



**Development and Production of
On-Road Mobile Source,
Photo-Chemical Model Ready,
2007 Future Case Emissions Inventories
for the Houston-Galveston Eight-Hour
Ozone Nonattainment Counties**

**TEXAS TRANSPORTATION INSTITUTE
THE TEXAS A&M UNIVERSITY SYSTEM
COLLEGE STATION, TEXAS**

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TECHNICAL NOTE

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TO: Mary McGarry-Barber, Project Manager DATE: 3 March 2004
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SUBJECT: Development and Production of On-Road Mobile Source, Photo-Chemical Model Ready, 2007 Future Case Emissions Inventories for the Houston-Galveston Eight-Hour Nonattainment Counties
(Umbrella Contract 60200-04-09: Task 1) - **Review Draft**

INTRODUCTION

This Technical Note documents the methods that the Texas Transportation Institute (TTI) used to develop the Houston/Galveston ozone nonattainment area (HGA) 2007 future base case ozone episode on-road mobile source modeling emissions inventories (EI), a task in support of HGA eight-hour ozone standard State Implementation Planning. The 2010 and 2013 future base-case episode EI analyses documentation associated with this task are provided in separate Technical Notes.

The eight HGA counties are: Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller. The forecast period for the emissions estimates was the 20-day, base-case analysis sequence, Friday, August 18 through Wednesday, September 6, 2000. 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 is maintained. Emissions of volatile organic compounds (VOC), carbon monoxide (CO), and oxides of nitrogen (NO_x) were estimated for each day on an hourly basis. The hourly estimates were computed by network link with geographical coordinates provided. Emissions were categorized by 28 vehicle types and 14 pollutant-specific emissions types.

Documented within are the methods used for developing EI elements including link-based vehicle miles traveled (VMT) and speed estimates (developed by post-processing the Houston/Galveston Area Council's [HGAC] travel demand models [TDM]), development of

episode period day-of-week-adjusted Highway Performance Monitoring System (HPMS) consistent VMT totals, VMT mix, MOBILE6 emissions factors, and the emissions estimates.

ACKNOWLEDGMENTS

Chris Kite, with the Texas Commission on Environmental Quality (TCEQ), and Martin Boardman, L.D. White, and Teresa Qu, of TTI, contributed to the development of the MOBILE6 emissions factors input data parameter values. Boardman produced the MOBILE6 model set-ups, and performed the emissions factors and emissions analyses. Chris van Slyke of HGAC provided the 2007 Houston/Galveston area network traffic assignment and intrazonal trips. Dennis Perkinson, Ph.D., of TTI, developed seasonal day-of-week and HPMS consistency VMT adjustment factors and VMT mix. White post-processed the HGAC TDM data sets producing VMT and operational speeds inputs estimates. Each member of the assigned TTI staff contributed to the quality assurance of the emissions inventory elements. Dr. Perkinson was the principle investigator for this project. This work was performed by TTI under contract to TCEQ. Mary McGarry-Barber 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, which is 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 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 2007 emissions inventory data sets were previously submitted to TCEQ on CD-ROM. Appendix A lists the CD-ROM volume names and the data set file names and descriptions contained on each CD-ROM. The data sets provided include:

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

SUMMARY OF VMT AND EMISSIONS

A summary of the 2007 24-hour HGA network total VMT, average speed (VMT divided by vehicle hours traveled [VHT]), and on-road mobile source emissions for the 20 analysis days is presented in Table 1.

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

Day	VMT	Speed	VOC	CO	NOx
Friday, August 18	161,609,890	35.6	98.8	1,408.3	178.3
Saturday, August 19	135,286,294	37.7	71.6	1,101.2	149.5
Sunday, August 20	107,474,790	38.0	57.2	911.5	86.0
Monday, August 21	146,019,214	36.4	88.0	1,268.2	196.7
Tuesday, August 22	146,019,214	36.4	85.1	1,249.6	192.2
Wednesday, August 23	146,019,214	36.4	84.5	1,229.9	191.5
Thursday, August 24	146,019,214	36.4	84.4	1,229.1	191.3
Friday, August 25	161,609,890	35.6	96.9	1,405.4	173.7
Saturday, August 26	135,286,294	37.7	71.1	1,105.5	147.4
Sunday, August 27	107,474,790	38.0	56.6	910.6	84.8
Monday, August 28	146,019,214	36.4	87.8	1,269.1	196.0
Tuesday, August 29	146,019,214	36.4	88.6	1,275.3	196.2
Wednesday, August 30	146,019,214	36.4	90.4	1,283.0	200.1
Thursday, August 31	146,019,214	36.4	92.9	1,292.4	203.8
Friday, September 01	161,609,890	35.6	101.8	1,444.2	179.1
Saturday, September 02	135,286,294	37.7	74.3	1,152.8	151.0
Sunday, September 03	107,474,790	38.0	60.3	941.7	91.4
Monday, September 04**	107,474,790	38.0	61.6	943.7	92.9
Tuesday, September 05	146,019,214	36.4	92.4	1,298.5	202.0
Wednesday, September 06	146,019,214	36.4	86.5	1,226.0	199.2

* VMT/VHT,

** September 4, Labor Day, emissions estimates are 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 2007 HGA ozone episode emissions estimates, a directional link-based, hourly methodology was applied. Emissions estimates were calculated at the roadway network link level for each hour of each analysis day.

The MOBILE6 model (U.S. Environmental Protection Agency [EPA], October 2002) was used to develop hourly emissions factors by MOBILE6 road type (or drive cycle) and 28 vehicle types. The speed sensitive freeway and arterial emissions factors, and the fixed-speed ramp emissions factors were used. The freeway emissions factors were applied to links with interstate, freeway, and toll roads functional classification codes; the ramp emissions factors were used with links coded as ramp (for freeway, toll roads, and frontage roads); and arterial emissions factors were applied to all other links. The activity basis was the Houston/Galveston directional 2007 TDM link-based and intrazonal VMT (from HGAC, January 2004), adjusted to episode day type-specific activity and for consistency with HPMS VMT. ATR data were used to produce the episode day-type VMT adjustment factors. ATR-based hourly travel fractions were applied to allocate the episode day type VMT by hour-of-day. Hourly, directional, average operational speeds (congested speed estimates based on estimated volume-to-capacity[v/c] ratios) were modeled by link. Vehicle classification data were used to estimate time-of-day VMT mixes for apportioning fleetwide link VMT for three road type groups to the 28 EPA vehicle types. Based on comparative analysis of ATR data and in consultation with TCEQ, the Sunday activity factors and Sunday VMT mix estimates were chosen to represent activity for the 4 September (Monday Labor Day) episode day. Link-level emissions by vehicle type were calculated by hour. For the geographical allocation of emissions, the link endpoints (designated by network node numbers for which X-Y coordinates are provided) were recorded with the hourly link emissions.

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

ESTIMATION OF VMT

The outputs of the VMT estimation process are estimates of HPMS consistent, hourly link VMT by four episode day types (average Monday through Thursday, Friday, Saturday and Sunday) for the HGAC 2007 TDM network (consisting of an AM Peak assignment, Mid-Day assignment, PM Peak assignment and an Overnight assignment) and for each of the added intrazonal links. See Table 4 for hours associated with each assignment period. The TRANSVMTHSPDWKD and TRANSVMTHSPDWKE programs were used to produce these VMT estimates (and to estimate operational link speeds, discussed in a following section). Appendix B describes these programs.

Data Sources

The 2007 TDM (consisting of four directional, time-of-day period assignments) and trip tables (one for each time-of-day assignment) were supplied by HGAC (January 2004). Since the intrazonal trips are not included in the TDM, the trip tables were used (along with a calculated

zonal radii) to estimate the intrazonal VMT. To adjust the TDM VMT to consistency with HPMS VMT and from average non-summer weekday traffic (ANSWT) form to episode day type-specific VMT, as well as to allocate it to episode day type hourly proportions, several other sources of data are needed.

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 this study, county total HPMS Annual Average Daily Traffic (AADT) VMT were used to ensure the 2007 travel model VMT are 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 made consistent with that reported through HPMS.)

ATR vehicle counts are collected by the Texas Department of Transportation (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 comparisons (e.g., seasonal adjustment and hourly allocation factors), even though there may be relatively few ATR data collection locations in any given area. For VMT adjustment factors requiring episode day-type specificity, multi-year (1999 through 2002) day type-specific ATR data for the episode period were grouped from all active ATR stations in the HGA eight-county area. ATR count data were used in developing the HPMS adjustment factor, episode day type adjustment factors, episode weekend day type assignment period travel profile factors, and episode day-type-specific hourly travel factors.

VMT Adjustments

The TDM VMT were adjusted for consistency with HPMS (using an HPMS factor) and to episode day-type-specific travel (using episode day-type factors). For weekend days (Saturday and Sunday), weekend day profile factors corresponding to each of the four TDM assignment periods were applied to convert the TDM assignment and intrazonal ANSWT VMT assignment period proportions to weekend day travel proportions. Hourly travel factors were then applied to generate the hourly link files. Table 2 shows the unadjusted TDM VMT and the TDM VMT adjusted to episode day-type-specific VMT. The VMT factors applied for developing Sunday day type hourly link VMT were also used to develop the 4 September (Monday Labor Day) VMT estimates — this decision was based on comparative analysis of ATR data and consultations with TCEQ staff.

Table 2
HGA County 2007 Travel Model and Episode Day Type-Specific VMT¹

County	Travel Model VMT ²	Weekday VMT ³	Friday VMT	Saturday VMT	Sunday VMT ⁴
Brazoria	5,988,850	6,216,326	6,880,050	5,759,402	4,575,415
Chambers	2,591,256	2,689,680	2,976,861	2,491,979	1,979,690
Fort Bend	9,740,650	10,110,632	11,190,157	9,367,464	7,441,747
Galveston	5,625,799	5,839,485	6,462,976	5,410,261	4,298,047
Harris	101,836,550	105,704,622	116,990,85	97,934,970	77,801,965
Liberty	2,310,600	2,398,364	2,654,441	2,222,076	1,765,272
Montgomer	10,349,389	10,742,491	11,889,482	9,952,880	7,906,815
Waller	2,232,806	2,317,615	2,565,070	2,147,262	1,705,839
HGA	140,675,899	146,019,214	161,609,89	135,286,294	107,474,790

¹ Rounded to whole numbers.

² These are unadjusted 24-hour VMT totals from time-of-day traffic assignments including intrazonal VMT.

³ Weekday activity is average Monday through Thursday.

⁴ Sunday activity is also applied for the Monday, September 4 (Labor Day) episode day, based on comparative analysis of regional ATR data and in consultation with TCEQ.

HPMS Factor

The HPMS adjustment factor was used to adjust the 2007 TDM for HPMS consistency. This factor was developed using the 2002 TDM (HGAC, January 2004), the estimated intrazonal VMT for the 2002 TDM, and the 2002 HPMS VMT reported by TxDOT. The HPMS factor is calculated as:

$$\text{HPMS VMT (AADT)} \times \text{ANSWT Adjustment Factor} = \text{HPMS VMT (ANSWT)}$$

$$\text{HPMS VMT (ANSWT)} / \text{Model VMT (ANSWT)} = \text{HPMS Factor}$$

The HPMS VMT (AADT) component was the eight-county total 2002 HPMS VMT (reported by TxDOT in the 2002 Roadway Inventory Functional Classification Record [RIFCREC] Report). The ANSWT adjustment factor (i.e, used to convert AADT to ANSWT) was based on ATR data aggregated from all ATR stations within the HGA eight-county TDM network area. The model VMT (ANSWT) was produced from the 2002 travel model assignments and estimated intrazonal VMT. The actual values for the HPMS factor calculation are:

$$122,832,328 \times 1.0558338 = 129,690,523.6$$

$$129,690,523.6 / 124,088,850.0 = 1.045142441$$

Episode Day-Type Factors

The HGA regional ATR-based episode day-type factors 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 factors are average episode day-type traffic count divided by the ANSWT traffic count. One episode day-type factor is developed for each of the four day types, as shown in Table 3.

Table 3
HGA Episode Day Type Factors

Weekday	Friday	Saturday	Sunday*
0.99315	1.09919	0.92015	0.73099

* Also applied for the Monday, September 4 (Labor Day) episode day.

Weekend Day Profile Factors

Prior to application of the hourly travel factors required to produce the weekend day type hourly link VMT estimates (discussed in the next subsection), the TDM ANSWT assignment and intrazonal VMT proportions by assignment period were adjusted to represent the weekend day type proportions, or profiles. This step was not performed for the Weekday and Friday day type VMT estimates. Weekend day profile factors, developed by county and individually for the Saturday and Sunday day types, were used to perform this conversion.

The weekend day profile factors by TDM assignment period (i.e., four factors) are the product of two main components, one which essentially expands TDM assignment time-period VMT to the 24-hour total, and one which then reallocates the expanded TDM VMT for the time period to the weekend day-type proportion for that time period. These weekend day profile factors were developed using: 1) county level time period assignment (AM Peak, Mid-Day, PM Peak, and Overnight) ANSWT and intrazonal VMT (to develop the TDM time period VMT expansion component) and 2) regional ATR-based weekend day type hourly travel fractions (to develop the TDM assignment period reallocation component). The expansion components (one per assignment period for each day-type) of the weekend day profile factors were calculated for each county as county 24-hour TDM VMT (assignment and intrazonal) divided by county assignment time period TDM VMT. The reallocation components were developed by summing the weekend day hourly travel fractions within each TDM assignment period to produce one four-factor set of assignment-period-specific regional weekend day travel fractions for each day-type. The two components, corresponding to each assignment period, were multiplied producing the weekend day profile factors. These calculations were performed for each weekend day-type and county. Table 4 and Table 5, respectively, show the Saturday and Sunday county level weekend profile factors. These weekend profile factors were correlated to and multiplied by appropriate link VMT by day type, county, and assignment period.

**Table 4
HGA Saturday Profile Factors**

County	Assignment Period*			
	AM Peak	Mid-Day	PM Peak	Overnight
Harris	0.44393	1.09084	0.79907	2.24039
Brazoria	0.44993	1.11665	0.79302	2.10696
Fort Bend	0.46884	1.10727	0.79521	2.00111
Waller	0.60990	1.02807	0.82539	1.59494
Montgomery	0.47036	1.11969	0.79609	1.93945
Liberty	0.51097	1.09061	0.80648	1.78699
Chambers	0.60264	1.03766	0.82760	1.57761
Galveston	0.47814	1.02854	0.80066	2.28870

* AM Peak (6 a.m. - 9 a.m.), Mid-Day (9 a.m. - 3 p.m.), PM Peak (3 p.m. - 7 p.m.), Overnight (7 p.m. - 6 a.m.)

**Table 5
HGA Sunday* Profile Factors**

County	Assignment Period**			
	AM Peak	Mid-Day	PM Peak	Overnight
Harris	0.28265	1.08869	0.87561	2.34617
Brazoria	0.28647	1.11445	0.86897	2.20644
Fort Bend	0.29851	1.10509	0.87137	2.09559
Waller	0.38832	1.02605	0.90444	1.67025
Montgomery	0.29947	1.11748	0.87233	2.03102
Liberty	0.32533	1.08847	0.88372	1.87136
Chambers	0.38370	1.03561	0.90687	1.65210
Galveston	0.30443	1.02652	0.87735	2.39676

* Also applied for the Monday, September 4 (Labor Day) episode day.

** AM Peak (6 a.m. - 9 a.m.), Mid-Day (9 a.m. - 3 p.m.), PM Peak (3 p.m. - 7 p.m.), Overnight (7 p.m. - 6 a.m.)

Hourly Travel Factors

The hourly travel factors (used to distribute the TDM VMT to each hour of the day) were developed using the multi-year, eight-county region, episode day-type-specific ATR data. There are 24 hourly fractions for the entire area for each day type (or 96 total fractions). Using the episode day type-specific volumes, these factors are the ratio of each hourly volume to 24-hour volume. To maintain VMT proportions within each of the four assignment time periods (including those proportions produced specifically for the weekend day types as described above), the hourly fractions were normalized within each time period. Table 6 shows the assignment time periods, their respective hours of the day and corresponding hourly travel factors.

Table 6
HGA Hourly Time Period Volume Factors

Assignment	Hour	Weekday	Friday	Saturday	Sunday*
AM Peak	6:00 a.m.	0.311316	0.303761	0.255836	0.255161
	7:00 a.m.	0.376676	0.380096	0.334913	0.321913
	8:00 a.m.	0.312008	0.316143	0.409251	0.422926
Mid-Day	9:00 a.m.	0.161271	0.154817	0.137256	0.112699
	10:00 a.m.	0.155423	0.152677	0.155208	0.145346
	11:00 a.m..	0.162897	0.162358	0.169051	0.160840
	12:00 p.m..	0.166953	0.170667	0.178414	0.182652
	1:00 p.m.	0.171248	0.174042	0.180240	0.198844
	2:00 p.m.	0.182208	0.185439	0.179831	0.199619
PM Peak	3:00 p.m.	0.235002	0.245732	0.256349	0.254714
	4:00 p.m.	0.259968	0.261074	0.252739	0.249387
	5:00 p.m.	0.279245	0.265580	0.250680	0.251099
	6:00 p.m.	0.225785	0.227614	0.240232	0.244800
Overnight	7:00 p.m.	0.215708	0.207428	0.180356	0.189218
	8:00 p.m.	0.169380	0.167748	0.157804	0.170075
	9:00 p.m.	0.145394	0.146959	0.146968	0.144121
	10:00 p.m..	0.109447	0.129020	0.134706	0.112983
	11:00 p.m.	0.071095	0.097889	0.109719	0.078063
	12:00 a.m.	0.045275	0.040042	0.068396	0.084048
	1:00 a.m.	0.028843	0.026552	0.046432	0.060523
	2:00 a.m.	0.026558	0.025268	0.043094	0.058215
	3:00 a.m.	0.023763	0.022056	0.029346	0.036939
	4:00 a.m.	0.039596	0.034831	0.029652	0.028295
	5:00 a.m.	0.124941	0.102207	0.053527	0.037520

* Also applied for the Monday, September 4 (Labor Day) episode day.

ESTIMATION OF LINK SPEEDS

The operational speeds for each link, excluding centroid connectors and the special intrazonal links, were calculated using the Houston speed model. The Houston speed model calculates these speeds using the travel model speed, speed factors (consisting of a freeflow speed factor and level of service [LOS] E speed factor) and a v/c ratio based speed reduction factor (SRF) for each link. For the centroid connector links, the travel model speed was used as the operational speed. For the intrazonal links, the centroid connector speeds within each zone were averaged to determine the operational speed for each zone.

The speed factors were used to convert the travel model speed to a freeflow speed and an LOS E speed (i.e, application of these factors results in two speeds). These factors were grouped into seven functional groups. Appendix C shows the speed factors and the network functional class and functional group relationship.

The link specific v/c ratio is calculated as the time period (hourly) volume divided by the time period capacity. The v/c ratio is expressed as:

$$v/c \text{ ratio} = V_h / C_h$$

Where:

- V_h = the hourly link volume (travel model \times HPMS factor \times Seasonal Adjustment Factor \times hourly time period factor; Weekend profile factor is included for Saturday and Sunday); and
- C_h = the hourly link capacity (travel model capacity \times hourly capacity factor). Appendix C shows the hourly capacity factors.

Once the v/c ratio was calculated, the link specific SRF was determined using the v/c ratio, the link specific SRF area type, the link specific SRF functional class, and the SRFs. The speed reduction factors are for v/c ratios of 0 to 1 in 0.05 increments (i.e, 0, 0.05, 0.10, ... , 0.95, 1.0). Appendix C shows these speed reduction factors. The link specific SRF was calculated using linear interpolation. For v/c ratios greater than 1.0, a SRF is not required.

The speed model (for v/c ratios from 0.00 to 1.00) is expressed as:

$$S_{v/c} = S_{0.0} - \text{SRF}_{v/c} \times (S_{0.0} - S_{1.0})$$

Where:

- $S_{v/c}$ = estimated directional speed for the forecast v/c ratio on the link in the subject direction;
- $S_{0.0}$ = estimated freeflow speed for v/c ratio equal to 0.0;
- $S_{1.0}$ = estimated LOS E speed for v/c ratio equal to 1.0; and

$SRF_{v/c}$ = speed reduction factor for the v/c ratio on the link. The v/c ratio can be 0.0 to 1.0. See four SRF plots in Appendix C.

For v/c ratios greater than 1.0 and less than 1.5, the model extension discussed below was used. The speed model extension is:

$$S_{v/c} = S_{1.0} \times (1.15 / (1.0 + (0.15 \times (v/c)^4)))$$

Where:

$S_{v/c}$ = estimated directional speed for the forecast v/c ratio on the link in the subject direction;

$S_{1.0}$ = estimated LOS E speed for the v/c ratio equal to 1.0; and

v/c = the forecast v/c ratio on the link. The v/c ratio can be 1.0 to 1.5.

For v/c ratios greater than 1.5, the speed was computed using the speed model extension shown above, except the v/c ratio was set to 1.5.

These speed models were applied to all functional classes excluding the centroid connector and intrazonal functional classes. For these functional classes, capacity data were not used. The centroid connector travel model input speeds were used as the centroid connector operational speeds estimates. Operational speeds for the intrazonal functional class 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 were provided electronically to TCEQ (see Appendix A for electronic data descriptions).

ESTIMATION OF VMT MIX

VMT mix was estimated using TxDOT 1997 - 2002 vehicle classification data, TxDOT registrations data (latest available, i.e., 2003) and MOBILE6 default diesel fractions where necessary. There were four time-of-day (TDM assignment) period VMT mix estimates developed by three functional classification groups for each of the four day types. The eight-county area data were aggregated.

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 7). The FHWA axle/vehicle length-based classification categories must be converted into 28 MOBILE GVWR/fuel type-based categories.

The FHWA vehicle classification counts were first aggregated into three intermediate groups.

Passenger Vehicles (PV)	C + P;
Heavy-Duty Vehicles (HDV)	SU2 + SU3 + SU4 + SE4; and
HDDV8b (HDX)	SE5 + SE6 + SD5 + SD6 + SD7.

This was followed by a second intermediate allocation that separates light-duty vehicles (LDV) into PVs and light-duty trucks (LDT) based on TxDOT registration data:

LDV	$0.695 \times PV$ (by county, 2002 Harris registration data shown); and
LDT	$0.305 \times PV$ (by county, 2002 Harris registration data shown).

A third intermediate allocation further separates LDTs into LDT1 and HLDT (note that LDT1 is itself intermediate and is further divided into LDGT1 and LDDT):

LDT1	$0.813 \times LDT$ (by county, 2002 Harris registration data shown); and
HLDT	$0.187 \times LDT$ (by county, 2002 Harris registration data shown).

Next, the remaining FHWA categories were disaggregated into EPA vehicle groups, as shown. Note that TxDOT vehicle classification count procedures do not distinguish between gasoline and diesel LDTs. Consequently, MOBILE defaults for the year of interest were used. As before, actual TxDOT vehicle registration data were used to separate gasoline from diesel heavy-duty trucks. Note also that motorcycles were not counted separately and were included as a default (subtracted from LDGV):

LDGV	$0.9989987 \times LDV$ (MOBILE6 default for 2007 shown);
LDDV	$0.0010013 \times LDV$ (MOBILE6 default for 2007 shown);
LLDT	$0.9947975 \times LDT1$ (MOBILE6 default for 2007 shown);
LDDT	$0.0052025 \times LDT1$ (MOBILE6 default for 2007 shown);
HDGV	$0.358 \times HDV$ (by county, 2002 Harris County registration data shown);
HDDV	$0.642 \times HDV$ (by county, 2002 Harris County registration data shown); and
MC	0.001 of total (subtracted from LDGV).

This converts the FHWA axle count-based categories into GVWR categories. Table 8 schematically shows this part of the conversion procedure. Starting with the TxDOT vehicle classification data, these data themselves provide sufficient information to complete the first step in the conversion process, the allocation of vehicles into PVs, HDVs, HDDV8b, and buses (B). Steps 2 and 3 further allocate these categories using TxDOT registration data. Finally, Step 4 allocates light-duty vehicles by fuel type using EPA MOBILE diesel fractions and motorcycles are separated from light-duty gas vehicles using a nominal constant.

The MOBILE6 28-category typology is a subset of this typology. A combination of EPA MOBILE6 defaults and area vehicle registration data were used to expand these intermediate categories.

For the 28-category EPA scheme, heavy-duty vehicles (HDV) — HDGV and HDDV — were separated into eight and seven categories respectively. HDDV8b vehicle were counted directly. The 15 HDV categories were separated from total HDV, which have been separated by fuel type using TxDOT registration data by county. Each HDV category (HDGV and HDDV) was then divided into sub-categories based on TxDOT area vehicle registration data. Buses were treated separately.

The 28-category EPA scheme also further divided the two LDT categories based in part on assumed loading. The previous LDGT1 and LDGT2 categories (previously defined as $GVWR \leq 6,000$ and $GVWR > 6,000$ to $8,500$, respectively) were separated into subcategories in terms of adjusted loaded vehicle weight (ALVW). ALVW is the average of vehicle curb weight and GVWR. Thus, two new intermediate categories are introduced. These are light light-duty trucks (LLDT) and heavy light-duty trucks (HLDT), which are defined as:

- LLDT - any light-duty truck rated through 6,000 pounds GVWR, and
- HLDT - any light-duty truck rated greater than 6,000 pounds GVWR.

These two new intermediate categories were then used to define the four LDT categories using EPA MOBILE6 defaults for the year of interest. The four LDT categories are:

- LDGT1 - light light-duty trucks through 3,750 pounds loaded vehicle weight (LVW);
- LDGT2 - light light-duty trucks greater than 3,750 pounds LVW;
- LDGT3 - heavy light-duty trucks to 5,750 pounds ALVW; and
- LDGT4 - heavy light-duty trucks greater than 5,750 pounds ALVW.

Similarly, the LDDT category was sub-divided into two categories based on GVWR (less than or equal to 6,000 GVWR and 6,000 to 8,500 GVWR). This was accomplished using EPA MOBILE6 default values for the year of interest.

Finally the three bus categories were separated from the TxDOT classification counts bus category using EPA MOBILE6 default values. (Under MOBILE6 the HDV category does not include buses.)

Vehicle classification data was not forecast. For future VMT mix estimates, MOBILE6 default values consistent with the future year were used (i.e., 2007). No other adjustments were made to alter the count data and conversion procedure to accommodate future years. Table 9 shows the VMT mix estimation procedure summary followed by explanatory notes. For this analysis, VMT mix estimates were developed for three functional classification groups (see Table 32 in Emissions Calculations section) and the four HGAC TDM time-of-day assignment periods (See Table 4).

This procedure was performed as described for weekdays. TxDOT vehicle classification data are only collected for weekdays (Monday through Thursday), consequently other data was used to estimate VMT mix for Fridays, Saturdays, and Sundays. The procedure used to estimate Friday, Saturday, and Sunday VMT mix relies 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 applied to the weekday VMT mix to produce region specific Friday, Saturday and Sunday VMT mix. (No seasonal changes are assumed.) Tables 10 through 13 show the VMT mixes.

Table 7
EPA Vehicle Types - 28 Categories

Category	Description	GVWR
LDGV	Light-duty gasoline vehicle	≤ 6,000
LDGT1	Light-duty gasoline truck	≤ 6,000
LDGT2	Light-duty gasoline truck	≤ 6,000
LDGT3	Light-duty gasoline truck	6,001 - 8,500
LDGT4	Light-duty gasoline truck	6,001 - 8,500
HDGV2b	Heavy-duty gasoline vehicle	8,501 - 10,000
HDGV3	Heavy-duty gasoline vehicle	10,001 - 14,000
HDGV4	Heavy-duty gasoline vehicle	14,001 - 16,000
HDGV5	Heavy-duty gasoline vehicle	16,001 - 19,500
HDGV6	Heavy-duty gasoline vehicle	19,501 - 26,000
HDGV7	Heavy-duty gasoline vehicle	26,001 - 33,000
HDGV8a	Heavy-duty gasoline vehicle	33,001 - 60,000
HDGV8b	Heavy-duty gasoline vehicle	> 60,000
HDGB	Heavy-duty gasoline bus	all
LDDV	Light-duty diesel vehicle	≤ 6,000
LDDT12	Light-duty diesel truck	≤ 6,000
LDDT34	Light-duty diesel truck	6,001 - 8,500
HDDV2b	Heavy-duty diesel vehicle	8,501 - 10,000
HDDV3	Heavy-duty diesel vehicle	10,001 - 14,000
HDDV4	Heavy-duty diesel vehicle	14,001 - 16,000
HDDV5	Heavy-duty diesel vehicle	16,001 - 19,500
HDDV6	Heavy-duty diesel vehicle	19,501 - 26,000
HDDV7	Heavy-duty diesel vehicle	26,001 - 33,000
HDDV8a	Heavy-duty diesel vehicle	33,001 - 60,000
HDDV8b	Heavy-duty diesel vehicle	> 60,000
HDDBS	Heavy-duty diesel school bus	all
HDDBT	Heavy-duty diesel transit bus	all
MC	Motorcycle	all

Table 8
Initial Vehicle Classification Conversion Procedure

Start	Step 1	Step 2	Step 3	Step 4
Total Vehicles	PV	LDV	LDGV	MC
				LDGV
			LDDV	
		LDT	LDT1	LLDT
				LDDT
			HLDT	
	HDV	HDGV		
		HDDV		
	HDDV8b			
	B			

Table 9
VMT Mix Estimation Procedure Summary

EPA-8	EPA-28	Conversion
LDGV	LDGV	.9990 × LDV
LDGT1	LDGT1	.2310 × LLDT
	LDGT2	.7690 × LLDT
LDGT2	LDGT3	.6850 × HLDT
	LDGT4	.3150 × HLDT
HDGV	HDGV2b	.519 × HDGV
	HDGV3	.194 × HDGV
	HDGV4	.094 × HDGV
	HDGV5	.034 × HDGV
	HDGV6	.091 × HDGV
	HDGV7	.032 × HDGV
	HDGV8a	.032 × HDGV
	HDGV8b	.004 × HDGV
	HDGB	.0931 × B
LDDV	LDDV	.0010 × LDV
LDDT	LDDT12	.0337 × LDDT
	LDDT34	.9663 × LDDT
HDDV	HDDV2b	.278 × HDDV
	HDDV3	.134 × HDDV
	HDDV4	.081 × HDDV
	HDDV5	.053 × HDDV
	HDDV6	.168 × HDDV
	HDDV7	.102 × HDDV
	HDDV8a	.184 × HDDV
	HDDV8b	HDX
	HDDBT	.3239 × B
	HDDBS	.5830 × B
MC	MC	MC

Notes to VMT Mix Estimation Procedure Summary

Intermediate category factors and sources:

LDV	.695 × PV (by county, 2002 Harris County registration data shown)
LDT	.305 × PV (by county, 2002 Harris County registration data shown)
LDT1	.813 × LDT (by county, 2002 Harris County registration data shown)
HLDT	.187 × LDT (by county, 2002 Harris County registration data shown)
LLDT	.9948 × LDT1 (EPA MOBILE6 default, 2007 shown)
LDDT	.0052 × LDT1 (EPA MOBILE6 default, 2007 shown)
HDV	SU2+SU3+SU4+SE3+SE4
HDX	SE5+SE6+SD5+SD6+SD7
HDGV	.358 × HDV (by county, 2002 Harris County registration data shown)
HDDV	.642 × HDV (by county, 2002 Harris County registration data shown)

Category conversion factors and sources:

LDGV	.9990 × LDV (EPA MOBILE6 default, 2007 shown)
LDGT1	.2310 × LLDT (EPA MOBILE6 default, 2007 shown)
LDGT2	.7690 × LLDT (EPA MOBILE6 default, 2007 shown)
LDGT3	.6850 × HLDT (EPA MOBILE6 default, 2007 shown)
LDGT4	.3150 × HLDT (EPA MOBILE6 default, 2007 shown)
HDGV2a	.519 × HDGV (HGAC area registration data)
HDGV3	.194 × HDGV (HGAC area registration data)
HDGV4	.094 × HDGV (HGAC area registration data)
HDGV5	.034 × HDGV (HGAC area registration data)
HDGV6	.091 × HDGV (HGAC area registration data)
HDGV7	.032 × HDGV (HGAC area registration data)
HDGV8a	.032 × HDGV (HGAC area registration data)
HDGV8b	.004 × HDGV (HGAC area registration data)
HDGB	.0931 × B (EPA MOBILE6 default, 2007 shown)
LDDV	.0010 × LDV (EPA MOBILE6 default, 2007 shown)
LDDT12	.0337 × LDDT (EPA MOBILE6 default, 2007 shown)
LDDT34	.9663 × LDDT (EPA MOBILE6 default, 2007 shown)
HDDV2b	.278 × HDDV (HGAC area registration data)
HDDV3	.134 × HDDV (HGAC area registration data)
HDDV4	.081 × HDDV (HGAC area registration data)
HDDV5	.053 × HDDV (HGAC area registration data)
HDDV6	.168 × HDDV (HGAC area registration data)
HDDV7	.102 × HDDV (HGAC area registration data)
HDDV8a	.184 × HDDV (HGAC area registration data)
HDDV8b	HDX (TxDOT classification counts)
HDDBT	.3239 × B (EPA MOBILE6 default, 2007 shown)
HDDBS	.5830 × B (EPA MOBILE6 default, 2007 shown)
MC	MC (default subtracted from LDGV, no conversion)

Table 10
HGA 2007 Weekday VMT Mix by Time Period and Roadway Functional Classification Group

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	0.6124331	0.0576128	0.1917888	0.0423706	0.0194852	0.0072073	0.0026941	0.0013054	0.0004722
2	AM_Peak	Col	0.5264376	0.0670994	0.2233691	0.0546828	0.0251472	0.0105142	0.0039302	0.0019043	0.0006888
3	AM_Peak	Fway	0.6397357	0.0541079	0.1801214	0.0380305	0.0174892	0.0066781	0.0024962	0.0012095	0.0004375
4	Mid_Day	Art	0.5757442	0.0543948	0.1810764	0.0399901	0.0183904	0.0124925	0.0046696	0.0022626	0.0008184
5	Mid_Day	Col	0.5046956	0.0640104	0.2130860	0.0521862	0.0239991	0.0165846	0.0061993	0.0030038	0.0010865
6	Mid_Day	Fway	0.6075354	0.0514720	0.1713467	0.0362499	0.0166704	0.0108722	0.0040640	0.0019691	0.0007122
7	Ovr_Nite	Art	0.6117866	0.0580412	0.1932151	0.0426431	0.0196105	0.0051843	0.0019379	0.0009390	0.0003396
8	Ovr_Nite	Col	0.5454964	0.0698500	0.2325256	0.0569033	0.0261684	0.0071514	0.0026731	0.0012952	0.0004685
9	Ovr_Nite	Fway	0.6273975	0.0529925	0.1764081	0.0372530	0.0171317	0.0050887	0.0019021	0.0009216	0.0003334
10	PM_Peak	Art	0.6131139	0.0581321	0.1935177	0.0427911	0.0196785	0.0073561	0.0027497	0.0013323	0.0004819
11	PM_Peak	Col	0.5345395	0.0682973	0.2273570	0.0556482	0.0255912	0.0101361	0.0037888	0.0018358	0.0006640
12	PM_Peak	Fway	0.6404781	0.0543822	0.1810347	0.0383689	0.0176449	0.0063659	0.0023795	0.0011530	0.0004170
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	0.0012637	0.0004444	0.0004444	0.0000555	0.0005459	0.0000439	0.0079770	0.0038450	0.0023242	0.0015208	
2	0.0018435	0.0006483	0.0006483	0.0000810	0.0004694	0.0000512	0.0118599	0.0057167	0.0034556	0.0022611	
3	0.0011709	0.0004118	0.0004118	0.0000515	0.0005702	0.0000413	0.0067461	0.0032517	0.0019656	0.0012861	
4	0.0021904	0.0007702	0.0007702	0.0000963	0.0005132	0.0000415	0.0137108	0.0066088	0.0039949	0.0026139	
5	0.0029079	0.0010226	0.0010226	0.0001278	0.0004500	0.0000488	0.0188863	0.0091035	0.0055028	0.0036006	
6	0.0019063	0.0006703	0.0006703	0.0000838	0.0005415	0.0000392	0.0109317	0.0052692	0.0031851	0.0020841	
7	0.0009090	0.0003197	0.0003197	0.0000400	0.0005453	0.0000443	0.0057442	0.0027688	0.0016737	0.0010951	
8	0.0012539	0.0004409	0.0004409	0.0000551	0.0004863	0.0000533	0.0081688	0.0039375	0.0023801	0.0015574	
9	0.0008922	0.0003138	0.0003138	0.0000392	0.0005592	0.0000404	0.0051637	0.0024890	0.0015045	0.0009844	
10	0.0012898	0.0004536	0.0004536	0.0000567	0.0005465	0.0000443	0.0081296	0.0039186	0.0023687	0.0015499	
11	0.0017772	0.0006250	0.0006250	0.0000781	0.0004766	0.0000521	0.0116743	0.0056272	0.0034015	0.0022257	
12	0.0011162	0.0003925	0.0003925	0.0000491	0.0005708	0.0000415	0.0064215	0.0030953	0.0018710	0.0012243	
Obs	P_HDDV_6	P_HDDV_7	P_HDDV8a	P_HDDV8b	P_MC	P_HDGB	P_HDDBT	P_HDDBS	P_LDDT34		
1	0.0048206	0.0029268	0.0052797	0.0262273	0.0010000	0.0004332	0.0015065	0.0027113	0.0012604		
2	0.0071671	0.0043515	0.0078497	0.0299725	0.0010000	0.0006876	0.0023914	0.0043039	0.0014679		
3	0.0040768	0.0024752	0.0044650	0.0265124	0.0010000	0.0003794	0.0013196	0.0023749	0.0011837		
4	0.0082857	0.0050306	0.0090748	0.0522103	0.0010000	0.0001918	0.0006670	0.0012005	0.0011900		
5	0.0114133	0.0069295	0.0125003	0.0365162	0.0010000	0.0002530	0.0008798	0.0015833	0.0014003		
6	0.0066062	0.0040109	0.0072354	0.0513383	0.0010000	0.0002244	0.0007804	0.0014045	0.0011260		
7	0.0034713	0.0021076	0.0038019	0.0395785	0.0010000	0.0001503	0.0005228	0.0009409	0.0012697		
8	0.0049365	0.0029972	0.0054067	0.0208784	0.0010000	0.0001814	0.0006307	0.0011351	0.0015281		
9	0.0031205	0.0018946	0.0034177	0.0550760	0.0010000	0.0002424	0.0008432	0.0015174	0.0011593		
10	0.0049128	0.0029828	0.0053807	0.0233649	0.0010000	0.0002908	0.0010114	0.0018202	0.0012717		
11	0.0070550	0.0042834	0.0077269	0.0172468	0.0010000	0.0006309	0.0021939	0.0039485	0.0014941		
12	0.0038806	0.0023561	0.0042502	0.0267151	0.0010000	0.0002989	0.0010396	0.0018709	0.0011897		

Table 11
HGA 2007 Friday VMT Mix by Time Period and Roadway Functional Classification Group

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	0.6620190	0.0531076	0.1767914	0.0393714	0.0181059	0.0041210	0.0015404	0.0007464	0.0002700
2	AM_Peak	Col	0.5812751	0.0631764	0.2103097	0.0518997	0.0238673	0.0061405	0.0022953	0.0011122	0.0004023
3	AM_Peak	Fway	0.6875014	0.0495868	0.1650709	0.0351330	0.0161567	0.0037962	0.0014190	0.0006876	0.0002487
4	Mid_Day	Art	0.6354038	0.0511901	0.1704082	0.0379366	0.0174461	0.0072924	0.0027259	0.0013208	0.0004777
5	Mid_Day	Col	0.5655919	0.0611661	0.2036176	0.0502683	0.0231171	0.0098301	0.0036745	0.0017804	0.0006440
6	Mid_Day	Fway	0.6645331	0.0480103	0.1598227	0.0340838	0.0156743	0.0062903	0.0023513	0.0011393	0.0004121
7	Ovr_Nite	Art	0.6608454	0.0534642	0.1779785	0.0395962	0.0182093	0.0029622	0.0011073	0.0005365	0.0001941
8	Ovr_Nite	Col	0.5947835	0.0649451	0.2161977	0.0533330	0.0245265	0.0041244	0.0015417	0.0007470	0.0002702
9	Ovr_Nite	Fway	0.6784826	0.0488694	0.1626828	0.0346308	0.0159258	0.0029109	0.0010881	0.0005272	0.0001907
10	PM_Peak	Art	0.6620958	0.0535331	0.1782080	0.0397226	0.0182674	0.0042019	0.0015707	0.0007610	0.0002753
11	PM_Peak	Col	0.5871636	0.0639719	0.2129580	0.0525431	0.0241632	0.0058891	0.0022013	0.0010666	0.0003858
12	PM_Peak	Fway	0.6877507	0.0497985	0.1657758	0.0354174	0.0162876	0.0036158	0.0013516	0.0006549	0.0002369
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	0.0007226	0.0002541	0.0002541	0.0000318	0.0005883	0.0000406	0.0053447	0.0025762	0.0015573	0.0010190	
2	0.0010767	0.0003786	0.0003786	0.0000473	0.0005166	0.0000482	0.0081164	0.0039122	0.0023649	0.0015474	
3	0.0006656	0.0002341	0.0002341	0.0000293	0.0006109	0.0000379	0.0044937	0.0021660	0.0013093	0.0008567	
4	0.0012786	0.0004496	0.0004496	0.0000562	0.0005647	0.0000391	0.0093786	0.0045206	0.0027326	0.0017880	
5	0.0017236	0.0006061	0.0006061	0.0000758	0.0005027	0.0000467	0.0131176	0.0063229	0.0038220	0.0025008	
6	0.0011029	0.0003878	0.0003878	0.0000485	0.0005905	0.0000367	0.0074114	0.0035724	0.0021594	0.0014130	
7	0.0005194	0.0001826	0.0001826	0.0000228	0.0005872	0.0000408	0.0038459	0.0018538	0.0011206	0.0007332	
8	0.0007232	0.0002543	0.0002543	0.0000318	0.0005286	0.0000496	0.0055206	0.0026610	0.0016085	0.0010525	
9	0.0005104	0.0001795	0.0001795	0.0000224	0.0006029	0.0000373	0.0034612	0.0016684	0.0010085	0.0006599	
10	0.0007368	0.0002591	0.0002591	0.0000324	0.0005883	0.0000409	0.0054415	0.0026229	0.0015855	0.0010374	
11	0.0010326	0.0003631	0.0003631	0.0000454	0.0005219	0.0000489	0.0079481	0.0038311	0.0023158	0.0015153	
12	0.0006340	0.0002229	0.0002229	0.0000279	0.0006111	0.0000380	0.0042741	0.0020602	0.0012453	0.0008148	
Obs	P_HDDV_6	P_HDDV_7	P_HDDV8a	P_HDDV8b	P_MC	P_HDGB	P_HDDBT	P_HDDBS	P_LDDT34		
1	0.0032299	0.0019610	0.0035375	0.0175727	0.0010000	0.0002477	0.0010094	0.0018166	0.0011637		
2	0.0049049	0.0029780	0.0053720	0.0205119	0.0010000	0.0004016	0.0016366	0.0029454	0.0013843		
3	0.0027156	0.0016488	0.0029742	0.0176604	0.0010000	0.0002157	0.0008790	0.0015820	0.0010865		
4	0.0056677	0.0034411	0.0062074	0.0357135	0.0010000	0.0001120	0.0004563	0.0008212	0.0011216		
5	0.0079272	0.0048129	0.0086822	0.0253626	0.0010000	0.0001499	0.0006110	0.0010997	0.0013402		
6	0.0044788	0.0027193	0.0049054	0.0348058	0.0010000	0.0001298	0.0005291	0.0009522	0.0010520		
7	0.0023242	0.0014111	0.0025455	0.0264992	0.0010000	0.0000859	0.0003500	0.0006299	0.0011715		
8	0.0033362	0.0020255	0.0036539	0.0141099	0.0010000	0.0001046	0.0004263	0.0007671	0.0014230		
9	0.0020917	0.0012699	0.0022909	0.0369176	0.0010000	0.0001387	0.0005652	0.0010171	0.0010708		
10	0.0032884	0.0019965	0.0036016	0.0156393	0.0010000	0.0001661	0.0006770	0.0012183	0.0011730		
11	0.0048032	0.0029162	0.0052606	0.0117420	0.0010000	0.0003665	0.0014937	0.0026882	0.0014017		
12	0.0025829	0.0015682	0.0028289	0.0177813	0.0010000	0.0001698	0.0006919	0.0012453	0.0010911		

Table 12
HGA 2007 Saturday VMT Mix by Time Period and Roadway Functional Classification Group

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	0.6872088	0.0523499	0.1742693	0.0364439	0.0167596	0.0026009	0.0009722	0.0004711	0.0001704
2	AM_Peak	Col	0.6107125	0.0630288	0.2098186	0.0486221	0.0223600	0.0039224	0.0014662	0.0007104	0.0002570
3	AM_Peak	Fway	0.7114351	0.0487272	0.1622095	0.0324194	0.0149088	0.0023885	0.0008928	0.0004326	0.0001565
4	Mid_Day	Art	0.6692445	0.0511979	0.1704341	0.0356294	0.0163851	0.0046698	0.0017455	0.0008458	0.0003059
5	Mid_Day	Col	0.6004400	0.0616592	0.2052592	0.0475845	0.0218829	0.0063447	0.0023716	0.0011491	0.0004156
6	Mid_Day	Fway	0.6961741	0.0477607	0.1589921	0.0318397	0.0146423	0.0040066	0.0014976	0.0007257	0.0002625
7	Ovr_Nite	Art	0.6858747	0.0526926	0.1754098	0.0366458	0.0168525	0.0018692	0.0006987	0.0003385	0.0001225
8	Ovr_Nite	Col	0.6193489	0.0642184	0.2137785	0.0495214	0.0227736	0.0026112	0.0009760	0.0004729	0.0001711
9	Ovr_Nite	Fway	0.7056223	0.0482627	0.1606630	0.0321159	0.0147693	0.0018406	0.0006880	0.0003334	0.0001206
10	PM_Peak	Art	0.6867115	0.0527252	0.1755184	0.0367382	0.0168949	0.0026498	0.0009905	0.0004799	0.0001736
11	PM_Peak	Col	0.6144677	0.0635714	0.2116248	0.0490311	0.0225482	0.0037470	0.0014006	0.0006786	0.0002455
12	PM_Peak	Fway	0.7113020	0.0489085	0.1628128	0.0326639	0.0150213	0.0022737	0.0008499	0.0004118	0.0001490
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	0.0004560	0.0001604	0.0001604	0.0000200	0.0006113	0.0000399	0.0033729	0.0016258	0.0009827	0.0006430	
2	0.0006877	0.0002418	0.0002418	0.0000302	0.0005434	0.0000480	0.0051841	0.0024988	0.0015105	0.0009883	
3	0.0004188	0.0001473	0.0001473	0.0000184	0.0006328	0.0000371	0.0028270	0.0013627	0.0008237	0.0005390	
4	0.0008188	0.0002879	0.0002879	0.0000360	0.0005954	0.0000390	0.0060052	0.0028946	0.0017497	0.0011449	
5	0.0011125	0.0003912	0.0003912	0.0000489	0.0005342	0.0000470	0.0084657	0.0040806	0.0024666	0.0016140	
6	0.0007025	0.0002470	0.0002470	0.0000309	0.0006193	0.0000364	0.0047201	0.0022752	0.0013753	0.0008999	
7	0.0003277	0.0001153	0.0001153	0.0000144	0.0006101	0.0000401	0.0024267	0.0011697	0.0007070	0.0004626	
8	0.0004578	0.0001610	0.0001610	0.0000201	0.0005510	0.0000489	0.0034948	0.0016845	0.0010183	0.0006663	
9	0.0003227	0.0001135	0.0001135	0.0000142	0.0006277	0.0000368	0.0021884	0.0010548	0.0006376	0.0004172	
10	0.0004646	0.0001634	0.0001634	0.0000204	0.0006109	0.0000401	0.0034311	0.0016539	0.0009997	0.0006541	
11	0.0006570	0.0002310	0.0002310	0.0000289	0.0005467	0.0000484	0.0050566	0.0024373	0.0014733	0.0009640	
12	0.0003987	0.0001402	0.0001402	0.0000175	0.0006327	0.0000372	0.0026874	0.0012954	0.0007830	0.0005123	
Obs	P_HDDV_6	P_HDDV_7	P_HDDV8a	P_HDDV8b	P_MC	P_HDGB	P_HDDBT	P_HDDBS	P_LDDT34		
1	0.0020383	0.0012375	0.0022324	0.0110896	0.0010000	0.0001563	0.0006370	0.0011464	0.0011438		
2	0.0031328	0.0019021	0.0034312	0.0131012	0.0010000	0.0002565	0.0010453	0.0018813	0.0013771		
3	0.0017084	0.0010373	0.0018711	0.0111103	0.0010000	0.0001357	0.0005530	0.0009952	0.0010646		
4	0.0036290	0.0022033	0.0039746	0.0228674	0.0010000	0.0000717	0.0002922	0.0005258	0.0011186		
5	0.0051159	0.0031061	0.0056032	0.0163682	0.0010000	0.0000968	0.0003944	0.0007097	0.0013472		
6	0.0028525	0.0017319	0.0031241	0.0221671	0.0010000	0.0000827	0.0003370	0.0006064	0.0010435		
7	0.0014665	0.0008904	0.0016061	0.0167201	0.0010000	0.0000542	0.0002209	0.0003975	0.0011513		
8	0.0021119	0.0012822	0.0023131	0.0089322	0.0010000	0.0000662	0.0002698	0.0004856	0.0014031		
9	0.0013225	0.0008029	0.0014484	0.0233414	0.0010000	0.0000877	0.0003573	0.0006431	0.0010545		
10	0.0020735	0.0012589	0.0022710	0.0098613	0.0010000	0.0001048	0.0004269	0.0007682	0.0011520		
11	0.0030558	0.0018553	0.0033468	0.0074702	0.0010000	0.0002332	0.0009503	0.0017102	0.0013890		
12	0.0016240	0.0009860	0.0017787	0.0111802	0.0010000	0.0001068	0.0004351	0.0007830	0.0010686		

Table 13
HGA 2007 Sunday VMT Mix by Time Period and Roadway Functional Classification Group

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	0.6466237	0.0622285	0.2071542	0.0415747	0.0191191	0.0017516	0.0006547	0.0003172	0.0001147
2	AM_Peak	Col	0.5679451	0.0740513	0.2465116	0.0548224	0.0252114	0.0026108	0.0009759	0.0004729	0.0001710
3	AM_Peak	Fway	0.6723705	0.0581769	0.1936670	0.0371463	0.0170826	0.0016156	0.0006039	0.0002926	0.0001058
4	Mid_Day	Art	0.6347725	0.0613466	0.2042186	0.0409712	0.0188416	0.0031700	0.0011849	0.0005742	0.0002077
5	Mid_Day	Col	0.5620242	0.0729127	0.2427212	0.0540010	0.0248337	0.0042505	0.0015888	0.0007698	0.0002785
6	Mid_Day	Fway	0.6623764	0.0574064	0.1911018	0.0367274	0.0168900	0.0027283	0.0010198	0.0004941	0.0001787
7	Ovr_Nite	Art	0.6450138	0.0626014	0.2083956	0.0417821	0.0192145	0.0012581	0.0004703	0.0002279	0.0000824
8	Ovr_Nite	Col	0.5728057	0.0750341	0.2497832	0.0555295	0.0255366	0.0017285	0.0006461	0.0003131	0.0001132
9	Ovr_Nite	Fway	0.6687634	0.0577851	0.1923625	0.0369026	0.0169705	0.0012485	0.0004667	0.0002261	0.0000818
10	PM_Peak	Art	0.6455681	0.0626176	0.2084496	0.0418723	0.0192560	0.0017828	0.0006664	0.0003229	0.0001168
11	PM_Peak	Col	0.5700262	0.0745046	0.2480206	0.0551473	0.0253608	0.0024879	0.0009300	0.0004506	0.0001630
12	PM_Peak	Fway	0.6718815	0.0583618	0.1942824	0.0374063	0.0172022	0.0015371	0.0005746	0.0002784	0.0001007
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	0.0003071	0.0001080	0.0001080	0.0000135	0.0005764	0.0000472	0.0022716	0.0010950	0.0006619	0.0004331	
2	0.0004578	0.0001610	0.0001610	0.0000201	0.0005063	0.0000562	0.0034508	0.0016634	0.0010055	0.0006579	
3	0.0002833	0.0000996	0.0000996	0.0000125	0.0005993	0.0000441	0.0019124	0.0009218	0.0005572	0.0003646	
4	0.0005558	0.0001955	0.0001955	0.0000244	0.0005658	0.0000466	0.0040769	0.0019651	0.0011879	0.0007772	
5	0.0007453	0.0002621	0.0002621	0.0000328	0.0005011	0.0000553	0.0056719	0.0027339	0.0016526	0.0010813	
6	0.0004784	0.0001682	0.0001682	0.0000210	0.0005904	0.0000436	0.0032144	0.0015494	0.0009366	0.0006128	
7	0.0002206	0.0000776	0.0000776	0.0000097	0.0005749	0.0000475	0.0016334	0.0007873	0.0004759	0.0003114	
8	0.0003031	0.0001066	0.0001066	0.0000133	0.0005107	0.0000569	0.0023135	0.0011152	0.0006741	0.0004411	
9	0.0002189	0.0000770	0.0000770	0.0000096	0.0005961	0.0000438	0.0014845	0.0007156	0.0004325	0.0002830	
10	0.0003126	0.0001099	0.0001099	0.0000137	0.0005754	0.0000475	0.0023087	0.0011128	0.0006727	0.0004402	
11	0.0004362	0.0001534	0.0001534	0.0000192	0.0005082	0.0000565	0.0033577	0.0016184	0.0009783	0.0006401	
12	0.0002695	0.0000948	0.0000948	0.0000118	0.0005988	0.0000443	0.0018169	0.0008758	0.0005294	0.0003464	
Obs	P_HDDV_6	P_HDDV_7	P_HDDV8a	P_HDDV8b	P_MC	P_HDGB	P_HDDBT	P_HDDBS	P_LDDT34		
1	0.0013728	0.0008335	0.0015035	0.0074688	0.0010000	0.0001053	0.0004290	0.0007721	0.0013549		
2	0.0020854	0.0012661	0.0022840	0.0087210	0.0010000	0.0001707	0.0006958	0.0012523	0.0016123		
3	0.0011557	0.0007017	0.0012657	0.0075157	0.0010000	0.0000918	0.0003741	0.0006732	0.0012667		
4	0.0024637	0.0014958	0.0026983	0.0155245	0.0010000	0.0000487	0.0001983	0.0003570	0.0013357		
5	0.0034276	0.0020811	0.0037541	0.0109664	0.0010000	0.0000648	0.0002642	0.0004755	0.0015875		
6	0.0019425	0.0011794	0.0021275	0.0150959	0.0010000	0.0000563	0.0002295	0.0004130	0.0012499		
7	0.0009871	0.0005993	0.0010811	0.0112547	0.0010000	0.0000365	0.0001487	0.0002675	0.0013630		
8	0.0013981	0.0008489	0.0015313	0.0059131	0.0010000	0.0000438	0.0001786	0.0003215	0.0016337		
9	0.0008971	0.0005447	0.0009826	0.0158341	0.0010000	0.0000595	0.0002424	0.0004363	0.0012582		
10	0.0013952	0.0008471	0.0015281	0.0066355	0.0010000	0.0000705	0.0002872	0.0005169	0.0013634		
11	0.0020291	0.0012320	0.0022223	0.0049604	0.0010000	0.0001548	0.0006310	0.0011356	0.0016222		
12	0.0010980	0.0006666	0.0012026	0.0075588	0.0010000	0.0000722	0.0002941	0.0005294	0.0012707		

ESTIMATION OF EMISSIONS FACTORS

The MOBILE6 model (October 2002) was applied for each county to calculate the episode-day emissions factors (in grams per mile [g/mi]) of VOC, CO, and NO_x. Emissions factors were estimated by pollutant, speed, emissions type (i.e., composite emissions factor and sub-components), hour, MOBILE6 road type (or drive cycle), and average vehicle class. Emissions factor post-processing was required to properly model the vehicle Anti-Tampering Program (ATP) and Inspection and Maintenance (I/M) Program, as well as to model the impacts of the Texas Low-Emissions Diesel Fuel Program (LED). The county-level, episode-day-specific emissions factors were organized in “look-up” tables which were input to the emissions calculations.

The MOBILE6 model is equipped with national (or EPA) default modeling values for a wide range of conditions that affect emissions factors. The only actual data parameters requiring user-input values to run the model are fuel Reid Vapor Pressure (RVP), temperature, and calendar year. Many MOBILE6 default modeling parameters may be overridden through the use of MOBILE6 commands and their associated inputs and options. For this analysis, particular MOBILE6 defaults were replaced by local input values that were developed to yield emissions factors characteristic of the episode-day climatic conditions, and evaluation-specific vehicle fleets, activity, and emissions control programs.

The following emissions factors documentation discusses the MOBILE6 input/output files, summarizes the control programs modeled, details the aggregation-level of the applied MOBILE6 emissions factors, and briefly describes all of the MOBILE6 commands that may affect emissions factor calculations. It also identifies the commands that are applied, explains the development of the locality-specific inputs, and describes the emissions factor post-processing procedures.

MOBILE6 Input and Output Files

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

The POLFAC62 program (see program descriptions in Appendix B) was applied to run MOBILE6 with the user-input command and external data files to produce VOC, CO, and NO_x emissions factor output tables. (RATEADJ62 and RATEADJV62 were applied to POLFAC62 output where post-processing of emissions factors was required, discussed later.) The final product of the emissions factor modeling was 160 emissions factor files (i.e., one table of hourly emissions factors for each county for each day). A corresponding set of average 24-hour emissions factors was also produced for quality assurance use.

All of the MOBILE6 input files and output files (MOBILE6 emissions factor tables developed with POLFAC62 and post-processed with the RATEADJ programs) were previously provided on CD-ROM. Appendix A lists the CD-ROM volume names and MOBILE6 input and output file names.

Control Programs Modeled

All federal motor vehicle control programs were modeled (this is the MOBILE6 default). Also modeled were the federal programs to offset heavy-duty diesel (HDDV) defeat device effects — the low emissions rebuild program and the HDDV 2004 standard pull-ahead program (this is the MOBILE6 default). The Reformulated Gasoline (RFG) program, the ATP and I/M programs, and the Texas LED Fuel Program were also modeled.

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 by vehicle class. POLFAC62 performs this function for each vehicle type by weighting (multiplying) each of its age-specific emissions factors by their corresponding travel fractions (developed from the MOBILE6 database output age-specific REG_DIST and MILES parameter values) and summing the resulting products. Each emissions factor table provides the MOBILE6 emissions factors by:

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

Tables 14 through 16 describe the MOBILE6 vehicle type, emissions type (pertaining to VOC, CO, and NO_x pollutants), and roadway type classifications. Tables 17 and 18 show the speeds and the sequence for hourly time periods, respectively.

Table 14 shows the 28 MOBILE6 vehicle types as defined by fuel-type (gasoline or diesel) and GVWR category, in sequence by EPA vehicle type number.

Table 14
Complete 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*)
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)

* The ALVW is the numerical average of the vehicle curb weight and the GVWR.

Source: MOBILE6 User's Guide (EPA, January 2002).

Table 15 shows the eight MOBILE6 emissions type classifications (excludes the non-pertinent pollutants, e.g., particulates and toxics). Expanding these emissions types by individual pollutant yields 12 pollutant-specific emissions types. In addition to these 12 pollutant-specific emissions types shown in Table 15, POLFAC62 emissions factor tables contain the three composite emissions factors (i.e., one for each pollutant). Thus, POLFAC62 calculates MOBILE6 emissions factors for up to 15 pollutant-specific emissions types. For this analysis, MOBILE6 emissions factors were calculated for 14 pollutant-specific emissions types — the refueling emissions type is excluded since refueling emissions are classified as an area source emissions category.

Table 15
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	All light-duty vehicles plus MC
3	Hot Soak	Evaporative Hot Soak Emissions (trip end)	HC	Gas, including MC
4	Diurnal	Evaporative Diurnal Emissions (heat rise)	HC	Gas, including MC
5	Resting	Evaporative Resting Loss Emissions (leaks and seepage)	HC	Gas, including MC
6	Run Loss	Evaporative Running Loss Emissions	HC	Gas, less MC
7	Crankcase	Evaporative Crankcase Emissions (blow-by)	HC	Gas, including MC
8	Refueling	Evaporative Refueling Emissions (fuel displacement and spillage)	HC	Gas, less MC

Source: MOBILE6 User's Guide (EPA, January 2002).

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 16 shows the driving cycle (or roadway type) descriptions. The fifth roadway type, according to MOBILE6 is "None." None, or roadway type number 5, is the index for the emissions types that do not apply to the driving cycles, and thus are not sensitive to, or do not vary by, roadway type or speed.

POLFAC62, however, categorizes all of the pollutant-specific emissions types by MOBILE6 roadway types one through four — Freeway, Arterial, Local, and Ramp. That is, in POLFAC62 tables, the MOBILE6 g/mi emissions factors corresponding to the "None" roadway type are

tabulated as emissions factors under each of the four actual roadway types. This allocation of the MOBILE6 “None” road type emissions factors to the Freeway, Arterial, Local, and Ramp MOBILE6 road types is performed in POLFAC62 so that all emissions, regardless of “type,” may be spatially allocated to the functional class (or roadway type)-coded network links.

Table 16
MOBILE6 Roadway Classifications

Number	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)

Source: MOBILE6 User’s Guide (EPA, January 2002).

Table 17 shows the 14 speeds for which the MOBILE6 freeway and arterial emissions factors were calculated and tabulated. Later in the emissions estimation process, emissions factors for average operational speeds that are not represented in the 14 speeds as tabulated, were calculated by interpolation (except for those speeds higher than the MOBILE6 maximum speed, and those lower than the MOBILE6 minimum speed, in which case the emissions factors corresponding to these bounding speeds were used, respectively). The MOBILE6 Local and Ramp road type emissions factors are not speed sensitive and were each characterized by one average speed.

Table 17
Speeds for POLFAC62 Tabulated MOBILE6 Freeway and Arterial Emissions Factors*

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

* 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, etc.) 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 18 shows the MOBILE6 sequence for hourly inputs.

Table 18
General Sequence for Calendar Day Hourly* Inputs to MOBILE6

Input Sequence Number	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.

* For some MOBILE6 hourly input parameters, overnight hours are grouped. Each hourly inputs data set is representative of the same day or day type, with the hourly data reordered for input to MOBILE6 to start at 6 a.m.

Application of MOBILE6 Commands and Associated Input Parameters

Tables 19 through 25 list and describe all of the MOBILE6 commands that may affect emissions factor calculations (and some commands that affect only the output format or content).

Respectively, these seven 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.

Parameters associated with each MOBILE6 command were in general labeled as either EPA default, locality- (or county- or region-) specific, or NOT APPLIED. The tabulated commands where associated input parameters are labeled only as “EPA default” are generally not required as input by the analyst. References to MOBILE6 technical reports (available on the EPA MOBILE website [<http://www.epa.gov/otaq/models/mobile6/m6tech.htm>]) pertaining to particular commands/input parameters are provided in the tables.

The procedures used to develop the locality-specific inputs to MOBILE6 are detailed following the seven MOBILE6 input category tables.

Table 19
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 MOBILE.	NOT APPLIED.
EXPRESS HC AS VOC	One of five possible commands allowing the user to specify the particular HC species (non-methane HC, non-methane organic gases, total HC, total organic gases, VOC) to report in the exhaust emissions output.	APPLIED "VOC" command. 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 are assumed.)

Table 20
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-specific by episode day (based on local time, i.e., Central Daylight Time), provided by TCEQ (May, 2003). See Appendix D.
ALTITUDE	Specifies high- or low-altitude for modeling area.	NOT APPLIED. (EPA default, low altitude, is 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.)
<u>Environmental Effects on Air Conditioning:</u>	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, 7 a.m. and 8 p.m., TCEQ.
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-specific by episode day (based on local time, i.e., Central Daylight Time), provided by TCEQ (May, 2003). See Appendix D.
BAROMETRIC PRES	Specifies use of user input daily average barometric pressure for use with hourly relative humidity to calculate hourly absolute humidity values.	County-specific by episode day (based on local time, i.e., Central Daylight Time), provided by TCEQ (May, 2003). See Appendix D.

Table 21
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.	<p>Locality-Specific/EPA default. TTI developed age distributions (for use with all future evaluation years) input using the latest available TxDOT registrations data and MOBILE6 defaults.</p> <p>Mid-year 2003 TxDOT county-level registrations data are applied for LDV, LDT and MC, and eight-county regional data are applied for HDV; MOBILE6 default is used for buses. Input values are shown in Appendix E.</p>
DIESEL FRACTIONS	Permits user to supply locality-specific diesel fractions for 14 of the 16 composite vehicle categories by age.	<p>Locality-Specific/EPA default. TTI developed the evaluation year-specific diesel fractions inputs with the latest available TxDOT registrations data and MOBILE6 defaults.</p> <p>Mid-year 2003 TxDOT HGA eight-county regional gasoline/diesel registrations data is used for HDV; LDV, LDT, Bus fractions are MOBILE6 defaults. The latest diesel fractions (2003 for TxDOT-based fractions and 1996 for MOBILE6 defaults) are assumed for each newer model year up to the future year of evaluation. Input values are shown in Appendix E.</p>
MILE ACCUM RATE	Allows the user to supply the annual mileage accumulation rates by vehicle type and age.	NOT APPLIED. (EPA defaults are 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, is 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, is assumed.)

Table 22
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 are not applied in 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 in conversion of grams per hour (g/hr) to g/mi, as well as in weighting of hourly g/mi rates to obtain daily emissions factors.	County-specific by day-type. The hourly VMT fractions were produced from the 2007 hourly link VMT estimates, by county. See Appendix F.
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. Same for all counties. Inputs are 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 (EPA weekday or weekend defaults assumed — see technical report M6FLT.003.)
START DIST	Allows user to allocate engine starts by hour of the day for weekend days and weekdays.	NOT APPLIED (EPA weekday or weekend default assumed — see technical report M6FLT.003.)
SOAK DISTRIBUTION	Allows use of alternate vehicle soak duration distributions for weekend days and weekdays.	NOT APPLIED (EPA weekday or weekend defaults assumed — see technical report 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 (EPA weekday or weekend defaults assumed — see technical report M6FLT.003 and 004.)
DIURN SOAK ACTIVITY	Allows user set diurnal soak time distributions for each of 18 daily time periods.	NOT APPLIED. (EPA 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.	Locality-Specific. Latest 2007 TDM-based regional distributions from HGAC (see Table 28).
WE EN TRI LEN DI	Specifies hourly alternate fractions of VMT for trips of various lengths for weekend days.	Locality-Specific. Used latest distributions (same set as used above for “WE DA TRI LEN DI”) from HGAC.
WE VEH US	Directs MOBILE6 to use weekend activity data for calculating emissions factors.	Applied command for weekend day analyses.

**Table 23
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 ATP.	Locality-Specific. Program design, by county. Applied for all counties (exhaust I/M program start year is assumed for ATP start year for new I/M counties). The inputs are the same as those used in the MCR 2007 EI analysis (TTI, August 2003). See Table 29.
<u>I/M Commands:</u> 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.	Locality-Specific. Program design, by county. Exhaust and Evaporative modeled for all counties. The inputs are the same as those used in the MCR 2007 EI analysis (TTI, August 2003). See Table 30.

**Table 24
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) RFG: 3) Conventional Gasoline West Tier 2 sulfur geographical phase-in area schedule: or 4) Sulfur content for gasoline after 1999.	Option 2: Applied for all counties.
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 RVP for area being modeled (required to run model).	MOBILE6 default RFG is applied via FUEL PROGRAM command. The default RFG RVP is 6.8 psi. This setup overrides the FUEL RVP command/input. The RVP input value is 6.8 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 25
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.
<u>HDDV NOx Off-Cycle Emissions Effects:</u> 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 change Rebuild program effectiveness rate.	NOT APPLIED. (MOBILE6 default, 0.90, is assumed for REBUILD EFFECTS.)
<u>Tier 2 Emission Standards and Fuel Requirements:</u> 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, NLEV (or California 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 applied by calendar day based on local (central daylight) time. TCEQ developed these input values (provided May 2003, initially for Mid-Course Review EI analysis) based on data from the 2000 episode day series.

Temperatures (HOURLY TEMPERATURES Command)

TCEQ developed ambient hourly temperatures (degrees Fahrenheit) for input to MOBILE6 by county for each of the analysis days, August 18, 2000 through September 6, 2000. The temperatures were hourly averages from monitoring stations within the HGA 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 used the hourly average temperatures from the monitoring stations within

its border. Counties without monitoring stations (Fort Bend, Liberty, Waller), used average hourly temperatures from monitoring stations from adjacent counties.

The MOBILE6 User's Guide states that the 24 hourly temperature inputs are to be entered from 6 a.m. continuing through 5 a.m. of the "next day." The emissions estimation method applied by TTI, however, applied the hourly input data by "calendar day." This calendar day method simplified the emissions estimation process, especially when modeling consecutive calendar days exhibiting different hourly travel activity. Thus, the hourly average temperatures for each calendar day provided by TCEQ are 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 (local time).

Modeling eight counties for 20 days resulted in 160 hourly temperature datasets. The temperatures were input in the MOBILE6 command file. Appendix D shows a summary of the temperatures used.

Humidity (RELATIVE HUMIDITY Command)

The RELATIVE HUMIDITY command was used to specify hourly percent relative humidity values for each of the eight counties.

TCEQ developed hourly relative humidity input values essentially following the hourly temperature input development procedure and used data available from the stations described in the hourly temperature discussion above. Many of these stations did not record humidity; humidity data from adjacent counties were used for the counties with no humidity data available. The humidity parameter was input in the MOBILE6 command file. Appendix D 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. This feature affects only the air-conditioning correction. 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. central daylight time.

Barometric Pressure (BAROMETRIC PRES Command)

The BAROMETRIC PRES command was 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 is the case for temperature and humidity inputs for counties without available data, values from adjacent counties were applied. The barometric pressure was input in the MOBILE6 command file. Appendix D shows the barometric pressure input values.

Vehicle Fleet Characteristics

Vehicle registration (age) distributions and diesel fractions inputs to MOBILE6 were developed from TxDOT mid-year 2003 county vehicle registration data for those vehicle types where TxDOT registrations data were available. EPA defaults were used where necessary. Due to sparse registration data for some of the HDV vehicle classes resulting from the increased disaggregation level of the vehicle classifications in MOBILE6, the registrations data were aggregated for the eight-county region for HDV vehicle classes. The TxDOT 2003 registrations-based age distributions were used for all future year evaluations.

Vehicle Registration Distributions (REG DIST Command)

Table 26 shows the 16 composite (combined gasoline and diesel) vehicle types for which user-supplied vehicle age distributions may be input to MOBILE6. EPA default distributions were internally applied by MOBILE6 for vehicle classes for which the user did not provide alternate values. The input values for each vehicle class were 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 26 lists the sources of the age distributions used for each composite vehicle class.

Table 26
Composite Vehicle Classes and Data Sources for Vehicle Age Distributions
(REG DIST Command)

Number*	Abbreviation	Description	Source of Distributions
1	LDV	Light-Duty Vehicles	TxDOT July 2003 HGA County Registrations
2	LDT1	Light-Duty Trucks 1	TxDOT July 2003 HGA County Registrations
3	LDT2	Light-Duty Trucks 2	TxDOT July 2003 HGA County Registrations
4	LDT3	Light-Duty Trucks 3	TxDOT July 2003 HGA County Registrations
5	LDT4	Light-Duty Trucks 4	TxDOT July 2003 HGA County Registrations
6	HDV2B	Class 2b Heavy-Duty Vehicles	TxDOT July 2003 HGA Region Registrations
7	HDV3	Class 3 Heavy-Duty Vehicles	TxDOT July 2003 HGA Region Registrations
8	HDV4	Class 4 Heavy-Duty Vehicles	TxDOT July 2003 HGA Region Registrations
9	HDV5	Class 5 Heavy-Duty Vehicles	TxDOT July 2003 HGA Region Registrations
10	HDV6	Class 6 Heavy-Duty Vehicles	TxDOT July 2003 HGA Region Registrations
11	HDV7	Class 7 Heavy-Duty Vehicles	TxDOT July 2003 HGA Region Registrations
12	HDV8A	Class 8a Heavy-Duty Vehicles	TxDOT July 2003 HGA Region Registrations
13	HDV8B	Class 8b Heavy-Duty Vehicles	TxDOT July 2003 HGA Region Registrations
14	HDBS	School Buses	MOBILE6 Default
15	HDBT	Transit and Urban Buses	MOBILE6 Default
16	MC	Motorcycles	TxDOT July 2003 HGA County Registrations

* MOBILE6 input sequence.

TTI developed MOBILE6 age distributions fractions input from TxDOT data for all vehicle types except for the two bus categories. EPA defaults were used for the two bus categories. To develop these distributions, TTI used two county-level data sets provided by TxDOT. The TxDOT registrations data provided are summarized as:

- July 2003 registrations for:
gasoline and diesel: LDV, LDT12, LDT34, MC, HDGT, HDDT.
- July 2003 registrations for:
gasoline: HDV2B, HDV3, HDV4, HDV5, HDV6, HDV7, HDV8A, HDV8B;
diesel: HDV2B, HDV3, HDV4, HDV5, HDV6, HDV7, HDV8A, HDV8B.

The LDT12 and LDT34 classes of the combined gasoline and diesel registrations data set correspond to the MOBILE6 classes LDT1 and LDT2, and LDT3 and LDT4, respectively. The aggregate HDGTs and HDDTs were not used.

The TxDOT registrations data for each of the HDV weight classes (numbers 6 through 13 in Table 26) were first summed to the HGA eight-county-region level and also across fuel types within each model year (model years corresponding to 25 years old and older were summed together to form the “25 years old and older” age group). There were then three steps to developing the TxDOT registrations-based MOBILE6 age distributions input for the 14 non-bus vehicle classes. The first step in the process developed the July 2003 registrations by the 25 age groups (as required by MOBILE6) for 12 of the 16 composite (by fuel) vehicle classes (the eight HDV classes at the regional level, and the LDV, LDT12, LDT34, MC classes at the county level). The second step converted the registrations for each of the 25 model years from numbers of vehicles registered, to fractions registered by age for each of these 12 classes. The registrations were then expanded from 12 to 14 vehicle classes.

The eight original HDV class registrations (fuel type composites) were combined with the four light-duty vehicle class county-level registrations to yield one data set for the 12 vehicle classes of composite-by-fuel vehicle class registrations by age (i.e., the eight HDV classes and LDV, LDT12, LDT34, and MC).

The conversion of the registrations from numbers of vehicles to fractions of vehicles by age was made for each vehicle class by dividing its registrations for each age by its total registrations. In some cases the age distributions fractions do not sum to one due to insignificant rounding error. In such cases, MOBILE6 normalizes the input age distribution fractions.

The resulting July 2003 estimated age distribution fractions for the 12 composite classes were then expanded to 14 classes. This was accomplished by using the LDT12 age fractions for both the MOBILE6 LDT1 and LDT2 classes, and the by using the LDT34 age fractions for both the MOBILE6 LDT3 and LDT4 classes. The MOBILE6 vehicle registration distributions were input from external data files. The external data files were provided to TCEQ on CD-ROM. Appendix A lists the data files submitted. Appendix E provides the registration distributions input values.

Diesel Fractions (DIESEL FRACTIONS Command)

The DIESEL FRACTIONS command allows the user to specify diesel fractions for 14 of the 16 composite (gasoline and diesel) vehicle categories by vehicle age. MOBILE6 assumes that urban/transit buses are 100 percent diesel, and that motorcycles are all gasoline fueled, so these two categories do not require diesel fractions. The diesel fraction represents the portion of diesels in a composite (gasoline and diesel) vehicle class for any vehicle age. When the user enters diesel fractions, all 14 sets of fractions are required. Each set of fractions contains the diesel fractions for 25 vehicle ages from the evaluation year back through the 25th fraction, which represents vehicle ages of 25 years and older.

The MOBILE6 default fractions vary by age for model years 1972 through 1996. MOBILE6 thus assumes that the diesel fractions for 1971 and earlier model years are the same as the 1972 model year fractions, and that the diesel fractions for the 1997 and later model years (through the calendar year of evaluation) are the same as its latest model year (1996) fraction.

TTI developed the 2007 diesel fractions input data set using a combination of estimated TxDOT HGA regional fractions (based on the 2003 mid-year HDV registrations data sets) and EPA default diesel fractions. Table 27 shows the MOBILE6 diesel fractions input sequence and categories with corresponding data sources.

The HGA regional diesel fractions estimates through the latest available model year registrations (2003 model year) were calculated using individual diesel and gasoline vehicle HGA eight-county-region 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 vehicle class 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 vehicle class and model year.

To produce the diesel fractions input data sets specific to the 2007 evaluation year, the latest available fractions (2003 for HGA data and 1996 for MOBILE6 default data) were assumed for each later year through the year of evaluation. Earlier model year diesel fractions that exceed the 25 model year input data set requirement were removed from the 2007 evaluation year input data set. The estimated evaluation year-specific HDV diesel fractions were combined with the corresponding evaluation year-specific EPA default diesel fractions for the remaining vehicle classes (LDV, LDT1, LDT2, LDT3, LDT4, and HDBS) to produce the complete input data set for 2007. Diesel fractions are entered in the MOBILE6 command file. Appendix E shows the diesel fractions inputs.

Table 27
Source of Diesel Fractions for Composite Vehicle Types
(DIESEL FRACTIONS Command)

Number*	Abbreviation	Description	Source of Fractions
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 July, 2003 HGA Region Registrations
7	HDV3	Class 3 Heavy-Duty Vehicles	TxDOT July, 2003 HGA Region Registrations
8	HDV4	Class 4 Heavy-Duty Vehicles	TxDOT July, 2003 HGA Region Registrations
9	HDV5	Class 5 Heavy-Duty Vehicles	TxDOT July, 2003 HGA Region Registrations
10	HDV6	Class 6 Heavy-Duty Vehicles	TxDOT July, 2003 HGA Region Registrations
11	HDV7	Class 7 Heavy-Duty Vehicles	TxDOT July, 2003 HGA Region Registrations
12	HDV8A	Class 8a Heavy-Duty Vehicles	TxDOT July, 2003 HGA Region Registrations
13	HDV8B	Class 8b Heavy-Duty Vehicles	TxDOT July, 2003 HGA Region Registrations
14	HDBS	School Buses	EPA MOBILE6 Evaluation Year Default

* MOBILE6 input sequence.

Activity

The locality-specific activity inputs applied to develop the MOBILE6 hourly emissions factors were the fleet total hourly VMT fractions (by county and day type), and average hourly weekday trip length distributions (one set for the area used for all analysis days).

Additional non-default, but generic activity inputs used in the modeling were hourly fractions of VMT by the 14 speeds for arterials and freeways (SPEED VMT command). Also, weekend day hourly vehicle usage rates (MOBILE6 defaults) for particular activity input parameters (through the WE VEH US command) were applied 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) were an input to MOBILE6, however, the method for this study calls for the application of 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 by using the VMT BY HOUR command. These fractions are used by 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 the daily emissions factors as composites of the hourly emissions factors.)

The hourly link-VMT estimates by day-type (discussed previously in the “Estimation of VMT” section) were used to develop the MOBILE6 fleet hourly VMT input. One set of 24 fractions was developed for each of the four activity day types for each county (i.e., 32 input data sets). The fractions were calculated by dividing the county fleet total VMT for each hour by the county fleet total 24-hour VMT.

These fractions were input to MOBILE6 as an external data file. Appendix F lists the hourly travel factors. The factors in MOBILE6 external data file format were provided on CD-ROM, 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 program (that is, no user speed input commands or data parameter values were required when producing MOBILE6 emissions factors tables with POLFAC62). POLFAC62 uses the SPEED VMT inputs to produce the individual Freeway and Arterial emissions factors indexed by the 14 MOBILE6 speed bin speeds.

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.

Trip Length Distributions, Hourly (WE DA TRI LEN DI and WE EN TRI LEN DI Commands)

The trip length distributions (TLDs) input to MOBILE6 is called by the WE DA TRI LEN DI command (for weekdays), or by the WE EN TRI LEN DI command (for weekend days). TLDs specify the percentage of average weekday (or weekend) VMT that occurs during trips of different durations at each hour of the day.

The VMT distributions were entered as percentages of VMT for six trip length ranges, and must sum to 100 percent. The percentage values correspond to VMT accumulated within the trip duration ranges:

- Under 10 minutes,
- 11-20 minutes,
- 21-30 minutes,
- 31-40 minutes,
- 41-50 minutes, and
- 51 minutes and longer.

HGA regional TLDs from the HGAC 2007 TDMs (HGAC, January 2004) were applied for all eight HGA counties. No weekend day TLD data were available, thus the weekday values, shown in Table 28, were applied for all of the analysis days. The hourly TLD data were input to

MOBILE6 in an external data file. The external data files were provided on CD-ROM (see description in Appendix A).

TABLE 28
HGA Percent of VMT by Trip Length, Hourly

Hour	Trip Length Ranges (minutes)					
	< 10	11-20	21-30	31-40	41-50	>51
6 a.m.	11.43	26.84	25.13	17.77	9.65	9.18
7 a.m.	11.43	26.84	25.13	17.77	9.65	9.18
8 a.m.	11.43	26.84	25.13	17.77	9.65	9.18
9 a.m.	15.41	30.51	23.34	14.10	7.36	9.28
10 a.m.	15.41	30.51	23.34	14.10	7.36	9.28
11 a.m.	15.41	30.51	23.34	14.10	7.36	9.28
12 p.m.	15.41	30.51	23.34	14.10	7.36	9.28
1 p.m.	15.41	30.51	23.34	14.10	7.36	9.28
2 p.m.	15.41	30.51	23.34	14.10	7.36	9.28
3 p.m.	13.95	29.23	24.04	15.44	8.18	9.16
4 p.m.	13.95	29.23	24.04	15.44	8.18	9.16
5 p.m.	13.95	29.23	24.04	15.44	8.18	9.16
6 p.m.	13.95	29.23	24.04	15.44	8.18	9.16
7 p.m. through 5 a.m.	14.68	29.66	22.95	14.34	7.79	10.58

* Based on HGAC 2007 TDMs (HGAC, January 2004)

Weekend Day Vehicle Usage (WE VEH US Command)

MOBILE6 is structured to supply either weekday or weekend day activity values for particular input parameters. Use of the WE VEH US directs MOBILE6 to select the weekend input parameter data sets for start distributions, soak distributions, hot soak activity, and TLDs. The WE VEH US command was used for the Saturday and Sunday episode analysis days. Thus for the Saturdays and Sundays, EPA default weekend usage rates were applied for start distributions, soak distributions, hot soak activity. The HGAC-developed local weekday TLDs were used for all analysis days (no weekend day values were available, including MOBILE6 defaults).

State Programs

The state programs inputs to MOBILE6 model the effects of vehicle ATPs and exhaust and evaporative I/M programs that apply to the gasoline-fueled vehicle classes, except motorcycles. For 2007, all HGA counties are to administer ATP and I/M programs. For the development of MOBILE6 ATP and I/M program set-ups and post-processing procedures (discussed in a later section), the eight HGA counties were grouped according to their exhaust I/M program start dates as:

- Harris (1997),
- Urban (2003: Brazoria, Fort Bend, Galveston, Montgomery), and
- Rural (2004: Chambers, Liberty, and Waller).

For the Urban and Rural county categories, it is assumed that the ATP start dates coincide with the exhaust I/M program start dates for those counties. The I/M and ATP modeling setups were developed with information from the I/M SIP (TCEQ, December 2002) and based on discussions with TCEQ Technical Analysis Division preliminary to development of these inputs for the 2007 Mid-Course Review EI analysis (the inputs for this task were the same as used for the MCR 2007 EI analysis, TTI, August 2003).

Vehicle ATP (ANTI-TAMP PROG Command)

Table 29 describes the HGA counties 2007 ATP set-ups. The MOBILE6 ATP set-ups were entered in the MOBILE6 command file. For all counties, the ATP was composed of two sub-programs. The post-processing procedures required to account for the full effects of the two-part ATP are discussed in the “Emissions Factor Post-Processing Requirements and Procedures” section.

Table 29
HGA Counties 2007 ATP:
MOBILE6 Command and Data Parameter Values

Geographic coverage: All counties

MOBILE6 Inputs: The command and data parameter values for the two ATP sub-programs, ATP1 and ATP2, respectively, are:

ANTI-TAMP PROG
 YY 83 83 22222 22222222 2 11 096. 21112222

ANTI-TAMP PROG
 YY 84 05 22222 22222222 2 11 096. 22112222

Data parameter value definitions:

- the first number (“YY”) is the last two digits of the program start year, where start years are: Harris County, 84; Urban counties, 03; Rural counties, 04.
- the second number is the last two digits of earliest model year covered* by the program. The program is designed to cover 24-year-old vehicles and newer.
- the third number is the final model year covered by the program.* Vehicles less than two years old are exempt from the program.
- the next 14 values are on/off toggles to identify the vehicle types covered (1 = no, 2 = yes). The vehicle are in input string order are: LDGV, LDGT1, LDGT2, LDGT3, LDGT4; and HDGV2B, HDGV3, HDGV4, HDGV5, HDGV6, HDGV7, HDGV8A, HDGV8B; and GAS BUS.
- the next entry must be one (EPA no longer supports additional credit for test only program). A “2” will cause ATP credit to be discontinued.
- the next data parameter is the program inspection frequency (1 = annual, 2 = biennial).
- the next number is the program compliance rate in percent.
- the last eight data parameters in the input string are on/off toggles (1 = no, 2 = yes) indicating which checks are performed, in the following order: 1) air pump disablement; 2) catalyst removal; 3) fuel inlet restrictor removal; 4) tailpipe lead deposit; 5) exhaust gas recirculation disablement; 6) evaporative system disablement; 7) positive crankcase ventilation system disablement; and 8) missing gas cap.

*Note: Vehicles less than two years old and 25 years old and older are exempt from inspection.

I/M Programs

Table 30 describes the HGA I/M set-ups required to model the I/M programs as designed for operation in 2007. The emissions factor post-processing procedure necessary to model the effects of the May 1 start date for the Urban and Rural counties is described in the “Emissions Factor Post-Processing Requirements and Procedures” section. The I/M commands and data

parameters were input to MOBILE6 in an external data file called from the command file using the I/M DESC FILE command.

Table 30
MOBILE6 I/M Commands and Data Parameter Values for HGA 2007

Geographic coverage: All eight counties.		
MOBILE6 inputs: The commands (in bold) with their corresponding data parameters values as defined by program design, are described below. Except for the I/M EFFECTIVENESS command, the first data value following each command identifies the program number (i.e., 1 through 6) to which the command and its associated parameters apply. Stringency applies only to exhaust I/M programs (thus “&” takes the values 1, 2, and 3). Compliance and Waiver Rates applies to all I/M programs (thus “#” takes values 1 through 6).		
I/M STRINGENCY: & 20 (percent stringency level for pre-1981 automobiles and light trucks)		
I/M COMPLIANCE: # 96 (percent compliance)		
I/M WAIVER RATES: # 3 3 (pre-1981 and post-1980 waiver rates in percent)		
I/M EFFECTIVENESS: 1 1 1 (fractional exhaust I/M effectiveness for HC, CO, and NOx)		
I/M PROGRAM	I/M MODEL YEARS	I/M VEHICLES
1 YYYY 2050 1 TRC 2500/IDLE	1 1983 2005	1 11111 22222222 2
2 YYYY 2050 1 TRC ASM 2525/5015 PHASE-IN	2 1983 1995	2 22222 11111111 1
3 YYYY 2050 1 TRC OBD I/M	3 1996 2005	3 22222 11111111 1
4 YYYY 2050 1 TRC GC	4 1983 2005	4 11111 22222222 2
5 YYYY 2050 1 TRC GC	5 1983 1995	5 22222 11111111 1
6 YYYY 2050 1 TRC EVAP OBD & GC	6 1996 2005	6 22222 11111111 1
<i>Explanation of command data parameters:</i>		
<u>I/M PROGRAM command:</u>		
The parameters, by numerical order, are defined as: 2 nd and 3 rd are the program start (see YYYY explanation below) and end years, respectively; 4 th is the program frequency (1 = annual, 2 = biennial); 5 th is the program type (TRC = test and repair computerized); and 6 th is inspection type (2500/IDLE = test at idle, 2,500 rpm; ASM 2525/5015 PHASE-IN = Acceleration Simulated Mode-2 Test with phase-in cut points; OBD I/M and EVAP OBD & GC are on-board diagnostic exhaust and evaporative I/M [with GC], respectively, and GC = gas cap pressure check).		
The start year field (YYYY) varies by county grouping and by I/M program emission type as follows: 1, 2, and 3 are exhaust programs for the county/start year: Harris, 1997; Urban, 2003; Rural, 2004; 4, 5, and 6 are evaporative programs for the county/start year: Harris, 1997; Urban and Rural, 2000.		
<u>I/M MODEL YEARS command:</u>		
The first field is the first model year covered, and the second field is the last model year covered. By program design, vehicles less than two years old and greater than or equal to 25 years old are exempt from testing.		
<u>I/M VEHICLES command:</u>		
The 14 data parameters are on/off toggles (1 = no, 2 = yes) indicating which vehicle types are subject to inspection. The 14 corresponding vehicle types, in input order are: LDGV, LDGT1, LDGT2, LDGT3, LDGT4; and HDGV2B, HDGV3, HDGV4, HDGV5, HDGV6, HDGV7, HDGV8A, HDGV8B; and GAS BUS.		

Fuels — Locality-Specific Inputs to MOBILE6

Fuel effects modeling for HGA 2007 includes only the summer RFG. The RVP of gasoline is a required input to run MOBILE6, but is not used in the emissions factor calculations — it is overridden by the RVP value associated with the MOBILE6 RFG option modeled.

Fuel Program (FUEL PROGRAM Command)

The MOBILE6 FUEL PROGRAM command provides the user four options for modeling fuels effects. The second option, RFG (with the southern volatility region indicated), was modeled for all eight counties. This option directs MOBILE6 to model the effects of RFG as defined by the EPA default parameters for the southern volatility region, summer RFG (with an RVP of 6.8 psi). The selected FUEL PROGRAM option was entered in the MOBILE6 command file.

Gasoline RVP (FUEL RVP Command)

The gasoline RVP input to MOBILE6 was overridden by the selected FUEL PROGRAM command option described above for RFG, which inputs an RVP of 6.8 psi. This value was also entered as the RVP input corresponding to the FUEL RVP command. The RVP value was entered in the MOBILE6 command file.

MOBILE6 Alternative Emissions Regulations and Control Measures Commands

No user input was applied in this section of the model; thus, all inputs pertaining to this part of the model were MOBILE6 defaults. This includes the REBUILD EFFECTS parameter (i.e., sets the effectiveness rate for modeling the low-NOx emissions rebuilds program for heavy duty diesels) for which MOBILE6 uses a default effectiveness of 0.90, or 90 percent.

According to all of the above-described MOBILE6 input parameters and options, MOBILE6 input files were set up and run with the POLFAC62 program for each county and analysis day. The resulting POLFAC62 tabulated hourly emissions factors output were then post-processed as required, described below.

Emissions Factor Post-Processing Requirements and Procedures

There are three limitations of the MOBILE6 model that result in the emissions factors post-processing requirements for this analysis:

- MOBILE6 models only one ATP program per run;
- MOBILE6 assumes a January 1 start for I/M and ATP start year; and
- MOBILE6 does not model user-specified alternate diesel fuel parameters.

For 2007, all HGA counties are to operate two ATPs (see Table 29), the seven non-Harris county ATP and exhaust I/M programs are scheduled to start May 1 of the program start years, and all HGA counties are to use Texas LED fuel.

Thus, to produce the final emissions factor inputs to the emissions estimation process, three emissions factor post-processing steps were performed. To model the full effects of the two-part ATP for each county, emissions factors from three runs were combined. To model the ATP and exhaust I/M programs May 1 start for the seven counties excluding Harris, two emissions factors

data sets (each produced from the output of three MOBILE6 runs) were combined. To model the LED effects, no additional MOBILE6 runs were required. Adjustment factors were applied to the NOx emissions factors after the ATP and I/M post-processing steps were completed.

The county groupings for post-processing purposes were the same as those used to develop the ATP and I/M input records. The eight HGA counties were grouped according to their exhaust I/M program start dates as:

- Harris (1997);
- Urban (2003: Brazoria, Fort Bend, Galveston, Montgomery); and
- Rural (2004: Chambers, Liberty, and Waller).

For the Urban and Rural county categories, it was assumed that the ATP start dates coincide with the exhaust I/M program start dates for those counties.

Step 1: Emissions Factor Post-Processing to Combine Effects of Two-Part ATP

This procedure is performed for all eight HGA counties, once for Harris County and twice for the Urban and Rural county categories. For the Urban and Rural county categories, the second set of emissions factors was required for the “May 1” post-processing step (Step 2 below).

To model the credits of both parts of the ATP (ATP1 and ATP2 as described in Table 33), the following emissions factor post-processing calculation (taken from the HGA original 1990 base-year emissions inventory as developed and documented by HGAC, 1992) was performed:

$$EF_{ATP1} + EF_{ATP2} - EF_{NO\ ATP} = EF_{FINAL}$$

Where:

- EF_{ATP1} = emissions factor with ATP1 credits;
- EF_{ATP2} = emissions factor with ATP2 credits;
- EF_{NO ATP} = emissions factor with no ATP credits; and
- EF_{FINAL} = emissions factor with including estimated credits for both ATP1 and ATP2.

The RATEADJ62 program (see Appendix B) performs this calculation for each county and analysis day. The calculation was performed on the second set of runs for the Urban and Rural county categories, to develop required emissions factor input for the May 1 post-processing step (see EF_{Start Year+1} definition in the discussion of Step 2 below). The resulting emissions factors after this step include the full effects of the two-part ATP.

Step 2: Emissions Factor Post-Processing to model May 1 Program Start Effects

To model the Urban and Rural county categories ATP and exhaust I/M program May 1 start date, ratio calculations (from the Technical Supplement to the October 2001 I/M SIP) were performed on the Urban and Rural emissions factors from the first post-processing step. There were two MOBILE6 emissions factors sets required for the calculation, the difference between

them being the following exhaust I/M and ATP start year input: 1) actual start year, and 2) one year after actual start year. The emissions factors from these two sets were combined as:

$$\frac{((N - 1)12 + 8) \times EF_{Act. Start Year}}{12 \times N} + \frac{4 \times EF_{Start Year + 1}}{12 \times N} = EF_{FINAL}$$

Where:

- N = evaluation year - start year;
- EF_{Act. Start Year} = emissions factor with actual exhaust I/M and ATP start year;
- EF_{Start Year+1} = emissions factor with an exhaust I/M and ATP start year one year later; and
- EF_{FINAL} = emissions factor with the estimated May 1 start date of the actual I/M start year.

Thus the Urban (N=4) and Rural (N=3) county ratio formulae are:

Urban Counties: $(0.9167) EF_{Act. Start Year} + (0.0833) EF_{Start Year+1} = EF_{FINAL}$; and
 Rural Counties: $(0.8889) EF_{Act. Start Year} + (0.1111) EF_{Start Year+1} = EF_{FINAL}$.

The RATEADJ62 program is applied to perform this calculation for each county and analysis day. The resulting emissions factors after this step include the full ATP effects and effects of the exhaust I/M and ATP program May 1 start for the program actual start years.

Step 3: Emissions Factor Post-Processing to Account for Low-Emissions Diesel Effects
 MOBILE6 does not have an alternate diesel fuel modeling feature. To model the impacts of the Texas LED Fuel Program, MOBILE6 diesel vehicle emissions factors were post-processed (with the RATADJV62 program, described in Appendix B). TCEQ provided TTI with the estimated Houston area NOx reductions and corresponding adjustment factors by diesel vehicle type (January 2004) as shown in Table 31. TTI multiplied the 2007 diesel vehicle type-specific NOx adjustment factors by the corresponding vehicle-type NOx emissions factors for each county and analysis day.

Table 31
2007 LED Program NO_x Adjustment Factors* Applied To Diesel
Vehicle Emissions Factors

Diesel Vehicle Type	NO_x Reduction	NO_x Adjustment Factor
LDDV	6.09%	0.9391
LDDT12	6.20%	0.9380
LDDT34	5.40%	0.9460
HDDV2b	5.09%	0.9491
HDDV3	5.29%	0.9471
HDDV4	5.37%	0.9463
HDDV5	5.27%	0.9473
HDDV6	5.43%	0.9457
HDDV7	5.53%	0.9447
HDDV8a	5.84%	0.9416
HDDV8b	5.61%	0.9439
HDDBT	5.81%	0.9419
HDDBS	5.82%	0.9418

* Analysis provided by TCEQ, January 2004. Based on latest age distributions and diesel fraction estimates.

TCEQ developed the average vehicle class adjustment factors in Table 31 for each vehicle type. TCEQ applied 4.8 percent and 6.2 percent reductions to a set of locality-specific emissions estimates on a by-model-year (4.8 percent for 2002 and newer, and 6.2 percent for 2001 and older, per EPA Memorandum, Texas LED Fuel Benefits, September 27, 2001) and drive cycle-specific basis. TCEQ produced the tabulated average vehicle class results using Houston area on-road mobile source inventory-specific model year travel fractions and the latest age distributions and diesel fractions estimates (developed from mid-year 2003 TxDOT registrations data).

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

EMISSIONS CALCULATIONS

Hourly emissions were calculated at the network link level using the IMPSUM62 program (Appendix B). Generally, for each hour the episode day link-VMT estimates were multiplied by the episode day emissions factors (g/mi) to produce hourly emissions estimates for each of the 28 vehicle types and each pollutant and pollutant subcomponent on each network link (the MOBILE6 Freeway, Arterial, or Ramp emissions factors were used depending on the link facility type code). For each day, 195 files were output from the emissions calculations: 192

hourly link emissions files (24 hours multiplied by eight counties), a summary file of county-level and area total hourly and 24-hour emissions estimates cross-classified by vehicle type and road type, a tab-delimited version of the emissions summary file, and the file that logged the execution of the emissions calculation programs. These files were provided on CD-ROM (see Appendix A).

Hourly Link Emissions

For each analysis day, the emissions were calculated by hour for each network and intrazonal link (indexed to county and road type) using the following basic inputs:

- MOBILE6 emissions factors indexed by pollutant, speed, emission type, hour, road type and vehicle type, as developed with POLFAC62 (and RATEADJ62);
- records associating the MOBILE6 drive-cycle-specific emissions factors with the appropriate functional classification codes (or facility type codes) used in the network links;
- link data from the assignment results as developed (for each hour) using the TRANSVMTHSPDWKD or TRANSVMTHSPDWKE program (depending on day type) including: county number, functional classification (or facility type) number, VMT on link, operational link-speed estimate, link node (end point) numbers, and link distance; and
- VMT mix (to allocate link VMT by each of the 28 vehicle types) by time period and roadway type.

For each county, day and hour, the emissions estimates were computed by vehicle type for each link. The analysis day emissions factors, discussed previously, were tabulated by pollutant, emissions type, hour, road type (drive cycle), vehicle type, and 14 speeds (2.5 mph and 5 mph to 65 mph at 5 mph intervals) for each county. The county coded hourly fleet total link VMT estimates were first stratified by vehicle type. The time period and functional classification group-specific VMT mixes were correlated to the appropriate links (by functional classification code and hour of day) and were multiplied by the fleet total link VMT to produce the hourly link VMT estimates by the 28 vehicle types. The emissions factors for each pollutant were then matched with appropriate link-level VMT based on road type drive cycle, vehicle class and speed. Freeway, arterial and ramp drive cycle emissions factors were applied at the link level depending on the link functional classification code (local drive cycle emissions factors were not used). Emissions factors for link speeds that were not represented in the set of 14 speed indexes were calculated by interpolation (see example calculation, Appendix B), except for ramp links for which the emissions factors use a single speed (34.6 mph). For link speeds outside of the model speed range, emissions factors corresponding to the appropriate bounding speeds were applied. The link VMT were then multiplied by the emissions factors to produce the link-level emissions estimates.

Table 32 shows the HGA TDM network functional classification groupings used to allocate the MOBILE6 drive-cycle-specific emissions factors and VMT mix to the links based on facility type code. The four-period, time-of-day-specific VMT mixes were applied by peak and off-peak periods (see Table 4 for the definition of tim-of-day periods).

Table 32
HGAC TDM Functional Classification Groupings
for Application of VMT Mix and MOBILE6 Drive Cycle Emissions Factors

MOBILE6 Drive Cycle	TDM Functional Classification	VMT Mix
Freeway	Urban Interstate	Freeway
	Urban Other Freeway	
	Rural Interstate	
	Rural Other Freeway	
	Toll Roads	
Ramp	Ramps (Freeway, Toll Roads, Frontage)	
Arterial	Urban Principal Arterial	Arterial
	Urban Other Arterial	
	Rural Principal Arterial	
	Rural Other Arterial	
	Urban Collector	Collector
	Rural Major Collector	
	Rural Collector	
	Local (centroid connector)	
	Local (intra-zonal)	

Episode Day Hourly and 24-hour 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 were summed for each day. The resulting composite VOC, CO, and NOx emissions estimates were summarized by road type (HGA network functional classification), vehicle type, road-type, and vehicle-type cross-classification. VMT mix, VMT, VHT, and VMT-weighted speeds were included with the emissions summaries. These files (*.LST and the tab delimited version, *.TAB) were provided on CD-ROM (see Appendix A).

APPENDIX A
ELECTRONIC SUBMITTAL DATA SET NAMES AND DESCRIPTIONS

ELECTRONIC SUBMITTAL DATA SET NAMES/DESCRIPTIONS (TTI February, 2004)

This appendix describes the HGA 2007 modeling emissions inventory electronic data submittal. The HGA 2007 modeling emissions inventories data are contained on 44 CD-ROMs:

- 40 CD-ROMs containing link-emissions and inventory summary report files, and
- 4 CD-ROM containing: 1) HGA 2007 travel model network node coordinates, 2) MOBILE6 input and output files, and 3) a copy of this data description.

The link emissions file format and data definitions are tabulated at the end of this appendix.

EMISSIONS

There are two CD-ROMs (A and B) for each analysis day (20) containing the following (195) files in a ZIP file:

- county level hourly link-emissions files (192 ASCII files: * *.Thr* , *hr* = 01, 02,... 24);
- county-level hourly emissions inventory data summaries that include VMT mix, VMT, VHT, average speed, and emissions cross-classified by vehicle type and road type; hourly “all counties” emissions inventory data summaries; county-level and “all counties” 24-hour emissions inventory data summaries (1 ASCII file, *.LST* extension);
- a tab delimited version of second bullet above (1 ASCII file, *.TAB* extension); and
- a log of the emissions estimation program runs (1 ASCII file with *.LOG* extension).

The CD-ROM names, zip file names, and data set file names follow the convention:

ddmmm07hga_A (Day-specific CD-ROM, Part A)

ddmmm07hga_A.zip (zip file, Part A)

ddmmm2007Harr_ems.Thr (Harris County link-emissions files)

ddmmm07hga_B (Day-specific CD-ROM, Part B)

ddmmm07hga_B.zip (zip file, Part B)

ddmmm2007hga_ems.tab (eight-county network TAB file)

ddmmm2007hga_ems.lst (eight-county network LST file)

ddmmm2007hga_ems.log (eight-county network LOG file)

ddmmm2007CCCC_ems.Thr (Link-emissions files, seven non-Harris Counties).

Where:

dd is the day date for each of the 20 days for the period 18AUG through 06SEP;

mmm is the month, AUG or SEP, corresponding to the episode date day (*dd*);

CCCC is the first four letters of each of the seven non-Harris county names; and

hr is 01... 24 representing the hours 12 a.m. through 11 p.m.

COORDINATES

The CD-ROM with the coordinates is HG07M6A_XY. This CD-ROM contains a file named “HGAC2007coord.txt” that contains Longitude and Latitude in millionths of degrees for the HGAC 2007 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

There are four CD-ROMs (hga07rates_A, B, C, D) that contain the emissions factor run input/output, post-processing factors used, HGAC 2007 TDM network coordinates, and a copy of this data files description.

- MOBILE6 command input files (900):
ddmmm2007_CCCC.in* (where “*” represents characters designating the IM/ATP inputs used to develop interim rates that were post-processed to produce the final emissions factors that include the effects of two-part ATP, May I/M start date, and LED).
- MOBILE6 external data input files (45):
*03.rgd (eight county-level registration distributions files); *.im (five county group-level I/M files); *.tld (two region-level trip length distributions files); and *.vhr (32 county-level, day type-specific hourly VMT fraction files).
- MOBILE6 final hourly emissions factor output files (160):
ddmmm2007CCCC.rat (final rate files post-processed as needed for I/M, ATP, LED).
- I/M, ATP, and LED factor files (4) for post-processing interim emissions factors:
ATPfull.fc (1 file for combining effects of two-part ATP);
2007Rur_IMstrt.fc (1 file for modeling May IM start for Rural county group);
2007Urb_IMstrt.fc (1 file for modeling May IM start for Urban county group); and
LED_hga2007_nox.fc (1 file for modeling LED effects for all counties).
- MOBILE6 interim hourly emissions factor output files (1,520):
ddmmm2007_CCCC.rat* (interim emissions factor files, where “*” represents characters designating different IM/ATP input options used to produce the interim rate files).
- MOBILE6 daily emissions factor output files* (1,680):
Identical file set/file names as for hourly rate files except with .rtd extension.
- Program run LOG and LST files** (40):
ddmmm2007hga_RT.LOG (20 files); and
ddmmm2007hga_RT.LST (20 files).

Where:

CCCC is the first four letters of the HGA county names; and
ddmmm is the episode day date/month (e.g., 18AUG, ... 06SEP).

*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, Ramp) emissions factors are valid.

**Emissions Factor Log (*.LOG) and MOBILE6 Descriptive Output (*.LST) files:

The log files recorded the emissions factor (POLFAC62) runs (one file with .log extension). The MOBILE6 descriptive output (LST) is a record of MOBILE6 descriptive output for each POLFAC62 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.

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	Functional Classification 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.??*	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

* 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.

HGA Travel Model Network Functional Classification Names and Codes

1	Urban Interstate Freeways
2	Urban Other Freeways
3	Toll Roads
4	Ramps (Frwy/Toll/Frontage)
5	Urban Principal Arterials
6	Urban Other Arterials
7	Urban Collectors
8	Locals (Centroid Connectors)
10	Rural Interstate Freeways
11	Rural Other Freeways
12	Rural Principal Arterials
13	Rural Other Arterials
14	Rural Major Collectors
15	Rural Collectors
40	Local (Intrazonals)

Emissions Sub-Component Type

Sub-Component Abbreviation	Comments
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 apply them to travel model-based activity estimates to calculate 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: TRANSVMTHSPDWKD and TRANSVMTHSPDWKE, POLFAC62, RATEADJ62, RATEADJV62, IMPSUM62, and SUMALL62. TRANSVMTHSPDWKD and TRANSVMTHSPDWKE prepare activity input for weekday and weekend day types, respectively, POLFAC62 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.

TRANSVMTHSPDWKD and TRANSVMTHSPDWKE

The TRANSVMTHSPDWKD and TRANSVMTHSPDWKE programs are TRANSCAD-based utilities that post-process TDMs to produce time-of-day specific, on-road vehicle, link VMT and speed estimates. The TRANSVMTHSPDWKD program processes a TDM traffic assignment consisting of four time-of-day assignments by scaling the link volumes by the appropriate HPMS, seasonal, or other VMT factors. Time-of-day factors are then applied to distribute the link VMT to each hour in the day. The Houston speed model is used to estimate the operational time-of-day speeds for each link (or by direction if the assignment is not directional). Since intrazonal links are not included in the TDMs, special intrazonal links are created and the VMT and speeds for these special links are estimated. The TRANSVMTHSPDWKD program is specifically designed for estimating VMT and speeds for Weekdays (day types Weekdays and Friday). The TRANSVMTHSPDWKE program operates in a similar manner as the TRANSVMTHSPDWKD program except that it allows for an extra VMT factor that can be used to estimate VMT and speeds for Weekends (day types Saturday and Sunday). The link VMT and speeds produced by these programs are subsequently input to the IMPSUM62 program for the application of MOBILE6 emission factors.

POLFAC62

The POLFAC62 program is used to apply the EPA's MOBILE6 program (October 2002 version with additional pollutant capabilities) 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 emissions factors are average vehicle class rates calculated from the MOBILE6

database output by weighting the by-model-year emissions rates within each vehicle class by its corresponding travel fraction. These emissions factors are tabulated 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 apply the hourly emissions factors to hourly VMT estimates by link. (POLFAC62 also optionally produces a set of daily emissions factors.) POLFAC62 also calculates the additional pollutant emissions factors provided by the MOBILE6 October 2002 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. There is one set of linear factors. Each factor is applied to all emissions rates in a single data set.

A practical application of the RATEADJ62 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 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 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 Texas LED 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 applies the emissions factors obtained from POLFAC62 (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 calculate emissions by the specified time periods. The five primary inputs to IMPSUM62 are:

- MOBILE6 emissions factors developed with POLFAC62 (or a RATEADJ6, if used);
- link-based hourly VMT and speeds developed using the TRANSVMTHSPDWKD or TRANSVMTHSPDWKE program. For each link, the following information is input to IMPSUM62: 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
- data records associating the MOBILE6 drive cycle (Freeway, Arterial, Local, Ramp) emissions factors (or percentages thereof) to specific travel model functional classifications. These MOBILE6 drive cycle emissions factor percentages (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 subject 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 types 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, January 2002).

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:

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

Where:

EF_{LowSpeed} = emission factor (EF) corresponding to tabulated speed below the average link speed;

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

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

Given that:

$$\begin{aligned} EF_{LowSpeed} &= 0.7413 \text{ g/mi;} \\ EF_{HighSpeed} &= 0.7274 \text{ g/mi;} \\ Speed_{link} &= 41.2 \text{ mph;} \\ Speed_{low} &= 40 \text{ mph;} \text{ and} \\ Speed_{high} &= 45 \text{ mph.} \end{aligned}$$

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

$$\begin{aligned} EF_{Interp} &= 0.7413 \text{ g/mi} - (0.26214) \times (0.7413 \text{ g/mi} - 0.7274 \text{ g/mi}) \\ &= 0.7377 \text{ g/mi} \end{aligned}$$

SUMALL62

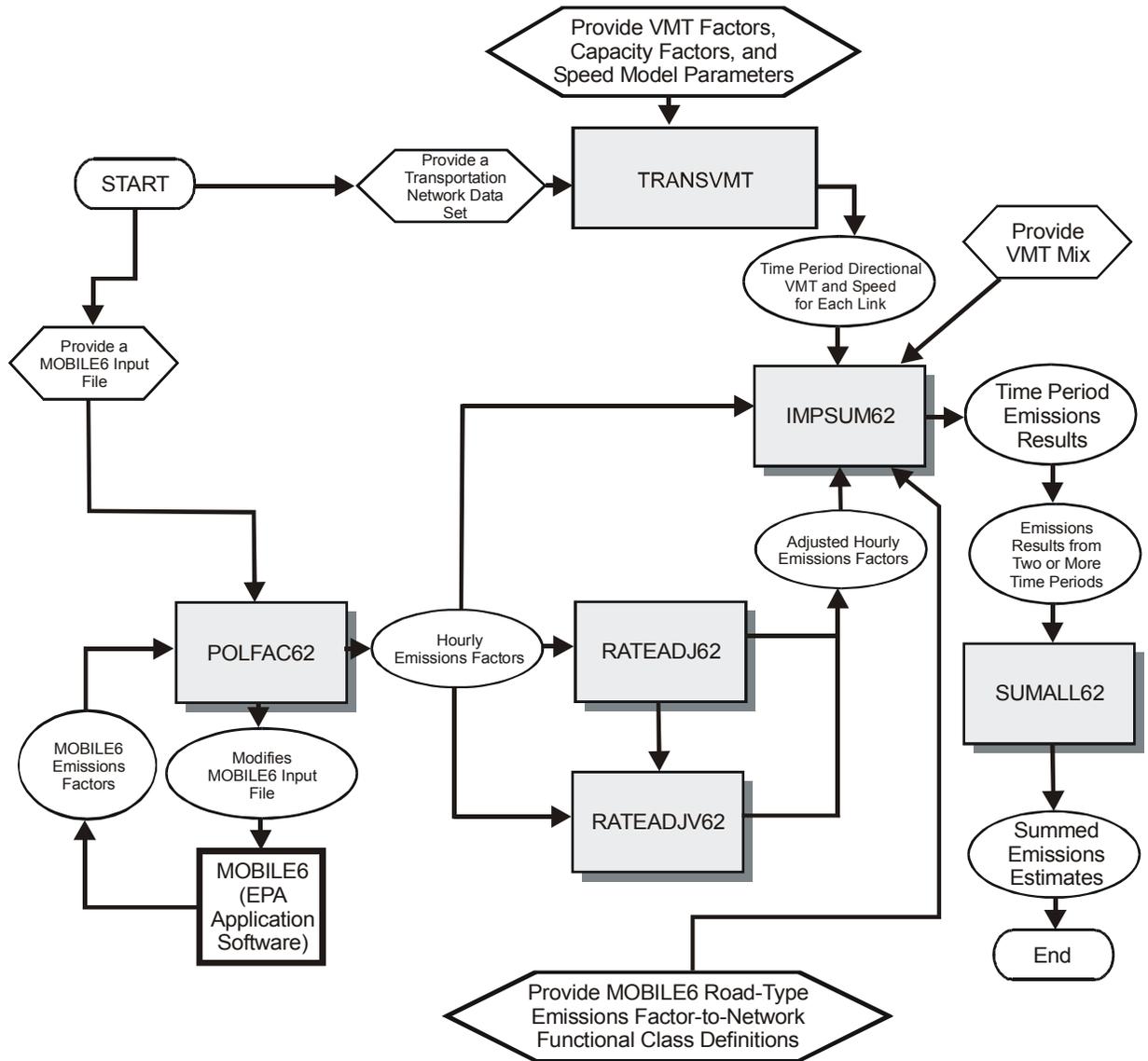
The SUMALL62 program is used to sum the emissions estimates for the time-of-day periods (e.g., 24 periods in the case of hourly analyses) to develop 24-hour emissions estimates. The emissions by pollutant type are reported by roadway type and 28 vehicle types (or optionally condensed to eight vehicle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

Capacity Factors

Time of Day Assignment	Capacity Factor¹
AM Peak	0.3333333
Mid-Day	0.1666667
PM Peak	0.2500000
Overnight	0.0909091

Freeflow (Volume = 1) Speed Factors for Houston/Galveston Speed Model

Functional Group	Area Type				
	CBD	Urban	Urban Fringe	Suburban	Rural
Freeways, Interstates	1.198177	1.158839	1.063315	1.168733	1.192189
Principal Arterials	1.154026	0.827978	0.890652	1.102505	1.176415
Other Arterials, Major Collectors	1.145946	0.811634	0.813180	0.813180	1.290531
Collectors	1.238447	0.895662	0.890640	1.199254	1.192486
Toll Roads	1.054545	1.054545	0.997586	0.950484	1.083538
Ramps	1.238447	0.895662	0.890640	1.199254	1.192486
Locals	1.000000	1.000000	1.000000	1.000000	1.000000

¹ To obtain hourly capacities, a single capacity factor for each time-of-day assignment is used for all area types and function classes.

LOS E (V/C = 1.0) Speed Factors for Houston/Galveston Speed Model

Functional Group	Area Type				
	CBD	Urban	Urban Fringe	Suburban	Rural
Freeways, Interstates	0.802524	0.768691	0.757099	0.901573	0.809269
Principal Arterials	0.642357	0.560208	0.668272	0.822853	0.955472
Other Arterials, Major Collectors	0.681081	0.562673	0.616082	0.865193	1.118835
Collectors	0.750462	0.636429	0.662149	0.913293	1.006409
Toll Roads	0.636364	0.636364	0.689655	0.806452	0.769231
Ramps	0.750462	0.636429	0.662149	0.913293	1.006409
Locals	1.000000	1.000000	1.000000	1.000000	1.000000

**Functional Classification to Functional Group Relationship
for the Application of and Speed Factors**

Functional Group	Corresponding Network Functional Classifications
Freeways, Interstates	1. Urban Interstate Freeways 2. Urban Other Freeways 10. Rural Interstate Freeways 11. Rural Other Freeways
Principal Arterials	5. Urban Principal Arterials 12. Rural Principal Arterials
Other Arterials, Major Collectors	6. Urban Other Arterials 13. Rural Other Arterials 14. Rural Major Collectors
Collectors	7. Urban Collectors 15. Rural Collectors
Toll Roads	3. Toll Roads
Ramps	4. Ramps
Locals	8. Locals (Centroid Connectors) 16. Locals (Intrazonals)

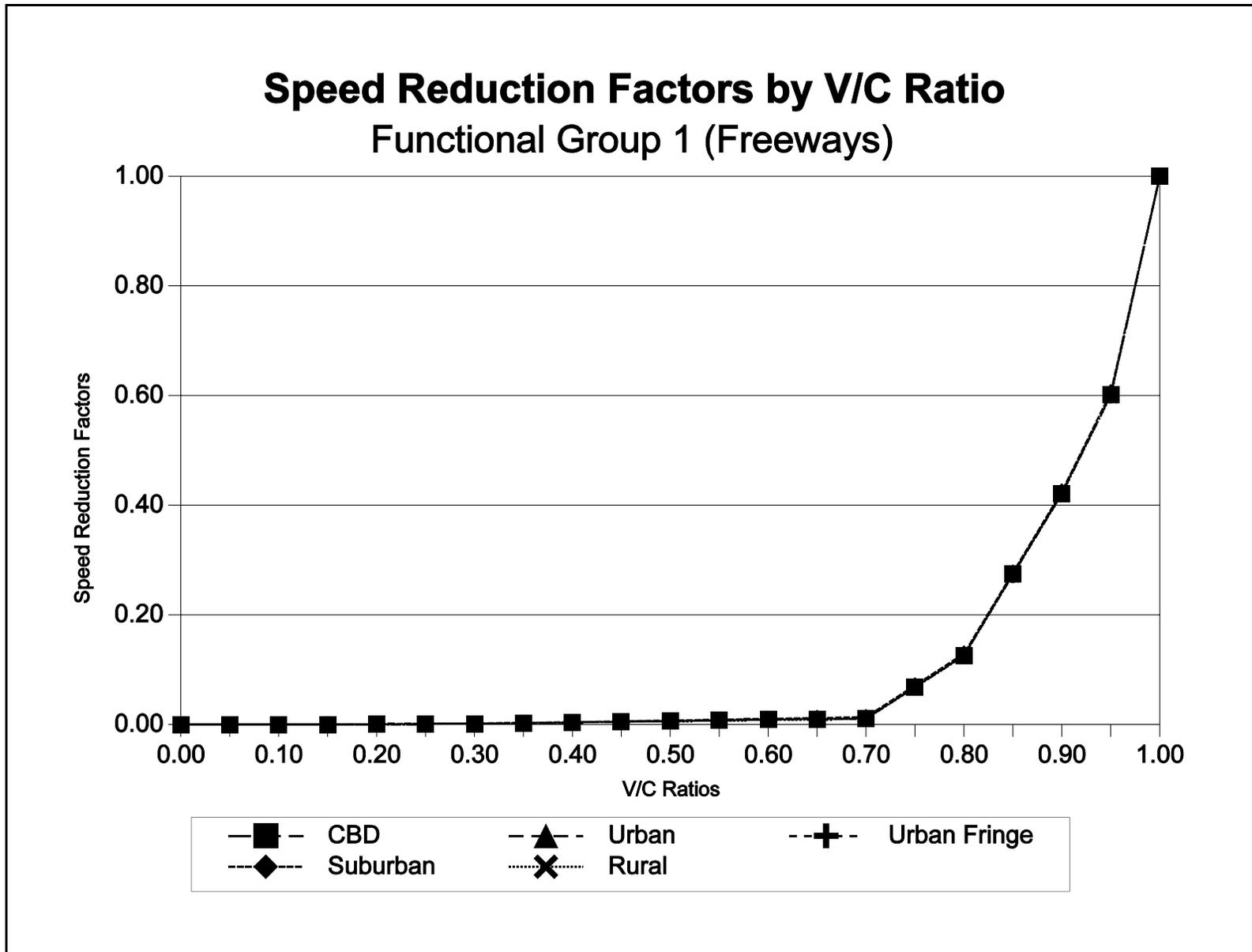


Figure 1. Freeway Speed Reduction Factors by V/C Ratio.

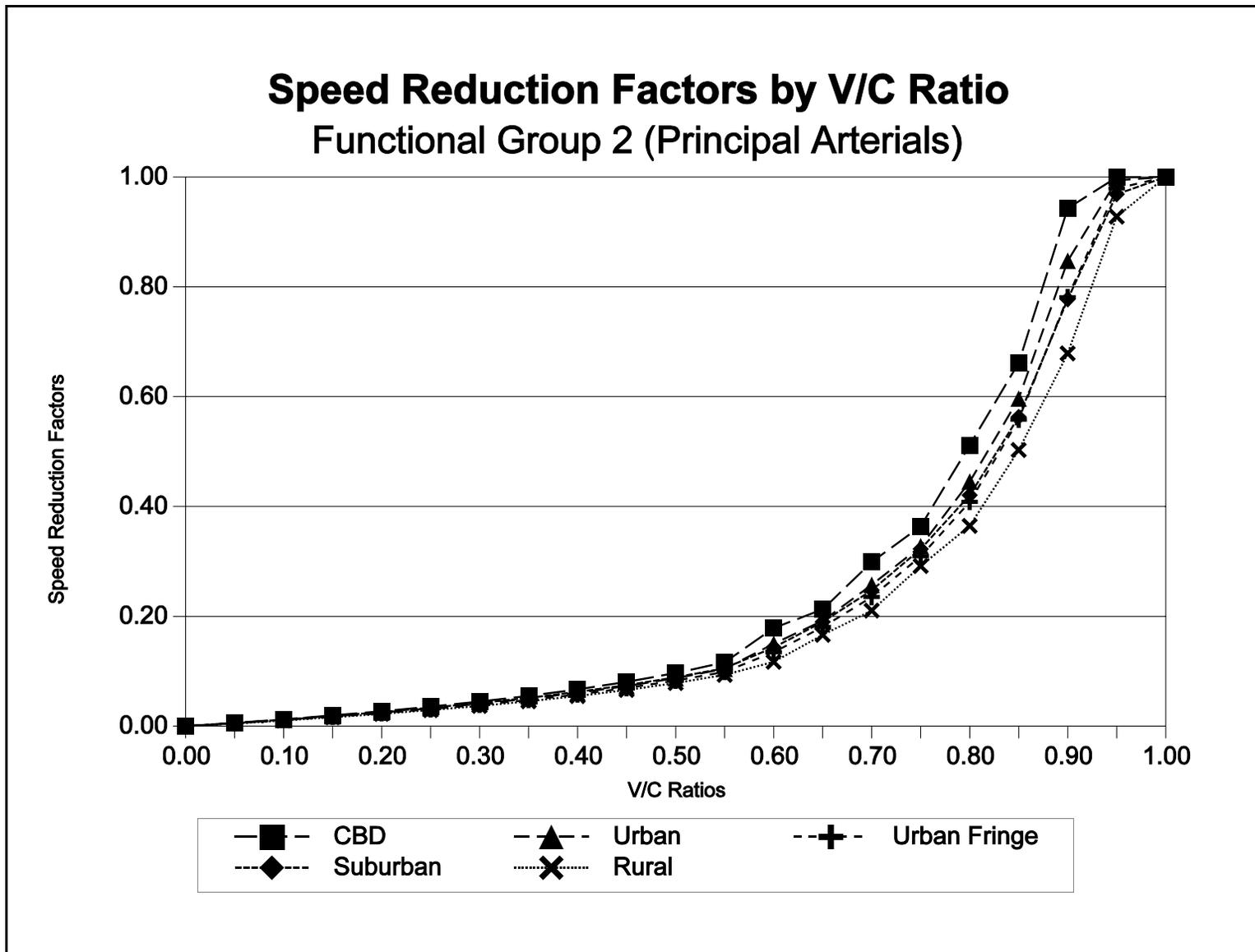


Figure 2. Principal Arterial Speed Reduction Factors by V/C Ratio.

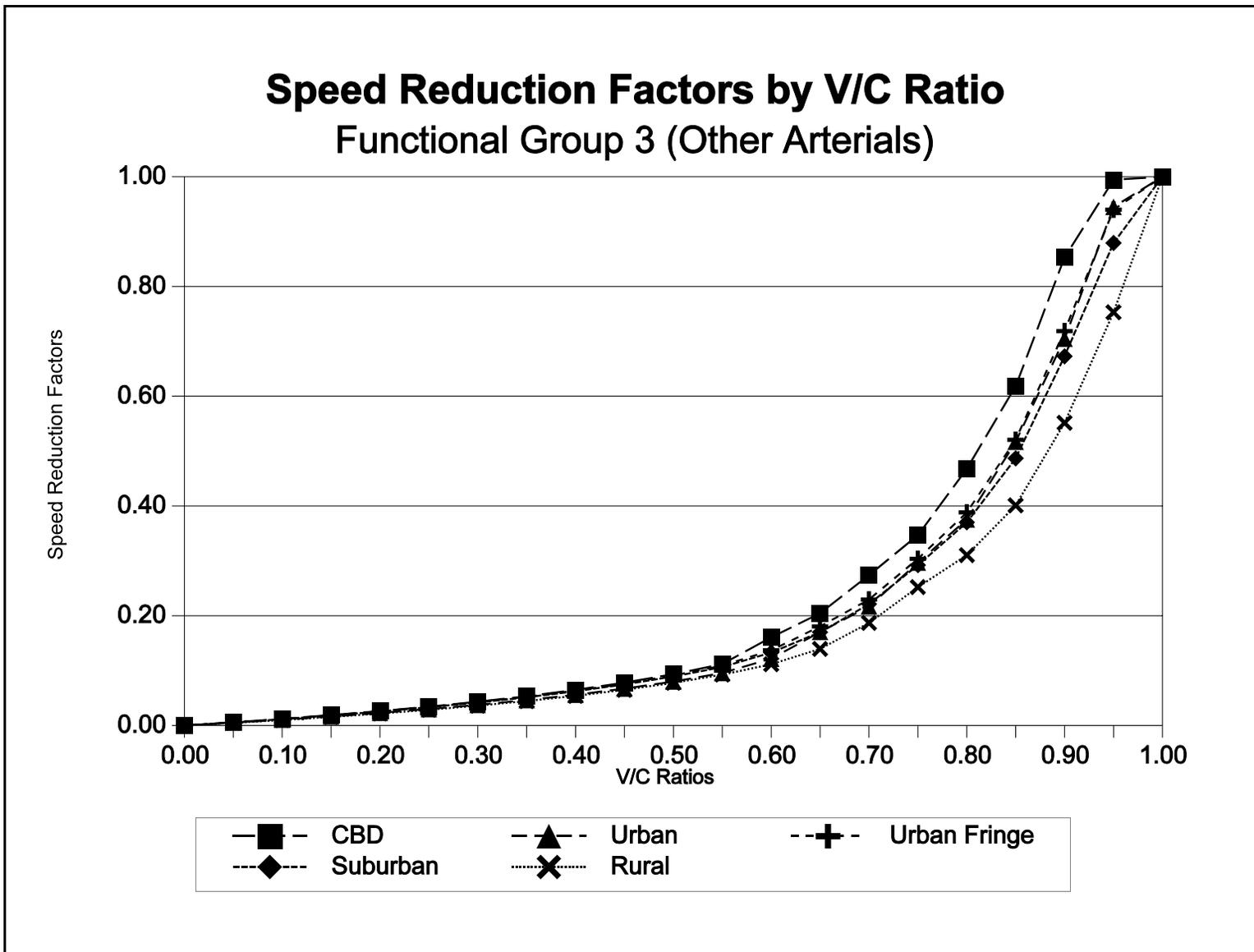


Figure 3. Other Arterial Speed Reduction Factors by V/C Ratio.

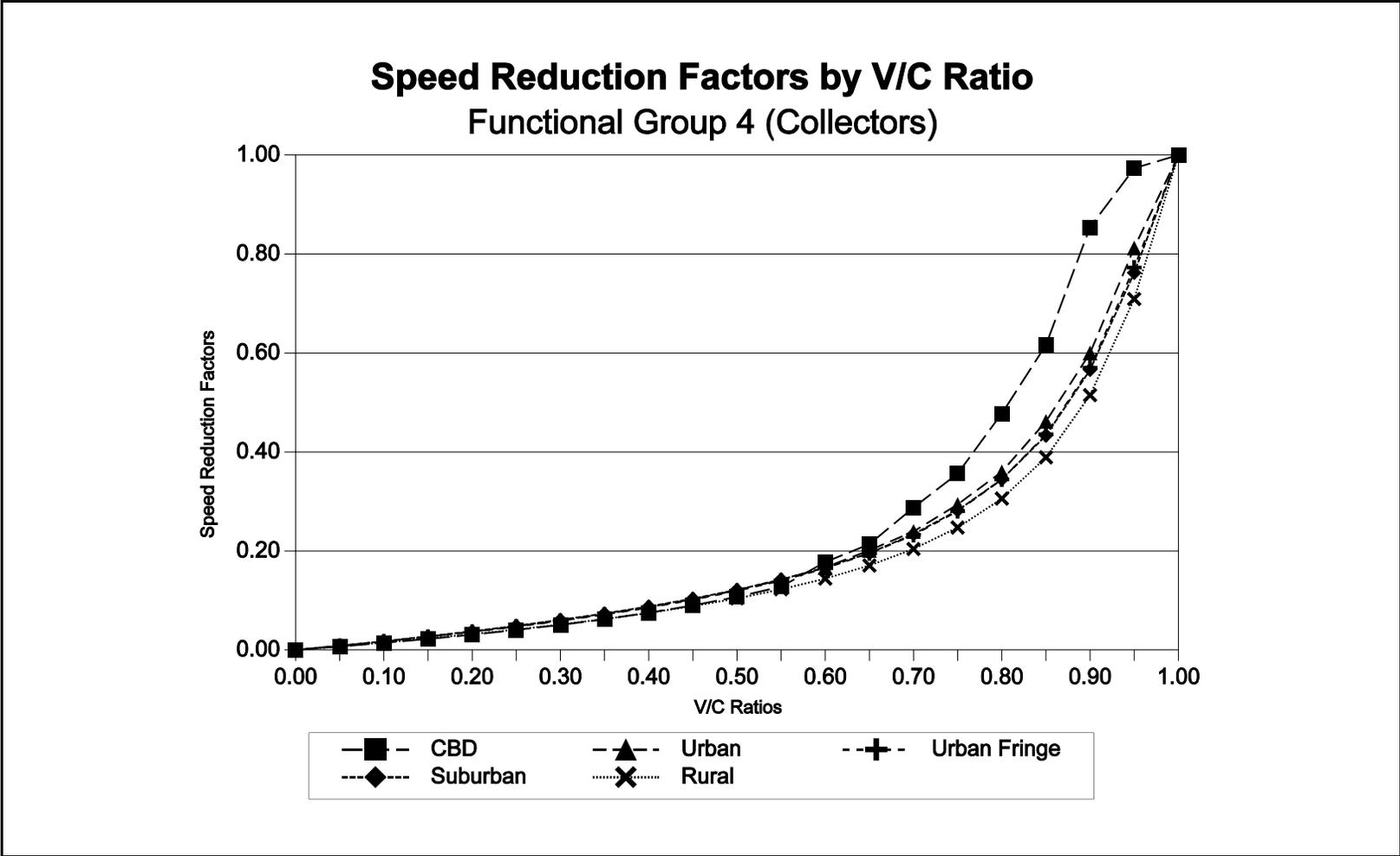


Figure 4. Collector Speed Reduction Factors by V/C Ratio.

Functional Classification to Functional Group Relationship for the Application of Speed Reduction Factors

Functional Group	Corresponding Network Functional Classifications
1. Freeways, Interstates	1. Urban Interstate Freeways 2. Urban Other Freeways 3. Toll Roads 10. Rural Interstate Freeways 11. Rural Other Freeways
2. Principal Arterials	5. Urban Principal Arterials 12. Rural Principal Arterials
3. Other Arterials, Major Collectors	6. Urban Other Arterials 13. Rural Other Arterials 14. Rural Major Collectors
4. Collectors	4. Ramps 7. Urban Collectors 15. Rural Collectors

APPENDIX D
HGA EPISODE DAY HOURLY CLIMATIC INPUTS TO MOBILE6

HGA Episode Day Climatic Inputs to MOBILE6

Central Daylight (Local) Time, Temperature (degrees F), Humidity (%), and Sunrise/sunset times rounded to nearest hour (calendar day hourly data input order: 6 a.m. to 12 a.m., 12 a.m. to 6 a.m.). (From the 2000 base-case episode.)

Friday, August 18

Eight-County Houston/Galveston Nonattainment Area

Brazoria County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 74.0 79.4 83.2 86.2 89.3 91.8 93.4 94.2 94.3 93.8 92.5 90.1 86.2 82.8 81.7 79.2 77.8 77.0 77.5 76.4 76.1 74.9 75.5 73.7

RELATIVE HUMIDITY: 97.0 84.5 72.0 61.0 52.0 45.5 38.5 33.0 35.5 37.5 40.0 47.0 64.5 77.5 79.5 87.5 92.0 93.0 97.0 97.0 97.0 98.5 97.0 97.0

BAROMETRIC PRES: 29.93

Chambers County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 73.7 73.9 78.3 83.3 86.3 88.8 91.6 94.0 94.8 95.5 94.3 92.9 90.4 87.1 84.0 82.7 81.6 79.8 80.2 78.8 77.8 76.8 75.0 74.4

RELATIVE HUMIDITY: 98.4 98.5 92.4 86.4 77.5 66.6 58.5 50.8 47.6 45.8 43.3 45.6 46.9 53.7 67.4 79.1 84.6 88.3 92.3 94.4 96.0 97.0 98.0 97.6

BAROMETRIC PRES: 29.92

Fort Bend County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 74.9 75.4 80.0 84.1 87.1 90.3 92.7 94.9 96.5 97.6 97.9 98.0 95.4 91.8 88.0 84.7 82.3 80.7 80.1 79.0 77.9 76.9 76.1 75.5

RELATIVE HUMIDITY: 96.2 95.0 83.3 72.5 62.3 53.4 48.0 42.9 35.4 32.3 30.5 29.0 32.0 42.4 51.4 65.0 75.4 80.5 85.5 88.5 90.4 92.9 93.9 94.7

BAROMETRIC PRES: 29.92

Galveston County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 79.1 79.4 81.7 84.1 85.9 87.9 88.6 88.9 89.0 90.8 89.1 88.2 87.4 86.1 85.3 84.9 84.6 84.4 84.3 83.8 83.4 83.2 81.8 80.3

RELATIVE HUMIDITY: 85.1 84.6 80.5 73.0 70.1 65.7 69.7 67.9 69.3 68.6 68.4 69.3 70.4 71.5 75.6 76.0 76.6 76.9 82.9 84.4 82.6 85.4 86.1 84.6

BAROMETRIC PRES: 29.92

Harris County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 76.3 77.4 80.5 83.7 86.4 89.1 91.5 93.3 94.8 95.6 95.6 94.7 92.8 89.9 86.7 84.2 82.5 81.3 80.8 79.6 78.4 77.3 76.8 76.2

RELATIVE HUMIDITY: 96.9 90.9 81.2 71.7 62.1 53.1 46.6 40.9 36.5 35.7 35.9 38.2 41.6 49.6 59.6 70.6 79.0 83.7 88.2 91.6 94.2 96.1 96.9 97.1

BAROMETRIC PRES: 29.89

Liberty County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 71.2 71.5 76.4 81.2 84.5 87.7 90.6 93.2 94.8 95.7 95.3 94.2 92.4 88.3 84.3 82.1 80.3 78.2 79.2 77.6 76.7 75.2 73.2 72.3

RELATIVE HUMIDITY: 93.0 79.0 72.0 59.0 45.0 40.0 34.0 31.0 28.0 29.0 28.0 32.0 41.0 51.0 61.0 61.0 71.0 82.0 79.0 85.0 91.0 97.0 96.0 96.0

BAROMETRIC PRES: 29.68

Montgomery County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 70.4 76.0 80.3 83.7 87.3 90.7 93.9 96.0 97.6 98.5 98.3 97.3 94.8 90.4 86.5 83.9 80.6 77.9 79.2 77.3 75.3 72.8 71.2 70.2

RELATIVE HUMIDITY: 93.0 79.0 72.0 59.0 45.0 40.0 34.0 31.0 28.0 29.0 28.0 32.0 41.0 51.0 61.0 61.0 71.0 82.0 79.0 85.0 91.0 97.0 96.0 96.0

BAROMETRIC PRES: 29.68

Waller County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 79.3 79.4 78.3 84.4 88.5 91.9 94.6 96.9 98.6 100.1 100.6 100.7 99.7 96.4 91.9 88.6 85.5 82.6 82.8 81.5 80.4 79.4 79.9 79.8

RELATIVE HUMIDITY: 100.0 88.0 74.0 63.0 53.0 42.0 39.0 34.0 34.0 32.0 34.0 32.0 38.0 48.0 55.0 64.0 77.0 85.0 87.0 94.0 97.0 100.0 100.0 100.0

BAROMETRIC PRES: 29.79

Saturday, August 19
Eight-County Houston/Galveston Nonattainment Area

Brazoria County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 75.1 79.0 82.7 85.9 88.4 89.7 91.2 92.3 92.4 91.6 89.7 88.2 85.1 82.6
80.6 79.2 77.5 76.6 76.2 76.1 75.4 75.2 74.5 74.5

RELATIVE HUMIDITY: 95.0 83.5 72.0 61.0 52.5 50.0 46.5 44.0 45.5 49.0 55.0 56.5 67.5 75.5 81.5
85.0 90.5 92.5 95.5 97.0 97.0 97.0 97.0

BAROMETRIC PRES: 29.94

Chambers County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 73.5 73.5 78.0 82.9 87.0 89.3 91.5 93.5 94.6 94.3 93.5 91.5 88.9 85.8
83.7 81.9 80.5 78.8 78.5 78.4 77.5 76.2 75.3 73.7

RELATIVE HUMIDITY: 95.9 95.3 90.3 82.0 70.2 63.6 57.8 51.5 54.0 53.5 57.3 56.5 58.6 66.6 78.7
84.0 85.8 89.2 90.4 91.8 93.1 94.0 94.2 95.0

BAROMETRIC PRES: 29.94

Fort Bend County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 74.6 74.8 79.8 84.2 87.0 89.1 91.4 94.6 96.3 97.7 98.0 96.6 93.8 90.0
86.2 83.4 81.2 79.5 79.6 79.0 78.5 77.5 76.6 75.6

RELATIVE HUMIDITY: 93.0 90.9 79.7 71.5 62.4 52.2 44.8 38.7 36.2 32.3 31.6 36.2 44.4 52.2 61.2
69.2 73.6 78.5 83.2 83.7 84.2 86.4 89.8 91.9

BAROMETRIC PRES: 29.93

Galveston County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 79.5 78.9 79.6 82.3 85.0 85.6 86.6 88.0 88.4 88.4 88.2 87.7 86.8 85.6
84.7 84.3 84.2 83.8 84.2 84.0 83.7 83.0 82.1 80.4

RELATIVE HUMIDITY: 86.3 91.4 85.5 73.9 69.7 69.6 68.7 67.9 69.2 68.3 68.4 70.3 74.7 77.0 78.6
75.6 79.9 79.0 76.1 75.2 77.2 79.6 80.6 81.2

BAROMETRIC PRES: 29.93

Harris County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 75.9 76.7 80.3 83.9 86.7 89.0 91.2 93.1 94.3 94.9 94.5 93.3 91.3 88.4 85.3 83.2 81.6 80.1 80.4 79.5 78.4 77.8 77.1 76.2

RELATIVE HUMIDITY: 93.7 89.2 79.3 67.9 60.0 51.3 43.9 39.4 39.7 38.4 41.9 47.6 52.7 60.3 69.6 76.7 78.7 84.6 86.1 88.9 91.0 91.7 93.6 95.0

BAROMETRIC PRES: 29.91

Liberty County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 72.4 72.3 76.3 81.4 85.3 88.4 90.9 93.0 94.4 94.9 95.1 93.7 91.3 87.9 84.1 81.7 79.5 77.7 77.0 76.4 75.1 74.5 73.9 72.9

RELATIVE HUMIDITY: 94.0 79.0 57.0 52.0 42.0 35.0 27.0 28.0 24.0 23.0 25.0 25.0 45.0 55.0 65.0 71.0 79.0 88.0 81.0 82.0 88.0 90.0 94.0 96.0

BAROMETRIC PRES: 29.69

Montgomery County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 72.4 76.4 81.1 85.1 88.2 91.4 94.4 95.8 98.7 98.3 98.4 97.8 94.5 90.8 86.2 83.1 80.5 77.5 76.2 76.8 76.0 75.4 73.7 71.4

RELATIVE HUMIDITY: 94.0 79.0 57.0 52.0 42.0 35.0 27.0 28.0 24.0 23.0 25.0 25.0 45.0 55.0 65.0 71.0 79.0 88.0 81.0 82.0 88.0 90.0 94.0 96.0

BAROMETRIC PRES: 29.69

Waller County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 78.3 77.4 77.9 84.6 88.8 91.9 94.8 96.3 98.8 100.1 100.7 100.5 99.5 95.5 90.6 87.2 84.4 81.9 79.8 78.2 77.5 77.5 78.3 78.3

RELATIVE HUMIDITY: 96.0 88.0 74.0 53.0 48.0 41.0 35.0 32.0 30.0 29.0 30.0 44.0 50.0 57.0 65.0 71.0 79.0 90.0 91.0 94.0 94.0 96.0 97.0 100.0

BAROMETRIC PRES: 29.80

Sunday, August 20
Eight-County Houston/Galveston Nonattainment Area

Brazoria County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 76.5 81.7 84.0 87.1 89.6 90.8 93.1 95.2 94.0 93.3 91.1 89.0 86.2 83.6
81.9 80.1 79.7 77.9 76.0 76.3 75.9 75.2 75.3 75.3

RELATIVE HUMIDITY: 95.5 79.0 73.5 63.0 53.0 49.5 41.5 41.5 48.5 48.5 55.0 59.0 66.5 74.5 81.0
89.5 90.5 94.0 93.5 93.0 93.5 97.0 95.0 97.0

BAROMETRIC PRES: 29.91

Chambers County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 73.8 74.1 77.9 82.7 86.0 88.8 90.5 92.6 94.7 94.7 93.7 92.2 90.1 87.3
85.1 83.2 81.7 80.7 77.9 77.1 76.8 75.7 75.2 74.9

RELATIVE HUMIDITY: 96.2 95.4 91.7 86.6 80.4 70.5 64.4 56.2 53.3 55.6 60.5 65.2 68.2 73.6 78.5
84.0 89.5 91.8 91.5 93.5 95.4 94.9 95.0 95.6

BAROMETRIC PRES: 29.91

Fort Bend County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 75.5 75.8 79.9 84.0 86.8 89.4 92.4 94.0 96.1 98.2 99.2 98.6 95.6 91.1
87.6 85.2 83.1 81.4 78.4 77.4 76.5 76.0 75.8 75.9

RELATIVE HUMIDITY: 91.0 90.8 80.2 74.6 66.5 56.3 47.9 41.4 36.7 33.6 32.5 35.2 46.8 54.2 60.1
67.3 74.1 77.6 82.0 83.2 83.3 85.9 88.6 89.3

BAROMETRIC PRES: 29.90

Galveston County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 80.5 79.6 80.4 82.5 84.8 86.3 86.7 86.9 87.8 88.1 88.3 87.8 87.1 85.9
85.2 84.9 84.7 84.5 83.5 83.4 83.2 82.9 82.8 82.0

RELATIVE HUMIDITY: 86.2 85.1 82.8 84.4 78.3 75.5 75.0 75.6 75.4 73.0 74.0 76.2 78.6 79.6 78.7
78.9 82.5 84.2 76.8 79.3 81.2 82.3 83.9 85.0

BAROMETRIC PRES: 29.90

Harris County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 76.1 76.9 80.0 83.7 86.4 88.9 91.3 92.9 94.5 95.2 95.3 94.0 92.0 89.0
86.1 84.2 82.9 81.7 78.9 78.1 77.4 76.9 76.6 76.1

RELATIVE HUMIDITY: 92.6 87.8 80.6 73.0 66.2 57.3 50.9 44.2 42.9 44.4 44.8 51.3 60.2 65.9 71.0
75.4 79.6 84.7 88.3 90.3 92.0 92.4 93.6 93.5

BAROMETRIC PRES: 29.88

Liberty County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 72.2 71.8 76.4 81.2 85.1 87.9 90.1 92.3 93.9 95.3 95.1 93.9 92.0 89.0
85.6 83.4 81.6 79.9 76.7 75.8 74.8 73.8 73.1 73.2

RELATIVE HUMIDITY: 93.0 79.0 70.0 59.0 50.0 44.0 42.0 34.0 31.0 29.0 31.0 34.0 46.0 63.0 67.0
74.0 77.0 82.0 94.0 93.0 96.0 96.0 93.0 97.0

BAROMETRIC PRES: 29.67

Montgomery County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 70.9 74.7 80.1 84.2 87.5 90.5 91.7 95.5 96.5 97.5 98.0 96.9 95.1 91.7
88.3 84.8 83.2 80.4 75.6 73.6 72.4 71.8 71.0 70.5

RELATIVE HUMIDITY: 93.0 79.0 70.0 59.0 50.0 44.0 42.0 34.0 31.0 29.0 31.0 34.0 46.0 63.0 67.0
74.0 77.0 82.0 94.0 93.0 96.0 96.0 93.0 97.0

BAROMETRIC PRES: 29.67

Waller County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 77.8 76.6 78.2 85.4 88.5 92.3 93.6 95.5 98.3 99.8 100.6 101.0 100.4
96.8 91.5 88.5 86.1 83.7 79.5 77.7 76.3 77.2 78.3 78.2

RELATIVE HUMIDITY: 94.0 85.0 74.0 61.0 54.0 49.0 41.0 39.0 35.0 33.0 33.0 37.0 56.0 61.0 65.0
69.0 77.0 88.0 93.0 97.0 97.0 97.0 100.0 97.0

BAROMETRIC PRES: 29.77

Monday, August 21
Eight-County Houston/Galveston Nonattainment Area

Brazoria County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 77.3 81.7 84.7 86.8 89.5 91.3 91.7 93.0 93.3 92.9 91.0 88.2 85.9 83.7
82.1 81.9 80.7 79.9 77.3 77.9 76.9 76.4 76.3 75.9

RELATIVE HUMIDITY: 97.0 82.0 71.0 64.5 55.0 48.0 53.0 45.5 43.0 43.0 51.0 61.0 68.5 77.0 83.5
83.0 88.0 91.0 95.0 95.0 97.0 98.0 97.0 98.0

BAROMETRIC PRES: 29.93

Chambers County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 76.3 77.0 79.5 82.7 86.3 89.2 91.3 93.5 95.1 95.4 95.2 91.6 89.8 87.0
85.4 84.4 83.9 82.2 80.1 79.6 79.1 78.7 78.5 77.7

RELATIVE HUMIDITY: 97.8 96.9 92.3 86.8 74.3 65.0 61.1 58.8 50.7 50.3 52.2 56.5 60.4 68.2 78.2
85.5 89.6 90.8 92.3 93.2 93.9 95.4 96.5 97.1

BAROMETRIC PRES: 29.93

Fort Bend County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 76.6 77.1 81.1 85.2 88.2 91.0 93.9 94.8 96.4 96.9 97.6 96.6 95.7 91.8
87.3 85.0 83.4 82.3 80.4 79.4 78.5 78.0 77.7 77.3

RELATIVE HUMIDITY: 92.8 90.3 81.4 72.0 63.4 55.5 48.3 44.4 40.1 37.2 29.8 30.9 34.6 49.9 61.7
68.6 74.7 79.8 80.2 84.1 86.9 88.4 90.3 91.6

BAROMETRIC PRES: 29.91

Galveston County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 80.8 79.2 80.7 82.4 84.2 86.1 86.7 87.5 88.0 88.1 88.0 87.9 87.2 86.0
85.4 85.2 85.0 84.8 84.1 83.9 83.7 83.6 83.2 82.6

RELATIVE HUMIDITY: 88.0 88.4 88.6 83.6 76.5 74.5 74.0 68.9 71.4 72.8 72.0 72.9 79.6 81.3 81.0
82.0 83.8 84.8 84.1 84.3 85.2 85.6 87.0 86.5

BAROMETRIC PRES: 29.91

Harris County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 77.9 78.7 81.4 84.3 87.1 89.5 91.7 93.4 94.7 95.3 95.4 94.1 91.6 88.7
86.2 84.7 83.6 82.9 80.9 80.1 79.3 78.8 78.4 77.8

RELATIVE HUMIDITY: 95.7 89.5 80.9 71.9 60.8 53.5 48.8 44.3 41.1 40.6 40.3 44.2 48.8 56.9 67.0
74.4 80.4 83.9 86.5 89.8 91.3 93.0 94.1 94.9

BAROMETRIC PRES: 29.89

Liberty County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 74.2 74.4 77.8 82.0 85.1 88.3 91.2 93.3 94.7 94.8 94.7 93.0 91.4 88.6
85.8 84.0 82.3 80.1 78.7 77.9 76.9 76.2 75.5 74.8

RELATIVE HUMIDITY: 94.0 85.0 72.0 59.0 49.0 42.0 35.0 33.0 33.0 29.0 33.0 34.0 46.0 52.0 53.0
61.0 67.0 71.0 88.0 88.0 94.0 94.0 97.0 97.0

BAROMETRIC PRES: 29.69

Montgomery County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 72.6 75.8 80.9 85.3 88.3 91.2 94.6 96.8 97.3 99.1 98.5 96.7 93.9 90.9
87.6 84.3 81.7 79.4 78.5 77.0 74.5 73.8 72.2 71.7

RELATIVE HUMIDITY: 94.0 85.0 72.0 59.0 49.0 42.0 35.0 33.0 33.0 29.0 33.0 34.0 46.0 52.0 53.0
61.0 67.0 71.0 88.0 88.0 94.0 94.0 97.0 97.0

BAROMETRIC PRES: 29.69

Waller County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 78.9 78.6 78.9 84.4 88.2 92.1 94.4 97.3 99.2 100.4 101.0 100.3 99.3
96.1 90.2 87.0 84.8 83.6 82.0 80.5 78.4 77.7 78.4 78.4

RELATIVE HUMIDITY: 97.0 85.0 74.0 63.0 50.0 44.0 43.0 36.0 34.0 34.0 36.0 40.0 45.0 48.0 55.0
67.0 77.0 82.0 91.0 94.0 94.0 94.0 97.0 100.0

BAROMETRIC PRES: 29.79

Tuesday, August 22
Eight-County Houston/Galveston Nonattainment Area

Brazoria County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 79.2 80.6 81.8 81.2 83.2 85.7 88.5 89.4 89.9 89.8 88.8 87.5 85.3 83.5
81.5 80.6 79.7 78.7 78.5 77.8 78.1 77.8 77.0 77.3

RELATIVE HUMIDITY: 93.5 87.0 78.5 79.0 73.0 69.0 60.5 60.0 59.0 55.5 60.5 62.0 71.0 78.0 85.0
86.5 91.0 94.0 95.0 95.5 97.0 97.0 97.0

BAROMETRIC PRES: 29.97

Chambers County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 76.9 77.6 80.7 84.7 85.6 85.7 84.0 81.3 83.4 86.3 88.9 89.0 87.1 85.2
82.9 81.8 80.9 79.8 81.0 80.6 79.7 79.1 77.9 77.3

RELATIVE HUMIDITY: 96.1 95.1 92.2 88.0 84.8 84.5 81.2 79.9 74.8 75.0 70.6 67.5 69.9 74.6 80.4
84.5 87.6 89.7 91.6 92.3 93.2 94.5 95.7 96.1

BAROMETRIC PRES: 29.97

Fort Bend County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 77.4 78.8 82.5 85.1 87.3 86.4 80.2 83.2 87.9 89.7 89.8 89.2 88.7 87.4
85.7 83.9 82.5 81.3 81.2 80.4 79.5 78.9 78.2 77.7

RELATIVE HUMIDITY: 92.4 88.4 80.2 77.1 68.4 70.6 77.8 70.0 64.0 60.7 58.1 54.2 54.0 60.6 65.5
71.2 78.0 81.6 83.2 85.2 87.5 89.4 90.4 91.6

BAROMETRIC PRES: 29.96

Galveston County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 83.7 83.1 84.1 84.9 85.3 85.5 85.4 85.1 85.6 86.2 86.4 86.1 85.8 85.4
85.1 84.7 84.8 84.9 84.6 84.6 84.3 84.3 84.1 84.0

RELATIVE HUMIDITY: 81.5 79.8 77.3 73.8 70.3 69.6 71.3 75.1 73.5 73.0 76.0 75.4 74.8 77.3 78.1
80.3 79.0 80.4 82.9 84.0 86.2 84.0 81.9 82.5

BAROMETRIC PRES: 29.96

Harris County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 79.1 79.8 82.0 84.4 85.4 84.6 83.0 83.6 85.6 87.0 88.2 88.7 88.1 86.3 84.7 83.6 82.9 82.0 82.0 81.5 80.8 80.3 79.7 79.3

RELATIVE HUMIDITY: 90.5 85.7 80.1 75.0 71.9 71.8 71.2 73.3 68.9 65.9 61.1 59.9 62.3 69.4 74.8 78.8 82.3 86.9 86.5 87.9 90.2 92.2 92.6 92.2

BAROMETRIC PRES: 29.94

Liberty County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 74.0 75.1 78.9 83.2 85.4 85.0 81.5 78.8 78.7 81.5 84.2 85.8 85.2 83.4 80.8 79.5 79.1 77.5 78.4 77.1 76.4 75.4 74.6 74.4

RELATIVE HUMIDITY: 85.0 77.0 72.0 65.0 59.0 52.0 87.0 91.0 91.0 82.0 77.0 79.0 90.0 96.0 90.0 96.0 100.0 100.0 77.0 79.0 84.0 87.0 90.0 90.0

BAROMETRIC PRES: 29.74

Montgomery County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 73.3 77.3 81.4 84.4 86.5 88.9 80.6 77.3 74.0 77.1 80.2 82.1 81.1 79.8 78.4 76.6 76.7 75.8 78.0 76.7 74.7 73.8 72.5 72.1

RELATIVE HUMIDITY: 85.0 77.0 72.0 65.0 59.0 52.0 87.0 91.0 91.0 82.0 77.0 79.0 90.0 96.0 90.0 96.0 100.0 100.0 77.0 79.0 84.0 87.0 90.0 90.0

BAROMETRIC PRES: 29.74

Waller County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 78.4 78.3 80.9 85.5 87.7 90.0 92.4 87.7 89.0 89.2 89.8 90.4 91.8 89.6 86.9 84.5 83.9 82.5 81.6 79.8 78.8 77.9 77.4 77.5

RELATIVE HUMIDITY: 85.0 77.0 72.0 63.0 54.0 57.0 65.0 65.0 68.0 65.0 53.0 55.0 57.0 67.0 74.0 76.0 79.0 94.0 84.0 88.0 90.0 94.0 94.0 94.0

BAROMETRIC PRES: 29.84

Wednesday, August 23
Eight-County Houston/Galveston Nonattainment Area

Brazoria County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 77.1 79.2 83.3 84.4 81.9 80.5 83.0 83.9 86.8 88.2 88.0 86.1 84.3 82.1
80.4 78.9 78.2 77.8 79.1 79.9 79.3 78.8 76.8 76.7

RELATIVE HUMIDITY: 94.5 90.5 73.5 67.0 74.5 88.0 74.5 66.5 61.5 56.5 59.0 66.5 73.5 79.5 87.5
92.5 95.0 95.0 92.0 94.0 94.0 96.0 98.0 97.0

BAROMETRIC PRES: 30.00

Chambers County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 74.2 75.2 78.1 81.8 78.6 76.0 77.1 78.9 80.7 83.1 85.7 85.6 85.3 83.9
82.6 82.1 81.3 79.5 78.5 77.2 76.1 75.3 74.5 74.0

RELATIVE HUMIDITY: 99.5 98.6 94.7 93.9 95.1 84.2 80.6 92.2 90.4 89.5 86.6 85.8 81.5 87.5 94.8
99.4 100.0 100.0 90.2 91.2 92.9 96.7 98.7 98.8

BAROMETRIC PRES: 30.00

Fort Bend County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 76.9 77.4 80.5 81.6 82.3 85.8 85.7 84.1 85.5 87.5 89.5 89.9 88.5 87.2
85.3 83.6 82.1 80.6 80.0 79.0 78.3 77.7 77.0 76.6

RELATIVE HUMIDITY: 91.4 91.1 85.1 85.2 81.2 66.5 68.2 77.2 70.1 60.0 55.0 54.7 56.1 61.2 67.6
72.0 77.1 82.7 83.9 85.9 87.6 89.5 92.1 92.9

BAROMETRIC PRES: 29.99

Galveston County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 81.7 80.2 80.3 82.0 83.8 82.3 80.4 80.5 81.9 83.2 84.0 85.0 85.0 84.3
83.7 83.8 84.0 83.9 84.7 84.5 84.5 84.2 84.0 83.7

RELATIVE HUMIDITY: 84.4 93.1 82.8 74.5 79.1 81.5 89.3 85.2 81.3 79.5 76.0 78.0 82.3 86.1 85.5
84.5 81.3 80.8 83.2 77.9 79.7 80.6 80.2 82.3

BAROMETRIC PRES: 29.99

Harris County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 77.2 77.3 79.4 81.6 80.8 81.6 82.3 83.1 84.1 85.2 86.3 86.6 86.0 84.9
83.4 82.7 81.8 81.0 81.2 80.6 79.7 79.2 78.4 77.5

RELATIVE HUMIDITY: 93.7 90.8 84.0 79.3 78.0 73.9 74.0 71.1 67.6 65.2 64.8 67.3 70.3 75.9 81.4
84.7 88.3 90.7 89.0 89.9 91.8 92.7 93.1 93.6

BAROMETRIC PRES: 29.97

Liberty County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 74.1 74.2 75.9 79.0 80.8 81.4 82.6 79.2 79.1 83.0 84.9 84.9 83.6 82.6
81.4 80.1 78.4 77.0 76.3 75.7 74.8 74.6 74.1 73.8

RELATIVE HUMIDITY: 100.0 100.0 88.0 79.0 61.0 61.0 85.0 79.0 69.0 74.0 79.0 77.0 88.0 97.0
100.0 79.4 84.9 88.3 100.0 89.5 94.2 91.4 100.0 100.0

BAROMETRIC PRES: 29.77

Montgomery County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 72.3 73.0 76.8 79.8 83.8 86.0 82.0 80.2 80.3 82.6 82.7 82.2 80.5 79.1
76.8 74.5 72.8 71.1 74.3 76.6 75.1 74.7 72.4 71.8

RELATIVE HUMIDITY: 100.0 100.0 88.0 79.0 61.0 61.0 85.0 79.0 69.0 74.0 79.0 77.0 88.0 97.0
100.0 79.4 84.9 88.3 100.0 89.5 94.2 91.4 100.0 100.0

BAROMETRIC PRES: 29.77

Waller County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 78.7 77.9 79.8 84.4 85.5 87.0 89.9 90.8 89.7 88.9 89.8 90.3 89.0 86.7
84.2 82.9 81.0 80.1 80.6 79.1 77.8 77.5 77.4 78.1

RELATIVE HUMIDITY: 90.0 82.0 72.0 63.0 61.0 63.0 65.0 61.0 53.0 51.0 57.0 61.0 70.0 77.0 88.0
94.0 94.0 96.0 94.0 94.0 97.0 94.0 91.0 94.0

BAROMETRIC PRES: 29.87

Thursday, August 24
Eight-County Houston/Galveston Nonattainment Area

Brazoria County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 75.7 79.8 83.4 86.1 86.9 87.5 85.0 81.7 79.5 79.0 79.6 80.2 80.3 79.2
78.7 77.4 76.8 76.4 77.7 77.4 76.7 77.2 76.8 75.2

RELATIVE HUMIDITY: 97.0 83.0 72.0 64.0 60.0 55.5 69.5 86.0 84.5 88.5 92.0 89.5 91.0 92.0 93.5
98.0 97.0 98.0 98.5 98.5 98.0 97.0 98.0 97.0

BAROMETRIC PRES: 29.97

Chambers County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 75.2 75.8 78.7 83.7 86.2 87.2 88.0 84.2 77.9 74.3 76.2 77.9 78.5 78.5
77.3 76.6 75.7 75.6 77.8 76.8 76.2 75.8 75.6 75.2

RELATIVE HUMIDITY: 100.0 100.0 100.0 100.0 96.4 89.3 70.4 78.2 94.5 92.8 94.2 94.2 92.3 92.9
94.8 96.3 96.7 97.0 100.0 100.0 100.0 100.0 100.0

BAROMETRIC PRES: 29.98

Fort Bend County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 76.3 77.4 81.5 85.2 87.2 88.6 90.9 93.3 91.6 85.8 85.2 83.3 82.3 81.6
80.4 79.9 78.9 78.0 79.7 79.0 78.1 77.6 77.0 76.6

RELATIVE HUMIDITY: 95.1 91.2 81.5 76.0 66.5 60.8 54.5 49.6 63.3 73.2 76.6 82.0 82.9 84.4 84.9
84.2 85.7 88.3 86.0 88.6 91.0 93.8 94.8 95.4

BAROMETRIC PRES: 29.96

Galveston County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 79.5 80.2 81.5 82.8 83.7 81.6 83.7 85.0 84.2 82.7 81.2 80.6 80.5 81.3
81.4 81.4 81.5 81.7 83.9 84.0 84.0 83.8 83.3 82.1

RELATIVE HUMIDITY: 89.1 88.1 87.6 82.2 77.5 85.8 87.0 75.6 80.1 87.6 84.5 86.6 84.5 86.9 86.7
84.2 82.5 83.1 83.0 82.0 83.4 82.8 84.8 85.9

BAROMETRIC PRES: 29.96

Harris County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 78.1 78.6 81.0 83.9 85.9 88.0 89.3 89.0 84.4 81.6 80.2 80.0 80.0 79.7
79.0 78.5 78.0 77.7 80.4 79.9 79.2 78.6 77.9 77.8

RELATIVE HUMIDITY: 95.9 89.3 82.3 73.0 66.7 60.1 59.5 60.2 77.5 86.6 88.2 87.6 89.2 91.6 93.7
94.3 95.0 96.2 93.5 93.4 94.6 96.3 96.7 96.5

BAROMETRIC PRES: 29.95

Liberty County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 73.9 74.4 77.3 81.5 84.6 86.0 86.4 86.5 83.1 82.3 79.5 79.9 79.6 78.9
77.5 76.8 76.1 75.4 76.1 75.5 75.4 74.9 74.6 74.3

RELATIVE HUMIDITY: 96.6 89.3 79.7 90.0 85.0 53.0 47.0 41.0 52.0 61.0 61.0 65.0 74.0 85.0 88.0
88.0 94.0 94.0 92.4 94.0 95.7 96.3 97.1 96.2

BAROMETRIC PRES: 29.74

Montgomery County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 68.0 70.9 73.7 78.8 81.2 88.0 90.1 92.5 91.2 89.6 84.8 84.0 81.5 79.1
77.4 76.3 74.7 73.3 69.9 70.2 69.0 68.7 68.5 67.3

RELATIVE HUMIDITY: 96.6 89.3 79.7 90.0 85.0 53.0 47.0 41.0 52.0 61.0 61.0 65.0 74.0 85.0 88.0
88.0 94.0 94.0 92.4 94.0 95.7 96.3 97.1 96.2

BAROMETRIC PRES: 29.74

Waller County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 77.6 77.7 79.2 84.5 87.5 91.3 93.0 95.3 96.3 97.3 83.1 83.9 82.8 82.0
81.7 81.8 82.6 82.8 79.6 78.1 78.2 78.1 77.5 77.5

RELATIVE HUMIDITY: 97.0 85.0 77.0 61.0 52.0 46.0 41.0 37.0 67.0 90.0 90.0 85.0 87.0 94.0
100.0 100.0 97.0 100.0 97.0 94.0 97.0 100.0 100.0 100.0

BAROMETRIC PRES: 29.84

Friday, August 25
Eight-County Houston/Galveston Nonattainment Area

Brazoria County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 75.6 79.8 82.9 84.9 87.1 84.6 87.2 88.5 89.8 89.4 88.7 86.3 84.3 81.8
79.8 78.3 77.5 76.4 75.7 75.5 75.8 75.1 74.1 73.5

RELATIVE HUMIDITY: 97.0 85.0 74.0 66.5 61.0 75.5 61.0 58.5 56.5 57.5 61.0 67.0 71.0 79.5 86.5
92.0 95.5 97.0 98.0 98.0 97.0 98.5 98.5 98.5

BAROMETRIC PRES: 29.91

Chambers County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 73.1 73.4 76.3 79.8 83.4 85.8 87.8 89.7 91.1 91.3 90.7 89.1 87.4 85.1
83.1 82.0 80.2 79.2 75.3 74.6 74.1 73.5 73.3 73.3

RELATIVE HUMIDITY: 99.8 98.0 91.9 88.2 79.0 73.6 71.7 69.7 65.6 58.3 58.6 63.7 70.7 74.6 82.2
84.6 89.2 91.6 97.7 98.5 99.0 99.7 99.9 100.0

BAROMETRIC PRES: 29.91

Fort Bend County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 74.9 76.4 80.6 84.8 86.5 88.4 90.5 93.0 94.6 94.5 93.0 93.1 92.2 89.2
86.3 84.1 82.2 80.6 77.3 76.6 75.9 75.3 75.2 74.9

RELATIVE HUMIDITY: 98.2 93.9 85.4 75.5 65.9 56.8 51.8 46.4 44.1 47.0 47.3 49.4 50.9 60.8 62.5
68.7 76.5 80.3 91.1 94.2 96.5 98.2 98.5 98.9

BAROMETRIC PRES: 29.90

Galveston County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 79.5 79.3 80.8 81.6 82.8 84.2 85.1 85.8 86.6 87.0 87.0 86.8 86.4 85.3
84.5 84.1 83.7 83.5 81.8 81.7 81.1 80.1 79.9 79.7

RELATIVE HUMIDITY: 90.7 94.3 86.5 85.5 84.6 75.2 76.3 76.6 76.8 75.9 76.0 75.2 76.8 79.0 81.6
83.3 84.5 82.8 83.1 85.0 83.0 83.0 86.5 89.7

BAROMETRIC PRES: 29.90

Harris County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 76.4 77.5 79.6 82.6 84.6 86.8 88.4 89.9 91.2 92.3 92.0 91.0 89.3 87.1 85.1 83.4 81.9 80.9 77.6 77.5 76.8 76.4 76.0 76.1

RELATIVE HUMIDITY: 97.3 93.3 84.1 75.5 67.5 60.0 57.5 53.5 50.9 49.2 50.1 53.6 60.3 66.7 72.5 77.0 82.6 85.9 97.2 97.5 97.5 97.9 97.9 98.6

BAROMETRIC PRES: 29.88

Liberty County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 72.3 72.8 75.2 79.1 82.4 84.9 86.8 89.0 90.8 91.6 91.4 90.6 89.0 86.4 83.6 81.5 79.9 78.7 74.7 73.9 73.3 72.7 72.6 72.3

RELATIVE HUMIDITY: 100.0 94.0 79.0 65.0 57.0 50.0 46.0 40.0 39.0 37.0 39.0 41.0 47.0 59.0 67.0 74.0 82.0 85.0 94.0 94.0 94.0 100.0 100.0 100.0

BAROMETRIC PRES: 29.67

Montgomery County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 70.7 72.9 78.0 82.7 85.6 88.0 90.7 92.8 94.5 95.3 94.8 93.9 91.4 88.1 84.9 82.9 80.9 79.0 72.9 72.0 71.9 70.8 70.6 70.3

RELATIVE HUMIDITY: 100.0 94.0 79.0 65.0 57.0 50.0 46.0 40.0 39.0 37.0 39.0 41.0 47.0 59.0 67.0 74.0 82.0 85.0 94.0 94.0 94.0 100.0 100.0 100.0

BAROMETRIC PRES: 29.67

Waller County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 82.3 82.3 79.7 83.8 87.1 87.8 92.5 94.8 95.3 97.6 97.5 97.0 95.0 92.0 89.0 86.7 84.5 82.1 82.7 83.1 82.1 82.2 82.4 82.1

RELATIVE HUMIDITY: 96.0 90.0 85.0 70.0 61.0 55.0 52.0 46.0 44.0 44.0 46.0 47.0 57.0 65.0 72.0 72.0 85.0 88.0 100.0 100.0 97.0 97.0 97.0 97.0

BAROMETRIC PRES: 29.78

Saturday, August 26
Eight-County Houston/Galveston Nonattainment Area

Brazoria County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 75.4 79.4 83.3 85.4 86.9 89.8 90.9 91.0 91.2 90.4 89.7 88.2 85.6 83.4
82.0 81.3 79.2 78.6 75.7 75.9 75.8 75.2 74.8 73.9

RELATIVE HUMIDITY: 97.0 85.0 72.5 63.0 57.5 54.0 54.5 55.5 55.0 55.5 50.0 55.0 65.0 74.0 79.0
82.0 90.0 94.0 98.0 97.0 98.0 98.0 98.0 98.5

BAROMETRIC PRES: 29.84

Chambers County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 74.4 74.6 77.9 82.1 84.9 87.0 88.0 90.4 92.1 92.6 92.1 90.4 88.1 85.7
84.1 82.7 81.7 79.9 78.6 78.4 78.0 77.5 76.3 75.1

RELATIVE HUMIDITY: 98.2 97.1 91.7 86.5 76.3 67.7 64.4 63.5 59.9 61.3 64.2 61.9 62.3 68.2 78.4
86.0 90.3 91.4 92.9 94.7 96.2 96.7 97.4 98.0

BAROMETRIC PRES: 29.83

Fort Bend County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 74.4 75.4 81.0 85.0 87.5 89.7 92.0 93.3 93.7 96.4 96.8 94.9 93.0 89.9
86.5 83.9 81.9 80.3 79.2 78.2 77.5 76.8 75.5 74.9

RELATIVE HUMIDITY: 95.6 92.1 82.1 75.1 63.1 54.6 50.6 45.4 42.7 39.0 41.4 47.5 49.7 53.1 62.8
71.9 76.9 81.1 84.0 86.5 86.9 88.9 93.1 94.6

BAROMETRIC PRES: 29.82

Galveston County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 80.1 80.1 80.1 82.6 84.4 85.0 85.6 86.2 87.0 87.9 87.9 87.6 86.8 85.7
84.9 84.5 84.2 84.0 83.4 83.1 82.4 81.0 80.5 79.8

RELATIVE HUMIDITY: 91.3 93.3 85.8 79.5 77.2 73.3 72.6 70.4 70.5 70.4 70.9 71.9 72.9 76.1 79.1
80.1 81.9 82.8 81.9 83.7 84.8 86.5 86.8 89.2

BAROMETRIC PRES: 29.82

Harris County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 76.5 77.4 80.3 83.7 86.4 88.4 90.1 91.6 92.8 93.4 93.1 92.1 90.4 87.9 85.3 83.3 82.0 80.8 79.8 78.9 78.1 77.5 76.8 76.3

RELATIVE HUMIDITY: 95.3 89.6 81.4 72.2 63.1 56.1 51.9 49.5 46.6 46.4 49.8 54.4 56.8 61.8 69.9 77.7 82.4 86.7 90.0 92.3 93.7 94.1 95.8 97.0

BAROMETRIC PRES: 29.80

Liberty County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 72.5 72.9 76.6 80.7 83.7 86.3 88.4 90.2 92.0 92.7 92.8 92.0 90.0 86.8 84.0 82.0 80.3 78.4 77.7 76.7 75.7 74.8 73.7 72.9

RELATIVE HUMIDITY: 94.0 82.0 74.0 61.0 52.0 44.0 42.0 36.0 34.0 35.0 36.0 41.0 50.0 59.0 61.0 69.0 74.0 82.0 88.0 94.0 94.0 94.0 97.0 93.0

BAROMETRIC PRES: 29.59

Montgomery County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 70.9 75.1 79.1 83.9 86.9 90.2 91.6 94.6 96.3 96.2 96.7 95.2 92.1 89.0 86.2 83.3 81.1 78.5 77.3 75.3 74.1 73.1 71.5 70.7

RELATIVE HUMIDITY: 94.0 82.0 74.0 61.0 52.0 44.0 42.0 36.0 34.0 35.0 36.0 41.0 50.0 59.0 61.0 69.0 74.0 82.0 88.0 94.0 94.0 94.0 97.0 93.0

BAROMETRIC PRES: 29.59

Waller County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 79.9 77.9 79.3 84.4 88.8 91.2 93.3 95.2 97.7 98.7 99.4 99.6 98.1 93.3 89.6 87.4 84.8 82.7 80.8 79.9 79.0 78.3 79.0 79.7

RELATIVE HUMIDITY: 96.0 85.0 77.0 65.0 57.0 49.0 47.0 43.0 39.0 39.0 39.0 54.0 55.0 59.0 65.0 74.0 82.0 90.0 96.0 97.0 97.0 96.0 97.0 100.0

BAROMETRIC PRES: 29.70

Sunday, August 27
Eight-County Houston/Galveston Nonattainment Area

Brazoria County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 78.6 82.3 85.1 87.0 88.2 90.9 91.0 92.1 91.0 89.9 89.0 87.2 84.8 82.7
81.5 80.0 79.3 77.9 78.4 77.7 77.9 77.6 78.1 77.5

RELATIVE HUMIDITY: 94.0 82.0 70.0 61.0 59.0 57.0 56.5 52.5 53.0 59.5 60.5 64.5 75.0 81.0 83.5
89.0 93.5 95.0 94.0 96.0 96.0 97.0 94.0 97.0

BAROMETRIC PRES: 29.81

Chambers County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 75.7 76.2 78.8 82.6 85.8 87.8 90.7 91.8 91.6 91.4 90.6 89.5 87.7 85.5
84.1 83.5 82.7 82.6 78.5 77.5 77.4 77.2 76.8 76.3

RELATIVE HUMIDITY: 97.8 97.0 92.7 86.6 81.6 70.3 63.0 64.9 67.5 66.6 64.0 63.0 65.5 71.2 81.6
88.7 90.5 92.1 93.6 94.0 95.0 96.5 97.4 97.5

BAROMETRIC PRES: 29.81

Fort Bend County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 75.1 76.1 81.6 85.7 88.0 90.7 92.9 94.9 96.1 95.4 95.8 93.8 91.7 89.2
86.4 84.1 82.4 81.1 78.9 78.1 77.2 76.4 76.0 75.3

RELATIVE HUMIDITY: 96.2 93.4 82.5 75.1 71.1 61.3 51.9 42.1 45.1 44.8 44.6 52.3 54.5 59.3 66.0
75.2 80.8 83.4 84.4 86.6 89.3 91.9 94.0 95.8

BAROMETRIC PRES: 29.80

Galveston County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 82.9 81.8 82.4 84.4 85.8 86.9 87.8 88.0 88.4 88.3 88.1 87.6 86.8 85.8
85.1 84.7 84.5 84.4 83.9 83.6 83.6 83.5 83.5 83.3

RELATIVE HUMIDITY: 84.3 83.5 78.0 74.4 74.4 75.7 73.8 70.1 73.6 73.4 75.6 76.0 74.4 77.1 81.4
83.1 84.0 83.4 83.6 83.3 84.2 83.6 83.5 84.4

BAROMETRIC PRES: 29.80

Harris County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 77.3 78.4 81.3 84.2 87.0 89.5 91.3 92.6 92.9 93.0 92.6 91.4 89.7 87.3 85.1 83.5 82.4 81.6 79.8 79.3 78.8 78.4 78.1 77.5

RELATIVE HUMIDITY: 95.5 90.1 81.3 72.7 66.1 57.3 52.1 49.1 51.2 52.9 53.9 55.2 59.4 65.2 73.2 80.1 83.9 86.4 90.1 91.7 93.9 94.9 95.2 95.8

BAROMETRIC PRES: 29.77

Liberty County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 71.9 72.7 77.0 81.9 84.9 87.7 90.4 92.0 92.4 92.9 92.5 91.3 88.9 86.1 83.7 82.2 80.7 79.7 77.3 76.3 75.1 74.1 73.4 72.4

RELATIVE HUMIDITY: 90.0 79.0 70.0 57.0 45.0 43.0 37.0 36.0 36.0 34.0 42.0 51.0 57.0 65.0 70.0 72.0 82.0 85.0 88.0 91.0 93.0 96.0 93.0 96.0

BAROMETRIC PRES: 29.56

Montgomery County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 70.3 75.3 80.7 85.7 88.2 91.3 93.6 95.9 96.1 96.6 96.5 94.1 90.6 87.5 85.1 83.0 80.5 79.0 76.6 74.5 72.1 70.6 70.2 69.2

RELATIVE HUMIDITY: 90.0 79.0 70.0 57.0 45.0 43.0 37.0 36.0 36.0 34.0 42.0 51.0 57.0 65.0 70.0 72.0 82.0 85.0 88.0 91.0 93.0 96.0 93.0 96.0

BAROMETRIC PRES: 29.56

Waller County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 78.1 76.7 80.4 86.4 88.5 92.1 94.3 96.1 98.1 99.9 100.8 97.2 95.6 92.0 89.3 87.1 84.8 83.1 81.2 79.7 78.9 78.3 78.2 78.0

RELATIVE HUMIDITY: 96.0 85.0 72.0 59.0 54.0 49.0 44.0 40.0 37.0 40.0 49.0 51.0 57.0 61.0 70.0 77.0 82.0 87.0 94.0 97.0 100.0 100.0 96.0 96.0

BAROMETRIC PRES: 29.67

Monday, August 28
Eight-County Houston/Galveston Nonattainment Area

Brazoria County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 77.0 82.1 85.2 87.7 90.0 91.0 91.8 92.2 92.4 91.5 89.7 88.1 85.2 82.7
81.1 80.0 79.0 78.3 77.9 76.9 76.5 76.5 76.2 75.6

RELATIVE HUMIDITY: 97.0 83.5 71.0 54.5 50.5 51.5 48.5 45.0 47.5 48.5 55.0 61.0 73.5 81.0 86.0
91.0 91.5 95.0 97.0 96.5 97.0 98.5 98.0 98.0

BAROMETRIC PRES: 29.85

Chambers County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 76.9 76.7 80.2 84.3 85.7 87.9 89.3 90.8 92.5 92.8 91.6 90.1 88.1 85.5
83.7 82.5 82.1 79.9 82.2 81.7 80.4 79.0 78.1 77.8

RELATIVE HUMIDITY: 97.5 96.2 89.8 84.1 78.0 68.7 61.9 57.3 58.4 56.0 56.3 56.1 59.6 70.3 83.3
90.1 92.2 93.1 93.1 93.9 94.4 95.2 96.0 96.7

BAROMETRIC PRES: 29.84

Fort Bend County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 75.7 76.8 81.7 86.0 88.8 91.1 93.0 94.9 96.2 97.9 98.2 96.6 93.8 90.6
87.1 84.6 82.7 81.2 79.8 78.8 78.1 77.2 76.8 76.2

RELATIVE HUMIDITY: 96.2 91.8 81.5 70.2 57.2 53.2 46.4 37.9 34.5 34.2 34.9 38.5 45.0 52.9 66.6
76.3 81.2 84.4 87.1 89.8 90.8 92.4 94.2 95.5

BAROMETRIC PRES: 29.83

Galveston County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 82.7 82.1 82.5 83.4 85.2 86.6 87.8 88.8 89.2 89.1 88.7 87.8 87.1 86.0
85.1 84.7 84.5 84.4 84.4 84.3 84.2 84.0 83.9 83.6

RELATIVE HUMIDITY: 85.7 84.5 77.4 78.9 71.8 70.6 70.7 68.7 67.7 68.7 70.5 73.2 76.0 79.1 80.5
81.6 82.6 81.6 83.8 83.0 83.1 82.8 81.5 83.7

BAROMETRIC PRES: 29.83

Harris County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 77.8 79.0 82.1 85.3 87.6 89.8 91.8 93.4 94.2 94.5 94.2 93.0 91.0 88.2 85.5 83.6 82.5 81.5 80.7 80.1 79.6 79.1 78.5 78.0

RELATIVE HUMIDITY: 95.5 88.0 79.5 69.3 58.8 53.8 49.1 43.3 41.7 43.2 44.6 48.0 54.0 61.4 72.9 81.1 85.2 87.6 90.6 92.0 93.9 93.5 95.2 95.7

BAROMETRIC PRES: 29.81

Liberty County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 72.9 73.5 77.7 82.6 85.6 88.0 89.6 91.2 92.7 93.5 93.3 91.9 89.9 86.6 83.8 81.7 80.3 78.5 78.9 78.2 76.7 75.1 74.2 73.5

RELATIVE HUMIDITY: 91.0 79.0 68.0 61.0 49.0 46.0 40.0 33.0 36.0 34.0 37.0 44.0 49.0 55.0 63.0 69.0 79.0 85.0 88.0 94.0 90.0 94.0 94.0 93.0

BAROMETRIC PRES: 29.60

Montgomery County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 71.5 76.1 81.1 85.1 88.6 90.6 92.7 96.3 95.5 96.9 96.6 95.4 92.7 89.0 85.6 83.9 81.2 79.7 77.2 75.6 74.7 72.5 72.1 70.4

RELATIVE HUMIDITY: 91.0 79.0 68.0 61.0 49.0 46.0 40.0 33.0 36.0 34.0 37.0 44.0 49.0 55.0 63.0 69.0 79.0 85.0 88.0 94.0 90.0 94.0 94.0 93.0

BAROMETRIC PRES: 29.60

Waller County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 81.6 80.9 81.1 87.1 89.9 92.8 95.2 96.4 99.0 99.0 99.1 100.6 98.8 93.9 90.0 87.6 85.3 83.6 82.2 81.2 80.6 80.2 80.4 80.8

RELATIVE HUMIDITY: 97.0 82.0 70.0 59.0 50.0 46.0 41.0 36.0 36.0 33.0 34.0 44.0 50.0 53.0 65.0 74.0 79.0 87.0 94.0 96.0 96.0 97.0 100.0 96.0

BAROMETRIC PRES: 29.71

Tuesday, August 29
Eight-County Houston/Galveston Nonattainment Area

Brazoria County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 77.8 82.6 85.4 87.3 89.6 91.7 92.7 94.4 93.5 92.3 91.0 88.6 85.8 82.9
82.0 80.1 77.8 78.0 77.2 76.6 76.6 76.1 75.7 75.7

RELATIVE HUMIDITY: 97.0 85.0 73.5 62.0 56.5 48.0 44.5 44.0 47.5 56.0 57.5 62.0 72.0 78.5 81.0
87.5 97.0 94.0 97.0 96.0 96.0 97.0 98.5 97.0

BAROMETRIC PRES: 29.86

Chambers County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 75.3 74.8 78.4 82.6 86.3 89.0 91.3 93.4 94.5 95.1 94.6 93.1 90.6 87.1
84.5 82.3 80.6 79.8 78.8 78.6 78.4 77.5 76.3 75.3

RELATIVE HUMIDITY: 97.7 96.5 92.1 86.2 77.9 67.7 60.9 55.5 50.0 48.4 52.7 63.3 68.6 74.8 81.1
84.8 87.7 91.1 93.8 94.7 95.7 96.3 97.2 97.5

BAROMETRIC PRES: 29.85

Fort Bend County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 75.3 76.1 81.3 85.9 88.3 90.7 93.4 95.8 97.7 99.2 99.5 98.4 94.6 91.0
87.8 85.7 83.8 82.3 80.1 79.0 78.3 77.7 76.5 75.7

RELATIVE HUMIDITY: 95.9 92.4 82.0 74.0 65.4 54.9 48.6 39.3 36.4 33.5 31.8 40.6 55.4 61.5 63.7
67.8 74.3 80.8 85.9 87.6 86.9 89.0 92.3 95.1

BAROMETRIC PRES: 29.85

Galveston County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 81.2 80.1 81.9 83.9 85.5 87.1 87.5 87.9 88.7 88.8 88.8 88.7 88.1 86.8
86.1 85.3 85.1 84.5 84.3 84.1 84.0 84.0 83.2 82.1

RELATIVE HUMIDITY: 85.7 86.6 80.5 77.9 77.9 73.1 73.2 73.5 73.0 72.0 71.9 71.8 74.7 78.2 79.7
82.6 85.6 84.3 87.6 83.7 84.1 84.5 84.1 83.8

BAROMETRIC PRES: 29.85

Harris County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 77.1 78.1 81.3 84.9 87.8 90.3 92.2 94.1 95.6 96.8 96.5 94.8 92.4 89.4
86.5 84.6 83.2 81.9 80.5 79.6 78.9 78.2 77.7 77.2

RELATIVE HUMIDITY: 94.9 89.1 80.5 72.1 62.4 54.1 47.4 41.8 37.9 39.1 40.9 49.4 60.3 67.2 72.6
76.2 79.4 84.9 89.8 92.4 93.9 94.8 95.8 96.0

BAROMETRIC PRES: 29.83

Liberty County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 72.7 72.8 77.2 81.7 85.1 87.9 90.4 92.7 94.4 95.8 96.4 95.3 93.1 89.2
85.8 83.2 81.1 79.8 77.6 76.8 76.2 75.2 73.6 73.0

RELATIVE HUMIDITY: 94.0 79.0 72.0 57.0 49.0 40.0 33.0 32.0 28.0 26.0 28.0 29.0 42.0 54.0 63.0
72.0 74.0 77.0 88.0 94.0 94.0 96.0 93.0 96.0

BAROMETRIC PRES: 29.61

Montgomery County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 71.0 76.1 80.9 85.2 88.2 91.9 94.9 96.2 98.3 99.6 100.0 99.1 96.1
92.9 88.8 86.4 84.1 82.6 77.9 76.4 75.3 73.5 71.2 70.4

RELATIVE HUMIDITY: 94.0 79.0 72.0 57.0 49.0 40.0 33.0 32.0 28.0 26.0 28.0 29.0 42.0 54.0 63.0
72.0 74.0 77.0 88.0 94.0 94.0 96.0 93.0 96.0

BAROMETRIC PRES: 29.61

Waller County

SUNRISE/SUNSET : 7 8

HOURLY TEMPERATURES: 79.7 79.8 79.0 85.9 89.7 93.6 95.8 97.2 99.2 101.9 102.5 102.1 100.9
96.4 91.7 89.0 86.8 84.9 82.5 81.4 80.8 80.6 80.8 80.3

RELATIVE HUMIDITY: 96.0 85.0 72.0 59.0 49.0 46.0 40.0 34.0 30.0 32.0 32.0 35.0 57.0 65.0 68.0
77.0 77.0 85.0 96.0 96.0 100.0 100.0 100.0 100.0

BAROMETRIC PRES: 29.72

Wednesday, August 30
Eight-County Houston/Galveston Nonattainment Area

Brazoria County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 76.5 79.7 83.4 86.5 89.7 92.8 95.7 97.9 99.4 98.2 95.2 91.9 88.7 85.9
84.4 82.7 80.9 79.1 76.9 76.3 75.3 74.2 75.4 75.2

RELATIVE HUMIDITY: 97.0 87.5 75.0 63.5 51.5 40.0 37.0 33.5 30.0 38.0 52.0 59.5 68.5 76.0 79.5
85.0 87.5 92.0 97.0 95.5 98.5 98.0 98.5 98.5

BAROMETRIC PRES: 29.81

Chambers County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 75.5 75.8 78.9 83.1 86.7 90.2 93.3 96.2 98.6 100.2 100.3 99.5 97.1
91.7 87.9 84.9 83.5 83.2 79.2 78.8 78.2 78.1 77.8 76.8

RELATIVE HUMIDITY: 97.8 97.1 92.3 85.8 74.1 63.1 52.6 45.9 40.4 36.7 35.1 35.1 43.0 64.4 78.3
85.0 87.6 85.1 92.9 94.0 95.7 96.5 96.6 97.0

BAROMETRIC PRES: 29.79

Fort Bend County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 76.7 77.2 80.0 83.1 86.9 90.1 93.9 97.7 100.3 101.8 102.5 103.3
101.8 98.3 93.2 90.1 87.9 86.1 81.0 80.2 79.3 78.2 77.8 77.3

RELATIVE HUMIDITY: 93.9 92.7 85.3 78.4 63.8 54.1 40.1 33.1 26.3 22.5 21.2 21.1 22.0 39.6 60.2
64.6 67.0 62.9 84.9 87.1 86.9 88.3 89.5 91.9

BAROMETRIC PRES: 29.79

Galveston County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 78.7 78.2 78.9 81.1 84.4 87.7 90.5 92.2 92.4 92.9 92.7 92.1 90.5 88.1
86.4 85.7 84.9 84.3 83.9 82.7 82.1 81.1 80.0 79.6

RELATIVE HUMIDITY: 97.3 97.8 94.3 90.0 81.0 67.7 59.3 57.5 67.3 71.7 73.5 74.4 80.5 85.6 88.7
90.5 91.8 92.5 86.8 86.2 89.0 92.5 96.4 96.2

BAROMETRIC PRES: 29.79

Harris County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 78.2 78.8 80.8 83.9 87.4 90.6 93.8 96.6 98.6 100.3 101.0 100.5 98.5
94.5 90.4 88.0 86.4 85.2 80.7 80.0 79.2 78.5 78.1 78.0

RELATIVE HUMIDITY: 93.7 90.4 82.0 71.2 59.5 50.1 40.0 34.3 30.1 27.3 26.9 30.4 36.5 51.6 66.9
72.1 73.6 71.6 88.7 90.8 92.6 94.8 94.2 95.2

BAROMETRIC PRES: 29.77

Liberty County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 74.8 75.0 77.8 81.5 85.4 89.0 92.5 95.7 98.1 100.0 100.8 100.5 98.8
93.8 88.9 86.6 84.9 83.7 79.3 78.7 77.8 76.5 75.8 75.4

RELATIVE HUMIDITY: 87.0 82.0 61.0 53.0 43.0 32.0 27.0 23.0 23.0 22.0 21.0 22.0 36.0 45.0 42.0
57.0 61.0 61.0 77.0 82.0 87.0 88.0 91.0 88.0

BAROMETRIC PRES: 29.56

Montgomery County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 76.8 78.2 82.0 85.6 88.7 92.7 96.2 99.5 100.7 102.2 102.8 102.5 97.2
92.9 91.5 87.4 87.1 86.3 82.0 80.2 78.8 77.7 76.6 76.5

RELATIVE HUMIDITY: 87.0 82.0 61.0 53.0 43.0 32.0 27.0 23.0 23.0 22.0 21.0 22.0 36.0 45.0 42.0
57.0 61.0 61.0 77.0 82.0 87.0 88.0 91.0 88.0

BAROMETRIC PRES: 29.56

Waller County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 81.8 81.6 80.3 83.5 89.1 93.7 97.6 100.8 103.5 105.5 105.6 105.7
104.8 100.7 95.8 93.1 91.2 88.6 82.9 81.3 80.5 80.3 79.9 80.2

RELATIVE HUMIDITY: 94.0 88.0 74.0 57.0 46.0 37.0 27.0 26.0 23.0 22.0 23.0 26.0 30.0 41.0 63.0
65.0 63.0 60.0 88.0 94.0 97.0 100.0 97.0 100.0

BAROMETRIC PRES: 29.67

Thursday, August 31
Eight-County Houston/Galveston Nonattainment Area

Brazoria County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 77.4 80.2 84.4 89.2 92.5 96.3 99.3 100.9 102.0 102.4 100.9 97.6 92.9
89.2 86.5 84.0 82.6 80.9 78.8 77.8 77.4 76.8 76.3 76.0

RELATIVE HUMIDITY: 93.0 82.0 58.5 46.5 39.5 30.5 27.0 26.5 26.0 27.0 33.5 40.5 46.5 59.0 64.0
66.0 69.5 73.5 90.0 93.0 95.0 97.0 97.0 98.5

BAROMETRIC PRES: 29.74

Chambers County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 78.3 78.5 81.9 86.2 90.9 95.4 98.9 101.2 103.3 104.1 104.0 103.1
100.4 95.1 92.0 90.0 88.6 87.1 82.2 79.9 79.5 79.9 79.5 78.3

RELATIVE HUMIDITY: 87.5 86.2 72.0 59.7 52.4 42.8 37.6 44.9 43.2 32.4 32.0 32.0 32.5 35.0 45.8
59.6 61.9 63.4 85.1 82.6 82.2 81.6 83.3 84.8

BAROMETRIC PRES: 29.73

Fort Bend County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 78.0 78.0 80.9 85.4 90.2 95.2 99.7 102.5 103.7 104.9 105.7 105.8
104.1 101.2 97.9 94.7 91.4 88.7 84.3 82.7 81.5 80.3 79.6 78.9

RELATIVE HUMIDITY: 84.2 83.1 67.3 54.4 41.7 31.7 26.1 23.6 22.6 21.9 21.2 21.1 22.0 24.2 29.1
42.7 45.3 48.1 66.2 73.0 73.7 79.0 80.1 80.9

BAROMETRIC PRES: 29.73

Galveston County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 79.1 78.6 79.1 82.3 86.2 90.8 94.7 97.2 97.2 96.7 96.0 95.0 93.5 91.2
89.4 88.5 87.9 86.5 83.5 81.8 80.9 81.3 80.4 79.8

RELATIVE HUMIDITY: 99.3 98.6 92.3 81.3 67.6 53.7 42.1 40.7 60.9 67.4 66.7 71.3 78.5 82.4 82.6
71.2 72.1 76.1 88.5 90.7 93.4 95.5 97.7 98.3

BAROMETRIC PRES: 29.73

Harris County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 78.9 79.8 83.0 87.0 91.7 95.9 99.3 101.6 103.1 104.0 104.2 103.8
101.8 98.5 95.3 92.8 90.7 88.5 83.8 82.8 81.8 80.9 80.4 79.7

RELATIVE HUMIDITY: 83.1 75.9 60.8 49.6 38.6 32.3 28.4 26.8 25.5 24.9 24.8 25.5 30.2 37.7 42.7
50.3 53.3 55.8 73.2 73.5 75.5 77.6 79.1 81.0

BAROMETRIC PRES: 29.71

Liberty County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 76.0 76.4 80.6 85.8 91.2 95.6 98.6 100.9 102.7 103.5 103.9 103.8
101.6 96.5 91.6 90.0 88.4 86.5 82.4 81.2 80.1 79.4 78.2 76.8

RELATIVE HUMIDITY: 79.0 46.0 39.0 31.0 29.0 24.0 22.0 24.0 21.0 22.0 20.0 22.0 36.0 46.0 41.0
46.0 56.0 46.0 59.0 57.0 65.0 74.0 76.0 79.0

BAROMETRIC PRES: 29.50

Montgomery County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 74.7 81.3 86.6 92.0 96.6 100.3 102.7 102.7 104.7 104.4 104.5 103.8
98.6 93.8 91.4 89.8 86.8 88.8 84.6 83.5 80.5 78.0 76.1 74.4

RELATIVE HUMIDITY: 79.0 46.0 39.0 31.0 29.0 24.0 22.0 24.0 21.0 22.0 20.0 22.0 36.0 46.0 41.0
46.0 56.0 46.0 59.0 57.0 65.0 74.0 76.0 79.0

BAROMETRIC PRES: 29.50

Waller County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 76.2 76.6 81.5 89.4 95.3 99.7 102.5 105.1 107.4 107.9 108.1 108.5
107.3 103.8 99.0 94.9 92.3 89.2 85.8 83.2 81.2 80.2 78.7 77.3

RELATIVE HUMIDITY: 77.1 69.5 53.9 40.7 27.0 24.0 23.0 23.0 21.0 21.0 21.0 23.0 36.0 50.0 43.0
48.0 55.0 59.0 67.0 72.0 77.0 79.0 72.0 75.2

BAROMETRIC PRES: 29.61

Friday, September 1
Eight-County Houston/Galveston Nonattainment Area

Brazoria County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 77.0 80.3 84.4 88.4 91.4 94.7 96.9 98.4 98.0 97.7 96.1 93.3 89.5 86.7
86.3 83.7 83.2 82.1 79.9 79.2 78.4 77.8 77.4 76.8

RELATIVE HUMIDITY: 93.0 85.0 70.0 60.0 50.0 42.0 40.0 37.5 42.0 41.5 45.5 49.5 55.5 63.5 64.0
72.5 76.0 83.5 78.5 82.0 85.0 89.0 90.5 92.5

BAROMETRIC PRES: 29.78

Chambers County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 77.7 78.5 82.6 86.1 90.8 94.2 96.7 99.6 101.5 102.9 104.0 95.0 87.2
84.6 82.7 81.8 80.8 81.1 84.0 82.3 80.9 79.0 77.3 76.5

RELATIVE HUMIDITY: 80.9 85.0 80.0 70.5 62.5 58.7 51.2 45.0 41.4 37.7 36.7 38.0 50.3 61.3 64.8
63.1 65.1 67.2 63.9 64.8 66.7 69.1 71.7 75.8

BAROMETRIC PRES: 29.77

Fort Bend County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 79.8 80.0 82.2 85.5 89.0 92.9 96.6 100.0 102.2 102.8 102.6 103.6
99.2 88.4 84.7 84.0 84.1 82.7 86.5 84.9 83.7 82.5 81.4 80.3

RELATIVE HUMIDITY: 77.1 78.9 71.8 63.6 52.4 43.9 39.2 33.0 30.4 27.0 28.1 25.0 32.5 53.0 62.8
80.4 69.6 65.9 50.8 53.8 57.2 60.6 63.6 69.3

BAROMETRIC PRES: 29.76

Galveston County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 81.5 80.4 81.0 83.1 85.8 88.9 91.2 92.7 92.0 91.5 91.3 91.6 91.8 90.4
89.5 89.3 88.3 86.4 85.4 84.2 82.8 81.7 81.1 81.8

RELATIVE HUMIDITY: 91.8 93.6 94.9 87.8 77.1 69.1 72.6 81.7 80.2 76.1 79.8 78.7 81.3 85.8 85.2
82.3 87.1 89.2 80.2 82.8 82.2 88.1 89.8 87.9

BAROMETRIC PRES: 29.76

Harris County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 80.6 81.2 83.6 87.0 90.4 93.6 96.9 99.8 101.9 103.0 101.8 99.8 91.0
86.8 86.1 85.7 84.8 83.8 86.6 85.3 83.7 82.5 81.5 80.7

RELATIVE HUMIDITY: 74.0 71.5 63.8 56.1 48.7 43.0 38.0 33.4 30.9 31.0 37.8 46.1 57.8 63.6 69.0
68.5 69.9 73.8 59.3 61.2 63.2 66.5 68.6 71.8

BAROMETRIC PRES: 29.74

Liberty County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 77.6 78.1 81.9 86.2 90.2 93.9 96.8 99.3 101.1 101.8 101.3 90.0 85.4
85.1 82.6 81.4 80.8 80.2 84.5 82.5 82.1 80.2 78.4 76.9

RELATIVE HUMIDITY: 71.0 50.0 42.0 37.0 32.0 27.0 23.0 23.0 24.0 22.0 50.0 43.0 50.0 57.0 60.0
61.0 71.0 64.0 51.0 64.0 69.0 71.0 74.0 77.0

BAROMETRIC PRES: 29.53

Montgomery County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 78.7 83.2 87.4 92.2 96.2 100.0 102.8 104.1 104.7 104.5 96.3 90.1
87.9 86.1 84.1 82.3 80.0 80.4 87.1 83.1 81.4 79.4 77.9 76.9

RELATIVE HUMIDITY: 71.0 50.0 42.0 37.0 32.0 27.0 23.0 23.0 24.0 22.0 50.0 43.0 50.0 57.0 60.0
61.0 71.0 64.0 51.0 64.0 69.0 71.0 74.0 77.0

BAROMETRIC PRES: 29.53

Waller County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 79.7 78.8 83.2 89.9 95.2 98.7 102.4 104.3 106.4 107.8 107.4 104.6
88.0 86.6 87.5 88.2 86.7 85.1 86.9 85.6 83.8 81.9 81.2 80.8

RELATIVE HUMIDITY: 71.0 61.0 48.0 37.0 36.0 30.0 29.0 25.0 25.0 29.0 55.0 67.0 76.0 72.0 82.0
72.0 82.0 82.0 69.0 67.0 67.0 67.0 67.0 71.0

BAROMETRIC PRES: 29.64

Saturday, September 2
Eight-County Houston/Galveston Nonattainment Area

Brazoria County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 79.1 81.8 85.3 88.7 92.4 94.8 97.9 99.1 99.2 98.1 96.9 92.9 89.4 86.3 84.4 83.7 82.9 81.7 83.0 81.6 80.3 80.4 79.2 78.6

RELATIVE HUMIDITY: 95.0 88.0 67.0 57.5 47.0 44.0 35.0 33.5 39.0 38.0 39.5 51.5 58.5 66.5 73.5 76.0 78.0 83.5 85.0 89.5 93.5 93.5 94.0 97.0

BAROMETRIC PRES: 29.77

Chambers County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 79.0 79.1 83.3 86.3 89.4 92.8 95.8 98.2 100.4 101.2 99.9 97.0 94.6 91.8 89.8 88.2 86.8 85.5 82.0 81.9 81.7 81.9 80.2 79.2

RELATIVE HUMIDITY: 96.8 96.9 93.1 81.8 70.6 59.0 50.3 45.3 41.7 39.1 37.8 40.1 47.6 57.0 63.8 65.0 68.2 75.3 74.0 83.8 86.2 92.8 94.8 95.9

BAROMETRIC PRES: 29.75

Fort Bend County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 81.1 81.1 82.3 85.6 89.5 93.1 96.6 99.6 101.7 103.2 103.6 103.9 102.3 99.5 94.8 91.1 88.7 86.7 82.0 81.2 81.8 82.0 81.7 81.4

RELATIVE HUMIDITY: 89.3 89.1 84.5 68.3 53.6 44.8 36.5 32.6 30.2 26.4 25.9 25.7 26.4 32.1 48.7 52.0 57.6 64.2 71.2 71.9 74.9 79.7 84.4 88.2

BAROMETRIC PRES: 29.75

Galveston County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 82.6 82.5 83.2 84.3 86.9 89.4 91.7 93.0 93.4 92.6 91.8 90.8 89.8 88.3 86.9 85.9 85.1 84.5 85.7 85.5 84.8 83.3 82.3 82.9

RELATIVE HUMIDITY: 95.7 95.4 90.3 87.4 76.9 64.5 64.9 76.6 79.3 76.7 73.0 77.0 80.2 83.1 84.6 86.1 87.3 85.6 89.9 88.1 91.0 94.5 95.7 95.6

BAROMETRIC PRES: 29.75

Harris County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 80.7 81.3 83.5 86.5 89.6 93.2 96.2 98.7 100.3 101.3 100.6 99.8 97.2
94.5 91.3 89.0 87.3 85.8 83.6 83.0 82.5 81.8 81.3 80.8

RELATIVE HUMIDITY: 92.4 88.7 80.7 68.1 57.1 47.8 40.5 35.7 34.0 31.9 36.5 39.5 47.5 49.6 59.4
63.8 65.1 70.4 79.1 83.7 83.8 86.1 89.3 92.4

BAROMETRIC PRES: 29.73

Liberty County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 77.4 77.2 81.2 84.7 87.3 91.2 95.2 97.7 99.7 100.9 101.0 98.4 96.2
92.1 86.7 85.2 84.3 84.2 80.8 80.7 79.9 79.9 79.2 77.8

RELATIVE HUMIDITY: 82.0 72.0 67.0 61.0 49.0 35.0 31.0 26.0 25.0 25.0 24.0 29.0 37.0 50.0 55.0
46.0 50.0 58.0 64.0 67.0 71.0 67.0 72.0 82.0

BAROMETRIC PRES: 29.52

Montgomery County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 77.4 80.2 82.1 84.8 88.9 95.1 99.1 101.2 103.3 103.9 103.7 101.8
97.9 91.7 88.5 88.5 87.1 84.4 80.2 80.1 79.3 80.6 79.8 77.3

RELATIVE HUMIDITY: 82.0 72.0 67.0 61.0 49.0 35.0 31.0 26.0 25.0 25.0 24.0 29.0 37.0 50.0 55.0
46.0 50.0 58.0 64.0 67.0 71.0 67.0 72.0 82.0

BAROMETRIC PRES: 29.52

Waller County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 80.3 80.7 84.0 86.9 91.5 96.1 99.9 102.3 104.5 106.2 107.0 104.6
100.0 96.7 91.6 88.7 87.6 86.3 83.5 85.3 84.1 82.5 81.2 81.1

RELATIVE HUMIDITY: 90.0 79.0 72.0 58.0 48.0 38.0 33.0 30.0 30.0 30.0 35.0 49.0 49.0 48.0 46.0
55.0 61.0 65.0 79.0 85.0 72.0 77.0 82.0 90.0

BAROMETRIC PRES: 29.63

Sunday, September 3
Eight-County Houston/Galveston Nonattainment Area

Brazoria County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 78.4 81.0 84.8 88.9 92.3 95.3 97.7 99.4 101.8 101.2 99.6 96.0 92.3
89.1 86.9 84.9 83.8 82.3 79.8 79.9 79.8 78.5 78.4 78.2

RELATIVE HUMIDITY: 94.0 80.5 58.5 44.5 39.0 35.5 33.0 30.0 28.5 29.5 37.0 41.5 47.0 56.5 60.5
66.5 69.0 71.5 90.5 91.0 90.0 95.5 95.5 95.5

BAROMETRIC PRES: 29.73

Chambers County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 79.2 79.9 83.1 86.6 90.3 93.6 96.6 99.1 101.3 103.1 103.9 102.7
100.4 95.3 90.1 89.3 88.9 87.9 84.2 82.9 82.5 82.2 81.2 80.3

RELATIVE HUMIDITY: 89.5 86.6 78.3 65.3 53.7 49.0 43.4 40.6 38.2 36.1 34.6 33.4 33.9 35.7 40.8
57.3 63.0 64.2 83.0 89.5 92.1 93.0 93.4 91.7

BAROMETRIC PRES: 29.71

Fort Bend County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 79.6 79.7 81.8 85.6 89.9 93.8 97.2 100.6 102.4 104.1 105.6 105.5
104.0 101.2 98.0 95.3 91.9 89.0 85.1 84.1 83.1 82.1 81.2 80.3

RELATIVE HUMIDITY: 83.0 78.2 69.7 52.5 38.0 33.2 29.9 28.0 26.7 25.3 23.9 23.3 23.2 25.2 33.6
42.1 44.0 44.7 70.1 73.4 77.8 81.5 82.7 83.0

BAROMETRIC PRES: 29.71

Galveston County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 80.7 80.3 80.4 83.1 86.2 89.3 92.3 94.2 95.0 95.0 94.2 93.5 92.1 90.9
88.9 86.2 85.0 85.1 83.6 82.8 82.0 81.5 81.8 81.3

RELATIVE HUMIDITY: 97.4 97.1 93.3 80.8 64.5 54.2 48.3 60.5 72.3 76.3 76.9 74.4 75.4 77.2 78.8
79.3 79.9 81.2 89.4 89.7 90.5 92.0 94.2 95.7

BAROMETRIC PRES: 29.71

Harris County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 80.4 80.9 83.2 86.5 90.3 93.6 96.8 99.7 101.6 102.7 103.5 103.3
101.5 99.0 95.4 92.7 90.5 88.9 84.4 83.3 82.4 81.9 81.4 80.8

RELATIVE HUMIDITY: 86.5 77.9 65.6 54.2 43.9 39.4 35.4 31.8 30.0 29.3 27.4 26.8 31.3 38.3 47.5
57.0 58.2 58.9 75.1 79.9 83.3 86.0 86.2 87.3

BAROMETRIC PRES: 29.69

Liberty County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 77.1 77.5 81.2 85.7 89.7 93.1 96.2 98.8 100.3 102.0 103.1 102.7 99.3
94.2 89.7 87.9 86.2 84.5 83.2 81.8 81.2 80.3 79.0 77.7

RELATIVE HUMIDITY: 69.0 55.0 45.0 39.0 34.0 29.0 27.0 25.5 24.0 21.0 22.0 24.0 29.0 40.0 43.0
46.0 58.0 62.0 59.0 65.0 69.0 74.0 72.0 74.0

BAROMETRIC PRES: 29.48

Montgomery County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 78.6 81.9 86.3 91.4 95.2 98.8 101.0 101.7 103.2 105.2 104.9 103.5
100.9 95.9 92.4 90.5 86.0 83.3 83.9 82.6 80.9 79.8 79.0 77.9

RELATIVE HUMIDITY: 69.0 55.0 45.0 39.0 34.0 29.0 27.0 25.5 24.0 21.0 22.0 24.0 29.0 40.0 43.0
46.0 58.0 62.0 59.0 65.0 69.0 74.0 72.0 74.0

BAROMETRIC PRES: 29.48

Waller County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 79.0 78.9 82.9 87.8 93.0 96.8 100.4 103.0 105.4 107.3 106.3 106.5
104.2 98.7 94.9 91.8 90.5 89.4 85.6 84.1 82.7 81.4 81.0 80.0

RELATIVE HUMIDITY: 88.0 69.0 50.0 43.0 35.0 33.0 32.0 26.0 25.0 27.0 25.0 27.0 35.0 42.0 53.0
59.0 51.0 61.0 69.0 74.0 79.0 82.0 85.0 88.0

BAROMETRIC PRES: 29.59

Monday, September 4
Eight-County Houston/Galveston Nonattainment Area

Brazoria County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 78.8 82.3 86.9 92.0 96.3 100.0 103.3 104.9 105.5 103.1 101.5 97.2
91.9 87.6 84.4 83.0 80.7 80.2 81.0 80.8 79.7 78.9 78.9 78.3

RELATIVE HUMIDITY: 85.0 68.5 50.5 40.0 33.5 29.5 25.5 23.5 25.5 28.0 29.0 43.5 56.0 67.0 73.5
77.5 83.0 86.0 79.5 82.5 86.0 91.0 88.0 88.0

BAROMETRIC PRES: 29.73

Chambers County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 80.3 80.5 83.5 88.4 93.7 98.3 101.1 103.5 105.5 105.8 105.4 102.1
96.5 92.8 90.0 87.9 86.2 84.2 86.1 82.7 81.5 81.1 79.0 80.7

RELATIVE HUMIDITY: 78.8 75.6 67.3 56.4 47.9 42.9 37.6 33.1 29.9 29.6 30.9 33.1 38.7 45.1 52.9
59.2 63.4 66.6 62.8 62.8 69.5 78.5 84.3 83.4

BAROMETRIC PRES: 29.72

Fort Bend County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 79.3 79.2 82.3 87.7 92.8 97.7 101.6 105.3 107.3 108.6 108.6 107.6
104.8 101.3 97.1 93.5 90.9 89.0 86.7 84.8 83.7 82.3 81.2 80.1

RELATIVE HUMIDITY: 76.7 75.0 63.4 49.2 38.2 30.4 26.4 21.4 20.1 16.9 18.0 20.0 22.9 27.0 35.9
42.7 48.7 53.0 50.3 55.8 59.5 66.3 71.0 75.0

BAROMETRIC PRES: 29.71

Galveston County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 78.6 78.5 80.1 83.8 88.4 92.8 95.6 97.5 96.0 96.7 96.7 95.1 92.9 90.9
89.4 89.0 88.0 86.6 84.3 83.9 83.0 81.6 80.5 79.6

RELATIVE HUMIDITY: 96.2 93.3 86.3 75.6 62.7 51.8 44.6 37.8 63.0 68.6 70.1 78.0 82.7 87.8 86.9
86.5 87.5 90.3 82.8 87.4 90.4 91.2 94.5 96.6

BAROMETRIC PRES: 29.71

Harris County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 80.8 81.6 84.9 89.7 94.4 98.8 102.1 104.2 105.6 105.8 105.6 104.0
100.8 97.2 94.1 91.2 89.1 87.4 87.5 85.7 83.9 82.2 81.3 80.8

RELATIVE HUMIDITY: 76.3 67.6 55.5 44.6 36.2 30.7 27.2 24.0 22.5 23.1 24.1 27.3 33.3 40.8 46.6
52.3 57.7 62.1 60.4 64.6 70.6 74.9 76.1 77.3

BAROMETRIC PRES: 29.69

Liberty County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 77.6 77.1 80.7 87.4 92.9 97.2 100.4 102.8 104.6 104.8 104.9 103.2
98.8 94.8 90.6 88.1 85.7 83.5 82.6 81.0 81.4 79.9 78.1 77.9

RELATIVE HUMIDITY: 79.0 53.0 35.0 29.0 24.0 19.0 19.0 19.0 18.0 19.0 19.0 21.0 29.0 43.0 45.0
53.0 55.0 58.0 71.0 67.0 76.0 79.0 81.0 84.0

BAROMETRIC PRES: 29.49

Montgomery County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 76.0 81.5 88.6 95.7 100.6 103.7 106.1 107.6 108.0 107.9 107.8 106.7
102.2 96.1 92.4 88.8 86.4 84.5 80.2 81.2 79.9 78.1 75.9 75.0

RELATIVE HUMIDITY: 79.0 53.0 35.0 29.0 24.0 19.0 19.0 19.0 18.0 19.0 19.0 21.0 29.0 43.0 45.0
53.0 55.0 58.0 71.0 67.0 76.0 79.0 81.0 84.0

BAROMETRIC PRES: 29.49

Waller County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 78.2 78.1 82.9 91.5 98.4 103.5 107.0 108.8 110.8 111.5 111.0 110.1
107.8 104.0 99.1 96.1 93.1 89.4 88.4 85.5 84.5 82.1 81.1 79.6

RELATIVE HUMIDITY: 82.0 61.0 40.0 30.0 24.0 21.0 21.0 19.0 18.0 21.0 21.0 24.0 31.0 45.0 48.0
53.0 62.0 67.0 63.0 69.0 71.0 74.0 74.0 79.0

BAROMETRIC PRES: 29.59

Tuesday, September 5
Eight-County Houston/Galveston Nonattainment Area

Brazoria County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 77.9 80.4 83.3 93.5 97.2 101.5 103.3 103.7 102.0 100.5 94.4 89.5
85.7 84.1 82.3 80.9 79.9 79.9 78.8 79.0 77.9 78.1 77.7 76.5

RELATIVE HUMIDITY: 96.0 71.1 62.2 34.0 31.0 27.0 27.0 26.5 32.5 35.0 57.0 72.0 72.0 74.5 81.0
87.5 89.0 77.5 89.5 90.5 92.5 92.5 94.0 95.0

BAROMETRIC PRES: 29.74

Chambers County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 75.3 76.1 82.1 88.3 94.4 98.5 101.2 102.9 104.2 102.3 90.4 96.9 97.7
92.6 87.3 85.4 83.2 81.3 81.9 80.3 78.7 77.7 77.2 76.2

RELATIVE HUMIDITY: 77.9 80.0 72.1 59.8 52.1 39.5 36.1 35.0 34.9 34.7 45.4 50.2 48.4 57.6 62.9
62.0 52.1 50.0 69.1 71.5 74.0 74.6 74.4 75.1

BAROMETRIC PRES: 29.74

Fort Bend County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 81.3 81.4 85.5 91.1 96.6 101.1 103.4 105.1 106.1 106.5 103.6 100.1
99.3 94.6 91.5 89.0 87.6 88.0 87.2 85.6 84.1 83.3 82.5 81.9

RELATIVE HUMIDITY: 66.4 65.5 58.5 44.0 32.2 25.9 24.7 24.2 23.5 22.6 24.9 33.0 34.7 42.4 46.9
53.1 52.3 34.9 58.5 60.6 64.8 65.3 66.8 68.6

BAROMETRIC PRES: 29.72

Galveston County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 81.6 81.9 84.5 88.0 89.8 91.2 93.6 96.4 98.8 100.4 100.1 95.6 93.9
93.3 90.8 88.2 87.3 87.1 86.2 85.1 84.0 83.1 82.4 82.0

RELATIVE HUMIDITY: 82.7 77.0 68.2 62.1 68.5 54.8 45.4 42.0 34.8 33.2 43.9 62.3 60.9 62.1 71.6
74.5 76.7 72.9 92.9 92.3 92.8 87.0 89.4 88.1

BAROMETRIC PRES: 29.72

Harris County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 80.9 81.9 85.9 90.6 95.0 98.9 101.4 103.0 103.9 103.7 99.2 98.1 97.6 94.8 92.1 90.4 89.2 88.1 85.9 84.4 83.2 82.1 81.6 81.2

RELATIVE HUMIDITY: 78.4 70.2 58.5 46.4 36.9 30.9 28.2 27.3 27.6 31.1 34.2 38.7 40.5 45.8 49.0 48.9 46.6 43.2 68.3 70.7 73.3 74.6 76.1 77.7

BAROMETRIC PRES: 29.71

Liberty County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 75.6 76.2 81.8 88.7 94.1 97.7 99.7 101.3 102.4 101.2 97.7 100.0 98.8 95.1 90.7 88.3 86.4 84.2 81.5 80.0 78.5 77.6 76.9 76.1

RELATIVE HUMIDITY: 76.0 51.0 38.0 30.0 24.0 25.0 23.0 28.0 27.0 27.0 28.0 26.0 29.0 35.0 39.0 43.0 45.0 44.0 67.0 69.0 74.0 76.0 81.0 81.0

BAROMETRIC PRES: 29.51

Montgomery County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 75.3 81.3 88.2 95.0 99.8 102.2 104.0 103.3 103.8 103.7 102.3 101.6 98.7 94.8 91.8 88.9 87.4 85.4 80.8 79.3 77.3 76.1 75.1 74.6

RELATIVE HUMIDITY: 76.0 51.0 38.0 30.0 24.0 25.0 23.0 28.0 27.0 27.0 28.0 26.0 29.0 35.0 39.0 43.0 45.0 44.0 67.0 69.0 74.0 76.0 81.0 81.0

BAROMETRIC PRES: 29.51

Waller County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 77.8 78.2 84.8 93.2 99.9 103.4 105.4 107.0 107.7 107.1 106.9 105.4 104.8 101.9 97.9 96.0 93.8 91.1 87.0 83.6 81.4 80.4 79.2 78.3

RELATIVE HUMIDITY: 85.0 63.0 46.0 30.0 25.0 25.0 24.0 23.0 25.0 26.0 29.0 30.0 35.0 36.0 37.0 41.0 43.0 42.0 79.0 74.0 77.0 82.0 84.0 84.0

BAROMETRIC PRES: 29.61

Wednesday, September 6
Eight-County Houston/Galveston Nonattainment Area

Brazoria County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 73.7 75.7 78.1 81.1 83.4 86.2 88.2 89.8 90.4 89.8 88.7 87.2 84.3 82.6
82.2 80.3 78.2 77.4 79.9 80.6 79.5 77.2 75.8 74.1

RELATIVE HUMIDITY: 73.5 67.5 67.0 60.5 58.0 54.0 50.5 48.5 50.0 51.5 54.5 58.5 68.5 75.5 76.5
83.0 89.5 92.5 71.5 61.5 63.0 66.5 69.0 73.5

BAROMETRIC PRES: 29.75

Chambers County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 69.3 69.1 72.2 76.5 80.6 84.4 87.6 90.2 91.7 92.6 92.7 90.6 88.4 86.1
84.5 83.5 81.1 78.8 81.2 78.6 78.0 75.3 71.7 70.7

RELATIVE HUMIDITY: 76.2 81.1 81.7 78.2 72.8 68.8 64.8 60.6 57.7 54.1 53.3 56.6 58.4 62.8 71.1
79.6 82.7 84.7 48.5 51.7 56.1 58.9 65.9 70.8

BAROMETRIC PRES: 29.75

Fort Bend County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 76.6 75.6 76.5 78.5 81.8 85.1 88.0 90.4 92.4 94.0 95.0 94.8 93.5 91.4
88.5 85.6 83.6 82.1 86.6 86.0 84.6 82.9 80.7 78.3

RELATIVE HUMIDITY: 59.8 64.8 67.0 64.5 59.3 54.5 50.0 46.8 42.6 36.8 35.4 36.2 40.5 47.1 53.2
66.3 73.8 76.9 34.1 34.3 38.1 43.0 49.5 53.8

BAROMETRIC PRES: 29.74

Galveston County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 77.4 76.3 75.8 76.3 77.6 79.5 82.2 83.9 84.7 85.2 85.7 85.9 85.7 85.1
84.8 84.7 84.2 83.8 88.2 88.1 86.2 83.5 80.8 78.9

RELATIVE HUMIDITY: 77.3 80.8 82.0 81.0 79.2 79.0 76.1 74.8 76.6 76.1 74.0 74.8 76.5 78.3 79.1
79.3 79.2 81.7 57.6 54.5 57.6 61.2 67.5 73.2

BAROMETRIC PRES: 29.74

Harris County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 74.5 74.0 75.2 77.6 80.7 83.7 86.5 89.2 91.0 92.2 92.5 91.7 90.5 88.3 86.5 84.8 83.4 82.3 86.8 84.8 82.6 80.2 77.9 75.9

RELATIVE HUMIDITY: 69.9 71.4 69.9 66.1 60.9 56.5 52.0 46.9 44.7 42.6 42.6 44.1 47.6 56.2 63.3 72.4 76.9 79.8 42.4 44.8 49.2 54.6 60.1 65.7

BAROMETRIC PRES: 29.73

Liberty County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 69.4 69.1 72.2 76.0 79.7 83.1 86.4 89.3 91.0 91.9 92.5 92.3 89.8 87.4 84.9 83.3 81.9 80.5 83.3 80.8 78.4 75.5 72.9 71.0

RELATIVE HUMIDITY: 76.0 67.0 62.0 55.0 51.0 44.0 37.0 34.0 36.0 34.0 35.0 33.0 38.0 51.0 48.0 51.0 56.0 66.0 41.0 44.0 52.0 62.0 73.0 78.0

BAROMETRIC PRES: 29.53

Montgomery County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 70.5 72.7 75.9 79.7 82.9 86.5 89.4 93.1 93.5 94.4 93.5 93.3 91.6 87.3 86.6 84.5 82.4 79.6 83.8 81.9 79.0 75.7 71.9 69.4

RELATIVE HUMIDITY: 76.0 67.0 62.0 55.0 51.0 44.0 37.0 34.0 36.0 34.0 35.0 33.0 38.0 51.0 48.0 51.0 56.0 66.0 41.0 44.0 52.0 62.0 73.0 78.0

BAROMETRIC PRES: 29.53

Waller County

SUNRISE/SUNSET: 7 8

HOURLY TEMPERATURES: 75.2 74.2 76.9 79.9 83.3 86.8 90.4 93.0 94.8 96.8 97.3 97.3 96.0 93.1 90.2 87.0 86.9 84.3 88.2 87.6 85.1 82.3 79.5 77.2

RELATIVE HUMIDITY: 71.0 69.0 62.0 57.0 50.0 45.0 38.0 34.0 34.0 32.0 36.0 36.0 43.0 58.0 50.0 63.0 74.0 79.0 43.0 45.0 50.0 58.0 62.0 66.0

BAROMETRIC PRES: 29.63

APPENDIX E
MOBILE6 REGISTRATION DISTRIBUTIONS AND
DIESEL FRACTIONS INPUT

Brazoria County Registration Distributions

* Calculated from Mid-Year (July) 2003 Registration data												
* LDV												
1	0.05188	0.08423	0.08577	0.09478	0.08372	0.07391	0.07080	0.06130	0.06506	0.05375	0.05032	
0.03874	0.03629	0.02932	0.02722	0.01940	0.01420	0.01197	0.01020	0.00796	0.00428	0.00327	0.00275	
0.00191	0.01698											
* LDT1												
2	0.04986	0.09227	0.09340	0.08295	0.07223	0.06812	0.06903	0.05397	0.06033	0.06045	0.04474	
0.03674	0.03468	0.03140	0.02978	0.02292	0.01499	0.01623	0.01316	0.01155	0.00643	0.00719	0.00526	
0.00255	0.01977											
* LDT2												
3	0.04986	0.09227	0.09340	0.08295	0.07223	0.06812	0.06903	0.05397	0.06033	0.06045	0.04474	
0.03674	0.03468	0.03140	0.02978	0.02292	0.01499	0.01623	0.01316	0.01155	0.00643	0.00719	0.00526	
0.00255	0.01977											
* LDT3												
4	0.10294	0.13209	0.14142	0.10355	0.12130	0.04514	0.07477	0.05284	0.04478	0.03169	0.02721	
0.02151	0.01897	0.01278	0.01351	0.00951	0.00515	0.00866	0.00739	0.00576	0.00357	0.00436	0.00164	
0.00182	0.00763											
* LDT4												
5	0.10294	0.13209	0.14142	0.10355	0.12130	0.04514	0.07477	0.05284	0.04478	0.03169	0.02721	
0.02151	0.01897	0.01278	0.01351	0.00951	0.00515	0.00866	0.00739	0.00576	0.00357	0.00436	0.00164	
0.00182	0.00763											
* HDV2												
6	0.12549	0.14885	0.14233	0.12668	0.08635	0.05306	0.07035	0.03391	0.04193	0.02309	0.02385	
0.01715	0.01441	0.01259	0.01113	0.01082	0.00656	0.00771	0.00700	0.00749	0.00359	0.00660	0.00448	
0.00310	0.01148											
* HDV3												
7	0.04688	0.07526	0.10778	0.11846	0.12478	0.03849	0.07928	0.04102	0.07687	0.06182	0.04171	
0.03194	0.02631	0.02792	0.01999	0.01666	0.00770	0.00804	0.00965	0.00609	0.00264	0.00437	0.00345	
0.00218	0.02068											
* HDV4												
8	0.06016	0.09553	0.10019	0.14277	0.12434	0.04914	0.08685	0.06397	0.07626	0.03919	0.02881	
0.02288	0.01758	0.01695	0.01440	0.00932	0.00551	0.00360	0.00424	0.00466	0.00212	0.00424	0.00339	
0.00191	0.02203											
* HDV5												
9	0.06186	0.09005	0.10650	0.13665	0.15857	0.04542	0.04307	0.03054	0.04150	0.02819	0.02193	
0.02467	0.02153	0.02075	0.01879	0.02193	0.01684	0.01410	0.01135	0.01175	0.00901	0.00979	0.01096	
0.00783	0.03641											
* HDV6												
10	0.03500	0.05167	0.08642	0.10604	0.11463	0.07886	0.05334	0.04924	0.07334	0.03590	0.04334	
0.02847	0.03398	0.03654	0.02500	0.02090	0.01949	0.01693	0.01641	0.01334	0.00769	0.01244	0.00962	
0.00487	0.02654											
*HDV7												
11	0.04494	0.04805	0.06479	0.08941	0.09897	0.06933	0.06503	0.06240	0.09037	0.04279	0.03514	
0.03705	0.05570	0.04375	0.02606	0.02247	0.01721	0.01387	0.01458	0.01458	0.00669	0.00693	0.00837	
0.00478	0.01673											
*HDV8a												
12	0.02072	0.03495	0.03827	0.05153	0.04808	0.04490	0.03468	0.05001	0.07267	0.06314	0.05982	
0.04615	0.05443	0.05665	0.06148	0.05057	0.03426	0.02404	0.03081	0.02445	0.00746	0.01534	0.01644	
0.01603	0.04311											
*HDV8b												
13	0.05676	0.04757	0.08054	0.09135	0.13243	0.07351	0.06595	0.03676	0.08973	0.06595	0.05568	
0.01892	0.02973	0.02649	0.05405	0.01622	0.01459	0.00865	0.00649	0.00919	0.00162	0.00378	0.00324	
0.00162	0.00919											
* HDBS is MOBILE6 default												
* HDBT is MOBILE6 default												
* MC												
16	0.09538	0.15516	0.12065	0.08832	0.07663	0.05272	0.04212	0.04511	0.02989	0.03478	0.02826	
0.01821	0.01223	0.01114	0.01168	0.01033	0.01196	0.01793	0.01957	0.00815	0.01141	0.01821	0.00978	
0.01332	0.05707											

* Based on TxDOT mid-year 2003 eight-county regional data for HDVs and county registration data otherwise (except where MOBILE6 defaults are used).

Chambers County Registration Distributions

* Calculated from Mid-Year (July) 2003 Registration data												
* LDV												
1	0.03007	0.07901	0.08586	0.09350	0.08983	0.07514	0.07077	0.06184	0.06422	0.05052	0.05141	
0.04238	0.03772	0.02898	0.02998	0.02342	0.01390	0.01310	0.01290	0.01072	0.00586	0.00417	0.00318	
0.00288	0.01866											
* LDT1												
2	0.03771	0.08347	0.09076	0.08410	0.06989	0.07731	0.07379	0.05317	0.05783	0.06336	0.04651	
0.03909	0.03570	0.03206	0.02728	0.02212	0.01471	0.01559	0.01584	0.01320	0.00805	0.00792	0.00679	
0.00289	0.02087											
* LDT2												
3	0.03771	0.08347	0.09076	0.08410	0.06989	0.07731	0.07379	0.05317	0.05783	0.06336	0.04651	
0.03909	0.03570	0.03206	0.02728	0.02212	0.01471	0.01559	0.01584	0.01320	0.00805	0.00792	0.00679	
0.00289	0.02087											
* LDT3												
4	0.07199	0.14752	0.14713	0.11448	0.12589	0.04485	0.07592	0.05389	0.04996	0.03226	0.03344	
0.02242	0.01456	0.00747	0.01101	0.01141	0.00275	0.00826	0.00708	0.00393	0.00275	0.00275	0.00118	
0.00079	0.00629											
* LDT4												
5	0.07199	0.14752	0.14713	0.11448	0.12589	0.04485	0.07592	0.05389	0.04996	0.03226	0.03344	
0.02242	0.01456	0.00747	0.01101	0.01141	0.00275	0.00826	0.00708	0.00393	0.00275	0.00275	0.00118	
0.00079	0.00629											
* HDV2												
6	0.12549	0.14885	0.14233	0.12668	0.08635	0.05306	0.07035	0.03391	0.04193	0.02309	0.02385	
0.01715	0.01441	0.01259	0.01113	0.01082	0.00656	0.00771	0.00700	0.00749	0.00359	0.00660	0.00448	
0.00310	0.01148											
* HDV3												
7	0.04688	0.07526	0.10778	0.11846	0.12478	0.03849	0.07928	0.04102	0.07687	0.06182	0.04171	
0.03194	0.02631	0.02792	0.01999	0.01666	0.00770	0.00804	0.00965	0.00609	0.00264	0.00437	0.00345	
0.00218	0.02068											
* HDV4												
8	0.06016	0.09553	0.10019	0.14277	0.12434	0.04914	0.08685	0.06397	0.07626	0.03919	0.02881	
0.02288	0.01758	0.01695	0.01440	0.00932	0.00551	0.00360	0.00424	0.00466	0.00212	0.00424	0.00339	
0.00191	0.02203											
* HDV5												
9	0.06186	0.09005	0.10650	0.13665	0.15857	0.04542	0.04307	0.03054	0.04150	0.02819	0.02193	
0.02467	0.02153	0.02075	0.01879	0.02193	0.01684	0.01410	0.01135	0.01175	0.00901	0.00979	0.01096	
0.00783	0.03641											
* HDV6												
10	0.03500	0.05167	0.08642	0.10604	0.11463	0.07886	0.05334	0.04924	0.07334	0.03590	0.04334	
0.02847	0.03398	0.03654	0.02500	0.02090	0.01949	0.01693	0.01641	0.01334	0.00769	0.01244	0.00962	
0.00487	0.02654											
*HDV7												
11	0.04494	0.04805	0.06479	0.08941	0.09897	0.06933	0.06503	0.06240	0.09037	0.04279	0.03514	
0.03705	0.05570	0.04375	0.02606	0.02247	0.01721	0.01387	0.01458	0.01458	0.00669	0.00693	0.00837	
0.00478	0.01673											
*HDV8a												
12	0.02072	0.03495	0.03827	0.05153	0.04808	0.04490	0.03468	0.05001	0.07267	0.06314	0.05982	
0.04615	0.05443	0.05665	0.06148	0.05057	0.03426	0.02404	0.03081	0.02445	0.00746	0.01534	0.01644	
0.01603	0.04311											
*HDV8b												
13	0.05676	0.04757	0.08054	0.09135	0.13243	0.07351	0.06595	0.03676	0.08973	0.06595	0.05568	
0.01892	0.02973	0.02649	0.05405	0.01622	0.01459	0.00865	0.00649	0.00919	0.00162	0.00378	0.00324	
0.00162	0.00919											
* HDBS is MOBILE6 default												
* HDBT is MOBILE6 default												
* MC												
16	0.10331	0.14620	0.12865	0.10136	0.10526	0.06823	0.04483	0.04678	0.04678	0.01949	0.02339	
0.02144	0.00780	0.00975	0.01559	0.00390	0.00195	0.00390	0.02144	0.00390	0.01365	0.01365	0.00975	
0.00195	0.03704											

* Based on TxDOT mid-year 2003 eight-county regional data for HDVs and county registration data otherwise (except where MOBILE6 defaults are used).

Fort Bend County Registration Distributions

* Calculated from Mid-Year (July) 2003 Registration data											
* LDV											
1	0.05385	0.09118	0.09778	0.10522	0.08840	0.08148	0.07320	0.06519	0.06567	0.05066	0.04419
0.03615	0.03218	0.02595	0.01916	0.01451	0.01058	0.00859	0.00731	0.00584	0.00331	0.00272	0.00191
0.00142	0.01356										
* LDT1											
2	0.05109	0.11488	0.10739	0.09946	0.07885	0.07648	0.06841	0.05099	0.05490	0.05317	0.03997
0.03148	0.02668	0.02425	0.02092	0.01702	0.01241	0.01208	0.01109	0.01028	0.00487	0.00664	0.00494
0.00239	0.01935										
* LDT2											
3	0.05109	0.11488	0.10739	0.09946	0.07885	0.07648	0.06841	0.05099	0.05490	0.05317	0.03997
0.03148	0.02668	0.02425	0.02092	0.01702	0.01241	0.01208	0.01109	0.01028	0.00487	0.00664	0.00494
0.00239	0.01935										
* LDT3											
4	0.14406	0.16356	0.16117	0.10330	0.12199	0.04391	0.06342	0.03982	0.03866	0.02126	0.02032
0.01582	0.00934	0.00736	0.00870	0.00666	0.00274	0.00491	0.00566	0.00362	0.00274	0.00292	0.00111
0.00117	0.00578										
* LDT4											
5	0.14406	0.16356	0.16117	0.10330	0.12199	0.04391	0.06342	0.03982	0.03866	0.02126	0.02032
0.01582	0.00934	0.00736	0.00870	0.00666	0.00274	0.00491	0.00566	0.00362	0.00274	0.00292	0.00111
0.00117	0.00578										
* HDV2											
6	0.12549	0.14885	0.14233	0.12668	0.08635	0.05306	0.07035	0.03391	0.04193	0.02309	0.02385
0.01715	0.01441	0.01259	0.01113	0.01082	0.00656	0.00771	0.00700	0.00749	0.00359	0.00660	0.00448
0.00310	0.01148										
* HDV3											
7	0.04688	0.07526	0.10778	0.11846	0.12478	0.03849	0.07928	0.04102	0.07687	0.06182	0.04171
0.03194	0.02631	0.02792	0.01999	0.01666	0.00770	0.00804	0.00965	0.00609	0.00264	0.00437	0.00345
0.00218	0.02068										
* HDV4											
8	0.06016	0.09553	0.10019	0.14277	0.12434	0.04914	0.08685	0.06397	0.07626	0.03919	0.02881
0.02288	0.01758	0.01695	0.01440	0.00932	0.00551	0.00360	0.00424	0.00466	0.00212	0.00424	0.00339
0.00191	0.02203										
* HDV5											
9	0.06186	0.09005	0.10650	0.13665	0.15857	0.04542	0.04307	0.03054	0.04150	0.02819	0.02193
0.02467	0.02153	0.02075	0.01879	0.02193	0.01684	0.01410	0.01135	0.01175	0.00901	0.00979	0.01096
0.00783	0.03641										
* HDV6											
10	0.03500	0.05167	0.08642	0.10604	0.11463	0.07886	0.05334	0.04924	0.07334	0.03590	0.04334
0.02847	0.03398	0.03654	0.02500	0.02090	0.01949	0.01693	0.01641	0.01334	0.00769	0.01244	0.00962
0.00487	0.02654										
*HDV7											
11	0.04494	0.04805	0.06479	0.08941	0.09897	0.06933	0.06503	0.06240	0.09037	0.04279	0.03514
0.03705	0.05570	0.04375	0.02606	0.02247	0.01721	0.01387	0.01458	0.01458	0.00669	0.00693	0.00837
0.00478	0.01673										
*HDV8a											
12	0.02072	0.03495	0.03827	0.05153	0.04808	0.04490	0.03468	0.05001	0.07267	0.06314	0.05982
0.04615	0.05443	0.05665	0.06148	0.05057	0.03426	0.02404	0.03081	0.02445	0.00746	0.01534	0.01644
0.01603	0.04311										
*HDV8b											
13	0.05676	0.04757	0.08054	0.09135	0.13243	0.07351	0.06595	0.03676	0.08973	0.06595	0.05568
0.01892	0.02973	0.02649	0.05405	0.01622	0.01459	0.00865	0.00649	0.00919	0.00162	0.00378	0.00324
0.00162	0.00919										
* HDBS is MOBILE6 default											
* HDBT is MOBILE6 default											
* MC											
16	0.09547	0.15431	0.13585	0.09605	0.08451	0.05798	0.04211	0.04009	0.03404	0.02855	0.02596
0.01673	0.01327	0.01038	0.01240	0.01038	0.01010	0.01327	0.01183	0.01038	0.01269	0.01788	0.01183
0.00808	0.04586										

* Based on TxDOT mid-year 2003 eight-county regional data for HDVs and county registration data otherwise (except where MOBILE6 defaults are used).

Galveston County Registration Distributions

* Calculated from Mid-Year (July) 2003 Registration data											
* LDV											
1	0.05374	0.08574	0.08415	0.08891	0.08126	0.07348	0.06738	0.06130	0.06471	0.05375	0.04951
0.04031	0.03671	0.03110	0.02675	0.01970	0.01546	0.01275	0.01141	0.00867	0.00485	0.00389	0.00261
0.00231	0.01956										
* LDT1											
2	0.05385	0.10536	0.09331	0.07961	0.07185	0.07077	0.06815	0.05159	0.05586	0.05803	0.04492
0.03486	0.03179	0.02909	0.02681	0.02077	0.01550	0.01573	0.01391	0.01303	0.00753	0.00757	0.00565
0.00286	0.02158										
* LDT2											
3	0.05385	0.10536	0.09331	0.07961	0.07185	0.07077	0.06815	0.05159	0.05586	0.05803	0.04492
0.03486	0.03179	0.02909	0.02681	0.02077	0.01550	0.01573	0.01391	0.01303	0.00753	0.00757	0.00565
0.00286	0.02158										
* LDT3											
4	0.12906	0.14434	0.14297	0.09979	0.12279	0.04371	0.06938	0.04585	0.04417	0.02850	0.02499
0.01933	0.01383	0.01039	0.01077	0.00879	0.00489	0.00604	0.00619	0.00581	0.00336	0.00329	0.00176
0.00084	0.00917										
* LDT4											
5	0.12906	0.14434	0.14297	0.09979	0.12279	0.04371	0.06938	0.04585	0.04417	0.02850	0.02499
0.01933	0.01383	0.01039	0.01077	0.00879	0.00489	0.00604	0.00619	0.00581	0.00336	0.00329	0.00176
0.00084	0.00917										
* HDV2											
6	0.12549	0.14885	0.14233	0.12668	0.08635	0.05306	0.07035	0.03391	0.04193	0.02309	0.02385
0.01715	0.01441	0.01259	0.01113	0.01082	0.00656	0.00771	0.00700	0.00749	0.00359	0.00660	0.00448
0.00310	0.01148										
* HDV3											
7	0.04688	0.07526	0.10778	0.11846	0.12478	0.03849	0.07928	0.04102	0.07687	0.06182	0.04171
0.03194	0.02631	0.02792	0.01999	0.01666	0.00770	0.00804	0.00965	0.00609	0.00264	0.00437	0.00345
0.00218	0.02068										
* HDV4											
8	0.06016	0.09553	0.10019	0.14277	0.12434	0.04914	0.08685	0.06397	0.07626	0.03919	0.02881
0.02288	0.01758	0.01695	0.01440	0.00932	0.00551	0.00360	0.00424	0.00466	0.00212	0.00424	0.00339
0.00191	0.02203										
* HDV5											
9	0.06186	0.09005	0.10650	0.13665	0.15857	0.04542	0.04307	0.03054	0.04150	0.02819	0.02193
0.02467	0.02153	0.02075	0.01879	0.02193	0.01684	0.01410	0.01135	0.01175	0.00901	0.00979	0.01096
0.00783	0.03641										
* HDV6											
10	0.03500	0.05167	0.08642	0.10604	0.11463	0.07886	0.05334	0.04924	0.07334	0.03590	0.04334
0.02847	0.03398	0.03654	0.02500	0.02090	0.01949	0.01693	0.01641	0.01334	0.00769	0.01244	0.00962
0.00487	0.02654										
*HDV7											
11	0.04494	0.04805	0.06479	0.08941	0.09897	0.06933	0.06503	0.06240	0.09037	0.04279	0.03514
0.03705	0.05570	0.04375	0.02606	0.02247	0.01721	0.01387	0.01458	0.01458	0.00669	0.00693	0.00837
0.00478	0.01673										
*HDV8a											
12	0.02072	0.03495	0.03827	0.05153	0.04808	0.04490	0.03468	0.05001	0.07267	0.06314	0.05982
0.04615	0.05443	0.05665	0.06148	0.05057	0.03426	0.02404	0.03081	0.02445	0.00746	0.01534	0.01644
0.01603	0.04311										
*HDV8b											
13	0.05676	0.04757	0.08054	0.09135	0.13243	0.07351	0.06595	0.03676	0.08973	0.06595	0.05568
0.01892	0.02973	0.02649	0.05405	0.01622	0.01459	0.00865	0.00649	0.00919	0.00162	0.00378	0.00324
0.00162	0.00919										
* HDBS is MOBILE6 default											
* HDBT is MOBILE6 default											
* MC											
16	0.07586	0.15430	0.11648	0.08917	0.08100	0.05509	0.03548	0.04575	0.03315	0.02684	0.02404
0.01424	0.01190	0.01821	0.01494	0.01377	0.01261	0.01937	0.01821	0.01377	0.01657	0.01751	0.01120
0.01331	0.06723										

* Based on TxDOT mid-year 2003 eight-county regional data for HDVs and county registration data otherwise (except where MOBILE6 defaults are used).

Harris County Registration Distributions

* Calculated from Mid-Year (July) 2003 Registration data											
* LDV											
1	0.06868	0.08662	0.08645	0.08932	0.07736	0.07207	0.06821	0.06166	0.06590	0.05274	0.04859
0.04170	0.03746	0.03176	0.02527	0.01930	0.01388	0.01101	0.00948	0.00693	0.00419	0.00304	0.00217
0.00172	0.01447										
* LDT1											
2	0.06381	0.10601	0.09473	0.08399	0.07436	0.07243	0.07139	0.05186	0.05891	0.05757	0.04475
0.03420	0.02856	0.02440	0.02364	0.01881	0.01338	0.01311	0.01186	0.01058	0.00580	0.00691	0.00534
0.00269	0.02091										
* LDT2											
3	0.06381	0.10601	0.09473	0.08399	0.07436	0.07243	0.07139	0.05186	0.05891	0.05757	0.04475
0.03420	0.02856	0.02440	0.02364	0.01881	0.01338	0.01311	0.01186	0.01058	0.00580	0.00691	0.00534
0.00269	0.02091										
* LDT3											
4	0.14142	0.15832	0.15437	0.10480	0.11909	0.04697	0.06084	0.04007	0.03917	0.02465	0.02095
0.01571	0.01193	0.00979	0.00896	0.00682	0.00360	0.00515	0.00517	0.00485	0.00276	0.00312	0.00159
0.00144	0.00846										
* LDT4											
5	0.14142	0.15832	0.15437	0.10480	0.11909	0.04697	0.06084	0.04007	0.03917	0.02465	0.02095
0.01571	0.01193	0.00979	0.00896	0.00682	0.00360	0.00515	0.00517	0.00485	0.00276	0.00312	0.00159
0.00144	0.00846										
* HDV2											
6	0.12549	0.14885	0.14233	0.12668	0.08635	0.05306	0.07035	0.03391	0.04193	0.02309	0.02385
0.01715	0.01441	0.01259	0.01113	0.01082	0.00656	0.00771	0.00700	0.00749	0.00359	0.00660	0.00448
0.00310	0.01148										
* HDV3											
7	0.04688	0.07526	0.10778	0.11846	0.12478	0.03849	0.07928	0.04102	0.07687	0.06182	0.04171
0.03194	0.02631	0.02792	0.01999	0.01666	0.00770	0.00804	0.00965	0.00609	0.00264	0.00437	0.00345
0.00218	0.02068										
* HDV4											
8	0.06016	0.09553	0.10019	0.14277	0.12434	0.04914	0.08685	0.06397	0.07626	0.03919	0.02881
0.02288	0.01758	0.01695	0.01440	0.00932	0.00551	0.00360	0.00424	0.00466	0.00212	0.00424	0.00339
0.00191	0.02203										
* HDV5											
9	0.06186	0.09005	0.10650	0.13665	0.15857	0.04542	0.04307	0.03054	0.04150	0.02819	0.02193
0.02467	0.02153	0.02075	0.01879	0.02193	0.01684	0.01410	0.01135	0.01175	0.00901	0.00979	0.01096
0.00783	0.03641										
* HDV6											
10	0.03500	0.05167	0.08642	0.10604	0.11463	0.07886	0.05334	0.04924	0.07334	0.03590	0.04334
0.02847	0.03398	0.03654	0.02500	0.02090	0.01949	0.01693	0.01641	0.01334	0.00769	0.01244	0.00962
0.00487	0.02654										
*HDV7											
11	0.04494	0.04805	0.06479	0.08941	0.09897	0.06933	0.06503	0.06240	0.09037	0.04279	0.03514
0.03705	0.05570	0.04375	0.02606	0.02247	0.01721	0.01387	0.01458	0.01458	0.00669	0.00693	0.00837
0.00478	0.01673										
*HDV8a											
12	0.02072	0.03495	0.03827	0.05153	0.04808	0.04490	0.03468	0.05001	0.07267	0.06314	0.05982
0.04615	0.05443	0.05665	0.06148	0.05057	0.03426	0.02404	0.03081	0.02445	0.00746	0.01534	0.01644
0.01603	0.04311										
*HDV8b											
13	0.05676	0.04757	0.08054	0.09135	0.13243	0.07351	0.06595	0.03676	0.08973	0.06595	0.05568
0.01892	0.02973	0.02649	0.05405	0.01622	0.01459	0.00865	0.00649	0.00919	0.00162	0.00378	0.00324
0.00162	0.00919										
* HDBS is MOBILE6 default											
* HDBT is MOBILE6 default											
* MC											
16	0.12231	0.15074	0.12324	0.09745	0.07996	0.05813	0.04258	0.04184	0.03588	0.02814	0.02572
0.01507	0.01058	0.01112	0.00988	0.01074	0.00896	0.01644	0.01310	0.00985	0.01029	0.01485	0.00864
0.00911	0.04538										

* Based on TxDOT mid-year 2003 eight-county regional data for HDVs and county registration data otherwise (except where MOBILE6 defaults are used).

Liberty County Registration Distributions

* Calculated from Mid-Year (July) 2003 Registration data												
* LDV												
1	0.03811	0.06644	0.07765	0.08464	0.07593	0.06683	0.06437	0.06066	0.06618	0.05204	0.05523	
0.04458	0.04355	0.03626	0.03540	0.02531	0.02057	0.01785	0.01630	0.01181	0.00780	0.00504	0.00354	
0.00250	0.02139											
* LDT1												
2	0.05384	0.08583	0.08544	0.07508	0.06326	0.06460	0.06928	0.05150	0.05841	0.05707	0.04275	
0.03729	0.03478	0.03088	0.03121	0.02664	0.01616	0.01778	0.01700	0.01611	0.01070	0.01265	0.00886	
0.00379	0.02909											
* LDT2												
3	0.05384	0.08583	0.08544	0.07508	0.06326	0.06460	0.06928	0.05150	0.05841	0.05707	0.04275	
0.03729	0.03478	0.03088	0.03121	0.02664	0.01616	0.01778	0.01700	0.01611	0.01070	0.01265	0.00886	
0.00379	0.02909											
* LDT3												
4	0.10733	0.13765	0.13923	0.09137	0.10713	0.05238	0.07621	0.05061	0.04647	0.03013	0.03269	
0.01831	0.01575	0.01201	0.01398	0.00847	0.00610	0.00906	0.01083	0.00866	0.00492	0.00551	0.00492	
0.00098	0.00926											
* LDT4												
5	0.10733	0.13765	0.13923	0.09137	0.10713	0.05238	0.07621	0.05061	0.04647	0.03013	0.03269	
0.01831	0.01575	0.01201	0.01398	0.00847	0.00610	0.00906	0.01083	0.00866	0.00492	0.00551	0.00492	
0.00098	0.00926											
* HDV2												
6	0.12549	0.14885	0.14233	0.12668	0.08635	0.05306	0.07035	0.03391	0.04193	0.02309	0.02385	
0.01715	0.01441	0.01259	0.01113	0.01082	0.00656	0.00771	0.00700	0.00749	0.00359	0.00660	0.00448	
0.00310	0.01148											
* HDV3												
7	0.04688	0.07526	0.10778	0.11846	0.12478	0.03849	0.07928	0.04102	0.07687	0.06182	0.04171	
0.03194	0.02631	0.02792	0.01999	0.01666	0.00770	0.00804	0.00965	0.00609	0.00264	0.00437	0.00345	
0.00218	0.02068											
* HDV4												
8	0.06016	0.09553	0.10019	0.14277	0.12434	0.04914	0.08685	0.06397	0.07626	0.03919	0.02881	
0.02288	0.01758	0.01695	0.01440	0.00932	0.00551	0.00360	0.00424	0.00466	0.00212	0.00424	0.00339	
0.00191	0.02203											
* HDV5												
9	0.06186	0.09005	0.10650	0.13665	0.15857	0.04542	0.04307	0.03054	0.04150	0.02819	0.02193	
0.02467	0.02153	0.02075	0.01879	0.02193	0.01684	0.01410	0.01135	0.01175	0.00901	0.00979	0.01096	
0.00783	0.03641											
* HDV6												
10	0.03500	0.05167	0.08642	0.10604	0.11463	0.07886	0.05334	0.04924	0.07334	0.03590	0.04334	
0.02847	0.03398	0.03654	0.02500	0.02090	0.01949	0.01693	0.01641	0.01334	0.00769	0.01244	0.00962	
0.00487	0.02654											
* HDV7												
11	0.04494	0.04805	0.06479	0.08941	0.09897	0.06933	0.06503	0.06240	0.09037	0.04279	0.03514	
0.03705	0.05570	0.04375	0.02606	0.02247	0.01721	0.01387	0.01458	0.01458	0.00669	0.00693	0.00837	
0.00478	0.01673											
* HDV8a												
12	0.02072	0.03495	0.03827	0.05153	0.04808	0.04490	0.03468	0.05001	0.07267	0.06314	0.05982	
0.04615	0.05443	0.05665	0.06148	0.05057	0.03426	0.02404	0.03081	0.02445	0.00746	0.01534	0.01644	
0.01603	0.04311											
* HDV8b												
13	0.05676	0.04757	0.08054	0.09135	0.13243	0.07351	0.06595	0.03676	0.08973	0.06595	0.05568	
0.01892	0.02973	0.02649	0.05405	0.01622	0.01459	0.00865	0.00649	0.00919	0.00162	0.00378	0.00324	
0.00162	0.00919											
* HDBS is MOBILE6 default												
* HDBT is MOBILE6 default												
* MC												
16	0.07358	0.14047	0.12152	0.09253	0.07915	0.06243	0.05463	0.05017	0.03790	0.03679	0.02787	
0.01449	0.01003	0.00557	0.00780	0.01003	0.01003	0.01895	0.01449	0.00557	0.02230	0.01561	0.01226	
0.01672	0.05909											

* Based on TxDOT mid-year 2003 eight-county regional data for HDVs and county registration data otherwise (except where MOBILE6 defaults are used).

Montgomery County Registration Distributions

* Calculated from Mid-Year (July) 2003 Registration data												
* LDV												
1	0.05011	0.08835	0.09339	0.09756	0.08339	0.07518	0.06968	0.06105	0.06450	0.05132	0.04681	
0.03839	0.03412	0.02900	0.02418	0.01835	0.01415	0.01107	0.01020	0.00751	0.00459	0.00342	0.00244	
0.00208	0.01918											
* LDT1												
2	0.05666	0.10793	0.10183	0.08529	0.07262	0.07163	0.06820	0.05106	0.05831	0.05258	0.04126	
0.03264	0.02972	0.02495	0.02328	0.01963	0.01285	0.01451	0.01377	0.01256	0.00667	0.00795	0.00623	
0.00295	0.02493											
* LDT2												
3	0.05666	0.10793	0.10183	0.08529	0.07262	0.07163	0.06820	0.05106	0.05831	0.05258	0.04126	
0.03264	0.02972	0.02495	0.02328	0.01963	0.01285	0.01451	0.01377	0.01256	0.00667	0.00795	0.00623	
0.00295	0.02493											
* LDT3												
4	0.12379	0.14948	0.15864	0.10413	0.11677	0.04837	0.05999	0.04577	0.04140	0.02821	0.02658	
0.01538	0.01334	0.00994	0.01022	0.00716	0.00437	0.00609	0.00534	0.00688	0.00321	0.00344	0.00121	
0.00139	0.00892											
* LDT4												
5	0.12379	0.14948	0.15864	0.10413	0.11677	0.04837	0.05999	0.04577	0.04140	0.02821	0.02658	
0.01538	0.01334	0.00994	0.01022	0.00716	0.00437	0.00609	0.00534	0.00688	0.00321	0.00344	0.00121	
0.00139	0.00892											
* HDV2												
6	0.12549	0.14885	0.14233	0.12668	0.08635	0.05306	0.07035	0.03391	0.04193	0.02309	0.02385	
0.01715	0.01441	0.01259	0.01113	0.01082	0.00656	0.00771	0.00700	0.00749	0.00359	0.00660	0.00448	
0.00310	0.01148											
* HDV3												
7	0.04688	0.07526	0.10778	0.11846	0.12478	0.03849	0.07928	0.04102	0.07687	0.06182	0.04171	
0.03194	0.02631	0.02792	0.01999	0.01666	0.00770	0.00804	0.00965	0.00609	0.00264	0.00437	0.00345	
0.00218	0.02068											
* HDV4												
8	0.06016	0.09553	0.10019	0.14277	0.12434	0.04914	0.08685	0.06397	0.07626	0.03919	0.02881	
0.02288	0.01758	0.01695	0.01440	0.00932	0.00551	0.00360	0.00424	0.00466	0.00212	0.00424	0.00339	
0.00191	0.02203											
* HDV5												
9	0.06186	0.09005	0.10650	0.13665	0.15857	0.04542	0.04307	0.03054	0.04150	0.02819	0.02193	
0.02467	0.02153	0.02075	0.01879	0.02193	0.01684	0.01410	0.01135	0.01175	0.00901	0.00979	0.01096	
0.00783	0.03641											
* HDV6												
10	0.03500	0.05167	0.08642	0.10604	0.11463	0.07886	0.05334	0.04924	0.07334	0.03590	0.04334	
0.02847	0.03398	0.03654	0.02500	0.02090	0.01949	0.01693	0.01641	0.01334	0.00769	0.01244	0.00962	
0.00487	0.02654											
*HDV7												
11	0.04494	0.04805	0.06479	0.08941	0.09897	0.06933	0.06503	0.06240	0.09037	0.04279	0.03514	
0.03705	0.05570	0.04375	0.02606	0.02247	0.01721	0.01387	0.01458	0.01458	0.00669	0.00693	0.00837	
0.00478	0.01673											
*HDV8a												
12	0.02072	0.03495	0.03827	0.05153	0.04808	0.04490	0.03468	0.05001	0.07267	0.06314	0.05982	
0.04615	0.05443	0.05665	0.06148	0.05057	0.03426	0.02404	0.03081	0.02445	0.00746	0.01534	0.01644	
0.01603	0.04311											
*HDV8b												
13	0.05676	0.04757	0.08054	0.09135	0.13243	0.07351	0.06595	0.03676	0.08973	0.06595	0.05568	
0.01892	0.02973	0.02649	0.05405	0.01622	0.01459	0.00865	0.00649	0.00919	0.00162	0.00378	0.00324	
0.00162	0.00919											
* HDBS is MOBILE6 default												
* HDBT is MOBILE6 default												
* MC												
16	0.10124	0.12755	0.13997	0.10419	0.08083	0.06293	0.04378	0.04189	0.03347	0.02694	0.02021	
0.01326	0.00968	0.01263	0.01179	0.00926	0.01179	0.01747	0.01621	0.01305	0.01473	0.01642	0.01179	
0.01052	0.04841											

* Based on TxDOT mid-year 2003 eight-county regional data for HDVs and county registration data otherwise (except where MOBILE6 defaults are used).

Waller County Registration Distributions

* Calculated from Mid-Year (July) 2003 Registration data											
* LDV											
1	0.03817	0.05975	0.07117	0.08201	0.07109	0.06667	0.06409	0.05850	0.06234	0.05567	0.05392
0.04517	0.04234	0.04225	0.03084	0.03142	0.02259	0.01808	0.01775	0.01425	0.00900	0.00642	0.00458
0.00450	0.02742										
* LDT1											
2	0.04904	0.08662	0.08637	0.07414	0.06318	0.06522	0.06102	0.05096	0.05529	0.05745	0.04637
0.03911	0.03248	0.03083	0.02879	0.02650	0.01924	0.01567	0.01720	0.01745	0.01045	0.01490	0.00930
0.00484	0.03758										
* LDT2											
3	0.04904	0.08662	0.08637	0.07414	0.06318	0.06522	0.06102	0.05096	0.05529	0.05745	0.04637
0.03911	0.03248	0.03083	0.02879	0.02650	0.01924	0.01567	0.01720	0.01745	0.01045	0.01490	0.00930
0.00484	0.03758										
* LDT3											
4	0.09241	0.13034	0.13517	0.09483	0.11276	0.05034	0.08310	0.05241	0.05000	0.03379	0.03241
0.01897	0.01552	0.01310	0.01241	0.00897	0.00724	0.00793	0.01069	0.01034	0.00276	0.00310	0.00448
0.00241	0.01448										
* LDT4											
5	0.09241	0.13034	0.13517	0.09483	0.11276	0.05034	0.08310	0.05241	0.05000	0.03379	0.03241
0.01897	0.01552	0.01310	0.01241	0.00897	0.00724	0.00793	0.01069	0.01034	0.00276	0.00310	0.00448
0.00241	0.01448										
* HDV2											
6	0.12549	0.14885	0.14233	0.12668	0.08635	0.05306	0.07035	0.03391	0.04193	0.02309	0.02385
0.01715	0.01441	0.01259	0.01113	0.01082	0.00656	0.00771	0.00700	0.00749	0.00359	0.00660	0.00448
0.00310	0.01148										
* HDV3											
7	0.04688	0.07526	0.10778	0.11846	0.12478	0.03849	0.07928	0.04102	0.07687	0.06182	0.04171
0.03194	0.02631	0.02792	0.01999	0.01666	0.00770	0.00804	0.00965	0.00609	0.00264	0.00437	0.00345
0.00218	0.02068										
* HDV4											
8	0.06016	0.09553	0.10019	0.14277	0.12434	0.04914	0.08685	0.06397	0.07626	0.03919	0.02881
0.02288	0.01758	0.01695	0.01440	0.00932	0.00551	0.00360	0.00424	0.00466	0.00212	0.00424	0.00339
0.00191	0.02203										
* HDV5											
9	0.06186	0.09005	0.10650	0.13665	0.15857	0.04542	0.04307	0.03054	0.04150	0.02819	0.02193
0.02467	0.02153	0.02075	0.01879	0.02193	0.01684	0.01410	0.01135	0.01175	0.00901	0.00979	0.01096
0.00783	0.03641										
* HDV6											
10	0.03500	0.05167	0.08642	0.10604	0.11463	0.07886	0.05334	0.04924	0.07334	0.03590	0.04334
0.02847	0.03398	0.03654	0.02500	0.02090	0.01949	0.01693	0.01641	0.01334	0.00769	0.01244	0.00962
0.00487	0.02654										
*HDV7											
11	0.04494	0.04805	0.06479	0.08941	0.09897	0.06933	0.06503	0.06240	0.09037	0.04279	0.03514
0.03705	0.05570	0.04375	0.02606	0.02247	0.01721	0.01387	0.01458	0.01458	0.00669	0.00693	0.00837
0.00478	0.01673										
*HDV8a											
12	0.02072	0.03495	0.03827	0.05153	0.04808	0.04490	0.03468	0.05001	0.07267	0.06314	0.05982
0.04615	0.05443	0.05665	0.06148	0.05057	0.03426	0.02404	0.03081	0.02445	0.00746	0.01534	0.01644
0.01603	0.04311										
*HDV8b											
13	0.05676	0.04757	0.08054	0.09135	0.13243	0.07351	0.06595	0.03676	0.08973	0.06595	0.05568
0.01892	0.02973	0.02649	0.05405	0.01622	0.01459	0.00865	0.00649	0.00919	0.00162	0.00378	0.00324
0.00162	0.00919										
* HDBS is MOBILE6 default											
* HDBT is MOBILE6 default											
* MC											
16	0.05691	0.13008	0.11653	0.08672	0.06775	0.04607	0.05420	0.04065	0.04607	0.02710	0.04336
0.01355	0.01355	0.01897	0.02710	0.02439	0.01355	0.01626	0.02168	0.02439	0.01084	0.02710	0.01626
0.01084	0.04607										

* Based on TxDOT mid-year 2003 eight-county regional data for HDVs and county registration data otherwise (except where MOBILE6 defaults are used).

2007 Houston Eight-County Region Diesel Sales Fractions Estimates

* HDV fractions are estimated from TxDOT registration data (Mid-year July 2003)
 * 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
0.00090	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	0.00000	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	0.00000	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
0.01260	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
0.01260	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									
0.74320	0.74320	0.74320	0.74320	0.74320	0.72722	0.66739	0.53919	0.57598	0.41855	0.42974	
0.40654	0.15116	0.33205	0.27881	0.23514	0.34462	0.26056	0.22311	0.13115	0.14189	0.27586	
0.17089	0.24852	0.13580									
0.70343	0.70343	0.70343	0.70343	0.70343	0.61527	0.65352	0.65082	0.67772	0.54328	0.64638	
0.57703	0.33034	0.58550	0.58678	0.61151	0.54585	0.54733	0.54598	0.43448	0.37313	0.35714	
0.23810	0.32075	0.30435									
0.70775	0.70775	0.70775	0.70775	0.70775	0.67184	0.73362	0.69881	0.64395	0.71983	0.76585	
0.63245	0.40000	0.71351	0.68382	0.63889	0.67470	0.68750	0.44118	0.27273	0.50000	0.29412	
0.30000	0.31818	0.10000									
0.86709	0.86709	0.86709	0.86709	0.86709	0.95652	0.93015	0.91404	0.90370	0.83621	0.74545	
0.73077	0.46226	0.79167	0.85714	0.76190	0.67273	0.69811	0.58333	0.48214	0.51163	0.30556	
0.20690	0.46667	0.08696									
0.91941	0.91941	0.91941	0.91941	0.91941	0.95533	0.90950	0.87183	0.88031	0.89756	0.72115	
0.84375	0.63112	0.85000	0.87574	0.67568	0.77736	0.78596	0.76410	0.68712	0.73026	0.65152	
0.57813	0.54808	0.45000									
0.98404	0.98404	0.98404	0.98404	0.98404	0.96020	0.91513	0.91979	0.92271	0.94138	0.83456	
0.87739	0.55026	0.92737	0.93878	0.97419	0.90987	0.90164	0.92661	0.79787	0.84722	0.87931	
0.85246	0.83607	0.64286									
0.96667	0.96667	0.96667	0.96667	0.96667	0.95652	0.96390	0.95442	0.96839	0.97846	0.90040	
0.90055	0.75856	0.96937	0.96536	0.95509	0.95431	0.93171	0.96854	0.97541	0.94758	0.94828	
0.92825	0.96045	0.85185									
1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	0.97143	0.99265	0.90984	
1.00000	0.79518	0.91803	0.97087	0.97143	0.98182	0.93878	0.99000	0.90000	0.88889	0.87500	
1.00000	1.00000	1.00000									
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									

* Based on TxDOT HGA regional level mid-year 2003 county registration data except EPA fractions are used for LDV, LDT and Bus.

APPENDIX F
MOBILE6 VMT BY HOUR INPUT

County-Level, Weekday 2007 Hourly VMT Fractions Input to MOBILE6

Fleetwide VMT Fractions by Hour-of-Day;
Based on Hourly VMT Totals from August 2007
First Hour is 6 a.m. to 7 a.m.

Hour	Harris	Brazoria	Fort Bend	Waller	Montgomery	Liberty	Chambers	Galveston
7	0.07150	0.07054	0.06770	0.05204	0.06748	0.06212	0.05267	0.06638
8	0.08651	0.08535	0.08191	0.06297	0.08165	0.07516	0.06372	0.08032
9	0.07165	0.07070	0.06785	0.05216	0.06763	0.06225	0.05278	0.06653
10	0.05271	0.05149	0.05192	0.05592	0.05135	0.05272	0.05541	0.05590
11	0.05080	0.04962	0.05004	0.05390	0.04949	0.05081	0.05340	0.05387
12	0.05324	0.05201	0.05245	0.05649	0.05187	0.05325	0.05597	0.05646
1	0.05456	0.05330	0.05375	0.05789	0.05316	0.05457	0.05736	0.05787
2	0.05597	0.05467	0.05514	0.05938	0.05453	0.05598	0.05884	0.05936
3	0.05955	0.05817	0.05867	0.06318	0.05801	0.05956	0.06260	0.06316
4	0.07372	0.07428	0.07408	0.07137	0.07399	0.07304	0.07118	0.07357
5	0.08155	0.08217	0.08195	0.07895	0.08186	0.08080	0.07874	0.08139
6	0.08760	0.08827	0.08802	0.08480	0.08793	0.08679	0.08458	0.08742
7	0.07083	0.07137	0.07117	0.06857	0.07109	0.07018	0.06838	0.07069
8	0.02801	0.02978	0.03136	0.03934	0.03235	0.03511	0.03977	0.02742
9	0.02199	0.02338	0.02462	0.03089	0.02540	0.02757	0.03123	0.02153
10	0.01888	0.02007	0.02113	0.02652	0.02181	0.02367	0.02681	0.01848
11	0.01421	0.01511	0.01591	0.01996	0.01641	0.01782	0.02018	0.01391
12	0.00923	0.00982	0.01033	0.01297	0.01066	0.01157	0.01311	0.00904
1	0.00588	0.00625	0.00658	0.00826	0.00679	0.00737	0.00835	0.00575
2	0.00374	0.00398	0.00419	0.00526	0.00433	0.00469	0.00532	0.00367
3	0.00345	0.00367	0.00386	0.00484	0.00398	0.00432	0.00490	0.00338
4	0.00309	0.00328	0.00345	0.00433	0.00356	0.00387	0.00438	0.00302
5	0.00514	0.00547	0.00576	0.00722	0.00594	0.00645	0.00730	0.00503
6	0.01622	0.01725	0.01816	0.02279	0.01874	0.02034	0.02304	0.01588
Total	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000

County-Level, Friday 2007 Hourly VMT Fractions Input to MOBILE6

Fleetwide VMT Fractions by Hour-of-Day;
Based on Hourly VMT Totals from August 2007
First Hour is 6 a.m. to 7 a.m.

Hour	Harris	Brazoria	Fort Bend	Waller	Montgomery	Liberty	Chambers	Galveston
7	0.06976	0.06883	0.06605	0.05078	0.06584	0.06061	0.05139	0.06477
8	0.08729	0.08613	0.08265	0.06354	0.08239	0.07584	0.06430	0.08105
9	0.07260	0.07164	0.06875	0.05285	0.06853	0.06308	0.05348	0.06741
10	0.05060	0.04943	0.04985	0.05369	0.04929	0.05061	0.05319	0.05366
11	0.04990	0.04874	0.04916	0.05294	0.04861	0.04991	0.05246	0.05292
12	0.05306	0.05184	0.05227	0.05630	0.05169	0.05307	0.05578	0.05628
1	0.05578	0.05449	0.05495	0.05918	0.05434	0.05579	0.05864	0.05916
2	0.05688	0.05557	0.05604	0.06035	0.05541	0.05689	0.05980	0.06033
3	0.06061	0.05920	0.05971	0.06431	0.05904	0.06062	0.06371	0.06428
4	0.07708	0.07767	0.07746	0.07463	0.07737	0.07638	0.07443	0.07693
5	0.08190	0.08252	0.08229	0.07929	0.08220	0.08114	0.07907	0.08173
6	0.08331	0.08395	0.08371	0.08065	0.08362	0.08254	0.08044	0.08314
7	0.07140	0.07195	0.07175	0.06912	0.07167	0.07074	0.06894	0.07126
8	0.02693	0.02864	0.03015	0.03783	0.03111	0.03376	0.03825	0.02636
9	0.02178	0.02316	0.02438	0.03059	0.02516	0.02731	0.03093	0.02132
10	0.01908	0.02029	0.02136	0.02680	0.02204	0.02392	0.02710	0.01868
11	0.01675	0.01781	0.01875	0.02353	0.01935	0.02100	0.02379	0.01640
12	0.01271	0.01351	0.01423	0.01785	0.01468	0.01593	0.01805	0.01244
1	0.00520	0.00553	0.00582	0.00730	0.00601	0.00652	0.00738	0.00509
2	0.00345	0.00367	0.00386	0.00484	0.00398	0.00432	0.00490	0.00337
3	0.00328	0.00349	0.00367	0.00461	0.00379	0.00411	0.00466	0.00321
4	0.00286	0.00304	0.00321	0.00402	0.00331	0.00359	0.00407	0.00280
5	0.00452	0.00481	0.00506	0.00635	0.00522	0.00567	0.00642	0.00443
6	0.01327	0.01411	0.01486	0.01864	0.01533	0.01664	0.01884	0.01299
Total	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000

County-Level, Saturday 2007 Hourly VMT Fractions Input to MOBILE6

Fleetwide VMT Fractions by Hour-of-Day;
Based on Hourly VMT Totals from August 2007
First Hour is 6 a.m. to 7 a.m.

Hour	Harris	Brazoria	Fort Bend	Waller	Montgomery	Liberty	Chambers	Galveston
7	0.02608	0.02608	0.02608	0.02608	0.02608	0.02608	0.02608	0.02608
8	0.03415	0.03415	0.03415	0.03415	0.03415	0.03415	0.03415	0.03415
9	0.04172	0.04172	0.04172	0.04172	0.04172	0.04172	0.04172	0.04172
10	0.04893	0.04893	0.04893	0.04893	0.04893	0.04893	0.04893	0.04893
11	0.05533	0.05533	0.05533	0.05533	0.05533	0.05533	0.05533	0.05533
12	0.06027	0.06027	0.06027	0.06027	0.06027	0.06027	0.06027	0.06027
1	0.06361	0.06361	0.06361	0.06361	0.06361	0.06361	0.06361	0.06361
2	0.06426	0.06426	0.06426	0.06426	0.06426	0.06426	0.06426	0.06426
3	0.06411	0.06411	0.06411	0.06411	0.06411	0.06411	0.06411	0.06411
4	0.06426	0.06426	0.06426	0.06426	0.06426	0.06426	0.06426	0.06426
5	0.06335	0.06335	0.06335	0.06335	0.06335	0.06335	0.06335	0.06335
6	0.06284	0.06284	0.06284	0.06284	0.06284	0.06284	0.06284	0.06284
7	0.06022	0.06022	0.06022	0.06022	0.06022	0.06022	0.06022	0.06022
8	0.05246	0.05246	0.05246	0.05246	0.05246	0.05246	0.05246	0.05246
9	0.04590	0.04590	0.04590	0.04590	0.04590	0.04590	0.04590	0.04590
10	0.04275	0.04275	0.04275	0.04275	0.04275	0.04275	0.04275	0.04275
11	0.03918	0.03918	0.03918	0.03918	0.03918	0.03918	0.03918	0.03918
12	0.03191	0.03191	0.03191	0.03191	0.03191	0.03191	0.03191	0.03191
1	0.01989	0.01989	0.01989	0.01989	0.01989	0.01989	0.01989	0.01989
2	0.01351	0.01351	0.01351	0.01351	0.01351	0.01351	0.01351	0.01351
3	0.01254	0.01254	0.01254	0.01254	0.01254	0.01254	0.01254	0.01254
4	0.00854	0.00854	0.00854	0.00854	0.00854	0.00854	0.00854	0.00854
5	0.00863	0.00863	0.00863	0.00863	0.00863	0.00863	0.00863	0.00863
6	0.01557	0.01557	0.01557	0.01557	0.01557	0.01557	0.01557	0.01557
Total	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000

County-Level, Sunday 2007 Hourly VMT Fractions Input to MOBILE6

Fleetwide VMT Fractions by Hour-of-Day;
Based on Hourly VMT Totals from August 2007
First Hour is 6 a.m. to 7 a.m.

Hour	Harris	Brazoria	Fort Bend	Waller	Montgomery	Liberty	Chambers	Galveston
7	0.01656	0.01656	0.01656	0.01656	0.01656	0.01656	0.01656	0.01656
8	0.02090	0.02090	0.02090	0.02090	0.02090	0.02090	0.02090	0.02090
9	0.02745	0.02745	0.02745	0.02745	0.02745	0.02745	0.02745	0.02745
10	0.04010	0.04010	0.04010	0.04010	0.04010	0.04010	0.04010	0.04010
11	0.05171	0.05171	0.05171	0.05171	0.05171	0.05171	0.05171	0.05171
12	0.05723	0.05723	0.05723	0.05723	0.05723	0.05723	0.05723	0.05723
1	0.06499	0.06499	0.06499	0.06499	0.06499	0.06499	0.06499	0.06499
2	0.07075	0.07075	0.07075	0.07075	0.07075	0.07075	0.07075	0.07075
3	0.07103	0.07103	0.07103	0.07103	0.07103	0.07103	0.07103	0.07103
4	0.06996	0.06996	0.06996	0.06996	0.06996	0.06996	0.06996	0.06996
5	0.06850	0.06850	0.06850	0.06850	0.06850	0.06850	0.06850	0.06850
6	0.06897	0.06897	0.06897	0.06897	0.06897	0.06897	0.06897	0.06897
7	0.06724	0.06724	0.06724	0.06724	0.06724	0.06724	0.06724	0.06724
8	0.05764	0.05764	0.05764	0.05764	0.05764	0.05764	0.05764	0.05764
9	0.05181	0.05181	0.05181	0.05181	0.05181	0.05181	0.05181	0.05181
10	0.04390	0.04390	0.04390	0.04390	0.04390	0.04390	0.04390	0.04390
11	0.03442	0.03442	0.03442	0.03442	0.03442	0.03442	0.03442	0.03442
12	0.02378	0.02378	0.02378	0.02378	0.02378	0.02378	0.02378	0.02378
1	0.02560	0.02560	0.02560	0.02560	0.02560	0.02560	0.02560	0.02560
2	0.01844	0.01844	0.01844	0.01844	0.01844	0.01844	0.01844	0.01844
3	0.01773	0.01773	0.01773	0.01773	0.01773	0.01773	0.01773	0.01773
4	0.01125	0.01125	0.01125	0.01125	0.01125	0.01125	0.01125	0.01125
5	0.00862	0.00862	0.00862	0.00862	0.00862	0.00862	0.00862	0.00862
6	0.01143	0.01143	0.01143	0.01143	0.01143	0.01143	0.01143	0.01143
Total	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000