.0005544	0.0001412	0.0001963	0.0000069	0.0005575	0.0000572	0.0038397	0.0012525	0.0006160	0.0005133

Obs	P_HDDV_6	P_HDDV_7	P_HDDV8a	P_HDDV8b	P_MC	P_HDGB	P_HDDBT	P_HDDBS	P_LDDT34
1	0.0016515	0.0006562	0.0020015	0.0109049	0.0010000	0.0001644	0.0006700	0.0012059	0.0017136
2	0.0019539	0.0007764	0.0023680	0.0081323	0.0010000	0.0003519	0.0014340	0.0025808	0.0019015
3	0.0018748	0.0007450	0.0022721	0.0336860	0.0010000	0.0001184	0.0004824	0.0008682	0.0016335
4	0.0023422	0.0009307	0.0028386	0.0156855	0.0010000	0.0000830	0.0003381	0.0006085	0.0017035
5	0.0021574	0.0008573	0.0026146	0.0103394	0.0010000	0.0001547	0.0006304	0.0011345	0.0018896
6	0.0023044	0.0009156	0.0027927	0.0464852	0.0010000	0.0000984	0.0004010	0.0007216	0.0016046
7	0.0013295	0.0005283	0.0016113	0.0115098	0.0010000	0.0000709	0.0002888	0.0005198	0.0017295
8	0.0013925	0.0005533	0.0016876	0.0065002	0.0010000	0.0000710	0.0002894	0.0005209	0.0019188
9	0.0017582	0.0006986	0.0021308	0.0769153	0.0010000	0.0001556	0.0006341	0.0011412	0.0015656
10	0.0013511	0.0005368	0.0016374	0.0055262	0.0010000	0.0000365	0.0001489	0.0002679	0.0017308
11	0.0014930	0.0005932	0.0018093	0.0050150	0.0010000	0.0000517	0.0002108	0.0003794	0.0019206
12	0.0015503	0.0006160	0.0018788	0.0347960	0.0010000	0.0000775	0.0003160	0.0005687	0.0016407

APPENDIX F
BPA AUGUST/SEPTEMBER 2000 EPISODE DAY CLIMATIC INPUTS TO MOBILE6

BPA COUNTY AUGUST 2000 EPISODE DAY CLIMATIC INPUTS TO MOBILE6

Hourly temperatures (degrees F)**;**
Hour of sunrise and sunset;
Hourly relative humidity (percent); and
Barometric pressure (inches of Mercury).

Central Daylight (Local) Time (hourly data sequence: 6 a.m. to 12 a.m., 12 a.m. to 6 a.m.).

Thursday, August 10

Hardin County
SUNRISE/SUNSET: 7 8
HOURLY TEMPERATURES: 75.3 75.9 77.6 81.5 84.5 87.0 89.7 91.3 92.2 94.0 94.9 94.4 91.2 88.3 85.3 83.2 81.8 80.6 79.7 78.2 77.5 76.8 76.8 76.3
RELATIVE HUMIDITY: 96.0 85.0 77.0 63.0 56.0 49.0 42.0 41.0 40.0 44.0 54.0 57.0 65.0 74.0 74.0 75.0 75.0 88.0 97.0 96.0 97.0 100.0 97.0 97.0
BAROMETRIC PRES: 29.94

Jefferson County
SUNRISE/SUNSET: 7 8
HOURLY TEMPERATURES: 75.3 76.3 79.4 82.5 85.3 88.0 90.2 91.9 92.9 93.6 93.7 92.1 89.8 86.9 84.1 82.0 80.8 79.5 79.1 78.0 77.3 76.6 75.9 75.1
RELATIVE HUMIDITY: 96.0 85.0 77.0 63.0 56.0 49.0 42.0 41.0 40.0 44.0 54.0 57.0 65.0 74.0 74.0 75.0 75.0 88.0 97.0 96.0 97.0 100.0 97.0 97.0
BAROMETRIC PRES: 29.94

Orange County
SUNRISE/SUNSET: 7 8
HOURLY TEMPERATURES: 74.6 75.2 78.0 81.2 83.9 86.4 88.8 91.1 92.4 93.7 94.0 93.0 91.2 88.9 86.0 84.2 82.7 81.0 80.1 79.4 78.1 77.6 76.7 75.3
RELATIVE HUMIDITY: 96.0 85.0 77.0 63.0 56.0 49.0 42.0 41.0 40.0 44.0 54.0 57.0 65.0 74.0 74.0 75.0 75.0 88.0 97.0 96.0 97.0 100.0 97.0 97.0
BAROMETRIC PRES: 29.94

Friday, August 11

Hardin County
SUNRISE/SUNSET: 7 8
HOURLY TEMPERATURES: 77.8 78.4 80.1 81.9 84.5 86.3 88.8 91.4 94.4 96.3 88.3 79.3 76.3 76.6 75.4 75.7 76.3 77.3 79.6 79.3 80.0 79.7 78.8 77.8
RELATIVE HUMIDITY: 90.0 79.0 81.7 72.5 62.2 55.0 50.5 43.8 43.0 51.0 72.0 82.0 85.0 94.0 90.0 90.0 94.0 94.0 88.0 85.0 94.0 94.0 90.0 94.0
BAROMETRIC PRES: 29.88

Jefferson County
SUNRISE/SUNSET: 7 8
HOURLY TEMPERATURES: 77.4 78.4 80.2 82.3 84.8 86.5 89.0 92.0 94.1 94.1 90.8 84.3 79.9 78.4 77.4 76.1 76.0 75.9 78.9 78.8 78.6 78.3 77.9 77.4
RELATIVE HUMIDITY: 90.0 79.0 81.7 72.5 62.2 55.0 50.5 43.8 43.0 51.0 72.0 82.0 85.0 94.0 90.0 90.0 94.0 94.0 88.0 85.0 94.0 94.0 90.0 94.0
BAROMETRIC PRES: 29.88

Orange County
SUNRISE/SUNSET: 7 8
HOURLY TEMPERATURES: 77.0 78.1 79.8 82.1 83.7 85.7 88.2 90.8 93.0 94.4 93.4 87.9 82.9 78.6 77.1 76.4 75.9 75.4 80.2 79.4 79.4 78.2 77.3 77.2
RELATIVE HUMIDITY: 90.0 79.0 81.7 72.5 62.2 55.0 50.5 43.8 43.0 51.0 72.0 82.0 85.0 94.0 90.0 90.0 94.0 94.0 88.0 85.0 94.0 94.0 90.0 94.0
BAROMETRIC PRES: 29.88

Saturday, August 12

Hardin County
SUNRISE/SUNSET: 7 8
HOURLY TEMPERATURES: 73.7 74.5 76.7 79.0 82.0 84.7 87.6 90.1 92.4 93.8 94.7 96.5 95.9 94.8 88.4 86.1 84.3 83.4 76.5 74.3 74.0 74.0 74.1 74.4
RELATIVE HUMIDITY: 84.0 74.0 65.0 63.0 54.0 56.0 49.0 46.0 39.0 42.0 40.0 48.0 70.0 79.0 85.0 90.0 85.0 96.0 94.0 91.0 91.0 90.0 96.0 96.0
BAROMETRIC PRES: 29.82

Jefferson County
SUNRISE/SUNSET: 7 8
HOURLY TEMPERATURES: 73.2 74.4 77.4 81.0 84.1 86.8 89.1 91.3 93.1 94.5 95.1 95.1 93.5 90.3 85.3 82.8 82.3 80.6 75.7 75.0 74.3 73.9 73.4 73.2
RELATIVE HUMIDITY: 84.0 74.0 65.0 63.0 54.0 56.0 49.0 46.0 39.0 42.0 40.0 48.0 70.0 79.0 85.0 90.0 85.0 96.0 94.0 91.0 91.0 90.0 96.0 96.0
BAROMETRIC PRES: 29.82

Orange County
SUNRISE/SUNSET: 7 8
HOURLY TEMPERATURES: 71.3 72.6 75.6 79.1 82.5 85.5 88.7 90.7 92.3 93.6 94.6 95.6 95.2 92.7 89.9 85.9 83.4 81.1 74.9 74.5 74.2 73.3 72.8 72.3
RELATIVE HUMIDITY: 84.0 74.0 65.0 63.0 54.0 56.0 49.0 46.0 39.0 42.0 40.0 48.0 70.0 79.0 85.0 90.0 85.0 96.0 94.0 91.0 91.0 90.0 96.0 96.0
BAROMETRIC PRES: 29.82

Sunday, August 13

Hardin County
SUNRISE/SUNSET: 7 8
HOURLY TEMPERATURES: 75.2 74.6 75.8 79.2 82.5 85.5 88.8 91.2 92.1 92.7 93.5 93.4 92.7 91.6 89.2 87.1 86.0 84.7 82.2 80.8 78.9 77.3 76.5 75.6
RELATIVE HUMIDITY: 74.0 58.0 51.0 46.0 41.0 34.0 36.0 36.0 36.0 36.0 37.0 41.0 53.0 61.0 77.0 82.0 82.0 85.0 94.0 97.0 94.0 97.0 96.0 96.0
BAROMETRIC PRES: 29.80

Jefferson County
SUNRISE/SUNSET: 7 8
HOURLY TEMPERATURES: 75.7 75.9 78.4 81.5 84.6 87.7 90.0 91.3 91.9 92.7 93.0 92.6 91.2 88.6 85.7 83.9 82.7 81.9 80.3 78.9 78.1 77.3 76.7 76.1
RELATIVE HUMIDITY: 74.0 58.0 51.0 46.0 41.0 34.0 36.0 36.0 36.0 36.0 37.0 41.0 53.0 61.0 77.0 82.0 82.0 85.0 94.0 97.0 94.0 97.0 96.0 96.0
BAROMETRIC PRES: 29.80

Orange County
SUNRISE/SUNSET: 7 8
HOURLY TEMPERATURES: 72.5 72.3 75.3 78.8 81.9 85.2 88.2 89.7 91.2 91.7 92.4 92.4 92.0 89.5 86.5 84.0 82.9 82.1 79.3 77.8 76.9 76.9 75.5 74.2
RELATIVE HUMIDITY: 74.0 58.0 51.0 46.0 41.0 34.0 36.0 36.0 36.0 36.0 37.0 41.0 53.0 61.0 77.0 82.0 82.0 85.0 94.0 97.0 94.0 97.0 96.0 96.0
BAROMETRIC PRES: 29.80

Monday, Friday 18

Hardin County
SUNRISE/SUNSET: 7 8
HOURLY TEMPERATURES: 75.6 75.4 77.4 81.7 84.5 87.5 90.4 92.0 93.9 95.0 95.2 93.9 91.6 88.3 84.7 81.7 80.1 79.3 78.9 78.0 77.3 77.1 76.5 76.0
RELATIVE HUMIDITY: 96.0 85.0 75.0 63.0 54.0 47.0 48.0 43.0 36.0 40.0 41.0 54.0 69.0 79.0 88.0 88.0 90.0 88.0 94.0 97.0 97.0 96.0 100.0 96.0
BAROMETRIC PRES: 29.94

Jefferson County
SUNRISE/SUNSET: 7 8
HOURLY TEMPERATURES: 74.0 75.0 78.4 82.2 85.8 88.6 91.1 92.9 93.8 94.3 93.9 92.1 89.5 85.9 82.2 79.9 78.7 78.1 78.1 77.3 76.7 76.1 74.6 74.2
RELATIVE HUMIDITY: 96.0 85.0 75.0 63.0 54.0 47.0 48.0 43.0 36.0 40.0 41.0 54.0 69.0 79.0 88.0 88.0 90.0 88.0 94.0 97.0 97.0 96.0 100.0 96.0
BAROMETRIC PRES: 29.94

Orange County
SUNRISE/SUNSET: 7 8
HOURLY TEMPERATURES: 73.4 73.5 76.4 80.0 83.8 86.8 89.4 91.3 92.9 94.0 93.8 92.8 90.6 87.8 84.7 82.2 80.0 78.3 78.9 78.5 77.2 76.0 75.4 74.2
RELATIVE HUMIDITY: 96.0 85.0 75.0 63.0 54.0 47.0 48.0 43.0 36.0 40.0 41.0 54.0 69.0 79.0 88.0 88.0 90.0 88.0 94.0 97.0 97.0 96.0 100.0 96.0
BAROMETRIC PRES: 29.94

Saturday, August 19

Hardin County
SUNRISE/SUNSET: 7 8
HOURLY TEMPERATURES: 74.9 75.0 78.5 81.9 84.6 87.8 90.1 92.4 94.1 95.1 94.7 92.7 90.0 86.9 84.2 81.8 80.0 78.9 78.9 78.0 77.2 76.2 75.7 75.9
RELATIVE HUMIDITY: 91.0 79.0 70.0 59.0 50.0 44.0 37.0 41.0 49.0 52.0 57.0 63.0 74.0 79.0 85.0 88.0 88.0 94.0 91.0 97.0 97.0 94.0 94.0 94.0
BAROMETRIC PRES: 29.95

Jefferson County
SUNRISE/SUNSET: 7 8
HOURLY TEMPERATURES: 74.3 75.3 78.8 82.6 85.9 89.0 91.1 92.6 93.2 93.4 92.6 90.8 88.3 85.3 82.1 80.2 79.1 78.2 77.0 76.5 76.0 75.3 74.9 74.4
RELATIVE HUMIDITY: 91.0 79.0 70.0 59.0 50.0 44.0 37.0 41.0 49.0 52.0 57.0 63.0 74.0 79.0 85.0 88.0 88.0 94.0 91.0 97.0 97.0 94.0 94.0 94.0
BAROMETRIC PRES: 29.95

Orange County
SUNRISE/SUNSET: 7 8
HOURLY TEMPERATURES: 73.1 73.4 76.9 80.8 84.3 87.3 89.7 91.6 93.1 93.5 92.7 91.8 89.8 87.1 83.9 81.8 80.6 80.1 77.8 77.8 76.7 75.7 74.7 74.2
RELATIVE HUMIDITY: 91.0 79.0 70.0 59.0 50.0 44.0 37.0 41.0 49.0 52.0 57.0 63.0 74.0 79.0 85.0 88.0 88.0 94.0 91.0 97.0 97.0 94.0 94.0 94.0
BAROMETRIC PRES: 29.95

Sunday, August 20

Hardin County
SUNRISE/SUNSET: 7 8
HOURLY TEMPERATURES: 76.4 76.3 78.6 82.3 85.0 87.4 89.9 91.6 93.5 94.8 96.0 95.5 92.8 88.3 84.9 83.3 82.0 81.3 78.3 77.6 77.0 76.8 76.9 76.4
RELATIVE HUMIDITY: 94.0 82.0 72.0 66.0 58.0 50.0 49.0 44.0 44.0 53.0 58.0 70.0 80.0 82.0 87.0 93.0 93.0 93.0 94.0 97.0 94.0 94.0 94.0 94.0
BAROMETRIC PRES: 29.93

Jefferson County
SUNRISE/SUNSET: 7 8
HOURLY TEMPERATURES: 75.2 76.2 79.2 82.7 85.8 88.3 90.4 92.3 93.4 94.2 93.9 92.5 89.9 86.7 83.9 82.1 81.1 80.2 77.5 76.9 76.6 76.3 76.0 75.5
RELATIVE HUMIDITY: 94.0 82.0 72.0 66.0 58.0 50.0 49.0 44.0 44.0 53.0 58.0 70.0 80.0 82.0 87.0 93.0 93.0 93.0 94.0 97.0 94.0 94.0 94.0 94.0
BAROMETRIC PRES: 29.93

Orange County
SUNRISE/SUNSET: 7 8
HOURLY TEMPERATURES: 75.1 75.7 77.9 81.0 84.3 87.0 89.3 91.2 92.9 94.3 94.6 93.7 92.1 89.0 86.3 83.9 82.2 81.7 79.5 78.5 77.9 77.5 76.9 75.8
RELATIVE HUMIDITY: 94.0 82.0 72.0 66.0 58.0 50.0 49.0 44.0 44.0 53.0 58.0 70.0 80.0 82.0 87.0 93.0 93.0 93.0 94.0 97.0 94.0 94.0 94.0 94.0
BAROMETRIC PRES: 29.93

Monday, August 21

Hardin County
SUNRISE/SUNSET: 7 8
HOURLY TEMPERATURES: 79.0 79.1 79.4 82.3 84.6 87.3 89.8 92.5 92.9 92.4 92.7 92.0 90.4 88.1 85.9 85.8 85.2 83.9 80.6 79.9 79.5 78.8 78.4 78.6
RELATIVE HUMIDITY: 93.0 82.0 75.0 62.0 59.0 56.0 52.0 61.0 60.0 44.0 59.0 54.0 67.0 72.0 79.0 85.0 87.0 90.0 94.0 97.0 97.0 94.0 94.0 96.0
BAROMETRIC PRES: 29.95

Jefferson County
SUNRISE/SUNSET: 7 8
HOURLY TEMPERATURES: 77.3 78.6 81.1 84.0 86.2 88.4 90.7 91.1 90.8 91.4 91.0 90.0 88.6 86.5 84.6 83.4 82.5 81.0 79.3 78.5 78.5 78.2 77.9 77.4
RELATIVE HUMIDITY: 93.0 82.0 75.0 62.0 59.0 56.0 52.0 61.0 60.0 44.0 59.0 54.0 67.0 72.0 79.0 85.0 87.0 90.0 94.0 97.0 97.0 94.0 94.0 96.0
BAROMETRIC PRES: 29.95

Orange County
SUNRISE/SUNSET: 7 8
HOURLY TEMPERATURES: 77.4 77.7 80.1 82.7 85.5 87.7 89.6 91.0 90.8 91.3 91.2 91.0 89.9 87.8 85.7 84.4 82.3 81.1 80.9 80.1 79.6 78.8 78.7 78.2
RELATIVE HUMIDITY: 93.0 82.0 75.0 62.0 59.0 56.0 52.0 61.0 60.0 44.0 59.0 54.0 67.0 72.0 79.0 85.0 87.0 90.0 94.0 97.0 97.0 94.0 94.0 96.0
BAROMETRIC PRES: 29.95

Tuesday, August 29

Hardin County
SUNRISE/SUNSET: 7 8
HOURLY TEMPERATURES: 77.0 76.5 77.6 82.6 85.8 88.8 91.2 93.5 95.3 96.0 97.3 96.6 92.6 88.9 85.8 83.7 82.4 81.3 79.0 78.4 77.7 77.3 76.9 77.0
RELATIVE HUMIDITY: 94.0 82.0 72.0 61.0 56.0 48.0 43.0 37.0 36.0 48.0 58.0 65.0 77.0 85.0 85.0 87.0 90.0 90.0 97.0 100.0 97.0 97.0 97.0 100.0
BAROMETRIC PRES: 29.87

Jefferson County
SUNRISE/SUNSET: 7 8
HOURLY TEMPERATURES: 75.5 76.7 79.8 83.3 86.4 88.9 91.1 93.1 94.4 94.9 94.6 93.2 90.1 86.6 83.8 81.9 81.0 79.8 78.3 77.6 76.9 76.4 75.8 75.2
RELATIVE HUMIDITY: 94.0 82.0 72.0 61.0 56.0 48.0 43.0 37.0 36.0 48.0 58.0 65.0 77.0 85.0 85.0 87.0 90.0 90.0 97.0 100.0 97.0 97.0 97.0 100.0
BAROMETRIC PRES: 29.87

Orange County
SUNRISE/SUNSET: 7 8
HOURLY TEMPERATURES: 75.3 75.2 78.4 81.8 84.7 87.4 89.8 91.9 94.2 95.7 95.6 94.9 92.7 89.6 86.0 83.9 82.7 81.1 79.4 78.4 77.5 77.1 75.6 75.1
RELATIVE HUMIDITY: 94.0 82.0 72.0 61.0 56.0 48.0 43.0 37.0 36.0 48.0 58.0 65.0 77.0 85.0 85.0 87.0 90.0 90.0 97.0 100.0 97.0 97.0 97.0 100.0
BAROMETRIC PRES: 29.87

Wednesday, August 30

Hardin County
SUNRISE/SUNSET: 7 8
HOURLY TEMPERATURES: 77.5 77.6 79.5 82.7 86.3 89.8 92.9 95.7 98.1 100.0 101.4 101.8 101.5 96.5 90.9 87.4 85.6 84.2 80.0 79.9 78.5 78.8 78.2 77.5
RELATIVE HUMIDITY: 94.0 85.0 65.0 54.0 43.0 36.0 33.0 30.0 26.0 25.0 31.0 49.0 61.0 77.0 85.0 91.0 94.0 97.0 90.0 94.0 97.0 94.0 96.0 94.0
BAROMETRIC PRES: 29.80

Jefferson County
SUNRISE/SUNSET: 7 8
HOURLY TEMPERATURES: 76.1 76.8 79.5 83.1 87.1 90.6 94.1 96.7 98.9 100.1 100.4 99.7 96.8 91.4 87.8 85.4 83.8 82.6 79.1 78.5 78.0 77.6 76.6 76.2
RELATIVE HUMIDITY: 94.0 85.0 65.0 54.0 43.0 36.0 33.0 30.0 26.0 25.0 31.0 49.0 61.0 77.0 85.0 91.0 94.0 97.0 90.0 94.0 97.0 94.0 96.0 94.0
BAROMETRIC PRES: 29.80

Orange County
SUNRISE/SUNSET: 7 8
HOURLY TEMPERATURES: 76.4 76.6 78.3 81.6 85.7 89.6 93.5 96.4 99.1 100.8 100.8 100.7 98.9 94.9 91.4 88.6 86.3 84.4 80.1 79.1 78.6 77.7 77.4 76.9
RELATIVE HUMIDITY: 94.0 85.0 65.0 54.0 43.0 36.0 33.0 30.0 26.0 25.0 31.0 49.0 61.0 77.0 85.0 91.0 94.0 97.0 90.0 94.0 97.0 94.0 96.0 94.0
BAROMETRIC PRES: 29.80

Thursday, August 31

Hardin County
SUNRISE/SUNSET: 7 8
HOURLY TEMPERATURES: 80.4 80.0 81.9 87.4 91.7 95.7 98.4 101.2 103.4 105.0 103.7 100.4 100.9 97.7 94.8 92.0 89.9 88.1 83.0 82.7 82.1 81.5 81.2 80.0
RELATIVE HUMIDITY: 90.0 65.0 39.0 33.0 30.0 29.0 27.0 26.0 25.0 29.0 33.0 43.0 52.0 61.0 70.0 72.0 85.0 88.0 94.0 94.0 90.0 97.0 94.0 88.0
BAROMETRIC PRES: 29.74

Jefferson County
SUNRISE/SUNSET: 7 8
HOURLY TEMPERATURES: 77.7 78.4 81.9 87.0 92.1 96.2 99.3 101.8 103.5 104.1 102.5 99.6 97.4 93.3 89.6 88.1 86.8 85.9 82.0 81.5 80.6 79.4 78.7 78.0
RELATIVE HUMIDITY: 90.0 65.0 39.0 33.0 30.0 29.0 27.0 26.0 25.0 29.0 33.0 43.0 52.0 61.0 70.0 72.0 85.0 88.0 94.0 94.0 90.0 97.0 94.0 88.0
BAROMETRIC PRES: 29.74

Orange County
SUNRISE/SUNSET: 7 8
HOURLY TEMPERATURES: 77.6 77.6 80.1 84.8 89.7 95.0 99.2 102.2 103.5 104.3 104.8 101.1 100.0 95.2 91.6 90.1 87.6 86.2 83.3 82.0 81.0 80.1 79.4 78.4
RELATIVE HUMIDITY: 90.0 65.0 39.0 33.0 30.0 29.0 27.0 26.0 25.0 29.0 33.0 43.0 52.0 61.0 70.0 72.0 85.0 88.0 94.0 94.0 90.0 97.0 94.0 88.0
BAROMETRIC PRES: 29.74

Friday, September 1

Hardin County
SUNRISE/SUNSET: 7 8
HOURLY TEMPERATURES: 80.8 80.6 83.2 86.2 89.5 93.0 95.1 97.7 99.9 101.0 96.3 88.5 89.6 88.6 86.5 85.8 86.7 84.7 87.2 85.1 83.8 82.7 82.5 80.9
RELATIVE HUMIDITY: 79.0 70.0 53.0 47.0 46.0 46.0 41.0 41.0 39.0 56.0 50.0 55.0 61.0 55.0 79.0 74.0 87.0 97.0 88.0 87.0 77.0 79.0 79.0 79.0
BAROMETRIC PRES: 29.78

Jefferson County
SUNRISE/SUNSET: 7 8
HOURLY TEMPERATURES: 79.9 80.0 82.3 85.4 89.2 92.8 95.1 96.8 98.5 98.2 94.3 89.0 87.2 86.9 85.0 84.5 83.3 82.0 85.2 84.0 83.1 82.3 81.5 80.7
RELATIVE HUMIDITY: 79.0 70.0 53.0 47.0 46.0 46.0 41.0 41.0 39.0 56.0 50.0 55.0 61.0 55.0 79.0 74.0 87.0 97.0 88.0 87.0 77.0 79.0 79.0 79.0
BAROMETRIC PRES: 29.78

Orange County
SUNRISE/SUNSET: 7 8
HOURLY TEMPERATURES: 80.6 80.0 81.7 83.5 87.4 90.9 94.0 96.8 98.1 98.3 95.3 91.3 88.5 86.5 85.2 85.0 81.9 80.9 85.7 85.5 84.4 83.2 83.3 82.0
RELATIVE HUMIDITY: 79.0 70.0 53.0 47.0 46.0 46.0 41.0 41.0 39.0 56.0 50.0 55.0 61.0 55.0 79.0 74.0 87.0 97.0 88.0 87.0 77.0 79.0 79.0 79.0
BAROMETRIC PRES: 29.78

Saturday, September 2

Hardin County
SUNRISE/SUNSET: 7 8
HOURLY TEMPERATURES: 78.5 78.9 81.8 85.0 88.4 90.9 94.3 97.1 99.4 100.7 101.8 101.9 95.3 81.5 79.2 78.6 78.4 79.0 82.9 81.8 81.0 80.5 80.0 79.1
RELATIVE HUMIDITY: 93.0 85.0 63.0 52.0 47.0 46.0 39.0 35.0 32.0 32.0 55.0 52.0 71.0 77.0 82.0 85.0 88.0 85.0 97.0 97.0 97.0 97.0 94.0 96.0
BAROMETRIC PRES: 29.77

Jefferson County
SUNRISE/SUNSET: 7 8
HOURLY TEMPERATURES: 77.9 78.8 82.4 86.1 89.4 92.2 95.0 97.4 99.0 100.2 99.3 95.6 89.1 82.2 80.6 80.0 80.3 80.7 81.9 81.7 81.1 80.3 79.1 78.5
RELATIVE HUMIDITY: 93.0 85.0 63.0 52.0 47.0 46.0 39.0 35.0 32.0 32.0 55.0 52.0 71.0 77.0 82.0 85.0 88.0 85.0 97.0 97.0 97.0 97.0 94.0 96.0
BAROMETRIC PRES: 29.77

Orange County
SUNRISE/SUNSET: 7 8
HOURLY TEMPERATURES: 77.8 77.8 80.7 84.3 88.0 91.1 94.1 96.7 98.7 100.4 100.7 96.8 86.1 79.7 80.6 79.4 79.3 79.7 81.7 81.8 81.1 80.8 80.3 78.9
RELATIVE HUMIDITY: 93.0 85.0 63.0 52.0 47.0 46.0 39.0 35.0 32.0 32.0 55.0 52.0 71.0 77.0 82.0 85.0 88.0 85.0 97.0 97.0 97.0 97.0 94.0 96.0
BAROMETRIC PRES: 29.77

Sunday, September 3

Hardin County
SUNRISE/SUNSET: 7 8
HOURLY TEMPERATURES: 79.9 79.1 80.6 83.9 88.1 91.7 95.5 98.3 99.9 101.9 102.4 88.9 86.1 86.8 87.4 85.9 84.2 82.1 79.5 81.2 81.4 80.7 79.3 79.9
RELATIVE HUMIDITY: 87.0 77.0 63.0 56.0 48.0 45.0 41.0 37.0 36.0 35.0 61.0 65.0 83.0 91.0 97.0 91.0 87.0 90.0 85.0 90.0 94.0 90.0 94.0 94.0
BAROMETRIC PRES: 29.73

Jefferson County
SUNRISE/SUNSET: 7 8
HOURLY TEMPERATURES: 77.9 78.6 80.9 84.6 88.4 91.8 95.1 97.8 99.6 100.9 99.5 92.9 89.3 87.7 86.2 84.7 83.2 81.6 80.9 80.5 79.9 79.3 78.9 78.4
RELATIVE HUMIDITY: 87.0 77.0 63.0 56.0 48.0 45.0 41.0 37.0 36.0 35.0 61.0 65.0 83.0 91.0 97.0 91.0 87.0 90.0 85.0 90.0 94.0 90.0 94.0 94.0
BAROMETRIC PRES: 29.73

Orange County
SUNRISE/SUNSET: 7 8
HOURLY TEMPERATURES: 76.5 76.7 79.7 84.0 88.2 91.9 95.2 97.9 100.2 101.4 101.0 93.5 89.1 87.9 85.7 84.4 82.9 82.0 80.6 81.0 80.0 79.0 78.5 77.0
RELATIVE HUMIDITY: 87.0 77.0 63.0 56.0 48.0 45.0 41.0 37.0 36.0 35.0 61.0 65.0 83.0 91.0 97.0 91.0 87.0 90.0 85.0 90.0 94.0 90.0 94.0 94.0
BAROMETRIC PRES: 29.73

Monday, September 4

Hardin County
SUNRISE/SUNSET: 7 8
HOURLY TEMPERATURES: 76.8 77.9 81.2 85.0 88.9 92.9 96.5 99.7 102.3 104.3 104.3 103.5 100.5 94.5 91.2 88.9 87.1 85.7 81.6 80.9 80.2 79.0 78.4 78.2
RELATIVE HUMIDITY: 90.0 72.0 61.0 54.0 37.0 34.0 30.0 29.0 28.0 30.0 34.0 49.0 63.0 77.0 79.0 87.0 85.0 90.0 90.0 96.0 87.0 90.0 94.0 97.0
BAROMETRIC PRES: 29.73

Jefferson County
SUNRISE/SUNSET: 7 8
HOURLY TEMPERATURES: 76.5 77.1 81.1 85.6 90.1 94.5 98.2 100.6 102.0 102.7 102.5 101.3 96.7 91.2 88.3 85.6 84.4 83.1 81.2 80.0 79.1 78.6 77.9 76.8
RELATIVE HUMIDITY: 90.0 72.0 61.0 54.0 37.0 34.0 30.0 29.0 28.0 30.0 34.0 49.0 63.0 77.0 79.0 87.0 85.0 90.0 90.0 96.0 87.0 90.0 94.0 97.0
BAROMETRIC PRES: 29.73

Orange County
SUNRISE/SUNSET: 7 8
HOURLY TEMPERATURES: 74.3 74.3 79.4 84.7 89.9 95.5 98.9 101.7 102.9 103.6 103.6 102.6 98.0 92.4 88.2 85.1 82.7 81.7 79.8 77.9 77.1 76.8 76.3 75.7
RELATIVE HUMIDITY: 90.0 72.0 61.0 54.0 37.0 34.0 30.0 29.0 28.0 30.0 34.0 49.0 63.0 77.0 79.0 87.0 85.0 90.0 90.0 96.0 87.0 90.0 94.0 97.0
BAROMETRIC PRES: 29.73

Tuesday, September 5

Hardin County
SUNRISE/SUNSET: 7 8
HOURLY TEMPERATURES: 80.9 80.9 83.0 86.0 89.4 92.6 96.0 98.6 100.5 101.2 101.6 101.0 99.4 96.5 94.3 92.3 90.2 88.1 85.2 84.9 84.5 82.3 81.6 80.8
RELATIVE HUMIDITY: 82.0 63.0 54.0 49.0 42.0 39.0 31.0 33.0 38.0 31.0 30.0 30.0 37.0 42.0 45.0 45.0 43.0 46.0 90.0 93.0 96.0 97.0 94.0 82.0
BAROMETRIC PRES: 29.75

Jefferson County
SUNRISE/SUNSET: 7 8
HOURLY TEMPERATURES: 79.8 80.9 84.5 88.7 92.0 95.0 97.2 98.9 100.6 101.0 101.4 100.6 98.5 95.1 91.6 89.7 87.5 84.9 82.5 81.7 80.9 80.1 79.8 79.6
RELATIVE HUMIDITY: 82.0 63.0 54.0 49.0 42.0 39.0 31.0 33.0 38.0 31.0 30.0 30.0 37.0 42.0 45.0 45.0 43.0 46.0 90.0 93.0 96.0 97.0 94.0 82.0
BAROMETRIC PRES: 29.75

Orange County
SUNRISE/SUNSET: 7 8
HOURLY TEMPERATURES: 78.3 78.9 84.4 88.3 91.7 95.4 98.3 100.7 102.1 100.1 101.5 100.8 98.3 94.6 90.8 88.8 86.8 84.6 81.0 79.4 77.9 77.4 77.1 77.0
RELATIVE HUMIDITY: 82.0 63.0 54.0 49.0 42.0 39.0 31.0 33.0 38.0 31.0 30.0 30.0 37.0 42.0 45.0 45.0 43.0 46.0 90.0 93.0 96.0 97.0 94.0 82.0
BAROMETRIC PRES: 29.75

Wednesday, September 6

Hardin County
SUNRISE/SUNSET: 7 8
HOURLY TEMPERATURES: 72.1 71.6 72.8 76.4 80.5 83.2 85.7 87.8 90.7 93.5 94.1 94.2 93.2 92.0 90.0 88.5 87.1 84.2 84.5 82.2 77.8 75.6 73.7 72.7
RELATIVE HUMIDITY: 79.0 74.0 65.0 59.0 55.0 52.0 47.0 43.0 41.0 40.0 47.0 44.0 52.0 51.0 55.0 59.0 65.0 71.0 52.0 62.0 66.0 74.0 76.0 81.0
BAROMETRIC PRES: 29.76

Jefferson County
SUNRISE/SUNSET: 7 8
HOURLY TEMPERATURES: 72.5 72.4 74.4 77.5 80.9 83.9 86.6 89.1 91.2 92.7 92.6 91.8 90.0 88.5 86.7 85.1 83.3 82.0 82.5 80.2 77.8 75.8 74.3 73.2
RELATIVE HUMIDITY: 79.0 74.0 65.0 59.0 55.0 52.0 47.0 43.0 41.0 40.0 47.0 44.0 52.0 51.0 55.0 59.0 65.0 71.0 52.0 62.0 66.0 74.0 76.0 81.0
BAROMETRIC PRES: 29.76

Orange County
SUNRISE/SUNSET: 7 8
HOURLY TEMPERATURES: 71.6 71.6 73.9 77.3 80.7 83.9 86.9 89.6 92.0 93.2 93.6 92.3 90.6 88.5 86.7 85.1 83.3 81.4 82.3 79.5 77.0 75.1 73.7 72.5
RELATIVE HUMIDITY: 79.0 74.0 65.0 59.0 55.0 52.0 47.0 43.0 41.0 40.0 47.0 44.0 52.0 51.0 55.0 59.0 65.0 71.0 52.0 62.0 66.0 74.0 76.0 81.0
BAROMETRIC PRES: 29.76

APPENDIX G
MOBILE6 REGISTRATION DISTRIBUTIONS AND DIESEL FRACTIONS INPUT

Hardin County MOBILE6 Registration Distributions Input[1]

```
* Calculated from Mid-Year (July) 2004 Registration data
* LD and MC are county level; HD (except bus) are three county area level
*
* LDV
       1 0.04505 0.08020 0.08217 0.08195 0.08940 0.07648 0.06958 0.06695 0.05365 0.06055 0.05009
0.04385 0.03635 0.03060 0.02880 0.02234 0.01796 0.01095 0.00996 0.00881 0.00712 0.00422 0.00246
0.00197 0.01856
* LDT1
       2 0.03853 0.08508 0.09657 0.09108 0.07055 0.06621 0.06296 0.06000 0.05233 0.05284 0.05335
0.03961 0.03477 0.03303 0.02559 0.02631 0.01995 0.01272 0.01214 0.01171 0.01164 0.00737 0.00730
0.00470 0.02364
* LDT2
       3 0.03853 0.08508 0.09657 0.09108 0.07055 0.06621 0.06296 0.06000 0.05233 0.05284 0.05335
0.03961 0.03477 0.03303 0.02559 0.02631 0.01995 0.01272 0.01214 0.01171 0.01164 0.00737 0.00730
0.00470 0.02364
* LDT3
       4 0.11982 0.14754 0.11478 0.12066 0.08399 0.09406 0.04787 0.06159 0.04451 0.03387 0.02016
0.02072 0.01904 0.01148 0.00868 0.01036 0.00560 0.00448 0.00644 0.00532 0.00616 0.00224 0.00252
0.00112 0.00700
* LDT4
       5 0.11982 0.14754 0.11478 0.12066 0.08399 0.09406 0.04787 0.06159 0.04451 0.03387 0.02016
0.02072 0.01904 0.01148 0.00868 0.01036 0.00560 0.00448 0.00644 0.00532 0.00616 0.00224 0.00252
0.00112 0.00700
* HDV2
       6 0.11980 0.17877 0.11235 0.13035 0.07945 0.09870 0.04655 0.04469 0.02607 0.02235 0.01428
0.01614 0.01055 0.01366 0.01241 0.00931 0.01055 0.00683 0.00869 0.00435 0.00497 0.00248 0.00435
0.00310 0.01924
* HDV3
       7 0.03535 0.09933 0.11448 0.09596 0.09091 0.09764 0.04377 0.06566 0.04377 0.06566 0.03872
0.02862 0.02189 0.03199 0.01515 0.01347 0.02525 0.00505 0.00337 0.00505 0.00168 0.00168 0.00673
0.00505 0.04377
* HDV4
       8 0.03571 0.07937 0.07143 0.08730 0.08730 0.13095 0.05952 0.08730 0.09127 0.05556 0.03175
0.03175 0.01190 0.02778 0.02381 0.01190 0.00397 0.01587 0.00397 0.00397 0.00000 0.00397 0.00000
0.00000 0.04365
* HDV5
       9 0.08197 0.07104 0.09290 0.10929 0.12568 0.08743 0.03825 0.06011 0.02732 0.03825 0.00546
0.02732 0.01093 0.00546 0.00546 0.03279 0.02732 0.00546 0.01639 0.00546 0.02186 0.02186 0.01639
0.01639 0.04918
* HDV6
      10 0.02988 0.05272 0.07381 0.05448 0.08260 0.10193 0.05097 0.05800 0.04218 0.03163 0.03515
0.04569 0.03339 0.04745 0.02460 0.02636 0.01933 0.02109 0.01054 0.02812 0.01933 0.01230 0.01757
0.01406 0.06678
* HDV7
      11 0.01117 0.00559 0.03352 0.01676 0.06145 0.03352 0.10056 0.03911 0.03911 0.07263 0.06145
0.06145 0.07821 0.04469 0.05587 0.02793 0.02235 0.03911 0.01117 0.02793 0.02793 0.00000 0.02793
0.02793 0.07263
* HDV8a
      12 0.00923 0.02768 0.01476 0.01845 0.03137 0.05166 0.02583 0.01476 0.02952 0.06458 0.07380
0.08672 0.04428 0.06273 0.08118 0.06458 0.04613 0.03690 0.02952 0.03137 0.02583 0.01292 0.00923
0.02399 0.08303
* HDV8b
      13 0.01280 0.07520 0.01760 0.09600 0.11200 0.12640 0.15360 0.07040 0.08480 0.17600 0.05120
0.00480 0.00320 0.00480 0.00480 0.00160 0.00160 0.00000 0.00320 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000
*   HDBS is MOBILE6 default
*   HDBT is MOBILE6 default
* MC
      16 0.06353 0.13529 0.12941 0.11647 0.11882 0.06353 0.04471 0.05059 0.03529 0.03059 0.02000
0.02000 0.01176 0.00706 0.00941 0.00824 0.01059 0.00471 0.01529 0.01059 0.00941 0.01294 0.01059
0.01412 0.04706
```

[1] Based on TxDOT mid-year 2004 three-county regional data for HDVs and county registration data otherwise

(except MOBILE6 defaults are used for Buses).

Jefferson County MOBILE6 Registration Distributions Input[1]

```
* Calculated from Mid-Year (July) 2004 Registration data
* LD and MC are county level; HD (except bus) are three county area level
*
* LDV
       1 0.04468 0.06907 0.07912 0.07893 0.08540 0.07339 0.06586 0.06290 0.05825 0.06172 0.05082
0.04633 0.04011 0.03558 0.03048 0.02576 0.01826 0.01442 0.01116 0.01087 0.00884 0.00489 0.00308
0.00266 0.01743
* LDT1
       2 0.03831 0.08459 0.09378 0.08149 0.06769 0.06576 0.06145 0.06128 0.05334 0.05436 0.05668
0.04127 0.03447 0.03254 0.02602 0.02617 0.01983 0.01439 0.01494 0.01305 0.01208 0.00766 0.00821
0.00724 0.02337
* LDT2
       3 0.03831 0.08459 0.09378 0.08149 0.06769 0.06576 0.06145 0.06128 0.05334 0.05436 0.05668
0.04127 0.03447 0.03254 0.02602 0.02617 0.01983 0.01439 0.01494 0.01305 0.01208 0.00766 0.00821
0.00724 0.02337
* LDT3
       4 0.12001 0.16456 0.13478 0.11615 0.08267 0.10164 0.03923 0.05468 0.04086 0.03236 0.01863
0.01837 0.01408 0.00910 0.00747 0.00833 0.00721 0.00309 0.00558 0.00335 0.00481 0.00258 0.00172
0.00163 0.00713
* LDT4
       5 0.12001 0.16456 0.13478 0.11615 0.08267 0.10164 0.03923 0.05468 0.04086 0.03236 0.01863
0.01837 0.01408 0.00910 0.00747 0.00833 0.00721 0.00309 0.00558 0.00335 0.00481 0.00258 0.00172
0.00163 0.00713
* HDV2
       6 0.11980 0.17877 0.11235 0.13035 0.07945 0.09870 0.04655 0.04469 0.02607 0.02235 0.01428
0.01614 0.01055 0.01366 0.01241 0.00931 0.01055 0.00683 0.00869 0.00435 0.00497 0.00248 0.00435
0.00310 0.01924
* HDV3
       7 0.03535 0.09933 0.11448 0.09596 0.09091 0.09764 0.04377 0.06566 0.04377 0.06566 0.03872
0.02862 0.02189 0.03199 0.01515 0.01347 0.02525 0.00505 0.00337 0.00505 0.00168 0.00168 0.00673
0.00505 0.04377
* HDV4
       8 0.03571 0.07937 0.07143 0.08730 0.08730 0.13095 0.05952 0.08730 0.09127 0.05556 0.03175
0.03175 0.01190 0.02778 0.02381 0.01190 0.00397 0.01587 0.00397 0.00397 0.00000 0.00397 0.00000
0.00000 0.04365
* HDV5
       9 0.08197 0.07104 0.09290 0.10929 0.12568 0.08743 0.03825 0.06011 0.02732 0.03825 0.00546
0.02732 0.01093 0.00546 0.00546 0.03279 0.02732 0.00546 0.01639 0.00546 0.02186 0.02186 0.01639
0.01639 0.04918
* HDV6
      10 0.02988 0.05272 0.07381 0.05448 0.08260 0.10193 0.05097 0.05800 0.04218 0.03163 0.03515
0.04569 0.03339 0.04745 0.02460 0.02636 0.01933 0.02109 0.01054 0.02812 0.01933 0.01230 0.01757
0.01406 0.06678
* HDV7
      11 0.01117 0.00559 0.03352 0.01676 0.06145 0.03352 0.10056 0.03911 0.03911 0.07263 0.06145
0.06145 0.07821 0.04469 0.05587 0.02793 0.02235 0.03911 0.01117 0.02793 0.02793 0.00000 0.02793
0.02793 0.07263
* HDV8a
      12 0.00923 0.02768 0.01476 0.01845 0.03137 0.05166 0.02583 0.01476 0.02952 0.06458 0.07380
0.08672 0.04428 0.06273 0.08118 0.06458 0.04613 0.03690 0.02952 0.03137 0.02583 0.01292 0.00923
0.02399 0.08303
* HDV8b
      13 0.01280 0.07520 0.01760 0.09600 0.11200 0.12640 0.15360 0.07040 0.08480 0.17600 0.05120
0.00480 0.00320 0.00480 0.00480 0.00160 0.00160 0.00000 0.00320 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000
*   HDBS is MOBILE6 default
*   HDBT is MOBILE6 default
* MC
      16 0.08098 0.13821 0.12585 0.12488 0.10829 0.06829 0.05301 0.04325 0.03772 0.02407 0.02211
0.01463 0.01008 0.00878 0.00650 0.00976 0.00878 0.00976 0.01008 0.01301 0.00813 0.00943 0.01073
0.00715 0.04650
```

[1] Based on TxDOT mid-year 2004 three-county regional data for HDVs and county registration data otherwise (except MOBILE6 defaults are used for Buses).

Orange County MOBILE6 Registration Distributions Input[1]

```
* Calculated from Mid-Year (July) 2004 Registration data
* LD and MC are county level; HD (except bus) are three county area level
*
* LDV
       1 0.04066 0.07025 0.08325 0.07754 0.08679 0.07512 0.06886 0.06542 0.05934 0.06141 0.05056
0.04560 0.03980 0.03235 0.02826 0.02345 0.01998 0.01383 0.01160 0.00909 0.00865 0.00481 0.00354
0.00264 0.01721
* LDT1
       2 0.03475 0.07498 0.08427 0.07919 0.06772 0.06680 0.06370 0.06225 0.05421 0.05552 0.05828
0.04085 0.03650 0.03558 0.03016 0.02885 0.02265 0.01520 0.01505 0.01317 0.01205 0.00881 0.00881
0.00658 0.02406
* LDT2
       3 0.03475 0.07498 0.08427 0.07919 0.06772 0.06680 0.06370 0.06225 0.05421 0.05552 0.05828
0.04085 0.03650 0.03558 0.03016 0.02885 0.02265 0.01520 0.01505 0.01317 0.01205 0.00881 0.00881
0.00658 0.02406
* LDT3
       4 0.09828 0.13747 0.10718 0.10718 0.07880 0.10125 0.04109 0.07011 0.05211 0.04702 0.02838
0.02309 0.02118 0.01271 0.01207 0.01419 0.00784 0.00466 0.00657 0.00445 0.00445 0.00402 0.00402
0.00191 0.00996
* LDT4
       5 0.09828 0.13747 0.10718 0.10718 0.07880 0.10125 0.04109 0.07011 0.05211 0.04702 0.02838
0.02309 0.02118 0.01271 0.01207 0.01419 0.00784 0.00466 0.00657 0.00445 0.00445 0.00402 0.00402
0.00191 0.00996
* HDV2
       6 0.11980 0.17877 0.11235 0.13035 0.07945 0.09870 0.04655 0.04469 0.02607 0.02235 0.01428
0.01614 0.01055 0.01366 0.01241 0.00931 0.01055 0.00683 0.00869 0.00435 0.00497 0.00248 0.00435
0.00310 0.01924
* HDV3
       7 0.03535 0.09933 0.11448 0.09596 0.09091 0.09764 0.04377 0.06566 0.04377 0.06566 0.03872
0.02862 0.02189 0.03199 0.01515 0.01347 0.02525 0.00505 0.00337 0.00505 0.00168 0.00168 0.00673
0.00505 0.04377
* HDV4
       8 0.03571 0.07937 0.07143 0.08730 0.08730 0.13095 0.05952 0.08730 0.09127 0.05556 0.03175
0.03175 0.01190 0.02778 0.02381 0.01190 0.00397 0.01587 0.00397 0.00397 0.00000 0.00397 0.00000
0.00000 0.04365
* HDV5
       9 0.08197 0.07104 0.09290 0.10929 0.12568 0.08743 0.03825 0.06011 0.02732 0.03825 0.00546
0.02732 0.01093 0.00546 0.00546 0.03279 0.02732 0.00546 0.01639 0.00546 0.02186 0.02186 0.01639
0.01639 0.04918
* HDV6
      10 0.02988 0.05272 0.07381 0.05448 0.08260 0.10193 0.05097 0.05800 0.04218 0.03163 0.03515
0.04569 0.03339 0.04745 0.02460 0.02636 0.01933 0.02109 0.01054 0.02812 0.01933 0.01230 0.01757
0.01406 0.06678
* HDV7
      11 0.01117 0.00559 0.03352 0.01676 0.06145 0.03352 0.10056 0.03911 0.03911 0.07263 0.06145
0.06145 0.07821 0.04469 0.05587 0.02793 0.02235 0.03911 0.01117 0.02793 0.02793 0.00000 0.02793
0.02793 0.07263
* HDV8a
      12 0.00923 0.02768 0.01476 0.01845 0.03137 0.05166 0.02583 0.01476 0.02952 0.06458 0.07380
0.08672 0.04428 0.06273 0.08118 0.06458 0.04613 0.03690 0.02952 0.03137 0.02583 0.01292 0.00923
0.02399 0.08303
* HDV8b
      13 0.01280 0.07520 0.01760 0.09600 0.11200 0.12640 0.15360 0.07040 0.08480 0.17600 0.05120
0.00480 0.00320 0.00480 0.00480 0.00160 0.00160 0.00000 0.00320 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000
*   HDBS is MOBILE6 default
*   HDBT is MOBILE6 default
* MC
      16 0.05259 0.14153 0.14308 0.11678 0.08662 0.07811 0.03867 0.03635 0.04254 0.03248 0.02320
0.02011 0.01469 0.00851 0.01160 0.01237 0.00541 0.00851 0.02011 0.01083 0.01005 0.00851 0.01856
```

```
0.00851 0.05027
```

[1] Based on TxDOT mid-year 2004 three-county regional data for HDVs and county registration data otherwise (except MOBILE6 defaults are used for Buses).

2007 Statewide Diesel Fraction Estimates[1]

```
* HDV fractions are estimated from TxDOT registration data (Mid-year July 2004)
* LDV, LDT and Bus fractions are EPA defaults
* One record per vehicle type.  The order of vehicle types is: LDV, LDT1, LDT2, LDT3,
LDT4, HDV2B, HDV3, HDV4, HDV5, HDV6, HDV7, HDV8a, HDV8b, HDBS

DIESEL FRACTIONS:
0.00090 0.00090 0.00090 0.00090 0.00090 0.00090 0.00090 0.00090 0.00090 0.00090
0.00090 0.00090 0.00060 0.00010 0.00030 0.00060 0.00130 0.00040 0.00040 0.00010
0.00270 0.00320 0.00970 0.01620 0.02410
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00070 0.00330 0.00480 0.01200 0.02230
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00070 0.00330 0.00480 0.01200 0.02230
0.01260 0.01260 0.01260 0.01260 0.01260 0.01260 0.01260 0.01260 0.01260 0.01260
0.01260 0.01260 0.01150 0.01110 0.01450 0.01150 0.01290 0.00960 0.00830 0.00720
0.00820 0.01240 0.01350 0.01690 0.02090
0.01260 0.01260 0.01260 0.01260 0.01260 0.01260 0.01260 0.01260 0.01260 0.01260
0.01260 0.01260 0.01150 0.01110 0.01450 0.01150 0.01290 0.00960 0.00830 0.00720
0.00820 0.01240 0.01350 0.01690 0.02090
0.88563 0.88563 0.88563 0.88563 0.81309 0.77966 0.72044 0.59186 0.63002 0.54190
0.46056 0.43055 0.20553 0.38983 0.37310 0.34438 0.35788 0.27757 0.22879 0.18284
0.15413 0.19001 0.17778 0.19679 0.17158
0.72198 0.72198 0.72198 0.72198 0.65470 0.64998 0.63211 0.64506 0.61992 0.49298
0.57222 0.53758 0.33289 0.54565 0.57020 0.61950 0.49214 0.52674 0.46608 0.35632
0.27254 0.31264 0.21457 0.23404 0.19136
0.81565 0.81565 0.81565 0.81565 0.72670 0.69889 0.70449 0.71724 0.64706 0.68324
0.74152 0.65808 0.44894 0.67123 0.67488 0.64012 0.72156 0.55718 0.61592 0.29545
0.25161 0.11336 0.12227 0.21429 0.18182
0.87557 0.87557 0.87557 0.87557 0.86605 0.88606 0.85864 0.89074 0.86116 0.70180
0.72335 0.79849 0.47491 0.66552 0.72481 0.65278 0.73464 0.60057 0.59797 0.34050
0.35968 0.23649 0.30435 0.25000 0.30189
0.87680 0.87680 0.87680 0.87680 0.90476 0.91638 0.87145 0.86580 0.82740 0.79135
0.76770 0.80283 0.59535 0.78600 0.77429 0.59492 0.67919 0.73922 0.73063 0.57382
0.65900 0.56172 0.46842 0.46250 0.42308
0.94783 0.94783 0.94783 0.94783 0.98257 0.90545 0.89330 0.90961 0.89110 0.84945
0.78594 0.81909 0.53993 0.82827 0.85079 0.88206 0.86895 0.84016 0.85782 0.81713
0.83038 0.78906 0.75852 0.72185 0.68944
0.94693 0.94693 0.94693 0.94693 0.96067 0.95596 0.94286 0.93528 0.95292 0.95020
0.90000 0.92354 0.73845 0.96314 0.94870 0.95054 0.93254 0.93707 0.94532 0.95140
0.94860 0.91219 0.91164 0.94034 0.90625
0.98522 0.98522 0.98522 0.98522 0.98188 0.98089 0.98964 0.98790 0.97927 0.97708
0.95161 0.99275 0.79417 0.96019 0.98762 0.96552 0.99248 0.93578 0.96970 0.96104
0.97826 0.92188 0.92683 0.96386 0.95000
0.95850 0.95850 0.95850 0.95850 0.95850 0.95850 0.95850 0.95850 0.95850 0.95850
0.95850 0.95850 0.88570 0.85250 0.87950 0.99000 0.91050 0.87600 0.77100 0.75020
0.73450 0.67330 0.51550 0.38450 0.32380
```

[1] Based on TxDOT Statewide mid-year 2004 county registration data except EPA fractions are used for LDV, LDT and Bus.