2008 On-Road, Mobile Source Statewide Air Toxics Annual Emissions Inventories

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INTRODUCTION

The Texas Commission on Environmental Quality (TCEQ) works with local planning districts, the Texas Department of Transportation (TxDOT), and the Texas Transportation Institute (TTI) to provide on-road, mobile source emissions inventories (EIs) of air quality pollutants. TCEQ typically funds mobile source inventory work in support of the federal Clean Air Act Amendment (CAAA) requirements, such as attainment of the National Ambient Air Quality Standards (NAAQS), 42 United States Code Annotated (USCA 7409), and the study and control of hazardous air pollutants (HAPs), including those from motor vehicles and/or motor vehicle fuels (as mandated under FCAA sections 202 and 211).

Accurate EIs are critical if state, local, and federal agencies are to attain, and maintain, the NAAQS that the U.S. Environmental Protection Agency (EPA) has established for criteria pollutants such as ozone, particulate matter (PM), carbon monoxide (CO), as well as to control HAP emissions. The EPA prepares a National Emissions Inventory (NEI) database every three years using input from various sources including state and local air agencies. The database includes annual emissions estimates of criteria air pollutants (CAPs), CAP precursors, and HAPs, by county, for both stationary and mobile sources.

Prior to the 1999 NEI effort, the EPA's national criteria and toxic emissions databases were separate, termed the National Emission Trends (NET) and the National Toxics Inventory (NTI), respectively. Beginning in 1999, the NET and NTI were integrated into the NEI. Additionally, to increase the efficiency of the EI program and provide more consistent and uniform data, the EPA combined the Periodic Emission Inventory (PEI) and the NEI reporting requirements (excluding the HAP component, which the EPA intends to address in the future) into a single EI requirement, which is detailed in the Federal Register and called the Consolidated Emission Reporting Rule (CERR), June 10, 2002, FR Volume 67, Number 111, pp 39602 - 39616. Although HAP reporting requirements were not included in the CERR, consistency and uniformity of data between HAP and CERR-required pollutants are desirable for data analysis purposes.

Mobile Source Air Toxics (MSAT) include various volatile organic compounds (VOC) and metals, as well as diesel particulate matter and diesel exhaust organic gases (collectively diesel particulate matter [DPM)] + diesel exhaust organic gases [DEOG]). MSATs are HAPs emitted from highway vehicles and non-road equipment. Some toxic compounds are present in fuels, and are emitted to the air when the fuel evaporates or passes through the engine unburned. Other toxics are emitted from the incomplete combustion of fuels or as secondary combination products.

Metal air toxics also result from engine wear or from impurities in oil or gasoline, and diesel (EPA420-R-00-023, December 2000). In the federal rule (Control of Emissions of Hazardous Air Pollutants From Mobile Sources, FR Vol. 66, No. 61, March 29, 2001), the EPA identified and labeled 21 HAPs as MSATs (substantially a subset of the 188 air toxics defined by section 112 of the CAAA). In the 2001 rulemaking, the EPA designated six of these MSATs as priority MSATs: benzene; 1,3-butadiene; formaldehyde; acetaldehyde; DPM+DEOG; and acrolein.

The MSAT emissions estimates are needed for the NEI, EPA's comprehensive three-year database. The most recent three-year inventory was for the year 2005. The next three-year cycle inventory year is 2008 and is due from the states to the EPA by June 2010. To meet the deadline, TCEQ must complete the MSAT inventories by August 2009. The EPA has specific quality assurance procedures and compilation requirements. The time between August 2009 and June 2010 is needed by TCEQ to perform the consolidation and quality assurance procedures. The on-road, mobile source inventories require incorporation of recently collected data and use of the latest EPA emissions factor model, MOBILE6.2.03. The purpose of this task is to provide the requisite on-road, mobile source, MSAT, 2008 evaluation year, annual EI estimates needed for Texas for inclusion in the EPA's 2008 NEI. The terms HAP and MSAT may be used interchangeably in this document.

BACKGROUND

As a previous task under contract to TCEQ, TTI prepared the 2008 CERR (CAP) EIs for 242 of the 254 Texas counties; the North Central Texas Council of Governments (NCTCOG), also contracted by TCEQ, prepared the 2008 CERR EIs for the remaining 12 Texas counties (i.e., the Dallas/Ft. Worth [DFW] Consolidated Metropolitan Statistical Area [CMSA] counties). For this MSAT EI project, TTI was contracted by TCEQ to produce the 2008 annual MSAT EIs for all of the 254 Texas counties.

When these CAP and HAP EIs are combined, an integrated inventory should result in which all pollutant emissions were derived from the same activity data set. To ensure that both the CAP and HAP EIs for each Texas county were based on the same activity data set, and to ensure consistency between other inventory inputs, at the request of TCEQ, NCTCOG and TTI coordinated their efforts.

The general method used to produce the MSAT annual emissions estimates for each Texas county may be described in two main parts:

- Base Annual EIs – These MOBILE6-based annual EIs including VOC, PM-10, and the six air toxic pollutants available in MOBILE6 were first produced (this step was performed consistent with the CERR annual CAP EI process and inputs, except that the MOBILE6 pollutants requested were those needed for the MSAT EIs);

- Additional HAPs – These emissions of additional HAPs not available in MOBILE6 were then calculated by multiplying HAP ratios (i.e., HAP/VOC, HAP/PM-10, or HAP/VMT, depending on the particular HAP) by the appropriate base annual EI pollutant emissions estimate, or VMT.

In consultation with TCEQ, TTI and NCTCOG agreed to produce the on-road mobile source MSAT EIs for the 12 DFW CMSA counties as follows: 1) Base Annual EIs – NCTCOG produced MOBILE6-based annual EIs needed for calculating the additional non-MOBILE6-based HAP emissions, and 2) Additional HAPs – TTI applied the additional HAP ratios to the base annual EI data from NCTCOG to produce the additional HAP emissions estimates.

TTI performed this general two-step process for the remaining 242 Texas counties. TTI then combined the 12-county and 242-county results to produce the complete 2008 annual MSAT EI

summaries for all 254 Texas counties, including NIF format summaries for inclusion in the TCEQ's Texas Air Emissions Repository (TxAER), and the EPA's Extenisbile Markup Language (XML) format EI summaries required for uploading to EPA's CERS EIS.

Table 1 shows a summary of NCTCOG's and TTI's areas of responsibility by county for the CERR EIs and MSAT EIs under contract to TCEQ, and by subsequent agreement.

Table 1. 2008 CERR and MSAT EIs – Components by County Produced by TTI and NCTCOG.

Task[1]	Component	NCTCOG	TTI
2008 CERR EI	Seasonal Weekday EI	12 DFW CMSA counties	242 remaining Texas counties
	Annual EI		
	NIF Summary		
	XML Summary[2]		
2008 MSAT EI	Base Annual EI[3]	12 DFW CMSA counties[1]	242 remaining Texas counties
	Complete Annual EI[4]	--	All 254 Texas counties
	NIF Summary		
	XML Summary[2]		

[1] NCTCOG and TTI, under separate TCEQ contracts, produced the CERR EIs listed. TTI, under TCEQ contract, produced MSAT EIs for all Texas counties. By subsequent agreement between TCEQ, NCTCOG, and TTI, NCTCOG produced the base annual EIs of the MSAT EI task for the 12 DFW counties to ensure consistency in data and methods between CERR (CAP) and MSAT (HAP) EIs for these counties.

[2] Although XML summaries were prepared individually for the annual component of CERR and MSAT EIs, EPA requires that the CAP and HAP EIs be integrated in a single XML document for submittal to the EPA's CERS EIS.

[3] The base annual EI includes all six MOBILE6-based air toxic pollutants, and VOC and PM-10, which are needed for the subsequent calculation of additional HAP annual emissions using HAP/VOC and HAP/PM-10 ratios.

[4] The complete MSAT annual EI is the combined tabulations of the base annual EI (MOBILE6 based) pollutant emissions, and the non-MOBILE6-based additional HAP emissions.

The purpose of this task was to provide the requisite on-road MSAT 2008 annual EIs for all Texas counties for EPA's 2008 NEI effort.

TTI completed a review draft of the 2008 annual MSAT EI for all 254 Texas counties using in-house data, prior to availability of the NCTCOG base annual EI needed for development of the complete MSAT EI for the 12 DFW counties. TTI updated the review draft MSAT EI Technical Note with the final MSAT EIs, including the 12 DFW county MSAT EIs based on the NCTCOG-provided base annual EI data. TTI did not incorporate NCTCOG documentation into this Technical Note, but makes reference to the NCTCOG analysis where necessary. An addendum is also attached to this Technical Note, which contains the agreement made between

TTI and NCTCOG to coordinate EI development efforts, and reference to the pertinent NCTCOG EI documentation.

The CERR requires both summer weekday and annual EIs. In production of the CERR EIs, TTI used an annual emissions estimation methodology for calculating annual emissions as the product of the summer weekday EI and summer weekday-to-annual conversion factors. Thus, although only annual emissions estimates were required for the MSATs portion of the NEI, summer weekday EIs (of the toxic pollutants available in MOBILE6, as well as VOC and exhaust PM pollutants which were needed for later calculation of additional HAP emissions) were developed as a first step in the process.

The following 2008 CERR on-road, mobile EI Technical Notes are referenced:

- 2008 On-Road, Mobile Source CERR Emissions Inventories for the Five-County Austin Area (TTI Review Draft, April 2009);
- 2008 On-Road, Mobile Source CERR Emissions Inventories for the Beaumont/Port Arthur Area (TTI Review Draft, April 2009);
- 2008 On-Road, Mobile Source CERR Emissions Inventories for the El Paso Area (TTI Review Draft, April 2009);
- 2008 On-Road, Mobile Source CERR Emissions Inventories for the HGB Area (TTI Review Draft, April 2009);
- 2008 On-Road, Mobile Source CERR Emissions Inventories for the San Antonio Area (TTI Review Draft, April 2009);
- 2008 On-Road, Mobile Source CERR Emissions Inventories for the Northeast Texas Area (TTI Review Draft, April 2009);
- 2008 On-Road, Mobile Source CERR Emissions Inventories for 215 Counties in Texas (TTI Review Draft, April 2009); and
- 2008 Consolidated Emissions Reporting Rule On-road Mobile Source Emissions Inventory (NCTCOG Draft, May 2009).

The emissions factors for MSATs not included in MOBILE6 (e.g., basic emissions factors [grams per mile (g/mi)] or MSAT-to-criteria pollutant emissions ratios) were acquired from the EPA Office of Transportation and Air Quality (OTAQ). These factors are the most currently available from EPA's National Mobile Inventory Model (NMIM) (i.e., NMIM County Database version 20080727 [NCD20080727]). The combination of MOBILE6 MSATs and diesel exhaust PM and VOC, and the MSAT emissions factors from the NCD20080727, include all of the 21 MSATs listed in EPA's MSAT rule (March 2001).

TTI used the latest release of MOBILE6 (MOBILE6.2.03, September 2003), re-compiled by TTI for producing MOBILE6 emissions factors in the look-up table form (via the POLFAC62_3 utility) needed as input for detailed link-based emissions analyses. This MOBILE6 re-compilation produces lower heavy-duty gasoline vehicle (HDGV) VOC-based exhaust toxic pollutant emissions. EPA is aware that in their latest version of MOBILE6, EPA caused a slight increase in the HDGV VOC-based exhaust toxic pollutants, due to the Lahey Fortran compiler

and settings that they used to compile the MOBILE6 source code. The compiler version used by EPA, however, was unavailable at the time of MOBILE6 model release, so TTI was not able to replicate this anomaly. The TTI re-compilation of MOBILE6 (using the current Lahey Fortran compiler) produced insignificant changes (e.g., rounding error) in toxics emissions output, from the previous version of MOBILE6.

The 2008 on-road MSAT EIs were produced based on the methods and data consistent with the 2008 CERR EI analyses, and as agreed upon and in consultation with the TCEQ project manager. Guidance on the development of actual EIs also came from the *User's Guide to MOBILE6.1 and MOBILE6.2*, EPA, August 2003 (*MOBILE6 User's Guide)*; *Technical Guidance on the Use of MOBIL6.2 for Emission Inventory Preparation* EPA, August 2004; *Procedures for Emission Inventory Preparation, Volume IV, Mobile Sources*, EPA 1992; *Emissions Inventory Guidance for Implementation of Ozone and Particulate Matter National Ambient Air Quality Standards (NAAQS) and Regional Haze Regulations*, EPA, August 2005; *EPA's National Inventory Model (NMIM), A Consolidated Emissions Modeling System for MOBILE6 and NONROAD,* EPA, December 2005; and consultation with EPA's OTAQ staff.

Task Description

The purpose of this task was to develop the 2008 annual air toxics emissions estimates for the ozone, CO, and PM nonattainment and/or maintenance counties and the eight-hour ozone near nonattainment counties using the Travel Demand Model (TDM) network link-based methodology, where such counties have complete TDM networks. Additionally, work under this task called for developing the 2008 annual air toxics emissions estimates for the remaining Texas counties using the Highway Performance Monitoring System (HPMS) virtual link-based methodology. (NCTCOG produced the DFW area county activity, emissions factors, and base annual emissions estimates per agreement – see Addendum.)

TTI produced the 2008 Texas on-road, mobile statewide annual air toxic emissions inventories within the following framework, based on methods consistent with the pertinent EPA requirements, guidance on development of actual emissions inventories, and as agreed upon and in consultation with the TCEQ Project Manager.

- Emissions Source: on-road mobile, 28 EPA MOBILE6.2.03 vehicle types.
- Pollutants: diesel exhaust (by organic gas [VOC] and PM components); benzene; methyl tertiary butyl ether (MTBE); 1,3-butadiene; formaldehyde; acetaldehyde; acrolein; and additional air toxic pollutants.
- Geographic level: for each Texas county, by vehicle type and road type.
- Temporal level: annual.
- Emissions Factor Model: used latest models officially released by EPA, MOBILE6.2.03 (September 24, 2003 release).
- Climate inputs: used temperature, humidity, barometric pressure, and sunrise/sunset times as agreed upon by TCEQ (used meteorological inputs consistent with the 2005 CERR EIs).
- Fuel Program: as appropriate for 2008 by season, county (RFG or conventional fuel).

- Oxygenated Fuels: used latest available appropriate seasonal data including summer data from TCEQ's statewide 2008 summer fuel survey, and winter 2007/08 data from Northrop Grumman Missions Systems (NGMS) fuel survey data from Texas cities.
- Diesel Sulfur: used 2008 average diesel fuel sulfur level from TCEQ's statewide 2008 statewide summer fuel survey.
- Gasoline Reid Vapor Pressure (RVP): used 2008 values by county and summer and winter season based on TCEQ and NGMS fuel survey data, and by month for spring and fall periods, as interpolated by TTI using the summer and winter values.
- Additional Air Toxics: used the latest basic emissions rates and CAP-to-HAP pollutant mass ratios from EPA's NMIM, applied as appropriate to annual VMT or annual CAP (i.e., VOC or PM-10).
- Registration Distributions and Diesel Fractions: TTI developed this data with TxDOT mid-year 2008 registrations data and MOBILE6 defaults, where needed.
- State Programs: modeled effects of inspection and maintenance (I/M) and anti-tampering programs (ATP) as appropriate for counties administering programs for 2008. (Applied ATP credit only for counties with I/M.)
- Federal Motor Vehicle Control Programs (FMVCP): modeled effects of all FMVCPs for 2008.
- HDDV Defeat Device and Mitigation Programs: modeled 2008 effects using a percent "Rebuild Effects" rate estimate developed by TTI using EPA data concerning percent of vehicles retrofitted as of 2008.
- VMT, seasonally adjusted as appropriate: where available, used TDM network link-based VMT for ozone and CO non-attainment/maintenance counties, and ozone near non-attainment counties, except for the 12 DFW CMSA counties; used HPMS-based VMT for remaining counties including the 12 DFW CMSA counties.
- Annual VMT: developed as appropriate for estimating annual emissions.
- VMT mix: used current methodology for 28 vehicle types.

This task developed the 2008 annual on-road MSAT emissions estimates for all 254 Texas counties. TTI developed summer or ozone season weekday EIs, which were then converted to annual EIs. For the ozone nonattainment areas (NAAs) and the Early Action Compact (EAC) counties with complete TDM networks available, the TDM link-based methodology was used. For the remaining Texas counties, the HPMS-based virtual link methodology was used. In the process of converting the summer weekday link-based EIs to annual estimates, seasonal variation in source activity, fleet make-up, climate, and fuel program parameters were considered. (NCTCOG produced the 12 DFW area county activity, emissions factors, and base annual emissions estimates per agreement – see Addendum.)

TTI included the estimation, documentation, and reporting of 2008 annual air toxics emissions for each Texas county. The following activities were completed by TTI under this task.

- Prepared 2008 annual air toxics emissions estimate summary files for each Texas county by vehicle type and roadway type, vehicle miles traveled (VMT), average speed, and emissions estimate totals for diesel exhaust (by organic gas VOC and PM components); benzene; MTBE; 1,3-butadiene; formaldehyde; acetaldehyde; acrolein; and additional air toxic pollutants. In each file, emissions estimates were also compiled by the individual roadway-based processes (running exhaust, running loss evaporative) and non-roadway-based processes (start, hot soak, diurnal soak, refueling, crankcase and resting loss), to the extent available in MOBILE6.
- Prepared documentation, complete and self contained, including electronic data files, consistent in format and level of detail in the latest TTI emissions estimation reports.
- Prepared electronic data files, consistent in format and level of detail with the National Emissions Inventory Input Format (NIF 3.0), which is the current TexAER input format.
- Prepared electronic EI data reporting files as specified in the pertinent EPA electronic data reporting format guidance (Consolidated Emissions Reporting System [CERS] Emissions Inventory System [EIS] XML format), in coordination with the TCEQ Project Manager.

The nonattainment and/or maintenance and EAC areas for which TDM link-based analyses were included are: the Beaumont/Port Arthur (BPA), Houston/Galveston (HGB), Dallas/Fort Worth and El Paso (ELP) ozone nonattainment (or maintenance) areas (NAAs); and the Austin (AUS), San Antonio (SAN), and Northeast Texas (TLM) EAC areas. Analysis for these six areas consisted of 27 TDM link-based counties and four HPMS-based counties (see delineation of HPMS virtual link-based versus TDM network link-based county analyses in Table 2). This Technical Note documents the methods used to develop the 2008 annual on-road MSAT EIs for all 254 Texas counties.

Table 2. County-Level Emissions Analyses by Region and Activity Basis.

Area	Counties	Activity Basis
1. Houston/Galveston nonattainment area (NAA)	Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, Waller	TDM
2. Beaumont-Port Arthur NAA	Jefferson, Hardin, Orange	TDM
3. El Paso maintenance area	El Paso	TDM
4. Austin EAC area	Hays, Travis, Williamson/Bastrop, Caldwell	TDM/HPMS
5. San Antonio EAC area[1]	Bexar, Comal, Guadalupe, Kendall,[1] Wilson	TDM
6. Northeast Texas EAC area	Gregg, Smith/Harrison, Rusk, Upshur	TDM/HPMS
7. Dallas/Fort-Worth CMSA[2]	Collin, Dallas, Denton, Rockwall, Tarrant/Ellis, Henderson, Hood, Hunt, Johnson, Kaufman, Parker	TDM/HPMS
8. Remainder of Texas	215 counties	HPMS
Totals by Activity Basis	27/227	TDM/HPMS

[1] Kendall is part of the new geographically-expanded San Antonio Region travel model, although not part of the San Antonio EAC area.
[2] DFW CMSA county base annual EI data were developed and provided by NCTCOG.

Documented in this technical note are the summary results, the methods relating to TTI's calculation of inventory elements including VMT and speeds, VMT mix, MOBILE6 emissions factors, annualization factors, additional MSAT emissions factors, and summer weekday and annual emissions estimates. See the Addendum for information on NCTCOG's development of EI data for the 12 DFW CMSA counties.

ACKNOWLEDGMENTS
Dennis Perkinson, Ph.D., Martin Boardman, and Andrea Herbst, of TTI, contributed to the development of the MOBILE6 emissions factors input data parameter values. L.D. White, of TTI, developed computer utility routines for various elements of the data-processing requirements. Dr. Perkinson developed the summer weekday VMT control totals, hourly VMT distributions, and VMT mix. White processed the VMT and speed model data to produce link-level VMT and operational speed inputs; Boardman modeled the emissions factors and performed the emissions analyses. Madhusudhan Venugopal, of NCTCOG, provided base annual emissions for the 12 DFW CMSA counties. Gary Lobaugh, of TTI, was responsible for editing, design, and production of this Technical Note. Each member of the assigned TTI staff contributed to the quality assurance of the EI elements. Dr. Perkinson was the principle investigator for this project. This work was performed by TTI under contract to TCEQ. Peter Ogbeide was the TCEQ Project 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 both Microsoft® Word 2003 and Adobe® Acrobat Portable Document Format (PDF), and will be

delivered in conjunction with supporting electronic document files. All pertinent data are being submitted in the specified electronic format. (There is no FORTRAN source code or executable files developed under this task.) CD-ROM or other electronic media 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 electronic data submittal (described in Appendix A) is included on an accompanying CD-ROM. The electronic data submittal includes the detailed emissions data summaries, emissions factors input and output files, annualization factors, climate and fuel parameter inputs and worksheets, EPA NIF 3.0 emissions files and descriptions, and EPA CERS Emissions Inventory System XML files and descriptions.

SUMMARY RESULTS

Table 3 presents the state total annual on-road MSAT pollutant emissions estimates (the 2008 statewide annual VMT estimate is 253,760,475,366). These consist of four groups — dioxins and furans, gaseous hydrocarbons (HCs), metals, and polycyclic aromatic hydrocarbons (PAH). All of the 21 MSATs as identified and listed in the MSAT rule (2001) are included in this analysis.

Table 3. Texas 2008 Annual On-Road MSAT Emissions Estimates (Tons).

Category	Pollutant	Code[1]	Factor Type[2]	Emissions
Gaseous HC	Toluene[3]	108883	HAP/VOC	13,588.13
	Xylene[3]	1330207	HAP/VOC	7,665.87
	Benzene[3]	71432	MOBILE6	5,692.71
	2,2,4-Trimethylpentane[3]	540841	HAP/VOC	5,225.55
	Hexane[3]	110543	HAP/VOC	2,427.83
	Ethyl Benzene[3]	100414	HAP/VOC	2,104.32
	Formaldehyde	50000	MOBILE6	1,985.51
	Acetaldehyde	75070	MOBILE6	914.36
	1,3-Butadiene	106990	MOBILE6	623.66
	Styrene	100425	HAP/VOC	365.27
	Propionaldehyde	123386	HAP/VOC	122.32
	Acrolein	107028	MOBILE6	96.57
	Methyl Tertiary Butyl Ether[3]	1634044	MOBILE6	9.52
PAH	Naphthalene[4]	91203	HAP/VOC, /PM10[4]	159.26
	Acenaphthylene	208968	HAP/PM10	5.46
	Phenanthrene	85018	HAP/PM10	3.52
	Fluorene	86737	HAP/PM10	2.16
	Pyrene	129000	HAP/PM10	1.78
	Fluoranthene	206440	HAP/PM10	1.28
	Anthracene	120127	HAP/PM10	1.25
	Acenaphthene	83329	HAP/PM10	1.04
	Benzo(g,h,i)perylene	191242	HAP/PM10	0.37
	Benz(a)anthracene	56553	HAP/PM10	0.30
	Benzo(b)fluoranthene	205992	HAP/PM10	0.21
	Benzo(k)fluoranthene	207089	HAP/PM10	0.21
	Benzo(a)pyrene	50328	HAP/PM10	0.19
	Chrysene	218019	HAP/PM10	0.16
	Indeno(1,2,3,c,d)pyrene	193395	HAP/PM10	0.10
	Dibenzo(a,h)anthracene	53703	HAP/PM10	0.000051

Category	Pollutant	Code[1]	Factor Type[2]	Emissions
Metal	Lead	7439921	MOBILE6	1.55
	Chromium (Cr3+)	16065831	BEF	1.02
	Nickel	7440020	BEF	0.96
	Arsenic and Compounds	93	BEF	0.63
	Manganese	7439965	BEF	0.43
	Chromium (Cr6+)	18540299	BEF	0.22
	Mercury (elemental gaseous)	200	BEF	0.026
	Mercury (divalent gaseous)	201	BEF	0.0025
	Mercury (divalent particulate)	202	BEF	0.00015
Dioxin/Furan	Octachlorodibenzo-p-dioxin	3268879	BEF	0.00024
	1,2,3,4,6,7,8-Heptachlorodibenzo-p-Dioxin	35822469	BEF	0.000052
	Octachlorodibenzofuran	39001020	BEF	0.000019
	1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562394	BEF	0.000017
	1,2,3,7,8,9-Hexachlorodibenzo-p-Dioxin	19408743	BEF	0.0000079
	1,2,3,4,7,8-Hexachlorodibenzofuran	70648269	BEF	0.0000071
	2,3,7,8-Tetrachlorodibenzofuran	51207319	BEF	0.0000052
	2,3,4,6,7,8-Hexachlorodibenzofuran	60851345	BEF	0.0000048
	1,2,3,6,7,8-Hexachlorodibenzo-p-Dioxin	57653857	BEF	0.0000044
	2,3,4,7,8-Pentachlorodibenzofuran	57117314	BEF	0.0000043
	1,2,3,6,7,8-Hexachlorodibenzofuran	57117449	BEF	0.0000034
	1,2,3,4,7,8-Hexachlorodibenzo-p-Dioxin	39227286	BEF	0.0000022
	1,2,3,7,8-Pentachlorodibenzofuran	57117416	BEF	0.0000021
	2,3,7,8-Tetrachlorodibenzo-p-Dioxin	1746016	BEF	0.0000020
	1,2,3,7,8,9-Hexachlorodibenzofuran	72918219	BEF	0.0000019
	1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673897	BEF	0.0000017
	1,2,3,7,8-Pentachlorodibenzo-p-Dioxin	40321764	BEF	0.0000016

[1] NEI pollutant code.
[2] Emissions were first estimated for the six MOBILE6 MSATs, lead, VOC (exhaust and evaporative sub-components), and exhaust PM-10, using MOBILE6 emissions factors. The remaining pollutants were estimated using factors from EPA's NMIM County database (version NCD20080727): metals, and dioxins and furans factors (basic emissions factors [BEFs]) are g/mi; and gaseous HC and PAH factors are pollutant mass ratios of HAP/exhaust or HAP/evaporative VOC and HAP/exhaust PM-10, respectively.
[3] These gaseous HC pollutant emissions estimates are comprised of evaporative and exhaust components.
[4] Napthalene estimates are different from other PAHs in that, in addition to the exhaust emissions estimated as a fraction of exhaust PM-10, evaporative emissions are estimated using HAP/VOC ratios applied to gasoline evaporative emissions.

More detailed data summaries were provided in electronic form, as described in Appendix A. These include a tab-delimited text file for each county with annual EI data summaries including VMT, vehicle hours traveled (VHT), and pollutant total emissions as well as pollutant sub-component totals in units of pounds, by vehicle type and road type. A spreadsheet file includes county total, and county vehicle class total summaries (extracted from the 254 tab-delimited text files). These county summaries include VOC and exhaust PM-10 emissions estimates from which the gaseous HC and PAH HAPs shown in Table 3 were estimated. An additional file (MSAT08_DEOG_DPM.xls) combines emissions estimates for particular vehicles, pollutants, and emission types — this file provides county emissions summaries of DPM+DEOG (sum of the exhaust VOC and exhaust PM-10 emissions estimates from diesel vehicles). The Texas statewide 2008 annual DPM+DEOG estimate is 13,568.51 tons (note that this value is not exclusive of the MSAT emissions estimates in Table 3).

OVERVIEW OF METHODOLOGY

Table 1 summarized the MSAT EI areas of responsibility – NCTCOG developed and provided base annual emissions for the 12 DFW counties, TTI produced base annual emissions for the remaining 242 Texas counties, and subsequently calculated additional HAPs emissions for all 254 Texas counties, and compiled the complete MSAT EIs (base annual emissions and additional HAPs) for all Texas counties. TTI's methodology is described below. Please see the addendum for the NCTCOG base annual emissions analysis information.

TTI produced the 2008 on-road MSAT EIs using the same general methodology that TTI used to produce the 2008 CERR criteria pollutant EIs, with an additional step for estimating emissions for the additional HAPs not included in MOBILE6. This method requires development of county, hourly, link-based seasonal weekday (average summer weekday) emissions estimates, followed by conversion of the 24-hour EI summaries to annual estimates. This procedure was performed for the pollutant and pollutant subcomponent categories included in MOBILE6 yielding the base annual emissions estimates. For the additional HAPs not included in MOBILE6, emissions were calculated as fractions of the (TTI and NCTCOG-developed) base annual EI data (i.e., VOC emissions, PM-10 emissions, VMT). Annual EI data were produced by county in a tab-delimited summary file format with results by vehicle type and road type, and were converted to the TCEQ's current TexAER-compatible input format (EPA's NIF 3.0). The NIF data files were converted to EPA's 2008 NEI input format (XML file as specified in the EPA's 2008 NEI plan).

The main steps in summary are:

- produce average summer weekday EIs of the six MSATs in MOBILE6, and VOC, and exhaust PM-10 (ECARBON, OCARBON, GASPM, LEAD, SO4; see MOBILE6 pollutant label descriptions in Table 13);
- convert the average summer weekday EIs to base annual EIs;
- estimate additional non-MOBILE6-based MSATs as fractions of base annual emissions data;

- translate annual EIs into the NIF 3.0 format, including conversion of EI data from TDM roadway classes to NIF 3.0 road type classes for the TDM-based counties; and
- convert the NIF EI summaries to EPA's 2008 NEI XML input format.

To develop summer weekday MOBILE6-based pollutant emissions estimates, the detailed directional link-based, hourly methodology was used. For each hour of the average summer weekday, emissions were calculated for each roadway network link (i.e., either HPMS virtual links [HPMS roadway type and area type combination], or TDM network links for NAA and EAC area counties with complete TDMs). In general, emissions were calculated as the product of source (on-road fleet) VMT, vehicle class VMT fraction, and vehicle class emissions factors at the estimated average link speed, in units of g/mi. These hourly link-emissions estimates were summed across all hours and within categories to produce the 24-hour summer weekday emissions by vehicle type, road type, pollutant and emissions type (sub-component, e.g., exhaust running, start, evaporatives).

Annual emissions estimates for the MOBILE6-based pollutants were then produced as a conversion of the 24-hour summer weekday emissions summaries, using annualization factors consisting of two components — VMT and emissions rates. Multiplying the county 24-hour summer weekday emissions by the appropriate VMT and emissions rate annualization factors (accounting for seasonal variation in activity, meteorology, fuels, and fleet makeup) produced the base annual emissions estimates.

Annual emissions estimates for additional HAPs not included in MOBILE6 were calculated by multiplying ratios for each HAP (in terms of mass pollutant ratios: HAP-to-exhaust VOC, or HAP-to-evaporative VOC or HAP-to-exhaust PM-10; or mass of HAP per mile travelled) by the appropriate MOBILE6-based annual VOC, PM-10, or VMT estimate.

The summer weekday, hourly link-based EIs required estimation of three major elements — hourly emissions factors, hourly VMT and speeds by link, and 24-hour VMT mix (VMT fractions by vehicle class). TTI developed the emissions factors using MOBILE6 as incorporated in TTI's POLFAC utility, which outputs emissions factor look-up tables indexed by speed, hour, road type, vehicle type, pollutant and emissions type. TTI forecasted link-VMT estimates by county in annual average daily traffic (AADT) form (actual estimates weren't available), made necessary adjustments and allocations, and disaggregated the data to the link level. Adjustment and allocation factors include seasonal, directional, time-of-day (hourly), and VMT mix. Fleet, link level average operational speeds were estimated as a function of delay from freeflow conditions due to varying levels of congestion (measured by link volume-to-capacity [v/c]).

The base annual emissions analysis for MOBILE6 pollutants required three major elements — county 24-hour summer weekday emissions, a county VMT annualization factor (one for all vehicle types and road types), and emissions rate annualization factors (one per pollutant, emissions type and vehicle type). In general, using 24-hour rates, the emissions rate annualization factor is the quotient using annual emissions rate as the numerator (i.e., combined monthly 24-hour average emissions factors to account for seasonal effects) and summer weekday rate as the denominator.

Calculating the annual emissions for the additional HAPs not included in MOBILE6 required two main components — the base annual estimates of exhaust and evaporative VOCs, exhaust PM-10, and VMT; and additional HAPs ratios or factors. Depending on the category of the HAP, the ratios or factors may be in terms of the mass HAP by emissions type per mass CAP by emissions type (in milligrams/gram) or mass HAP per VMT (or milligrams/mile).

The resulting MSAT annual EI data files for each county are tab-delimited text files providing summary tables of VMT, VHT, and average speed (same as for summer weekday analysis). The county EI data files also include pounds of emissions for each pollutant/emissions type combination by the 28 MOBILE6 vehicle classes and up to 21 HPMS road type/area type combinations (or for TDM-based counties, by the roadway types in the regional TDM network).

The EI data in this form were translated into the NIF 3.0 format, to include compression of data from the up to 28-by-21 vehicle types by road type matrix into the NIF 12-by-12 matrix. To convert EI data for TDM-based counties from the TDM roadway type scheme into the NIF roadway types (i.e., HPMS scheme), TxDOT's Roadway Inventory Functional Classification Record (RIFCREC) VMT (i.e., county HPMS data) proportions by road type within Freeway, Arterial, and Collector/Local categories were used. TTI then converted the annual EI data from NIF form to EPA's 2008 NEI XML reporting format.

TTI developed and maintains a series of computer utilities to calculate and summarize detailed on-road mobile source EIs in various formats. Appendix B describes these applications.

ESTIMATION OF SUMMER WEEKDAY VMT

This section describes TTI's processing of TDM, HPMS, and other vehicle activity data to produce the hourly, link level summer weekday VMT estimates for 242 Texas counties. NCTCOG produced the link activity data for the 12 DFW area county EIs per agreement – see the addendum for information on NCTCOG's EI analysis.

The detailed, hourly, link-based emissions process requires VMT estimates by hour and direction for each link in either the TDMs or the HPMS-based virtual network. It was also required for this analysis that VMT be adjusted for HPMS consistency and to estimate an average summer weekday (defined in this analysis, depending on area, as either June through August or July through September, Monday through Friday). The TRANSVMT and VirtualLinkVMT utilities (see Appendix B for descriptions of the utilities), TDMs (where applicable), an HPMS virtual network for those counties not included in the TDMs, and post-processing factors developed from several other data sources were used to produce this hourly VMT by direction.

Data Sources

The link VMT estimates were based on either a TDM or an HPMS virtual network. For those counties included in the TDMs, the most latest available TDM was used. Since intrazonal VMT are not accounted for in the TDMs, the intrazonal VMT was estimated using the respective TDM's trip matrix and zonal radii. Table 4 shows the activity basis for each county. The activity estimates used for this emissions analysis are the same activity inputs that were used to produce the 2008 CERR EIs.

Table 4. Activity Basis of Link VMT Estimates.

Area	Counties[1]	Activity Basis	Model Run Date
Austin EAC area	Hays, Travis, Williamson	2005 TDM	March 6, 2008
	Bastrop, Caldwell	HPMS	N/A
Beaumont-Port Arthur NAA	Jefferson, Hardin, Orange	2007 TDM	January 30, 2007
El Paso maintenance area	El Paso	2007 TDM	September 17, 2007
Houston/Galveston NAA	Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, Waller	2008 TDM	January 20, 2009
San Antonio EAC area	Bexar, Comal, Guadalupe, Kendall, Wilson	2005 TDM	May 8, 2008
Northeast Texas EAC area	Gregg	1998 TDM	July 7, 2005
	Smith	1998 TDM	July 7, 2005
	Harrison, Rusk, Upshur	HPMS	N/A
Dallas/Fort-Worth CMSA[1]	Collin, Dallas, Denton, Rockwall, Tarrant/Ellis, Henderson, Hood, Hunt, Johnson, Kaufman, Parker	(See Addendum)	
Remainder of Texas	215 counties	HPMS	N/A

[1] Activity data were estimated and applied by NCTCOG to produce the base annual emissions estimates for the 12-county DFW CMSA, which were provided to TTI for the MSAT EI analysis.

There were two other major traffic data sources used for developing the VMT estimates (and traffic volume estimates for operational speed modeling, discussed later) and their associated adjustment and allocation factors. These are automatic traffic recorder (ATR) counts and HPMS VMT estimates. Both are collected and developed by TxDOT on a formal and on-going basis as part of the larger HPMS data collection program. In addition to these traffic data, U.S. Census and Texas State Data Center (TSDC) county population statistics and projections were also used in developing the VMT forecasts.

HPMS VMT estimates are developed based on traffic count data collected according to a statistical sampling procedure specified by the Federal Highway Administration (FHWA) designed to estimate VMT. TxDOT compiles and reports Texas HPMS data in its annual RIFCREC reports. A wide range of traffic data is collected under the HPMS program. For the HPMS-based counties, the focus for this application is specifically the VMT, centerline miles, and lane miles. For the TDM-based counties, the county total HPMS AADT VMT was used to ensure the travel model VMT was consistent with the HPMS VMT estimates. (EPA and FHWA have endorsed HPMS as the appropriate source of VMT and require that VMT used to construct on-road mobile source emissions estimates be consistent with that reported through HPMS.) The

HPMS roadway data were categorized by seven roadway functional classifications and four area types (shown later in the estimation of speeds section).

TxDOT collects ATR vehicle counts at selected locations on a continuous basis throughout Texas. These counts are available by season, month, and day type, as well as on an annual average daily basis (i.e., AADT). Since they are continuous, they are well suited for making seasonal, day-of-week, and time-of-day comparisons (i.e., adjustment factors), even though there may be relatively few ATR data collection locations in any area. ATR data are available for most but not all counties. Consequently, the ATR data were aggregated to the TxDOT District level to provide adequate data coverage (see Appendix C for Texas counties listed by TxDOT District).

Summer Weekday Factors

Since the historical and forecast VMT data were initially developed in AADT form (i.e., Monday through Sunday, January through December), a seasonal factor was required to convert from AADT to traffic characteristic of the average summer (or peak ozone season) weekday (in general, average June through August, Monday through Friday. The exception this was the HGB and TLM area counties where the peak ozone season is defined as July through September).

Multiple years of TxDOT district ATR vehicle counts (i.e., 2000 through 2007) were aggregated to develop an average summer weekday VMT adjustment factor for each TxDOT District to use with the county AADT VMT estimates associated with each district. Two sets were developed, one for June through August, and the other for July through September. The factors were calculated as the ratio of average seasonal period weekday volumes to the AADT volumes. Appendix D lists the summer weekday conversion factors.

Development and Link-Level Allocation of County VMT Control Totals

County 2008 summer weekday VMT (control totals) were produced as AADT county VMT forecasts, converted to summer weekday form using the district summer weekday VMT adjustment factors (discussed previously). These county, aggregate VMT control totals were then disaggregated to the link level.

2008 VMT Control Total Estimates

TTI used an HPMS and population-based method to forecast aggregate county AADT VMT estimates for 2008. With this method, the AADT VMT forecast is produced as the combination of two intermediate forecasts — one based on population projections, and the other based on the historical, actual HPMS VMT.

The VMT per-capita-based forecasts were developed using VMT-to-population ratios (based on 2007 population and 2007 VMT) applied to official TSDC population projections. The growth-based VMT forecasts were developed using traditional regression analyses on historical HPMS AADT VMT data (i.e., from 1990 through 2007). Population-based forecasts (i.e., VMT per capita) tend to under estimate future VMT, especially in small counties adjacent to large urban areas. Conversely, historical-based (i.e., growth trend) forecasts tend to over estimate future VMT, especially in areas where there has been recent atypical rapid growth. These two forecast streams, however, form the range of credible results. The HPMS and population-based VMT forecasting method combines the population-based and historical VMT-based forecast streams with equal weight, and then calibrates the combined forecast result to the latest HPMS historical VMT (2007) data using a step-function adjustment.

The summer weekday factor was multiplied by the county AADT VMT forecasts to produce the county 2008 VMT control totals. Appendix E lists the summer weekday VMT control totals.

VMT Estimates by HPMS Virtual Links
The county, aggregate VMT control totals were disaggregated to the virtual links proportionally to the historical county HPMS AADT VMT on each virtual link, using the proportions from the latest available (2007) TxDOT RIFCREC Report.

The 2008 control total VMT disaggregation was performed in two steps. First, the county VMT control total was divided by the county historical (2007) HPMS AADT VMT total to produce the county-level summer weekday VMT factor. This county VMT factor was then multiplied by the corresponding county link-level 2007 AADT VMT estimates (in essence, a scaling of link VMT from 2007 AADT to 2008 summer weekday form).

Estimation of TDM-Based County VMT Totals
To develop the link-level VMT for the TDM-based counties, the county-level control totals were then divided by the county-level total VMT (TDM assignment VMT plus intrazonal VMT estimate) to produce three county-level VMT adjustment factors. For each link in the TDM, the volume was multiplied by the corresponding VMT adjustment factor (based on the county where the link is located). The adjusted link volumes were then multiplied by the associated link lengths to produce the link-level HPMS consistent, summer weekday VMT estimates. See Appendix F for tabulations of the regional TDM county control totals, TDM VMT, and VMT factors.

Hourly Travel and Directional Factors
To allocate the 24-hour, virtual link-level, summer weekday VMT by hour-of-day, TxDOT District hourly travel factors were multiplied by the 24-hour, link-based VMT from their corresponding counties. The district hourly travel factors were developed with the multi-year TxDOT ATR data (i.e., 2000 - 2007). Using the district average summer weekday ATR volumes, the hourly travel factors were calculated as the ratio of hourly volume to 24-hour volume. Appendix G (Hourly Travel Factors) shows the hourly travel factors.

Directional split factors were used to produce the VMT and speeds by direction for both the TDM-based counties (excluding HGB, which is a directional assignment and does not require directional split factors) and the counties where the HPMS-based virtual network was used. For the TDM-based counties, these factors were multiplied by the link volume to estimate the volume of travel in each direction — one record containing the estimated volume in the peak (or dominant) direction, and the second record containing the estimated volume in the opposite direction. These directional volume estimates were used not only to estimate the VMT in each direction, but also to estimate the directional speeds (discussed in the next section). Appendix F lists the time-of-day periods, the TDM's respective functional classes, area types, and directional splits.

The directional split ratio applied for the HPMS-based counties is 60/40 based on aggregate observed values for areas where data are available. The hourly, directional VMT estimates for each link were then divided by the link's centerline miles to produce the link volume estimates required for input to the speed model (discussed in the next section). Table 5 shows the HPMS functional classes and area types.

Table 5. HPMS Functional Classes and Area Types.

HPMS Area Type[1]	HPMS Roadway Functional Classification						
Rural	Interstate	Freeway	Other Principal Arterial	Minor Arterial	Major Collector	Minor Collector	Local
Small Urban							
Urban							

[1] For this analysis, the Urban area type is for populations of 50,000 +.

Hourly and 24-hour county VMT summaries (by road type and vehicle type) were produced and were included with the detailed EI data provided (see inventory data file descriptions in Appendix A).

ESTIMATION OF LINK SPEEDS

Speed is a critical parameter for estimating emissions. TTI used two general models to estimate link speeds for the analysis. The first model is the TTI speed model, which was applied for all Texas counties except for the eight HGB-area counties. The second model is the Houston speed model. (See the Addendum for the NCTCOG EI input information.)

TTI Speed Model

To estimate link operational (congested) speeds, a speed model involving both the link estimated freeflow speed and estimated directional delay (as a function of volume and capacity) was used. This model was used to estimate the hourly, directional, congested speed for each link, except for the TDM centroid connectors and added intrazonal links. The congested speed was calculated using the following formula:

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

Speed model input parameters were estimated differently depending on whether or not the county was TDM-based (network link) or HPMS-based (virtual link).

TDM-Based County Operational Link Speeds

Freeflow speed factors were used to convert TDM speeds (which are by definition level-of-service [LOS] C) to LOS A speeds (freeflow). For each functional class and area-type combination, the freeflow speed factors were calculated by dividing the freeflow speed by the corresponding speed from the speed/capacity look-up table used for the TDM. The freeflow speeds were determined using the Highway Capacity Manual (HCM), using suitable assumptions

to relate the HCM data to the functional classes used in the TDMs. Appendix F shows the freeflow speed factors used by area-type/functional-class combination.

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

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

Where:

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

The delay model parameters (A, B, and M) were developed for the DFW area and verified by application in other Texas urban areas. Appendix F lists the delay model parameters and each TDM's functional class and respective capacity category.

The time-of-day directional v/c ratios were estimated using the directional volume (from the VMT estimation) and the time-of-day directional capacity. However, the 24-hour user equilibrium assignment was performed using non-directional 24-hour capacities. To estimate the time-of-day directional capacity, the directional split for capacity was assumed at 50/50 and capacity factors were multiplied by the non-directional capacity for each link. Appendix F summarizes the capacity factors for each TDM. Capacity factors were calculated using the following formula:

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

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

HPMS-Based County Operational Link Speeds

The capacities and freeflow speeds used in the virtual link procedure are based on the HCM. For HPMS functional classifications 1 and 2 (Interstate and Freeway), both capacities and freeflow speeds are consistent with HCM guidance (HCM Chapters 13 and 30). The capacity (2,400 passenger cars per hour per lane [pcphpl]) and freeflow speed (70 mph) for four-lane Freeways is used for all Interstates and Rural Freeways. Similarly, a freeflow speed of 65 mph and capacity of 2,300 pcphpl is used for Small Urban and Urban Freeways (HCM Exhibits 13-3 and 30-2).

The only adjustment applied to these two highest-level roadways is for the impact of heavy trucks on capacity (which is measured in passenger car equivalents). Based on VMT mix for

these roads in the three area types (procedure discussed in the following sections), and HCM designated passenger car equivalents (1.5 per HCM Exhibit 23-8), Table 6 shows the capacities for Interstates and Freeways.

Table 6. Adjusted Interstate and Freeway Flow Rate (pcphpl) by Area Type.

Area Type	Ideal Flow	HDV	Factor	Adjusted Flow
Rural	2,400	0.2832	0.8760	2,102
Small Urban		0.1140	0.9461	2,271
Urban		0.0616	0.9701	2,328
Rural	2,300	NA		
Small Urban		0.1140	0.9461	2,176
Urban		0.0616	0.9701	2,231

HPMS functional classifications 3, 4, 5, 6, and 7 (Principal Arterial, Minor Arterial, Major Collector, Minor Collector, and Local) are interrupted flow facilities (i.e., they have traffic control devices). The capacities of these interrupted flow facilities are estimated as a function of adjusted flow and available green time (per HPMS Field Manual Appendix N, Equation 20):

$$Cap = Sat \times (gr/c).$$

Where:

Cap = capacity of lane group, vehicles per hour (vph);
Sat = saturation flow rate of lane group, vehicles per hour of effective green time (vphg);
gr/c = effective green ratio for lane group.

The saturation flow rate (Sat) is the flow in vph that could be accommodated by the lane group assuming that the green phase is always available to the lane group (i.e., green ratio = 1.0). Calculation of the adjusted saturation flow rate begins with the ideal saturation flow rate (HCM Exhibit 10-12) of 1,900 pcphpl, which is adjusted to reflect the deviation from ideal conditions. The saturation flow rate is adjusted using the following logic (from HCM equation 16-4, with parameter estimates consistent with HCM Exhibit 16-7 and Chapter 10):

$$S = fw \times fhv \times fg \times fp \times fbb \times fa \times flu \times frt \times flt \times flpb \times frpb$$

Where:

S = saturation flow rate adjustment factor;
fw = lane width factor (NA, 12-foot lane for all area types assumed);
fhv = heavy vehicle adjustment factor (based on area type VMT mix);
fg = approach grade factor (NA, level terrain assumed);

fp = parking lane adjustment (NA, unusual for rural or small urban areas, inappropriate for urban areas given HPMS aggregation);
fbb = bus blocking factor (NA, negligible per area type VMT mix);
fa = area-type adjustment (NA, since the default of 0.9 is for urban area central business districts (CBDs) and urban is more broadly defined in HPMS);
flu = lane utilization adjustment (NA, data unavailable in HPMS);
frt = right turn adjustment factor (exclusive lanes for urban areas, 90 percent shared lane for right turns for rural areas, midpoint for small urban areas);
flt = left turn adjustment factor (exclusive lanes for urban areas, 90 percent shared left turn lanes for rural areas, midpoint for small urban areas).
flpb = left turn pedestrian-bike adjustment (NA, no significant pedestrian-bike activity on average); and
frpb = right turn pedestrian-bike adjustment (NA, no significant pedestrian-bike activity).

Table 7 shows the saturation flow rate adjustment factors used for the three different area types. Unitary factors (i.e., factors whose value is 1 for all area types, or which are otherwise not applicable) for parameters fw, fg, fp, fbb fa, flu, flpb, and frpb are not shown.

Table 7. Saturation Flow Rate Adjustment Factors by Area Type.

Area Type	fhv	Frt	flt	Factor
Rural	0.8918	0.9850	0.9950	0.8740
Small Urban	0.9380	0.9175	0.9725	0.8369
Urban	0.9661	0.8500	0.9500	0.7801

Table 8 shows the adjusted saturation flow rate (expressed in pcphpl) for all interrupted flow facilities (i.e., signalized streets, not Interstate or Freeway) for the three area types.

Table 8. Adjusted Saturation Flow Rate (pcphpl) by Area Type.

Area Type	Ideal Flow	Adjustment Factor	Adjusted Saturation Flow
Rural	1,900	0.8740	1,661
Small Urban		0.8369	1,590
Urban		0.7801	1,482

Table 9 shows the effective green ratios used for different functional classes and area types. Since the virtual link procedure is highly aggregated, individual green ratio calculations are not meaningful. Instead, assuming a hierarchical interface of classifications, ratios of adjacent roadway functional category group AADT were used to estimate effective green ratios. The ratio of AADT between the two highest categories of Arterials, scaled to a hypothetical 0.5 balance, is used for Arterials. The ratio of the highest category of Collector AADT to the lowest category of Arterial AADT is used for Collectors, again scaled to a hypothetical 0.5 balance. Locals are the default values recommended in the HPMS procedures (HPMS Field Manual, Appendix N). The overall approach is based on, and consistent with, HPMS guidance.

Note that Interstates and Freeways are uninterrupted flow facilities, i.e., they have no traffic control devices, and therefore do not require green ratios. For this calculation, area-type definitions are made at the county level and are based on the U.S. Census criteria.

Table 9. Estimated Effective Green Ratios (gi/C) by Area Type.

Area Type	Arterials	Collectors	Locals
Rural	0.613	0.448	0.400
Small Urban	0.600	0.487	0.400
Urban	0.508	0.478	0.400

Table 10 incorporates Tables 9, 10, and 11, and the delay per mile values (1.0 for high-capacity facilities [HPMS Interstate and Freeway functional classifications] and 2.0 for low-capacity facilities [HPMS Arterial, Collector, and Local functional classifications]) to produce hourly lane capacities by functional class and area type.

Table 10. Hourly Lane Capacities (vehicles per hour per lane [vphpl]).

Area Type	Roadway Functional Classification				
	Interstate	Freeway	Arterials	Collectors	Local
Rural	2,102	2,102	1,018	744	664
Small Urban	2,271	2,176	954	774	636
Urban	2,328	2,231	753	708	593

The freeflow speed for Rural and Urban Interstates, Freeways, and Arterials is consistent with HCM guidance (HCM Chapter 10, especially Exhibit 10-5), with appropriate modifications for the aggregation inherent in the virtual link procedure. Minor Collectors and Locals are grouped. In recognition of the aggregation inherent in the process, a lower limit of 30 mph is set on freeflow speed. Freeflow speeds are provided for each of the three area types and seven roadway functional classifications (i.e., 21-HPMS virtual links). Table 11 shows the freeflow speeds.

Table 11. Freeflow Speeds (mph).

HPMS Area Type	HPMS Roadway Functional Classification					
	Interstate	Freeway	Other Principal Arterial	Minor Arterial	Major Collector	Minor Collector and Local
Rural	70	70	60	50	40	30
Small Urban	70	60	50	40	35	30
Urban	70	60	40	35	30	30

V/C ratios are generated for each combination of time period (hour), roadway functional classification, area type, and direction using these capacities and VMT. The calculations for this procedure are:

- Volume: VMT is multiplied by each of the 24 hourly time period factors yielding VMT for each hour. VMT per hour is divided by centerline miles, yielding volume for each hour. This procedure is performed for each combination of hour, roadway functional classification and area-type combination, and direction.
- Capacity: Lane miles are divided by centerline miles to produce lanes. Lanes are multiplied by the lane capacities (i.e., adjusted saturation flows) generated by the process described above, producing hourly lane capacities. This procedure is performed for each combination of roadway functional classification and area type. (Capacity is the same for each hour and each direction.)
- V/C ratios: The speed model uses the hourly volumes and capacities to produce hourly, directional v/c ratios for each roadway functional classification and area-type combination. These v/c ratios are used to calculate hourly, directional congestion-related delay and congested speeds (as described below) by functional classification and area-type combination.

The v/c ratios were input to the delay component of the congested speed model to calculate the delay on each link, which was subsequently used along with the link freeflow speed in the congested speed calculation to produce the link congested speed estimate. The delay equation

and congested speed equations, shown previously, are the same for both TDM-based and HPMS-based analyses. The delay equation parameters for the HPMS-based counties were the same as applied for TDM-based counties, except that v/c ratios were based on the estimated virtual link volumes and capacities for each HPMS county, and the maximum minutes of delay per mile (M) values for the HPMS counties were 1.0 for high-capacity facilities (HPMS Interstate and Freeway functional classifications) and 2.0 for low-capacity facilities (HPMS Arterial, Collector, and Local functional classifications).

Houston Speed Model

The Houston speed model calculates these speeds using the travel model speed, speed factors (consisting of a freeflow speed factor and LOS E speed factor) and a v/c ratio-based speed reduction factor (SRF) for each link.

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 F (Houston Speed Model) 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:

$$\text{v/c ratio} = Vh / Ch$$

Where:

Vh = the hourly link volume (travel model × HPMS factor × seasonal adjustment factor × hourly time period factor; Weekend profile factor is included for Saturday and Sunday); and

Ch = the hourly link capacity (travel model capacity × hourly capacity factor). Appendix F (Houston Speed Model) shows the hourly capacity factors.

After 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 SRFs 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 F (Houston Speed Model) 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:

$$S_{V/C} = S_{0.0} - SRF_{V/C} \times (S_{0.0} - S_{1.0})$$

Where:

$S_{V/C}$ = estimated directional speed for the forecast v/c ratio on the link;

$S_{0.0}$ = 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

$SRF_{V/C}$ = SRF for the v/c ratio on the link. The v/c ratio can be 0.0 to 1.0.

For v/c ratios greater than 1.0 and less than 1.5, the following speed model extension was used.

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

Where:

$S_{v/c}$ = estimated directional speed for the forecast v/c ratio on the link;
$S_{1.0}$ = 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 calculated using the speed model extension 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 average speed summaries by county and road type were produced with the emissions summaries that were provided in the EI data submittal (see Appendix A for list and descriptions of electronic data provided).

ESTIMATION OF MOBILE6 EMISSIONS FACTORS

Table 1 summarized the MSAT EI areas of responsibility – NCTCOG developed and provided base annual emissions for the 12 DFW counties, TTI produced base annual emissions for the remaining 242 Texas counties, and subsequently calculated additional HAPs emissions for all Texas counties, and compiled the complete MSAT EIs (base annual emissions and additional HAPs) for all Texas counties. TTI's emissions factor methodology is described below. (Please see the addendum to this Technical Note for information on NCTCOG's base annual emissions analysis.)

TTI used the same data and methods as used in the 2008 CERR emissions factor analyses, except that the pollutants modeled were those needed for the MSAT analysis.

TTI produced the on-road mobile source emissions factors by county (for the regional based analyses, e.g., nonattainment, maintenance, and EAC area counties) and by county group (for the remaining counties under the statewide method) using MOBILE6 as incorporated in TTI's utility that processes the detailed MOBILE6 data into the look-up table form needed in the emissions calculations. For the 2008 summer weekday emissions analysis step, hourly average summer weekday emissions factors were needed; for the 2008 annual emissions analysis, both 24-hour average monthly and 24-hour average summer weekday rates were needed to produce the emissions rate annualization factors discussed in a later section.

All Texas counties were placed in 69 MOBILE6 input groups for developing the emissions factors for use in the statewide methodology county EI development. These groups were defined by the unique combinations of MOBILE6 inputs produced using information within different geographic boundaries (e.g., TxDOT district, climate zone, fuel rule boundary). Appendix A lists

the counties-by-group codes as used in MOBILE6 input/output filenames for the statewide method-based counties.

MOBILE6 emissions factors were developed using a utility (see POLFAC62_3 description in Appendix B), which produces the MOBILE6 detailed, by-model-year (MY) emissions factor data, combines the emissions factors across MYs into average vehicle class form, and organizes the results in look-up tables. The emissions factors are indexed by speed, pollutant, emissions type, hour (and/or day in a separate look-up table, if requested), road type (drive cycle), and vehicle class. The MOBILE6 pollutants (see Table 13) included in the analysis include: VOC, exhaust PM-10 (all components available in the model), and the six MOBILE6 air toxic pollutant (1,3-butadiene, acetaldehyde, acrolein, benzene, formaldehyde, and MTBE).

The MOBILE6 model is equipped with national default modeling values for a wide range of conditions that affect emissions factors. Many of the default modeling parameters may be overridden using certain MOBILE6 commands and their associated inputs/options. Wherever possible, MOBILE6 defaults were replaced by local input values. MOBILE6 commands were set and local inputs were developed and used to produce the emissions factors by county or county group characteristic of the 2008 period (e.g., summer weekday, or monthly weekday for the annual analysis). The model functions and associated command/input options are divided into the following categories:

- Pollutants and Emissions Rates;
- External Conditions;
- Vehicle Fleet Characteristics;
- Activity;
- State Programs;
- Fuels; and
- Alternative Emissions Regulations and Control Measures.

The following discussion includes summary of control programs modeled, MOBILE6 emissions factor aggregation levels, MOBILE6 commands and input parameters, and development of locality-specific inputs. All of the MOBILE6 (command and external data) input files and output files are provided on CD-ROM as described in Appendix A.

Summary of Control Programs Modeled

All of the FMVCPs included in MOBILE6 were modeled (this is the MOBILE6 default). The new federal emissions standards implemented beginning in 2006 for motorcycles (MCs) (not included in MOBILE6) were incorporated by emissions factor post-processing. Also modeled were the federal programs to offset HDDV defeat device effects — the low emissions rebuild program (using the alternate rebuild rate estimate), and the HDDV 2004 standard pull-ahead program (using the MOBILE6 default), although these affect NOx only, which was not a part of this analysis. Fuel program effects were modeled using the MOBILE6 fuels commands and associated inputs, generally developed from the 2008 summer and winter gasoline survey data and summaries for Texas cities, and the 2008 summer highway diesel survey summary data.

MOBILE6 Emissions Factor Aggregation Levels

The emissions factors for each MY from the MOBILE6 detailed data were condensed into average fleet emissions factors by vehicle class. This was performed (using POLFAC62_3) by multiplying each by-MY emissions factor by its corresponding travel fraction and summing the products. (For the daily emissions factors, the hourly emissions factors were further compressed using the hourly VMT factors.) The resulting emissions factor tables provide the MOBILE6 emissions factors, for each selected pollutant, by:

- 28 vehicle types;
- 4 road types;
- 14 speeds (except for Local and Ramp MOBILE6 road types, each with one average speed);
- 24 hourly time periods (unless daily values are specified); and
- the emissions types associated with each selected pollutant.

The MOBILE6 vehicle types, pollutants and emission types are summarized in Tables 12 through 14. Tables 15 through 17 show the roadway type classifications, average speeds, and the sequence for the hourly time periods, respectively.

Table 12 MOBILE6 Vehicle Classifications.

Index	Label	Description[1]
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)

[1] GVWR is gross vehicle weight rating, LVW is loaded vehicle weight, and ALVW is adjusted loaded vehicle weight (the numerical average of the vehicle curb weight and the GVWR).

Table 13. MOBILE6 Pollutant Categories.

Abbreviation[1]	Description
HC	Hydrocarbons (gaseous)
CO	Carbon Monoxide (gaseous)
NOx	Oxides of Nitrogen (gaseous)
CO_2	Carbon Dioxide (gaseous)
SO_4	Sulfate Portion of Exhaust Particulate
OCARBON	Organic Carbon Portion of Diesel Exhaust Particulate
ECARBON	Elemental Carbon Portion of Diesel Exhaust Particulate
GASPM	Total Carbon Portion of Gasoline Exhaust Particulate
Lead	Lead Portion of Exhaust Particulate
SO_2	Sulfur Dioxide (gaseous)
NH_3	Ammonia (gaseous)
Brake	Brake Wear Particulate
Tire	Tire Wear Particulate
BENZ	Benzene
MTBE	Methyl Tertiary Butyl Ether
BUTA	1,3-Butadiene
FORM	Formaldehyde
ACET	Acetaldehyde
ACRO	Acrolein

[1] The HC species for this analysis is VOC as described in Section 2.8.3.5 of the MOBILE6 User's Guide. The particulate pollutants, SO_4, OCARBON, ECARBON, GASPM, LEAD, BRAKE, and TIRE may be modeled at particulate size cutoffs from 1.0 to 10.0 micrometers.

Table 14. MOBILE6 Emissions Type Classifications.

Label	Description[1]	Pollutants	Vehicle Classes
Running	Exhaust Running Emissions	All except tire and brake wear	All
Start	Exhaust Engine Start Emissions (trip start)	HC, CO, NOx, Air Toxics[1]	All light-duty plus MC
Hot Soak	Evaporative Hot Soak Emissions (trip end)	HC, BENZ, MTBE	Gasoline, including MC
Diurnal	Evaporative Diurnal Emissions (heat rise)	HC, BENZ, MTBE	Gasoline, including MC
Resting	Evaporative Resting Loss Emissions (leaks and seepage)	HC, BENZ, MTBE	Gasoline, including MC
Run Loss	Evaporative Running Loss Emissions	HC, BENZ, MTBE	Gasoline, less MC
Crankcase	Evaporative Crankcase Emissions (blow-by)	HC	Gasoline, including MC
Refueling[2]	Evaporative Refueling Emissions (fuel displacement and spillage)	HC, BENZ, MTBE	Gasoline, less MC
Brake Wear	PM from brake component wear	Brake wear particulate	All
Tire Wear	PM from tire wear	Tire wear particulate	All

[1] Air Toxics are BENZ, MTBE, BUTA, FORM, ACET, and ACRO.
[2] The refueling emissions are generally considered an area source category and are not included in the on-road mobile source emissions analysis.

MOBILE6 calculates emissions factors reflective of driving cycles observed on four roadway types (for the light-duty vehicle classes, and for the heavier heavy-duty vehicles, to include the varying degrees of NOx off-cycle effects, dependent on road type). Also calculated are 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 15 shows the driving cycle (or roadway type) descriptions. The fifth category, not actually a road type, is labeled by MOBILE6 as “None.” “None” (roadway type 5) is the index for the emissions types that do not apply to the driving cycles, and thus do not vary by roadway type or speed.

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

Table 15. 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[1]	None	Not applicable (for start and some evaporative emissions)

[1] In POLFAC62_3, the MOBILE6 g/mi start and non-running evaporative emissions factor components are associated with each of the four MOBILE6 roadway categories for subsequent link-level emissions calculations.

Table 16 lists the 14 speeds for calculating the MOBILE6 Freeway and Arterial emissions factors that are listed in the POLFAC emissions factor tables. Later in the emissions estimation process, emissions factors for average operational speeds that are not in the 14 speeds are estimated by interpolation (except for those speeds outside of the MOBILE6 speed range, in which case the emissions factors corresponding to the appropriate bounding speed are used). The MOBILE6 Local and Ramp road type emissions factors are not speed sensitive and are each characterized by one average speed.

Table 16. MOBILE6 Freeway and Arterial Average Speed Bin Speeds Used in POLFAC62_3 Emissions Factor Look-Up Tables.

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

[1] Also included in the POLFAC tables are the MOBILE6 Local and Ramp drive cycle emissions factors, whose 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 beginning from the 6 a.m. hour. In some cases, however, some overnight hours are grouped together as a single time period. Table 17 shows the MOBILE6 sequence for hourly inputs. In the POLFAC emissions factor table output, the hourly emissions factors are sequenced beginning with the midnight-to-1:00 a.m. hour.

Table 17. General Sequence for Calendar Day Hourly Inputs to MOBILE6.

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

[1] For some MOBILE6 hourly input parameters, overnight hours are grouped. Hourly inputs are representative of the same day, but are reordered for input to MOBILE6 to begin at 6 a.m. POLFAC sequences the modeled emissions factor output beginning with midnight hour.

MOBILE6 Commands and Input Parameters
Tables 18 through 24 describe the MOBILE6 commands/parameters usage for the average summer weekday analysis and for the annual analysis (using average monthly weekday rates). Unless otherwise noted, commands and input parameter values were used for all counties and periods. For locality-specific inputs, the source of the data is given. Where MOBILE6 defaults were used, technical report references (electronic file names available on the EPA MOBILE website [http://www.epa.gov/otaq/models/mobile6/m6tech.htm]) are provided.

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

Table 18. MOBILE6 Pollutants and Emissions Rates.

Command	Function/Description	Input Parameter Source/Value
POLLUTANTS[1]	Defines the basic set of pollutants to report.	HC.
PARTICULATES[1]	Enables calculation of PM and related emissions factors.	SO_4, OCARBON, ECARBON, GASPM, LEAD.
PARTICULATE EF	Specifies location of files that contain the particulate emissions factors when PARTICULATES command is used.	Used MOBILE6 defaults.
PARTICLE SIZE	Sets the maximum particulate size cutoff value in micrometers used by MOBILE6.	10.0 (particle size associated with the HAP/PM-10 ratios).
EXPRESS HC AS VOC	One of five commands used to specify an HC species to report in the exhaust emissions output: non-methane HC (NMHC), non-methane organic gases (NMOG), total HC (THC), total organic gases (TOG), or VOC.	Used "VOC" command to model the VOC HC species.
NO REFUELING	MOBILE6 excludes refueling emissions.	APPLIED.
AIR TOXICS	Enables calculation of air toxic emissions factors (six explicit pollutants) and specifies which to calculate. Requires additional fuels input parameters and associated commands.	ACET, ACRO, BENZ, BUTA, FORM, MTBE.
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 MY.	Used updated fuel economy estimates that account for Corporate Average Fuel Economy standards changes that took effect beginning in the 2005 MY light-duty fleet vehicles (provided by TCEQ, June 2008).

[1] These commands and associated parameters were needed to produce the VOC and PM-10 emissions needed for calculating the additional HAP emissions using HAP/VOC and HAP/PM-10 ratios.

Table 19. MOBILE6 External Conditions.

Command	Function/Description	Input Parameter Source/Value
CALENDAR YEAR[1]	Calendar year for which emissions factors are to be calculated.	2008, 2009.[1]
EVALUATION MONTH[1]	Provides option of calculating January 1 or July 1 emissions factors for calendar year.	1 – (January) for winter season. 7 – (July) for summer season.
MIN/MAX TEMPERATURE	Sets minimum and maximum daily temperatures. (Required to run model if the HOURLY TEMPERATURES command is not used.)	NOT APPLIED.
HOURLY TEMPERATURES	Allows temperatures input for each hour of day. (Required to run model if the MIN/ MAX TEMPERATURE command is not used.)	Used summer season and monthly inputs consistent with the 2008 CERR EIs. See Appendix H.
ALTITUDE	Specifies high- or low-altitude for modeling area.	NOT APPLIED. (MOBILE6 default, low altitude, will be assumed.)
ABSOLUTE HUMIDITY	Used to specify daily average humidity (directly affects NOx emissions). MOBILE6 also converts absolute humidity to heat index that affects HC and CO emissions for the portion of the fleet that MOBILE6 determines is using air conditioning.	NOT APPLIED.
Environmental Effects on Air Conditioning: CLOUD COVER PEAK SUN SUNRISE/SUNSET	Commands used by MOBILE6 to model the extent of vehicle air-conditioning usage. Specifies average daily percent of cloud cover. Specifies mid-day hours with peak sun intensity. Allows user to specify time of sunrise and sunset.	NOT APPLIED.
RELATIVE HUMIDITY	Specifies use of 24 hourly relative humidity values entered by user. MOBILE6 will perform hour-specific calculations with hourly values rather than using single daily default absolute humidity values.	Used summer season and monthly inputs consistent with the 2008 CERR EIs. See Appendix H.
BAROMETRIC PRES	Specifies use of user input daily average barometric pressure for use with hourly relative humidity to calculate hourly absolute humidity.	Used summer season and monthly inputs consistent with the 2008 CERR EIs. See Appendix H.

[1] To model changes in fleet composition due to fleet turnover, Calendar Year/Evaluation Month input combinations by month used were: 2008/1 for January – March; 2008/7 for April – September; and 2009/1 for October – December. For summer weekdays, Year/Month combination used was 2008/7.

Table 20. MOBILE6 Vehicle Fleet Characteristics.

Command	Function/Description	Input Parameter Source/Value
REG DIST	Allows the user to supply registration distributions by age for any of the 16 composite (combined gasoline and diesel) vehicle types.	Locality-specific, developed by TTI. Mid-year 2008 TxDOT registrations data were used for all vehicle types, except MOBILE6 defaults were used for Buses. For all counties, HDV8b was aggregated at the state level. For nonattainment and EAC area counties, area-level data were used for the other heavy-duty vehicle (HDV) categories and county-level data were used for light-duty vehicle (LDV), light-duty truck (LDT), and MC classes. For the remaining counties, TxDOT District aggregate data were used for all vehicle classes except HDV8b and Buses. See Appendix I.
DIESEL FRACTIONS	Permits user to supply locality-specific diesel fractions for 14 of the 16 composite vehicle categories by age.	Locality-specific, developed by TTI. Mid-year 2008 TxDOT statewide registrations were used to develop the HDV diesel fractions, and MOBILE6 defaults were used for LDV, LDT, MC, and Bus. See Appendix I.
MILE ACCUM RATE	Allows the user to supply the annual mileage accumulation rates by vehicle type and age.	NOT APPLIED. (MOBILE6 defaults were assumed – see technical report M6FLT.007.)
NGV FRACTION	Allows user to 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 MOBILE6 default percentage of NGV vehicles in the fleet, zero, was assumed.)
NGV EF	Allows the user to enter alternate NGV emissions factors for each of the 28 vehicle types for running and start emissions.	NOT APPLIED. (The MOBILE6 default, none, was assumed.)

Table 21. 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. (VMT mix was used externally in the emissions calculations.)
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. (Not applicable to detailed disaggregate analyses.)
VMT BY HOUR[1]	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.	Based on the hourly VMT distributions reflected in the hourly link-VMT estimates developed for each county. Summer or winter distributions were used, depending on the period of analysis.
SPEED VMT	Allows user to allocate VMT by average speed (14 pre-selected: 2.5 mph and 5 mph through 65 mph at 5 mph increments) for Freeways and Arterials for each hour of the day.	Set up to calculate Freeway and Arterial emissions factors by 14 MOBILE6 speed bin average speeds (i.e., 2.5 mph, 5 mph through 65 mph at 5 mph increments) for the look-up tables.
AVERAGE SPEED	Allows a single average speed for combined Freeways and Arterials for the entire day.	NOT APPLIED.
STARTS PER DAY	Allows user to specify the average number of engine starts per vehicle per day by vehicle types for weekend days and weekdays.	NOT APPLIED. (MOBILE6 weekday defaults were used – 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. (MOBILE6 weekday defaults were used – see M6FLT.003.)
SOAK DISTRIBUTION	Allows use of alternate vehicle soak duration distributions for weekend days and weekdays.	NOT APPLIED. (MOBILE6 weekday defaults were used – see M6FLT.003.)
HOT SOAK ACTIVITY	Allows user to specify a hot soak duration distribution for each of 14 daily time periods for weekend days and weekdays.	NOT APPLIED. (MOBILE6 weekday defaults were used – see M6FLT.004.)
DIURN SOAK ACTIVITY	Allows user to set diurnal soak time distributions for each of 18 daily time periods.	NOT APPLIED. (MOBILE6 defaults were used – see 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.	Applied locality-specific inputs for Houston and DFW area counties acquired from HGAC and NCTCOG, respectively. The MOBILE6 external data input files were provided as described in Appendix A.
WE EN TRI LEN DI	Specifies hourly alternate fractions of VMT for trips of various lengths for weekend days.	NOT APPLIED.
WE VEH US	Directs MOBILE6 to use weekend activity data for calculating emissions factors.	NOT APPLIED.

[1] TxDOT District-level summer and winter hourly VMT distributions were applied by month for the annual analysis as follows: summer – April through September; and winter – January through March and October through December.

Table 22. 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.	Applied for counties also subject to I/M. This includes nine DFW counties, five Houston counties, El Paso County, and Austin's Travis and Williamson counties. Appendix J provides the input descriptions.
I/M Commands: I/M PROGRAM I/M MODEL YEARS I/M VEHICLES I/M STRINGENCY I/M COMPLIANCE I/M WAIVER RATES I/M CUTPOINTS I/M EXEMPTION AGE I/M GRACE PERIOD NO I/M TTC CREDITS I/M EFFECTIVENESS I/M DESC FILE	 Required for exhaust/evaporative I/M programs. Required for exhaust/evaporative I/M programs. Required for exhaust/evaporative I/M programs. Required for exhaust. Do not use for evaporative. Required for exhaust. Optional for evaporative. Required for exhaust. Optional for evaporative. Optional for exhaust (but required for IM240). Do not use with evaporative. Optional for both exhaust and evaporative. Optional for both exhaust and evaporative. Optional for exhaust. Do not use with evaporative. Optional for exhaust. Do not use with evaporative. Optional for both.	Applied county-specific descriptive inputs for the counties subject to an I/M program. Appendix J provides the input descriptions.

Table 23. MOBILE6 Fuels.

Command	Function/Description	Input Parameter Source/Value[1]
FUEL PROGRAM	Allows specification of one of four options: 1) Conventional Gasoline East Tier2 sulfur phase-in schedule (includes Texas); 2) Reformulated Gasoline (RFG); 3) Conventional Gasoline West Tier2 sulfur geographical phase-in area schedule; or 4) Sulfur content for gasoline after 1999.	Option 4 – with user supplied average gasoline sulfur content values[1] and maximum sulfur content values by MY.[2]
SULFUR CONTENT	(or GASOLINE SULFUR) Allows use of alternate sulfur content for conventional gasoline through calendar year 1999.	NOT APPLIED.
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).	Used 2008 diesel sample survey-based estimates from TCEQ's 2008 statewide summer fuel survey.
OXYGENATED FUELS	Allows modeling of oxygenated gasoline effects on exhaust for all gasoline-fueled vehicles. Not for use with AIR TOXICS.	NOT APPLIED.
FUEL RVP GAS AROMATIC% GAS OLEFIN% GAS BENZENE% E200 E300 OXYGENATE RVP OXY WAIVER	Specifies a gasoline property input parameter value that will be input to the model for the area being modeled. Except for FUEL RVP, these parameters are only for use when the AIR TOXICS command is used.	Used summer season input parameter values based on TCEQ's 2008 statewide fuel survey. Winter season parameter values were based on NGMS winter 2007-08 survey data from Texas cities. The RVP oxygenate waiver was not applied.
SEASON	Identifies effective season for RFG calculation regardless of month modeled.	NOT APPLIED.

[1] TTI produced winter gas inputs using NGMS 2007-08 gasoline sample data, and used summer gas inputs from the TCEQ's 2008 statewide summer fuel survey. TTI interpolated inputs for months in between (for annual analysis), based on summer and winter survey-based RVP estimates and American Society for Testing and Materials (ASTM) temporal (month-to-month) RVP limit profiles. Inputs were mapped to counties correlating district-sample to district-county, except where fuel types differed, in which case fuel type jurisdiction was primary, and mapping protocol was to use the inputs from the nearest sample location of same fuel type as the affected county.

[2] TTI estimated inputs for the maximum sulfur level content by vehicle MY (see Table 32) from available TCEQ statewide fuel survey samples (e.g., Texas 2005, 2007, and 2008 summer surveys). The highest sulfur content level of all individual samples in a district (regardless of fuel grade) was used for the MOBILE6 maximum sulfur input for all district counties where the fuel type was consistent between the district sample and the district county. Otherwise, mapping was performed in general as described in Footnote 1.

Table 24. 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 CAAA of 1990 had not been implemented.	NOT APPLIED.
HDDV NOx Off-Cycle Emissions Effects: NO DEFEAT DEVICE NO NOX PULL AHEAD NO REBUILD REBUILD EFFECTS	 Turns off the effects of the HDD vehicle NOx off-cycle emissions effects (defeat device emissions). Turns off HDD NOx emissions reduction effects of the Pull- Ahead program. Turns off HDD NOx emissions reduction effects of the Rebuild program. Allows user to change the Rebuild program effectiveness rate.	 NOT APPLIED. NOT APPLIED. NOT APPLIED. Used the actual estimate of 18.7 percent based on third quarter 2008 EPA Heavy-Duty Diesel Engine Low NOx Rebuild program summary data.
Tier 2 Emission Standards and Fuel Requirements: NO TIER2 T2 EXH PHASE-IN T2 EVAP PHASE-IN T2 CERT	Allow the overriding of the default Tier 2 emissions standards and fuel requirements settings. Disables Tier 2 requirements. Allows alternate Tier 2 exhaust standard phase-in schedules. Allows alternate Tier 2 evaporative standard phase-in schedules. Allows user to specify alternate Tier 2 50,000-mile certification standards.	NOT APPLIED.
94+ LDG IMPLEMENTATON	Allows use of alternate 1994 and later fleet penetration fractions for LDGVs under the Tier 1, NLEV (or California LEV 1), and Tier 2 emissions standard programs.	NOT APPLIED.
NO 2007 HDDV RULE	Disables 2007 HDV emissions standards.	NOT APPLIED.

Development of Locality-Specific Inputs

External Conditions

Data from 11 weather stations were used to develop the meteorological inputs for the entire state. These meteorological inputs used are the same as those used to produce the 2008 CAP EIs under the CERR, allowing for development of an integrated annual CAP/HAP EI, based on the same inputs.

Two sets of meteorological inputs were developed and used, one for the summer weekday emissions step, and the other for the annual emissions estimates. (Due to scheduling constraints, readily available inputs from the 2005 CERR EIs were used for the 2008 CERR EIs and for this HAP EI analysis.)

For the statewide analyses, an eight-weather station, climate-zone-based scheme was used, which was developed and used for prior statewide analyses. The state was divided into eight zones (or county groups), with an urban area weather station located at the major airport in each zone used to represent all of its associated counties. These zones, named for the city where the weather station is located, are Amarillo, Corpus Christi, Dallas, El Paso, Houston, Lubbock, Midland, and San Antonio. Of these eight stations, four are located in cities within EAC and nonattainment/maintenance areas (i.e., Dallas, El Paso, Houston, and San Antonio). Three additional weather station locations were added so that each of the EAC/nonattainment/maintenance areas would be represented by a set of centrally located weather stations (Austin, Beaumont, and Tyler stations were added).

For the annual emissions analysis, monthly meteorological inputs were developed for each of the 11 weather stations. See Appendix H for counties listed by weather station (or climate zone), and a key on the use of weather station data by county for both monthly and summer season. For each month, hourly observations of temperature, relative humidity, and barometric pressure were used. The temperature and humidity were averaged within each hour, and the barometric pressure was averaged over all hours. The meteorological input data and the actual MOBILE6 input records were provided in electronic form as described in Appendix A.

For the summer weekday emissions step, two methods were used to produce meteorological inputs, one that is based on data from ozone exceedance days within the analysis period (used for most of the nonattainment and EAC areas), and one that uses average data from all days in the period (using the method described in the previous paragraph for development of the monthly inputs). Ozone exceedance-day-based inputs were used for the three EAC areas and for the BPA and HGB areas. These inputs are consistent with the meteorological data used in the two prior three-year cycle EIs, and were developed based on guidance in *Procedures for Emissions Inventory Preparation, Volume IV: Mobile Sources* (EPA, 1992). TTI and TCEQ used weather station hourly data from the 10 highest unique ozone concentration days from the three-month peak ozone season over a three- or four-year period. The meteorological data and MOBILE6 inputs were provided in electronic form as described in Appendix A. See Appendix H for the list of counties by climate zone, and a key providing the data source for monthly and summer (or ozone) season inputs by county.

TTI produced the following average period day inputs, based on local time — hourly average temperature, hourly average relative humidity, and daily average barometric pressure.

Temperature and Relative Humidity – The HOURLY TEMPERATURES and RELATIVE HUMIDITY commands were used to specify hourly temperature and hourly relative humidity input, respectively. The temperature and humidity values were sequenced as required beginning with the 6 a.m. hour. The temperatures are a MOBILE6 command file input. The MOBILE6 command files are provided on CD-ROM (see Appendix A). The meteorological input data and the actual MOBILE6 input records were provided in electronic form as described in Appendix A.

Barometric Pressure – The BAROMETRIC PRES command was used to specify the 24-hour average barometric pressure input value. The barometric pressure is input in the MOBILE6 command file. MOBILE6 input files are provided on CD-ROM as described in Appendix A.

Vehicle Fleet Characteristics
TTI used the same vehicle fleet characteristics inputs as applied in the 2008 CERR EIs. TTI developed the vehicle registration (age) distributions and diesel fractions inputs to MOBILE6 using mid-year 2008 TxDOT registrations data sets. MOBILE6 default age distributions and diesel fractions inputs were used for the vehicle classes for which the TxDOT registrations data were not available.

Two data aggregation schemes were used depending on whether a county was under the statewide EI method, or under the regional EI method. For statewide method counties, TxDOT District-level registrations data were used for the vehicle weight classes below HDV8B. For regional method counties, additional detail was added by using LDV, LDT, and MC data to produce county-level age distributions. For both statewide and regional method counties, state-level data were used to produce the HDV8B vehicle class age distributions, and state-level registrations data were used for developing diesel fractions for all of the HDV classes. These aggregation levels prevent sample size problems that can occur, especially for rural counties, for vehicle classes with minimal registrations.

Vehicle Registration Distributions – The user-supplied vehicle registration distributions input to MOBILE6 (using the REG DIST command) are by vehicle age for any of the 16 composite (combined gasoline and diesel) vehicle types, as shown in Table 25. EPA default distributions are internally applied by MOBILE6 for vehicle classes for which the analyst does not provide alternate values.

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

Table 25. Composite Vehicle Classes and Data Sources for Age Distributions Input.

Number[1]	Abbreviation	Description	Source of Distributions
1	LDV	Light-Duty Vehicles	TxDOT District[2] Mid-Year 2008 Registrations
2	LDT1	Light-Duty Trucks 1	TxDOT District[2] Mid-Year 2008 Registrations
3	LDT2	Light-Duty Trucks 2	TxDOT District[2] Mid-Year 2008 Registrations
4	LDT3	Light-Duty Trucks 3	TxDOT District[2] Mid-Year 2008 Registrations
5	LDT4	Light-Duty Trucks 4	TxDOT District[2] Mid-Year 2008 Registrations
6	HDV2B	Class 2b Heavy-Duty Vehicles	TxDOT District Mid-Year 2008 Registrations
7	HDV3	Class 3 Heavy-Duty Vehicles	TxDOT District Mid-Year 2008 Registrations
8	HDV4	Class 4 Heavy-Duty Vehicles	TxDOT District Mid-Year 2008 Registrations
9	HDV5	Class 5 Heavy-Duty Vehicles	TxDOT District Mid-Year 2008 Registrations
10	HDV6	Class 6 Heavy-Duty Vehicles	TxDOT District Mid-Year 2008 Registrations
11	HDV7	Class 7 Heavy-Duty Vehicles	TxDOT District Mid-Year 2008 Registrations
12	HDV8A	Class 8a Heavy-Duty Vehicles	TxDOT District Mid-Year 2008 Registrations
13	HDV8B	Class 8b Heavy-Duty Vehicles	TxDOT Statewide Mid-Year 2008 Registrations
14	HDBS	School Buses	MOBILE6 Default
15	HDBT	Transit and Urban Buses	MOBILE6 Default
16	MC	Motorcycles	TxDOT[2] District Mid-Year 2008 Registrations

[1] MOBILE6 vehicle class index number for age distributions input.
[2] These vehicle class inputs were based on county-level registrations for the 26 regional method-based counties.

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

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

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

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

The following steps were performed to develop the MOBILE6 registration distributions input using the TxDOT data:

- for each of the eight HDV sub-categories, gasoline and diesel registrations were combined;
- county data were aggregated to the district level, except for the HDV8b class, which was aggregated to statewide (and except for the MC, LDV, and LDT classes, which were kept at the county level for the 36 regional method-based counties);
- MY registrations for vehicles 25 years old and older were summed to form the "25 years old and older" age group;
- registrations were converted from numbers of vehicles registered to fractions registered by age (class registrations for each age divided by class total registrations); and
- age distributions were expanded from 12-to-14 classes by using the LDT12 distributions for both LDT1 and LDT2, and using the LDT34 distributions for both LDT3 and LDT4.

Appendix I shows the age distributions input. The MOBILE6 age distributions external data input files are provided on CD-ROM as described in Appendix A.

Diesel Fractions – The DIESEL FRACTIONS command allows the analyst to specify diesel fractions for 14 of the 16 composite (gasoline and diesel) vehicle categories by MY. MOBILE6 assumes that urban/transit buses are all diesel fueled and that MCs are all gasoline fueled, thus these two categories do not require diesel fractions. The diesel fractions represent the portion of diesel vehicles in a composite (gasoline and diesel) vehicle class for each vehicle age group. MOBILE6 requires that diesel fractions for all 14 vehicle classes must be input if any non-default values are to be used. Each set of fractions contains the diesel fractions for 25 MYs, beginning with the evaluation year as the first MY, and going back in annual increments to the 25th MY, or earliest MY fraction.

TTI developed the analysis year diesel fractions input data sets using a combination of estimated TxDOT statewide diesel fractions (based on the mid-year 2008 registrations data) and MOBILE6 default diesel fractions. Table 26 shows the MOBILE6 diesel fractions input sequence and categories with corresponding data sources.

Table 26. Source of Diesel Fractions for Composite Vehicle Types.

Number[1]	Label	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 Mid-Year 2008 Statewide Registrations
7	HDV3	Class 3 Heavy-Duty Vehicles	TxDOT Mid-Year 2008 Statewide Registrations
8	HDV4	Class 4 Heavy-Duty Vehicles	TxDOT Mid-Year 2008 Statewide Registrations
9	HDV5	Class 5 Heavy-Duty Vehicles	TxDOT Mid-Year 2008 Statewide Registrations
10	HDV6	Class 6 Heavy-Duty Vehicles	TxDOT Mid-Year 2008 Statewide Registrations
11	HDV7	Class 7 Heavy-Duty Vehicles	TxDOT Mid-Year 2008 Statewide Registrations
12	HDV8A	Class 8a Heavy-Duty Vehicles	TxDOT Mid-Year 2008 Statewide Registrations
13	HDV8B	Class 8b Heavy-Duty Vehicles	TxDOT Mid-Year 2008 Statewide Registrations
14	HDBS	School Buses	EPA MOBILE6 Evaluation Year Default

[1] Required MOBILE6 input sequence.

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

The MOBILE6 data defaults do not completely match the 25 MY input data series specific to the calendar year of evaluation. For example, the MOBILE6 diesel fractions vary by age for MYs 1972 through 1996 (the year of the data). MOBILE6 thus uses the 1972 diesel fractions for the 1972 and earlier MYs, and the 1996 diesel fractions for the 1996 and later MYs. This procedure was used to produce the needed MOBILE6 default 25 MY diesel fractions data sets; and for TxDOT registrations-based diesel fractions by MY, the fractions were truncated beyond the 25th MY to produce the needed 25 MY diesel fractions data sets.

The estimated analysis year Texas HDV diesel fractions and MOBILE6 default light-duty and bus category diesel fractions were combined to produce the required complete 14-vehicle class input data set. The diesel fractions (MOBILE6 command file input data) are provided on CD-ROM (see Appendix A). Appendix I also provides the diesel fractions inputs.

Activity
Locality-specific fleet hourly summer and winter weekday VMT fractions were used, and, for Houston and DFW nonattainment counties, weekday hourly trip length distributions (TLD) were used. Additionally, hourly fractions of VMT by average speed (i.e., for each of the14 MOBILE6 speed bins) for Freeways and Arterials were used for modeling emissions factors incrementally by speed.

VMT Fractions (Also Known as VMT Mix) – These sets of fractions (VMT fractions attributable to individual vehicle classes) are an input to MOBILE6; however, the method for this study required the external application of the VMT mix (or mixes) later in the emissions calculation process. VMT mix development is discussed in the next main section.

Total VMT by Hour – Development of the hourly travel fractions were previously discussed in the Hourly Travel and Directional Factors section. For input to MOBILE6, the VMT distributions by hour are consistent with the hourly VMT activity input to the EI. The summer weekday hourly travel factors were formatted as required for MOBILE6 input and used in the summer weekday analysis emissions factor runs.

Additionally, winter weekday hourly factors were produced and used along with the summer weekday factors as input for the monthly rates used in the annual emissions analysis. Summer and winter factors were allocated to months as follows: summer – April through September; and winter – January through March and October through December.

These fractions are input to MOBILE6 as an external data file. The MOBILE6 external data files are included on CD-ROM, as described in Appendix A. Appendix G shows the hourly VMT factors.

Hourly Trip Length Distributions – The TLDs input to MOBILE6 specifies the percentage of average weekday (or weekend) VMT that occurs during trips of different durations at each hour of the day. The MOBILE6 default values were used for all counties except for the HGB and DFW nonattainment counties, for which available TDM-based TLD inputs were used.

The VMT distributions are the percentages of VMT for six trip length ranges that 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.

For the DFW and HGB nonattainment counties, TTI used inputs developed by NCTCOG and HGAC, based on their latest 2008 regional TDMs. The hourly TLD data were input to MOBILE6 in an external data file. The external data files are provided on CD-ROM (see description in Appendix A).

VMT Distribution by Average Speed on Freeways and Arterials – The VMT distributions by average speed inputs are called by the SPEED VMT command, and are accommodated internally by the POLFAC62_3 utility (no user speed input commands or data parameter values are required when producing MOBILE6 emissions factors tables with POLFAC62_3). POLFAC62_3 uses the SPEED VMT inputs to produce the individual Freeway and Arterial emissions factors for each of the 14 MOBILE6 speed bin speeds.

There are 14 scenarios, one for each speed bin. Each scenario applies 100 percent of Freeway VMT and 100 percent of Arterial VMT to an individual speed bin, producing a set of Freeway and Arterial emissions factors corresponding to the average speed for that speed bin.

State Programs

This section of the MOBILE6 model was applied to model the effects of area-specific exhaust and evaporative I/M programs and the statewide ATP (modeled only for counties subject to I/M). The I/M and ATP are annual inspection programs that apply to the gasoline-fueled vehicle classes except MCs, including vehicles in the age group from 2-through-24 years old. The I/M and ATP input to MOBILE6 are consistent with the inputs used in the 2008 CERR EIs.

I/M and ATP modeling was included in the emissions factors for counties that were subject to I/M during 2008. These counties include: El Paso, Harris, Brazoria, Fort Bend, Galveston, Montgomery, Dallas, Collin, Denton, Tarrant, Ellis, Johnson, Kaufman, Parker, Rockwall, Travis, and Williamson.

Vehicle ATP - Texas registered vehicles are required to receive an annual safety inspection. The effects of various items inspected in the annual safety inspection were modeled using the vehicle ATP section of MOBILE6. To model an ATP, MOBILE6 requires the program compliance rate; however, compliance information for the annual safety inspection was not available. Thus, the I/M program compliance rate was also used for the ATP (the protocol has been to model ATP only for counties and vehicles that are additionally subject to an exhaust and evaporative I/M program). Appendix J describes the detailed MOBILE6 ATP set-ups, and MOBILE6 command files containing the inputs were provided on CD-ROM as described in Appendix A.

I/M Programs - The I/M programs cover gasoline vehicles (excluding MCs and some other exemptions) within the 2-through-24 year vehicle age coverage window. Appendix J describes the detailed MOBILE6 exhaust and evaporative I/M program set-ups; external data files containing the inputs were provided on CD-ROM as described in Appendix A.

Fuels
MOBILE6 provides two methods to model fuel effects, one of which requires additional fuel parameter inputs that allow modeling of the MOBILE6 HAPs as well as the CAPs. These additional fuel parameters required for HAP modeling were used in both the 2008 CERR EIs and in this analysis, allowing consistency in fuels inputs between both the 2008 CAP HAP emissions modeling.

TTI used two main data sources (summer and winter fuel surveys data from Texas cities) to acquire or estimate seasonal fuel parameter inputs to MOBILE6. From each seasonal data set, the average fuel properties data for each city or region were directly acquired or calculated as needed. Due to limitations of MOBILE6 regarding modeling of a gasoline with multiple oxygenates (see section 2.8.10.7.f, *MOBILE6 User's Guide*), a multi-run, post-processing procedure was performed to combine the estimated effects of the individual oxygenates in a multi-oxygenate fuel. To estimate inputs for months between summer and winter, fuel property input values were interpolated using the summer and winter values with the proportional changes in RVP limits from the ASTM geographical and monthly volatility class schedules. The MOBILE6 fuel property input values were mapped to counties along regional lines and fuel rule jurisdictional boundaries.

Data Sources – A geographically extensive summer 2008 Texas fuels survey data set was available for use in this analysis, *Sampling and Laboratory Analysis of Retail Gasoline and Diesel Fuel for Selected Texas Cities – Summer 2008*, by ERG for TCEQ, August 31, 2008. The survey provided individual sample data and summaries of MOBILE6 inputs for the average gasoline and diesel fuel by the 25 TxDOT Districts (i.e., retail outlet fuels were sampled in cities within districts, and average properties were calculated within each district and mapped straight to district counties). Such geographically extensive data were not available for the winter season. TTI acquired the winter fuel survey *Motor Gasolines, Winter 2007-08 for Texas Cities*, NGMS, which included raw gasoline sample data for five Texas cities. The TCEQ survey sampled all three grades of gasoline, while the NGMS survey sampled premium and regular grade gasoline.

TCEQ has produced summer fuel surveys for several recent years (2003, 2005, 2007, and 2008). TTI used these additional fuel survey data sets to produce local estimates of MOBILE6 inputs for maximum gasoline sulfur content experienced by vehicle MY.

Data Processing – The TCEQ survey summary data were in the form of district average fuel property values in MOBILE6 input form, whereas the NGMS data were in raw sample form, requiring some processing to convert data into average gasoline parameter values by city in the numerical form and units required for input to MOBILE6. The winter fuel parameter inputs from the five sample cities were mapped to the 25 districts for interpolation with the district-level summer data.

The fuel parameter inputs to MOBILE6 used in this analysis included:

- gasoline sulfur content (parts per million [ppm]);
- maximum gasoline sulfur content by vehicle MY (ppm);
- gasoline RVP (pounds per square inch [psi]);

- gasoline aromatic compounds content (volume %);
- gasoline olefin compounds content (volume %);
- gasoline benzene compounds content (volume %);
- MTBE oxygenate content (volume %);
- MTBE oxygenated gasoline market share fraction;
- ETBE oxygenate content (volume %);
- ETBE oxygenated gasoline market share fraction;
- TAME oxygenate content (volume %);
- TAME oxygenated gasoline market share fraction;
- ethanol (ETOH) oxygenate content (volume %);
- ETOH oxygenated gasoline market share fraction;
- percentage of gasoline in vapor phase at 200 degrees Fahrenheit (F) (E200);
- percentage of gasoline in vapor phase at 300 degrees F (E300); and
- diesel sulfur content (ppm).

TTI made three refinements to the district average gasoline parameter input values from the TCEQ study (i.e., all the above gasoline parameters except for maximum sulfur content and market share fraction). First, the Beaumont District values were re-calculated to exclude RFG samples from the fuel property averages (RFG and conventional gasoline data were combined in the original calculated averages). Second, any district average oxygenate content value less than 0.10 volume percent was considered inconsequential and set to zero. Third, the individual oxygenate content values (volume percent) of average fuels with multiple oxygenates were each increased to individually reflect the total oxygen content of the average fuel (needed for the post-processing procedure that combines individual run results to estimate a single set of emissions factors with the estimated effect of multiple oxygenates).

TTI processed the NGMS winter 2007/08 individual sample data into fuel-property averages for each of the five Texas cities (Amarillo, El Paso, Dallas, Houston, and San Antonio). Since the NGMS survey sampled only premium and regular grades, TTI modified the gasoline sales volume weights by grade from the TCEQ study (86 percent regular, 8 percent mid-grade, 6 percent premium – based on Energy Information Administration 2007 petroleum marketing sales data for Texas) by dropping the mid-grade weight and normalizing the regular and premium weights (yielding 93 percent regular and 7 percent premium). TTI first calculated average parameters by fuel grade, and then combined the results across grades using the sales-by-grade weighting factors. The E200 and E300 inputs were an exception to this procedure, and were estimated by first calculating individual sample values by straight interpolation using the sample distillation values (temperatures with corresponding gasoline vapor percentages), then averaging by grade and combining with the sales-by-grade weights. There were no multiple-oxygenate gasolines in the winter NGMS data for Texas.

Tables 27 and 28 show the estimated MOBILE6 average fuel property inputs for the winter and summer seasons used in this analysis. The oxygenate values for multiple oxygenate gasoline (Childress and Houston summer season) shown in Table 28 were expanded for the multi-oxygenate gasoline modeling procedure as shown in the following example.

Example Calculation of Individual Oxygenate Inputs for Multiple Emissions Factor Runs and Associated Result Weighting Factors – Childress District Average Summer Gasoline – The data required for the calculation include:

The oxygenate-to-oxygen content conversion factors found in section 2.8.10.7.f of the *MOBILE6 User's Guide*:

- Volume percent MTBE = weight % oxygen / 0.1786;
- Volume percent ETBE = weight % oxygen / 0.1533;
- Volume percent ETOH = weight % oxygen / 0.3488; and
- Volume percent TAME = weight % oxygen / 0.1636.

Note that the ETOH conversion factor is a correction provided by EPA, which replaced the value documented in the *MOBILE6 User's Guide.*

The Childress District average conventional gasoline volume percent (vol%) oxygenate content values for each oxygenate (from the TCEQ summary) are:

- ETOH = 3.329 vol%; and
- MTBE = 0.101 vol%.

The procedure is performed using the following steps:

1. Calculate weight percent (wt%) oxygen per oxygenate in the multi-oxygenate gasoline:

   oxygen wt% from ETOH = (3.329 vol% ETOH) × (0.3488) = 1.161 wt% oxygen; and
   oxygen wt% from MTBE = (0.101 vol% MTBE) × (0.1786) = 0.018 wt% oxygen.

2. Sum the oxygen wt% parts to obtain total wt% oxygen:

   1.161 wt% + 0.0180 wt% = 1.1792 total wt% oxygen from combined oxygenates.

3. Convert total oxygen wt% to equivalent oxygenate vol% for each individual oxygenate:

   ETOH vol% equivalent of total wt% oxygen =
   1.1792 total wt% oxygen / 0.3488 (wt% oxygen/vol% ETOH) =
   3.381 vol% ETOH; and

MTBE vol% equivalent of total wt% oxygen =
1.1792 total wt% oxygen / 0.1786 (wt% oxygen/vol% MTBE) =
6.602 vol% MTBE.

These values are input for individual emissions factor runs, per oxygenate in the multi-oxygenate gasoline, with market share set to 100 percent (all other inputs constant); the emissions factors from each run are combined using the weights from the next step.

4. Calculate weighting factors (sum of which is 1.0) for each individual oxygenate run using values from steps 1 and 2:

   ETOH run emission rates weight = 1.161 wt% / 1.179 wt% = 0.985; and
   MTBE run emission rates weight = 0.018 wt% / 1.179 wt% = 0.015.

   This procedure was performed for all multi-oxygenate gasolines in the analysis (i.e., Childress District and the eight-county Houston Region). Post-processing is discussed further in a later section.

Table 27. Winter 2008 Average Gasoline Property Inputs to MOBILE6 by Sample City.

Sample City	RVP (psi) [1]	Gas Sulfur[2] (ppm)	Aromatic (vol%)	Olefin (vol%)	Benzene (vol%)	ETOH (vol%)	E200 (%)	E300 (%)
Amarillo	11.89	22.1	31.41	10.36	1.37	0	48.34	86.99
Dallas	12.08	25.2	18.31	8.08	0.61	9.911	60.74	84.68
El Paso	11.97	81.4	24.31	9.09	1.65	8.558	61.15	89.32
Houston	11.45	33.5	17.28	11.07	0.54	9.728	59.16	85.05
San Antonio	12.49	28.0	24.15	11.13	0.70	0	53.72	81.67

[1] Based on NGMS winter 2007-08 gasoline sample survey data.
[2] The minimum input value allowed in MOBILE6, 30.0 ppm, was used for estimated values < 30.0 ppm.

Table 28. Summer 2008 Average Fuel Property Inputs to MOBILE6 by TxDOT District.

Sample District[1]	Sample-City[2] Gas Rule	RVP (psi)	Gas Sulfur[3] (ppm)	Aromatic (vol%)	Olefin (vol%)	Benzene (vol%)	ETOH[4] (vol%)	MTBE[4] (vol%)	ETBE[4] (vol%)	E200 (vapor%)	E300 (vapor%)	Diesel Sulfur[4] (ppm)
Abilene	9.0 RVP	8.06	35.3	41.36	5.64	1.92	0	0	0	42.62	81.53	5.3
Amarillo	9.0 RVP	8.73	12.6	36.05	8.42	2.14	1.166	0	0	52.59	87.64	2.3
Atlanta	7.8 RVP	7.33	66.0	36.15	7.88	1.96	0	0	0	42.37	83.26	8.7
Austin	7.8 RVP	7.39	42.6	30.71	12.60	0.72	0	0.147	0	44.10	80.10	5.6
Beaumont[2]	7.8 RVP	7.46	15.4	33.75	8.90	1.43	0	0	0	43.54	83.62	4.9
Brownwood	9.0 RVP	7.56	35.8	27.61	12.58	0.68	0	0.150	0	44.42	80.16	5.5
Bryan	7.8 RVP	7.44	8.4	39.14	3.40	1.88	0	0	0	43.11	81.79	4.7
Childress[4]	9.0 RVP	9.06	9.8	33.32	8.46	2.07	3.329	0.101	0	58.20	88.32	3.5
Corpus Christi	7.8 RVP	7.48	28.0	23.20	15.86	0.73	0	0.114	0	47.39	83.74	31.1
Dallas	RFG	6.85	26.7	18.46	7.05	0.53	5.904	0	0	49.00	86.00	6.1
El Paso	7.0 RVP	7.44	160.7	34.89	12.10	2.24	0.738	0	0	44.31	85.48	5.7
Fort Worth	RFG	6.97	23.8	18.28	6.12	0.47	6.815	0	0	48.81	85.40	4.6
Houston[4]	RFG	7.04	29.7	17.50	12.58	0.53	5.295	0	0.320	51.44	87.42	60.5
Laredo	9.0 RVP	7.38	26.3	28.68	11.64	0.76	0	0.117	0	44.05	82.75	3.8
Lubbock	9.0 RVP	8.59	10.6	36.95	5.84	2.02	0	0	0	48.77	84.69	3.9
Lufkin	7.8 RVP	7.68	51.0	35.35	9.16	1.68	2.177	0	0	44.83	83.73	5.8
Odessa	9.0 RVP	8.39	30.4	34.45	10.07	1.08	0	0.106	0	44.53	81.47	5.0
Paris	7.8 RVP	7.25	62.5	25.07	8.25	1.07	5.539	0	0	48.36	85.33	6.1
Pharr	9.0 RVP	8.44	24.9	27.80	16.31	0.87	0	0	0	51.81	82.54	3.2
San Angelo	9.0 RVP	7.87	35.4	31.29	12.09	0.76	0	0.136	0	44.06	80.65	4.2
San Antonio	7.8 RVP	7.48	31.0	32.94	10.05	0.83	0	0	0	45.05	80.29	3.8
Tyler	7.8 RVP	7.69	116.5	34.69	9.09	2.25	3.830	0	0	46.80	84.73	9.7
Waco	7.8 RVP	7.44	79.3	32.29	11.47	1.35	0.593	0	0	43.71	80.27	5.6
Wichita Falls	9.0 RVP	8.71	35.0	33.45	10.59	2.72	0	0.102	0	46.05	88.36	5.4
Yoakum	7.8 RVP	7.21	38.2	28.54	13.15	0.65	0	0.129	0	43.06	81.90	156.7

[1] These values are based on the TCEQ summer 2008 fuel study. TTI made several refinements.
[2] TTI re-calculated the Beaumont average gasoline properties without RFG sample data. The Beaumont average fuel properties had originally been calculated using RFG and conventional gasoline data.
[3] The minimum input value allowed in MOBILE6, 30.0 ppm, was used for values < 30.0 ppm.
[4] Inconsequential oxygenate values, < 0.10 volume %, were set equal to zero. TTI adjusted the values shown for Childress and Houston as needed for the multi-oxygenate gasoline emissions factor post-processing procedure, discussed elsewhere. Each oxygenate value was increased to account for the total oxygen content of the fuel. The increased volume % values (and weighting factors) are: Childress – ETOH 3.381 (0.985), MTBE 6.602 (0.015); and Houston – ETOH 5.436 (0.974), ETBE 12.368 (0.026).

Mapping of Fuels Data to Counties – TTI modified the TCEQ study straight district-to-county mapping (for gasoline only), where needed, to ensure use of fuels data representative of the summer gasoline rules in place for each county. General "gasoline rule" criteria were used including whether gasoline was RFG, and for conventional gasoline, whether the RVP limit was 7.0, 7.8, or 9.0. TTI identified the rule pertaining to each county and to each district survey summary data set. Each county in a district that was under a rule different from its district fuel sample data was assigned fuels input data from a nearby district fuel survey falling under the applicable rule.

TTI mapped the NGMS winter gasoline data from sample cities (Amarillo, El Paso, Dallas, Houston, and San Antonio), first to the 25 districts for interpolation with the summer data at the district level, then to counties based on gasoline rules also (winter oxygenated gasoline, RFG, and summer 7.8/9.0 RVP limits). The El Paso data were used only for El Paso County since it is the only county covered by the state winter oxygenated gasoline rule. Dallas and Houston (RFG) data were used for DFW and HGB RFG counties, respectively. The remaining counties used San Antonio and Amarillo data based on summer 7.8 and 9.0 RVP limit county coverage (even though these rules pertain to ozone control periods during the summer). San Antonio (under the 7.8 limit) and Amarillo (under the 9.0 limit) data were mapped to 7.8 and 9.0 RVP limit county categories, respectively. This distinction was used because the state 7.8/9.0 RVP limit geographic boundary is close to the 99-degree longitude division of Texas East/West counties used in the ASTM Schedule of Seasonal and Geographic Volatility Classes for Texas. The ASTM schedule provides the volatility classes by county and month that TTI used to develop interpolation factors for estimating the transitional month MOBILE6 fuel property inputs (the ASTM monthly volatility class profile is different for counties on either side of this boundary).

The fuel parameter input data to county mapping was provided in a Microsoft® Excel spreadsheet provided on CD-ROM. See description in Appendix A.

Estimation of Fuel Properties by Month – To distribute the summer and winter fuels data to each month of the year, TTI interpolated the fuels data based on the method found in *Documentation for the On-Road National Emissions Inventory (NEI) for Base Years 1970-2002*, E.H. Pechan & Associates, Inc., January 2004.

Volatility (RVP) classes (Table 29) were assigned to each county by month and for the summer and winter seasons (Table 30). These class schedules provided an annual RVP profile for each county with stepwise changes by month for those months between the summer and winter periods. This process of applying the ASTM volatility classes and the ASTM Schedule of Geographic Volatility Classes was based in part on "ASTM Class Guidance" in the *User's Guide to MOBILE4*, EPA, February 1989. This original guidance was followed in that for cases where more than one volatility class was listed for a month, the class with the lower volatility limit was used. The ASTM volatility class schedule lists volatility classes for each state, or portion of state, for each month of the year.

Using these RVP profiles, TTI calculated interpolation factors for each county group and month (Table 30) using the formula:

$$\text{Factor}_{\text{M-I}} = (\text{RVP}_{\text{M-class}} - \text{RVP}_{\text{S-class}})/(\text{RVP}_{\text{W-class}} - \text{RVP}_{\text{S-class}})$$

Where:

$Factor_{M\text{-}I}$ = the monthly interpolation factor;
$RVP_{M\text{-}class}$ = the RVP value associated with the month and RVP class;
$RVP_{S\text{-}class}$ = the RVP value associated with the summer period RVP class; and
$RVP_{W\text{-}class}$ = the RVP value associated with the winter period RVP class.

Fuel property input values by county or county group and month were calculated as:

$$\text{Monthly Value} = \text{Summer Value} + Factor_{M\text{-}I} \times (\text{Winter Value} - \text{Summer Value})$$

This method was used for estimating all of the monthly gasoline property input values, producing stepwise changes in values proportional to the month-to-month RVP changes reflected in the pertinent RVP classes (see Table 31 footnote on El Paso winter oxygenate interpolation exception).

Table 29. Volatility Classes for Texas Counties.

RVP Class	RVP (psi)[1]
ELP	7.0
RFG	7.2
AA	7.8
A	9.0
B	10.0
C	11.5
D	13.5

[1] RVP values are from the ASTM standard D4814-04b[1] Schedule of Geographic Volatility Classes, except for RFG RVP value, which is an assumed limit based on observed data that shows that the RFG RVP can be as high as 7.2 psi in isolated cases (provided by the EPA).

Table 30. RVP Class Schedule for Texas Counties.

Month[1]	El Paso County	RFG Counties	7.8 Limit Counties[2]	9.0 Limit Counties[2]
January	D	D	D	D
February	C	D	D	C
March	B	C	C	B
April	A	A	A	A
May	A	A	A	A
June	ELP	RFG	AA	A
July	ELP	RFG	AA	A
August	ELP	RFG	AA	A
September[1]	ELP	RFG	AA	A
October	B	B	B	B
November	C	C	C	C
December	D	D	D	D
Summer	ELP	RFG	AA	A
Winter	D	D	D	D

[1] For volatility control periods through September 15, the RVP class value was applied through the end of September.

[2] 7.8 RVP limit county group (i.e., East Texas Regional low RVP counties and BPA nonattainment counties) and 9.0 RVP limit county group RVP profiles are based, respectively, on the volatility class schedule for counties east and west of the 99-degree longitude dividing line in the ASTM Schedule of Geographic Volatility Classes.

Table 31. Interpolation Factors for Estimating Texas Gasoline Parameter Values by Month.

Month	El Paso County[1]	RFG Counties	7.8 Limit Counties	9.0 Limit Counties
January	1.00	1.00	1.00	1.00
February	1.00	0.69	1.00	0.56
March	0.65	0.46	0.68	0.22
April	0.21	0.31	0.29	0.00
May	0.21	0.31	0.29	0.00
June	0.00	0.00	0.00	0.00
July	0.00	0.00	0.00	0.00
August	0.00	0.00	0.00	0.00
September[1]	0.00	0.00	0.00	0.00
October	0.39	0.46	0.44	0.22
November	0.65	0.69	0.68	0.56
December	1.00	1.00	1.00	1.00

[1] El Paso County winter oxygenate was an exception to the interpolation procedure due to the winter oxygenated gasoline control period, October 1 through March 31. The estimated actual winter oxygen content value (solely ethanol-based) was applied to all winter control period months, and was not interpolated with summer oxygenate for estimating transitional month oxygen content values for El Paso.

The Microsoft® Excel worksheet identified in Appendix A provides all fuel property inputs by month for county groups as well as for individual counties.

MOBILE6 Fuel Parameter Commands – The following MOBILE6 commands and parameters were used.

- FUEL PROGRAM (Option 4) with user-supplied gasoline average sulfur values (30 ppm, the minimum allowable in MOBILE6, was input for any estimated actual average value less than that), and MOBILE6 maximum sulfur values as shown in Table 32;
- DIESEL SULFUR with user-supplied average diesel sulfur values. As previously noted, the summer fuel study diesel sulfur values were used for all months;
- FUEL RVP with user-supplied average RVP input values;
- GAS AROMATIC% with user-supplied average volume percent content for aromatic compounds;
- GAS OLEFIN% with user-supplied average volume percent content for Olefin compounds;

- GAS BENZENE% with user-supplied average volume percent content for benzene compounds;
- E200 with percentage of gasoline in vapor phase at 200 degrees F;
- E300 with percentage of gasoline in vapor phase at 300 degrees F; and
- OXYGENATE with user-supplied volume percent oxygenate values and market shares (100 percent market share used for all runs with oxygenate).

The MOBILE6 model FUEL PROGRAM Option 4 command requires average gasoline sulfur content by calendar year, and maximum sulfur content by MY for 2000 through 2015. In the case of the average gasoline sulfur content value, the estimated value for the period modeled was input for all calendar years (2000 through 2015) to simplify the development of model set-ups. The maximum sulfur values are maximum gasoline sulfur content by vehicle MY for MYs 2000 through 2015. These values should represent the maximum sulfur in any batch of gasoline sold in the modeled area. TTI additionally estimated the maximum sulfur values by district based on the multiple years of TCEQ fuel survey data and available NGMS survey data. Table 32 summarizes the maximum sulfur values used in this analysis, which are a combination of values based on MOBILE6 defaults and on Texas fuel survey data.

TTI assembled and reviewed the available TCEQ statewide fuel survey sample data sets (summer 2008, 2007, 2005, and 2003 data) and NGMS winter retail gasoline samples for Texas cities (winter 2007/08, 2006/07, 2005/06, and 2001/02 data). The maximum sampled value by district or city found in each data set was recorded. The maximum values were found mainly in the regular grade, which is the most predominantly used. The maximum values from the winter data sets compared closely with their summer counterparts, thus the geographically more detailed summer data were the focus.

The basic rules followed to produce the maximum sulfur by MY inputs were:

- where the MOBILE6 default MY maximum sulfur value was greater than the actual sampled value for that year, the MOBILE6 default value was used;
- where a newer survey actual maximum sampled value was greater than next available older year survey actual maximum sampled value and any subsequent older survey actual maximum sampled values (with no actual values in between exceeding the newer year maximum value), the newer year value was used for all associated MY inputs, including any years between for which no survey data were readily available (e.g., 2006 and 2004); and
- where there was no survey sample data available for a year, the maximum sulfur value used was the higher of: 1) the highest actual maximum sulfur value from all the newer year surveys, and 2) the MOBILE6 default value.

Table 32 shows the MOBILE6 default maximum sulfur values in the last row. All of the actual sampled maximum sulfur values recorded were less than the 2003-through-2000 MYs MOBILE6 default (1,000 ppm), thus the 2003 MY MOBILE6 default was used for all districts for 2003 and earlier MYs. Since 2004 survey data were not available, where the 2005 actual

sampled maximum was greater than both the 2005 MY MOBILE6 default and newer survey sampled maximums, the 2005 actual maximum value was used for both 2005 and 2004 MYs. Since 2006 survey data were not available, where the 2007 actual sampled maximum was greater than both the 2007 MY MOBILE6 default and subsequent survey year sampled maximums, the 2007 actual maximum value was used as input for both 2007 and 2006 MYs. Where the 2007 actual maximum value was higher than the 2005 actual maximum value, the 2007 maximum sampled value was used as the maximum sulfur value by MY for 2007-through-2004 MYs (El Paso District is an example of this case).

Table 32. 2008 Analysis Year Maximum Sulfur by Vehicle MY MOBILE6 Inputs.

District	2008[1] MY	2007[1] MY	2006 MY	2005[1] MY	2004 MY	2003[1] MY
Abilene	80	327	327	392	392	1,000
Amarillo	80	87	87	303	303	1,000
Atlanta	192	227	227	303	303	1,000
Austin	80	87	87	303	303	1,000
Beaumont	80	87	87	303	303	1,000
Brownwood	80	87	87	303	303	1,000
Bryan	80	87	87	303	303	1,000
Childress	80	87	87	303	303	1,000
Corpus Christi	80	87	87	303	303	1,000
Dallas	80	87	87	303	303	1,000
El Paso	226	334	334	334	334	1,000
Ft. Worth	80	87	87	303	303	1,000
Houston	80	87	87	303	303	1,000
Laredo	80	87	87	303	303	1,000
Lubbock	80	87	87	303	303	1,000
Lufkin	134	134	134	303	303	1,000
Odessa	80	87	87	398	398	1,000
Paris	136	201	201	303	303	1,000
Pharr	80	87	87	303	303	1,000
San Angelo	80	87	87	303	303	1,000
San Antonio	80	87	87	303	303	1,000
Tyler	199	220	220	303	303	1,000
Waco	170	170	170	303	303	1,000
Wichita Falls	80	275	275	396	396	1,000
Yoakum	80	87	87	303	303	1,000
MOBILE6 Default	80	87	87	303	303	1,000

[1] Fuel survey sample data were available for use in this analysis for the summer season of this year.

Alternative Emissions Regulations and Control Measures
The only alternate input value used within this section of the MOBILE6 model, which includes application of the HDDV NOx off-cycle emissions effects and the effects of the associated NOx off-cycle emissions mitigation programs, was the Rebuild Effectiveness Rate. Although these model features affect only NOx, which was not a part of this analysis, these inputs were applied for consistency with the 2008 CERR EI analysis.

In the late 1980s and most of the 1990s, HDDV engines were built with "defeat devices" allowing in-use engine emissions to be higher than emissions as required under Federal Test Procedure conditions. MOBILE6 includes estimates of these excess HDDV emissions as well as the emissions offsetting effects of two programs — early pull-ahead of 2004 HDDV emissions standards, and the low emissions rebuilds of existing engines. The MOBILE6 default 2004 pull-ahead program was used (the model does not allow alternatives), and for modeling the effectiveness of the rebuild program, an alternate, actual effectiveness rate was used.

The EPA provided the latest rebuild program-tracking data in the form of the third quarter 2008 "Heavy-Duty Diesel Engine Consent Decree Low NOx Rebuild Program Summary." The summary includes the number of installations for each manufacturer versus the affected population. The estimated effectiveness rate from manufacturer installations is total low NOx rebuild kits installed as a percentage of the affected total population, or 9.8 percent. The EPA summary includes additional kits installed through incentive/environmental projects. As a percentage of the affected population, the additional effectiveness rate from incentive/environmental projects is 8.9 percent. The total effectiveness rate estimate is 18.7 percent (input to MOBILE6 for this analysis in the form 0.187).

Using the MOBILE6 input parameters and options previously described, MOBILE6 input files were set up and run with the POLFAC62_3 utility for each county group for the summer weekday (for both hourly and daily emissions factors) and for each month of the year (for daily emissions factors). The resulting hourly summer weekday emissions factors indexed by speed, MOBILE6 drive cycle, vehicle type, and pollutant-specific emissions type were then post-processed for multi-oxygenate gasoline effects, and to incorporate the effects of the new federal emissions standard for highway MCs on VOC emissions.

Emissions Factor Post-Processing Procedures
There are up to two post-processing steps, depending on the county: 1) combine multiple oxygenate effects; and 2) incorporate the new highway MC emissions standards effects (for all counties).

Combine Multiple Oxygenate Effects
As described previously, for each individual gasoline with multiple oxygenates (Childress District and eight-county Houston Region only), individual MOBILE6 set-ups were produced for each oxygenate in the gasoline. MOBILE6 emissions factor tables were produced for each set-up using the POLFAC utility, and the results were combined (using the RATEADJ62X utility) into a single set of emissions factors using the fraction of oxygen in the gasoline contributed by each oxygenate as weights.

The following is a summer season emissions factor post-processing example for combining effects of multiple oxygenates into one set of emissions factors. Using the Childress District county group code G08H08_C1 (see coding convention in Appendix A), the example can be for Briscoe County, or any of the other counties in this group.

The calculation is for summer weekday, hourly, VOC Exhaust Running, Freeway LDGV rates for an average speed of 40 mph and for Hour 9 (9:00 a.m. to 10:00 a.m. in the POLFAC *.rat tables). The calculation is:

$$[(\text{ETOH run weight}) \times (\text{ETOH run EF})] + [(\text{MTBE run weight}) \times (\text{MTBE run EF})] = \text{Average Multi-oxygenate gasoline EF}$$

Where the components for this example are:

ETOH run weight = 0.985; and ETOH run EF = 0.17185525 g/mi;
MTBE run weight = 0.015; and MTBE EF = 0.17224389 g/mi.

The sum of their products provides the combined emissions factor: 0.17186108 g/mi.

Highway MC Standards Effects Post-Processing

The EPA has adopted more stringent emissions standards for highway MCs that are not included in MOBILE6. The standard regulates both exhaust and evaporative emissions from highway MCs. The new evaporative emissions standards control the loss of gasoline (described as "permeation") through the walls of fuel hoses and fuel tanks. The new exhaust and evaporative standards for highway MCs may be found in *Control of Emissions From Highway Motorcycles,* Final Rule, EPA 40 CFR Parts 9, 86, 90, and 1051.

Table 33 shows the exhaust and evaporative emissions reduction factors used to incorporate the estimated effects of EPA's new highway MC emissions standards into MOBILE6 MC emissions factors by evaluation year. EPA provided the exhaust reduction factors from its EI analysis in support of the rule, and TTI developed the evaporative reduction factors based on information also from EPA's EI regulatory support analysis (see *Final Regulatory Support Document: Control of Emissions from Highway Motorcycles*, EPA, December 2003). The exhaust adjustment factors (for VOC and NOx) are applied to MOBILE6 exhaust running and start emissions factors. The evaporative adjustment factors are applied to MOBILE6 resting loss VOC emissions factors. According to the EPA's regulatory support document, the diurnal and refueling vapor loss of evaporative emissions are not regulated.

Table 33. MOBILE6 MC Rule Emissions Rate Reduction and Adjustment Factor Summary.

Calendar Year	Emissions Rate Reductions			Emissions Rate Adjustment Factors		
	Exhaust		Evaporative	Exhaust		Evaporative
	NOx	VOC	Resting Loss VOC	NOx	VOC	Resting Loss VOC
2006	1.27%	0.80%	0.00%	0.9873	0.9920	1.0000
2007	3.74%	2.61%	0.00%	0.9626	0.9739	1.0000
2008	6.51%	4.93%	7.34%	0.9349	0.9507	0.9266
2009	8.91%	7.16%	14.67%	0.9109	0.9284	0.8533
2010	11.81%	9.35%	22.01%	0.8819	0.9065	0.7799
2011	16.79%	13.36%	28.79%	0.8321	0.8664	0.7121
2012	22.08%	18.01%	35.58%	0.7792	0.8199	0.6442
2013	27.02%	22.85%	42.36%	0.7298	0.7715	0.5764
2014	30.91%	27.20%	49.15%	0.6909	0.7280	0.5085
2015	35.31%	32.21%	55.93%	0.6469	0.6779	0.4407
2016	38.58%	35.87%	61.72%	0.6142	0.6413	0.3828
2017	41.89%	39.74%	67.51%	0.5811	0.6026	0.3249
2018	45.34%	43.94%	73.30%	0.5466	0.5606	0.2670
2019	48.43%	47.89%	79.08%	0.5157	0.5211	0.2092
2020	50.11%	50.13%	84.87%	0.4989	0.4987	0.1513
2021	51.61%	52.18%	86.90%	0.4839	0.4782	0.1310
2022	52.86%	53.91%	88.92%	0.4714	0.4609	0.1108
2023	53.91%	55.36%	90.95%	0.4609	0.4464	0.0905
2024	54.74%	56.53%	92.97%	0.4526	0.4347	0.0703
2025	55.44%	57.51%	95.00%	0.4456	0.4249	0.0500
2026	56.01%	58.31%	95.56%	0.4399	0.4169	0.0444
2027	56.41%	58.89%	96.13%	0.4359	0.4111	0.0387
2028	56.69%	59.28%	96.69%	0.4331	0.4072	0.0331
2029	56.88%	59.55%	97.25%	0.4312	0.4045	0.0275
2030	56.99%	59.71%	97.82%	0.4301	0.4029	0.0218

The individual oxygenate emissions factor results for multi-oxygenate gasolines were combined using the RATEADJ62X utility. The highway MC VOC adjustment factors (NOx was not a part of this analysis) were applied to the appropriate emissions factors using the RATEADJV62DK utility.

The resulting hourly emissions factors indexed by speed, MOBILE6 drive cycle, vehicle type, and pollutant-specific emissions type were then input to the emissions calculation utility, EMSCALC, to calculate the summer weekday, county-level EIs. The daily emissions factor tables were also developed for use in producing the emissions rate annualization factors for the annual emissions calculations, discussed later. The modeled emissions factors were provided on CD-ROM (see CD-ROM description in Appendix A). Appendix B contains a description of the utilities.

ESTIMATION OF VMT MIX

Table 1 summarized the MSAT EI areas of responsibility. NCTCOG developed and provided base annual emissions for the 12 DFW counties, TTI produced base annual emissions for the remaining 242 Texas counties, and subsequently calculated additional HAPs emissions for all Texas counties, and compiled the complete MSAT EIs (base annual emissions and additional HAPs) for all Texas counties. TTI's VMT mix methodology is described below. (See the addendum to this Technical Note for information on NCTCOG's base annual emissions analysis.)

To distribute the county on-road, fleet wide VMT estimates to each of the 28 MOBILE6 vehicle classes, TTI estimated and used TxDOT District-level, 24-hour VMT mixes for 2008 by three functional classification groups (Freeway, Arterial, and Collector).

Data

The primary data used to estimate VMT mixes were official TxDOT classification counts recorded by roadway functional class, that are collected as part of TxDOT's ongoing statewide data collection effort. TTI aggregated the TxDOT classification counts across years, by TxDOT District, and by the three functional classification groups using the latest eight years of data (2000-2007). Additional data used to expand from the vehicle classification count categories to MOBILE6 vehicle classes were the latest available year-end (2007) TxDOT District-level registrations data and the mid-analysis year (2008) MOBILE6 default diesel fractions.

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.

The 28 MOBILE6 vehicle classes are defined as a function of GVWR and fuel type (see Table 14). The FHWA axle/vehicle length-based classification categories were converted into the 28 MOBILE GVWR/fuel-type-based categories following the allocation methodology as described in the TTI Technical Report, *VMT Mix Estimation Method Refinement for MOBILE6*, August 2003, and summarized in the following section.

Procedure

The FHWA vehicle classification counts were first aggregated into three intermediate groups, and the bus category:

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

The PV intermediate group was disaggregated into the nine MOBILE6 "light" classes (i.e., LDVs, LDTs, and MC – see MOBILE6 vehicle numbers 1-5, 14-15, 24, and 28, defined in Table 14) using a combination of TxDOT registrations data, MOBILE6 defaults, and a nominal constant (for MC). TxDOT registrations data were used to split PV into light cars (LDV) and light trucks (LDT), and to further divide LDT into the ≤ 6,000 GVWR and > 6,000-to-8,500 GVWR categories. TxDOT LDV registrations do not distinguish by fuel type, and include just the two weight classes of LDT. MOBILE6 defaults were thus used to produce the gasoline/diesel sub-classes, and to produce the further subsets of LDTs completing the LDT expansion to the four gasoline and two diesel classes as used in MOBILE6. MC was subtracted from the LDGV category using a nominal constant.

The HDV intermediate group was disaggregated into 15 of the 16 MOBILE6 HDV vehicle classes (i.e., the eight gasoline [HDGV] categories, and the lighter seven of the eight diesel [HDDV] categories: see MOBILE6 vehicle class numbers 6-13, and numbers 16-22, respectively, in Table 14). The allocation was performed using the TxDOT registration data, which includes all 16 of the MOBILE6 HDV vehicle categories. The HDX intermediate group classification counts were used directly for the heaviest of the MOBILE6 diesel vehicle categories, HDDV8b, to better represent this critical category, which is possibly under represented by regional registration data.

The B, or bus, classifications were divided into the three MOBILE6 bus categories (see Table 14) using MOBILE6 defaults. (The TxDOT registrations data do not distinguish buses separately from the HDV classes.)

The VMT mixes are weekday estimates, as the TxDOT vehicle classification data are collected for weekdays (Monday through Thursday). No seasonal changes were made. Appendix K shows the estimated VMT mixes. Appendix L shows the use of the functional group VMT mixes by individual HPMS and TDM functional classes in the emissions calculations.

ESTIMATION OF ANNUALIZATION FACTORS

Table 1 summarized the MSAT EI areas of responsibility. NCTCOG developed and provided base annual emissions for the 12 DFW counties, TTI produced base annual emissions for the remaining 242 Texas counties, and subsequently calculated additional HAPs emissions for all Texas counties, and compiled the complete MSAT EIs (base annual emissions and additional HAPs) for all Texas counties. TTI's procedure for developing annualization factors is described below. (See the addendum to this Technical Note for information on NCTCOG's base annual emissions analysis.)

TTI developed a methodology for producing annual emissions estimates from seasonal weekday emissions estimates. There are two elements in the annualization methodology. The first is the VMT adjustment that converts the seasonal weekday VMT component of seasonal weekday emissions to annual VMT. The second is the emissions rate adjustment that is needed to accommodate changes in emissions rates between a season and the remainder of the year due to variation in parameters. The following general expression shows how the VMT annualization factor and the emissions rate annualization factors were applied to summer weekday emissions for each county to produce the annual emissions estimate. For each county, a single VMT annualization factor was applied to all pollutants and vehicle types, whereas a separate emissions rate annualization factor was applied per pollutant and vehicle type:

$$EM_A_{v,p,t,r} = EM_S_{v,p,t,r} \times VMT_A \times ER_A_{v,p,t}$$

Where:

v,p,t,r	=	vehicle class, pollutant, emissions type, and road class;
EM_A	=	annual emissions estimates;
EM_S	=	summer weekday emissions estimate;
VMT_A	=	county VMT annualization factor; and
ER_A	=	emissions rate annualization factor.

Annualization Factors for Summer Weekday VMT

To produce link-level summer weekday VMT for the summer weekday emissions analyses, the HPMS consistent, summer weekday VMT control totals were used (Appendix E). The control totals consist of the 2008 HPMS AADT VMT forecast for each county multiplied by a summer weekday adjustment factor. Thus, to annualize the summer weekday VMT, a factor to produce AADT VMT and expand it from the daily to the annual period was needed. This VMT annualization factor is the inverse of the summer weekday adjustment factor multiplied by 365.

For example, the AADT-to-summer weekday adjustment factor for Tyler District counties is 1.05834. The VMT annualization factor for each Tyler District county is thus (1/1.05834) × 365, or 344.879717293. Conceptually, this value represents the number of days of summer weekday VMT equivalent to the calendar year 2008 VMT total for counties in the Tyler District. Appendix E shows the summer season weekday VMT adjustment factors for all counties. The actual VMT annualization factors were an internal utility calculation. Annual VMT estimates by county were included in electronic form (Microsoft® Excel spreadsheet) in the annual EI summary as described in Appendix A.

Annualization Factors for Average Summer Weekday Emissions Rates
In addition to the VMT annualization component, ratios of emissions factors were needed to convert summer weekday emissions to annual emissions. These factors essentially consist of an annual average weekday emissions factor as the numerator, and the summer weekday emissions factor as the denominator. For each county or county group, one set of emissions rate annualization factors was developed by pollutant, emissions type, and vehicle type.

As previously described in the section on emissions factors development, average weekday emissions rates for each month were estimated to reflect changes in emissions rates during the year from the seasonal variation in meteorology, fuel properties, and fleet makeup. The average of the 12 monthly rates was calculated (using monthly weights of equal value for this study, since the multi-year, TxDOT District ATR-based travel factors show minimal difference by month), yielding an annual average daily emissions factor. The quotient of the annual average weekday emissions factor and the summer weekday emissions factor for each vehicle type pollutant and emissions type yielded the desired annualization factors.

The general expression for the emissions rate annualization factor is:

$$ER_ANNFAC_{v,p,t} = \frac{\sum_{i=1}^{12} EF_{i(v,p,t)} \times W_i}{EF_{SWKD(v,p,t)}} = \frac{EF_{AAD(v,p,t)}}{EF_{SWKD(v,p,t)}}$$

Where:

ER_ANNFAC	=	emissions rate annualization factor;
v,p,t	=	vehicle type, pollutant, emissions type;
EF_i	=	average weekday rate for month *i*;
W*i*	=	weighting factor for month *i*;
EF_{SWKD}	=	summer weekday emissions rate; and
EF_{AAD}	=	annual average weekday emissions rate.

All emissions factors used to develop the annualization factors were 24-hour weekday Freeway road type rates at the county level average speed rounded to the nearest 5 mph increment. Additionally, no adjustments for new federal MC effects were made to the rates used to produce the emissions rate annualization factors. This is because the same factors would be applied in both the numerator and denominator, cancelling out their effects.

For example, Table 34 lists the components used to calculate the ER_ANNFAC for Anderson County (and other counties in its group, see group codes in Appendix A) VOC exhaust running emissions. These components include the average monthly weekday emissions rates and associated monthly travel factors (in this case, equal across months), and the average summer weekday rate.

Table 34. Anderson County Emissions Rate Annualization Factor – Inputs for LDGV VOC Exhaust Running Example Calculation.

Period[1]	g/mi	Weighting Factor
Month 1	0.20934049	0.08333
Month 2	0.21389527	0.08333
Month 3	0.21341319	0.08333
Month 4	0.18166191	0.08333
Month 5	0.17953497	0.08333
Month 6	0.18591897	0.08334
Month 7	0.18643929	0.08334
Month 8	0.18711021	0.08334
Month 9	0.18536499	0.08334
Month 10	0.17892992	0.08333
Month 11	0.19889389	0.08333
Month 12	0.19395047	0.08333
Annual (monthly weighted average)	0.19287086	
Summer (average June through August)	0.18642351	

[1] All emissions factors are based on weekday activity input data and are 24-hour, Freeway rates for Anderson County summer weekday average speed rounded to nearest 5 mph increment (i.e., 40 mph). The average summer weekday rate is from the summer weekday emissions analysis. Since MC emissions standards adjustment factors would apply in both the numerator and denominator of this ratio, and factor to unity, these post-processing factors were not applied to the emissions factors used to produce the emissions rate annualization factors.

Using Table 32 values, the calculated emissions rate annualization factor is:

$$ER_ANNFAC = \frac{EF_{AAD}}{EF_{SWKD}} = 0.19287086 \text{ (g/mi)} / 0.18642351 \text{ (g/mi)}$$

$$= 1.0345844$$

The values in the example were taken from analysis data files provided on CD-ROM as described in Appendix A. Appendix A lists the emissions rate annualization ratios provided in electronic form as part of the electronic data submittal.

PREPARATION OF ADDITIONAL NON-MOBILE6-BASED EMISSIONS FACTORS

The additional HAPs emissions ratios and factors for gasoline and diesel vehicles used for all 254 counties in this analysis are the latest available from the NCD20080827 SCC Toxics Table (the NMIM database table containing air toxic pollutant emissions factors, provided by EPA, April 2009). Table 3 lists all the HAPs in the analysis, including those for which the emissions factors were developed using MOBILE6. The NMIM document, *EPA's National Inventory Model (NMIM), A Consolidated Emissions Modeling System for MOBILE6 and NONROAD*, EPA, December 2005, refers to the source of HAP data and methods used in NMIM as those described in the 1999 NEI for HAPS, version 3, and summarized in Volume 1, Appendix D, Table 1 of the documentation. Additionally, EPA added three species of mercury pollutants and arsenic to the NCD since the 2005 emissions analysis.

The following three approaches for estimating the additional HAPs in the NMIM were also used for this analysis:

- for Gasious HAPs – toxic-to-VOC ratios (grams/gram) were applied to VOC estimates;
- for PAHs – toxic-to-PM-10 ratios (grams/gram) were applied to PM-10 estimates; and
- for Metals, Dioxins and Furans – toxic grams/mile emissions factors (BEFs) were multiplied by VMT estimates.

Gaseous HAPs

As described in the NMIM documentation, for gaseous HAPs (see Table 3), separate ratios are used for evaporative and exhaust emissions. The ratios in the NMIM for gaseous HAPs vary for each of four categories of gasoline blends. Of these four blends, all Texas counties fit into either fuel type 1 or fuel type 2 (below) for the entire year, or into a combination of these two. Thus, the first two NMIM fuel types were used in the analysis, and also a third fuel type, which TTI produced as the average of the first two (associated factor files were provided as described in Appendix A).

1. Baseline Gasoline: all cases that do not fall into the other three fuel types in the NMIN (i.e., "2" below, winter oxygenate gasoline high in MTBE or TAME, and RFG with significant quantities of MTBE or TAME) (factors data file: hap_base.csv).
2. Winter Oxygenate Gasoline /Ethanol or ETBE: fuel that contains ethanol, which is greater than or equal to 5 percent by volume or ETBE greater than or equal to 5 percent by volume (factors data file: hap_eth1.csv).

TTI added a third set of ratios, specifically for annual emissions modeling for counties under fuels data allocations indicating fuel type "1" in one season (i.e., summer or winter), and fuel type "2" in the other season.

3. Combination of 1 and 2, above: TTI used a 50/50 weighting to produce gaseous HAPs ratios. (factors data file: hap_ave1.csv).

PAHs
All PAHs emitted in exhaust are estimated as fractions of exhaust PM-10, although the data used to calculate mass ratios include both gas and particulate phase PAH emissions. The data used to develop the PAH fractions used in the NMIM and in this analysis are described in the documentation for the 1999 NEI for HAPs. The one exception in the PAH group is for naphthalene, for which on-road gasoline vehicle evaporative emissions are additionally estimated as a fraction of evaporative VOC.

Metals, Dioxins, and Furans
These exhaust HAPs are estimated using grams/mile emissions factors from the NMIM (developed for the 1999 NEI for HAPs, version 3, except that the chromium ratios have been updated, mercury and arsenic ratios were added, and lead rates were MOBILE6-based). See the appropriate NEI documentation for details on development of HAP emissions factors.

Additional HAPs Factor Files
To apply the additional HAP factors as described above, TTI previously developed a routine (RATIOEMSCALC utility) which reads the HAP factors from MOBILE6 ADDITIONAL HAPS external data files. Thus, TTI reformatted the HAPs factors data (provided by EPA as NCD20080827 SCCToxics Table extract in a Microsoft® Excel spreadsheet) into MOBILE6 external data file form (as specified in the *MOBILE6 User's Guide)*, to include the specified units (milligrams/mile and milligrams/gram). TTI produced three external data files, one each corresponding to the first two fuel cases listed for gaseous HAPs, above, and the third which is the average of these two. These external data files include the gaseous HAPs; and the PAHs, dioxins/furans and metals factors (which do not vary by gasoline blend), in each file. The external data files were provided in electronic form as described in Appendix A.

The three gasoline blend external data files applied in this analysis (original factors from the NMIM for gasoline blends 1 and 2, above, and the 3rd annual average gasoline blend) were applied in this analysis as follows:

- Winter Oxygenate Gasoline /Ethanol or ETBE blend (factors data file: hap_eth1.csv) was used for: Dallas, Collin, Denton, Tarrant, Harris, Brazoria, Chambers, Fort Bend, Galveston, Liberty, Montgomery, and Waller counties;
- 50/50 Weighting of Winter Oxygenate Gasoline /Ethanol or ETBE and Baseline Gasoline blends, (factors data file: hap_ave1.csv) was used for El Paso County and counties mapped to Paris District fuel survey data; and
- Baseline Gasoline blend (factors data file: hap_base.csv) was used for the remaining Texas counties.

EMISSIONS CALCULATIONS
Table 1 summarized the MSAT EI areas of responsibility. NCTCOG developed and provided base annual emissions for the 12 DFW counties, and TTI produced base annual emissions for the remaining 242 Texas counties, and subsequently calculated additional HAPs emissions for all Texas counties, and compiled the complete MSAT EIs (base annual emissions and additional HAPs) for all Texas counties. TTI's procedure for annual emissions is described below. (See the

addendum to this Technical Note for information on NCTCOG's base annual emissions analysis.)

TTI calculated summer weekday hourly emissions (grams/hour), summer weekday 24-hour emissions (grams/day) and annual emissions (pounds/year) estimates using utilities developed by TTI for this purpose (see EMSCALC, ANNUALIZATION, and RATIOEMSCALC emissions estimation utility descriptions in Appendix B). For pollutants available in MOBILE6, average summer or peak ozone season weekday hourly link-level emissions were calculated and summed across hours to produce 24-hour totals. These 24-hour totals were converted to annual estimates, and the annual emissions estimates for the additional HAPs not included in MOBILE6 were then calculated (for all 254 counties) as fractions of the associated underlying criteria pollutant base annual emissions values, or were calculated based on annual VMT, depending on the additional pollutant factor type (mass emissions ratio or BEF) supplied.

Hourly emissions were calculated at the TDM network link or HPMS virtual link level, depending on the county (see Table 2). Generally, for each hour of the average summer weekday, link-VMT estimates were multiplied by the emissions factors (all in units of g/mi) to produce hourly emissions estimates for each of the 28 vehicle types and each pollutant and emissions type on each link. The MOBILE6 Freeway, Arterial, and Ramp drive-cycle emissions factors were used; Freeway emissions factors were applied to Freeway links and Arterial emissions factors to non-Freeway links, except for Freeway ramp links to which Ramp drive-cycle emissions factors were applied. The daily summaries by vehicle type, road type, pollutant, and emissions type were next calculated by summing the hourly emissions estimates. The annualization factors (VMT and emissions rate components) were then multiplied by the daily summer weekday emissions summaries to produce the base annual emissions estimates. The (MOBILE6-based pollutant) base annual emissions estimates calculated in this manner are VOC, exhaust PM-10 components (GASPM, ECARBON, OCARBON, SO4, and LEAD), and the six MOBILE6 MSATs (BENZ, MTBE, BUTA, FORM, ACET, and ACRO).

Tab-delimited output was produced from the hourly and daily emissions calculations. The tab-delimited emissions summary file includes county-level hourly and 24-hour emissions estimates by pollutant and emissions type cross classified by vehicle type and road type (including VMT, VHT, average speed [VMT/VHT], and VMT mix). The annual emissions output file is similar to the daily output — a tab-delimited emissions summary file with the same data as the hourly/daily output, except for VMT mix.

To produce the annual emissions estimates for each of the additional HAPs not included in MOBILE6 (includes seven gaseous hydrocarbons, 16 PAHs, eight metal/metal compounds, and 17 dioxin/furan cogeners), the base annual emissions estimates (for all 254 counties) for VOC, exhaust PM-10 or annual VMT were multiplied by one of two types of factors — HAP-to-CAP pollutant ratio (mg/g), or HAP BEF (mg/mi). For metals and dioxin/furan cogener (exhaust) emissions, the emissions factors are the BEF type. For the gaseous hydrocarbons, the factors are HAP-to-VOC ratios, and, depending on the HAP, consist of different ratios for exhaust and evaporative emissions types. For PAH HAPs, the factors are HAP-to-exhaust PM-10 ratios, except that the PAH naphthalene additionally includes a naphthalene-to-evaporative VOC ratio (applied to gasoline vehicle evaporative VOC emissions components). See the full list in Table 3, as well as the detailed description of the RATIOEMSCALC utility, which performs the calculations (described in Appendix B). The output from the additional HAPs runs is a tab-

delimited emissions file including the data tables from the annualization step (i.e., VOC, PM-10, and MOBILE6 Air Toxic pollutants) and the tables of additional HAPs.

An additional set of NIF 3.0-formatted EI results, compatible with TCEQ's TxAER system, were also produced. The EI data were also formatted in EPA's 2008 NEI reporting format (XML document according to the appropriate XML scheme) in preparation for submittal to EPA's CERS EIS. These files are provided on CD-ROM (see Appendix A).

Summer Weekday Hourly and 24-Hour Emissions

TTI calculated emissions by hour and link using the following basic inputs:

- MOBILE6 hourly Freeway and Arterial emissions factors, for the pollutants and emissions types, indexed by speed for 28 vehicle types, developed with POLFAC62_3;
- records associating the MOBILE6 Freeway, Arterial, and Ramp emissions factors to the appropriate links, based on network functional classification or facility type codes;
- directional link data from the post-processed TDM network assignment results from the TRANSVMT utility, or directional virtual link data from post-processed HPMS data (TxDOT's RIFCREC data set) from the VirtualLinkVMT utility including: A-node and B-node of link (for TDM counties), county index, functional class or road type code, fleet total directional VMT, operational speed estimate, and link length (or centerline miles); and
- VMT mix (to allocate link VMT by each of the 28 vehicle types) by time period and roadway type.

For each hour, the MOBILE6 emissions-type-specific pollutant emissions estimates were calculated by vehicle type for each link. District-level, 24-hour VMT mixes indexed by functional class group were multiplied by the county fleet total link VMT to produce hourly link VMT estimates by the 28 vehicle types for each individual county in a district. Emissions factors from the associated county or county group look-up table were then matched to appropriate link data using the pertinent parameter indexes. Emissions factors for estimated average operational link speeds not represented in the set of 14 MOBILE6 speed bin speeds were calculated by interpolation (see example calculation, Appendix B). For link speeds greater than or less than the MOBILE6 bounding speeds of 2.5 mph and 65 mph, the emissions factors corresponding to the bounding speeds were used. The link VMT was then multiplied by the emissions factors to produce the link-level emissions estimates in grams.

Appendix L shows the mapping of the functional classes to the MOBILE6 drive cycles and to the VMT mix functional classification groups (for each TDM and for the HPMS-based analyses), as used in the link-level emissions calculations.

For each county, the link-emissions estimates were summed by roadway and vehicle type for each hour (and for each pollutant with multiple emissions types), and the hourly emissions were summed for the 24-hour period. The resulting VOC, exhaust PM-10 components (GASPM, ECARBON, OCARBON, SO4, and LEAD), and six MOBILE6 MSATs (BENZ, MTBE, BUTA, FORM, ACET, and ACRO) emissions estimates (by sub-component as well as composites) are

summarized by road type, vehicle type, and road type and vehicle type cross classification. VMT, VHT, and speed (VMT/VHT) tabulations are included with the emissions summaries. These tab-delimited files are included with the set of data files provided on CD-ROM (see Appendix A).

Annual Emissions for MOBILE6-Based Pollutants

The methodology that TTI used for producing the base annual emissions estimates was an annualization of the summer weekday emissions estimates. One county-level VMT annualization factor was multiplied by county summer weekday emissions (for all pollutants and emissions types) at the vehicle-type and roadway-type level (as well as by summer weekday VMT and VHT). The emissions rate annualization ratios were also multiplied by the summer weekday emissions, but on a pollutant, emissions type, and vehicle-type-specific basis. The annual emissions were calculated with the following major inputs:

- tab-delimited county, 24-hour summer weekday emissions (pounds/day) summary file output from the summer weekday emissions analysis;
- summer weekday VMT adjustment factor (for internal calculation of VMT annualization factor);
- emissions rate annualization factors by pollutant, emissions type, and vehicle type; and
- units (directs utility to convert from input emissions units to desired emissions units).

Using the equation from the "Estimation of Annualization Factors" section and data from the EI analysis, the following example shows the calculation of annual Anderson County LDGV VOC exhaust running emissions for the Rural Minor Arterial roadway type:

$$EM_A_{(v,p,t,r)} = EM_S_{(v,p,t,r)} \times VMT_ANNFAC \times ER_ANNFAC_{(v,p,t)} \times Units_Fac$$

Where:

v,p,t,r	=	LDGV, VOC, exhaust running, and Rural Minor Arterial;
EM_S	=	104.283154 lbs./day;
VMT_ANNFAC	=	344.879717293 days/year;
ER_ANNFAC	=	1.0345844; and
Units_Fac	=	(no conversion was made).

Anderson County Annual Rural Minor Arterial LDGV VOC exhaust running emissions =
104.283154 lbs./day × 344.879717293 days/year × 1.0345844 =
37,208.98 pounds/year.

The values for this example are in the EI input and output files provided as described in Appendix A.

Annual Emissions for Non-MOBILE6 Pollutants

TTI calculated annual emissions estimates for the HAPs not included in MOBILE6, for all 254 Texas counties, as a fraction of the MOBILE6-based annual emissions estimates for VOC exhaust, VOC evaporative, PM-10 exhaust, or calculated as a fraction of annual VMT. The additional HAP factors used were the latest factors available extracted from the NMIM database

and supplied by EPA in a Microsoft® Excel spreadsheet form. The HAP factors from the NMIM are in MOBILE6-specified input form (files provided on CD-ROM, see description in Appendix A.)

The additional MSAT annual emissions were calculated using the RATIOEMSCALC utility with the following major inputs:

- additional HAP factors (HAP-to-CAP mass emissions ratios and BEFs) in MOBILE6 input file format (see detailed discussion in section 2.8.3.8 of the *MOBILE6 User's Guide*);
- ANNUALIZATION utility tab-delimited county annual EI data summary output file from the MOBILE6-based annual emissions analysis (includes pounds/year VOC emissions by the MOBILE6-based subcomponents excluding the evaporative refueling emissions, PM-10 exhaust emissions, and six MOBILE6 MSAT emissions summaries as well as annual VMT); and
- list of pollutant emissions summaries from the MOBILE6-based annual emissions input to be included in the tab-delimited emissions data RATIOEMSCALC output file.

As previously described, the additional non-MOBILE6 MSAT emissions estimates are calculated based on underlying VMT or underlying emissions (i.e., VOC or PM-10). The general equations, depending on whether the calculation is emissions-based or VMT-based are:

$EM_A_{Add'lHAP} = EM_A \times Add'lHAP_Fac \times Units_Fac$ (emissions based); and
$EM_A_{Add'lHAP} = VMT_A \times Add'lHAP_Fac \times Units_Fac$ (VMT based).

Where:

$EM_A_{Add'lHAP}$	=	additional non-MOBILE6-based HAP emissions estimate;
EM_A	=	underlying MOBILE6-based pollutant emissions estimate;
VMT_A	=	annual VMT estimate;
Add'lHAP_Fac	=	milligrams of MSAT emissions per gram of underlying pollutant emissions (or per mile for VMT-based estimate); and
Units_Fac	=	1 gram/1000 milligrams.

The following example shows the calculation for Anderson County LDGV ethyl benzene annual exhaust running emissions for the Rural Minor Arterial roadway type. Using the emissions-based formula, above, and the analysis data values, where:

EM_A	=	37,208.98 pounds/year (exhaust running VOC);
Add'lHAP_Fac	=	17.8752 milligrams/gram (exhaust ethyl benezene-to-exhaust VOC); and
Units_Fac	=	1 gram/1000 milligrams.

Annual Rural Minor Arterial LDGV ethyl benezene exhaust running emissions = 37,208.98 pounds/year × 17.8752 milligrams/gram × 1 gram/1000 milligrams = 665.12 pounds/year.

The values for this example are in the EI input and output files provided as described in Appendix A.

The annual EI data for all Texas counties were then converted to NIF 3.0 format summaries compatible with the TCEQ's TxAER system (see Appendix M for NIF formatting information). The annual EI data were then converted from NIF form to EPA's 2008 NEI reporting format (XML document according to the appropriate XML scheme) in preparation for submittal to EPA's CERS EIS. These files are provided on CD-ROM (see Appendix A).

APPENDIX A:
2008 MSAT ANNUAL EI ELECTRONIC SUBMITTAL DATA SET DESCRIPTION

2008 MSAT Annual EI Electronic Data Submittal Description
TTI submitted to TCEQ (June 2009) the following EI data on one CD-ROM to replace the initial Review Draft submittal (May 2009), in support of the Texas 254 counties 2008 annual MSAT EI task:

1. Emissions Data Summaries;
2. Emissions Factors Data;
3. Fuels and Meteorological Inputs;
4. TexAER Compatible Format Emissions Files; and
5. XML document.

1. Emissions Data Summaries
The following table outlines the 254 Texas counties by activity basis (HPMS-based or TDM-based). The 39 counties tabulated under "Area" as 1 through 7 are referred to as region-based, and the remaining 215 counties are referred to as statewide-based. The regional method uses finer detail in some MOBILE6 inputs, and uses TDM activity data if available.

County-Level Emissions Analyses by Region and Activity Basis.

Area	Counties	Activity Basis
1. Houston/Galveston nonattainment area (NAA)	Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, Waller	TDM
2. Beaumont-Port Arthur NAA	Jefferson, Hardin, Orange	TDM
3. El Paso maintenance area	El Paso	TDM
4. Austin EAC area	Hays, Travis, Williamson/Bastrop, Caldwell	TDM/HPMS
5. San Antonio EAC area[1]	Bexar, Comal, Guadalupe, Kendall,[1] Wilson	TDM
6. Northeast Texas EAC area	Gregg, Smith/Harrison, Rusk, Upshur	TDM/HPMS
7. Dallas/Fort-Worth CMSA[2]	Collin, Dallas, Denton, Rockwall, Tarrant/Ellis, Henderson, Hood, Hunt, Johnson, Kaufman, Parker	TDM/HPMS
8. Remainder of Texas	215 counties	HPMS
Totals by Activity Basis	27/227	TDM/HPMS

[1] Kendall is part of the new geographically-expanded San Antonio Region travel model, although not part of the San Antonio EAC area.
[2] DFW CMSA county base annual EI data were developed and provided by NCTCOG.

County level emissions data files and emissions summary spreadsheets provided in "08MSAT_tx254_ems_final.zip" include:

- two summary spreadsheet files of EI data extracts: "MSAT08_CountyTotals_master.xls" (contains a spreadsheet of county totals and a spreadsheet of county totals by vehicle class), and "MSAT08_DEOG_DPM.xls" (county EI data spreadsheet that may be set up to exclude selected vehicle types and/or pollutant emission types – used in summarizing DPM + DEOG totals by county).
- final annual emissions output files including both MOBILE6-based and additional HAP EI summaries (254 each *.TAB and *.LST files);
- intermediate step base annual (MOBILE6-based) emissions output (254 *.TAB files [12 provided by NCTCOG and 242 produced by TTI] and 243 *.LST files); and
- intermediate step summer weekday output files including hourly and 24-hour MOBILE6-based emissions summaries (242 each *.TAB and *.LST files [excludes the 12 DFW counties]).

The summary spreadsheets include the final EI data extracted from the 254, county-level, tab-delimited, final annual emissions output files. There were three main emissions calculation steps. The first step produced initial 24-hour EIs (TTI results included for 242 counties). The second step converted the 24-hour EIs to base annual EIs (results included for all 254 counties – 242 counties by TTI, and 12 DFW counties provided by NCTCOG). The final step produced the annual emissions estimates of additional HAPs and combined them in a single TAB file with the MOBILE6-based pollutant annual emissions estimates (all 254 runs executed by TTI). The TAB files are tab-delimited EI summaries; LST files contain emissions utility execution information. The "summer weekday," "base annual," and "annual with additional HAPs" EI output for each county is specified by an "s," an "a" or "ann," and an "ah," respectively, in the filename prefix. The data included by vehicle type and road type in the final annual EI run tab-file output are (emissions units are pounds):

VEHICLE MILES OF TRAVEL
VEHICLE HOURS
SPEED (VMT/VHT)
VOC EMISSIONS
VOC EXH_RUNNING EMISSIONS
VOC START EMISSIONS
VOC Hot_Soak EMISSIONS
VOC Diurnal EMISSIONS
VOC Rest_Loss EMISSIONS
VOC Run_Loss EMISSIONS
VOC Crankcase EMISSIONS
SO4 EMISSIONS
OCARBON EMISSIONS
ECARBON EMISSIONS
GASPM EMISSIONS
LEAD EMISSIONS

PMTOTAL EMISSIONS
BENZ EMISSIONS
BENZ EXH_RUNNING EMISSIONS
BENZ START EMISSIONS
BENZ Hot_Soak EMISSIONS
BENZ Diurnal EMISSIONS
BENZ Rest_Loss EMISSIONS
BENZ Run_Loss EMISSIONS
MTBE EMISSIONS
MTBE EXH_RUNNING EMISSIONS
MTBE START EMISSIONS
MTBE Hot_Soak EMISSIONS
MTBE Diurnal EMISSIONS
MTBE Rest_Loss EMISSIONS
MTBE Run_Loss EMISSIONS
BUTA EMISSIONS
BUTA EXH_RUNNING EMISSIONS
BUTA START EMISSIONS
FORM EMISSIONS
FORM EXH_RUNNING EMISSIONS
FORM START EMISSIONS
ACETA EMISSIONS
ACETA EXH_RUNNING EMISSIONS
ACETA START EMISSIONS
ACROL EMISSIONS
ACROL EXH_RUNNING EMISSIONS
ACROL START EMISSIONS
Ethyl Benzene EMISSIONS
Ethyl Benzene EXH_RUNNING EMISSIONS
Ethyl Benzene START EMISSIONS
Ethyl Benzene HOT_SOAK EMISSIONS
Ethyl Benzene DIURNAL EMISSIONS
Ethyl Benzene REST_LOSS EMISSIONS
Ethyl Benzene RUN_LOSS EMISSIONS
Ethyl Benzene CRANKCASE EMISSIONS
Styrene EMISSIONS
Styrene EXH_RUNNING EMISSIONS
Styrene START EMISSIONS
Toluene EMISSIONS
Toluene EXH_RUNNING EMISSIONS
Toluene START EMISSIONS
Toluene HOT_SOAK EMISSIONS
Toluene DIURNAL EMISSIONS
Toluene REST_LOSS EMISSIONS
Toluene RUN_LOSS EMISSIONS
Toluene CRANKCASE EMISSIONS
Hexane EMISSIONS
Hexane EXH_RUNNING EMISSIONS

Hexane START EMISSIONS
Hexane HOT_SOAK EMISSIONS
Hexane DIURNAL EMISSIONS
Hexane REST_LOSS EMISSIONS
Hexane RUN_LOSS EMISSIONS
Hexane CRANKCASE EMISSIONS
Anthracene EMISSIONS
Propionaldehyde EMISSIONS
Propionaldehyde EXH_RUNNING EMISSIONS
Propionaldehyde START EMISSIONS
Pyrene EMISSIONS
Xylene EMISSIONS
Xylene EXH_RUNNING EMISSIONS
Xylene START EMISSIONS
Xylene HOT_SOAK EMISSIONS
Xylene DIURNAL EMISSIONS
Xylene REST_LOSS EMISSIONS
Xylene RUN_LOSS EMISSIONS
Xylene CRANKCASE EMISSIONS
Chromium (Cr6+) EMISSIONS
Benzo(ghi)perylene EMISSIONS
Indeno(123cd)pyrene EMISSIONS
123789-Hexachlorodibenzo-p-Dioxin EMISSIONS
Benzo(b)fluoranthene EMISSIONS
Fluoranthene EMISSIONS
Benzo(k)fluoranthene EMISSIONS
Acenaphthylene EMISSIONS
Chrysene EMISSIONS
Octachlorodibenzo-p-dioxin EMISSIONS
1234678-Heptachlorodibenzo-p-Dioxin EMISSIONS
Octachlorodibenzofuran EMISSIONS
123478-Hexachlorodibenzo-p-Dioxin EMISSIONS
12378-Pentachlorodibenzo-p-Dioxin EMISSIONS
Benzo(a)pyrene EMISSIONS
2378-Tetrachlorodibenzofuran EMISSIONS
Dibenzo(ah)anthracene EMISSIONS
224-Trimethylpentane EMISSIONS
224-Trimethylpentane EXH_RUNNING EMISSIONS
224-Trimethylpentane START EMISSIONS
224-Trimethylpentane HOT_SOAK EMISSIONS
224-Trimethylpentane DIURNAL EMISSIONS
224-Trimethylpentane REST_LOSS EMISSIONS
224-Trimethylpentane RUN_LOSS EMISSIONS
224-Trimethylpentane CRANKCASE EMISSIONS
1234789-Heptachlorodibenzofuran EMISSIONS
Benz(a)anthracene EMISSIONS
23478-Pentachlorodibenzofuran EMISSIONS
12378-Pentachlorodibenzofuran EMISSIONS

123678-Hexachlorodibenzofuran EMISSIONS
123678-Hexachlorodibenzo-p-Dioxin EMISSIONS
2378-Tetrachlorodibenzo-p-Dioxin EMISSIONS
234678-Hexachlorodibenzofuran EMISSIONS
1234678-Heptachlorodibenzofuran EMISSIONS
123478-Hexachlorodibenzofuran EMISSIONS
123789-Hexachlorodibenzofuran EMISSIONS
Manganese EMISSIONS
Nickel EMISSIONS
Chromium (Cr3+) EMISSIONS
Acenaphthene EMISSIONS
Phenanthrene EMISSIONS
Fluorene EMISSIONS
Naphthalene EMISSIONS
Naphthalene EXH_RUNNING EMISSIONS
Naphthalene HOT_SOAK EMISSIONS
Naphthalene DIURNAL EMISSIONS
Naphthalene REST_LOSS EMISSIONS
Naphthalene RUN_LOSS EMISSIONS
Naphthalene CRANKCASE EMISSIONS
Mercury (elemental gaseous) EMISSIONS
Mercury (divalent gaseous) EMISSIONS
Mercury (divalent particulate) EMISSIONS
Arsenic and Compounds EMISSIONS

2. Emissions Factors Data

The statewide method MOBILE6 inputs and rates were produced for the entire state, even though the regional method-based county emissions rates were developed separately. This was performed for expediency. Although all of the statewide method emissions rate inputs and outputs were developed and included in the data submittal, only the regional method rates were used in the emissions calculations for the 27 (non-DFW) regional method-based counties. The emissions factor input/output data produced by NCTCOG for the 12 DFW CMSA counties was not included here. The following emissions factor data files, compressed in "08MSAT_rates_242.zip," were provided.

MOBILE6 Command Files:

- MOBILE6 command input filenames (431) for the regional analyses are:

  08S_PM1_***CCCC***.IN (35 summer weekday*); and
  08***PP***_PM1_***CCCC***.IN (396 monthly weekday*).

- MOBILE6 command input filenames (861) for the statewide method counties are:

  08S_PM1_***GGGG***.IN (69 summer weekday*); and
  08***PP***_PM1_***ZZZZ***.IN (792 monthly weekday*).

  Where:
  - ***PP*** is 01 - 12 for month (Jan. – Dec.);
  - ***CCCC*** is "region_county" (e.g., HGB_HARR is Harris, AUS_BAST is Bastrop);

- ***GGGG*** is a county group code for statewide seasonal weekday runs that includes identifiers for source or fuel parameter inputs, associated TxDOT District, if TxLED is required (used to separate East and West Texas counties for mapping of monthly fuel parameters to counties), and source of meteorological inputs (see "Emissions Factor Filenames by County and Period" table at the end of the appendix); and
- ***ZZZZ*** is a county group code for statewide method monthly runs similar to the ***GGGG*** code, except there is no TxLED identifier, and an identifier for the period of the fuels data is added.

* Two runs were required where two oxygenates in a fuel were modeled. In such cases, the following identifiers were appended to filename prefixes: "_A," "_E," and "_M," for ethanol, ETBE, and MTBE runs, respectively.

MOBILE6 External Data Files:

- *.IM – six I/M set-up files, each for the following counties: Collin/Denton; Dallas/Tarrant; El Paso; Harris; Travis/Williamson; and the I/M expansion counties in Houston and DFW areas;
- *.rgd – 25 district-level registration distribution files (i.e., D01 through D25), and 27 county-level registration distribution files (e.g., ELPA08.rgd, GALV08.rgd);
- *.tld – one HGB and one DFW regional trip length distribution file from the respective regional travel models; and
- *.vhr – 60 VMT by hour fractions input files:
  - 25 district-level winter files (with "w1" label);
  - 25 district-level summer files (with "s1" label, based on June through August data);
  - 8 HGB county-level and two district-level summer files (with "s2" label, based on July through September and four period TDM data).

Emissions Rates:

The emissions rate output consists of some interim files and final rate files after post-processing. The Houston Region and the Childress District fuels inputs consisted of gasoline with two oxygenates. The rates for counties in these areas were post-processed to incorporate the multi-oxygenate gasoline effects. Rates for all counties were post-processed to incorporate the effects of new federal highway MC emissions standards.

The rate files consist of hourly emissions rate look-up tables, and daily (24-hour) rate look-up tables. The hourly and the 24-hour rate tables were inputs to the seasonal weekday emissions and emissions rate annualization factor calculations, respectively.

Summer Weekday Rates:

- final hourly rate files (90 *.rat, consisting of 27 county-level, region-method-based rate files, and 63 county-group, statewide-method-based rate files consisting of MOBILE6 pollutant and emissions type rates indexed by hour, road type, vehicle type, and MOBILE6 speed bin speed);
- final daily rate files (90 *.rtd, matching the set of hourly rate files of the previous bullet, except these look-up tables include only 24-hour rates);

- interim hourly rate files (118 *.irat, consisting of 104 initial tables, which includes 14 two-set tables for dual oxygenate gasoline counties or county groups, which when combined into a single set of tables, adds 14 more);
- interim daily rate files (118 *.irtd, matching the set of interim hourly rate files in the previous bullet; and
- LOG/LST files (combination of 312 total) – the initial rate table runs were performed with POLFAC62_3, which also outputs a LOG and a LST file (104 each). The RATEADJ utilities used to perform the multi-oxygenate post-processing and MC standards effects each produce LST files (14 for oxygenate post-processing, and 90 for MC effects). The LOG files include a MOBILE6 descriptive output for each POLFAC62_3 run, and the LST files provide utility execution information, input/output locations, and other summary information pertaining to each run.

Average Monthly Weekday (24-hour) Rates:

- final daily rate files (1,068 *.rtd, includes 90 per month for months 03 through 11, 85 per month for months 12 and 01, and 88 for month 02);
- interim daily rate files (240 *.irtd, includes 28 per month for months 04 through 09, 24 per month for months 03, 10, and 11); and
- LOG/LST files (combination of 2,496total) – initial runs were performed with POLFAC62_3, which outputs a LOG and LST file (1,188 each) in addition to the MOBILE6 rate tables, and the multi-oxygenate post-processing runs (120) each produced a LST file in addition to a look-up table. No MC adjustments were made to the monthly rates, which were used to produce ratios (annual average daily rate-to-seasonal weekday daily rate) using the pre-MC-adjusted summer weekday rates. Since the same MC factors would appear in both the numerator and denominator, dropping them from the ratio has no effect.

Adjustment Factors:

- 03_g13_oxyfacs.txt, 04_g13_oxyfacs.txt, 04_g08_oxyfacs.txt, 06_g13_oxyfacs.txt, 06_g08_oxyfacs.txt, 10_g13_oxyfacs.txt, and 11_g13_oxyfacs.txt are the factor files by period and area for combining the individual oxygenate run emissions factors for multi-oxygenate gasolines (g08 is Childress District, and g13 is for Houston RFG); and
- 2008adjfacts_MC_HAPS.txt is the highway MC VOC adjustment factors file for incorporating new federal highway MC emissions standards effects in MOBILE6 emissions factors.

Emission Rate Annualization Factors:

Factor filenames (27) for the regional analyses are:

08PM1_***CCCC_SSSS***rfac.txt.

Factor filenames (133) for the statewide method are:

08PM1_***GGGG_SSSS***rfac.txt.

"RatanfacKey_242.xls" provides the rate annualization factor file names by county.

Where:

- CCCC is region/county label (e.g., HGB_HARR for Harris, AUS_BAST for Bastrop);
- ***GGGG*** is a county group code for the statewide method rate annualization factor runs including identifiers for the source of fuel parameter inputs, meteorological inputs, and whether the counties are subject to TxLED (to indicate East Texas versus West Texas); and
- ***SSSS*** is the average speed of the daily rates used, to the nearest 5 mph increment.

There is an additional set of files for each run (RATEANNUALFACT utility execution output files listing run information including input/output filenames) bearing the same filename prefixes shown above and the file extension "LST."

Additional HAP Factor Files:

The following additional HAP factors files, in MOBILE6 external data file format (see MOBILE6 User's Guide, EPA, August 2003), were developed by TTI using the factors from NCD20080727 (NMIM County Database version 20080727, SCC Toxics Table):

- hap_base.csv;
- hap_eth1.csv; and
- hap_ave1.csv (the average of 1 and 2).

These additional HAP factor files were applied, as appropriate, to base annual EI data for all 254 Texas counties in producing the final MSAT annual emissions estimates for each county.

3. Fuels and Meteorological Inputs

The fuels and meteorological data and inputs used are the same as those used in the 2008 on-road mobile source CERR EIs. (Note that the "zip" files described below were taken directly from the 2008 CERR EI task – thus "CERR" in the filenames is correct. Although these files are the same as what was provided in the CERR EI task, they are also provided here for completeness.) These input data were also used by NCTCOG in producing the MOBILE6 emissions factors for the 12 DFW CMSA counties CERR EIs and base annual emissions for this statewide MSAT EI.

Meteorological Inputs:

"08cerr_ met.zip" contains the MOBILE6 meteorological inputs used and the underlying weather observation data. "MetKey08cerr.xls" lists the files containing the MOBILE6 hourly temperatures, hourly relative humidity, and 24-hour barometric pressure inputs used for each county and period. The hourly weather observation data, the spreadsheets used to calculate the average hourly inputs over each period (i.e., summer or ozone season period, winter season [El Paso], and month), and the ozone data used to select meteorological data used to calculate the average ozone season inputs for particular areas are also included.

Fuels Inputs:

"08cerr_fuels.zip" contains the file "08M6FuelsbyMonth_master.xls" that lists all the MOBILE6 fuel parameter inputs developed for the 2008 CERR and MSAT EIs. Within this file, the "Values" and "byCounty" spreadsheets, respectively, list all fuel parameter inputs by temporal/geographic fuel code, and all temporal/geographic fuel codes used by county and month. The "GasolineAves_Winter0708.xls" and "RevisedBPA_08SummerGas.xls" files provide for weighting of the winter fuel properties across grades to produce overall winter averages by sample city, and revisions to the Beaumont District summer fuel property averages (to remove RFG samples that were originally included with CG).

4. TexAER Compatible Format Emissions Files

- "08MSAT_nif.zip" includes files containing the 254 EIs in a format compatible with TCEQ's TexAER system (i.e., a format based on EPA's NIF 3.0).

  - The 2008 NIF records for the 254 Texas counties are in:
    - 254tx_m62_2008_MTOX_NIFtr.txt (contains the transmittal records);
    - 254tx_m62_2008_MTOX_NIFpe.txt (contains the VMT records); and
    - 254tx_m62_2008_MTOX_NIFem.txt (contains the emissions records).

  - Also included are:
    - 254tx_m62_2008_MTOX_NIFreadme.txt (EI descriptive information); and
    - 254tx_m62_2008_MTOX_NIF.lst (a listing of information from the utility execution performed [EMISSIONSFORMAT utility] to convert the tab-delimited emissions summaries output to NIF form).

5. XML Document File

- "08MSAT_XML.zip" includes files produced by the utility XMLformat that converted the annual emissions and VMT from the NIF files (listed in "4" above) to an XML file form produced according to the specification as provided in EPA's *2008 NEI/EIS Implementation Plan* EPA, December 22, 2008).

  - The files included are:
    - 254tx_m62_2008_MTOX_XML.xml (2008 annual EIs for 254 counties in XML form);
    - 254tx_m62_2008_MTOX_XML.tab (a tab-delimited summary table with the following data from the XML file: emissions by county, SCC, pollutant and emissions type; and VMT by county, SCC and emissions type); and
    - 254tx_m62_2008_MTOX_XML.lst (a listing of information from the utility execution performed to convert the NIF files to an XML file).

Emissions Factor Filenames by County and Period

(See "Notes" at End of Table)

County	FIPS	District	Summer Weekday	December, January	February	March	April, May	June thru September	October	November
Borden	033	Abilene	08S*G01H01N_C6*	*12_G02*	*02_G01*	*03_G01*	*04_G01*	*06_G01*	*10_G01*	*11_G01*
Callahan	059	Abilene	08S*G01H01N_C6*	*12_G02*	*02_G01*	*03_G01*	*04_G01*	*06_G01*	*10_G01*	*11_G01*
Fisher	151	Abilene	08S*G01H01N_C6*	*12_G02*	*02_G01*	*03_G01*	*04_G01*	*06_G01*	*10_G01*	*11_G01*
Haskell	207	Abilene	08S*G01H01N_C6*	*12_G02*	*02_G01*	*03_G01*	*04_G01*	*06_G01*	*10_G01*	*11_G01*
Howard	227	Abilene	08S*G01H01N_C6*	*12_G02*	*02_G01*	*03_G01*	*04_G01*	*06_G01*	*10_G01*	*11_G01*
Jones	253	Abilene	08S*G01H01N_C6*	*12_G02*	*02_G01*	*03_G01*	*04_G01*	*06_G01*	*10_G01*	*11_G01*
Kent	263	Abilene	08S*G01H01N_C6*	*12_G02*	*02_G01*	*03_G01*	*04_G01*	*06_G01*	*10_G01*	*11_G01*
Mitchell	335	Abilene	08S*G01H01N_C6*	*12_G02*	*02_G01*	*03_G01*	*04_G01*	*06_G01*	*10_G01*	*11_G01*
Nolan	353	Abilene	08S*G01H01N_C6*	*12_G02*	*02_G01*	*03_G01*	*04_G01*	*06_G01*	*10_G01*	*11_G01*
Scurry	415	Abilene	08S*G01H01N_C6*	*12_G02*	*02_G01*	*03_G01*	*04_G01*	*06_G01*	*10_G01*	*11_G01*
Shackelford	417	Abilene	08S*G01H01N_C6*	*12_G02*	*02_G01*	*03_G01*	*04_G01*	*06_G01*	*10_G01*	*11_G01*
Stonewall	433	Abilene	08S*G01H01N_C6*	*12_G02*	*02_G01*	*03_G01*	*04_G01*	*06_G01*	*10_G01*	*11_G01*
Taylor	441	Abilene	08S*G01H01N_C6*	*12_G02*	*02_G01*	*03_G01*	*04_G01*	*06_G01*	*10_G01*	*11_G01*
Armstrong	011	Amarillo	08S*G02H02N_C1*	*12_G02*	*02_G02*	*03_G02*	*04_G02*	*06_G02*	*10_G02*	*11_G02*
Carson	065	Amarillo	08S*G02H02N_C1*	*12_G02*	*02_G02*	*03_G02*	*04_G02*	*06_G02*	*10_G02*	*11_G02*
Dallam	111	Amarillo	08S*G02H02N_C1*	*12_G02*	*02_G02*	*03_G02*	*04_G02*	*06_G02*	*10_G02*	*11_G02*
Deaf Smith	117	Amarillo	08S*G02H02N_C1*	*12_G02*	*02_G02*	*03_G02*	*04_G02*	*06_G02*	*10_G02*	*11_G02*
Gray	179	Amarillo	08S*G02H02N_C1*	*12_G02*	*02_G02*	*03_G02*	*04_G02*	*06_G02*	*10_G02*	*11_G02*
Hansford	195	Amarillo	08S*G02H02N_C1*	*12_G02*	*02_G02*	*03_G02*	*04_G02*	*06_G02*	*10_G02*	*11_G02*
Hartley	205	Amarillo	08S*G02H02N_C1*	*12_G02*	*02_G02*	*03_G02*	*04_G02*	*06_G02*	*10_G02*	*11_G02*
Hemphill	211	Amarillo	08S*G02H02N_C1*	*12_G02*	*02_G02*	*03_G02*	*04_G02*	*06_G02*	*10_G02*	*11_G02*
Hutchinson	233	Amarillo	08S*G02H02N_C1*	*12_G02*	*02_G02*	*03_G02*	*04_G02*	*06_G02*	*10_G02*	*11_G02*
Lipscomb	295	Amarillo	08S*G02H02N_C1*	*12_G02*	*02_G02*	*03_G02*	*04_G02*	*06_G02*	*10_G02*	*11_G02*
Moore	341	Amarillo	08S*G02H02N_C1*	*12_G02*	*02_G02*	*03_G02*	*04_G02*	*06_G02*	*10_G02*	*11_G02*
Ochiltree	357	Amarillo	08S*G02H02N_C1*	*12_G02*	*02_G02*	*03_G02*	*04_G02*	*06_G02*	*10_G02*	*11_G02*
Oldham	359	Amarillo	08S*G02H02N_C1*	*12_G02*	*02_G02*	*03_G02*	*04_G02*	*06_G02*	*10_G02*	*11_G02*
Potter	375	Amarillo	08S*G02H02N_C1*	*12_G02*	*02_G02*	*03_G02*	*04_G02*	*06_G02*	*10_G02*	*11_G02*
Randall	381	Amarillo	08S*G02H02N_C1*	*12_G02*	*02_G02*	*03_G02*	*04_G02*	*06_G02*	*10_G02*	*11_G02*
Roberts	393	Amarillo	08S*G02H02N_C1*	*12_G02*	*02_G02*	*03_G02*	*04_G02*	*06_G02*	*10_G02*	*11_G02*
Sherman	421	Amarillo	08S*G02H02N_C1*	*12_G02*	*02_G02*	*03_G02*	*04_G02*	*06_G02*	*10_G02*	*11_G02*

County	FIPS	District	Summer Weekday	December, January	February	March	April, May	June thru September	October	November
Bowie	037	Atlanta	08S*G03H03L_C3*	*12_G21*	*02_G21*	*03_G03*	*04_G03*	*06_G03*	*10_G03*	*11_G03*
Camp	063	Atlanta	08S*G03H03L_C3*	*12_G21*	*02_G21*	*03_G03*	*04_G03*	*06_G03*	*10_G03*	*11_G03*
Cass	067	Atlanta	08S*G03H03L_C3*	*12_G21*	*02_G21*	*03_G03*	*04_G03*	*06_G03*	*10_G03*	*11_G03*
Harrison	203	Atlanta	08S*TLM_HRSN*	*HRSN*	*HRSN*	*HRSN*	*HRSN*	*HRSN*	*HRSN*	*HRSN*
Marion	315	Atlanta	08S*G03H03L_C3*	*12_G21*	*02_G21*	*03_G03*	*04_G03*	*06_G03*	*10_G03*	*11_G03*
Morris	343	Atlanta	08S*G03H03L_C3*	*12_G21*	*02_G21*	*03_G03*	*04_G03*	*06_G03*	*10_G03*	*11_G03*
Panola	365	Atlanta	08S*G03H03L_C3*	*12_G21*	*02_G21*	*03_G03*	*04_G03*	*06_G03*	*10_G03*	*11_G03*
Titus	449	Atlanta	08S*G03H03L_C3*	*12_G21*	*02_G21*	*03_G03*	*04_G03*	*06_G03*	*10_G03*	*11_G03*
Upshur	459	Atlanta	08S*TLM_UPSH*	*UPSH*	*UPSH*	*UPSH*	*UPSH*	*UPSH*	*UPSH*	*UPSH*
Bastrop	021	Austin	08S*AUS_BAST*	*BAST*	*BAST*	*BAST*	*BAST*	*BAST*	*BAST*	*BAST*
Blanco	031	Austin	08S*G06H04N_C8*	*12_G02*	*02_G06*	*03_G06*	*04_G06*	*06_G06*	*10_G06*	*11_G06*
Burnet	053	Austin	08S*G06H04N_C8*	*12_G02*	*02_G06*	*03_G06*	*04_G06*	*06_G06*	*10_G06*	*11_G06*
Caldwell	055	Austin	08S*AUS_CALD*	*CALD*	*CALD*	*CALD*	*CALD*	*CALD*	*CALD*	*CALD*
Gillespie	171	Austin	08S*G06H04N_C8*	*12_G02*	*02_G06*	*03_G06*	*04_G06*	*06_G06*	*10_G06*	*11_G06*
Hays	209	Austin	08S*AUS_HAYS*	*HAYS*	*HAYS*	*HAYS*	*HAYS*	*HAYS*	*HAYS*	*HAYS*
Lee	287	Austin	08S*G04H04L_C8*	*12_G21*	*02_G21*	*03_G04*	*04_G04*	*06_G04*	*10_G04*	*11_G04*
Llano	299	Austin	08S*G06H04N_C8*	*12_G02*	*02_G06*	*03_G06*	*04_G06*	*06_G06*	*10_G06*	*11_G06*
Mason	319	Austin	08S*G06H04N_C8*	*12_G02*	*02_G06*	*03_G06*	*04_G06*	*06_G06*	*10_G06*	*11_G06*
Travis	453	Austin	08S*AUS_TRAV*	*TRAV*	*TRAV*	*TRAV*	*TRAV*	*TRAV*	*TRAV*	*TRAV*
Williamson	491	Austin	08S*AUS_WILL*	*WILL*	*WILL*	*WILL*	*WILL*	*WILL*	*WILL*	*WILL*
Chambers	071	Beaumont	08S*HGB_CHAM*	*CHAM*	*CHAM*	*CHAM*	*CHAM*	*CHAM*	*CHAM*	*CHAM*
Hardin	199	Beaumont	08S*BPA_HARD*	*HARD*	*HARD*	*HARD*	*HARD*	*HARD*	*HARD*	*HARD*
Jasper	241	Beaumont	08S*G05H05L_C5*	*12_G21*	*02_G21*	*03_G05*	*04_G05*	*06_G05*	*10_G05*	*11_G05*
Jefferson	245	Beaumont	08S*BPA_JEFF*	*JEFF*	*JEFF*	*JEFF*	*JEFF*	*JEFF*	*JEFF*	*JEFF*
Liberty	291	Beaumont	08S*HGB_LIBE*	*LIBE*	*LIBE*	*LIBE*	*LIBE*	*LIBE*	*LIBE*	*LIBE*
Newton	351	Beaumont	08S*G05H05L_C5*	*12_G21*	*02_G21*	*03_G05*	*04_G05*	*06_G05*	*10_G05*	*11_G05*
Orange	361	Beaumont	08S*BPA_ORAN*	*ORAN*	*ORAN*	*ORAN*	*ORAN*	*ORAN*	*ORAN*	*ORAN*
Tyler	457	Beaumont	08S*G05H05L_C5*	*12_G21*	*02_G21*	*03_G05*	*04_G05*	*06_G05*	*10_G05*	*11_G05*
Brown	049	Brownwood	08S*G06H06N_C7*	*12_G02*	*02_G06*	*03_G06*	*04_G06*	*06_G06*	*10_G06*	*11_G06*
Coleman	083	Brownwood	08S*G06H06N_C7*	*12_G02*	*02_G06*	*03_G06*	*04_G06*	*06_G06*	*10_G06*	*11_G06*
Comanche	093	Brownwood	08S*G06H06N_C3*	*12_G02*	*02_G06*	*03_G06*	*04_G06*	*06_G06*	*10_G06*	*11_G06*
Eastland	133	Brownwood	08S*G06H06N_C6*	*12_G02*	*02_G06*	*03_G06*	*04_G06*	*06_G06*	*10_G06*	*11_G06*
Lampasas	281	Brownwood	08S*G06H06N_C8*	*12_G02*	*02_G06*	*03_G06*	*04_G06*	*06_G06*	*10_G06*	*11_G06*

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Mc Culloch	307	Brownwood	08S*G06H06N_C7*	*12_G02*	*02_G06*	*03_G06*	*04_G06*	*06_G06*	*10_G06*	*11_G06*
Mills	333	Brownwood	08S*G06H06N_C8*	*12_G02*	*02_G06*	*03_G06*	*04_G06*	*06_G06*	*10_G06*	*11_G06*
San Saba	411	Brownwood	08S*G06H06N_C8*	*12_G02*	*02_G06*	*03_G06*	*04_G06*	*06_G06*	*10_G06*	*11_G06*
Stephens	429	Brownwood	08S*G06H06N_C6*	*12_G02*	*02_G06*	*03_G06*	*04_G06*	*06_G06*	*10_G06*	*11_G06*
Brazos	041	Bryan	08S*G07H07L_C5*	*12_G21*	*02_G21*	*03_G07*	*04_G07*	*06_G07*	*10_G07*	*11_G07*
Burleson	051	Bryan	08S*G07H07L_C8*	*12_G21*	*02_G21*	*03_G07*	*04_G07*	*06_G07*	*10_G07*	*11_G07*
Freestone	161	Bryan	08S*G07H07L_C3*	*12_G21*	*02_G21*	*03_G07*	*04_G07*	*06_G07*	*10_G07*	*11_G07*
Grimes	185	Bryan	08S*G07H07L_C5*	*12_G21*	*02_G21*	*03_G07*	*04_G07*	*06_G07*	*10_G07*	*11_G07*
Leon	289	Bryan	08S*G07H07L_C5*	*12_G21*	*02_G21*	*03_G07*	*04_G07*	*06_G07*	*10_G07*	*11_G07*
Madison	313	Bryan	08S*G07H07L_C5*	*12_G21*	*02_G21*	*03_G07*	*04_G07*	*06_G07*	*10_G07*	*11_G07*
Milam	331	Bryan	08S*G07H07L_C8*	*12_G21*	*02_G21*	*03_G07*	*04_G07*	*06_G07*	*10_G07*	*11_G07*
Robertson	395	Bryan	08S*G07H07L_C5*	*12_G21*	*02_G21*	*03_G07*	*04_G07*	*06_G07*	*10_G07*	*11_G07*
Walker	471	Bryan	08S*G07H07L_C5*	*12_G21*	*02_G21*	*03_G07*	*04_G07*	*06_G07*	*10_G07*	*11_G07*
Washington	477	Bryan	08S*G07H07L_C8*	*12_G21*	*02_G21*	*03_G07*	*04_G07*	*06_G07*	*10_G07*	*11_G07*
Briscoe	045	Childress	08S*G08H08N_C1*	*12_G02*	*02_G08*	*03_G08*	*04_G08*	*06_G08*	*10_G08*	*11_G08*
Childress	075	Childress	08S*G08H08N_C1*	*12_G02*	*02_G08*	*03_G08*	*04_G08*	*06_G08*	*10_G08*	*11_G08*
Collingsworth	087	Childress	08S*G08H08N_C1*	*12_G02*	*02_G08*	*03_G08*	*04_G08*	*06_G08*	*10_G08*	*11_G08*
Cottle	101	Childress	08S*G08H08N_C6*	*12_G02*	*02_G08*	*03_G08*	*04_G08*	*06_G08*	*10_G08*	*11_G08*
Dickens	125	Childress	08S*G08H08N_C6*	*12_G02*	*02_G08*	*03_G08*	*04_G08*	*06_G08*	*10_G08*	*11_G08*
Donley	129	Childress	08S*G08H08N_C1*	*12_G02*	*02_G08*	*03_G08*	*04_G08*	*06_G08*	*10_G08*	*11_G08*
Foard	155	Childress	08S*G08H08N_C6*	*12_G02*	*02_G08*	*03_G08*	*04_G08*	*06_G08*	*10_G08*	*11_G08*
Hall	191	Childress	08S*G08H08N_C1*	*12_G02*	*02_G08*	*03_G08*	*04_G08*	*06_G08*	*10_G08*	*11_G08*
Hardeman	197	Childress	08S*G08H08N_C6*	*12_G02*	*02_G08*	*03_G08*	*04_G08*	*06_G08*	*10_G08*	*11_G08*
King	269	Childress	08S*G08H08N_C6*	*12_G02*	*02_G08*	*03_G08*	*04_G08*	*06_G08*	*10_G08*	*11_G08*
Knox	275	Childress	08S*G08H08N_C6*	*12_G02*	*02_G08*	*03_G08*	*04_G08*	*06_G08*	*10_G08*	*11_G08*
Motley	345	Childress	08S*G08H08N_C6*	*12_G02*	*02_G08*	*03_G08*	*04_G08*	*06_G08*	*10_G08*	*11_G08*
Wheeler	483	Childress	08S*G08H08N_C1*	*12_G02*	*02_G08*	*03_G08*	*04_G08*	*06_G08*	*10_G08*	*11_G08*
Aransas	007	Corpus Christi	08S*G09H09L_C2*	*12_G21*	*02_G21*	*03_G09*	*04_G09*	*06_G09*	*10_G09*	*11_G09*
Bee	025	Corpus Christi	08S*G09H09L_C2*	*12_G21*	*02_G21*	*03_G09*	*04_G09*	*06_G09*	*10_G09*	*11_G09*
Goliad	175	Corpus Christi	08S*G09H09L_C2*	*12_G21*	*02_G21*	*03_G09*	*04_G09*	*06_G09*	*10_G09*	*11_G09*
Jim Wells	249	Corpus Christi	08S*G19H09N_C2*	*12_G02*	*02_G19*	*03_G19*	*04_G19*	*06_G19*	*10_G19*	*11_G19*
Karnes	255	Corpus Christi	08S*G09H09L_C2*	*12_G21*	*02_G21*	*03_G09*	*04_G09*	*06_G09*	*10_G09*	*11_G09*
Kleberg	273	Corpus Christi	08S*G19H09N_C2*	*12_G02*	*02_G19*	*03_G19*	*04_G19*	*06_G19*	*10_G19*	*11_G19*

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Live Oak	297	Corpus Christi	08S*G09H09L_C2*	*12_G21*	*02_G21*	*03_G09*	*04_G09*	*06_G09*	*10_G09*	*11_G09*
Nueces	355	Corpus Christi	08S*G09H09L_C2*	*12_G21*	*02_G21*	*03_G09*	*04_G09*	*06_G09*	*10_G09*	*11_G09*
Refugio	391	Corpus Christi	08S*G09H09L_C2*	*12_G21*	*02_G21*	*03_G09*	*04_G09*	*06_G09*	*10_G09*	*11_G09*
San Patricio	409	Corpus Christi	08S*G09H09L_C2*	*12_G21*	*02_G21*	*03_G09*	*04_G09*	*06_G09*	*10_G09*	*11_G09*
Collin	085	Dallas	08S*DFW_COLL*	*COLL*	*COLL*	*COLL*	*COLL*	*COLL*	*COLL*	*COLL*
Dallas	113	Dallas	08S*DFW_DALL*	*DALL*	*DALL*	*DALL*	*DALL*	*DALL*	*DALL*	*DALL*
Denton	121	Dallas	08S*DFW_DENT*	*DENT*	*DENT*	*DENT*	*DENT*	*DENT*	*DENT*	*DENT*
Ellis	139	Dallas	08S*DFW_ELLI*	*ELLI*	*ELLI*	*ELLI*	*ELLI*	*ELLI*	*ELLI*	*ELLI*
Kaufman	257	Dallas	08S*DFW_KAUF*	*KAUF*	*KAUF*	*KAUF*	*KAUF*	*KAUF*	*KAUF*	*KAUF*
Navarro	349	Dallas	08S*G23H10L_C3*	*12_G21*	*02_G21*	*03_G23*	*04_G23*	*06_G23*	*10_G23*	*11_G23*
Rockwall	397	Dallas	08S*DFW_ROCK*	*ROCK*	*ROCK*	*ROCK*	*ROCK*	*ROCK*	*ROCK*	*ROCK*
Brewster	043	El Paso	08S*G17H11N_C7*	*12_G02*	*02_G17*	*03_G17*	*04_G17*	*06_G17*	*10_G17*	*11_G17*
Culberson	109	El Paso	08S*G17H11N_C7*	*12_G02*	*02_G17*	*03_G17*	*04_G17*	*06_G17*	*10_G17*	*11_G17*
El Paso	141	El Paso	08S*ELP_ELPA*	*ELPA*	*ELPA*	*ELPA*	*ELPA*	*ELPA*	*ELPA*	*ELPA*
Hudspeth	229	El Paso	08S*G17H11N_C4*	*12_G02*	*02_G17*	*03_G17*	*04_G17*	*06_G17*	*10_G17*	*11_G17*
Jeff Davis	243	El Paso	08S*G17H11N_C7*	*12_G02*	*02_G17*	*03_G17*	*04_G17*	*06_G17*	*10_G17*	*11_G17*
Presidio	377	El Paso	08S*G17H11N_C7*	*12_G02*	*02_G17*	*03_G17*	*04_G17*	*06_G17*	*10_G17*	*11_G17*
Erath	143	Fort Worth	08S*G06H12N_C3*	*12_G02*	*02_G06*	*03_G06*	*04_G06*	*06_G06*	*10_G06*	*11_G06*
Hood	221	Fort Worth	08S*G23H12L_C3*	*12_G21*	*02_G21*	*03_G23*	*04_G23*	*06_G23*	*10_G23*	*11_G23*
Jack	237	Fort Worth	08S*G24H12N_C3*	*12_G02*	*02_G24*	*03_G24*	*04_G24*	*06_G24*	*10_G24*	*11_G24*
Johnson	251	Fort Worth	08S*DFW_JOHN*	*JOHN*	*JOHN*	*JOHN*	*JOHN*	*JOHN*	*JOHN*	*JOHN*
Palo Pinto	363	Fort Worth	08S*G06H12N_C3*	*12_G02*	*02_G06*	*03_G06*	*04_G06*	*06_G06*	*10_G06*	*11_G06*
Parker	367	Fort Worth	08S*DFW_PARK*	*PARK*	*PARK*	*PARK*	*PARK*	*PARK*	*PARK*	*PARK*
Somervell	425	Fort Worth	08S*G23H12L_C3*	*12_G21*	*02_G21*	*03_G23*	*04_G23*	*06_G23*	*10_G23*	*11_G23*
Tarrant	439	Fort Worth	08S*DFW_TARR*	*TARR*	*TARR*	*TARR*	*TARR*	*TARR*	*TARR*	*TARR*
Wise	497	Fort Worth	08S*G18H12L_C3*	*12_G21*	*02_G21*	*03_G18*	*04_G18*	*06_G18*	*10_G18*	*11_G18*
Brazoria	039	Houston	08S*HGB_BRAZ*	*BRAZ*	*BRAZ*	*BRAZ*	*BRAZ*	*BRAZ*	*BRAZ*	*BRAZ*
Fort Bend	157	Houston	08S*HGB_FORT*	*FORT*	*FORT*	*FORT*	*FORT*	*FORT*	*FORT*	*FORT*
Galveston	167	Houston	08S*HGB_GALV*	*GALV*	*GALV*	*GALV*	*GALV*	*GALV*	*GALV*	*GALV*
Harris	201	Houston	08S*HGB_HARR*	*HARR*	*HARR*	*HARR*	*HARR*	*HARR*	*HARR*	*HARR*
Montgomery	339	Houston	08S*HGB_MONT*	*MONT*	*MONT*	*MONT*	*MONT*	*MONT*	*MONT*	*MONT*
Waller	473	Houston	08S*HGB_WALL*	*WALL*	*WALL*	*WALL*	*WALL*	*WALL*	*WALL*	*WALL*
Dimmit	127	Laredo	08S*G14H14N_C8*	*12_G02*	*02_G14*	*03_G14*	*04_G14*	*06_G14*	*10_G14*	*11_G14*

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Duval	131	Laredo	08S*G14H14N_C2*	*12_G02*	*02_G14*	*03_G14*	*04_G14*	*06_G14*	*10_G14*	*11_G14*
Kinney	271	Laredo	08S*G14H14N_C8*	*12_G02*	*02_G14*	*03_G14*	*04_G14*	*06_G14*	*10_G14*	*11_G14*
La Salle	283	Laredo	08S*G14H14N_C8*	*12_G02*	*02_G14*	*03_G14*	*04_G14*	*06_G14*	*10_G14*	*11_G14*
Maverick	323	Laredo	08S*G14H14N_C8*	*12_G02*	*02_G14*	*03_G14*	*04_G14*	*06_G14*	*10_G14*	*11_G14*
Val Verde	465	Laredo	08S*G14H14N_C7*	*12_G02*	*02_G14*	*03_G14*	*04_G14*	*06_G14*	*10_G14*	*11_G14*
Webb	479	Laredo	08S*G14H14N_C8*	*12_G02*	*02_G14*	*03_G14*	*04_G14*	*06_G14*	*10_G14*	*11_G14*
Zavala	507	Laredo	08S*G14H14N_C8*	*12_G02*	*02_G14*	*03_G14*	*04_G14*	*06_G14*	*10_G14*	*11_G14*
Bailey	017	Lubbock	08S*G15H15N_C6*	*12_G02*	*02_G15*	*03_G15*	*04_G15*	*06_G15*	*10_G15*	*11_G15*
Castro	069	Lubbock	08S*G15H15N_C1*	*12_G02*	*02_G15*	*03_G15*	*04_G15*	*06_G15*	*10_G15*	*11_G15*
Cochran	079	Lubbock	08S*G15H15N_C6*	*12_G02*	*02_G15*	*03_G15*	*04_G15*	*06_G15*	*10_G15*	*11_G15*
Crosby	107	Lubbock	08S*G15H15N_C6*	*12_G02*	*02_G15*	*03_G15*	*04_G15*	*06_G15*	*10_G15*	*11_G15*
Dawson	115	Lubbock	08S*G15H15N_C6*	*12_G02*	*02_G15*	*03_G15*	*04_G15*	*06_G15*	*10_G15*	*11_G15*
Floyd	153	Lubbock	08S*G15H15N_C6*	*12_G02*	*02_G15*	*03_G15*	*04_G15*	*06_G15*	*10_G15*	*11_G15*
Gaines	165	Lubbock	08S*G15H15N_C6*	*12_G02*	*02_G15*	*03_G15*	*04_G15*	*06_G15*	*10_G15*	*11_G15*
Garza	169	Lubbock	08S*G15H15N_C6*	*12_G02*	*02_G15*	*03_G15*	*04_G15*	*06_G15*	*10_G15*	*11_G15*
Hale	189	Lubbock	08S*G15H15N_C6*	*12_G02*	*02_G15*	*03_G15*	*04_G15*	*06_G15*	*10_G15*	*11_G15*
Hockley	219	Lubbock	08S*G15H15N_C6*	*12_G02*	*02_G15*	*03_G15*	*04_G15*	*06_G15*	*10_G15*	*11_G15*
Lamb	279	Lubbock	08S*G15H15N_C6*	*12_G02*	*02_G15*	*03_G15*	*04_G15*	*06_G15*	*10_G15*	*11_G15*
Lubbock	303	Lubbock	08S*G15H15N_C6*	*12_G02*	*02_G15*	*03_G15*	*04_G15*	*06_G15*	*10_G15*	*11_G15*
Lynn	305	Lubbock	08S*G15H15N_C6*	*12_G02*	*02_G15*	*03_G15*	*04_G15*	*06_G15*	*10_G15*	*11_G15*
Parmer	369	Lubbock	08S*G15H15N_C1*	*12_G02*	*02_G15*	*03_G15*	*04_G15*	*06_G15*	*10_G15*	*11_G15*
Swisher	437	Lubbock	08S*G15H15N_C1*	*12_G02*	*02_G15*	*03_G15*	*04_G15*	*06_G15*	*10_G15*	*11_G15*
Terry	445	Lubbock	08S*G15H15N_C6*	*12_G02*	*02_G15*	*03_G15*	*04_G15*	*06_G15*	*10_G15*	*11_G15*
Yoakum	501	Lubbock	08S*G15H15N_C6*	*12_G02*	*02_G15*	*03_G15*	*04_G15*	*06_G15*	*10_G15*	*11_G15*
Angelina	005	Lufkin	08S*G16H16L_C3*	*12_G21*	*02_G21*	*03_G16*	*04_G16*	*06_G16*	*10_G16*	*11_G16*
Houston	225	Lufkin	08S*G16H16L_C5*	*12_G21*	*02_G21*	*03_G16*	*04_G16*	*06_G16*	*10_G16*	*11_G16*
Nacogdoches	347	Lufkin	08S*G16H16L_C3*	*12_G21*	*02_G21*	*03_G16*	*04_G16*	*06_G16*	*10_G16*	*11_G16*
Polk	373	Lufkin	08S*G16H16L_C5*	*12_G21*	*02_G21*	*03_G16*	*04_G16*	*06_G16*	*10_G16*	*11_G16*
Sabine	403	Lufkin	08S*G16H16L_C3*	*12_G21*	*02_G21*	*03_G16*	*04_G16*	*06_G16*	*10_G16*	*11_G16*
San Augustine	405	Lufkin	08S*G16H16L_C3*	*12_G21*	*02_G21*	*03_G16*	*04_G16*	*06_G16*	*10_G16*	*11_G16*
San Jacinto	407	Lufkin	08S*G16H16L_C5*	*12_G21*	*02_G21*	*03_G16*	*04_G16*	*06_G16*	*10_G16*	*11_G16*
Shelby	419	Lufkin	08S*G16H16L_C3*	*12_G21*	*02_G21*	*03_G16*	*04_G16*	*06_G16*	*10_G16*	*11_G16*
Trinity	455	Lufkin	08S*G16H16L_C5*	*12_G21*	*02_G21*	*03_G16*	*04_G16*	*06_G16*	*10_G16*	*11_G16*

County	FIPS	District	Summer Weekday	December, January	February	March	April, May	June thru September	October	November
Andrews	003	Odessa	08S*G17H17N_C6*	*12_G02*	*02_G17*	*03_G17*	*04_G17*	*06_G17*	*10_G17*	*11_G17*
Crane	103	Odessa	08S*G17H17N_C7*	*12_G02*	*02_G17*	*03_G17*	*04_G17*	*06_G17*	*10_G17*	*11_G17*
Ector	135	Odessa	08S*G17H17N_C7*	*12_G02*	*02_G17*	*03_G17*	*04_G17*	*06_G17*	*10_G17*	*11_G17*
Loving	301	Odessa	08S*G17H17N_C7*	*12_G02*	*02_G17*	*03_G17*	*04_G17*	*06_G17*	*10_G17*	*11_G17*
Martin	317	Odessa	08S*G17H17N_C6*	*12_G02*	*02_G17*	*03_G17*	*04_G17*	*06_G17*	*10_G17*	*11_G17*
Midland	329	Odessa	08S*G17H17N_C7*	*12_G02*	*02_G17*	*03_G17*	*04_G17*	*06_G17*	*10_G17*	*11_G17*
Pecos	371	Odessa	08S*G17H17N_C7*	*12_G02*	*02_G17*	*03_G17*	*04_G17*	*06_G17*	*10_G17*	*11_G17*
Reeves	389	Odessa	08S*G17H17N_C7*	*12_G02*	*02_G17*	*03_G17*	*04_G17*	*06_G17*	*10_G17*	*11_G17*
Terrell	443	Odessa	08S*G17H17N_C7*	*12_G02*	*02_G17*	*03_G17*	*04_G17*	*06_G17*	*10_G17*	*11_G17*
Upton	461	Odessa	08S*G17H17N_C7*	*12_G02*	*02_G17*	*03_G17*	*04_G17*	*06_G17*	*10_G17*	*11_G17*
Ward	475	Odessa	08S*G17H17N_C7*	*12_G02*	*02_G17*	*03_G17*	*04_G17*	*06_G17*	*10_G17*	*11_G17*
Winkler	495	Odessa	08S*G17H17N_C7*	*12_G02*	*02_G17*	*03_G17*	*04_G17*	*06_G17*	*10_G17*	*11_G17*
Delta	119	Paris	08S*G18H18L_C3*	*12_G21*	*02_G21*	*03_G18*	*04_G18*	*06_G18*	*10_G18*	*11_G18*
Fannin	147	Paris	08S*G18H18L_C3*	*12_G21*	*02_G21*	*03_G18*	*04_G18*	*06_G18*	*10_G18*	*11_G18*
Franklin	159	Paris	08S*G18H18L_C3*	*12_G21*	*02_G21*	*03_G18*	*04_G18*	*06_G18*	*10_G18*	*11_G18*
Grayson	181	Paris	08S*G18H18L_C3*	*12_G21*	*02_G21*	*03_G18*	*04_G18*	*06_G18*	*10_G18*	*11_G18*
Hopkins	223	Paris	08S*G18H18L_C3*	*12_G21*	*02_G21*	*03_G18*	*04_G18*	*06_G18*	*10_G18*	*11_G18*
Hunt	231	Paris	08S*G18H18L_C3*	*12_G21*	*02_G21*	*03_G18*	*04_G18*	*06_G18*	*10_G18*	*11_G18*
Lamar	277	Paris	08S*G18H18L_C3*	*12_G21*	*02_G21*	*03_G18*	*04_G18*	*06_G18*	*10_G18*	*11_G18*
Rains	379	Paris	08S*G18H18L_C3*	*12_G21*	*02_G21*	*03_G18*	*04_G18*	*06_G18*	*10_G18*	*11_G18*
Red River	387	Paris	08S*G18H18L_C3*	*12_G21*	*02_G21*	*03_G18*	*04_G18*	*06_G18*	*10_G18*	*11_G18*
Brooks	047	Pharr	08S*G19H19N_C2*	*12_G02*	*02_G19*	*03_G19*	*04_G19*	*06_G19*	*10_G19*	*11_G19*
Cameron	061	Pharr	08S*G19H19N_C2*	*12_G02*	*02_G19*	*03_G19*	*04_G19*	*06_G19*	*10_G19*	*11_G19*
Hidalgo	215	Pharr	08S*G19H19N_C2*	*12_G02*	*02_G19*	*03_G19*	*04_G19*	*06_G19*	*10_G19*	*11_G19*
Jim Hogg	247	Pharr	08S*G19H19N_C2*	*12_G02*	*02_G19*	*03_G19*	*04_G19*	*06_G19*	*10_G19*	*11_G19*
Kenedy	261	Pharr	08S*G19H19N_C2*	*12_G02*	*02_G19*	*03_G19*	*04_G19*	*06_G19*	*10_G19*	*11_G19*
Starr	427	Pharr	08S*G19H19N_C2*	*12_G02*	*02_G19*	*03_G19*	*04_G19*	*06_G19*	*10_G19*	*11_G19*
Willacy	489	Pharr	08S*G19H19N_C2*	*12_G02*	*02_G19*	*03_G19*	*04_G19*	*06_G19*	*10_G19*	*11_G19*
Zapata	505	Pharr	08S*G19H19N_C2*	*12_G02*	*02_G19*	*03_G19*	*04_G19*	*06_G19*	*10_G19*	*11_G19*
Coke	081	San Angelo	08S*G20H20N_C7*	*12_G02*	*02_G20*	*03_G20*	*04_G20*	*06_G20*	*10_G20*	*11_G20*
Concho	095	San Angelo	08S*G20H20N_C7*	*12_G02*	*02_G20*	*03_G20*	*04_G20*	*06_G20*	*10_G20*	*11_G20*
Crockett	105	San Angelo	08S*G20H20N_C7*	*12_G02*	*02_G20*	*03_G20*	*04_G20*	*06_G20*	*10_G20*	*11_G20*
Edwards	137	San Angelo	08S*G20H20N_C7*	*12_G02*	*02_G20*	*03_G20*	*04_G20*	*06_G20*	*10_G20*	*11_G20*

County	FIPS	District	Summer Weekday	December, January	February	March	April, May	June thru September	October	November
Glasscock	173	San Angelo	08S*G20H20N_C7*	*12_G02*	*02_G20*	*03_G20*	*04_G20*	*06_G20*	*10_G20*	*11_G20*
Irion	235	San Angelo	08S*G20H20N_C7*	*12_G02*	*02_G20*	*03_G20*	*04_G20*	*06_G20*	*10_G20*	*11_G20*
Kimble	267	San Angelo	08S*G20H20N_C7*	*12_G02*	*02_G20*	*03_G20*	*04_G20*	*06_G20*	*10_G20*	*11_G20*
Menard	327	San Angelo	08S*G20H20N_C7*	*12_G02*	*02_G20*	*03_G20*	*04_G20*	*06_G20*	*10_G20*	*11_G20*
Reagan	383	San Angelo	08S*G20H20N_C7*	*12_G02*	*02_G20*	*03_G20*	*04_G20*	*06_G20*	*10_G20*	*11_G20*
Real	385	San Angelo	08S*G20H20N_C7*	*12_G02*	*02_G20*	*03_G20*	*04_G20*	*06_G20*	*10_G20*	*11_G20*
Runnels	399	San Angelo	08S*G20H20N_C7*	*12_G02*	*02_G20*	*03_G20*	*04_G20*	*06_G20*	*10_G20*	*11_G20*
Schleicher	413	San Angelo	08S*G20H20N_C7*	*12_G02*	*02_G20*	*03_G20*	*04_G20*	*06_G20*	*10_G20*	*11_G20*
Sterling	431	San Angelo	08S*G20H20N_C7*	*12_G02*	*02_G20*	*03_G20*	*04_G20*	*06_G20*	*10_G20*	*11_G20*
Sutton	435	San Angelo	08S*G20H20N_C7*	*12_G02*	*02_G20*	*03_G20*	*04_G20*	*06_G20*	*10_G20*	*11_G20*
Tom Green	451	San Angelo	08S*G20H20N_C7*	*12_G02*	*02_G20*	*03_G20*	*04_G20*	*06_G20*	*10_G20*	*11_G20*
Atascosa	013	San Antonio	08S*G21H21L_C8*	*12_G21*	*02_G21*	*03_G21*	*04_G21*	*06_G21*	*10_G21*	*11_G21*
Bandera	019	San Antonio	08S*G06H21N_C8*	*12_G02*	*02_G06*	*03_G06*	*04_G06*	*06_G06*	*10_G06*	*11_G06*
Bexar	029	San Antonio	08S*SAN_BEXA*	*BEXA*	*BEXA*	*BEXA*	*BEXA*	*BEXA*	*BEXA*	*BEXA*
Comal	091	San Antonio	08S*SAN_COMA*	*COMA*	*COMA*	*COMA*	*COMA*	*COMA*	*COMA*	*COMA*
Frio	163	San Antonio	08S*G14H21N_C8*	*12_G02*	*02_G14*	*03_G14*	*04_G14*	*06_G14*	*10_G14*	*11_G14*
Guadalupe	187	San Antonio	08S*SAN_GUAD*	*GUAD*	*GUAD*	*GUAD*	*GUAD*	*GUAD*	*GUAD*	*GUAD*
Kendall	259	San Antonio	08S*SAN_KEND*	*KEND*	*KEND*	*KEND*	*KEND*	*KEND*	*KEND*	*KEND*
Kerr	265	San Antonio	08S*G20H21N_C8*	*12_G02*	*02_G20*	*03_G20*	*04_G20*	*06_G20*	*10_G20*	*11_G20*
Mc Mullen	311	San Antonio	08S*G14H21N_C2*	*12_G02*	*02_G14*	*03_G14*	*04_G14*	*06_G14*	*10_G14*	*11_G14*
Medina	325	San Antonio	08S*G14H21N_C8*	*12_G02*	*02_G14*	*03_G14*	*04_G14*	*06_G14*	*10_G14*	*11_G14*
Uvalde	463	San Antonio	08S*G14H21N_C8*	*12_G02*	*02_G14*	*03_G14*	*04_G14*	*06_G14*	*10_G14*	*11_G14*
Wilson	493	San Antonio	08S*SAN_WILS*	*WILS*	*WILS*	*WILS*	*WILS*	*WILS*	*WILS*	*WILS*
Anderson	001	Tyler	08S*G22H22L_C3*	*12_G21*	*02_G21*	*03_G22*	*04_G22*	*06_G22*	*10_G22*	*11_G22*
Cherokee	073	Tyler	08S*G22H22L_C3*	*12_G21*	*02_G21*	*03_G22*	*04_G22*	*06_G22*	*10_G22*	*11_G22*
Gregg	183	Tyler	08S*TLM_GREG*	*GREG*	*GREG*	*GREG*	*GREG*	*GREG*	*GREG*	*GREG*
Henderson	213	Tyler	08S*G22H22L_C3*	*12_G21*	*02_G21*	*03_G22*	*04_G22*	*06_G22*	*10_G22*	*11_G22*
Rusk	401	Tyler	08S*TLM_RUSK*	*RUSK*	*RUSK*	*RUSK*	*RUSK*	*RUSK*	*RUSK*	*RUSK*
Smith	423	Tyler	08S*TLM_SMIT*	*SMIT*	*SMIT*	*SMIT*	*SMIT*	*SMIT*	*SMIT*	*SMIT*
Van Zandt	467	Tyler	08S*G22H22L_C3*	*12_G21*	*02_G21*	*03_G22*	*04_G22*	*06_G22*	*10_G22*	*11_G22*
Wood	499	Tyler	08S*G22H22L_C3*	*12_G21*	*02_G21*	*03_G22*	*04_G22*	*06_G22*	*10_G22*	*11_G22*
Bell	027	Waco	08S*G23H23L_C8*	*12_G21*	*02_G21*	*03_G23*	*04_G23*	*06_G23*	*10_G23*	*11_G23*
Bosque	035	Waco	08S*G23H23L_C3*	*12_G21*	*02_G21*	*03_G23*	*04_G23*	*06_G23*	*10_G23*	*11_G23*

County	FIPS	District	Summer Weekday	December, January	February	March	April, May	June thru September	October	November
Coryell	099	Waco	08S*G23H23L_C8*	*12_G21*	*02_G21*	*03_G23*	*04_G23*	*06_G23*	*10_G23*	*11_G23*
Falls	145	Waco	08S*G23H23L_C3*	*12_G21*	*02_G21*	*03_G23*	*04_G23*	*06_G23*	*10_G23*	*11_G23*
Hamilton	193	Waco	08S*G06H23N_C3*	*12_G02*	*02_G06*	*03_G06*	*04_G06*	*06_G06*	*10_G06*	*11_G06*
Hill	217	Waco	08S*G23H23L_C3*	*12_G21*	*02_G21*	*03_G23*	*04_G23*	*06_G23*	*10_G23*	*11_G23*
Limestone	293	Waco	08S*G23H23L_C3*	*12_G21*	*02_G21*	*03_G23*	*04_G23*	*06_G23*	*10_G23*	*11_G23*
Mc Lennan	309	Waco	08S*G23H23L_C3*	*12_G21*	*02_G21*	*03_G23*	*04_G23*	*06_G23*	*10_G23*	*11_G23*
Archer	009	Wichita Falls	08S*G24H24N_C6*	*12_G02*	*02_G24*	*03_G24*	*04_G24*	*06_G24*	*10_G24*	*11_G24*
Baylor	023	Wichita Falls	08S*G24H24N_C6*	*12_G02*	*02_G24*	*03_G24*	*04_G24*	*06_G24*	*10_G24*	*11_G24*
Clay	077	Wichita Falls	08S*G24H24N_C3*	*12_G02*	*02_G24*	*03_G24*	*04_G24*	*06_G24*	*10_G24*	*11_G24*
Cooke	097	Wichita Falls	08S*G18H24L_C3*	*12_G21*	*02_G21*	*03_G18*	*04_G18*	*06_G18*	*10_G18*	*11_G18*
Montague	337	Wichita Falls	08S*G24H24N_C3*	*12_G02*	*02_G24*	*03_G24*	*04_G24*	*06_G24*	*10_G24*	*11_G24*
Throckmorton	447	Wichita Falls	08S*G24H24N_C6*	*12_G02*	*02_G24*	*03_G24*	*04_G24*	*06_G24*	*10_G24*	*11_G24*
Wichita	485	Wichita Falls	08S*G24H24N_C6*	*12_G02*	*02_G24*	*03_G24*	*04_G24*	*06_G24*	*10_G24*	*11_G24*
Wilbarger	487	Wichita Falls	08S*G24H24N_C6*	*12_G02*	*02_G24*	*03_G24*	*04_G24*	*06_G24*	*10_G24*	*11_G24*
Young	503	Wichita Falls	08S*G24H24N_C6*	*12_G02*	*02_G24*	*03_G24*	*04_G24*	*06_G24*	*10_G24*	*11_G24*
Austin	015	Yoakum	08S*G25H25L_C5*	*12_G21*	*02_G21*	*03_G25*	*04_G25*	*06_G25*	*10_G25*	*11_G25*
Calhoun	057	Yoakum	08S*G25H25L_C2*	*12_G21*	*02_G21*	*03_G25*	*04_G25*	*06_G25*	*10_G25*	*11_G25*
Colorado	089	Yoakum	08S*G25H25L_C5*	*12_G21*	*02_G21*	*03_G25*	*04_G25*	*06_G25*	*10_G25*	*11_G25*
De Witt	123	Yoakum	08S*G25H25L_C2*	*12_G21*	*02_G21*	*03_G25*	*04_G25*	*06_G25*	*10_G25*	*11_G25*
Fayette	149	Yoakum	08S*G25H25L_C8*	*12_G21*	*02_G21*	*03_G25*	*04_G25*	*06_G25*	*10_G25*	*11_G25*
Gonzales	177	Yoakum	08S*G25H25L_C8*	*12_G21*	*02_G21*	*03_G25*	*04_G25*	*06_G25*	*10_G25*	*11_G25*
Jackson	239	Yoakum	08S*G25H25L_C2*	*12_G21*	*02_G21*	*03_G25*	*04_G25*	*06_G25*	*10_G25*	*11_G25*
Lavaca	285	Yoakum	08S*G25H25L_C2*	*12_G21*	*02_G21*	*03_G25*	*04_G25*	*06_G25*	*10_G25*	*11_G25*
Matagorda	321	Yoakum	08S*G25H25L_C5*	*12_G21*	*02_G21*	*03_G25*	*04_G25*	*06_G25*	*10_G25*	*11_G25*
Victoria	469	Yoakum	08S*G25H25L_C2*	*12_G21*	*02_G21*	*03_G25*	*04_G25*	*06_G25*	*10_G25*	*11_G25*
Wharton	481	Yoakum	08S*G25H25L_C5*	*12_G21*	*02_G21*	*03_G25*	*04_G25*	*06_G25*	*10_G25*	*11_G25*

Notes:
(These notes pertain to all Texas counties except for the 12 DFW CMSA counties for which the emissions factors were produced by NCTCOG, shown in table rows distinguished by grey background). The table shows the emissions factor input and output files naming convention by county and time period, using wildcards (*) for some common labeling in the filenames. There is a maximum of 69 unique county groups (representing all counties under the statewide method) depending on time period (summer has the maximum due to finer geographic detail in the summer fuel survey data set than for winter). Additionally, the 36 individual county runs (regional method) are named (coded) with the first four letters of the county name in the filenames (except Harrison is labeled as "HRSN" to distinguish it from Harris).

Common Codes: The first wildcard of each filename includes "PM1" that specifies PM-10. The H## and C# codes (see "Summer Weekday" column) for each county group are common to all time periods (for monthly county group files, these codes are located in the second wildcard). The numerical (##) portion of the H## codes is the district number and specifies that particular input data (e.g., diesel sulfur, fleet characteristics, hourly VMT) are from the district where the county is located (Abilene District is H01, Amarillo District is H02, etc.). The numerical portion of the C# code (1 through 8) specifies the source (weather station) of the meteorological inputs.

The G## code identifies the source of the gasoline input properties for a county and may be mapped from a different district, depending on the fuel rule applicable to the county (e.g., RVP limit, RFG). Using Blanco County summer weekday as an example (08S*G06H04N_C8*), note that diesel, fleet characteristics, and activity data are from the Austin District (H04), but the gasoline input data are from the Brownwood District (H06). (Blanco County is subject to the 9.0 psi ozone season RVP limit and thus uses the nearby Brownwood 9.0 limit gasoline property data rather than the Austin 7.8 limit gasoline data from the city of Austin in the Austin District.)

Additionally, for the Houston Region and Childress District emissions factors, multiple runs were performed for individual oxygenates in the multiple-oxygenate gasoline (for post-processing multiple oxygenate effects). The filenames were appended with the labels "_A," "_E," or "_M" for ethanol, ETBE, and MTBE (located in the last wildcard) to specify the oxygenate included in the run (excludes winter gasoline, which included only ethanol).

Summer Weekday Codes: In addition to the codes described above, "08S" denotes 2008 summer weekday. Following the H## code there is an "N" or an "L." L specifies TxLED counties, and N specifies that the counties are not subject to TxLED.

Monthly Emissions Factor Codes: In addition to the common codes, in the monthly filenames, the first wildcard includes the period of analysis in "yymm" form. There is an emissions factor file for each month. For example, the filenames in the June through September column represent four monthly files assigned to the county, differentiated by a leading 0806, 0807, 0808, and 0809. The next portion of the filename (e.g., 12_G02, 11_G01) denotes the period and geographic source of the gasoline data. For example, "12" denotes winter period gasoline data, and "11" indicates interpolated gasoline input data (for November).

Note that the gasoline codes for a county may vary by time period. This is due to the smaller number of sample cities (five) in the winter data versus the sample districts in the summer data (25). Summer and interpolated (transitional month) gasoline input properties use the summer

period gasoline codes (i.e., G01 through G25), whereas the pure winter gasoline input properties use the winter period gasoline codes (i.e., G02, G10, G11, G13, or G21). For the gasoline data, the period codes and their corresponding months are: 12 – December and January; 02 – February; 03 – March; 04 – April and May; 06 – June through September; 10 – October; and 11 – November.

APPENDIX B:
EMISSIONS ESTIMATION UTILITIES

TTI EMISSIONS ESTIMATION UTILITIES

Following is a summary of utilities developed by TTI for producing detailed, link-based, hourly, and 24-hour emissions estimates for on-road mobile sources. The utilities also produce annual emissions estimates as a conversion of 24-hour emissions; calculate additional HAP emissions by applying HAP-to-CAP ratios or basic emissions factors (g/mi) to annual EI data; and are used in formatting the results into EPA's NEI reporting format (NIF 3.0), and converting from the NIF form to the XML document form according to EPA's latest NEI reporting requirements.

These utilities produce emissions factors with the latest version of EPA's MOBILE emissions factor model, and multiply them with travel model link-based or HPMS-based (virtual link) activity estimates to produce emissions at user-specified temporal and spatial scales. For the annual emissions calculations, the emissions factors are used in the form of emissions rate annualization factors used in converting 24-hour emissions estimates to annual period estimates. Additional HAP emissions are calculated by applying HAP-to-CAP mass emissions ratios or g/mile emissions factors to the annual emissions (VOC or PM-10) or VMT.

The main utilities for calculating hourly and 24-hour emissions are TRANSVMT, VirtualLinkVMT, POLFAC62_3, RATEADJ (several utilities), and EMSCALC. TRANSVMT and VirtualLinkVMT prepare activity input; POLFAC62_3 prepares emissions factor input; the RATEADJ utilities make special adjustments to emissions factors when required; and EMSCALC calculates emissions by hourly time periods and produces 24-hour totals.

The RATEANNUALFACT and ANNUALIZATION utilities are used to calculate annual emissions. RATEANNUALFACT is used to calculate emissions rate annualization factors and ANNUALIZATION is used to calculate annual emissions. Another utility, RATIOEMSCALC, applies HAP factors to the annual emissions (VOC or PM-10) or VMT to estimate annual emissions of additional HAPs. Additionally, the EMISSIONSFORMAT utility formats EI data into the EPA's NIF 3.0 reporting format, and the XMLFORMAT utility converts the NIF EI summaries to an XML document according to EPA's latest NEI reporting requirements. All of the utilities were written in the Visual Basic programming language, except for POLFAC62_3, which was developed in FORTRAN.

A process flow diagram follows the utility descriptions.

TRANSVMT

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

VirtualLinkVMT
The VirtualLinkVMT utility post-processes county HPMS AADT VMT, centerline miles, and lane miles by functional classification and area type (from TxDOT's annual RIFCREC Report) to produce hourly, on-road vehicle fleet, seasonal and day-of-week specific actual or projected VMT, and directional operational speed estimates. These estimated VMT and speeds are produced for up to 42 directional HPMS functional-classification/area-type combinations, or "links." The VirtualLinkVMT utility was developed for use in areas that do not have TDM networks, as well as for EI applications for which network link-based detail is not required. The main inputs to VirtualLinkVMT are: 1) county HPMS data sets, which include AADT VMT, centerline miles, and lane miles by HPMS area type and functional class; and 2) county-level VMT control totals. The other main inputs are: 3) hourly VMT distributions; and 4) speed model inputs to include volume/delay equation parameters adapted for HPMS, and freeflow speeds and lane capacities by HPMS functional classification and area type.

VirtualLinkVMT initially scales the county HPMS AADT VMT at the link level to the appropriate VMT (e.g., uses county-level VMT control total-to-AADT ratio to produce seasonal, day-of-week specific VMT). Hourly factors and directional split factors are applied to the adjusted VMT on each link to estimate the hourly, directional VMT (and volumes) by HPMS link. Congested speed models each for the high- and low-capacity links are used to estimate the hourly operational speeds by direction for each link. The operational speeds are based on v/c derived directional delay (minutes/mile) applied to the estimated freeflow speeds for each link. The virtual link VMT and speeds produced using the VirtualLinkVMT utility are an input to the emissions calculation utility, EMSCALC.

POLFAC62_3
The POLFAC62_3 utility is used to apply the EPA's MOBILE6 program (September 2003 release) to calculate the on-road mobile source 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, and four MOBILE6 functional classifications (or drive cycles, i.e., Freeway, Arterial/Collector, Local, and Ramp). They may also be produced for 14 speeds (i.e., 2.5 mph, and 5 mph through 65 mph at 5 mph increments for Freeway and Arterial functional classifications — MOBILE6 Local and Ramp functional classification rates are single speed only, 12.9 mph, and 34.6 mph, respectively), and each of the 24 hours of the day.

The POLFAC62_3 emissions factors are average vehicle class rates calculated from the MOBILE6 detailed database data by weighting each by-MY emissions rate within a vehicle class by its corresponding travel factor, and summing the results. These emissions factors are produced individually by geographical area (county or county group) and analysis day for the evaluation year. These emissions factors are output to an ASCII file for subsequent input to the EMSCALC utility. The EMSCALC utility is then used to multiply the hourly emissions factors by hourly VMT estimates by link. (POLFAC62_3 also optionally produces a set of daily emissions factors.) POLFAC62_3 also calculates the additional pollutant (i.e., PM-related pollutants and toxics) emissions factors provided by MOBILE6.

RATEADJV62DK
RATEADJV62DK is a special utility that produces a new set of emissions factors by applying emissions factor adjustments to each pollutant, emissions type, and vehicle type. RATEADJV62DK can be applied to emissions rates produced by POLFAC62_3, RATEADJV62DK, RATEADJ62DK, or RATEADJV62hrDK.

A practical application of RATEADJV62DK is the application of emissions factor credits by individual vehicle class and/or individual pollutant. For example, for analyses requiring the effects of the TxLED fuel program in MOBILE6 emissions factors, RATEADJV62DK may be used to apply reduction factors to the NOx emissions factors for diesel-fueled vehicle classes only.

RATEADJ62DK and RATEADJ62X
RATEADJ62DK is a special utility that produces a new set of emissions factors by linearly combining the emissions factors from multiple applications of POLFAC62_3, RATEADJV62DK, RATEADJ62DK, or RATEADJV62hrDK. There is a separate set of factors for each of the input emissions factor data sets.

A practical application of RATEADJ62DK 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 utility may be used to combine different ATP credits from two separate POLFAC62_3 runs into one set of emissions factors that includes the credits for both ATPs.

The RATEADJ62X utility performs the same function as RATEADJ62DK, except that the input emissions factor look-up tables to be combined are not required to have the same number of records (i.e., pollutants and emission types). This may be useful when combining monthly rates to produce an annual average rate table, for instance, if the winter month temperatures are low enough that some of the evaporative emissions rates are not produced.

RATEADJV62hrDK
RATEADJV62hrDK is a special utility that produces a new set of emissions factors by applying emissions factor adjustments to each pollutant, emissions type, and vehicle type by hour. RATEADJV62DK can be applied to emissions rates produced by POLFAC62_3, RATEADJV62DK, RATEADJ62DK, or RATEADJV62hrDK.

EMSCALC
The EMSCALC utility uses the emissions factors, VMT mixes (fractions of fleet VMT attributable to each vehicle classification in the study), and the time-of-day fleet VMT and speed estimates to calculate emissions by the user-specified time periods for the specified county. This utility calculates emissions for the one user-specified county. The four primary inputs to EMSCALC are:

- MOBILE6 emissions factors developed with POLFAC62_3 (or a RATEADJ62, if used);
- link-based hourly VMT and speeds developed with the TRANSVMT or VirtualLinkVMT utility. For each link, the following information is input to EMSCALC: county number, roadway type number, VMT on link, operational link-speed estimate, and link distance;
- VMT mix by time period, county, and roadway type; and

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

The VMT for each link is distributed by MOBILE6 drive cycle to each of the 28 vehicle types. The emissions factors are selected based on drive cycle, speed, and vehicle type. For those speeds that fall between the 14 MOBILE6 speeds, the emissions factors are interpolated using the MOBILE6 interpolation methodology (see the following section). These vehicle-type-specific emissions factors are multiplied by the vehicle-type-specific VMT to estimate the mobile source emissions for that link by vehicle type. For link speeds greater than 65 mph, the emissions factors for 65 mph are used. For link speeds less than 2.5 mph, the emissions factors for 2.5 mph are used.

The emissions estimates are output in a tab-delimited file (including all 28 vehicle types on a single line, separated by a tab character) for the specified county by pollutant, roadway type, and vehicle type for each of the specified episode time periods. This emissions data is also saved for the output of the 24-hour (or time period if all 24 hours are not specified). Link emissions may also be output by county, pollutant, sub-component, and the 28 MOBILE6 vehicle types.

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

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

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

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

Where:

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

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

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

Given that:

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

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

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

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

TABCOMB

The TABCOMB utility combines the tab-delimited output from multiple runs of the EMSCALC utility to produce a regional summary of the VMT, VHT, speed (VMT/VHT), and emissions for each hour and a 24-hour summary. A maximum of 10 tab files can be combined in one run of the TABCOMB utility. However, each tab file must have the same roadway types or the utility will not function properly.

The new regional tab-delimited file is in the same form as the individual county files taken as input, except that each time period includes the individual county data summaries plus the regional summary. The individual county summaries are taken directly from the input tab-delimited files. The regional data summaries are summations of the county data except for "speed," which is calculated as regional VMT/regional VHT.

RATEANNUALFACT

This utility calculates emissions rate annualization factors for input to the ANNUALIZATION utility, which calculates annual emissions by multiplying an existing average daily emissions estimate (e.g., summer weekday emissions) by a set of conversion factors (i.e., the emissions rate annualization factor and VMT annualization factors).

The RATEANNUALFACT utility weights MOBILE6 emissions factors together in the numerator to form the 24-hour average annual rate, and, for the denominator, uses the 24-hour average daily rates from the emissions to be converted to annual emissions. The main inputs to RATEANNUALFACT are: 1) average daily emissions factors for periods comprising the analysis year (e.g., seasonal or monthly periods); and 2) weighting factors for combining these rates into 24-hour average annual rate estimates. The other main inputs are: 3) 24-hour average emissions factors from the (average seasonal day) emissions estimate to be converted to annual emissions; and 4) the average speed and road type for the emissions factors to be used in the calculation. The input emissions factors are in the POLFAC look-up table form.

The utility looks up the emissions factor sets (i.e., by pollutant, emission type, and vehicle type) in the input tables for the user-selected speed (e.g., county average speed to nearest MOBILE6 speed bin speed) and road type. The seasonal period emissions factors are then combined, with the associated weights, into average annual daily rates, which are divided by the average daily rate from the 24-hour emissions estimate to be converted to annual period emissions. The resulting table of emissions rate annualization factors by pollutant, emissions type, and vehicle type are an input to the ANNUALIZATION utility.

ANNUALIZATION
The ANNUALIZATION utility produces the annual emissions estimate as a conversion from a specified 24-hour average emissions estimate. The utility converts the 24-hour average emissions estimate to annual emissions using a set of annualization factors consisting of VMT and emissions rate annualization components.

The main inputs consist of: 1) the seasonal adjustment factor for VMT from the emissions to be annualized (e.g., original summer weekday factor used to convert AADT VMT to summer weekday VMT); 2) the emissions rate annualization factors output from RATEANNUALFACT; and 3) the tab-delimited 24-hour average emissions output from EMSCALC to be annualized. The utility calculates annual emissions data and produces tab-delimited summary tables (in the same form as the EMSCALC tables, except with appropriate table header and units).

The utility calculates the VMT annualization factor as the inverse of the seasonal adjustment factor multiplied by days in the year (i.e., 365). The utility then multiplies the data to be converted to annual period estimates (from the input tab delimited 24-hour EMSCALC tables) by the annualization factors. All emissions, VMT, and VHT estimates are multiplied by the VMT annualization factor. Emissions by pollutant, emissions type, vehicle type, and road type are multiplied by the emissions rate annualization factors (i.e., one for each pollutant/emissions type/vehicle type combination). The resulting annual emissions output consists of the same data tables and format as contained in the input EMSCALC emissions tables.

RATIOEMSCALC
This utility calculates and reports daily or annual emissions estimates for additional pollutants by multiplying factors (i.e., BEFs or pollutant emissions ratios) by the 24-hour or the annual tab-delimited EI data tables produced by the EMSCALC and ANNUALIZATION utilities. The report produced is in the same form as the input emissions file and includes all activity data summaries from the input emissions file, the additional pollutant emissions estimates, and the input pollutant emissions estimates specified for inclusion in the report. The main inputs are:

- additional pollutant emissions factors in MOBILE6 ADDITIONAL HAPS input file form (see detailed discussion in section 2.8.3.8, *MOBILE6 User's Guide*, EPA, August 2003);
- list of additional pollutant names for output emissions summary table headers (required even if pollutant labels for output are to be the same as labels in ADDITIONAL HAPS input file;
- EMSCALC or ANNUALIZATION tab-delimited emissions data file; and
- list of input emissions summaries to be included in the tab-delimited emissions data output file.

The MOBILE6 ADDITIONAL HAPS input file includes the following fields: Poll#, Poll Name, Ekind, Vtype, Beg MY, End MY, Ratio/BEF, ZML, and DET (optional). The Beg MY (beginning model year), End MY (end model year) and DET (deterioration rate) fields are ignored by RATIOEMSCALC. For use with RATIOEMSCALC, the ADDITIONAL HAP factors (contained in the ZML field) may not vary by model year. The Ekind field value must be either "EVAP" or "EXH" to denote whether the factor is associated with exhaust or evaporative emissions processes. In the Vtype field, the MOBILE6 vehicle type number (i.e., 1-28) denotes

the vehicle type to which the factor applies; factors or ratios may be entered for any or all 28 vehicle types.

The Ratio/BEF field value (RATIOVOC, RATIOTOG, RATIOPM, or BEF) identifies the type of factor to be applied, which must match the associated criteria pollutant emissions to which it is to be applied (e.g., for calculating a new pollutant as a fraction of the pollutant/emissions type PM-10/exhaust, the underlying PM emissions must be PM-10). The ZML field contains the factor (BEF in milligrams/mile, or pollutant ratio in milligrams of pollutant per gram of criteria pollutant) associated with the particular Vtype, Ekind, and pollutant emissions estimate to be calculated.

RATIOEMSCALC converts the BEFs and pollutant ratios from units of milligrams/mile and milligrams/gram to g/mi and grams/gram. The utility multiplies pollutant BEFs by the VMT associated with the BEF's vehicle type to produce exhaust emissions estimates for the associated BEF pollutant, then converts the emissions value to the same units of the emissions values in the input tab-delimited emissions summary file. The utility multiplies the pollutant ratios by the associated criteria pollutant emissions value, by "Ekind" (e.g., RATIOVOC EXH, RATIOVOC EVAP, PM10 EXH) and vehicle type to produce the emissions estimates for the new pollutant.

Ratio-calculated emissions estimates are calculated for each of the pollutant subcomponents associated with the underlying criteria pollutant found in the input emissions tab file (e.g., EXH ratios applied to exhaust start and exhaust running emissions; EVAP ratios applied to the evaporative hot soak, diurnal, resting loss, running loss, and crankcase emissions; refueling emissions are not recognized by RATIOEMSCALC). Pollutant emissions calculated with RATIOPM are based on total exhaust PM for the particular vehicle type (i.e., for diesel vehicles: sum of ECARBON, OCARBON, SO4, and LEAD; for gasoline vehicles: sum of GASPM, SO4, and LEAD).

EMISSIONSFORMAT

The EMISSIONSFORMAT utility converts the tab-delimited 24-hour and/or annual output from an EMSCALC or ANNUALIZATION application into a format similar to NIF 3.0 format (for more information regarding the NIF 3.0 format see *NEI Input Format [NIF] Version 3.0, User's Guide Instructions and Conventions for Use,* EPA, November 2003). There are three records that can be produced using this utility — a transmittal record, an emissions period record, and an emissions record. The transmittal record contains information regarding the tab-delimited file that is being converted, as well as other inventory-specific-related information. The emissions period record contains the VMT data for the specified inventory. The emissions record contains the emissions estimates contained within the tab-delimited output file.

Since TDM-based EIs do not use NIF road types (i.e., HPMS road types), the utility includes a feature that reallocates the EI data (VMT and emissions) from a TDM functional class (or any other non-NIF road-type scheme) to NIF HPMS road type categories. The analysis year RIFCREC (i.e., HPMS) data set (or latest available for future year analyses) is a required input that is used to produce three HPMS AADT VMT distributions.

The annual tab-delimited EI results were converted to EPA's NIF 3.0 format. For each TDM county, the VMT and emissions from the EI tab file were re-categorized from TDM functional classes to an HPMS functional class (NIF road type) scheme. The annual TDM VMT and

emissions were summarized by vehicle class for three roadway group categories — Freeway, Arterial, and Collector/Local. The analysis year and county-specific HPMS road type VMT distributions (from the TxDOT RIFCREC report for the analysis year – or latest available) within each of the three roadway groups were then applied to the annual VMT and emissions for each vehicle type to distribute these data to the HPMS (NIF) road types. The re-distributed VMT and emissions were then compressed from the 28 MOBILE6 vehicle classes to the 12 NIF vehicle categories.

XMLFORMAT

The XMLFORMAT utility converts the annual on-road mobile EI output from the EmissionsFormat utility (the EI summary data in NIF 3.0 form) to the EPA's 2008 NEI reporting format. The product is the 2008 on-road mobile source annual emissions and VMT data in an XML format, which conforms to the EPA's CERS, which is required for submitting the inventory data to EPA's Emissions Inventory System.

The inputs include:

- the three NIF record files (i.e., file of NIF transmittal records, file of NIF period emissions [VMT] records, and file of NIF emissions records) from which EI data are to be converted to XML form;
- the list of pollutant codes from the input NIF files for which the pollutant emissions will be converted into the EPA's 2008 NEI XML reporting format; and
- an additional information input file (containing required and/or optional XML data elements [i.e., "Model," "ModelVersion," and "SubmittalComment"] specified for inclusion in the XML output file).

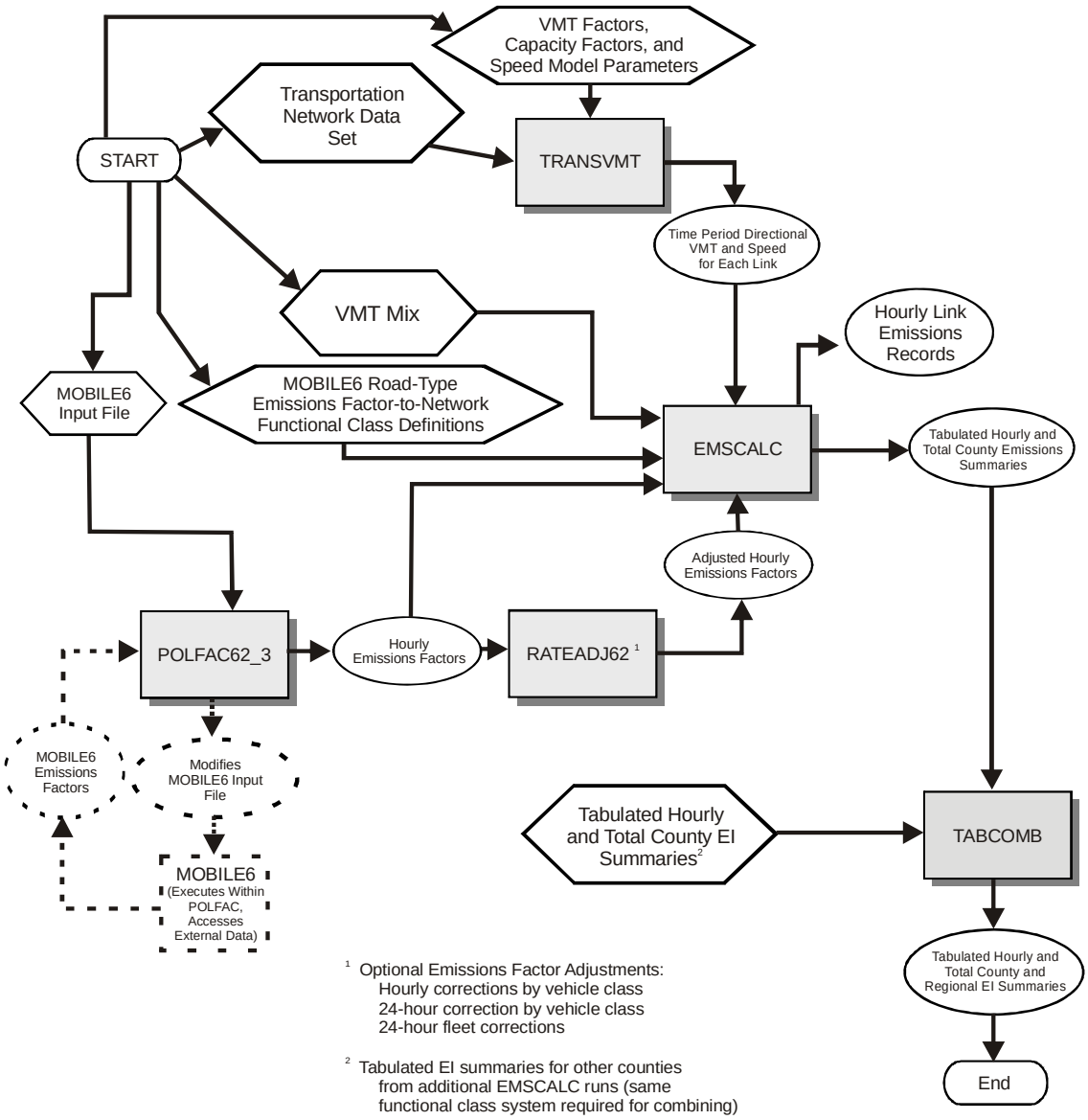
The outputs include:

- a "LST" or listing file recording the XMLformat utility execution times, run script, input and output file paths, pollutant codes, additional information input records, and a summary of the VMT and emissions converted to XML form for checking purposes,
- a tab-delimited file including a large summary matrix of the VMT and emissions by county, pollutant, and process (i.e., for codes X, V, B, T, or exhaust, evaporative, brake, and tire processes, respectively) for each source classification code (a maximum of 144 SCC codes, or 12 vehicle types by 12 road types) found in the XML output file. The 10 digit SCC code (which specifies major source category, vehicle class, road type, and emissions process) for each VMT and emissions data cell in the matrix is the combination of the cell's column header (which is the first nine digits of the SCC code) and process code from the cell's row (single digit X, V, B, or T).
- the XML file containing the annual VMT and emissions data, additional user-specified information, and required header information formatted in the 2008 NEI XML reporting format as specified in the *2008 NEI EIS Implementation Plan, Section 10, Reporting Instructions for Onroad and Nonroad Emissions*, EPA, December 22, 2008.

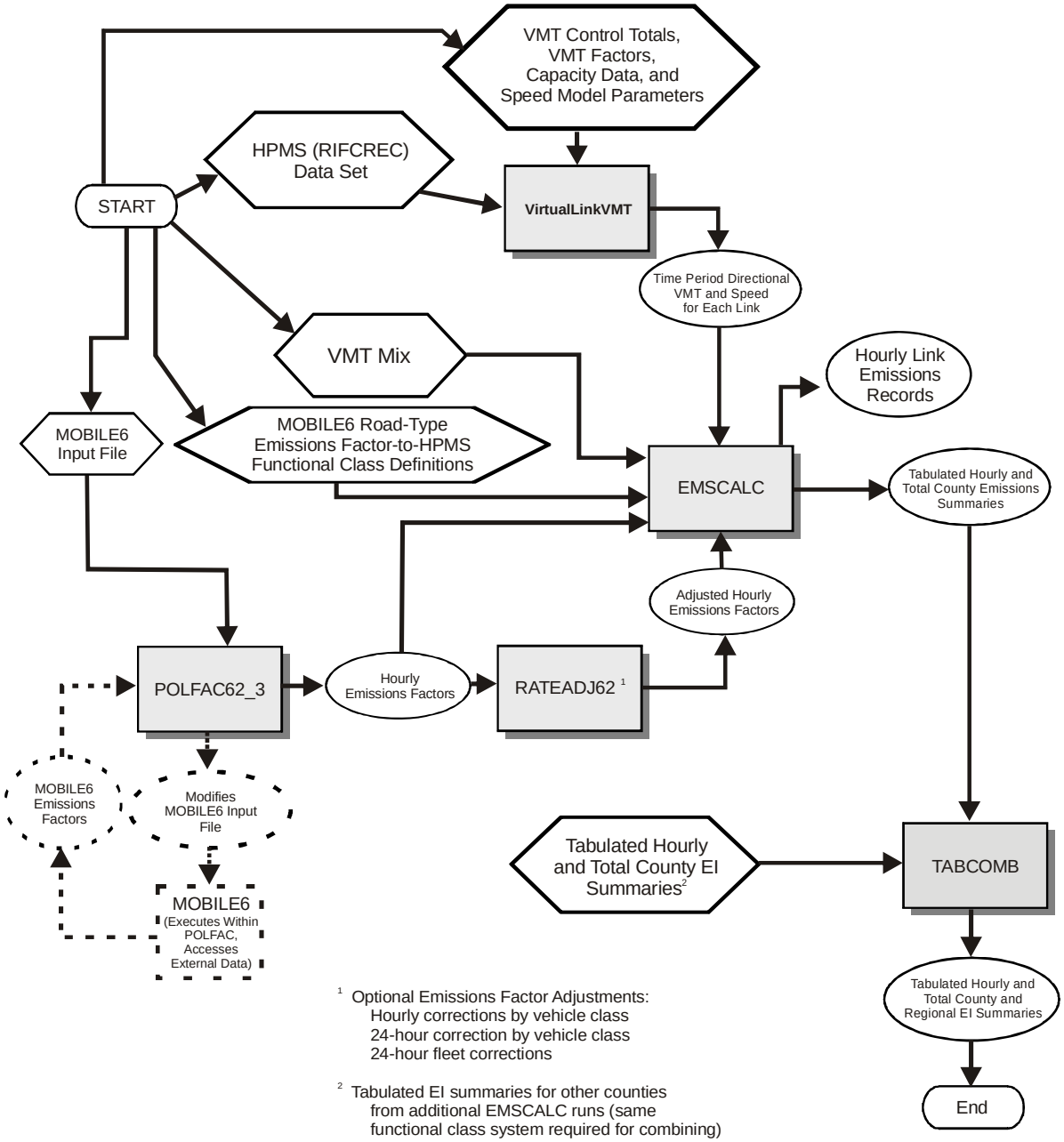
M6INPUTBUILD
The M6INPUTBUILD utility post-processes the TRANSVMT utility output (hourly link VMT/speed data sets) and VMT mix data sets to produce the MOBILE6 VMT by hour, speed VMT, and VMT by facility input files. The MOBILE6 input files created by this utility are in the required MOBILE6 format.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

The following diagrams show the overall emissions estimate process flow for a TDM link-based analysis and an HPMS virtual-link-based analysis.

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



HPMS / Virtual Link-Based Emissions Estimation Process



[1] Optional Emissions Factor Adjustments:
Hourly corrections by vehicle class
24-hour correction by vehicle class
24-hour fleet corrections

[2] Tabulated EI summaries for other counties from additional EMSCALC runs (same functional class system required for combining)

APPENDIX C:
TXDOT DISTRICTS

Abilene District (D01)
Borden
Callahan
Fisher
Haskell
Howard
Jones
Kent
Mitchell
Nolan
Scurry
Shackelford
Stonewall
Taylor

Amarillo District (D02)
Armstrong
Carson
Dallam
Deaf Smith
Gray
Hansford
Hartley
Hemphill
Hutchinson
Lipscomb
Moore
Ochiltree
Oldham
Potter
Randall
Roberts
Sherman

Atlanta District (D03)
Bowie
Camp
Cass
Harrison
Marion
Morris
Panola
Titus
Upshur

Austin District (D04)
Bastrop
Blanco
Burnet
Caldwell
Gillespie
Hays
Lee
Llano
Mason
Travis
Williamson

Beaumont District (D05)
Chambers
Hardin
Jasper
Jefferson
Liberty
Newton
Orange
Tyler

Brownwood District (D06)
Brown
Coleman
Comanche
Eastland
Lampasas
McCulloch
Mills
SanSaba
Stephens

Bryan District (D07)
Brazos
Burleson
Freestone
Grimes
Leon
Madison
Milam
Robertson
Walker
Washington

Childress District (D08)
Briscoe
Childress
Collingsworth
Cottle
Dickens
Donley
Foard
Hall
Hardeman
King
Knox
Motley
Wheeler

Corpus Christi District (D09)
Aransas
Bee
Goliad
Jim Wells
Karnes
Kleberg
Live Oak
Nueces
Refugio
San Patricio

Dallas District (D10)
Collin
Dallas
Denton
Ellis
Kaufman
Navarro
Rockwall

El Paso District (D11)
Brewster
Culberson
El Paso
Hudspeth
Jeff Davis
Presidio

Fort Worth District (D12)
Erath
Hood
Jack
Johnson
Palo Pinto
Parker
Somervell
Tarrant
Wise

Houston District (D13)
Brazoria
FortBend
Galveston
Harris
Montgomery
Waller

Laredo District (D14)
Dimmit
Duval
Kinney
La Salle
Maverick
Val Verde
Webb
Zavala

Lubbock District (D15)
Bailey
Castro
Cochran
Crosby
Dawson
Floyd
Gaines
Garza
Hale
Hockley
Lamb
Lubbock
Lynn
Parmer
Swisher
Terry
Yoakum

Lufkin District (D16)
Angelina
Houston
Nacogdoches
Polk
Sabine
San Augustine
San Jacinto
Shelby
Trinity

Odessa District (D17)
Andrews
Crane
Ector
Loving
Martin
Midland
Pecos
Reeves
Terrell
Upton
Ward
Winkler

Paris District (D18)
Delta
Fannin
Franklin
Grayson
Hopkins
Hunt
Lamar
Rains
RedRiver

Pharr District (D19)
Brooks
Cameron
Hidalgo
Jim Hogg
Kenedy
Starr
Willacy
Zapata

San Angelo District (D20)
Coke
Concho
Crockett
Edwards
Glasscock
Irion
Kimble
Menard
Reagan
Real
Runnels
Schleicher
Sterling
Sutton
Tom Green

San Antonio District (D21)
Atascosa
Bandera
Bexar
Comal
Frio
Guadalupe
Kendall
Kerr
McMullen
Medina
Uvalde
Wilson

Tyler District (D22)
Anderson
Cherokee
Gregg
Henderson
Rusk
Smith
Van Zandt
Wood

Waco District (D23)
Bell
Bosque
Coryell
Falls
Hamilton
Hill
Limestone
McLennan

Wichita Falls District (D24)
Archer
Baylor
Clay
Cooke
Montague
Throckmorton
Wichita
Wilbarger
Young

Yoakum District (D25)
Austin
Calhoun
Colorado
DeWitt
Fayette
Gonzales
Jackson
Lavaca
Matagorda
Victoria
Wharton

APPENDIX D:
SUMMER WEEKDAY CONVERSION FACTORS

AADT to Average Summer Weekday Factors
(June through August)

District	Factor
Abilene	1.02341
Amarillo	1.08167
Atlanta	1.08643
Austin	1.07229
Beaumont	1.10095
Brownwood	1.03024
Bryan	0.98232
Childress	1.09300
Corpus Christi	1.10029
Dallas	1.09111
El Paso	1.04660
Fort Worth	1.11676
Houston	1.03174
Laredo	1.01513
Lubbock	1.03913
Lufkin	1.06723
Odessa	1.08718
Paris	1.07141
Pharr	1.05530
San Angelo	1.03980
San Antonio	1.07780
Tyler	1.05834
Waco	1.02175
Wichita Falls	1.01713
Yoakum	1.01989

AADT to Average Summer Weekday Factors
(July through September)

District	Factor
Tyler[1]	1.05954
Atlanta[1,2]	1.06337
Beaumont[3,4]	1.05584
Houston[3]	1.04032

[1] TLM area only.

[2] Only used for Harrison and Upshur counties.

[3] HGB area only.

[4] Only used for Liberty and Chambers counties.

APPENDIX E:
2008 SUMMER WEEKDAY VMT CONTROL TOTALS

2008 Summer Weekday VMT Control Totals[1, 2]

FIPS	County	District	Control Total VMT
1	Anderson	Tyler	1,616,800
3	Andrews	Odessa	682,390
5	Angelina	Lufkin	2,719,254
7	Aransas	Corpus Christi	581,415
9	Archer	Wichita Falls	417,330
11	Armstrong	Amarillo	388,341
13	Atascosa	San Antonio	1,801,710
15	Austin	Yoakum	1,515,030
17	Bailey	Lubbock	307,102
19	Bandera	San Antonio	492,334
21	Bastrop	Austin	2,457,953
23	Baylor	Wichita Falls	196,077
25	Bee	Corpus Christi	873,479
27	Bell	Waco	7,994,516
29	Bexar	San Antonio	42,808,456
31	Blanco	Austin	696,648
33	Borden	Abilene	74,701
35	Bosque	Waco	638,184
37	Bowie	Atlanta	3,371,773
39	Brazoria[3]	Houston	6,395,414
41	Brazos	Bryan	4,394,865
43	Brewster	El Paso	322,818
45	Briscoe	Childress	78,291
47	Brooks	Pharr	687,810
49	Brown	Brownwood	1,059,062
51	Burleson	Bryan	806,985
53	Burnet	Austin	1,738,657
55	Caldwell	Austin	1,179,496
57	Calhoun	Yoakum	525,129
59	Callahan	Abilene	936,915
61	Cameron	Pharr	8,187,179
63	Camp	Atlanta	358,701

FIPS	County	District	Control Total VMT
65	Carson	Amarillo	941,380
67	Cass	Atlanta	1,183,572
69	Castro	Lubbock	357,207
71	Chambers[3]	Beaumont	2,704,909
73	Cherokee	Tyler	1,682,319
75	Childress	Childress	423,149
77	Clay	Wichita Falls	906,874
79	Cochran	Lubbock	145,468
81	Coke	San Angelo	210,373
83	Coleman	Brownwood	447,962
87	Collingsworth	Childress	127,667
89	Colorado	Yoakum	1,763,322
91	Comal	San Antonio	4,197,277
93	Comanche	Brownwood	580,103
95	Concho	San Angelo	266,090
97	Cooke	Wichita Falls	1,773,283
99	Coryell	Waco	1,221,618
101	Cottle	Childress	103,148
103	Crane	Odessa	251,249
105	Crockett	San Angelo	572,227
107	Crosby	Lubbock	256,701
109	Culberson	El Paso	739,741
111	Dallam	Amarillo	381,745
115	Dawson	Lubbock	574,592
117	Deaf Smith	Amarillo	524,019
119	Delta	Paris	210,183
123	De Witt	Yoakum	670,730
125	Dickens	Childress	129,694
127	Dimmit	Laredo	358,179
129	Donley	Childress	600,697
131	Duval	Laredo	486,519
133	Eastland	Brownwood	1,264,199
135	Ector	Odessa	3,481,681
137	Edwards	San Angelo	139,837

FIPS	County	District	Control Total VMT
141	El Paso	El Paso	16,055,867
143	Erath	Fort Worth	1,405,501
145	Falls	Waco	831,817
147	Fannin	Paris	980,268
149	Fayette	Yoakum	1,658,054
151	Fisher	Abilene	183,758
153	Floyd	Lubbock	276,016
155	Foard	Childress	77,024
157	Fort Bend[3]	Houston	9,515,437
159	Franklin	Paris	526,575
161	Freestone	Bryan	1,777,025
163	Frio	San Antonio	1,157,686
165	Gaines	Lubbock	719,176
167	Galveston[3]	Houston	6,300,200
169	Garza	Lubbock	497,577
171	Gillespie	Austin	978,157
173	Glasscock	San Angelo	211,308
175	Goliad	Corpus Christi	445,370
177	Gonzales	Yoakum	1,232,664
179	Gray	Amarillo	916,329
181	Grayson	Paris	4,004,044
183	Gregg[3]	Tyler	4,189,852
185	Grimes	Bryan	1,062,052
187	Guadalupe	San Antonio	3,631,525
189	Hale	Lubbock	1,144,505
191	Hall	Childress	266,760
193	Hamilton	Waco	426,388
195	Hansford	Amarillo	177,189
197	Hardeman	Childress	407,835
199	Hardin	Beaumont	1,827,859
201	Harris[3]	Houston	115,086,483
203	Harrison[3]	Atlanta	3,100,657
205	Hartley	Amarillo	333,593
207	Haskell	Abilene	280,501

FIPS	County	District	Control Total VMT
209	Hays	Austin	4,673,103
211	Hemphill	Amarillo	263,433
215	Hidalgo	Pharr	14,559,582
217	Hill	Waco	2,453,333
219	Hockley	Lubbock	893,769
223	Hopkins	Paris	1,785,981
225	Houston	Lufkin	779,427
227	Howard	Abilene	1,252,661
229	Hudspeth	El Paso	1,321,512
233	Hutchinson	Amarillo	518,526
235	Irion	San Angelo	134,094
237	Jack	Fort Worth	444,112
239	Jackson	Yoakum	972,944
241	Jasper	Beaumont	1,595,708
243	Jeff Davis	El Paso	208,474
245	Jefferson	Beaumont	8,176,790
247	Jim Hogg	Pharr	246,549
249	Jim Wells	Corpus Christi	1,720,377
253	Jones	Abilene	633,993
255	Karnes	Corpus Christi	498,305
259	Kendall	San Antonio	1,156,341
261	Kenedy	Pharr	476,015
263	Kent	Abilene	65,473
265	Kerr	San Antonio	1,420,544
267	Kimble	San Angelo	558,894
269	King	Childress	92,223
271	Kinney	Laredo	195,056
273	Kleberg	Corpus Christi	1,150,180
275	Knox	Childress	165,997
277	Lamar	Paris	1,480,559
279	Lamb	Lubbock	605,107
281	Lampasas	Brownwood	697,187
283	La Salle	Laredo	759,846
285	Lavaca	Yoakum	688,114

FIPS	County	District	Control Total VMT
287	Lee	Austin	878,595
289	Leon	Bryan	1,575,410
291	Liberty[3]	Beaumont	2,502,781
293	Limestone	Waco	889,961
295	Lipscomb	Amarillo	162,284
297	Live Oak	Corpus Christi	1,485,294
299	Llano	Austin	620,221
301	Loving	Odessa	24,696
303	Lubbock	Lubbock	6,303,684
305	Lynn	Lubbock	454,312
307	McCulloch	Brownwood	377,851
309	McLennan	Waco	7,467,990
311	McMullen	San Antonio	161,812
313	Madison	Bryan	989,222
315	Marion	Atlanta	436,895
317	Martin	Odessa	481,207
319	Mason	Austin	212,756
321	Matagorda	Yoakum	959,351
323	Maverick	Laredo	890,066
325	Medina	San Antonio	1,553,483
327	Menard	San Angelo	155,333
329	Midland	Odessa	3,742,698
331	Milam	Bryan	1,039,413
333	Mills	Brownwood	298,800
335	Mitchell	Abilene	622,457
337	Montague	Wichita Falls	854,904
339	Montgomery[3]	Houston	11,348,190
341	Moore	Amarillo	598,698
343	Morris	Atlanta	545,162
345	Motley	Childress	77,836
347	Nacogdoches	Lufkin	2,238,098
349	Navarro	Dallas	2,395,918
351	Newton	Beaumont	575,603
353	Nolan	Abilene	967,961

FIPS	County	District	Control Total VMT
355	Nueces	Corpus Christi	11,153,949
357	Ochiltree	Amarillo	348,636
359	Oldham	Amarillo	652,116
361	Orange	Beaumont	3,339,733
363	Palo Pinto	Fort Worth	1,214,404
365	Panola	Atlanta	1,365,306
369	Parmer	Lubbock	494,977
371	Pecos	Odessa	1,127,431
373	Polk	Lufkin	2,096,490
375	Potter	Amarillo	4,126,326
377	Presidio	El Paso	215,228
379	Rains	Paris	377,245
381	Randall	Amarillo	2,458,059
383	Reagan	San Angelo	153,564
385	Real	San Angelo	131,207
387	Red River	Paris	520,871
389	Reeves	Odessa	898,690
391	Refugio	Corpus Christi	957,878
393	Roberts	Amarillo	127,983
395	Robertson	Bryan	1,047,957
399	Runnels	San Angelo	430,832
401	Rusk[3]	Tyler	1,894,839
403	Sabine	Lufkin	368,466
405	San Augustine	Lufkin	346,385
407	San Jacinto	Lufkin	926,655
409	San Patricio	Corpus Christi	2,559,227
411	San Saba	Brownwood	205,079
413	Schleicher	San Angelo	177,291
415	Scurry	Abilene	789,932
417	Shackelford	Abilene	209,621
419	Shelby	Lufkin	986,532
421	Sherman	Amarillo	276,493
423	Smith[3]	Tyler	6,968,786
425	Somervell	Fort Worth	371,003

FIPS	County	District	Control Total VMT
427	Starr	Pharr	1,360,614
429	Stephens	Brownwood	297,646
431	Sterling	San Angelo	190,439
433	Stonewall	Abilene	110,651
435	Sutton	San Angelo	636,992
437	Swisher	Lubbock	517,862
441	Taylor	Abilene	4,050,195
443	Terrell	Odessa	110,784
445	Terry	Lubbock	568,346
447	Throckmorton	Wichita Falls	84,479
449	Titus	Atlanta	1,300,818
451	Tom Green	San Angelo	2,271,923
453	Travis	Austin	27,401,719
455	Trinity	Lufkin	399,311
457	Tyler	Beaumont	753,894
459	Upshur[3]	Atlanta	1,246,393
461	Upton	Odessa	211,538
463	Uvalde	San Antonio	955,334
465	Val Verde	Laredo	701,406
467	Van Zandt	Tyler	2,581,423
469	Victoria	Yoakum	2,773,284
471	Walker	Bryan	2,539,878
473	Waller[3]	Houston	2,162,653
475	Ward	Odessa	722,549
477	Washington	Bryan	1,386,724
479	Webb	Laredo	4,285,846
481	Wharton	Yoakum	1,926,815
483	Wheeler	Childress	710,440
485	Wichita	Wichita Falls	3,066,659
487	Wilbarger	Wichita Falls	735,407
489	Willacy	Pharr	568,260
491	Williamson	Austin	10,223,830
493	Wilson	San Antonio	1,057,864
495	Winkler	Odessa	238,016

FIPS	County	District	Control Total VMT
497	Wise	Fort Worth	2,963,592
499	Wood	Tyler	1,187,632
501	Yoakum	Lubbock	329,302
503	Young	Wichita Falls	476,246
505	Zapata	Pharr	496,771
507	Zavala	Laredo	336,078

[1] Excludes the 12-county DFW MSA.
[2] Unless noted otherwise, control total is for June through August.
[3] Control total is for July through September.

APPENDIX F:
TDM VMT ADJUSTMENT FACTORS AND SPEED MODEL INPUTS

AUSTIN AREA

VMT Adjustment Factors

County	Control Total	TDM VMT[1]	VMT Adjustment Factor
Hays	4,673,103	4,079,676.47	1.145459212
Travis	27,401,719	25,516,573.62	1.073879252
Williamson	10,223,830	8,723,970.32	1.171923977

[1] Including intrazonal VMT for 2005 TDM.

Time-of-Day Travel Periods

Period	Hours
AM Peak	6 a.m. - 9 a.m.
Mid-Day	9 a.m. – 4 p.m.
PM Peak	4 p.m. – 7 p.m.
Overnight	7 p.m. - 6 a.m.

TDM Network Functional Classifications

Functional Class Code	Functional Class Name
0	Centroid Connector
1	IH 35
2	Other Freeway
3	Expressway
4	Principal Arterial Divided
5	Principal Arterial Undivided
6	Minor Arterial Divided
7	Minor Arterial Undivided
8	Collectors
9	Local Street
10	Express Lanes
11	Ramps
12	Frontage Road
13	HOV Mainlanes
14	HOV Ramps
40[1]	Intrazonal

[1] Special classification added for intrazonal VMT application.

TDM Network Area Types

Area Type Code	Area Type Name
1	Central Business District (CBD)
2	CBD Fringe
3	Urban
4	Suburban
5	Rural

TDM AM Peak Directional Split Factors

Functional Classification		Area Type				
		1	2	3	4	5
		CBD	CBD Fringe	Urban	Suburban	Rural
0	Centroid Connector	54.5	82.5	78.0	73.5	74.0
1	IH 35	52.5	57.5	59.0	60.0	70.5
2	Other Freeway	52.5	57.5	59.0	60.0	70.5
3	Expressway	55.0	57.5	58.5	59.5	70.5
4	Principal Arterial Divided	58.0	57.5	58.5	59.0	70.5
5	Principal Arterial Undivided	58.0	57.5	58.5	59.0	70.5
6	Minor Arterial Divided	56.0	61.5	64.5	67.0	66.5
7	Minor Arterial Undivided	56.0	61.5	64.5	67.0	66.5
8	Collectors	54.5	82.5	78.0	73.5	74.0
9	Local Street	54.5	82.5	78.0	73.5	74.0
10	Express Lanes	52.5	57.5	59.0	60.0	70.5
11	Ramps	55.0	57.5	58.5	59.5	70.5
12	Frontage Road	55.0	57.5	58.5	59.5	70.5
13	HOV Mainlanes	50.0	50.0	50.0	50.0	50.0
14	HOV Ramps	50.0	50.0	50.0	50.0	50.0

TDM PM Peak Directional Split Factors

Functional Classification		Area Type				
		1	2	3	4	5
		CBD	CBD Fringe	Urban	Suburban	Rural
0	Centroid Connector	55.5	75.0	74.5	74.0	70.0
1	IH 35	52.5	58.0	61.5	65.0	65.5
2	Other Freeway	52.5	58.0	61.5	65.0	65.5
3	Expressway	57.0	56.5	57.5	58.0	65.0
4	Principal Arterial Divided	57.0	56.5	57.5	58.0	65.0
5	Principal Arterial Undivided	57.0	56.5	57.5	58.0	65.0
6	Minor Arterial Divided	53.5	58.0	61.5	65.0	61.5
7	Minor Arterial Undivided	53.5	58.0	61.5	65.0	61.5
8	Collectors	55.5	75.0	74.5	74.0	70.0
9	Local Street	55.5	75.0	74.5	74.0	70.0
10	Express Lanes	52.5	58.0	61.5	65.0	65.5
11	Ramps	57.0	56.5	57.5	58.0	65.0
12	Frontage Road	57.0	56.5	57.5	58.0	65.0
13	HOV Mainlanes	50.0	50.0	50.0	50.0	50.0
14	HOV Ramps	50.0	50.0	50.0	50.0	50.0

TDM Mid-Day and Overnight Directional Split Factors

Functional Classification		Area Type				
		1	2	3	4	5
		CBD	CBD Fringe	Urban	Suburban	Rural
0	Centroid Connector	54.5	53.0	53.5	53.5	53.5
1	IH 35	51.5	53.0	52.5	52.0	53.0
2	Other Freeway	51.5	53.0	52.5	52.0	53.0
3	Expressway	54.0	51.0	53.0	54.5	55.0
4	Principal Arterial Divided	54.0	51.0	53.0	54.5	55.0
5	Principal Arterial Undivided	54.0	51.0	53.0	54.5	55.0
6	Minor Arterial Divided	54.5	53.5	54.0	54.5	56.5
7	Minor Arterial Undivided	54.5	53.5	54.0	54.5	56.5
8	Collectors	54.5	53.0	53.5	53.5	53.5
9	Local Street	54.5	53.0	53.5	53.5	53.5
10	Express Lanes	51.5	53.0	52.5	52.0	53.0
11	Ramps	54.0	51.0	53.0	54.5	55.0
12	Frontage Road	54.0	51.0	53.0	54.5	55.0
13	HOV Mainlanes	50.0	50.0	50.0	50.0	50.0
14	HOV Ramps	50.0	50.0	50.0	50.0	50.0

These time-of-day directional split factors were taken from the Austin Early Action Compact Region (AER) State Implementation Plan (SIP) on-road mobile source EI Technical Note, *Austin/San Marcos Metropolitan Statistical Area On-Road Mobile Source Emissions Inventories: 1995, 1999, 2002, 2005, 2007, and 2012,* TTI, August 22, 2003.

TDM Freeflow Speed Factors

Functional Classification		Area Type				
		1	2	3	4	5
		CBD	CBD Fringe	Urban	Suburban	Rural
0	Centroid Connector	1.000000	1.000000	1.000000	1.000000	1.000000
1	IH 35	1.526316	1.414634	1.372093	1.333333	1.224138
2	Other Freeway	1.450000	1.380952	1.311111	1.276596	1.224138
3	Expressway	1.285714	1.216216	1.187500	1.250000	1.103774
4	Principal Arterial Divided	1.250000	1.250000	1.250000	1.250000	1.145833
5	Principal Arterial Undivided	1.250000	1.250000	1.250000	1.250000	1.170213
6	Minor Arterial Divided	1.250000	1.250000	1.250000	1.250000	1.219512
7	Minor Arterial Undivided	1.250000	1.250000	1.250000	1.250000	1.250000
8	Collectors	1.250000	1.250000	1.250000	1.250000	1.125000
9	Local Street	1.000000	1.000000	1.000000	1.000000	1.000000
10	Express Lanes	1.526316	1.414634	1.372093	1.333333	1.224138
11	Ramps	1.250000	1.250000	1.250000	1.250000	1.145833
12	Frontage Road	1.250000	1.250000	1.250000	1.250000	1.145833
13	HOV Mainlanes	1.166667	1.166667	1.166667	1.166667	1.166667
14	HOV Ramps	1.428571	1.428571	1.428571	1.428571	1.428571

Volume/Delay Equation Parameters

Facility Category	A	B	M
High-Capacity Facilities	0.015	3.5	5
Low-Capacity Facilities	0.050	3.0	10

TDM Functional Class Categories for Applying Delay Parameters

Category	Functional Class Code	Functional Class Name
High-Capacity	1	IH 35
	2	Other Freeway
	10	Express Lanes
	13	HOV Mainlanes
Low-Capacity	3	Expressway
	4	Principal Arterial Divided
	5	Principal Arterial Undivided
	6	Minor Arterial Divided
	7	Minor Arterial Undivided
	8	Collectors
	9	Local Street
	11	Ramps
	12	Frontage Road
	14	HOV Ramps

TDM Hourly Capacity Factors

Functional Classification		Area Type				
		1	2	3	4	5
		CBD	CBD Fringe	Urban	Suburban	Rural
0	Centroid Connector	0.100000	0.100000	0.100000	0.100000	0.100000
1	IH 35	0.065217	0.062712	0.067568	0.073585	0.125000
2	Other Freeway	0.075000	0.072549	0.074257	0.081250	0.137931
3	Expressway	0.047826	0.048000	0.048148	0.059184	0.088889
4	Principal Arterial Divided	0.061111	0.063158	0.065000	0.078378	0.123077
5	Principal Arterial Undivided	0.062500	0.062857	0.066667	0.081818	0.126087
6	Minor Arterial Divided	0.110000	0.109091	0.104167	0.127273	0.187500
7	Minor Arterial Undivided	0.105263	0.110000	0.104546	0.125000	0.192857
8	Collectors	0.088889	0.089474	0.085714	0.111111	0.262500
9	Local Street	0.100000	0.100000	0.100000	0.100000	0.100000
10	Express Lanes	0.065217	0.062712	0.067568	0.073585	0.125000
11	Ramps	0.065672	0.068571	0.071429	0.084849	0.142857
12	Frontage Road	0.057895	0.061538	0.062500	0.075676	0.115385
13	HOV Mainlanes	0.148148	0.148148	0.148148	0.148148	0.148148
14	HOV Ramps	0.148148	0.148148	0.148148	0.148148	0.148148

BPA AREA

VMT Adjustment Factors

County	Control Total	TDM VMT[1]	VMT Adjustment Factor
Jefferson	8,176,790	6,893,996.68	1.186073969
Orange	3,339,733	2,927,674.82	1.140745885
Hardin	1,827,859	1,665,056.06	1.097776251

[1] Including intrazonal VMT for 2007 TDM.

Time-of-Day Travel Periods

Period	Hours
AM Peak	6 a.m. - 9 a.m.
Mid-Day	9 a.m. – 4 p.m.
PM Peak	4 p.m. – 7 p.m.
Overnight	7 p.m. - 6 a.m.

Network Facility Types

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

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

Network Area Types

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

AM Peak-Period Directional Split Estimates

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

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

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

PM Peak-Period Directional Split Estimates

Area Types	Functional Classification Groups								
	Centroid Connector	IH and Freeway	Principal Arterial Divided	Principal Arterial Undivided	Minor Arterial Divided	Minor Arterial Undivided	Collector	Frontage Road	Ramp
CBD	55.0	54.0	62.0	62.0	52.0	52.0	57.5	54.0	54.0
CBD Fringe	72.0	54.0	59.0	59.0	53.0	53.0	64.5	54.0	54.0
Urban	72.0	56.0	57.0	57.0	64.0	64.0	68.0	56.0	56.0
Suburban	72.0	67.0	60.0	60.0	65.0	65.0	62.5	67.0	67.0
Rural	71.0	65.0	66.0	66.0	63.0	63.0	70.0	65.0	65

These time-of-day directional split factors were taken from the Technical Note, *1996 Jefferson, Orange, and Hardin Counties Periodic Emissions Inventory,* TTI, November 26, 1997. These data were provided by TxDOT's Transportation Planning and Programming Division after collaboration with TxDOT's Beaumont District and the Beaumont/Port Arthur Metropolitan Planning Organization.

Network Facility Types Correlated to Functional Classification Groups

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

TDM Freeflow (Volume = 1) Speed Factors

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

Volume/Delay Equation Parameters

Facility Category	A	B	M
High-Capacity Facilities	0.015	3.5	5
Low-Capacity Facilities	0.050	3.0	10

Facility Type Categories for Applying Delay Parameters

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

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

TDM Capacity Factors

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

EL PASO AREA

VMT Adjustment Factors

County	Control Total	TDM VMT[1]	VMT Adjustment Factor
El Paso	16,055,867	16,209,008.93	0.990552048

[1] Including intrazonal VMT for 2007 TDM.

Time-of-Day Travel Periods

Period	Hours
AM Peak	6 a.m. - 9 a.m.
Mid-Day	9 a.m. – 4 p.m.
PM Peak	4 p.m. – 7 p.m.
Overnight	7 p.m. - 6 a.m.

TDM Network Functional Classes

Functional Class Code	Functional Class Name
0	Centroid Connector
1	Border Highway
2	Freeway
3	Expressway
4	Principal Arterial Divided
5	Principal Arterial Undivided
6	Divided Arterial
7	Undivided Arterial
8	Collector Divided
9	Collector Undivided
11	Frontage Road
12	Ramp
13	Trans-Mountain
14	Freeway-Circumferential

TDM Network Area Types

Area Type Code	Area Type Name
1	CBD
2	CBD Fringe
3	Urban E
4	Urban N
5	Urban W
6	Suburban (N)
7	Suburban (W)
8	Suburban (E)
9	Rural

AM Peak-Period Directional Split Estimates

Functional Class Code	Area Type				
	1	2	3, 4, 5	6, 7, 8	9
0	54.0	87.0	85.0	76.0	78.0
1	65.0	60.0	62.0	66.5	71.0
2	50.0	50.0	60.0	63.0	70.0
3	65.0	60.0	62.0	66.5	71.0
4	65.0	60.0	62.0	66.5	71.0
5	65.0	60.0	62.0	66.5	71.0
6	58.0	59.0	58.0	65.0	68.0
7	58.0	59.0	58.0	65.0	68.0
8	64.5	63.0	53.0	73.8	75.0
9	64.5	63.0	53.0	73.8	75.0
10	50.0	50.0	60.0	63.0	70.0
11	50.0	50.0	60.0	63.0	70.0
12	50.0	50.0	60.0	63.0	70.0
13	65.0	60.0	62.0	66.5	71.0
14	50.0	50.0	60.0	63.0	70.0

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

Functional Class Code	Area Type				
	1	2	3, 4, 5	6, 7, 8	9
0	54.0	54.0	55.0	54.0	52.0
1	55.0	54.0	50.0	56.5	55.0
2	51.0	51.0	53.0	51.0	53.0
3	55.0	54.0	50.0	56.5	55.0
4	55.0	54.0	50.0	56.5	55.0
5	55.0	54.0	50.0	56.5	55.0
6	55.0	55.0	52.0	56.5	58.0
7	55.0	55.0	52.0	56.5	58.0
8	54.5	53.0	52.0	55.5	54.0
9	54.5	53.0	52.0	55.5	54.0
10	51.0	51.0	53.0	51.0	53.0
11	51.0	51.0	53.0	51.0	53.0
12	51.0	51.0	53.0	51.0	53.0
13	55.0	54.0	50.0	56.5	55.0
14	51.0	51.0	53.0	51.0	53.0

PM Peak-Period Directional Split Estimates

Functional Class Code	Area Type				
	1	2	3, 4, 5	6, 7, 8	9
0	55.0	72.0	72.0	71.5	71.0
1	62.0	59.0	57.0	61.5	66.0
2	54.0	54.0	56.0	66.5	65.0
3	62.0	59.0	57.0	61.5	66.0
4	62.0	59.0	57.0	61.5	66.0
5	62.0	59.0	57.0	61.5	66.0
6	52.0	53.0	54.0	64.5	63.0
7	52.0	53.0	54.0	64.5	63.0
8	57.5	64.5	68.0	64.8	70.0
9	57.5	64.5	68.0	64.8	70.0
10	54.0	54.0	56.0	66.5	65.0
11	54.0	54.0	56.0	66.5	65.0
12	54.0	54.0	56.0	66.5	65.0
13	62.0	59.0	57.0	61.5	66.0
14	54.0	54.0	56.0	66.5	65.0

These time-of-day directional splits for area type and facility type used for these analyses were obtained from the Technical Note entitled *1996 El Paso Periodic Emission Inventory* (from TTI to TNRCC, November 26, 1997). TxDOT's Transportation Planning and Programming Division initially provided these data after collaboration with TxDOT's El Paso District and the El Paso MPO.

El Paso TDM Freeflow (Volume = 1) Speed Factors

Functional Class Code	Area Type								
	1	2	3	4	5	6	7	8	9
0	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1	1.80	1.73	1.36	1.44	1.44	1.54	1.54	1.54	1.30
2	1.58	1.58	1.58	1.58	1.58	1.58	1.58	1.58	1.58
3	1.80	1.80	1.90	1.90	1.90	2.02	2.02	2.02	1.46
4	1.76	1.54	1.38	1.25	1.25	1.36	1.36	1.36	1.22
5	1.71	1.56	1.48	1.29	1.29	1.28	1.28	1.28	1.25
6	1.79	1.50	1.50	1.44	1.39	1.43	1.33	1.38	1.22
7	1.71	1.46	1.46	1.41	1.46	1.48	1.43	1.29	1.22
8	1.82	1.44	1.38	1.38	1.38	1.39	1.34	1.39	1.07
9	1.73	1.39	1.45	1.28	1.28	1.41	1.31	1.41	1.05
10	1.50	1.60	1.33	1.29	1.33	1.22	1.22	1.22	1.31
11	1.47	1.08	1.36	1.31	1.36	1.29	1.29	1.29	1.30
12	1.33	1.75	1.90	1.90	1.90	1.74	1.74	1.74	2.08
13	1.58	1.58	1.58	1.58	1.58	1.58	1.58	1.58	1.58
14	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Volume/Delay Equation Parameters

Facility Category	A	B	M
High-Capacity Facilities	0.015	3.5	5
Low-Capacity Facilities	0.050	3.0	10

Functional Classification Categories for Applying Delay Parameters

Category	TDM Functional Class Code	TDM Functional Class Description
High-Capacity	1	Border Highway
	2	Freeway
	3	Expressway
	14	Freeway Circumferential
Low-Capacity	0	Centroid Connector
	4	Principal Arterial Divided
	5	Principal Arterial Undivided
	6	Divided Arterial
	7	Undivided Arterial
	8	Collector Divided
	9	Collector Undivided
	11	Frontage Road
	12	Ramp
	13	Trans Mountain

TDM Capacity Factors

Functional Class Code	Area Type								
	1	2	3	4	5	6	7	8	9
0	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000
1	0.0897	0.1043	0.1113	0.1113	0.1113	0.1305	0.1305	0.1305	0.2222
2	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660
3	0.0897	0.1043	0.1113	0.1113	0.1113	0.1305	0.1305	0.1305	0.2222
4	0.0659	0.0800	0.0915	0.0915	0.0915	0.1160	0.1160	0.1160	0.1818
5	0.0662	0.0809	0.0938	0.0938	0.0938	0.1205	0.1205	0.1205	0.1859
6	0.0759	0.0923	0.1136	0.1136	0.1136	0.1728	0.1728	0.1728	0.2941
7	0.0758	0.0924	0.1139	0.1139	0.1139	0.1667	0.1667	0.1667	0.2813
8	0.0726	0.0856	0.1075	0.1075	0.1075	0.1642	0.1642	0.1642	0.3194
9	0.0702	0.0833	0.1047	0.1047	0.1047	0.1587	0.1587	0.1587	0.3088
10	0.0659	0.0800	0.0880	0.0880	0.0880	0.1120	0.1120	0.1120	0.1705
11	0.0611	0.0667	0.0694	0.0694	0.0694	0.0778	0.0778	0.0778	0.0833
12	0.0979	0.1021	0.1053	0.1053	0.1053	0.1115	0.1115	0.1115	0.1167
13	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660
14	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000

HOUSTON AREA

VMT Adjustment Factors

County	Control Total	TDM VMT[1]	VMT Adjustment Factor
Harris	115,086,483	107,655,089.97	1.069029649
Brazoria	6,395,414	7,095,498.68	0.901333971
Fort Bend	9,515,437	10,369,205.52	0.917663073
Waller	2,162,653	2,179,022.78	0.992487560
Montgomery	11,348,190	11,554,585.49	0.982137353
Liberty	2,502,781	2,736,671.69	0.914534620
Chambers	2,704,909	2,943,876.16	0.918825675
Galveston	6,300,200	5,802,442.22	1.085784185

[1] Including intrazonal VMT for 2008 TDM.

Capacity Factors

Time of Day Assignment	Capacity Factor[1]
AM Peak	0.3333333
Mid-Day	0.1666667
PM Peak	0.2500000
Overnight	0.0909091

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

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

Functional Group	Area Type				
	CBD	Urban	Urban Fringe	Suburban	Rural
Freeways, Interstates	1.147400	1.177508	1.157272	1.197842	1.137903
Principal Arterials	1.136702	0.860413	0.887801	1.002511	1.018546
Other Arterials, Major Collectors	1.145946	0.811981	0.813370	0.813370	1.112661
Collectors	1.235367	0.857297	0.889344	0.974734	1.033400
Toll Roads	1.054545	1.100000	1.081379	1.057097	1.077846
Ramps	1.235367	0.857297	0.889344	0.974734	1.033400
Locals	1.000000	1.000000	1.000000	1.000000	1.000000

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	0.700000	0.768691	0.737693	0.715108	0.645161
Principal Arterials	0.703191	0.578709	0.633464	0.750628	0.458973
Other Arterials, Major Collectors	0.677477	0.560596	0.613733	0.870193	0.517909
Collectors	0.727049	0.567228	0.642497	0.761987	0.554081
Toll Roads	0.636364	0.636364	0.689705	0.645161	0.615385
Ramps	0.727049	0.567228	0.642497	0.761987	0.554081
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) 40. Locals (Intrazonals)

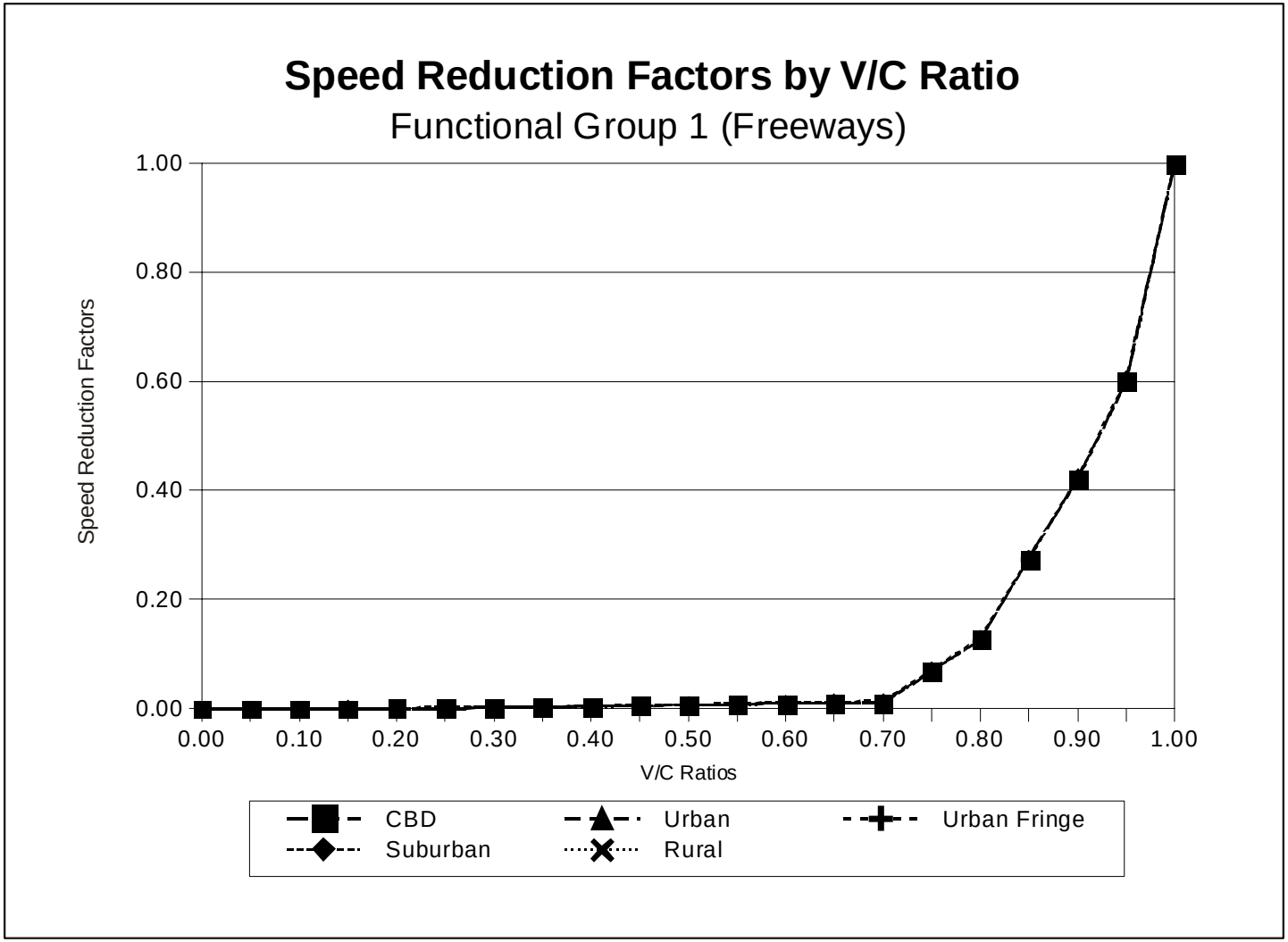


Figure 1. Freeway Speed Reduction Factors by V/C Ratio.

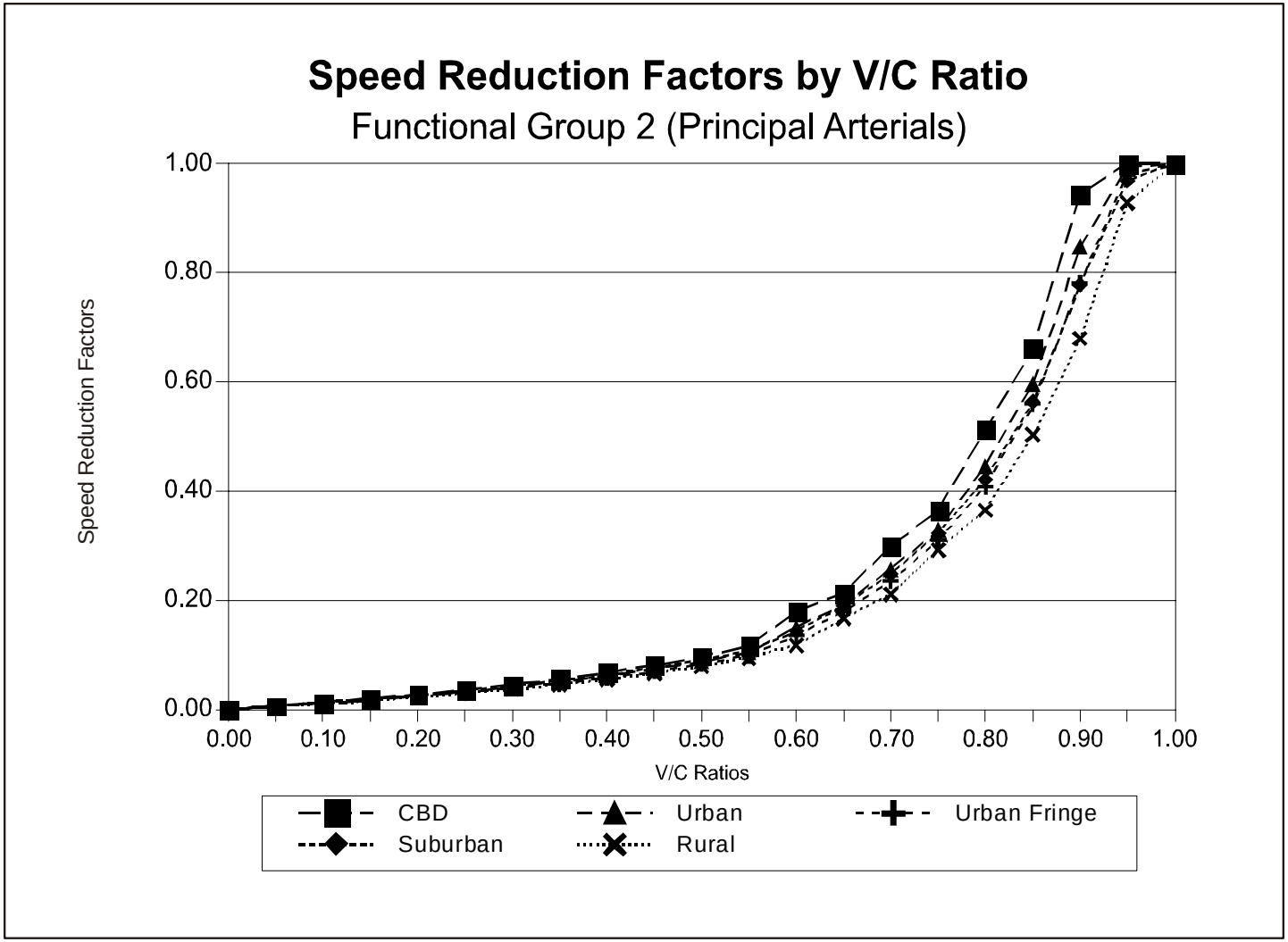


Figure 2. Principal Arterial Speed Reduction Factors by V/C Ratio.

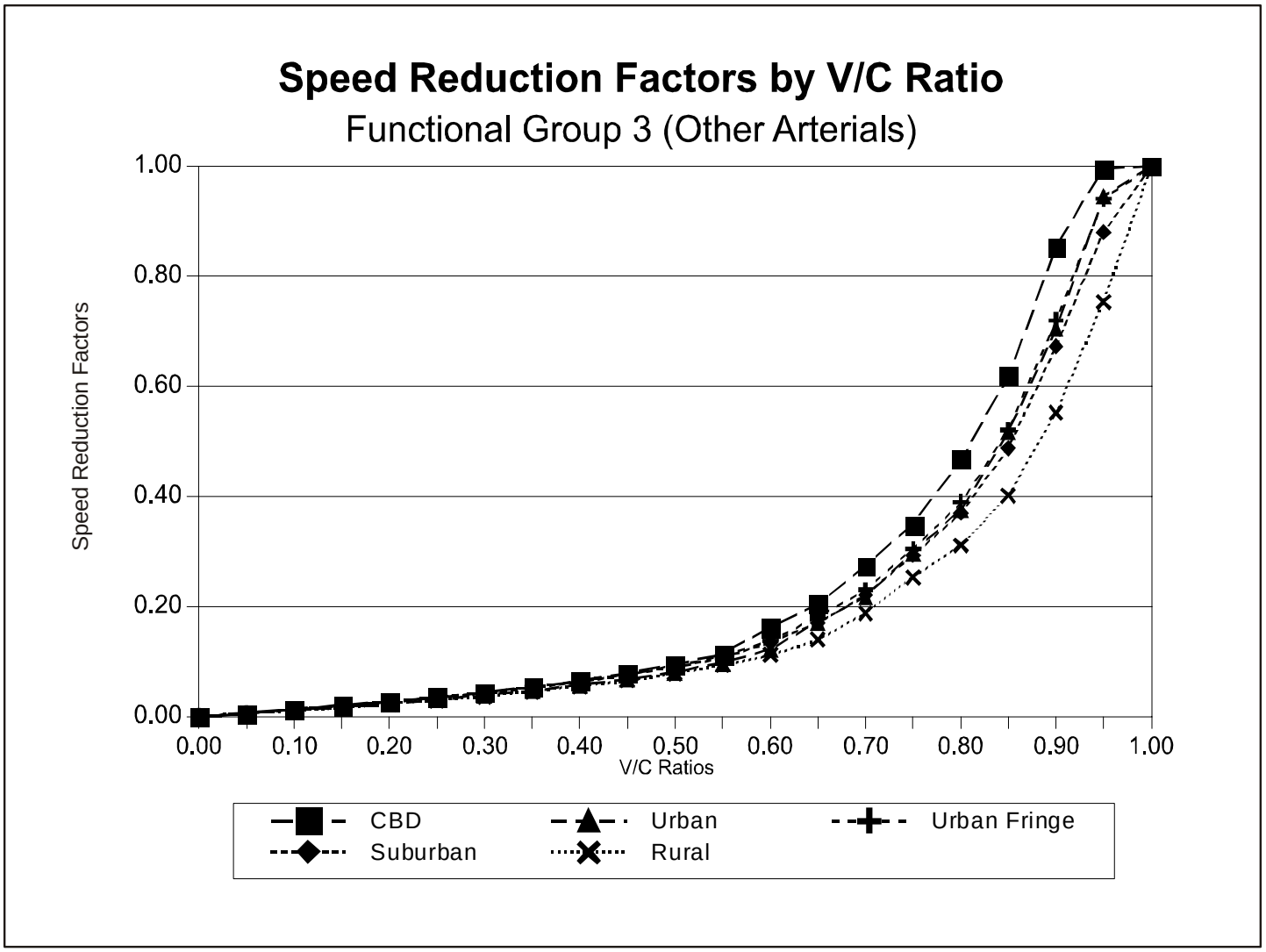


Figure 3. Other Arterial Speed Reduction Factors by V/C Ratio.

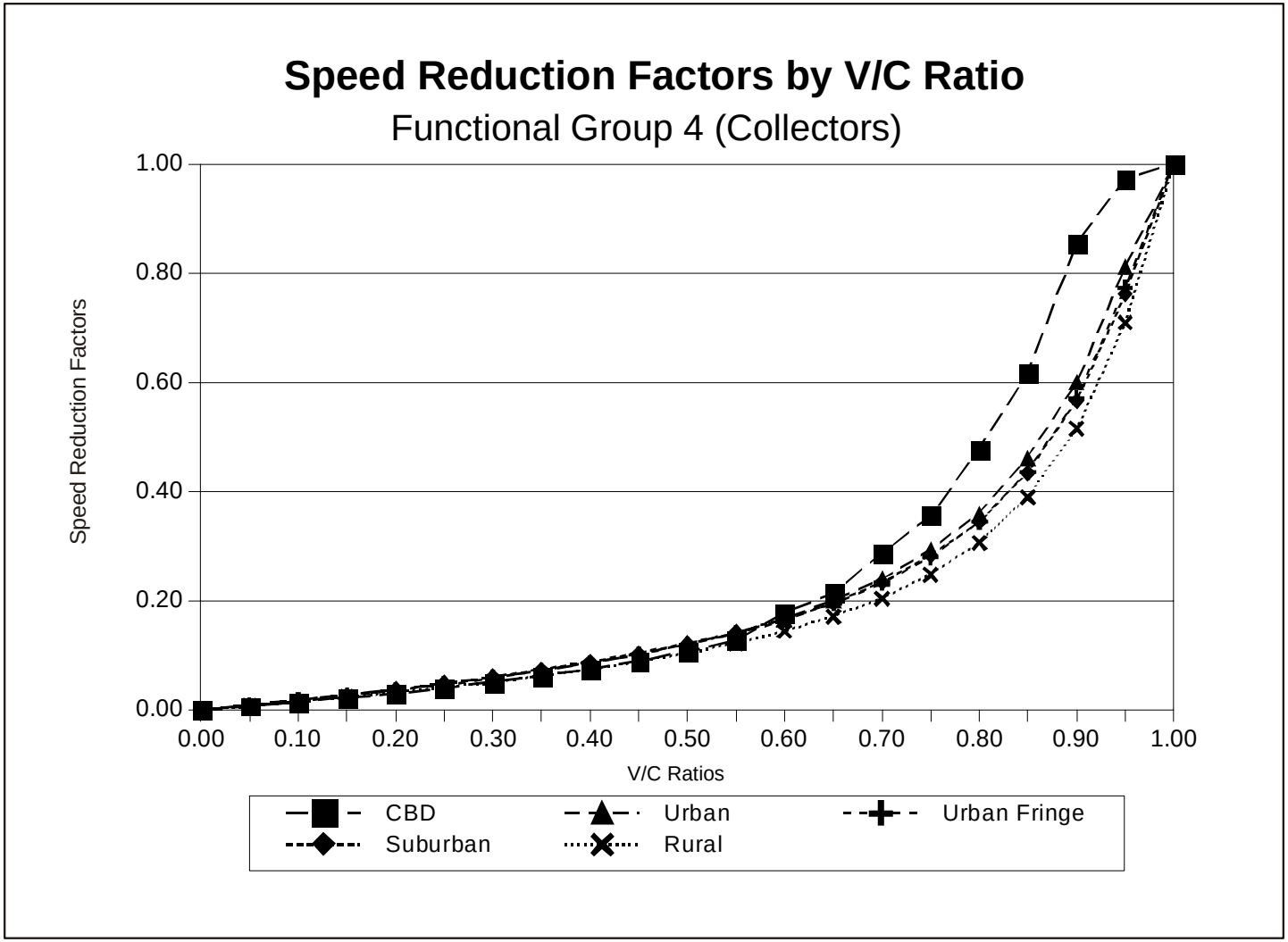


Figure 4. Collector Speed Reduction Factors by V/C Ratio.

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

SAN ANTONIO AREA

VMT Adjustment Factors

County	Control Total	TDM VMT[1]	VMT Adjustment Factor
Bexar	42,808,456	39,773,938.07	1.076294128
Comal	4,197,277	3,998,448.98	1.049726287
Guadalupe	3,631,525	3,890,133.20	0.933522019
Kendall	1,156,341	1,369,601.99	0.844289805
Wilson	1,057,864	1,262,964.39	0.837603978

[1] Including intrazonal VMT for 2005 TDM.

Time-of-Day Travel Periods

Period	Hours
AM Peak	6 a.m. - 9 a.m.
Mid-Day	9 a.m. – 4 p.m.
PM Peak	4 p.m. – 7 p.m.
Overnight	7 p.m. - 6 a.m.

TDM Network Facility Types

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

[1] Special classification added for intrazonal VMT application.

TDM Network Area Types

Area Type Code	Area Type Name
1	Central Business District (CBD)
2	CBD Fringe
3	Urban
4	Suburban
5	Rural

TDM AM Peak Directional Split Factors

Facility Type Code	Area Type				
	1	2	3	4	5
	CBD	CBD Fringe	Urban	Suburban	Rural
0	50.00000	50.00000	50.00000	50.00000	50.00000
1	53.37670	74.13610	53.37670	61.25710	61.73610
3	53.37670	74.13610	53.37670	61.25710	61.73610
5	53.37670	74.13610	53.37670	61.25710	61.73610
7	53.37670	74.13610	53.37670	61.25710	61.73610
9	53.37670	74.13610	53.37670	61.25710	61.73610
10	53.37670	74.13610	53.37670	61.25710	61.73610
11	68.72790	68.03360	68.72790	56.38190	61.73610
12	68.72790	68.03360	68.72790	56.38190	61.73610
13	68.72790	68.03360	68.72790	56.38190	61.73610
14	68.72790	68.03360	68.72790	56.38190	61.73610
15	68.72790	68.03360	68.72790	56.38190	61.73610
16	68.72790	68.03360	68.72790	56.38190	61.73610
17	65.87060	65.87060	65.87060	65.87060	65.57410
18	65.87060	65.87060	65.87060	65.87060	65.57410
19	65.87060	65.87060	65.87060	65.87060	65.57410
20	68.72790	68.03360	68.72790	56.38190	61.73610
21	68.72790	68.03360	68.72790	56.38190	61.73610
22	53.37670	74.13610	53.37670	61.25710	61.73610

TDM Mid-Day Directional Split Factors

Facility Type Code	Area Type				
	1	2	3	4	5
	CBD	CBD Fringe	Urban	Suburban	Rural
0	50.00000	50.00000	50.00000	50.00000	50.00000
1	51.85418	58.91482	51.85418	54.18890	56.18798
3	51.85418	58.91482	51.85418	54.18890	56.18798
5	51.85418	58.91482	51.85418	54.18890	56.18798
7	51.85418	58.91482	51.85418	54.18890	56.18798
9	51.85418	58.91482	51.85418	54.18890	56.18798
10	51.85418	58.91482	51.85418	54.18890	56.18798
11	59.80851	57.87852	59.80851	54.04745	56.18798
12	59.80851	57.87852	59.80851	54.04745	56.18798
13	59.80851	57.87852	59.80851	54.04745	56.18798
14	59.80851	57.87852	59.80851	54.04745	56.18798
15	59.80851	57.87852	59.80851	54.04745	56.18798
16	59.80851	57.87852	59.80851	54.04745	56.18798
17	59.53949	59.53949	59.53949	59.53949	58.27722
18	59.53949	59.53949	59.53949	59.53949	58.27722
19	59.53949	59.53949	59.53949	59.53949	58.27722
20	59.80851	57.87852	59.80851	54.04745	56.18798
21	59.80851	57.87852	59.80851	54.04745	56.18798
22	51.85418	58.91482	51.85418	54.18890	56.18798

TDM PM Peak Directional Split Factors

Facility Type Code	Area Type				
	1	2	3	4	5
	CBD	CBD Fringe	Urban	Suburban	Rural
0	50.00000	50.00000	50.00000	50.00000	50.00000
1	52.62830	69.38360	52.62830	56.48830	58.00540
3	52.62830	69.38360	52.62830	56.48830	58.00540
5	52.62830	69.38360	52.62830	56.48830	58.00540
7	52.62830	69.38360	52.62830	56.48830	58.00540
9	52.62830	69.38360	52.62830	56.48830	58.00540
10	52.62830	69.38360	52.62830	56.48830	58.00540
11	63.81940	60.33020	63.81940	56.78330	58.00540
12	63.81940	60.33020	63.81940	56.78330	58.00540
13	63.81940	60.33020	63.81940	56.78330	58.00540
14	63.81940	60.33020	63.81940	56.78330	58.00540
15	63.81940	60.33020	63.81940	56.78330	58.00540
16	63.81940	60.33020	63.81940	56.78330	58.00540
17	60.07770	60.07770	60.07770	60.07770	57.38310
18	60.07770	60.07770	60.07770	60.07770	57.38310
19	60.07770	60.07770	60.07770	60.07770	57.38310
20	63.81940	60.33020	63.81940	56.78330	58.00540
21	63.81940	60.33020	63.81940	56.78330	58.00540
22	52.62830	69.38360	52.62830	56.48830	58.00540

TDM Overnight Directional Split Factors

Facility Type Code	Area Type				
	1	2	3	4	5
	CBD	CBD Fringe	Urban	Suburban	Rural
0	50.00000	50.00000	50.00000	50.00000	50.00000
1	52.89322	57.80462	52.89322	58.35028	60.92629
3	52.89322	57.80462	52.89322	58.35028	60.92629
5	52.89322	57.80462	52.89322	58.35028	60.92629
7	52.89322	57.80462	52.89322	58.35028	60.92629
9	52.89322	57.80462	52.89322	58.35028	60.92629
10	52.89322	57.80462	52.89322	58.35028	60.92629
11	64.07599	60.11187	64.07599	58.87167	60.92629
12	64.07599	60.11187	64.07599	58.87167	60.92629
13	64.07599	60.11187	64.07599	58.87167	60.92629
14	64.07599	60.11187	64.07599	58.87167	60.92629
15	64.07599	60.11187	64.07599	58.87167	60.92629
16	64.07599	60.11187	64.07599	58.87167	60.92629
17	63.07224	63.07224	63.07224	63.07224	60.48731
18	63.07224	63.07224	63.07224	63.07224	60.48731
19	63.07224	63.07224	63.07224	63.07224	60.48731
20	64.07599	60.11187	64.07599	58.87167	60.92629
21	64.07599	60.11187	64.07599	58.87167	60.92629
22	52.89322	57.80462	52.89322	58.35028	60.92629

TDM Freeflow Speed Factors

Facility Type Code	Area Type				
	1	2	3	4	5
	CBD	CBD Fringe	Urban	Suburban	Rural
0	1.00000	1.00000	1.00000	1.00000	1.00000
1	1.37500	1.34884	1.30435	1.30000	1.32075
3	1.37500	1.34884	1.27660	1.30000	1.29630
5	1.44130	1.39826	1.27823	1.29225	1.32576
7	1.52820	1.45145	1.34650	1.36900	1.41271
9	1.57343	1.52284	1.32170	1.28175	1.28342
10	1.60714	1.50000	1.38889	1.37500	1.17647
11	1.66667	1.53571	1.40625	1.35135	1.10000
12	1.73913	1.59259	1.45161	1.38889	1.12245
13	1.80952	1.60000	1.55172	1.47059	1.17021
14	1.66667	1.52000	1.37931	1.32353	1.04167
15	1.75000	1.58333	1.42857	1.36364	1.06383
16	1.73684	1.52174	1.48148	1.40625	1.11111
17	1.66667	1.50000	1.34615	1.33333	1.02273
18	1.76471	1.57143	1.40000	1.37931	1.04651
19	1.75000	1.50000	1.45833	1.42857	1.07143
20	1.90476	1.72000	1.55172	1.47059	1.22222
21	1.34615	1.33333	1.32353	1.28205	1.10000
22	1.25000	1.25000	1.25000	1.21951	1.05769

Volume/Delay Equation Parameters

Facility Category	A	B	M
High-Capacity Facilities	0.015	3.5	5
Low-Capacity Facilities	0.050	3.0	10

Facility Type Categories for Applying Delay Parameters

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

TDM Hourly Capacity Factors

Facility Type Code	Area Type				
	1	2	3	4	5
	CBD	CBD Fringe	Urban	Suburban	Rural
0	0.10000000	0.10000000	0.10000000	0.10000000	0.10000000
1	0.07525084	0.07266300	0.07446386	0.08098007	0.13869626
3	0.07525084	0.07266300	0.07446386	0.08098007	0.13869626
5	0.09375000	0.09788360	0.09868421	0.11206897	0.12658228
7	0.09375000	0.09390863	0.09328358	0.10317460	0.11173184
9	0.09183673	0.09635417	0.10195652	0.12037037	0.13698630
10	0.07826087	0.07400000	0.07026217	0.07991803	0.11235955
11	0.06111111	0.06315789	0.06500000	0.07837838	0.12307692
12	0.06111111	0.06315789	0.06500000	0.07837838	0.12307692
13	0.06250000	0.06285714	0.06666667	0.08181818	0.12608696
14	0.11000000	0.10909091	0.10416667	0.12727273	0.18750000
15	0.11000000	0.10909091	0.10416667	0.12727273	0.18750000
16	0.10526316	0.11000000	0.10454545	0.12500000	0.19285714
17	0.08421053	0.08095238	0.07826087	0.10000000	0.21000000
18	0.08421053	0.08095238	0.07826087	0.10000000	0.21000000
19	0.07777778	0.07894737	0.07619048	0.10000000	0.23750000
20	0.11000000	0.10909091	0.10416667	0.12727273	0.18125000
21	0.07333333	0.08000000	0.08333333	0.09333333	0.10000000
22	0.07333333	0.08000000	0.08333333	0.09333333	0.10000000

TLM AREA

VMT Adjustment Factors

County	Control Total	TDM VMT[1]	VMT Adjustment Factor
Gregg	4,189,852.00	3,515,549.79	1.191805620
Smith	6,968,786.00	6,046,070.66	1.152614051

[1] Including intrazonal VMT for each counties respective 1998 TDM.

Time-of-Day Travel Periods

Period	Hours
AM Peak	6 a.m. - 9 a.m.
Mid-Day	9 a.m. – 4 p.m.
PM Peak	4 p.m. – 7 p.m.
Overnight	7 p.m. - 6 a.m.

1998 TDM Network Facility Types

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

[1] Centroid Connectors were listed in the model as facility type 0.

Network Area Types

Area Type Code[1]	Area Type Description
1	Central Business District (CBD)
2	Urban
3	Suburban
4	Rural

[1] Area Types are the same for both the Gregg County and Smith County TDMs.

Gregg County TDM AM Peak Directional Splits

Functional Class	Area Types			
	CBD	Urban	Suburban	Rural
Centroid Connector	54.0	85.0	72.0	78.0
Interstate	50.0	60.0	61.0	70.0
Divided Major Highway	65.0	62.0	65.0	71.0
Undivided Major Highway	65.0	62.0	65.0	71.0
Divided Principal Arterial	65.0	62.0	65.0	71.0
Undivided Principal Arterial	65.0	62.0	65.0	71.0
Divided Minor Arterial	58.0	58.0	64.0	68.0
Undivided Minor Arterial	58.0	58.0	64.0	68.0
Divided Collector	64.5	53.0	64.5	75.0
Undivided Collector	64.5	53.0	64.5	75.0

Gregg County TDM Mid-Day Directional Splits

Functional Class	Area Types			
	CBD	Urban	Suburban	Rural
Centroid Connector	54.0	55.0	55.0	52.0
Interstate	51.0	53.0	51.0	53.0
Divided Major Highway	55.0	50.0	57.0	55.0
Undivided Major Highway	55.0	50.0	57.0	55.0
Divided Principal Arterial	55.0	50.0	57.0	55.0
Undivided Principal Arterial	55.0	50.0	57.0	55.0
Divided Minor Arterial	55.0	52.0	56.0	58.0
Undivided Minor Arterial	55.0	52.0	56.0	58.0
Divided Collector	54.5	52.0	57.0	54.0
Undivided Collector	54.5	52.0	57.0	54.0

Gregg County TDM PM Peak Directional Splits

Functional Class	Area Types			
	CBD	Urban	Suburban	Rural
Centroid Connector	55.0	72.0	72.0	71.0
Interstate	54.0	56.0	67.0	65.0
Divided Major Highway	62.0	57.0	60.0	66.0
Undivided Major Highway	62.0	57.0	60.0	66.0
Divided Principal Arterial	62.0	57.0	60.0	66.0
Undivided Principal Arterial	62.0	57.0	60.0	66.0
Divided Minor Arterial	52.0	54.0	65.0	63.0
Undivided Minor Arterial	52.0	54.0	65.0	63.0
Divided Collector	57.5	68.0	62.5	70.0
Undivided Collector	57.5	68.0	62.5	70.0

Gregg County TDM Overnight Directional Splits

Functional Class	Area Types			
	CBD	Urban	Suburban	Rural
Centroid Connector	54.0	55.0	55.0	52.0
Interstate	51.0	53.0	51.0	53.0
Divided Major Highway	55.0	50.0	57.0	55.0
Undivided Major Highway	55.0	50.0	57.0	55.0
Divided Principal Arterial	55.0	50.0	57.0	55.0
Undivided Principal Arterial	55.0	50.0	57.0	55.0
Divided Minor Arterial	55.0	52.0	56.0	58.0
Undivided Minor Arterial	55.0	52.0	56.0	58.0
Divided Collector	54.5	52.0	57.0	54.0
Undivided Collector	54.5	52.0	57.0	54.0

Smith County TDM AM Peak Directional Splits

Functional Class	Area Types			
	CBD	Urban	Suburban	Rural
Centroid Connector	54.0	85.0	72.0	78.0
Freeway	50.0	60.0	61.0	70.0
Divided Circumferential Principal Arterial	65.0	62.0	65.0	71.0
Divided Principal Arterial	65.0	62.0	65.0	71.0
Undivided Principal Arterial	65.0	62.0	65.0	71.0
Divided Minor Arterial	58.0	58.0	64.0	68.0
Undivided Minor Arterial	58.0	58.0	64.0	68.0
Collector	64.5	53.0	64.5	75.0

Smith County TDM Mid-Day and Overnight Directional Splits

Functional Class	Area Types			
	CBD	Urban	Suburban	Rural
Centroid Connector	54.0	55.0	55.0	52.0
Freeway	51.0	53.0	51.0	53.0
Divided Circumferential Principal Arterial	55.0	50.0	57.0	55.0
Divided Principal Arterial	55.0	50.0	57.0	55.0
Undivided Principal Arterial	55.0	50.0	57.0	55.0
Divided Minor Arterial	55.0	52.0	56.0	58.0
Undivided Minor Arterial	55.0	52.0	56.0	58.0
Collector	54.5	52.0	57.0	54.0

Smith County TDM PM Peak Directional Splits

Functional Class	Area Types			
	CBD	Urban	Suburban	Rural
Centroid Connector	54.0	56.0	67.0	65.0
Freeway	62.0	57.0	60.0	66.0
Divided Circumferential Principal Arterial	62.0	57.0	60.0	66.0
Divided Principal Arterial	62.0	57.0	60.0	66.0
Undivided Principal Arterial	52.0	54.0	65.0	63.0
Divided Minor Arterial	52.0	54.0	65.0	63.0
Undivided Minor Arterial	57.5	68.0	62.5	70.0
Collector	55.0	72.0	72.0	71.0

These time-of-day directional split factors were taken from the Technical Note, *Northeast Texas Region On-Road Mobile Source Modeling Emissions Inventories: 1995, 1999, 2002, 2005, 2007, and 2012*, TTI, August 22, 2003.

Gregg County TDM Facility Types Correlated to Functional Classification Groups

Functional Classification Groups	Facility Type Code	Facility Type Name
Interstate	1	Radial IH Freeways - Mainlanes Only
	2	Radial IH Freeways - Mainlanes and Frontage Roads
Divided Major Highway/Undivided Major Highway	7	Circumferential Other Freeways (Loops) - Mainlanes Only
	8	Circumferential Other Freeways (Loops) - Mainlanes and Frontage Roads
	10	Circumferential Expressways (Loops)
Divided Principal Arterial	11	Principal Arterial – Divided
Undivided Principal Arterial	12	Principal Arterial - Continuous Left Turn Lane
	13	Principal Arterial – Undivided
Divided Minor Arterial	14	Minor Arterial – Divided
Undivided Minor Arterial	15	Minor Arterial - Continuous Left Turn Lane
	16	Minor Arterial – Undivided
Undivided Collector	18	Collector - Continuous Left Turn Lane
	19	Collector - Undivided
Centroid Connector	39	Centroid Connector[1]

[1] Centroid Connector has a facility type code of 0 in the TDM.

Smith County TDM Facility Types Correlated to Functional Classification Groups

Functional Classification Groups	Facility Type Code	Facility Type Name
Freeway	1	Radial IH Freeways - Mainlanes Only
	10	Circumferential Expressways (Loops)
Divided Principal Arterial	11	Principal Arterial – Divided
Undivided Principal Arterial	12	Principal Arterial - Continuous Left Turn Lane
	13	Principal Arterial – Undivided
Divided Minor Arterial	14	Minor Arterial – Divided
Undivided Minor Arterial	15	Minor Arterial - Continuous Left Turn Lane
	16	Minor Arterial – Undivided
Undivided Collector	18	Collector - Continuous Left Turn Lane
	19	Collector - Undivided
	20	Frontage Road
Centroid Connector	39	Centroid Connector[1]

[1] Centroid Connector has a facility type code of 0 in the TDM.

Freeflow (Volume=1) Speed Factors[1]

Facility Type	Area Type			
	CBD	Urban	Suburban	Rural
1	0.901639	0.952381	0.984848	1.000000
2	0.901639	0.952381	0.984848	1.000000
3	0.901639	0.952381	0.984848	1.000000
4	0.901639	0.952381	0.984848	1.000000
5	0.901639	0.952381	0.984848	1.000000
6	0.901639	0.952381	0.984848	1.000000
7	0.901639	0.952381	0.984848	1.000000
8	0.901639	0.952381	0.984848	1.000000
9	1.363636	1.282051	1.100000	0.937500
10	1.363636	1.282051	1.100000	0.937500
11	1.379310	1.153846	1.000000	0.982143
12	1.379310	1.153846	1.000000	0.982143
13	1.407407	1.250000	1.086957	1.100000
14	1.346154	1.142857	1.046512	1.020408
15	1.346154	1.142857	1.046512	1.020408
16	1.375000	1.250000	1.125000	1.086957
17	1.764706	1.250000	1.142857	1.125000
18	1.764706	1.250000	1.142857	1.125000
19	1.647059	1.250000	1.142857	1.125000
20	2.312139	1.863354	1.661130	0.981968
21	2.023121	1.863354	1.661130	0.981968
22	2.023121	1.863354	1.661130	0.981968

[1] The same speed factors were used for both the Gregg County and Smith County TDMs.

Volume/Delay Equation Parameters

Facility Category	A	B	M
High-Capacity Facilities	0.015	3.5	5
Low-Capacity Facilities	0.050	3.0	10

Facility Type Categories for Applying Delay Parameters

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

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

Capacity Factors[1]

Facility Type	Area Type			
	CBD	Urban	Suburban	Rural
1	0.093750	0.101902	0.116766	0.143885
2	0.093750	0.101902	0.116766	0.143885
3	0.093750	0.101902	0.116766	0.143885
4	0.093750	0.101902	0.116766	0.143885
5	0.093750	0.101902	0.116766	0.143885
6	0.093750	0.101902	0.116766	0.143885
7	0.093750	0.101902	0.116766	0.143885
8	0.093750	0.101902	0.116766	0.143885
9	0.091837	0.101957	0.120370	0.163934
10	0.091837	0.093800	0.105978	0.133333
11	0.073333	0.091549	0.116935	0.173913
12	0.073333	0.091549	0.116935	0.173913
13	0.074627	0.093750	0.120536	0.172619
14	0.084615	0.102459	0.129630	0.187500
15	0.084615	0.102459	0.129630	0.187500
16	0.084746	0.102679	0.125000	0.177632
17	0.080000	0.095745	0.119048	0.169355
18	0.080000	0.095745	0.119048	0.169355
19	0.087500	0.105263	0.132353	0.182692
20	0.084615	0.102459	0.129630	0.181250
21	0.073333	0.083333	0.093333	0.100000
22	0.073333	0.083333	0.093333	0.100000

[1] The same capacity factors were used for both the Gregg County and Smith County TDMs.

APPENDIX G:
HOURLY TRAVEL FRACTIONS

TLM Summer Weekday Hourly Travel Factors – Average July through September

Hour	Atlanta District	Tyler District
12:00 a.m.	0.014579	0.008213
1:00 a.m.	0.012097	0.005442
2:00 a.m.	0.010782	0.004810
3:00 a.m.	0.010287	0.004997
4:00 a.m.	0.011709	0.008760
5:00 a.m.	0.018913	0.020498
6:00 a.m.	0.032788	0.044919
7:00 a.m.	0.048261	0.071626
8:00 a.m.	0.047516	0.054727
9:00 a.m.	0.048925	0.049407
10:00 a.m.	0.052622	0.050235
11:00 a.m.	0.058379	0.051387
12:00 p.m.	0.061797	0.054705
1:00 p.m.	0.062199	0.056731
2:00 p.m.	0.063765	0.061315
3:00 p.m.	0.067627	0.068414
4:00 p.m.	0.069077	0.076419
5:00 p.m.	0.072433	0.086703
6:00 p.m.	0.060198	0.064949
7:00 p.m.	0.049417	0.047791
8:00 p.m.	0.041773	0.039267
9:00 p.m.	0.035527	0.030821
10:00 p.m.	0.027962	0.022486
11:00 p.m.	0.021365	0.015378

HGB Summer Weekday Hourly Travel Factors – Average July through September

To maintain VMT proportions within each of the four assignment time periods (including those proportions produced specifically for the weekend day types as described previously), the hourly fractions were normalized within each time period. The hourly fractions that were applied in this analysis are shown below.

Assignment	Hour	Hourly Travel Factor
AM Peak	6:00 a.m.	0.319298
	7:00 a.m.	0.369771
	8:00 a.m.	0.310931
Mid-Day	9:00 a.m.	0.160089
	10:00 a.m.	0.155494
	11:00 a.m.	0.162679
	12:00 p.m.	0.168526
	1:00 p.m.	0.171821
	2:00 p.m.	0.181391
PM Peak	3:00 p.m.	0.235669
	4:00 p.m.	0.259585
	5:00 p.m.	0.277276
	6:00 p.m.	0.227470
Overnight	7:00 p.m.	0.209087
	8:00 p.m.	0.161993
	9:00 p.m.	0.142812
	10:00 p.m.	0.113405
	11:00 p.m.	0.076942
	12:00 a.m.	0.042879
	1:00 a.m.	0.028511
	2:00 a.m.	0.026170
	3:00 a.m.	0.024880
	4:00 a.m.	0.042682
	5:00 a.m.	0.130639

District Hourly Travel Factors – Average June through August Weekday

	Wk1 Hr01	Wk1 Hr02	Wk1 Hr03	Wk1 Hr04	Wk1 Hr05	Wk1 Hr06	Wk1 Hr07	Wk1 Hr08	Wk1 Hr09	Wk1 Hr10	Wk1 Hr11	Wk1 Hr12
Abilene	0.015505	0.012699	0.011214	0.010700	0.012278	0.017125	0.029938	0.049636	0.048998	0.051967	0.055104	0.057422
Amarillo	0.016894	0.012364	0.010257	0.009745	0.012526	0.019585	0.034888	0.052078	0.047043	0.051116	0.053561	0.055970
Atlanta	0.014890	0.012279	0.010932	0.010356	0.011745	0.018963	0.032811	0.046932	0.047005	0.049390	0.053265	0.058744
Austin	0.011900	0.008084	0.007375	0.005801	0.007446	0.019158	0.050788	0.066700	0.060882	0.053812	0.050030	0.054060
Beaumont	0.011181	0.008346	0.007329	0.007243	0.011747	0.025560	0.043889	0.057981	0.050568	0.049105	0.052330	0.056864
Brownwood	0.006572	0.004561	0.003706	0.003885	0.007950	0.018509	0.034226	0.052536	0.052656	0.054903	0.059026	0.061998
Bryan	0.011484	0.008628	0.007831	0.008143	0.010786	0.017164	0.031486	0.053893	0.050076	0.050279	0.053635	0.059943
Childress	0.019443	0.016624	0.014717	0.013457	0.013807	0.015977	0.022877	0.032914	0.042460	0.052092	0.059201	0.062471
Corpus Christi	0.008640	0.005559	0.004989	0.003924	0.006511	0.016821	0.042725	0.067013	0.058899	0.049980	0.050953	0.057080
Dallas	0.011814	0.007848	0.007032	0.006654	0.010179	0.027322	0.055798	0.066450	0.058890	0.050730	0.048512	0.050701
El Paso	0.010441	0.006887	0.005965	0.005098	0.007373	0.019046	0.042436	0.071218	0.062280	0.051824	0.051459	0.055706
Fort Worth	0.009838	0.006018	0.005523	0.004611	0.007163	0.020446	0.050458	0.069515	0.060159	0.049397	0.048602	0.052797
Houston	0.009850	0.006505	0.005922	0.005580	0.009515	0.028933	0.060272	0.069658	0.058230	0.050898	0.049588	0.051816
Laredo	0.016633	0.012234	0.010324	0.009221	0.010766	0.016361	0.031108	0.047413	0.049710	0.050495	0.053447	0.056035
Lubbock	0.009730	0.006413	0.005154	0.004849	0.006523	0.013551	0.032074	0.068968	0.057314	0.054070	0.053794	0.055306
Lufkin	0.009786	0.007169	0.006427	0.006973	0.010634	0.019010	0.035541	0.059890	0.052228	0.053461	0.056017	0.060141
Odessa	0.009388	0.006502	0.005585	0.005282	0.007791	0.016734	0.040999	0.070823	0.059354	0.051964	0.051915	0.055220
Paris	0.014260	0.011210	0.009842	0.010681	0.014168	0.021340	0.034318	0.048704	0.048894	0.053152	0.058327	0.059754
Pharr	0.010609	0.006320	0.005230	0.004170	0.005962	0.013076	0.031951	0.058756	0.055591	0.051978	0.053815	0.058221
San Angelo	0.015245	0.011783	0.009753	0.009138	0.010393	0.015038	0.027488	0.048147	0.049424	0.052771	0.056940	0.060492
San Antonio	0.010219	0.006504	0.005734	0.004775	0.006964	0.016913	0.048904	0.073045	0.060122	0.049031	0.048556	0.052907
Tyler	0.008557	0.005640	0.004903	0.005130	0.008726	0.020584	0.044697	0.067872	0.054183	0.049509	0.050921	0.052081
Waco	0.015992	0.012460	0.010694	0.010451	0.012292	0.019200	0.033027	0.050154	0.046724	0.047905	0.052604	0.057029
Wichita Falls	0.010899	0.007845	0.006663	0.005786	0.007575	0.015750	0.037923	0.059056	0.049957	0.047715	0.051825	0.058299
Yoakum	0.013820	0.010890	0.009847	0.010055	0.012739	0.019023	0.033322	0.049769	0.048328	0.050359	0.055478	0.059014

	Wk1 Hr13	Wk1 Hr14	Wk1 Hr15	Wk1 Hr16	Wk1 Hr17	Wk1 Hr18	Wk1 Hr19	Wk1 Hr20	Wk1 Hr21	Wk1 Hr22	Wk1 Hr23	Wk1 Hr24
Abilene	0.059129	0.061795	0.064053	0.066272	0.068900	0.073134	0.060709	0.047958	0.041068	0.034919	0.028232	0.021246
Amarillo	0.057466	0.060448	0.064465	0.068324	0.073535	0.070687	0.058734	0.046142	0.039074	0.034080	0.028161	0.022858
Atlanta	0.062152	0.062575	0.063757	0.066874	0.068642	0.071857	0.059709	0.049124	0.042059	0.036092	0.028238	0.021612
Austin	0.056786	0.057686	0.059062	0.063870	0.065962	0.065700	0.061622	0.049404	0.039401	0.035925	0.028469	0.020076
Beaumont	0.059864	0.060965	0.062915	0.069101	0.073485	0.075534	0.058225	0.045423	0.038109	0.032460	0.024077	0.017698
Brownwood	0.063770	0.067061	0.070125	0.073379	0.076134	0.080299	0.063531	0.045140	0.036664	0.029178	0.021399	0.012793
Bryan	0.064647	0.065204	0.065494	0.067776	0.070644	0.078002	0.060961	0.048901	0.040628	0.032674	0.024725	0.016997
Childress	0.062751	0.063927	0.065723	0.066982	0.066128	0.063379	0.056771	0.049521	0.043328	0.037539	0.032077	0.025834
Corpus Christi	0.060373	0.060656	0.061468	0.067232	0.076067	0.088039	0.062022	0.044313	0.036137	0.030921	0.023737	0.015939
Dallas	0.053086	0.054484	0.057403	0.062778	0.067665	0.070465	0.061319	0.048056	0.038691	0.035178	0.028475	0.020470
El Paso	0.058483	0.059555	0.061867	0.068166	0.072480	0.074690	0.057339	0.043875	0.036551	0.032868	0.026311	0.018082
Fort Worth	0.056213	0.056338	0.058563	0.067316	0.077255	0.083823	0.063766	0.044659	0.034675	0.030756	0.024910	0.017199
Houston	0.053679	0.054735	0.057610	0.063471	0.069780	0.074741	0.061103	0.046194	0.035952	0.032468	0.025854	0.017645
Laredo	0.057919	0.059466	0.060006	0.062681	0.065677	0.069545	0.062777	0.053723	0.047261	0.040767	0.031768	0.024661
Lubbock	0.057219	0.059365	0.062046	0.066219	0.073309	0.084249	0.065940	0.047727	0.038251	0.034267	0.026429	0.017232
Lufkin	0.063284	0.065278	0.067365	0.071094	0.073491	0.077355	0.056963	0.042923	0.036352	0.030456	0.022579	0.015582
Odessa	0.056836	0.059997	0.060981	0.064645	0.072017	0.088383	0.064650	0.045478	0.035178	0.030360	0.023742	0.016175
Paris	0.060828	0.062354	0.064400	0.066311	0.068422	0.069673	0.057038	0.047013	0.039448	0.032883	0.026564	0.020417
Pharr	0.061549	0.062457	0.064262	0.068416	0.073232	0.080265	0.063577	0.049204	0.040772	0.035136	0.026451	0.019000
San Angelo	0.061529	0.063919	0.065209	0.066569	0.069213	0.070836	0.059536	0.049287	0.042095	0.035234	0.028275	0.021686
San Antonio	0.055286	0.056719	0.059371	0.066281	0.075126	0.079373	0.062313	0.045566	0.037308	0.033783	0.026518	0.018685
Tyler	0.055739	0.057580	0.061271	0.067942	0.075500	0.086213	0.064722	0.047629	0.039499	0.032293	0.023123	0.015686
Waco	0.059315	0.061864	0.064961	0.067062	0.069069	0.070626	0.057942	0.049428	0.043184	0.036449	0.029103	0.022466
Wichita Falls	0.062943	0.061304	0.063266	0.070241	0.076120	0.078303	0.060010	0.047854	0.040855	0.034746	0.026323	0.018741
Yoakum	0.060558	0.062443	0.064678	0.066523	0.068967	0.072018	0.058574	0.048676	0.042976	0.035345	0.027047	0.019550

APPENDIX H:
TEXAS COUNTIES BY CLIMATE ZONE AND METEOROLOGICAL INPUTS TO MOBILE6

Notes on weather inputs: All of the weather inputs used are the same as the inputs used in the Texas 2008 annual CERR (CAP) EIs.

The table below and the list of Texas counties by eight climate zones (or eight weather stations), provide the key to use of meteorological inputs by county. The "Summer Season Data" and "Monthly Data" columns provide information on the source of data and method used to produce the inputs for the summer weekday and annual steps in the emissions analysis. Note that the "Monthly Data" column shows "2005" for all counties – "2005" signifies that the meteorological inputs were developed with 2005 data, following a method requiring data from all days in the modeling period (i.e., month, or in the case of summer season, three-month period). Under "Summer Season Data," note that one of two methods were used, depending on the area, i.e., "Vol. IV," or "2005." Inputs for the areas labeled as "Vol. IV" are consistent with the meteorological data used in the two prior three year cycle EIs, and were developed based on guidance in *Procedures for Emissions Inventory Preparation, Volume IV: Mobile Sources* (EPA, 1992). The "Vol. IV" method employs weather station data from the 10 highest unique ozone concentration days from the three month peak ozone season over a three or four year period.

Key to use of Meteorological Inputs by County

Area	Weather Station[1]	Monthly Data[2]	Summer Season Data[3]
1. HGB 8-County NAA	IAH	2005	Vol. IV
2. BPA 3-County NAA	BPT	2005	Vol. IV
3. El Paso County Maintenance Area	ELP	2005	2005
4. AUS 5-County EAC Area	AUS	2005	Vol. IV
5. SAN 5-County Area[4]	SAT	2005	Vol. IV
6. TLM 5-County EAC Area	GGG	2005	Vol. IV
7. DFW 9-County NAA	DFW	2005	2005
8. Remainder of Texas (218 counties within eight climate zones)	AMA, CRP, DFW, ELP, IAH, LBB, MAF, SAT	2005	2005

[1] Weather station call sign. Each weather station is located at an international airport. Weather station information (e.g., station location, service information) may be found using the call sign and the station locator search feature at http://www.ncdc.noaa.gov/oa/climate/stationlocator.html. The counties grouped by climate zone (last row of table) are listed in the following section.

[2] Monthly inputs for all counties were based on 2005 hourly weather observation data from all days in each month.

[3] Summer season meteorological inputs for all counties were based on the 2005 hourly weather observation data from all days in the seasonal period, except for counties in the areas listed as "Vol. IV," which signifies use of the method requiring use of weather data coinciding with an area's 10 highest ozone exceedance (or concentration) days over a multi-year period (generally three years).

[4] Kendall, although not a part or the San Antonio EAC area, is part of the recently geographically-expanded San Antonio Regional travel model domain (which includes five counties: Kendall and the four San Antonio EAC counties), and was included in the San Antonio area for emissions modeling as well.

The HGB and BPA ozone or summer season Vol. IV-method-based inputs were originally developed as described in *Houston/Galveston One-Hour Ozone Nonattainment Area Rate-of-Progress On-Road Mobile Source Emissions Inventories Revisions* (TTI, August 2004), and *Rate-of-Progress On-Road Mobile Source Emissions Inventories For the Beaumont/Port Arthur Nonattainment Area* (TTI, August 2003), respectively. The AUS, SAN, and TLM area summer season Vol. IV-method-based inputs were originally developed as described in the documents *2002 Three-Year Cycle Emissions Inventory Methodology for the Austin Early Action Compact Counties, 2002 Three-Year Cycle Emissions Inventory Methodology for the San Antonio Early Action Compact Counties,* and *2002 Three-Year Cycle Emissions Inventory Methodology for the Northeast Texas Early Action Compact Counties* (TTI, August 2003).

Texas Counties by Climate Zone*

C1 – Amarillo (AMA)
Armstrong
Briscoe
Carson
Castor
Childress
Collingsworth
Dallam
Deaf Smith
Donley
Gray
Hall
Hansford
Hartley
Hemphill
Hutchinson
Lipscomb
Moore
Ochiltree
Oldham
Parmer
Potter
Randall
Roberts
Sherman
Swisher
Wheeler

C2- Corpus Christi (CRP)
Aransas
Bee
Brooks
Calhoun
Cameron
DeWitt
Duval
Goliad
Hidalgo
Jackson
Jimm Hogg
Jim Wells
Karnes
Kenedy
Lavaca
Live Oak
McMullen
Nueces
Refugio
San Patricio
Starr
Victoria
Zapata

C3 – Dallas (DFW)
Anderson
Angelina
Bosque
Bowie
Camp
Cass
Cherokee
Clay
Collin
Comanche
Cooke
Dallas
Delta
Denton
Ellis
Erath
Falls
Fannin
Franklin
Freestone
Grayson
Gregg
Hamilton
Harrison
Henderson
Hill
Hood
Hopkins
Hunt
Jack
Johnson
Kaufman
Lamar
Limestone
Marion
McLennan
Montague
Morris
Nacogdoches
Navarro
Palo Pinto
Panola
Parker
Rains
Red river
Rockwall
Rusk
Sabine
San Augustine
Shelby
Smith
Somervell
Tarrant
Titus
Upshur
Van Zandt
Wise
Wood

C-4 El Paso (ELP)
El Paso
Hudspeth

C-5 Houston (IAH)
Austin
Brazoria
Brazos
Chambers
Colorado
Fort Bend
Galveston
Grimes
Hardin
Harris
Houston
Jasper
Jefferson
Leon
Liberty
Madison
Matagorda
Montgomery
Newton
Orange
Polk
Robertson
San Jacinto
Trinity
Tyler
Walker
Waller
Wharton

C-6 Lubbock (LBB)
Andrews
Archer
Bailey
Baylor
Borden
Callahan
Cochran
Cottle
Crosby
Dawson
Dickens
Eastland
Fisher
Floyd
Foard
Gaines
Garza
Hale
Hardeman
Haskell
Hockley
Howard
Jones
Kent
King
Knox
Lamb
Lubbock
Lynn
Martin
Mitchell
Motley
Nolan
Scurry
Shackelford
Stephens
Stonewall
Taylor
Terry
Throckmorton
Wichita
Wilbarger
Yoakum
Young

C-7 Midland (MAF)
Brewster
Brown
Coke
Coleman
Concho
Crane
Crockett
Culberson
Ector
Edwards
Glasscock
Irion
Jeff Davis
Kimble
Loving
McCulloch
Menard
Midland
Pecos
Presidio
Reagan
Real
Reeves
Runnels
Schleicher
Sterlling
Sutton
Terrell
Tom Green
Upton
Val Verde
Ward
Winkler

C-8 San Antonio (SAT)
Atascosa
Bandera
Bastrop
Bell
Bexar
Blanco
Burleson
Burnet
Caldwell
Comal
Coryell
Dimmit
Fayette
Frio
Gillespie
Gonzales
Guadalupe
Hays
Kendall
Kerr
Kinney
Lampasas
La Salle
Lee
Llano
Mason
Maverick
Medina
Milam
Mills
San Saba
Travis
Uvalde
Washington
Webb
Williamson
Wilson
Zavala

* AMA, CRP, DFW, ELP, IAH, LBB, MAF, SAT are the weather station call signs. Each is located at an international airport. Weather station information (e.g., station location, service information) may be found using the call sign and the station locator search feature at http://www.ncdc.noaa.gov/oa/climate/stationlocator.html.

Meteorological Inputs to MOBILE6

The meteorological inputs (temperature in degrees Fahrenheit, percent relative humidity, and barometric pressures in inches of Mercury) for Appendix H are provided electronically (see electronic data submittal description in Appendix A).

APPENDIX I:
TXDOT DISTRICT VEHICLE REGISTRATION DISTRIBUTIONS AND STATEWIDE DIESEL FRACTIONS

County-level age distributions for the 27 region-method-based county emissions factors produced by TTI were provided in electronic form (see file descriptions in Appendix A).

Abilene District Registration Distributions

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* Calculated from district mid-year (July) 2008 registrations data
* All vehicle class distributions, except HDV8B and MOBILE6 defaults, were based on aggregate
Abilene District data
* Abilene District Counties: Borden, Callahan, Fisher, Haskell, Howard, Jones, Kent, Mitchell,
Nolan, Scurry, Shackelford, Stonewall, and Taylor.
* HDV8b vehicle class distribution was based on aggregate statewide data
* LDV
       1 0.04012 0.07152 0.07246 0.07675 0.07096 0.06894 0.07136 0.06723 0.06620 0.05784 0.04714
0.04294 0.03546 0.03708 0.02812 0.02481 0.02035 0.01738 0.01420 0.01217 0.00829 0.00610 0.00602
0.00529 0.03127
* LDT1
       2 0.02812 0.04704 0.05350 0.05577 0.05909 0.06780 0.06878 0.07029 0.06514 0.05216 0.04886
0.04940 0.03754 0.03853 0.03945 0.02680 0.02285 0.02204 0.01822 0.01634 0.01371 0.00803 0.01175
0.00999 0.06880
* LDT2
       3 0.02812 0.04704 0.05350 0.05577 0.05909 0.06780 0.06878 0.07029 0.06514 0.05216 0.04886
0.04940 0.03754 0.03853 0.03945 0.02680 0.02285 0.02204 0.01822 0.01634 0.01371 0.00803 0.01175
0.00999 0.06880
* LDT3
       4 0.09091 0.14575 0.09272 0.08493 0.10210 0.07986 0.06858 0.07012 0.04475 0.04774 0.02532
0.03270 0.02138 0.01821 0.01169 0.01164 0.00793 0.00707 0.00408 0.00498 0.00371 0.00195 0.00326
0.00281 0.01581
* LDT4
       5 0.09091 0.14575 0.09272 0.08493 0.10210 0.07986 0.06858 0.07012 0.04475 0.04774 0.02532
0.03270 0.02138 0.01821 0.01169 0.01164 0.00793 0.00707 0.00408 0.00498 0.00371 0.00195 0.00326
0.00281 0.01581
* HDV2b
       6 0.15202 0.13297 0.16535 0.13900 0.10346 0.06284 0.04157 0.05078 0.03078 0.02571 0.01777
0.01904 0.00793 0.00825 0.00349 0.00286 0.00413 0.00127 0.00222 0.00349 0.00349 0.00127 0.00222
0.00222 0.01587
* HDV3
       7 0.10745 0.10746 0.09403 0.05672 0.05373 0.08657 0.04925 0.05970 0.04925 0.05970 0.03134
0.03433 0.02239 0.02239 0.02239 0.01791 0.01493 0.01194 0.01045 0.01045 0.00896 0.00448 0.00149
0.00299 0.05970
* HDV4
       8 0.10377 0.11322 0.06604 0.05660 0.02830 0.05660 0.03774 0.04245 0.06132 0.06132 0.04245
0.04717 0.03302 0.03302 0.02358 0.01887 0.00000 0.01415 0.04245 0.00000 0.01415 0.00472 0.00000
0.00000 0.09906
* HDV5
       9 0.09783 0.07609 0.10870 0.05978 0.01087 0.03261 0.07065 0.02717 0.04348 0.02717 0.02174
0.04348 0.01630 0.01630 0.01630 0.00000 0.00543 0.03261 0.01630 0.02717 0.04348 0.02174 0.01630
0.02174 0.14676
* HDV6
      10 0.02331 0.08051 0.02331 0.04661 0.02542 0.02754 0.02331 0.04025 0.04449 0.08263 0.05297
0.05085 0.03178 0.04025 0.03390 0.02754 0.02754 0.03814 0.03390 0.01483 0.02119 0.01059 0.02331
0.02119 0.15464
* HDV7
      11 0.00727 0.07636 0.04727 0.02909 0.02182 0.03273 0.02545 0.03273 0.03636 0.10184 0.06909
0.04000 0.04000 0.07636 0.04364 0.04000 0.02182 0.02909 0.01818 0.02909 0.01091 0.01091 0.03636
0.02545 0.09818
* HDV8a
      12 0.01499 0.03212 0.03212 0.01713 0.02998 0.01713 0.02570 0.03212 0.04497 0.04925 0.05353
0.03640 0.05139 0.08565 0.06424 0.04925 0.02784 0.03854 0.02570 0.03854 0.02998 0.01071 0.02570
0.02570 0.14132
* HDV8b
      13 0.04990 0.14013 0.10871 0.09153 0.04383 0.05321 0.03327 0.06460 0.09722 0.08179 0.04999
0.03611 0.03143 0.03281 0.02362 0.01682 0.00505 0.00680 0.00524 0.00625 0.00331 0.00303 0.00239
0.00276 0.01020
*   HDBS is MOBILE6 default
*   HDBT is MOBILE6 default
* MC
      16 0.10618 0.12873 0.11036 0.08400 0.05927 0.07273 0.06545 0.05782 0.04582 0.03455 0.02545
0.02309 0.02055 0.01455 0.01200 0.00782 0.00945 0.00455 0.00509 0.00673 0.00382 0.00509 0.00945
0.00927 0.07818
```

Amarillo District Registration Distributions

```
* Calculated from district mid-year (July) 2008 registrations data
* All vehicle class distributions, except HDV8B and MOBILE6 defaults, were based on aggregate
Amarillo District data
* Amarillo District Counties: Armstrong, Carson, Dallam, Deaf Smith, Gray, Hansford, Hartley,
Hemphill, Hutchinson, Lipscomb, Moore, Ochiltree, Oldham, Potter, Randall, Roberts, and Sherman.
* HDV8b vehicle class distribution was based on aggregate statewide data
* LDV
       1 0.03533 0.06175 0.06150 0.06544 0.06427 0.06578 0.06660 0.06750 0.07143 0.06654 0.05380
0.04967 0.03951 0.04120 0.03264 0.02814 0.02220 0.01894 0.01588 0.01323 0.00928 0.00739 0.00614
0.00582 0.03002
* LDT1
       2 0.01441 0.02513 0.03962 0.04026 0.04799 0.05764 0.06965 0.07091 0.06691 0.06020 0.06024
0.06009 0.04266 0.04519 0.04702 0.03372 0.02583 0.02325 0.01972 0.02091 0.01656 0.01187 0.01400
0.01156 0.07466
* LDT2
       3 0.01441 0.02513 0.03962 0.04026 0.04799 0.05764 0.06965 0.07091 0.06691 0.06020 0.06024
0.06009 0.04266 0.04519 0.04702 0.03372 0.02583 0.02325 0.01972 0.02091 0.01656 0.01187 0.01400
0.01156 0.07466
* LDT3
       4 0.06851 0.11004 0.08382 0.08283 0.10612 0.08469 0.07766 0.07397 0.05202 0.06046 0.02782
0.03873 0.02301 0.02083 0.01444 0.01277 0.00927 0.00732 0.00581 0.00709 0.00523 0.00231 0.00398
0.00311 0.01816
* LDT4
       5 0.06851 0.11004 0.08382 0.08283 0.10612 0.08469 0.07766 0.07397 0.05202 0.06046 0.02782
0.03873 0.02301 0.02083 0.01444 0.01277 0.00927 0.00732 0.00581 0.00709 0.00523 0.00231 0.00398
0.00311 0.01816
* HDV2b
       6 0.13801 0.11230 0.13352 0.15099 0.08660 0.06838 0.05515 0.05490 0.02970 0.03868 0.02021
0.01647 0.01148 0.01373 0.00649 0.00948 0.00649 0.00524 0.00649 0.00349 0.00524 0.00175 0.00225
0.00200 0.02096
* HDV3
       7 0.06293 0.09310 0.10085 0.06293 0.05517 0.05862 0.05345 0.07069 0.05345 0.06638 0.01379
0.03362 0.01897 0.03103 0.02759 0.01897 0.01552 0.01466 0.01293 0.00862 0.00776 0.00776 0.00948
0.00690 0.09483
* HDV4
       8 0.04932 0.09589 0.06575 0.04658 0.06027 0.07671 0.04384 0.07945 0.05479 0.06301 0.03288
0.03836 0.02466 0.02466 0.02740 0.01370 0.00548 0.01096 0.00822 0.00548 0.00548 0.00548 0.00548
0.00274 0.15341
* HDV5
       9 0.09639 0.06024 0.12349 0.04819 0.04819 0.03916 0.03012 0.03614 0.03614 0.06325 0.03614
0.01807 0.01205 0.03012 0.01506 0.00301 0.00602 0.01807 0.02108 0.01807 0.00904 0.00602 0.02711
0.00904 0.18979
* HDV6
      10 0.01481 0.04296 0.05333 0.05630 0.03852 0.02815 0.03259 0.07556 0.06370 0.05481 0.03704
0.02222 0.03704 0.02222 0.01926 0.01778 0.02074 0.02963 0.02370 0.01630 0.01333 0.01481 0.02222
0.01481 0.22817
* HDV7
      11 0.02096 0.03593 0.04790 0.02994 0.02395 0.01198 0.03593 0.02395 0.03892 0.04790 0.05090
0.04192 0.05090 0.04790 0.06287 0.03293 0.02695 0.04790 0.05090 0.01796 0.01497 0.02096 0.01198
0.04192 0.16168
* HDV8a
      12 0.03402 0.03107 0.03846 0.03107 0.01036 0.01183 0.01923 0.02959 0.05325 0.04586 0.02811
0.04142 0.04586 0.03698 0.04438 0.06213 0.02071 0.03254 0.03994 0.01923 0.01479 0.01479 0.01923
0.03550 0.23965
* HDV8b
      13 0.04990 0.14013 0.10871 0.09153 0.04383 0.05321 0.03327 0.06460 0.09722 0.08179 0.04999
0.03611 0.03143 0.03281 0.02362 0.01682 0.00505 0.00680 0.00524 0.00625 0.00331 0.00303 0.00239
0.00276 0.01020
*   HDBS is MOBILE6 default
*   HDBT is MOBILE6 default
* MC
      16 0.07278 0.10269 0.09415 0.08887 0.06269 0.08178 0.07085 0.06389 0.05500 0.04527 0.03194
0.02558 0.02030 0.01717 0.01489 0.01033 0.00901 0.00576 0.00648 0.00540 0.00540 0.00673 0.00865
0.01117 0.08322
```

Atlanta District Registration Distributions

```
* Calculated from district mid-year (July) 2008 registrations data
* All vehicle class distributions, except HDV8B and MOBILE6 defaults, were based on aggregate
Atlanta District data
* Atlanta District Counties: Bowie, Camp, Cass, Harrison, Marion, Morris, Panola, Titus, and
Upshur.
* HDV8b vehicle class distribution was based on aggregate statewide data
* LDV
       1 0.04218 0.07210 0.07243 0.07825 0.07110 0.06918 0.06788 0.06494 0.06474 0.06019 0.05014
0.04387 0.03871 0.03987 0.03016 0.02535 0.02069 0.01609 0.01330 0.01130 0.00868 0.00598 0.00509
0.00481 0.02297
* LDT1
       2 0.02056 0.03768 0.04572 0.04731 0.05515 0.06198 0.06617 0.07252 0.06303 0.05300 0.05532
0.05485 0.04515 0.04900 0.04479 0.03100 0.02613 0.02321 0.01860 0.01928 0.01473 0.01079 0.01331
0.01147 0.05925
* LDT2
       3 0.02056 0.03768 0.04572 0.04731 0.05515 0.06198 0.06617 0.07252 0.06303 0.05300 0.05532
0.05485 0.04515 0.04900 0.04479 0.03100 0.02613 0.02321 0.01860 0.01928 0.01473 0.01079 0.01331
0.01147 0.05925
* LDT3
       4 0.07672 0.13252 0.09705 0.08442 0.10883 0.07642 0.06279 0.07188 0.04886 0.05092 0.02428
0.03535 0.02517 0.02268 0.01414 0.01279 0.00795 0.00749 0.00585 0.00556 0.00332 0.00236 0.00396
0.00354 0.01515
* LDT4
       5 0.07672 0.13252 0.09705 0.08442 0.10883 0.07642 0.06279 0.07188 0.04886 0.05092 0.02428
0.03535 0.02517 0.02268 0.01414 0.01279 0.00795 0.00749 0.00585 0.00556 0.00332 0.00236 0.00396
0.00354 0.01515
* HDV2b
       6 0.13894 0.12696 0.14947 0.12818 0.10592 0.08341 0.05259 0.06238 0.03523 0.03107 0.02226
0.01614 0.00685 0.00587 0.00391 0.00318 0.00220 0.00416 0.00245 0.00171 0.00196 0.00171 0.00098
0.00171 0.01076
* HDV3
       7 0.15334 0.12048 0.14348 0.05586 0.05915 0.04710 0.05257 0.05257 0.05038 0.04272 0.02081
0.04162 0.01205 0.01862 0.01424 0.02300 0.00986 0.01533 0.01095 0.00876 0.00329 0.00110 0.00548
0.00329 0.03395
* HDV4
       8 0.06548 0.05952 0.10714 0.04167 0.02976 0.03571 0.04167 0.04167 0.11907 0.05357 0.02976
0.05357 0.03571 0.04762 0.02381 0.02381 0.03571 0.03571 0.02381 0.00595 0.00595 0.00595 0.00595
0.00595 0.06548
* HDV5
       9 0.03243 0.07027 0.10270 0.09189 0.07568 0.08108 0.02703 0.07568 0.04865 0.04324 0.00541
0.01081 0.01081 0.05405 0.02162 0.01081 0.02162 0.01622 0.01081 0.02703 0.01622 0.00541 0.01622
0.01081 0.11350
* HDV6
      10 0.01244 0.04975 0.04726 0.05224 0.03483 0.06219 0.03731 0.03980 0.07214 0.03731 0.06219
0.03483 0.04478 0.04229 0.03980 0.04478 0.03234 0.03731 0.02488 0.02488 0.02488 0.01493 0.00249
0.02488 0.09947
* HDV7
      11 0.01227 0.06748 0.13502 0.03681 0.02454 0.04908 0.04294 0.03681 0.04908 0.05521 0.04908
0.06748 0.05521 0.03067 0.00613 0.02454 0.01840 0.03681 0.04294 0.01840 0.01227 0.01227 0.02454
0.02454 0.06748
* HDV8a
      12 0.01688 0.04641 0.04219 0.01688 0.00844 0.01266 0.02110 0.02954 0.02532 0.05485 0.08017
0.04641 0.04219 0.05485 0.07173 0.03376 0.02110 0.03797 0.02954 0.05063 0.01688 0.00844 0.04641
0.04641 0.13924
* HDV8b
      13 0.04990 0.14013 0.10871 0.09153 0.04383 0.05321 0.03327 0.06460 0.09722 0.08179 0.04999
0.03611 0.03143 0.03281 0.02362 0.01682 0.00505 0.00680 0.00524 0.00625 0.00331 0.00303 0.00239
0.00276 0.01020
*   HDBS is MOBILE6 default
*   HDBT is MOBILE6 default
* MC
      16 0.06768 0.14179 0.12252 0.11146 0.07560 0.08262 0.06335 0.05424 0.04408 0.03272 0.02913
0.02256 0.02062 0.01584 0.01150 0.01001 0.00837 0.00523 0.00553 0.00493 0.00523 0.00508 0.00732
0.00747 0.04512
```

Austin District Registration Distributions

```
* Calculated from district mid-year (July) 2008 registrations data
* All vehicle class distributions, except HDV8B and MOBILE6 defaults, were based on aggregate
Austin District data
* Austin District Counties: Bastrop, Blanco, Burnet, Caldwell, Gillespie, Hays, Lee, Llano,
Mason, Travis, and Williamson.
* HDV8b vehicle class distribution was based on aggregate statewide data
* LDV
       1 0.06283 0.08319 0.07939 0.08011 0.07650 0.07501 0.07482 0.07203 0.06869 0.05869 0.04719
0.04043 0.03134 0.03146 0.02349 0.01946 0.01498 0.01241 0.00961 0.00691 0.00503 0.00373 0.00316
0.00278 0.01676
* LDT1
       2 0.02606 0.04290 0.05112 0.05180 0.06081 0.07758 0.08844 0.08617 0.07810 0.06401 0.05763
0.05233 0.03771 0.03783 0.03661 0.02551 0.01818 0.01496 0.01278 0.01215 0.00913 0.00630 0.00770
0.00654 0.03765
* LDT2
       3 0.02606 0.04290 0.05112 0.05180 0.06081 0.07758 0.08844 0.08617 0.07810 0.06401 0.05763
0.05233 0.03771 0.03783 0.03661 0.02551 0.01818 0.01496 0.01278 0.01215 0.00913 0.00630 0.00770
0.00654 0.03765
* LDT3
       4 0.07206 0.11787 0.09091 0.07916 0.11735 0.09363 0.07073 0.07478 0.05632 0.06013 0.02532
0.03445 0.02261 0.02047 0.01386 0.01085 0.00741 0.00513 0.00392 0.00412 0.00288 0.00148 0.00241
0.00241 0.00974
* LDT4
       5 0.07206 0.11787 0.09091 0.07916 0.11735 0.09363 0.07073 0.07478 0.05632 0.06013 0.02532
0.03445 0.02261 0.02047 0.01386 0.01085 0.00741 0.00513 0.00392 0.00412 0.00288 0.00148 0.00241
0.00241 0.00974
* HDV2b
       6 0.13905 0.10383 0.12556 0.14864 0.10494 0.08106 0.05814 0.06326 0.04316 0.04175 0.01691
0.01528 0.01053 0.01179 0.00653 0.00556 0.00311 0.00334 0.00178 0.00237 0.00148 0.00096 0.00133
0.00193 0.00771
* HDV3
       7 0.10675 0.08081 0.10250 0.07687 0.06242 0.05092 0.05125 0.06439 0.07753 0.08377 0.02464
0.04238 0.02628 0.03384 0.02464 0.01216 0.00723 0.01051 0.01183 0.00690 0.00493 0.00493 0.00394
0.00394 0.02464
* HDV4
       8 0.04808 0.10417 0.11697 0.06731 0.06811 0.04647 0.05529 0.06010 0.11138 0.08333 0.03606
0.04567 0.03686 0.02484 0.01202 0.01362 0.00962 0.00801 0.01042 0.00801 0.00481 0.00080 0.00321
0.00240 0.02244
* HDV5
       9 0.05512 0.10799 0.14175 0.09336 0.08661 0.07987 0.04387 0.04387 0.06749 0.06749 0.01912
0.01687 0.01575 0.01462 0.01912 0.01012 0.00900 0.01575 0.01237 0.01012 0.00675 0.00900 0.00900
0.01012 0.03487
* HDV6
      10 0.03278 0.10249 0.11529 0.08327 0.05237 0.03353 0.03693 0.06255 0.06594 0.06368 0.05727
0.02864 0.03542 0.04145 0.01959 0.02261 0.01733 0.01809 0.01469 0.01017 0.00904 0.01281 0.00980
0.01206 0.04220
* HDV7
      11 0.03230 0.08639 0.05618 0.07022 0.05126 0.06110 0.04424 0.07303 0.08427 0.07374 0.04494
0.04775 0.04635 0.04916 0.02528 0.02739 0.01545 0.01264 0.01685 0.00843 0.01475 0.01404 0.00632
0.00562 0.03230
* HDV8a
      12 0.02216 0.08079 0.05679 0.04386 0.03001 0.02909 0.02632 0.05217 0.06187 0.06371 0.04940
0.03970 0.04709 0.05910 0.05494 0.05078 0.03093 0.02724 0.03693 0.03463 0.01939 0.01616 0.01200
0.01524 0.03970
* HDV8b
      13 0.04990 0.14013 0.10871 0.09153 0.04383 0.05321 0.03327 0.06460 0.09722 0.08179 0.04999
0.03611 0.03143 0.03281 0.02362 0.01682 0.00505 0.00680 0.00524 0.00625 0.00331 0.00303 0.00239
0.00276 0.01020
*   HDBS is MOBILE6 default
*   HDBT is MOBILE6 default
* MC
      16 0.07229 0.12858 0.11562 0.09222 0.06930 0.08229 0.06882 0.05655 0.04505 0.03561 0.02753
0.02331 0.01948 0.01675 0.01259 0.01208 0.00786 0.00672 0.00545 0.00578 0.00536 0.00549 0.00860
0.00876 0.06791
```

Beaumont District Registration Distributions

```
* Calculated from district mid-year (July) 2008 registrations data
* All vehicle class distributions, except HDV8B and MOBILE6 defaults, were based on aggregate
Beaumont District data
* Beaumont District Counties: Chambers, Hardin, Jasper, Jefferson, Liberty, Newton, Orange, and
Tyler.
* HDV8b vehicle class distribution was based on aggregate statewide data
* LDV
       1 0.04971 0.07811 0.08411 0.07722 0.06543 0.06393 0.06659 0.06346 0.06822 0.05866 0.05099
0.04579 0.03745 0.03702 0.02916 0.02428 0.01983 0.01644 0.01342 0.01066 0.00761 0.00541 0.00440
0.00401 0.01809
* LDT1
       2 0.02833 0.04955 0.06032 0.05103 0.06101 0.07537 0.08108 0.07379 0.06080 0.05673 0.05310
0.05013 0.03991 0.04039 0.04185 0.02844 0.02401 0.02195 0.01840 0.01718 0.01251 0.00791 0.00842
0.00730 0.03049
* LDT2
       3 0.02833 0.04955 0.06032 0.05103 0.06101 0.07537 0.08108 0.07379 0.06080 0.05673 0.05310
0.05013 0.03991 0.04039 0.04185 0.02844 0.02401 0.02195 0.01840 0.01718 0.01251 0.00791 0.00842
0.00730 0.03049
* LDT3
       4 0.07790 0.14110 0.10389 0.07442 0.10644 0.08905 0.07461 0.07049 0.04845 0.05399 0.02239
0.03279 0.02481 0.02039 0.01168 0.01042 0.00743 0.00575 0.00427 0.00509 0.00269 0.00118 0.00208
0.00158 0.00711
* LDT4
       5 0.07790 0.14110 0.10389 0.07442 0.10644 0.08905 0.07461 0.07049 0.04845 0.05399 0.02239
0.03279 0.02481 0.02039 0.01168 0.01042 0.00743 0.00575 0.00427 0.00509 0.00269 0.00118 0.00208
0.00158 0.00711
* HDV2b
       6 0.13981 0.13193 0.15822 0.13101 0.08574 0.08281 0.05484 0.05577 0.03306 0.04125 0.01529
0.01931 0.00726 0.00803 0.00541 0.00386 0.00278 0.00402 0.00185 0.00216 0.00294 0.00154 0.00154
0.00154 0.00803
* HDV3
       7 0.12153 0.11658 0.09113 0.05501 0.06076 0.06404 0.05993 0.06650 0.06979 0.05665 0.02463
0.03284 0.01970 0.03284 0.01642 0.01970 0.00903 0.01478 0.00985 0.00903 0.00985 0.00575 0.00164
0.00246 0.02956
* HDV4
       8 0.06045 0.11335 0.12593 0.06297 0.04534 0.07053 0.05793 0.06045 0.05542 0.06801 0.03526
0.07305 0.04786 0.03275 0.01008 0.01511 0.00756 0.00504 0.00756 0.00252 0.00000 0.00504 0.00756
0.00000 0.03023
* HDV5
       9 0.04255 0.10638 0.15499 0.08815 0.06079 0.05775 0.05167 0.05167 0.06079 0.06383 0.02128
0.02736 0.02432 0.01824 0.00912 0.01520 0.00912 0.01824 0.00304 0.01824 0.01216 0.00608 0.00912
0.00912 0.06079
* HDV6
      10 0.01848 0.08889 0.07506 0.05543 0.03233 0.04619 0.05658 0.05658 0.07390 0.06120 0.04042
0.04619 0.03580 0.04157 0.02194 0.02540 0.01732 0.03118 0.02079 0.02079 0.01848 0.01732 0.00924
0.01617 0.07275
* HDV7
      11 0.03509 0.05263 0.07310 0.04386 0.03509 0.01462 0.04094 0.04386 0.04386 0.04678 0.09064
0.05263 0.03216 0.05556 0.02924 0.05848 0.02924 0.03509 0.02632 0.01462 0.02924 0.02047 0.01754
0.01754 0.06140
* HDV8a
      12 0.02437 0.04971 0.05361 0.02437 0.01852 0.02047 0.02144 0.05945 0.07015 0.04094 0.03801
0.03704 0.04483 0.05263 0.06433 0.05458 0.03899 0.04094 0.03801 0.03704 0.03704 0.02242 0.01949
0.02144 0.07018
* HDV8b
      13 0.04990 0.14013 0.10871 0.09153 0.04383 0.05321 0.03327 0.06460 0.09722 0.08179 0.04999
0.03611 0.03143 0.03281 0.02362 0.01682 0.00505 0.00680 0.00524 0.00625 0.00331 0.00303 0.00239
0.00276 0.01020
*   HDBS is MOBILE6 default
*   HDBT is MOBILE6 default
* MC
      16 0.07900 0.13378 0.12662 0.09767 0.06793 0.07952 0.07105 0.06525 0.05108 0.04002 0.02826
0.02273 0.02118 0.01452 0.01132 0.00994 0.00752 0.00441 0.00415 0.00536 0.00424 0.00441 0.00596
0.00596 0.03812
```

Brownwood District Registration Distributions

```
* Calculated from district mid-year (July) 2008 registrations data
* All vehicle class distributions, except HDV8B and MOBILE6 defaults, were based on aggregate
Brownwood District data
* Brownwood District Counties: Brown, Coleman, Comanche, Eastland, Lampasas, Mcculloch, Mills,
San Saba, and Stephens.
* HDV8b vehicle class distribution was based on aggregate statewide data
* LDV
       1 0.03751 0.06562 0.07319 0.07593 0.06999 0.06562 0.06769 0.06428 0.06434 0.05869 0.04693
0.04464 0.03558 0.03977 0.02976 0.02679 0.02233 0.01886 0.01695 0.01358 0.01078 0.00814 0.00617
0.00632 0.03054
* LDT1
       2 0.02114 0.03534 0.04539 0.05065 0.05610 0.06467 0.07034 0.07943 0.06381 0.05590 0.05376
0.05144 0.04232 0.04270 0.04042 0.02909 0.02425 0.02218 0.01841 0.01776 0.01555 0.01036 0.01347
0.01078 0.06474
* LDT2
       3 0.02114 0.03534 0.04539 0.05065 0.05610 0.06467 0.07034 0.07943 0.06381 0.05590 0.05376
0.05144 0.04232 0.04270 0.04042 0.02909 0.02425 0.02218 0.01841 0.01776 0.01555 0.01036 0.01347
0.01078 0.06474
* LDT3
       4 0.06885 0.12782 0.08448 0.07378 0.10560 0.07968 0.06748 0.08194 0.04978 0.05410 0.02661
0.03751 0.02839 0.02215 0.01495 0.01543 0.01022 0.00857 0.00576 0.00590 0.00439 0.00165 0.00459
0.00309 0.01728
* LDT4
       5 0.06885 0.12782 0.08448 0.07378 0.10560 0.07968 0.06748 0.08194 0.04978 0.05410 0.02661
0.03751 0.02839 0.02215 0.01495 0.01543 0.01022 0.00857 0.00576 0.00590 0.00439 0.00165 0.00459
0.00309 0.01728
* HDV2b
       6 0.11874 0.13612 0.14770 0.14274 0.10550 0.07447 0.05172 0.06206 0.02979 0.03724 0.01738
0.02234 0.00952 0.00745 0.00496 0.00331 0.00496 0.00331 0.00248 0.00290 0.00041 0.00083 0.00207
0.00083 0.01117
* HDV3
       7 0.10765 0.14731 0.07932 0.06799 0.04816 0.05949 0.03399 0.04533 0.06516 0.06232 0.01133
0.03399 0.02266 0.01983 0.03683 0.01133 0.00850 0.00283 0.02266 0.00850 0.00850 0.00283 0.01133
0.00567 0.07649
* HDV4
       8 0.10345 0.05172 0.05172 0.05172 0.03448 0.05172 0.01724 0.01724 0.01724 0.01724 0.03448
0.03448 0.03448 0.05172 0.05172 0.06897 0.01724 0.01724 0.01724 0.06897 0.03448 0.00000 0.00000
0.01724 0.13797
* HDV5
       9 0.05814 0.09302 0.03488 0.01163 0.08140 0.03488 0.08140 0.03488 0.01163 0.05814 0.01163
0.03488 0.04651 0.02326 0.02326 0.01163 0.00000 0.04651 0.01163 0.03488 0.02326 0.01163 0.00000
0.02326 0.19766
* HDV6
      10 0.04000 0.03636 0.05818 0.04727 0.01091 0.02909 0.03273 0.03636 0.05455 0.04727 0.06909
0.04364 0.04364 0.03636 0.03273 0.04000 0.03273 0.03636 0.02545 0.00727 0.01455 0.02545 0.02182
0.01455 0.16364
* HDV7
      11 0.02797 0.09787 0.04895 0.06294 0.01399 0.00699 0.03497 0.02797 0.06294 0.03497 0.06294
0.05594 0.03497 0.06993 0.06294 0.03497 0.02797 0.02797 0.04895 0.03497 0.04196 0.02098 0.02797
0.01399 0.01399
* HDV8a
      12 0.00463 0.01852 0.02778 0.01389 0.00463 0.00463 0.03704 0.03704 0.04167 0.06019 0.04167
0.05093 0.06944 0.09259 0.06481 0.05556 0.03241 0.04630 0.02315 0.04167 0.05093 0.01389 0.01852
0.00463 0.14348
* HDV8b
      13 0.04990 0.14013 0.10871 0.09153 0.04383 0.05321 0.03327 0.06460 0.09722 0.08179 0.04999
0.03611 0.03143 0.03281 0.02362 0.01682 0.00505 0.00680 0.00524 0.00625 0.00331 0.00303 0.00239
0.00276 0.01020
*   HDBS is MOBILE6 default
*   HDBT is MOBILE6 default
* MC
      16 0.06539 0.12819 0.10454 0.08829 0.06021 0.08164 0.07314 0.04618 0.04876 0.03879 0.02475
0.02180 0.02290 0.01293 0.01773 0.01699 0.00628 0.00628 0.00628 0.00591 0.00960 0.00887 0.01256
0.00887 0.08312
```

Bryan District Registration Distributions

```
* Calculated from district mid-year (July) 2008 registrations data
* All vehicle class distributions, except HDV8B and MOBILE6 defaults, were based on aggregate
Bryan District data
* Bryan District Counties: Brazos, Burleson, Freestone, Grimes, Leon, Madison, Milam, Robertson,
Walker, and Washington.
* HDV8b vehicle class distribution was based on aggregate statewide data
* LDV
       1 0.07168 0.07918 0.07703 0.07608 0.06587 0.06452 0.06639 0.06417 0.06506 0.05537 0.04784
0.04198 0.03502 0.03501 0.02763 0.02330 0.01915 0.01630 0.01306 0.01098 0.00756 0.00593 0.00440
0.00434 0.02215
* LDT1
       2 0.02796 0.04709 0.05428 0.05422 0.05718 0.07225 0.07784 0.07751 0.06404 0.05438 0.05189
0.05183 0.03860 0.03961 0.03919 0.02895 0.02204 0.02073 0.01790 0.01698 0.01267 0.00925 0.00987
0.00850 0.04524
* LDT2
       3 0.02796 0.04709 0.05428 0.05422 0.05718 0.07225 0.07784 0.07751 0.06404 0.05438 0.05189
0.05183 0.03860 0.03961 0.03919 0.02895 0.02204 0.02073 0.01790 0.01698 0.01267 0.00925 0.00987
0.00850 0.04524
* LDT3
       4 0.07872 0.13062 0.08801 0.07643 0.10165 0.08651 0.07365 0.07376 0.04960 0.05275 0.02717
0.03429 0.02472 0.02349 0.01411 0.01325 0.01019 0.00676 0.00521 0.00529 0.00356 0.00156 0.00356
0.00320 0.01194
* LDT4
       5 0.07872 0.13062 0.08801 0.07643 0.10165 0.08651 0.07365 0.07376 0.04960 0.05275 0.02717
0.03429 0.02472 0.02349 0.01411 0.01325 0.01019 0.00676 0.00521 0.00529 0.00356 0.00156 0.00356
0.00320 0.01194
* HDV2b
       6 0.11720 0.13280 0.14668 0.14650 0.10917 0.08853 0.05183 0.06096 0.03434 0.03229 0.02016
0.01512 0.00599 0.00567 0.00504 0.00410 0.00236 0.00236 0.00236 0.00378 0.00173 0.00142 0.00221
0.00126 0.00614
* HDV3
       7 0.13144 0.14863 0.14433 0.07131 0.06186 0.05069 0.04467 0.04811 0.05498 0.04725 0.01976
0.03436 0.02148 0.01546 0.01718 0.01375 0.00945 0.00945 0.01031 0.00515 0.00601 0.00344 0.00515
0.00344 0.02234
* HDV4
       8 0.06148 0.09423 0.04918 0.06967 0.07787 0.03689 0.06967 0.09016 0.07377 0.06148 0.05328
0.06557 0.02459 0.03279 0.01639 0.01230 0.00820 0.01230 0.00410 0.00410 0.00410 0.00410 0.00820
0.00820 0.05738
* HDV5
       9 0.07009 0.09346 0.11216 0.07009 0.07009 0.04673 0.05140 0.04673 0.07009 0.05140 0.02336
0.01402 0.03271 0.03271 0.01869 0.01869 0.01869 0.00935 0.00000 0.00935 0.02804 0.00000 0.00935
0.00467 0.09813
* HDV6
      10 0.02862 0.05387 0.04545 0.05387 0.05387 0.03030 0.03367 0.04377 0.08756 0.07407 0.04882
0.07239 0.03872 0.04882 0.02357 0.04209 0.01178 0.02357 0.02020 0.02189 0.01515 0.01515 0.01515
0.01347 0.08418
* HDV7
      11 0.02826 0.09825 0.06326 0.04845 0.05518 0.10499 0.08748 0.08748 0.09017 0.04980 0.05384
0.03499 0.03499 0.03499 0.01750 0.01480 0.00673 0.01346 0.01346 0.00404 0.00673 0.00808 0.00808
0.00673 0.02826
* HDV8a
      12 0.01672 0.05319 0.02584 0.03799 0.01672 0.01976 0.01824 0.03799 0.04103 0.05167 0.04559
0.04559 0.03951 0.07447 0.05015 0.05927 0.04407 0.04863 0.03040 0.03951 0.02888 0.02736 0.02584
0.03040 0.09118
* HDV8b
      13 0.04990 0.14013 0.10871 0.09153 0.04383 0.05321 0.03327 0.06460 0.09722 0.08179 0.04999
0.03611 0.03143 0.03281 0.02362 0.01682 0.00505 0.00680 0.00524 0.00625 0.00331 0.00303 0.00239
0.00276 0.01020
*   HDBS is MOBILE6 default
*   HDBT is MOBILE6 default
* MC
      16 0.06972 0.11814 0.11225 0.09834 0.06908 0.08283 0.07307 0.06588 0.04189 0.03838 0.03150
0.02303 0.01807 0.01583 0.01503 0.01391 0.00911 0.00720 0.00592 0.00480 0.00560 0.00544 0.00911
0.00815 0.05772
```

Childress District Registration Distributions

```
* Calculated from district mid-year (July) 2008 registrations data
* All vehicle class distributions, except HDV8B and MOBILE6 defaults, were based on aggregate
Childress District data
* Childress District Counties: Briscoe, Childress, Collingsworth, Cottle, Dickens, Donley, Foard,
Hall, Hardeman, King, Knox, Motley, and Wheeler.
* HDV8b vehicle class distribution was based on aggregate statewide data
* LDV
       1 0.03826 0.06938 0.06911 0.07335 0.06878 0.07050 0.06673 0.05905 0.06521 0.05852 0.04535
0.04396 0.03879 0.03581 0.03065 0.02708 0.02343 0.01986 0.01635 0.01648 0.01099 0.00715 0.00569
0.00569 0.03383
* LDT1
       2 0.01425 0.03283 0.03817 0.04084 0.05026 0.05815 0.05815 0.06807 0.06718 0.05561 0.05840
0.05904 0.04097 0.04403 0.04377 0.03334 0.03067 0.02558 0.02278 0.02189 0.01921 0.01196 0.01629
0.01336 0.07520
* LDT2
       3 0.01425 0.03283 0.03817 0.04084 0.05026 0.05815 0.05815 0.06807 0.06718 0.05561 0.05840
0.05904 0.04097 0.04403 0.04377 0.03334 0.03067 0.02558 0.02278 0.02189 0.01921 0.01196 0.01629
0.01336 0.07520
* LDT3
       4 0.08912 0.12989 0.10189 0.07758 0.09723 0.06629 0.06359 0.07292 0.04640 0.05377 0.03241
0.03290 0.02283 0.02210 0.01694 0.01399 0.01031 0.01007 0.00393 0.00565 0.00540 0.00147 0.00368
0.00221 0.01743
* LDT4
       5 0.08912 0.12989 0.10189 0.07758 0.09723 0.06629 0.06359 0.07292 0.04640 0.05377 0.03241
0.03290 0.02283 0.02210 0.01694 0.01399 0.01031 0.01007 0.00393 0.00565 0.00540 0.00147 0.00368
0.00221 0.01743
* HDV2b
       6 0.16370 0.14100 0.17994 0.13938 0.09724 0.04862 0.03890 0.04862 0.02107 0.02917 0.01945
0.01459 0.00324 0.00486 0.00486 0.00648 0.00486 0.00486 0.00648 0.00486 0.00486 0.00162 0.00162
0.00162 0.00810
* HDV3
       7 0.07634 0.16029 0.07634 0.07634 0.09160 0.06870 0.09924 0.03053 0.02290 0.07634 0.00000
0.00763 0.00000 0.02290 0.00763 0.01527 0.03817 0.01527 0.01527 0.00763 0.01527 0.00000 0.00000
0.00000 0.07634
* HDV4
       8 0.26786 0.33927 0.08929 0.05357 0.00000 0.05357 0.00000 0.01786 0.01786 0.01786 0.03571
0.00000 0.00000 0.01786 0.01786 0.00000 0.00000 0.01786 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.05357
* HDV5
       9 0.13953 0.30231 0.09302 0.04651 0.02326 0.02326 0.00000 0.00000 0.02326 0.02326 0.02326
0.00000 0.00000 0.00000 0.00000 0.04651 0.09302 0.00000 0.02326 0.00000 0.02326 0.00000 0.00000
0.00000 0.11628
* HDV6
      10 0.18745 0.03125 0.03125 0.03125 0.04688 0.00000 0.04688 0.06250 0.03125 0.00000 0.06250
0.03125 0.03125 0.01563 0.01563 0.03125 0.01563 0.01563 0.07813 0.00000 0.01563 0.03125 0.00000
0.04688 0.14063
* HDV7
      11 0.05882 0.03922 0.03922 0.09804 0.00000 0.00000 0.05882 0.03922 0.00000 0.09804 0.07843
0.01961 0.05882 0.01961 0.05882 0.05882 0.01961 0.09804 0.01961 0.00000 0.01961 0.00000 0.00000
0.00000 0.11764
* HDV8a
      12 0.01429 0.04286 0.02857 0.02857 0.02857 0.01429 0.01429 0.02857 0.02857 0.02857 0.01429
0.07143 0.05714 0.02857 0.07143 0.02857 0.04286 0.02857 0.04286 0.01429 0.01429 0.05714 0.01429
0.00000 0.25712
* HDV8b
      13 0.04990 0.14013 0.10871 0.09153 0.04383 0.05321 0.03327 0.06460 0.09722 0.08179 0.04999
0.03611 0.03143 0.03281 0.02362 0.01682 0.00505 0.00680 0.00524 0.00625 0.00331 0.00303 0.00239
0.00276 0.01020
*   HDBS is MOBILE6 default
*   HDBT is MOBILE6 default
* MC
      16 0.05401 0.08951 0.08796 0.10032 0.07099 0.08951 0.06944 0.05247 0.06481 0.02932 0.03549
0.02315 0.02315 0.02006 0.01543 0.01543 0.00926 0.00926 0.01080 0.01235 0.01080 0.00000 0.02160
0.01852 0.06636
```

Corpus Christi District Registration Distributions

```
* Calculated from district mid-year (July) 2008 registrations data
* All vehicle class distributions, except HDV8B and MOBILE6 defaults, were based on aggregate
Corpus Christi District data
* Corpus Christi District Counties: Aransas, Bee, Goliad, Jim Wells, Karnes, Kleberg, Live Oak,
Nueces, Refugio, and San Patricio.
* HDV8b vehicle class distribution was based on aggregate statewide data
* LDV
       1 0.05769 0.08443 0.07854 0.08032 0.07198 0.07154 0.07043 0.06617 0.06700 0.05917 0.04858
0.04229 0.03300 0.03367 0.02562 0.02153 0.01630 0.01432 0.01085 0.00947 0.00669 0.00487 0.00400
0.00359 0.01795
* LDT1
       2 0.02789 0.05152 0.05557 0.05531 0.06470 0.07571 0.07688 0.07818 0.06901 0.05759 0.05644
0.05043 0.03844 0.03788 0.03628 0.02735 0.02114 0.01926 0.01633 0.01505 0.01195 0.00723 0.00877
0.00769 0.03340
* LDT2
       3 0.02789 0.05152 0.05557 0.05531 0.06470 0.07571 0.07688 0.07818 0.06901 0.05759 0.05644
0.05043 0.03844 0.03788 0.03628 0.02735 0.02114 0.01926 0.01633 0.01505 0.01195 0.00723 0.00877
0.00769 0.03340
* LDT3
       4 0.08332 0.13247 0.10322 0.08184 0.10667 0.08373 0.06574 0.06854 0.04711 0.05325 0.02692
0.03258 0.02305 0.02065 0.01290 0.01206 0.00824 0.00722 0.00565 0.00455 0.00363 0.00172 0.00280
0.00226 0.00988
* LDT4
       5 0.08332 0.13247 0.10322 0.08184 0.10667 0.08373 0.06574 0.06854 0.04711 0.05325 0.02692
0.03258 0.02305 0.02065 0.01290 0.01206 0.00824 0.00722 0.00565 0.00455 0.00363 0.00172 0.00280
0.00226 0.00988
* HDV2b
       6 0.17327 0.11980 0.13099 0.14826 0.10104 0.06845 0.04739 0.06286 0.03028 0.02682 0.01646
0.01448 0.00922 0.00856 0.00559 0.00576 0.00527 0.00329 0.00411 0.00313 0.00181 0.00066 0.00230
0.00214 0.00806
* HDV3
       7 0.12598 0.09807 0.11310 0.08017 0.06371 0.05225 0.05297 0.08304 0.05512 0.05870 0.02004
0.03078 0.02291 0.03221 0.02076 0.01360 0.00787 0.00358 0.01718 0.00859 0.00429 0.00358 0.00716
0.00358 0.02076
* HDV4
       8 0.07745 0.11162 0.10706 0.04328 0.03645 0.07517 0.02733 0.08200 0.07289 0.07745 0.02506
0.05239 0.05239 0.02050 0.02278 0.01822 0.01822 0.00911 0.01595 0.00911 0.00456 0.00228 0.00228
0.00456 0.03189
* HDV5
       9 0.06908 0.10197 0.11184 0.14143 0.06250 0.02303 0.05592 0.04276 0.05592 0.06579 0.01645
0.01316 0.00987 0.00987 0.01974 0.01974 0.01316 0.00987 0.04605 0.01316 0.01974 0.00987 0.00987
0.01316 0.04605
* HDV6
      10 0.01715 0.06464 0.06728 0.06201 0.05409 0.03826 0.04617 0.06728 0.05937 0.06201 0.04485
0.03430 0.04222 0.04222 0.03562 0.02243 0.01847 0.02770 0.01979 0.02770 0.01715 0.01187 0.01451
0.01187 0.09104
* HDV7
      11 0.02421 0.07076 0.04655 0.05400 0.02793 0.03166 0.05959 0.05028 0.08752 0.09128 0.06704
0.04655 0.05028 0.05959 0.02048 0.01676 0.03166 0.03352 0.02793 0.00745 0.01862 0.01117 0.01117
0.00745 0.04655
* HDV8a
      12 0.01938 0.06243 0.05059 0.05059 0.02691 0.02368 0.02368 0.04521 0.04844 0.06781 0.05920
0.04306 0.04306 0.07107 0.04952 0.06243 0.02691 0.03767 0.02906 0.02368 0.03229 0.01722 0.01184
0.01399 0.06028
* HDV8b
      13 0.04990 0.14013 0.10871 0.09153 0.04383 0.05321 0.03327 0.06460 0.09722 0.08179 0.04999
0.03611 0.03143 0.03281 0.02362 0.01682 0.00505 0.00680 0.00524 0.00625 0.00331 0.00303 0.00239
0.00276 0.01020
*   HDBS is MOBILE6 default
*   HDBT is MOBILE6 default
* MC
      16 0.09709 0.13045 0.12157 0.09040 0.07575 0.08736 0.06947 0.04907 0.04269 0.03474 0.02637
0.01758 0.01716 0.01517 0.01161 0.00994 0.00659 0.00544 0.00534 0.00418 0.00345 0.00450 0.00994
0.00743 0.05671
```

Dallas District Registration Distributions

```
* Calculated from district mid-year (July) 2008 registrations data
* All vehicle class distributions, except HDV8B and MOBILE6 defaults, were based on aggregate
Dallas District data
* Dallas District Counties: Collin, Dallas, Denton, Ellis, Kaufman, Navarro, and Rockwall.
* HDV8b vehicle class distribution was based on aggregate statewide data
* LDV
       1 0.05884 0.08378 0.08127 0.07860 0.07393 0.07115 0.07245 0.06875 0.06916 0.05956 0.05035
0.04329 0.03480 0.03484 0.02571 0.02025 0.01575 0.01256 0.00994 0.00692 0.00489 0.00365 0.00294
0.00249 0.01413
* LDT1
       2 0.02991 0.04404 0.05008 0.05199 0.05935 0.07180 0.08411 0.08096 0.07445 0.06522 0.06138
0.05656 0.03903 0.04079 0.03649 0.02369 0.01808 0.01530 0.01382 0.01264 0.01002 0.00663 0.00805
0.00650 0.03911
* LDT2
       3 0.02991 0.04404 0.05008 0.05199 0.05935 0.07180 0.08411 0.08096 0.07445 0.06522 0.06138
0.05656 0.03903 0.04079 0.03649 0.02369 0.01808 0.01530 0.01382 0.01264 0.01002 0.00663 0.00805
0.00650 0.03911
* LDT3
       4 0.08544 0.13188 0.09006 0.08496 0.11739 0.09167 0.07498 0.07422 0.05193 0.05656 0.02276
0.02938 0.01919 0.01776 0.01082 0.00824 0.00592 0.00371 0.00348 0.00329 0.00241 0.00129 0.00203
0.00200 0.00863
* LDT4
       5 0.08544 0.13188 0.09006 0.08496 0.11739 0.09167 0.07498 0.07422 0.05193 0.05656 0.02276
0.02938 0.01919 0.01776 0.01082 0.00824 0.00592 0.00371 0.00348 0.00329 0.00241 0.00129 0.00203
0.00200 0.00863
* HDV2b
       6 0.18753 0.08848 0.12828 0.11498 0.07053 0.06463 0.05991 0.04042 0.05790 0.03942 0.03316
0.04545 0.01242 0.01647 0.00871 0.00462 0.00380 0.00264 0.00302 0.00258 0.00220 0.00141 0.00195
0.00195 0.00754
* HDV3
       7 0.10140 0.08607 0.10460 0.09106 0.05504 0.04743 0.04601 0.06015 0.07299 0.07323 0.02770
0.03269 0.02378 0.03008 0.02901 0.01712 0.01224 0.00880 0.01236 0.00761 0.00951 0.01545 0.00999
0.01248 0.01320
* HDV4
       8 0.04561 0.15793 0.08256 0.05362 0.03417 0.03106 0.06179 0.06539 0.06032 0.05983 0.03858
0.06654 0.05754 0.03956 0.00883 0.00997 0.00507 0.01602 0.01488 0.01390 0.01112 0.01079 0.02501
0.01945 0.01046
* HDV5
       9 0.05414 0.08567 0.08565 0.05873 0.05047 0.04344 0.03181 0.03793 0.05292 0.04221 0.01713
0.01468 0.04894 0.06730 0.01591 0.01744 0.00673 0.04038 0.03396 0.03120 0.01560 0.02203 0.03824
0.02539 0.06210
* HDV6
      10 0.05079 0.15732 0.09034 0.07603 0.05584 0.03271 0.05511 0.05500 0.06215 0.05668 0.04217
0.05605 0.03586 0.03807 0.01620 0.01672 0.01346 0.01725 0.01220 0.01031 0.00610 0.00778 0.00536
0.00757 0.02293
* HDV7
      11 0.04842 0.07379 0.07148 0.07148 0.05342 0.04996 0.04381 0.05650 0.06879 0.07842 0.04842
0.04035 0.04766 0.04689 0.03190 0.02690 0.02383 0.02152 0.02075 0.01307 0.01076 0.01076 0.00884
0.00961 0.02267
* HDV8a
      12 0.02755 0.06976 0.05358 0.04675 0.03740 0.03892 0.03184 0.04802 0.04802 0.06849 0.05206
0.03740 0.04397 0.06015 0.04549 0.04599 0.03108 0.02982 0.03083 0.02830 0.02578 0.01693 0.01440
0.01516 0.05231
* HDV8b
      13 0.04990 0.14013 0.10871 0.09153 0.04383 0.05321 0.03327 0.06460 0.09722 0.08179 0.04999
0.03611 0.03143 0.03281 0.02362 0.01682 0.00505 0.00680 0.00524 0.00625 0.00331 0.00303 0.00239
0.00276 0.01020
*   HDBS is MOBILE6 default
*   HDBT is MOBILE6 default
* MC
      16 0.06909 0.13466 0.12516 0.10101 0.07482 0.08474 0.07195 0.05855 0.04497 0.03464 0.02624
0.02032 0.01859 0.01527 0.01213 0.00931 0.00727 0.00530 0.00470 0.00434 0.00446 0.00453 0.00774
0.00755 0.05266
```

El Paso District Registration Distributions

```
* Calculated from district mid-year (July) 2008 registrations data
* All vehicle class distributions, except HDV8B and MOBILE6 defaults, were based on aggregate El
Paso District data
* El Paso District Counties: Brewster, Culberson, El Paso, Hudspeth, Jeff Davis, and Presidio.
* HDV8b vehicle class distribution was based on aggregate statewide data
* LDV
       1 0.05422 0.07589 0.06790 0.06707 0.06471 0.06586 0.06715 0.06086 0.06582 0.05793 0.05211
0.04449 0.03619 0.03948 0.03078 0.02591 0.02127 0.01748 0.01466 0.01272 0.01011 0.00755 0.00614
0.00507 0.02863
* LDT1
       2 0.02605 0.04474 0.04488 0.04549 0.05424 0.05811 0.06353 0.06797 0.06414 0.05501 0.05139
0.05207 0.03497 0.04008 0.04046 0.02947 0.02311 0.01980 0.01820 0.01866 0.01960 0.01362 0.01459
0.01228 0.08754
* LDT2
       3 0.02605 0.04474 0.04488 0.04549 0.05424 0.05811 0.06353 0.06797 0.06414 0.05501 0.05139
0.05207 0.03497 0.04008 0.04046 0.02947 0.02311 0.01980 0.01820 0.01866 0.01960 0.01362 0.01459
0.01228 0.08754
* LDT3
       4 0.08322 0.13957 0.10982 0.09762 0.12013 0.06365 0.06209 0.04874 0.03874 0.04259 0.02403
0.03002 0.01795 0.02001 0.01430 0.01170 0.01004 0.00733 0.00686 0.00825 0.00588 0.00308 0.00406
0.00416 0.02616
* LDT4
       5 0.08322 0.13957 0.10982 0.09762 0.12013 0.06365 0.06209 0.04874 0.03874 0.04259 0.02403
0.03002 0.01795 0.02001 0.01430 0.01170 0.01004 0.00733 0.00686 0.00825 0.00588 0.00308 0.00406
0.00416 0.02616
* HDV2b
       6 0.16875 0.08421 0.11495 0.11950 0.08141 0.07163 0.05521 0.04787 0.04437 0.04263 0.02655
0.02341 0.00699 0.01747 0.01363 0.00804 0.00769 0.00978 0.00524 0.00839 0.00664 0.00419 0.00804
0.00384 0.01957
* HDV3
       7 0.07272 0.04242 0.07152 0.04970 0.04848 0.03879 0.04242 0.07030 0.06303 0.07273 0.03758
0.04727 0.02545 0.04485 0.04606 0.02424 0.01818 0.02061 0.02667 0.02061 0.01697 0.00970 0.00970
0.01939 0.06061
* HDV4
       8 0.02990 0.06977 0.04983 0.02658 0.07641 0.02326 0.02658 0.07973 0.12293 0.08306 0.03322
0.05648 0.04983 0.03322 0.00664 0.02326 0.01661 0.01993 0.02990 0.01661 0.01661 0.01329 0.01329
0.01661 0.06645
* HDV5
       9 0.02532 0.05063 0.04641 0.06329 0.02110 0.03376 0.01266 0.06329 0.08439 0.05485 0.02532
0.04641 0.04219 0.03797 0.02110 0.04219 0.00000 0.02954 0.02954 0.01688 0.05063 0.02110 0.02954
0.02110 0.13079
* HDV6
      10 0.01028 0.03213 0.03342 0.04113 0.04113 0.02185 0.03085 0.05270 0.08483 0.08098 0.06555
0.03985 0.04242 0.05656 0.03213 0.02442 0.03470 0.02185 0.03342 0.01671 0.02442 0.02314 0.02442
0.01414 0.11697
* HDV7
      11 0.00738 0.03321 0.02952 0.01845 0.01107 0.02214 0.02583 0.02952 0.12178 0.08487 0.03321
0.04428 0.03321 0.05904 0.04428 0.03690 0.07011 0.02952 0.03321 0.03321 0.04059 0.01845 0.02952
0.01845 0.09225
* HDV8a
      12 0.00194 0.01942 0.01359 0.02330 0.03495 0.02136 0.00583 0.04466 0.03301 0.05243 0.03883
0.03301 0.04078 0.05243 0.05243 0.05049 0.04466 0.05825 0.05437 0.05825 0.03301 0.04854 0.03689
0.03107 0.11650
* HDV8b
      13 0.04990 0.14013 0.10871 0.09153 0.04383 0.05321 0.03327 0.06460 0.09722 0.08179 0.04999
0.03611 0.03143 0.03281 0.02362 0.01682 0.00505 0.00680 0.00524 0.00625 0.00331 0.00303 0.00239
0.00276 0.01020
*   HDBS is MOBILE6 default
*   HDBT is MOBILE6 default
* MC
      16 0.08739 0.16275 0.13122 0.09765 0.06529 0.08415 0.05992 0.04448 0.03875 0.03551 0.02441
0.01886 0.01535 0.01276 0.01045 0.00832 0.00583 0.00536 0.00499 0.00342 0.00472 0.00509 0.00749
0.00638 0.05946
```

Fort Worth District Registration Distributions

```
* Calculated from district mid-year (July) 2008 registrations data
* All vehicle class distributions, except HDV8B and MOBILE6 defaults, were based on aggregate
Fort Worth District data
* Fort Worth District Counties: Erath, Hood, Jack, Johnson, Palo Pinto, Parker, Somervell,
Tarrant, and Wise.
* HDV8b vehicle class distribution was based on aggregate statewide data
* LDV
       1 0.08124 0.09559 0.07836 0.07661 0.07224 0.07001 0.07224 0.06705 0.06567 0.05578 0.04626
0.03968 0.03172 0.03138 0.02298 0.01876 0.01480 0.01158 0.00957 0.00709 0.00513 0.00380 0.00317
0.00289 0.01640
* LDT1
       2 0.02391 0.04518 0.05140 0.05386 0.06202 0.07662 0.08450 0.08214 0.07164 0.06090 0.05747
0.05291 0.03692 0.03884 0.03573 0.02379 0.01920 0.01576 0.01494 0.01393 0.01053 0.00721 0.00876
0.00716 0.04468
* LDT2
       3 0.02391 0.04518 0.05140 0.05386 0.06202 0.07662 0.08450 0.08214 0.07164 0.06090 0.05747
0.05291 0.03692 0.03884 0.03573 0.02379 0.01920 0.01576 0.01494 0.01393 0.01053 0.00721 0.00876
0.00716 0.04468
* LDT3
       4 0.08215 0.13397 0.09128 0.08349 0.11486 0.08965 0.07086 0.07475 0.05002 0.05551 0.02184
0.03118 0.02064 0.01925 0.01156 0.00954 0.00720 0.00520 0.00376 0.00375 0.00286 0.00142 0.00258
0.00233 0.01035
* LDT4
       5 0.08215 0.13397 0.09128 0.08349 0.11486 0.08965 0.07086 0.07475 0.05002 0.05551 0.02184
0.03118 0.02064 0.01925 0.01156 0.00954 0.00720 0.00520 0.00376 0.00375 0.00286 0.00142 0.00258
0.00233 0.01035
* HDV2b
       6 0.14274 0.14101 0.13608 0.14275 0.09740 0.07716 0.05132 0.05461 0.03837 0.03334 0.01793
0.01490 0.00832 0.00955 0.00555 0.00385 0.00241 0.00308 0.00262 0.00211 0.00170 0.00134 0.00190
0.00205 0.00791
* HDV3
       7 0.12829 0.11053 0.11722 0.08379 0.05955 0.05328 0.05391 0.06728 0.07083 0.06038 0.01964
0.02695 0.01463 0.02486 0.02842 0.01630 0.00773 0.00585 0.01003 0.00627 0.00543 0.00355 0.00418
0.00355 0.01755
* HDV4
       8 0.06699 0.14562 0.10097 0.08544 0.06553 0.06505 0.04660 0.04369 0.08447 0.08641 0.03252
0.04126 0.03010 0.02816 0.01214 0.00680 0.00922 0.00777 0.00583 0.00291 0.00388 0.00340 0.00097
0.00243 0.02184
* HDV5
       9 0.08199 0.12298 0.13711 0.06989 0.05309 0.05712 0.04301 0.06586 0.07661 0.07527 0.02285
0.01680 0.01344 0.02083 0.01344 0.01277 0.00605 0.00941 0.00941 0.01411 0.01478 0.00874 0.00672
0.00605 0.04167
* HDV6
      10 0.05845 0.12129 0.07924 0.07655 0.06334 0.04060 0.04255 0.06212 0.07801 0.06579 0.04304
0.02886 0.03008 0.03424 0.02152 0.01565 0.01590 0.01345 0.01614 0.01541 0.00685 0.00783 0.00929
0.00929 0.04451
* HDV7
      11 0.03338 0.07981 0.06531 0.05878 0.04064 0.04064 0.03556 0.06241 0.06604 0.07765 0.06604
0.04136 0.04282 0.04354 0.03411 0.02685 0.02032 0.02685 0.02540 0.02322 0.01161 0.01234 0.01379
0.01597 0.03556
* HDV8a
      12 0.02252 0.06857 0.05008 0.04336 0.03294 0.03899 0.02555 0.05882 0.06622 0.06487 0.05311
0.04067 0.04773 0.06957 0.04370 0.04370 0.02252 0.02992 0.03328 0.02286 0.01647 0.01782 0.01210
0.01782 0.05681
* HDV8b
      13 0.04990 0.14013 0.10871 0.09153 0.04383 0.05321 0.03327 0.06460 0.09722 0.08179 0.04999
0.03611 0.03143 0.03281 0.02362 0.01682 0.00505 0.00680 0.00524 0.00625 0.00331 0.00303 0.00239
0.00276 0.01020
*   HDBS is MOBILE6 default
*   HDBT is MOBILE6 default
* MC
      16 0.05968 0.12933 0.11866 0.10066 0.07591 0.09062 0.07779 0.05725 0.04529 0.03518 0.02556
0.02079 0.01936 0.01594 0.01152 0.01025 0.00710 0.00481 0.00430 0.00544 0.00458 0.00534 0.00816
0.00870 0.05778
```

Houston District Registration Distributions

```
* Calculated from district mid-year (July) 2008 registrations data
* All vehicle class distributions, except HDV8B and MOBILE6 defaults, were based on aggregate
Houston District data
* Houston District Counties: Brazoria, Fort Bend, Galveston, Harris, Montgomery, and Waller.
* HDV8b vehicle class distribution was based on aggregate statewide data
* LDV
       1 0.06583 0.08678 0.08030 0.07669 0.06939 0.06817 0.06993 0.06773 0.06983 0.05945 0.05186
0.04417 0.03538 0.03424 0.02532 0.02086 0.01644 0.01320 0.01014 0.00720 0.00495 0.00355 0.00274
0.00246 0.01339
* LDT1
       2 0.03427 0.05317 0.06136 0.05933 0.06338 0.07616 0.08961 0.08043 0.07223 0.06372 0.05872
0.05168 0.03509 0.03670 0.03317 0.02330 0.01792 0.01494 0.01324 0.01176 0.00876 0.00557 0.00557
0.00477 0.02515
* LDT2
       3 0.03427 0.05317 0.06136 0.05933 0.06338 0.07616 0.08961 0.08043 0.07223 0.06372 0.05872
0.05168 0.03509 0.03670 0.03317 0.02330 0.01792 0.01494 0.01324 0.01176 0.00876 0.00557 0.00557
0.00477 0.02515
* LDT3
       4 0.08788 0.14881 0.09308 0.08384 0.11211 0.09593 0.07686 0.07092 0.04777 0.05293 0.02127
0.02816 0.01799 0.01673 0.00988 0.00841 0.00589 0.00404 0.00323 0.00293 0.00203 0.00105 0.00124
0.00134 0.00568
* LDT4
       5 0.08788 0.14881 0.09308 0.08384 0.11211 0.09593 0.07686 0.07092 0.04777 0.05293 0.02127
0.02816 0.01799 0.01673 0.00988 0.00841 0.00589 0.00404 0.00323 0.00293 0.00203 0.00105 0.00124
0.00134 0.00568
* HDV2b
       6 0.16728 0.11741 0.13056 0.13645 0.08415 0.07149 0.05702 0.05503 0.04272 0.03274 0.01552
0.01912 0.01059 0.01283 0.00785 0.00671 0.00554 0.00446 0.00393 0.00299 0.00215 0.00157 0.00273
0.00152 0.00764
* HDV3
       7 0.10260 0.08662 0.11541 0.06688 0.06240 0.05029 0.05819 0.07153 0.07653 0.07223 0.02238
0.04388 0.02054 0.03827 0.02633 0.01711 0.01281 0.00878 0.01088 0.00869 0.00597 0.00298 0.00290
0.00369 0.01211
* HDV4
       8 0.07648 0.10539 0.09511 0.05978 0.06716 0.06269 0.06036 0.06366 0.08599 0.07822 0.03222
0.04581 0.04387 0.03513 0.01883 0.01339 0.00990 0.00699 0.00796 0.00679 0.00602 0.00330 0.00214
0.00175 0.01106
* HDV5
       9 0.08318 0.12788 0.13005 0.09699 0.06692 0.06340 0.05500 0.06584 0.06421 0.06963 0.01761
0.02140 0.01544 0.01598 0.00921 0.00813 0.01192 0.00840 0.01030 0.01030 0.01273 0.00433 0.00433
0.00271 0.02411
* HDV6
      10 0.03574 0.09765 0.08413 0.06826 0.05905 0.04284 0.04218 0.07137 0.08779 0.08446 0.06604
0.03796 0.03052 0.04073 0.02098 0.02098 0.01543 0.01720 0.01720 0.01132 0.00844 0.00666 0.00555
0.00388 0.02364
* HDV7
      11 0.03713 0.08550 0.05288 0.05345 0.04951 0.05204 0.05654 0.05992 0.08270 0.07707 0.05513
0.05176 0.04023 0.05063 0.02757 0.02757 0.02194 0.02504 0.02222 0.01322 0.00928 0.01210 0.00591
0.00450 0.02616
* HDV8a
      12 0.01745 0.06149 0.04229 0.03343 0.02927 0.02793 0.03289 0.04041 0.06378 0.05478 0.04981
0.03961 0.04901 0.06969 0.06163 0.05209 0.03894 0.03961 0.03679 0.03719 0.03169 0.02148 0.01356
0.01302 0.04216
* HDV8b
      13 0.04990 0.14013 0.10871 0.09153 0.04383 0.05321 0.03327 0.06460 0.09722 0.08179 0.04999
0.03611 0.03143 0.03281 0.02362 0.01682 0.00505 0.00680 0.00524 0.00625 0.00331 0.00303 0.00239
0.00276 0.01020
*   HDBS is MOBILE6 default
*   HDBT is MOBILE6 default
* MC
      16 0.07939 0.14694 0.12678 0.09680 0.07148 0.08578 0.07191 0.05617 0.04407 0.03619 0.02617
0.01886 0.01834 0.01521 0.01230 0.00968 0.00643 0.00463 0.00469 0.00426 0.00458 0.00382 0.00664
0.00540 0.04348
```

Laredo District Registration Distributions

```
* Calculated from district mid-year (July) 2008 registrations data
* All vehicle class distributions, except HDV8B and MOBILE6 defaults, were based on aggregate
Laredo District data
* Laredo District Counties: Dimmit, Duval, Kinney, Lasalle, Maverick, Val Verde, Webb, and
Zavala.
* HDV8b vehicle class distribution was based on aggregate statewide data
* LDV
       1 0.04954 0.07693 0.07081 0.06824 0.05998 0.06626 0.06818 0.06961 0.08204 0.07091 0.05727
0.04456 0.03420 0.03487 0.02730 0.02341 0.01706 0.01478 0.01259 0.01028 0.00799 0.00538 0.00447
0.00431 0.01903
* LDT1
       2 0.02554 0.04657 0.05020 0.05488 0.05807 0.07641 0.07867 0.08142 0.07061 0.06123 0.05166
0.04902 0.03363 0.03732 0.03729 0.02661 0.01963 0.01716 0.01551 0.01442 0.01190 0.00781 0.01051
0.00937 0.05456
* LDT2
       3 0.02554 0.04657 0.05020 0.05488 0.05807 0.07641 0.07867 0.08142 0.07061 0.06123 0.05166
0.04902 0.03363 0.03732 0.03729 0.02661 0.01963 0.01716 0.01551 0.01442 0.01190 0.00781 0.01051
0.00937 0.05456
* LDT3
       4 0.08764 0.14084 0.10624 0.08906 0.11424 0.08793 0.06513 0.06271 0.04057 0.04920 0.01930
0.02785 0.01705 0.01780 0.01334 0.01172 0.00755 0.00638 0.00496 0.00563 0.00367 0.00163 0.00359
0.00284 0.01313
* LDT4
       5 0.08764 0.14084 0.10624 0.08906 0.11424 0.08793 0.06513 0.06271 0.04057 0.04920 0.01930
0.02785 0.01705 0.01780 0.01334 0.01172 0.00755 0.00638 0.00496 0.00563 0.00367 0.00163 0.00359
0.00284 0.01313
* HDV2b
       6 0.17357 0.11507 0.12772 0.14828 0.08541 0.05813 0.04864 0.04626 0.03954 0.03084 0.01661
0.02017 0.00909 0.01147 0.01226 0.01186 0.00435 0.00435 0.00712 0.00277 0.00474 0.00356 0.00198
0.00277 0.01344
* HDV3
       7 0.07084 0.07414 0.08565 0.07578 0.06590 0.04613 0.04613 0.06590 0.05437 0.06260 0.02801
0.04448 0.03130 0.05107 0.03295 0.02801 0.01318 0.01812 0.01153 0.01977 0.00824 0.00824 0.00494
0.00659 0.04613
* HDV4
       8 0.06211 0.06211 0.09320 0.04969 0.06211 0.06211 0.06832 0.06832 0.08696 0.06211 0.06211
0.05590 0.01242 0.01863 0.04348 0.01242 0.02484 0.00621 0.01863 0.01863 0.00000 0.00621 0.00621
0.00000 0.03727
* HDV5
       9 0.05195 0.03247 0.12988 0.05844 0.03247 0.06494 0.04545 0.05844 0.03896 0.08442 0.01948
0.01948 0.03896 0.06494 0.03896 0.00649 0.00649 0.01299 0.02597 0.02597 0.02597 0.00649 0.01948
0.01299 0.07792
* HDV6
      10 0.02418 0.07912 0.02637 0.03956 0.04176 0.02198 0.01538 0.03077 0.05714 0.07253 0.09891
0.03956 0.04615 0.05495 0.04615 0.05055 0.02637 0.02418 0.02198 0.02418 0.01758 0.02637 0.00659
0.01758 0.09011
* HDV7
      11 0.04000 0.06182 0.04727 0.07273 0.01818 0.02909 0.04000 0.05455 0.06545 0.04000 0.05091
0.04727 0.04364 0.06545 0.03273 0.05455 0.02182 0.04000 0.02545 0.03636 0.02182 0.01818 0.01455
0.01091 0.04727
* HDV8a
      12 0.04293 0.06313 0.06566 0.06566 0.08081 0.01263 0.03788 0.02020 0.04040 0.04293 0.02525
0.02778 0.04293 0.05303 0.04040 0.05051 0.02525 0.02525 0.02273 0.03535 0.01515 0.01768 0.02020
0.02020 0.10606
* HDV8b
      13 0.04990 0.14013 0.10871 0.09153 0.04383 0.05321 0.03327 0.06460 0.09722 0.08179 0.04999
0.03611 0.03143 0.03281 0.02362 0.01682 0.00505 0.00680 0.00524 0.00625 0.00331 0.00303 0.00239
0.00276 0.01020
*   HDBS is MOBILE6 default
*   HDBT is MOBILE6 default
* MC
      16 0.10753 0.24386 0.18307 0.09375 0.06004 0.06619 0.05044 0.03568 0.02633 0.02018 0.01993
0.01033 0.01009 0.00910 0.00418 0.00566 0.00369 0.00246 0.00172 0.00271 0.00172 0.00394 0.00369
0.00492 0.02879
```

Lubbock District Registration Distributions

```
* Calculated from district mid-year (July) 2008 registrations data
* All vehicle class distributions, except HDV8B and MOBILE6 defaults, were based on aggregate
Lubbock District data
* Lubbock District Counties: Bailey, Castro, Cochran, Crosby, Dawson, Floyd, Gaines, Garza, Hale,
Hockley, Lamb, Lubbock, Lynn, Parmer, Swisher, Terry, and Yoakum.
* HDV8b vehicle class distribution was based on aggregate statewide data
* LDV
       1 0.03973 0.06992 0.06824 0.07187 0.07281 0.07447 0.07448 0.06862 0.06758 0.06078 0.04811
0.04419 0.03538 0.03573 0.02920 0.02420 0.01953 0.01733 0.01383 0.01207 0.00855 0.00606 0.00562
0.00510 0.02660
* LDT1
       2 0.01809 0.03706 0.04858 0.04753 0.05458 0.06504 0.06916 0.06921 0.06789 0.05564 0.05636
0.05646 0.03987 0.04174 0.04319 0.02967 0.02237 0.02179 0.01824 0.01864 0.01514 0.00963 0.01328
0.01218 0.06866
* LDT2
       3 0.01809 0.03706 0.04858 0.04753 0.05458 0.06504 0.06916 0.06921 0.06789 0.05564 0.05636
0.05646 0.03987 0.04174 0.04319 0.02967 0.02237 0.02179 0.01824 0.01864 0.01514 0.00963 0.01328
0.01218 0.06866
* LDT3
       4 0.08853 0.13503 0.10390 0.08634 0.10894 0.07526 0.06638 0.06361 0.04732 0.05191 0.02544
0.03470 0.02112 0.02020 0.01248 0.01077 0.00751 0.00562 0.00408 0.00497 0.00377 0.00161 0.00309
0.00312 0.01430
* LDT4
       5 0.08853 0.13503 0.10390 0.08634 0.10894 0.07526 0.06638 0.06361 0.04732 0.05191 0.02544
0.03470 0.02112 0.02020 0.01248 0.01077 0.00751 0.00562 0.00408 0.00497 0.00377 0.00161 0.00309
0.00312 0.01430
* HDV2b
       6 0.15848 0.10605 0.14035 0.15764 0.09078 0.07003 0.05159 0.05159 0.03343 0.02853 0.01902
0.02017 0.00749 0.01037 0.00807 0.00403 0.00375 0.00490 0.00231 0.00288 0.00375 0.00029 0.00346
0.00288 0.01816
* HDV3
       7 0.06886 0.08529 0.08325 0.06680 0.07297 0.05036 0.06578 0.06269 0.08530 0.05755 0.02878
0.02980 0.01953 0.01953 0.02878 0.02672 0.01439 0.01131 0.01131 0.01439 0.00822 0.00411 0.00617
0.00411 0.07400
* HDV4
       8 0.04494 0.09363 0.08989 0.04120 0.03371 0.05993 0.04869 0.04869 0.09363 0.05618 0.02622
0.05618 0.02247 0.04869 0.01498 0.00375 0.00375 0.01498 0.00749 0.01498 0.00375 0.00000 0.00375
0.01498 0.15354
* HDV5
       9 0.04816 0.08215 0.09915 0.08215 0.11615 0.08499 0.01983 0.03683 0.04249 0.05382 0.00850
0.03966 0.01133 0.01416 0.01983 0.01133 0.01133 0.01983 0.02266 0.00850 0.01133 0.00567 0.00000
0.00567 0.14448
* HDV6
      10 0.02457 0.04545 0.05283 0.06880 0.02826 0.04423 0.04423 0.04054 0.04914 0.04914 0.04423
0.02826 0.05037 0.05283 0.02457 0.01474 0.01966 0.03808 0.01966 0.01843 0.02088 0.02826 0.02211
0.02211 0.14862
* HDV7
      11 0.01504 0.01654 0.04812 0.04962 0.02406 0.01654 0.01203 0.01504 0.03008 0.02857 0.06015
0.04211 0.02707 0.04962 0.01955 0.03609 0.02406 0.23156 0.05865 0.01654 0.02707 0.02707 0.01654
0.01805 0.09023
* HDV8a
      12 0.03815 0.02589 0.02997 0.01362 0.02997 0.02180 0.01907 0.00817 0.11172 0.08856 0.05586
0.03270 0.04360 0.06540 0.05041 0.02725 0.02452 0.06131 0.02589 0.01907 0.01362 0.02861 0.01771
0.02725 0.11988
* HDV8b
      13 0.04990 0.14013 0.10871 0.09153 0.04383 0.05321 0.03327 0.06460 0.09722 0.08179 0.04999
0.03611 0.03143 0.03281 0.02362 0.01682 0.00505 0.00680 0.00524 0.00625 0.00331 0.00303 0.00239
0.00276 0.01020
*   HDBS is MOBILE6 default
*   HDBT is MOBILE6 default
* MC
      16 0.07804 0.12066 0.10801 0.09466 0.06456 0.07614 0.06756 0.06415 0.05598 0.03936 0.02956
0.02738 0.02234 0.01689 0.01090 0.00940 0.00640 0.00586 0.00572 0.00518 0.00477 0.00449 0.00967
0.00844 0.06388
```

Lufkin District Registration Distributions

```
* Calculated from district mid-year (July) 2008 registrations data
* All vehicle class distributions, except HDV8B and MOBILE6 defaults, were based on aggregate
Lufkin District data
* Lufkin District Counties: Angelina, Houston, Nacogdoches, Polk, Sabine, San Augustine, San
Jacinto, Shelby, and Trinity.
* HDV8b vehicle class distribution was based on aggregate statewide data
* LDV
       1 0.04563 0.07374 0.07379 0.07483 0.06776 0.06323 0.06442 0.06419 0.06765 0.06176 0.05140
0.04704 0.03870 0.03995 0.03027 0.02622 0.02038 0.01768 0.01318 0.01116 0.00888 0.00645 0.00517
0.00460 0.02192
* LDT1
       2 0.02221 0.04304 0.04804 0.04816 0.05705 0.06621 0.07002 0.07255 0.06270 0.05604 0.05604
0.05434 0.04309 0.04537 0.04333 0.03140 0.02551 0.02368 0.01907 0.01918 0.01464 0.01043 0.01198
0.00986 0.04606
* LDT2
       3 0.02221 0.04304 0.04804 0.04816 0.05705 0.06621 0.07002 0.07255 0.06270 0.05604 0.05604
0.05434 0.04309 0.04537 0.04333 0.03140 0.02551 0.02368 0.01907 0.01918 0.01464 0.01043 0.01198
0.00986 0.04606
* LDT3
       4 0.07105 0.12866 0.08607 0.07729 0.10159 0.07733 0.06868 0.07121 0.05173 0.05565 0.03026
0.03765 0.02899 0.02495 0.01519 0.01527 0.01086 0.00845 0.00629 0.00559 0.00372 0.00233 0.00355
0.00400 0.01364
* LDT4
       5 0.07105 0.12866 0.08607 0.07729 0.10159 0.07733 0.06868 0.07121 0.05173 0.05565 0.03026
0.03765 0.02899 0.02495 0.01519 0.01527 0.01086 0.00845 0.00629 0.00559 0.00372 0.00233 0.00355
0.00400 0.01364
* HDV2b
       6 0.11984 0.12899 0.15156 0.12069 0.09983 0.08897 0.05151 0.06343 0.03980 0.04300 0.02788
0.01724 0.00447 0.00788 0.00426 0.00404 0.00404 0.00426 0.00106 0.00362 0.00128 0.00085 0.00128
0.00128 0.00894
* HDV3
       7 0.10546 0.10298 0.09181 0.07072 0.06576 0.08685 0.06576 0.07692 0.06328 0.06079 0.00868
0.03474 0.01241 0.02730 0.01365 0.02109 0.00868 0.01241 0.01241 0.00620 0.00868 0.00496 0.00496
0.00124 0.03226
* HDV4
       8 0.07650 0.12025 0.05464 0.06557 0.03825 0.03279 0.05464 0.04372 0.07650 0.06557 0.01093
0.07104 0.04918 0.04918 0.02186 0.02186 0.01639 0.00546 0.01093 0.02732 0.01093 0.00546 0.00546
0.00000 0.06557
* HDV5
       9 0.05314 0.02899 0.09662 0.09179 0.07246 0.08213 0.05797 0.03865 0.05797 0.11596 0.03865
0.03382 0.01449 0.02415 0.02415 0.00966 0.00483 0.01449 0.00966 0.00966 0.01449 0.01932 0.00966
0.00966 0.06763
* HDV6
      10 0.01953 0.04883 0.08007 0.04883 0.03711 0.05273 0.03516 0.04297 0.06836 0.06836 0.05078
0.03906 0.03711 0.07422 0.03516 0.02734 0.02148 0.02930 0.02539 0.01758 0.02344 0.01758 0.02344
0.02148 0.05469
* HDV7
      11 0.02083 0.05000 0.02500 0.03333 0.02917 0.05833 0.05417 0.03750 0.07917 0.10000 0.07083
0.08750 0.03333 0.05000 0.02083 0.04167 0.02500 0.02917 0.02917 0.01667 0.03333 0.00833 0.00833
0.00417 0.05417
* HDV8a
      12 0.00623 0.01869 0.03427 0.04050 0.02492 0.00935 0.03115 0.03738 0.05919 0.04673 0.02492
0.03115 0.04050 0.05607 0.07165 0.04984 0.03427 0.03115 0.05919 0.05919 0.04984 0.02492 0.02181
0.03738 0.09971
* HDV8b
      13 0.04990 0.14013 0.10871 0.09153 0.04383 0.05321 0.03327 0.06460 0.09722 0.08179 0.04999
0.03611 0.03143 0.03281 0.02362 0.01682 0.00505 0.00680 0.00524 0.00625 0.00331 0.00303 0.00239
0.00276 0.01020
*   HDBS is MOBILE6 default
*   HDBT is MOBILE6 default
* MC
      16 0.07190 0.12281 0.11971 0.09985 0.05223 0.08257 0.06344 0.06087 0.05223 0.03954 0.03328
0.02152 0.02023 0.02023 0.01784 0.01361 0.00736 0.00515 0.00901 0.00625 0.00478 0.00644 0.00791
0.00791 0.05333
```

Odessa District Registration Distributions

```
* Calculated from district mid-year (July) 2008 registrations data
* All vehicle class distributions, except HDV8B and MOBILE6 defaults, were based on aggregate
Odessa District data
* Odessa District Counties: Andrews, Crane, Ector, Loving, Martin, Midland, Pecos, Reeves,
Terrell, Upton, Ward, and Winkler.
* HDV8b vehicle class distribution was based on aggregate statewide data
* LDV
       1 0.05791 0.08494 0.07512 0.07999 0.07014 0.06774 0.06612 0.06685 0.06569 0.05550 0.04682
0.04220 0.03299 0.03297 0.02694 0.02203 0.01783 0.01577 0.01276 0.01017 0.00808 0.00558 0.00440
0.00445 0.02701
* LDT1
       2 0.02933 0.05327 0.06097 0.06176 0.06370 0.06883 0.06880 0.07791 0.06066 0.05287 0.05182
0.05222 0.03555 0.03810 0.03871 0.02703 0.01908 0.01888 0.01581 0.01486 0.01314 0.00758 0.00872
0.00945 0.05095
* LDT2
       3 0.02933 0.05327 0.06097 0.06176 0.06370 0.06883 0.06880 0.07791 0.06066 0.05287 0.05182
0.05222 0.03555 0.03810 0.03871 0.02703 0.01908 0.01888 0.01581 0.01486 0.01314 0.00758 0.00872
0.00945 0.05095
* LDT3
       4 0.12673 0.16267 0.11380 0.09095 0.10493 0.07077 0.05887 0.06181 0.03886 0.04158 0.01790
0.02767 0.01725 0.01619 0.00817 0.00802 0.00558 0.00441 0.00345 0.00382 0.00256 0.00094 0.00183
0.00164 0.00960
* LDT4
       5 0.12673 0.16267 0.11380 0.09095 0.10493 0.07077 0.05887 0.06181 0.03886 0.04158 0.01790
0.02767 0.01725 0.01619 0.00817 0.00802 0.00558 0.00441 0.00345 0.00382 0.00256 0.00094 0.00183
0.00164 0.00960
* HDV2b
       6 0.27046 0.13611 0.16073 0.13611 0.06944 0.05455 0.03927 0.03194 0.01553 0.01831 0.00997
0.01136 0.00619 0.00581 0.00442 0.00379 0.00316 0.00316 0.00189 0.00189 0.00177 0.00025 0.00126
0.00152 0.01111
* HDV3
       7 0.14540 0.08537 0.12450 0.08582 0.06759 0.06092 0.04847 0.06492 0.04891 0.05024 0.01956
0.04002 0.02179 0.02801 0.02045 0.01512 0.00978 0.00800 0.00934 0.00756 0.00400 0.00133 0.00356
0.00222 0.02712
* HDV4
       8 0.09369 0.10811 0.12252 0.07568 0.07748 0.06486 0.04865 0.07387 0.04324 0.06667 0.01261
0.04685 0.01802 0.02162 0.02703 0.01081 0.01261 0.01261 0.01261 0.00541 0.00721 0.00000 0.00360
0.00541 0.02883
* HDV5
       9 0.15997 0.13143 0.11048 0.08762 0.03429 0.05333 0.03429 0.06286 0.05905 0.03810 0.01714
0.02667 0.00762 0.02286 0.01143 0.02286 0.00381 0.01524 0.01143 0.01143 0.01143 0.00381 0.00571
0.00762 0.04952
* HDV6
      10 0.06197 0.13897 0.08920 0.07042 0.04601 0.04225 0.04695 0.05540 0.04883 0.04225 0.05540
0.03380 0.02254 0.02817 0.01784 0.02723 0.02066 0.02347 0.01690 0.01502 0.01033 0.00376 0.01221
0.01127 0.05915
* HDV7
      11 0.04061 0.08291 0.05584 0.06599 0.03892 0.04738 0.04738 0.05922 0.06937 0.05245 0.06599
0.04569 0.03892 0.05584 0.02707 0.02200 0.02369 0.02876 0.03384 0.01015 0.01015 0.01184 0.01015
0.01015 0.04569
* HDV8a
      12 0.01806 0.07917 0.03750 0.02500 0.02639 0.02778 0.04167 0.05417 0.04861 0.05000 0.05556
0.04722 0.04444 0.05694 0.04583 0.03889 0.03194 0.02500 0.02222 0.02778 0.02361 0.02222 0.01806
0.01806 0.11388
* HDV8b
      13 0.04990 0.14013 0.10871 0.09153 0.04383 0.05321 0.03327 0.06460 0.09722 0.08179 0.04999
0.03611 0.03143 0.03281 0.02362 0.01682 0.00505 0.00680 0.00524 0.00625 0.00331 0.00303 0.00239
0.00276 0.01020
*   HDBS is MOBILE6 default
*   HDBT is MOBILE6 default
* MC
      16 0.09906 0.14810 0.11588 0.09442 0.07204 0.08171 0.06913 0.05628 0.04211 0.02900 0.02198
0.01602 0.01748 0.01496 0.00980 0.00808 0.00556 0.00344 0.00358 0.00503 0.00530 0.00622 0.00702
0.00728 0.06052
```

Paris District Registration Distributions

```
* Calculated from district mid-year (July) 2008 registrations data
* All vehicle class distributions, except HDV8B and MOBILE6 defaults, were based on aggregate
Paris District data
* Paris District Counties: Delta, Fannin, Franklin, Grayson, Hopkins, Hunt, Lamar, Rains, and Red
River.
* HDV8b vehicle class distribution was based on aggregate statewide data
* LDV
       1 0.04120 0.07397 0.07300 0.07631 0.06723 0.06685 0.06557 0.06334 0.06660 0.05901 0.04998
0.04501 0.03925 0.04022 0.03118 0.02599 0.02051 0.01765 0.01424 0.01164 0.00912 0.00639 0.00558
0.00500 0.02516
* LDT1
       2 0.02059 0.04139 0.04306 0.04652 0.05416 0.06177 0.06893 0.07274 0.06447 0.05557 0.05527
0.05228 0.04193 0.04478 0.04321 0.03058 0.02484 0.02192 0.01943 0.02002 0.01640 0.01090 0.01374
0.01203 0.06347
* LDT2
       3 0.02059 0.04139 0.04306 0.04652 0.05416 0.06177 0.06893 0.07274 0.06447 0.05557 0.05527
0.05228 0.04193 0.04478 0.04321 0.03058 0.02484 0.02192 0.01943 0.02002 0.01640 0.01090 0.01374
0.01203 0.06347
* LDT3
       4 0.05766 0.11204 0.08451 0.07477 0.10592 0.07778 0.07188 0.08172 0.05517 0.06367 0.02677
0.04044 0.02601 0.02615 0.01505 0.01440 0.01049 0.00763 0.00561 0.00572 0.00467 0.00221 0.00586
0.00430 0.01957
* LDT4
       5 0.05766 0.11204 0.08451 0.07477 0.10592 0.07778 0.07188 0.08172 0.05517 0.06367 0.02677
0.04044 0.02601 0.02615 0.01505 0.01440 0.01049 0.00763 0.00561 0.00572 0.00467 0.00221 0.00586
0.00430 0.01957
* HDV2b
       6 0.09667 0.12434 0.13231 0.14089 0.11931 0.08576 0.06102 0.06479 0.03649 0.04362 0.02558
0.01615 0.00692 0.00671 0.00587 0.00210 0.00482 0.00294 0.00336 0.00231 0.00231 0.00084 0.00231
0.00189 0.01069
* HDV3
       7 0.11810 0.09066 0.09341 0.05769 0.05220 0.05495 0.04121 0.06181 0.06319 0.06868 0.04121
0.04396 0.02473 0.04121 0.01923 0.00962 0.01236 0.00962 0.01099 0.01511 0.00962 0.00275 0.00412
0.00824 0.04533
* HDV4
       8 0.03398 0.09222 0.06311 0.08738 0.04854 0.05340 0.05340 0.06796 0.05825 0.07767 0.02913
0.02427 0.04854 0.04369 0.02913 0.01942 0.00971 0.01942 0.01942 0.02427 0.01942 0.00485 0.00000
0.00971 0.06311
* HDV5
       9 0.06145 0.07263 0.09495 0.08939 0.05587 0.06145 0.03352 0.02235 0.07821 0.04469 0.02235
0.00559 0.02793 0.02793 0.04469 0.00000 0.02235 0.02235 0.04469 0.01676 0.03352 0.00559 0.00559
0.01676 0.08939
* HDV6
      10 0.01493 0.04312 0.04975 0.03980 0.03483 0.03483 0.02156 0.04478 0.05473 0.07794 0.05804
0.04975 0.04809 0.05970 0.04643 0.03151 0.01824 0.03483 0.02819 0.01990 0.02985 0.01658 0.02156
0.01658 0.10448
* HDV7
      11 0.02198 0.06960 0.08056 0.04396 0.03663 0.02198 0.05128 0.02930 0.04762 0.03663 0.04396
0.05495 0.06227 0.05495 0.04029 0.02564 0.03297 0.02930 0.05495 0.01465 0.01832 0.01465 0.02564
0.01832 0.06960
* HDV8a
      12 0.00744 0.03474 0.01737 0.02233 0.03226 0.03226 0.02730 0.01985 0.05211 0.03722 0.03970
0.05707 0.06203 0.05955 0.06203 0.05707 0.03970 0.02730 0.03474 0.03226 0.03226 0.02481 0.03722
0.03474 0.11664
* HDV8b
      13 0.04990 0.14013 0.10871 0.09153 0.04383 0.05321 0.03327 0.06460 0.09722 0.08179 0.04999
0.03611 0.03143 0.03281 0.02362 0.01682 0.00505 0.00680 0.00524 0.00625 0.00331 0.00303 0.00239
0.00276 0.01020
*   HDBS is MOBILE6 default
*   HDBT is MOBILE6 default
* MC
      16 0.07294 0.12761 0.11197 0.09531 0.06677 0.07533 0.07145 0.05855 0.04771 0.03299 0.02865
0.02420 0.02260 0.01724 0.01221 0.00902 0.00731 0.00514 0.00525 0.00639 0.00468 0.00491 0.01187
0.00959 0.07031
```

Pharr District Registration Distributions

```
* Calculated from district mid-year (July) 2008 registrations data
* All vehicle class distributions, except HDV8B and MOBILE6 defaults, were based on aggregate
Pharr District data
* Pharr District Counties: Brooks, Cameron, Hidalgo, Jim Hogg, Kenedy, Starr, Willacy, and
Zapata.
* HDV8b vehicle class distribution was based on aggregate statewide data
* LDV
       1 0.05050 0.06980 0.06417 0.06328 0.05436 0.06196 0.06600 0.06998 0.08157 0.07486 0.06162
0.04901 0.03959 0.04028 0.03020 0.02534 0.02104 0.01638 0.01316 0.01196 0.00810 0.00562 0.00408
0.00343 0.01371
* LDT1
       2 0.02633 0.04394 0.04712 0.04817 0.05234 0.07237 0.07669 0.08440 0.07677 0.06967 0.05609
0.05501 0.03560 0.03829 0.04004 0.02790 0.02043 0.01751 0.01700 0.01655 0.01427 0.00927 0.00938
0.00814 0.03672
* LDT2
       3 0.02633 0.04394 0.04712 0.04817 0.05234 0.07237 0.07669 0.08440 0.07677 0.06967 0.05609
0.05501 0.03560 0.03829 0.04004 0.02790 0.02043 0.01751 0.01700 0.01655 0.01427 0.00927 0.00938
0.00814 0.03672
* LDT3
       4 0.10189 0.16249 0.09943 0.08789 0.12115 0.08343 0.06587 0.05548 0.04105 0.04434 0.01698
0.02644 0.01560 0.01643 0.01135 0.00994 0.00759 0.00556 0.00421 0.00438 0.00349 0.00175 0.00175
0.00211 0.00940
* LDT4
       5 0.10189 0.16249 0.09943 0.08789 0.12115 0.08343 0.06587 0.05548 0.04105 0.04434 0.01698
0.02644 0.01560 0.01643 0.01135 0.00994 0.00759 0.00556 0.00421 0.00438 0.00349 0.00175 0.00175
0.00211 0.00940
* HDV2b
       6 0.19040 0.08744 0.11231 0.16123 0.07562 0.05605 0.05320 0.04444 0.03893 0.04036 0.01855
0.02364 0.01080 0.01284 0.01325 0.00754 0.00836 0.00428 0.00489 0.00428 0.00489 0.00387 0.00428
0.00163 0.01692
* HDV3
       7 0.07945 0.05887 0.07285 0.04709 0.04636 0.06843 0.04047 0.07064 0.06255 0.06255 0.03532
0.05372 0.03164 0.04636 0.04047 0.02723 0.01766 0.02134 0.02208 0.01913 0.01398 0.00736 0.00515
0.01177 0.03753
* HDV4
       8 0.04436 0.08133 0.10167 0.06285 0.04621 0.05176 0.02218 0.07763 0.08133 0.07579 0.05545
0.04991 0.05545 0.01848 0.02403 0.00924 0.02033 0.00924 0.01294 0.01294 0.01294 0.00924 0.00370
0.00370 0.05730
* HDV5
       9 0.01364 0.08636 0.08409 0.01818 0.04545 0.03864 0.05227 0.06591 0.04773 0.07727 0.05227
0.02045 0.02727 0.03636 0.01818 0.01591 0.02727 0.02045 0.02273 0.02045 0.01136 0.02500 0.02727
0.01364 0.13185
* HDV6
      10 0.00558 0.04833 0.04740 0.03625 0.03439 0.02974 0.02416 0.05390 0.08457 0.07807 0.05762
0.04368 0.03810 0.06413 0.04182 0.02881 0.03253 0.03439 0.02974 0.01952 0.01580 0.01859 0.02230
0.02138 0.08920
* HDV7
      11 0.02754 0.03098 0.02926 0.03959 0.02754 0.03098 0.04131 0.04819 0.06196 0.06885 0.03442
0.04303 0.04475 0.07229 0.04819 0.04131 0.02754 0.03270 0.03442 0.01893 0.02754 0.02065 0.02410
0.03098 0.09295
* HDV8a
      12 0.00972 0.03013 0.01749 0.02818 0.01555 0.01846 0.01944 0.02332 0.05442 0.05053 0.03984
0.02721 0.04762 0.07094 0.06220 0.05053 0.05151 0.05248 0.04665 0.06122 0.04373 0.03499 0.02527
0.02527 0.09330
* HDV8b
      13 0.04990 0.14013 0.10871 0.09153 0.04383 0.05321 0.03327 0.06460 0.09722 0.08179 0.04999
0.03611 0.03143 0.03281 0.02362 0.01682 0.00505 0.00680 0.00524 0.00625 0.00331 0.00303 0.00239
0.00276 0.01020
*   HDBS is MOBILE6 default
*   HDBT is MOBILE6 default
* MC
      16 0.12157 0.19005 0.13787 0.10460 0.06518 0.07845 0.05815 0.04635 0.03444 0.02527 0.01786
0.01366 0.01005 0.01034 0.00634 0.00595 0.00371 0.00371 0.00273 0.00332 0.00273 0.00332 0.00634
0.00644 0.04157
```

San Angelo District Registration Distributions

```
* Calculated from district mid-year (July) 2008 registrations data
* All vehicle class distributions, except HDV8B and MOBILE6 defaults, were based on aggregate San
Angelo District data
* San Angelo District Counties: Coke, Concho, Crockett, Edwards, Glasscock, Irion, Kimble,
Menard, Reagan, Real, Runnels, Schleicher, Sterling, Sutton, and Tom Green.
* HDV8b vehicle class distribution was based on aggregate statewide data
* LDV
       1 0.04391 0.07548 0.07238 0.07669 0.07560 0.07475 0.07279 0.06727 0.06613 0.05955 0.04555
0.04346 0.03267 0.03350 0.02591 0.02253 0.01925 0.01556 0.01267 0.01022 0.00864 0.00612 0.00529
0.00439 0.02969
* LDT1
       2 0.02866 0.05669 0.05353 0.05444 0.05839 0.06609 0.06862 0.07464 0.06369 0.05060 0.05264
0.04741 0.03728 0.03652 0.03773 0.02687 0.02224 0.02164 0.01722 0.01686 0.01339 0.00937 0.01175
0.01019 0.06354
* LDT2
       3 0.02866 0.05669 0.05353 0.05444 0.05839 0.06609 0.06862 0.07464 0.06369 0.05060 0.05264
0.04741 0.03728 0.03652 0.03773 0.02687 0.02224 0.02164 0.01722 0.01686 0.01339 0.00937 0.01175
0.01019 0.06354
* LDT3
       4 0.08458 0.11865 0.09185 0.07712 0.09760 0.07903 0.06621 0.07310 0.05390 0.05403 0.02488
0.04063 0.02692 0.02392 0.01563 0.01416 0.00868 0.00797 0.00510 0.00625 0.00466 0.00223 0.00421
0.00217 0.01652
* LDT4
       5 0.08458 0.11865 0.09185 0.07712 0.09760 0.07903 0.06621 0.07310 0.05390 0.05403 0.02488
0.04063 0.02692 0.02392 0.01563 0.01416 0.00868 0.00797 0.00510 0.00625 0.00466 0.00223 0.00421
0.00217 0.01652
* HDV2b
       6 0.15158 0.12212 0.14731 0.15927 0.09863 0.06661 0.04313 0.05167 0.03074 0.03117 0.01537
0.02135 0.00598 0.01067 0.00939 0.00598 0.00299 0.00384 0.00256 0.00085 0.00171 0.00128 0.00043
0.00171 0.01366
* HDV3
       7 0.12128 0.10984 0.08689 0.10000 0.04590 0.04426 0.03607 0.05082 0.05246 0.08033 0.01639
0.05410 0.03115 0.02951 0.02787 0.00656 0.01311 0.01311 0.01148 0.01148 0.00492 0.00656 0.00984
0.00656 0.02951
* HDV4
       8 0.04192 0.02994 0.04790 0.04790 0.05988 0.07186 0.11976 0.14370 0.08982 0.02395 0.01198
0.08982 0.03593 0.00599 0.02395 0.00000 0.00599 0.04192 0.00000 0.00599 0.00599 0.01796 0.00599
0.00599 0.06587
* HDV5
       9 0.08844 0.10204 0.12244 0.02721 0.08163 0.06803 0.02041 0.06122 0.07483 0.00680 0.04082
0.02041 0.01361 0.02721 0.00680 0.02041 0.01361 0.01361 0.02041 0.00680 0.02721 0.00680 0.00000
0.00680 0.12245
* HDV6
      10 0.02446 0.03364 0.03364 0.04893 0.02446 0.03058 0.03670 0.03976 0.05505 0.06728 0.04893
0.06422 0.04587 0.05199 0.03364 0.03058 0.03364 0.02752 0.01835 0.01835 0.03670 0.01529 0.03976
0.00917 0.13149
* HDV7
      11 0.02752 0.04587 0.02294 0.02752 0.01835 0.03211 0.03670 0.05046 0.05505 0.05046 0.10549
0.02752 0.05505 0.07798 0.08257 0.02752 0.01835 0.05505 0.01835 0.01835 0.01835 0.00917 0.02294
0.00917 0.08716
* HDV8a
      12 0.01385 0.03878 0.03878 0.02493 0.02770 0.03047 0.01939 0.02216 0.05540 0.06371 0.08587
0.06371 0.05263 0.04986 0.04709 0.03324 0.01939 0.03324 0.03047 0.01662 0.04155 0.01939 0.01108
0.05817 0.10252
* HDV8b
      13 0.04990 0.14013 0.10871 0.09153 0.04383 0.05321 0.03327 0.06460 0.09722 0.08179 0.04999
0.03611 0.03143 0.03281 0.02362 0.01682 0.00505 0.00680 0.00524 0.00625 0.00331 0.00303 0.00239
0.00276 0.01020
*   HDBS is MOBILE6 default
*   HDBT is MOBILE6 default
* MC
      16 0.05192 0.12138 0.11607 0.09524 0.06878 0.08102 0.07440 0.05324 0.04795 0.03340 0.02745
0.02943 0.02149 0.01786 0.01521 0.00463 0.00595 0.00595 0.00364 0.00397 0.00562 0.00661 0.01323
0.01190 0.08366
```

San Antonio District Registration Distributions

```
* Calculated from district mid-year (July) 2008 registrations data
* All vehicle class distributions, except HDV8B and MOBILE6 defaults, were based on aggregate San
Antonio District data
* San Antonio District Counties: Atascosa, Bandera, Bexar, Comal, Frio, Guadalupe, Kendall, Kerr,
Mcmullen, Medina, Uvalde, and Wilson.
* HDV8b vehicle class distribution was based on aggregate statewide data
* LDV
       1 0.06814 0.08049 0.07542 0.07707 0.07100 0.07001 0.07127 0.06713 0.06713 0.05694 0.04667
0.04022 0.03199 0.03331 0.02606 0.02185 0.01722 0.01483 0.01147 0.00916 0.00695 0.00539 0.00459
0.00412 0.02157
* LDT1
       2 0.02488 0.04291 0.04964 0.05313 0.06100 0.07596 0.08152 0.07889 0.06615 0.05682 0.05126
0.04859 0.03577 0.03782 0.03855 0.02702 0.02081 0.01877 0.01539 0.01527 0.01252 0.00922 0.01128
0.00992 0.05691
* LDT2
       3 0.02488 0.04291 0.04964 0.05313 0.06100 0.07596 0.08152 0.07889 0.06615 0.05682 0.05126
0.04859 0.03577 0.03782 0.03855 0.02702 0.02081 0.01877 0.01539 0.01527 0.01252 0.00922 0.01128
0.00992 0.05691
* LDT3
       4 0.06369 0.12014 0.09068 0.08017 0.11178 0.08638 0.07373 0.07155 0.05276 0.06222 0.02447
0.03526 0.02245 0.02178 0.01561 0.01280 0.00878 0.00663 0.00560 0.00537 0.00399 0.00238 0.00341
0.00323 0.01514
* LDT4
       5 0.06369 0.12014 0.09068 0.08017 0.11178 0.08638 0.07373 0.07155 0.05276 0.06222 0.02447
0.03526 0.02245 0.02178 0.01561 0.01280 0.00878 0.00663 0.00560 0.00537 0.00399 0.00238 0.00341
0.00323 0.01514
* HDV2b
       6 0.11610 0.10077 0.12834 0.14635 0.11220 0.08066 0.06882 0.06109 0.03831 0.03085 0.01703
0.01642 0.00835 0.01143 0.00876 0.00718 0.00410 0.00534 0.00417 0.00424 0.00287 0.00198 0.00322
0.00397 0.01745
* HDV3
       7 0.08833 0.09731 0.10935 0.06590 0.05609 0.04347 0.04459 0.06955 0.07207 0.06478 0.02328
0.04206 0.02664 0.02720 0.02496 0.02328 0.01430 0.01346 0.01514 0.01318 0.00813 0.00477 0.00757
0.00617 0.03842
* HDV4
       8 0.05680 0.10913 0.11487 0.04914 0.05361 0.04786 0.06254 0.06956 0.07339 0.08041 0.03382
0.05041 0.04403 0.03382 0.01595 0.01213 0.01085 0.00702 0.00702 0.00638 0.00766 0.00893 0.00064
0.00638 0.03765
* HDV5
       9 0.06576 0.08994 0.12863 0.07544 0.07253 0.05029 0.05803 0.04545 0.07253 0.06286 0.02224
0.01547 0.01547 0.02515 0.01451 0.01547 0.01451 0.01451 0.01644 0.01934 0.01741 0.01064 0.00484
0.01064 0.06190
* HDV6
      10 0.03794 0.09818 0.09180 0.06284 0.05039 0.03186 0.03099 0.05213 0.07877 0.05879 0.06024
0.02751 0.02809 0.05068 0.02606 0.02172 0.01651 0.01680 0.01853 0.01216 0.01564 0.01303 0.01419
0.01593 0.06922
* HDV7
      11 0.03253 0.08740 0.05995 0.04464 0.03571 0.04145 0.04401 0.06122 0.07079 0.05548 0.05995
0.03316 0.04145 0.04018 0.03125 0.02934 0.02742 0.03380 0.03061 0.01849 0.01403 0.02168 0.01339
0.01276 0.05931
* HDV8a
      12 0.02580 0.04702 0.03288 0.02788 0.02289 0.03371 0.03121 0.04827 0.06908 0.06658 0.05035
0.03829 0.04994 0.06742 0.05410 0.04869 0.02788 0.03038 0.03454 0.02871 0.02622 0.02247 0.02330
0.02164 0.07075
* HDV8b
      13 0.04990 0.14013 0.10871 0.09153 0.04383 0.05321 0.03327 0.06460 0.09722 0.08179 0.04999
0.03611 0.03143 0.03281 0.02362 0.01682 0.00505 0.00680 0.00524 0.00625 0.00331 0.00303 0.00239
0.00276 0.01020
*   HDBS is MOBILE6 default
*   HDBT is MOBILE6 default
* MC
      16 0.08469 0.16314 0.13158 0.09652 0.06553 0.07950 0.06237 0.05031 0.04137 0.03380 0.02350
0.01699 0.01646 0.01436 0.01162 0.00953 0.00684 0.00495 0.00546 0.00513 0.00392 0.00463 0.00826
0.00725 0.05229
```

Tyler District Registration Distributions

```
* Calculated from district mid-year (July) 2008 registrations data
* All vehicle class distributions, except HDV8B and MOBILE6 defaults, were based on aggregate
Tyler District data
* Tyler District Counties: Anderson, Cherokee, Gregg, Henderson, Rusk, Smith, Van Zandt, and
Wood.
* HDV8b vehicle class distribution was based on aggregate statewide data
* LDV
       1 0.04683 0.07537 0.07321 0.07714 0.07080 0.06932 0.07018 0.06599 0.06668 0.05961 0.04775
0.04367 0.03656 0.03714 0.02790 0.02426 0.01970 0.01642 0.01338 0.01063 0.00784 0.00578 0.00505
0.00455 0.02424
* LDT1
       2 0.02022 0.04415 0.04968 0.05166 0.05606 0.06472 0.06835 0.07414 0.06558 0.05447 0.05367
0.05314 0.04068 0.04415 0.04159 0.02999 0.02367 0.02048 0.01911 0.01799 0.01427 0.01033 0.01242
0.01084 0.05864
* LDT2
       3 0.02022 0.04415 0.04968 0.05166 0.05606 0.06472 0.06835 0.07414 0.06558 0.05447 0.05367
0.05314 0.04068 0.04415 0.04159 0.02999 0.02367 0.02048 0.01911 0.01799 0.01427 0.01033 0.01242
0.01084 0.05864
* LDT3
       4 0.08160 0.13460 0.09221 0.08168 0.10713 0.07735 0.06821 0.06858 0.04961 0.05131 0.02369
0.03207 0.02414 0.02281 0.01466 0.01347 0.00975 0.00709 0.00585 0.00507 0.00419 0.00225 0.00380
0.00347 0.01541
* LDT4
       5 0.08160 0.13460 0.09221 0.08168 0.10713 0.07735 0.06821 0.06858 0.04961 0.05131 0.02369
0.03207 0.02414 0.02281 0.01466 0.01347 0.00975 0.00709 0.00585 0.00507 0.00419 0.00225 0.00380
0.00347 0.01541
* HDV2b
       6 0.13067 0.12940 0.15133 0.14413 0.09876 0.07799 0.05141 0.05594 0.03331 0.03319 0.02135
0.01543 0.00661 0.00894 0.00720 0.00395 0.00429 0.00267 0.00197 0.00313 0.00186 0.00104 0.00174
0.00162 0.01207
* HDV3
       7 0.15889 0.12284 0.11675 0.07056 0.06447 0.05533 0.03706 0.05990 0.06345 0.05431 0.01624
0.03198 0.01675 0.01827 0.01269 0.01168 0.00964 0.00609 0.00812 0.01066 0.00711 0.00355 0.00254
0.00660 0.03452
* HDV4
       8 0.05056 0.09363 0.08614 0.06929 0.05805 0.04869 0.05805 0.06742 0.10674 0.05431 0.02622
0.04120 0.02809 0.04869 0.01873 0.02247 0.01685 0.01311 0.01498 0.01124 0.00749 0.00187 0.00187
0.00749 0.04682
* HDV5
       9 0.05996 0.08351 0.12205 0.07709 0.06424 0.07281 0.04069 0.07066 0.07066 0.05567 0.01927
0.03426 0.00214 0.02784 0.02141 0.01499 0.00642 0.01499 0.01071 0.00857 0.02784 0.00857 0.01499
0.00642 0.06424
* HDV6
      10 0.01612 0.05937 0.06277 0.05683 0.04326 0.03562 0.03562 0.06446 0.06446 0.06616 0.05683
0.02969 0.03732 0.05004 0.02799 0.03732 0.02460 0.02545 0.01866 0.01527 0.01781 0.01442 0.02375
0.01612 0.10006
* HDV7
      11 0.01905 0.06286 0.05143 0.06095 0.04000 0.02095 0.06476 0.04762 0.08191 0.05714 0.06095
0.04952 0.04762 0.04762 0.03429 0.04381 0.02476 0.03810 0.03238 0.01714 0.01905 0.01143 0.00762
0.01714 0.04190
* HDV8a
      12 0.02198 0.05372 0.03419 0.01709 0.02930 0.01587 0.02320 0.04274 0.04884 0.04884 0.06960
0.04274 0.06349 0.05861 0.03541 0.05495 0.03785 0.04029 0.02808 0.03907 0.02930 0.03175 0.01709
0.02564 0.09036
* HDV8b
      13 0.04990 0.14013 0.10871 0.09153 0.04383 0.05321 0.03327 0.06460 0.09722 0.08179 0.04999
0.03611 0.03143 0.03281 0.02362 0.01682 0.00505 0.00680 0.00524 0.00625 0.00331 0.00303 0.00239
0.00276 0.01020
*   HDBS is MOBILE6 default
*   HDBT is MOBILE6 default
* MC
      16 0.07085 0.12308 0.11439 0.09164 0.06943 0.08191 0.06873 0.05641 0.04880 0.04142 0.02958
0.02322 0.02354 0.01593 0.01397 0.01177 0.00581 0.00549 0.00455 0.00651 0.00573 0.00549 0.00887
0.01051 0.06237
```

Waco District Registration Distributions

```
* Calculated from district mid-year (July) 2008 registrations data
* All vehicle class distributions, except HDV8B and MOBILE6 defaults, were based on aggregate
Waco District data
* Waco District Counties: Bell, Bosque, Coryell, Falls, Hamilton, Hill, Limestone, and Mclennan.
* HDV8b vehicle class distribution was based on aggregate statewide data
* LDV
       1 0.04990 0.07732 0.07768 0.08406 0.07684 0.07380 0.07302 0.06684 0.06455 0.05561 0.04550
0.04116 0.03370 0.03421 0.02637 0.02236 0.01803 0.01493 0.01129 0.00994 0.00704 0.00545 0.00444
0.00418 0.02178
* LDT1
       2 0.02229 0.04413 0.04758 0.05389 0.05834 0.06941 0.07374 0.07713 0.06467 0.05456 0.05235
0.04930 0.04061 0.04030 0.03976 0.02867 0.02311 0.01991 0.01797 0.01745 0.01351 0.00958 0.01152
0.00980 0.06042
* LDT2
       3 0.02229 0.04413 0.04758 0.05389 0.05834 0.06941 0.07374 0.07713 0.06467 0.05456 0.05235
0.04930 0.04061 0.04030 0.03976 0.02867 0.02311 0.01991 0.01797 0.01745 0.01351 0.00958 0.01152
0.00980 0.06042
* LDT3
       4 0.07505 0.11849 0.08079 0.08024 0.10760 0.08134 0.06911 0.07470 0.05305 0.05897 0.02674
0.03613 0.02716 0.02419 0.01451 0.01333 0.00964 0.00689 0.00539 0.00564 0.00524 0.00222 0.00399
0.00384 0.01575
* LDT4
       5 0.07505 0.11849 0.08079 0.08024 0.10760 0.08134 0.06911 0.07470 0.05305 0.05897 0.02674
0.03613 0.02716 0.02419 0.01451 0.01333 0.00964 0.00689 0.00539 0.00564 0.00524 0.00222 0.00399
0.00384 0.01575
* HDV2b
       6 0.11214 0.11589 0.12886 0.16130 0.09336 0.07749 0.04779 0.06383 0.04130 0.04267 0.02594
0.02185 0.00870 0.01178 0.00614 0.00478 0.00495 0.00393 0.00341 0.00239 0.00358 0.00102 0.00188
0.00222 0.01280
* HDV3
       7 0.08011 0.12800 0.09208 0.06722 0.04144 0.06538 0.03959 0.05801 0.05617 0.05985 0.02578
0.03039 0.02670 0.03683 0.02670 0.02670 0.01381 0.01105 0.01381 0.01197 0.01197 0.00645 0.01197
0.00645 0.05157
* HDV4
       8 0.07273 0.09091 0.07273 0.01818 0.04935 0.06234 0.04675 0.07013 0.10390 0.06234 0.02597
0.04416 0.03896 0.05714 0.01299 0.02597 0.01039 0.01039 0.01818 0.01039 0.01299 0.00260 0.00000
0.00519 0.07532
* HDV5
       9 0.04636 0.03974 0.09934 0.07616 0.04636 0.03642 0.04305 0.04636 0.09272 0.04967 0.02980
0.01987 0.00993 0.03642 0.01987 0.02649 0.01325 0.01325 0.02649 0.01325 0.05298 0.00662 0.00662
0.02649 0.12249
* HDV6
      10 0.01261 0.07225 0.03899 0.03326 0.01835 0.03555 0.03784 0.03326 0.06078 0.06651 0.05963
0.04472 0.05390 0.08028 0.04702 0.03440 0.02179 0.02408 0.02179 0.01261 0.02179 0.01261 0.02867
0.01950 0.10781
* HDV7
      11 0.01957 0.05217 0.02174 0.03913 0.05000 0.03696 0.03261 0.04130 0.06304 0.06087 0.10218
0.05870 0.03478 0.08043 0.04783 0.02391 0.03261 0.01087 0.02826 0.01957 0.01304 0.02174 0.01304
0.01739 0.07826
* HDV8a
      12 0.01121 0.04110 0.02117 0.02864 0.00747 0.01868 0.01993 0.03985 0.05106 0.06351 0.07098
0.04608 0.03611 0.06849 0.05106 0.05479 0.04857 0.03487 0.02740 0.04608 0.03985 0.02117 0.01993
0.03238 0.09962
* HDV8b
      13 0.04990 0.14013 0.10871 0.09153 0.04383 0.05321 0.03327 0.06460 0.09722 0.08179 0.04999
0.03611 0.03143 0.03281 0.02362 0.01682 0.00505 0.00680 0.00524 0.00625 0.00331 0.00303 0.00239
0.00276 0.01020
*   HDBS is MOBILE6 default
*   HDBT is MOBILE6 default
* MC
      16 0.09316 0.15003 0.13609 0.09994 0.07437 0.07992 0.06288 0.05184 0.04015 0.02944 0.02189
0.01859 0.01698 0.01375 0.01104 0.00897 0.00646 0.00458 0.00471 0.00600 0.00452 0.00420 0.00665
0.00607 0.04777
```

Wichita Falls District Registration Distributions

```
* Calculated from district mid-year (July) 2008 registrations data
* All vehicle class distributions, except HDV8B and MOBILE6 defaults, were based on aggregate
Wichita Falls District data
* Wichita Falls District Counties: Archer, Baylor, Clay, Cooke, Montague, Throckmorton, Wichita,
Wilbarger, and Young.
* HDV8b vehicle class distribution was based on aggregate statewide data
* LDV
       1 0.04304 0.07813 0.07249 0.07855 0.07205 0.06910 0.06863 0.06513 0.06450 0.06007 0.04887
0.04326 0.03614 0.03528 0.02784 0.02397 0.01983 0.01616 0.01305 0.01080 0.00823 0.00593 0.00534
0.00458 0.02903
* LDT1
       2 0.02036 0.04602 0.04463 0.05119 0.05607 0.06798 0.06988 0.07318 0.06385 0.05237 0.05252
0.04993 0.03879 0.04283 0.04332 0.03086 0.02316 0.02220 0.01873 0.01972 0.01424 0.01007 0.01324
0.01148 0.06338
* LDT2
       3 0.02036 0.04602 0.04463 0.05119 0.05607 0.06798 0.06988 0.07318 0.06385 0.05237 0.05252
0.04993 0.03879 0.04283 0.04332 0.03086 0.02316 0.02220 0.01873 0.01972 0.01424 0.01007 0.01324
0.01148 0.06338
* LDT3
       4 0.08120 0.13144 0.09626 0.08147 0.10291 0.08142 0.06534 0.06614 0.04802 0.05430 0.02471
0.03404 0.02535 0.02117 0.01404 0.01195 0.00884 0.00670 0.00493 0.00493 0.00504 0.00236 0.00423
0.00375 0.01946
* LDT4
       5 0.08120 0.13144 0.09626 0.08147 0.10291 0.08142 0.06534 0.06614 0.04802 0.05430 0.02471
0.03404 0.02535 0.02117 0.01404 0.01195 0.00884 0.00670 0.00493 0.00493 0.00504 0.00236 0.00423
0.00375 0.01946
* HDV2b
       6 0.14189 0.12492 0.14596 0.15038 0.09504 0.06483 0.04582 0.05227 0.03327 0.02953 0.01833
0.02105 0.00781 0.01561 0.00509 0.00543 0.00272 0.00441 0.00441 0.00272 0.00373 0.00034 0.00509
0.00136 0.01799
* HDV3
       7 0.14671 0.11538 0.09687 0.06553 0.04274 0.04416 0.03846 0.05271 0.04274 0.05271 0.01709
0.03134 0.01425 0.03276 0.03276 0.01140 0.02137 0.01140 0.01567 0.01852 0.00712 0.00427 0.00427
0.00570 0.07407
* HDV4
       8 0.13903 0.10160 0.04813 0.04813 0.02139 0.06952 0.02674 0.09091 0.06952 0.03743 0.02139
0.03743 0.01070 0.03209 0.02139 0.01604 0.00535 0.00535 0.01604 0.02674 0.00535 0.00535 0.01604
0.00535 0.12299
* HDV5
       9 0.05369 0.06040 0.05369 0.05369 0.03356 0.07383 0.03356 0.04698 0.08054 0.04027 0.02013
0.02013 0.01342 0.01342 0.01342 0.00671 0.01342 0.00000 0.00671 0.04698 0.02013 0.02013 0.01342
0.02013 0.24164
* HDV6
      10 0.02296 0.04082 0.03316 0.03571 0.02296 0.02041 0.02806 0.04847 0.03316 0.04847 0.06378
0.04082 0.04082 0.06122 0.02551 0.03571 0.02806 0.04082 0.02296 0.01786 0.02296 0.00510 0.02296
0.04592 0.19132
* HDV7
      11 0.00840 0.05042 0.03361 0.02521 0.01681 0.02521 0.04202 0.05882 0.05042 0.07143 0.07563
0.04202 0.05462 0.03361 0.02941 0.03361 0.03782 0.04202 0.04202 0.02521 0.03361 0.00420 0.02521
0.02521 0.11345
* HDV8a
      12 0.01208 0.03140 0.04831 0.01932 0.01449 0.01932 0.03623 0.03865 0.05797 0.04106 0.05797
0.02657 0.03865 0.05314 0.05072 0.05797 0.03382 0.03140 0.04106 0.03382 0.02174 0.01932 0.02899
0.02657 0.15943
* HDV8b
      13 0.04990 0.14013 0.10871 0.09153 0.04383 0.05321 0.03327 0.06460 0.09722 0.08179 0.04999
0.03611 0.03143 0.03281 0.02362 0.01682 0.00505 0.00680 0.00524 0.00625 0.00331 0.00303 0.00239
0.00276 0.01020
*   HDBS is MOBILE6 default
*   HDBT is MOBILE6 default
* MC
      16 0.07375 0.13683 0.13518 0.09806 0.05880 0.07671 0.06751 0.04780 0.04008 0.03219 0.02070
0.02349 0.01905 0.01495 0.01298 0.00969 0.00887 0.00476 0.00329 0.00756 0.00427 0.00575 0.01281
0.01117 0.07375
```

Yoakum District Registration Distributions

```
* Calculated from district mid-year (July) 2008 registrations data
* All vehicle class distributions, except HDV8B and MOBILE6 defaults, were based on aggregate
Yoakum District data
* Yoakum District Counties: Austin, Calhoun, Colorado, Dewitt, Fayette, Gonzales, Jackson,
Lavaca, Matagorda, Victoria, and Wharton.
* HDV8b vehicle class distribution was based on aggregate statewide data
* LDV
       1 0.05029 0.07819 0.07702 0.07844 0.06805 0.06453 0.06390 0.06307 0.06359 0.05625 0.04924
0.04426 0.03680 0.03679 0.02897 0.02516 0.02079 0.01751 0.01351 0.01186 0.00915 0.00627 0.00535
0.00532 0.02569
* LDT1
       2 0.02576 0.04730 0.05438 0.05447 0.06268 0.06884 0.07550 0.07207 0.06263 0.05348 0.05190
0.04965 0.03868 0.04221 0.03983 0.02944 0.02450 0.02169 0.01966 0.01707 0.01351 0.00835 0.01060
0.01016 0.04564
* LDT2
       3 0.02576 0.04730 0.05438 0.05447 0.06268 0.06884 0.07550 0.07207 0.06263 0.05348 0.05190
0.04965 0.03868 0.04221 0.03983 0.02944 0.02450 0.02169 0.01966 0.01707 0.01351 0.00835 0.01060
0.01016 0.04564
* LDT3
       4 0.07170 0.12176 0.08711 0.07575 0.10159 0.08327 0.07533 0.07755 0.05441 0.05671 0.02682
0.03654 0.02534 0.02243 0.01567 0.01395 0.00972 0.00776 0.00606 0.00585 0.00413 0.00162 0.00360
0.00365 0.01168
* LDT4
       5 0.07170 0.12176 0.08711 0.07575 0.10159 0.08327 0.07533 0.07755 0.05441 0.05671 0.02682
0.03654 0.02534 0.02243 0.01567 0.01395 0.00972 0.00776 0.00606 0.00585 0.00413 0.00162 0.00360
0.00365 0.01168
* HDV2b
       6 0.13058 0.12299 0.14653 0.14018 0.11354 0.08209 0.05716 0.05979 0.03315 0.02974 0.01518
0.01704 0.00743 0.00914 0.00434 0.00356 0.00294 0.00263 0.00341 0.00217 0.00170 0.00077 0.00248
0.00248 0.00898
* HDV3
       7 0.08958 0.09365 0.13271 0.08795 0.06678 0.05293 0.04479 0.07492 0.04967 0.06352 0.02769
0.04235 0.02280 0.02443 0.02199 0.01303 0.01466 0.01059 0.01221 0.00651 0.00326 0.00489 0.00326
0.00489 0.03094
* HDV4
       8 0.08273 0.08632 0.07194 0.06475 0.07554 0.06475 0.04317 0.06835 0.07194 0.06115 0.03237
0.05036 0.01439 0.04317 0.02158 0.02878 0.02158 0.00000 0.01799 0.00719 0.00360 0.00360 0.00719
0.00360 0.05396
* HDV5
       9 0.05325 0.11540 0.09763 0.10355 0.09467 0.05917 0.03846 0.06509 0.05030 0.04734 0.01183
0.01479 0.02663 0.01775 0.02071 0.00592 0.02071 0.01183 0.00592 0.01183 0.00888 0.00296 0.01183
0.01775 0.08580
* HDV6
      10 0.02263 0.04102 0.05658 0.04809 0.02829 0.03253 0.02687 0.06082 0.05799 0.05092 0.06789
0.03819 0.04385 0.04809 0.02829 0.04385 0.02546 0.03536 0.03112 0.01132 0.01556 0.01414 0.01980
0.01697 0.13437
* HDV7
      11 0.02821 0.07433 0.04872 0.03077 0.03846 0.01282 0.04103 0.04359 0.05641 0.06667 0.04359
0.03333 0.06667 0.04872 0.04615 0.03846 0.03077 0.03590 0.04103 0.01795 0.01282 0.02821 0.01795
0.02821 0.06923
* HDV8a
      12 0.00592 0.03402 0.02515 0.02811 0.01923 0.01479 0.02811 0.03846 0.04882 0.05178 0.05030
0.04142 0.04882 0.05178 0.05030 0.05769 0.03994 0.04438 0.03550 0.04734 0.03994 0.02811 0.01775
0.02663 0.12571
* HDV8b
      13 0.04990 0.14013 0.10871 0.09153 0.04383 0.05321 0.03327 0.06460 0.09722 0.08179 0.04999
0.03611 0.03143 0.03281 0.02362 0.01682 0.00505 0.00680 0.00524 0.00625 0.00331 0.00303 0.00239
0.00276 0.01020
*   HDBS is MOBILE6 default
*   HDBT is MOBILE6 default
* MC
      16 0.08200 0.13903 0.11126 0.09400 0.06919 0.08562 0.07740 0.05505 0.04306 0.03484 0.02991
0.01956 0.01824 0.01693 0.01430 0.00822 0.00690 0.00493 0.00460 0.00575 0.00477 0.00394 0.00805
0.00707 0.05538
```

2008 Statewide Diesel Fraction Estimates

```
* HDV fractions are estimated from TxDOT registration data (Mid-year July 2008)
* LDV, LDT and Bus fractions are MOBILE6 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
0.00000 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
0.00000 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
0.01260 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
0.01260 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
0.70322 0.78104 0.77701 0.81682 0.81511 0.76617 0.73412 0.69588 0.56999 0.61149
0.50315 0.43662 0.43485 0.21653 0.38548 0.37156 0.34646 0.35309 0.30994 0.27199
0.19841 0.15719 0.17719 0.16390 0.06132
0.74662 0.76231 0.77903 0.69612 0.67721 0.64307 0.63080 0.63362 0.64799 0.60707
0.47338 0.55825 0.52783 0.34291 0.53182 0.52291 0.57774 0.45914 0.57234 0.48033
0.40374 0.27124 0.29474 0.20900 0.06041
0.73586 0.81109 0.85643 0.81755 0.76618 0.72768 0.68040 0.69225 0.72295 0.64021
0.69839 0.74090 0.63828 0.42593 0.64985 0.62319 0.61650 0.69008 0.54545 0.66507
0.22222 0.23485 0.07071 0.09551 0.05836
0.92575 0.95141 0.90925 0.89474 0.87500 0.86012 0.87187 0.85993 0.88254 0.85745
0.67610 0.71290 0.78273 0.50820 0.65254 0.67943 0.60494 0.77816 0.64437 0.60662
0.39063 0.34706 0.20000 0.26882 0.13065
0.93032 0.96050 0.90586 0.90150 0.92612 0.90040 0.89068 0.90190 0.86905 0.84467
0.81289 0.80214 0.81021 0.61876 0.79980 0.77519 0.63392 0.67824 0.74766 0.75401
0.60082 0.72383 0.55579 0.44589 0.25804
0.94107 0.97920 0.92161 0.95933 0.95374 0.97698 0.91315 0.92151 0.92472 0.91502
0.86901 0.79577 0.82879 0.60778 0.85789 0.88491 0.86417 0.88006 0.86066 0.89568
0.81509 0.84942 0.71831 0.79909 0.53004
0.98712 0.99475 0.97008 0.97429 0.94836 0.96204 0.94725 0.94588 0.94226 0.95460
0.94282 0.90690 0.92136 0.80184 0.94711 0.94987 0.95597 0.93807 0.93607 0.93810
0.94471 0.94615 0.89885 0.93212 0.75101
0.99632 0.99672 0.99070 0.99799 0.99161 0.99827 0.97514 0.98578 0.98771 0.97978
0.98162 0.95165 0.97076 0.73669 0.96498 0.97814 0.98182 0.89189 0.94737 0.94118
0.94444 0.90909 0.96154 0.96667 0.73874
0.95850 0.95850 0.95850 0.95850 0.95850 0.95850 0.95850 0.95850 0.95850 0.95850
0.95850 0.95850 0.95850 0.88570 0.85250 0.87950 0.99000 0.91050 0.87600 0.77100
0.75020 0.73450 0.67330 0.51550 0.38450
```

APPENDIX J:
MOBILE6 I/M AND ATP INPUTS

Austin I/M and ATP MOBILE6 Modeling Parameters for 2008 Analysis

The emissions factors for the Austin counties that administered I/M programs (i.e., Travis and Williamson) included both ATP and I/M program modeling. The following tables show the MOBILE6 ATP and I/M descriptive inputs used.

Travis and Williamson County MOBILE6 ATP Descriptive Inputs[1] for 2008

MOBILE6 ATP (ANTI-TAMP PROG*) Parameters
06 84 06 22222 22222222 2 11 096. 22112222
* **ANTI-TAMP PROG command data parameter definitions**: • The first value is the last two digits of the year the program began (for new I/M counties, the I/M beginning year is used). • Next value is last two digits of oldest MY covered; vehicles age 25 years old and older are exempt. • The third value is the newest MY covered. Vehicles less than two years old are exempt. • The next 14 values are on/off toggles identifying the vehicle types covered (1 = no, 2 = yes), in order: LDGV, LDGT1, LDGT2, LDGT3, and LDGT4; HDGV2B, HDGV3, HDGV4, HDGV5, HDGV6, HDGV7, HDGV8A, and HDGV8B; and GAS BUS. • The next entry must be "1" (EPA no longer supports additional credit for test only program, or "2"). • The next data parameter is the program inspection frequency (1 = annual, 2 = biennial). • The next number is the program compliance rate in percent (the I/M compliance rate is assumed). • The last eight data parameters are on/off toggles (1 = no, 2 = yes) indicating checks performed: 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 disablement; and 8) missing gas cap. Notes: 1) MOBILE6 no longer applies tampering or tampering reduction effects for diurnal and hot soak emissions controls (M6.IM.003, EPA, October 2001); thus, the MOBILE6 ATP check numbers 6 and 8 have no effect on results; 2) Check 2, catalyst removal, applies only to 1984 and later MYs under the Texas annual safety inspection program; and 3) MOBILE6 includes no tampering effects or tampering reduction benefits for 1996 and newer vehicles.

[1] The Austin exhaust I/M Program was implemented September 1, 2005 (see next table). MOBILE6 assumes a January 1 program beginning date in the I/M (and ATP) implementation year. For the purpose of this application, 2006 was used as the year the I/M program began to approximate the September 2005 actual beginning of the program – to perform multiple runs with post-processing to incorporate the September I/M effect would produce an inconsequential difference for the purpose of this application. ATP is modeled as beginning concurrent with the I/M program.

Travis and Williamson County I/M Inputs[1] to MOBILE6

The commands (in bold) and corresponding data parameters values are described below. Except for the I/M EFFECTIVENESS command, the first data value following each command identifies the program (i.e., 1 through 7) to which the command and its associated parameters apply. The variable "#" following a command thus takes program number values 1 through 7, except for I/M Stringency, which applies only to exhaust I/M programs.

I/M GRACE PERIOD:	# 2	(age at which vehicles are first subject to mandatory I/M requirements)
I/M EXEMPTION AGE:	# 25	(age at which vehicles are no longer subject to mandatory I/M requirements)
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 2006 2050 1 TRC 2500/IDLE	1 1950 2050	1 11111 22222222 2
2 2006 2050 1 TRC 2500/IDLE	2 1950 1995	2 22222 11111111 1
3 2006 2050 1 TRC OBD I/M	3 1996 2050	3 22222 11111111 1
4 2000 2050 1 TRC GC	4 1950 2006	4 11111 22222222 2
5 2000 2050 1 TRC EVAP OBD & GC	5 2007 2050	5 11111 22222222 2
6 2000 2050 1 TRC GC	6 1950 1995	6 22222 11111111 1
7 2000 2050 1 TRC EVAP OBD & GC	7 1996 2050	7 22222 11111111 1

Explanation of command data parameters:

- **I/M PROGRAM** command input parameters are defined as:
  The first number is the I/M program number;
  The second and third numbers are the program beginning and ending years, respectively;
  The fourth number is the program frequency (1 = annual);
  The fifth entry is the program type (TRC = test and repair computerized); and
  The sixth entry is the inspection type (2500/IDLE = test at idle, 2500 rpm; OBD I/M and EVAP OBD and GC are OBD exhaust and evaporative I/M with GC; and GC = gas cap pressure check).
  NOTE: for HDGV Bus classes, MOBILE6 applies the same exhaust I/M benefit regardless of I/M test type. Although HDGV Buses with OBD systems are intended for ODB I/M-testing, they will be modeled only under the 2500/idle test – this allows for the full I/M program to be modeled in one MOBILE6 run, at the MOBILE6 limit of seven I/M programs per run.
- **I/M MODEL YEARS** command:
  The first entry is the I/M program number; and
  The second and third entries are the first MY covered and last MY covered, respectively.
  Vehicles less than two years old and greater than or equal to 25 years old are exempt from testing. Modeling this "2-through-24 year age-coverage window" is accomplished using the I/M GRACE PERIOD and I/M EXEMPTION AGE commands (described above).
- **I/M VEHICLES** command: The first parameter is I/M program number; the next 14 data parameters are on/off toggles (1 = no, 2 = yes) indicating which vehicle types are subject to inspection. The 14 vehicle types, in input order are: LDGV, LDGT1, LDGT2, LDGT3, and LDGT4; HDGV2B, HDGV3, HDGV4, HDGV5, HDGV6, HDGV7, HDGV8A, and HDGV8B; and GAS BUS.

[1] The Austin exhaust I/M Program was implemented September 1, 2005. MOBILE6 assumes a January 1 program beginning date in the I/M (and ATP) implementation year. For the purpose of this application, 2006 (January 1 model assumption) was used as the year the I/M program began to approximate the September 2005 actual beginning of the program – to perform multiple runs with post-processing to incorporate a "September I/M effect" would produce an inconsequential difference for the purpose of this application.

DFW I/M and ATP MOBILE6 Modeling Parameters for 2008

The emissions factors for DFW nonattainment counties included both ATP and I/M program modeling. The MOBILE6 ATP and I/M descriptive inputs used are shown in the following tables.

MOBILE6 ATP Descriptive Inputs for DFW Counties for 2008

Counties	MOBILE6 ATP (ANTI-TAMP PROG*) Parameters
Dallas, Tarrant	86 84 06 22222 22222222 2 11 096. 22112222
Collin, Denton	02 84 06 22222 22222222 2 11 096. 22112222
Ellis, Johnson, Kaufman, Parker, Rockwall	03 84 06 22222 22222222 2 11 096. 22112222

* **ANTI-TAMP PROG command data parameter definitions**:

- The first value is the last two digits of the beginning year for the program (for new I/M counties, the I/M beginning year is used).
- Next value is last two digits of oldest MY covered; vehicles age 25 years old and older are exempt.
- The third value is the newest MY covered. Vehicles less than two years old are exempt.
- The next 14 values are on/off toggles identifying the vehicle types covered (1 = no, 2 = yes), in order: LDGV, LDGT1, LDGT2, LDGT3, and LDGT4; HDGV2B, HDGV3, HDGV4, HDGV5, HDGV6, HDGV7, HDGV8A, and HDGV8B; and GAS BUS.
- The next entry must be "1" (EPA no longer supports additional credit for test only program, or "2").
- The next data parameter is the program inspection frequency (1 = annual, 2 = biennial).
- The next number is the program compliance rate in percent (the I/M compliance rate is assumed).
- The last eight data parameters are on/off toggles (1 = no, 2 = yes) indicating checks performed: 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 disablement; and 8) missing gas cap.

  Notes: 1) MOBILE6 no longer applies tampering or tampering reduction effects for diurnal and hot soak emissions controls (M6.IM.003, EPA, October 2001); thus, the MOBILE6 ATP check numbers 6 and 8 have no effect on results; 2) Check 2, catalyst removal, applies only to 1984 and later MYs under the Texas annual safety inspection program; and 3) MOBILE6 includes no tampering effects or tampering reduction benefits for 1996 and newer vehicles.

MOBILE6 I/M Descriptive Inputs for the DFW I/M Counties[1]

Counties: Harris DT (Dallas, Tarrant); CD (Collin, Denton); EDFW (Ellis, Johnson, Kaufman, Parker, Rockwall).

MOBILE6 inputs: Except for I/M EFFECTIVENESS, the first data value (i.e., 1-7, #, or $) following each command is the program number to which the command and related parameters apply (see programs under I/M PROGRAM command, below). I/M STRINGENCY applies to exhaust I/M programs (i.e., $ takes values 1-3). Commands with "#" for program number apply to all I/M programs (i.e., # takes values 1-7).

I/M GRACE PERIOD:	# 2	(exempts vehicles less than two years old)
I/M EXEMPTION AGE:	# 25	(exempts vehicles greater than or equal to 25 years old)
I/M STRINGENCY:	$ 20	(percent stringency level for pre-1981 cars 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 1950 2050	1 11111 22222222 2
2 **YYYY** 2050 1 TRC ASM 2525/5015 PHASE-IN	2 1950 1995	2 22222 11111111 1
3 **YYYY** 2050 1 TRC OBD I/M	3 1996 2050	3 22222 11111111 1
4 **YYYY** 2050 1 TRC GC	4 1950 2006	4 11111 22222222 2
5 **YYYY** 2050 1 TRC EVAP OBD & GC	5 2007 2050	5 11111 22222222 2
6 **YYYY** 2050 1 TRC GC	6 1950 1995	6 22222 11111111 1
7 **YYYY** 2050 1 TRC EVAP OBD & GC	7 1996 2050	7 22222 11111111 1

Explanation of command data parameters:

I/M PROGRAM command parameters:

1st is I/M program number; 2nd/3rd are program begin/end years (see "**YYYY**" below); 4th is program frequency (1 = annual); 5th is program type (TRC = test/repair computerized); 6th 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 and GC are on-board diagnostic exhaust and evaporative I/M; GC = gas cap pressure check). "**YYYY**" is the beginning year of the program, which varies by county group and by I/M program emissions type as follows:

county/begin year for exhaust programs (1 - 3) are: DT/1990, CD/2002, EDFW/2003; and
county/begin year for evaporative programs (4 - 7) are: H/1996; CD&EDFW/2000.

NOTE: for HDGV-Bus classes, MOBILE6 applies the same exhaust I/M benefit regardless of inspection type. Thus, although these classes with OBD are to be OBD-tested, they all will be modeled under 2500/idle test to allow the full set of inspection types to be modeled in one run (the limit is seven I/M programs per run).

I/M MODEL YEARS command parameters:

1st is the program number; 2nd and 3rd are first and last MYs. Vehicles less than two years old and greater than or equal to 25 years old are exempt from testing. The I/M GRACE PERIOD and I/M EXEMPTION AGE commands/parameters, described above, are used to model this "2-through-24 year old coverage window."

I/M VEHICLES command parameters:

The14 data parameters after the program number are on/off toggles (1 = no, 2 = yes) indicating vehicle types subject to inspection. The input order is: LDGV, LDGT1, LDGT2, LDGT3, LDGT4, HDGV2B, HDGV3, HDGV4, HDGV5, HDGV6, HDGV7, HDGV8A, HDGV8B, and GAS BUS.

[1] Note that the CD and EDFW counties exhaust I/M Program was implemented on May 1 of the respective program beginning years, whereas MOBILE6 assumes implementation occurred on January 1. For the purpose of this application, the model I/M beginning date assumptions were used.

El Paso County I/M and ATP MOBILE6 Modeling Parameters for 2008

The emissions factors for El Paso County included both ATP and I/M program modeling. The MOBILE6 ATP and I/M descriptive inputs used are shown in the following tables.

El Paso County MOBILE6 ATP Descriptive Inputs for 2008

MOBILE6 ATP (ANTI-TAMP PROG*) Parameters
86 84 06 22222 22222222 2 11 096. 22112222
* **ANTI-TAMP PROG command data parameter definitions**: • The first value is the last two digits of the program beginning year (for new I/M counties, the I/M beginning year is used). • Next value is last two digits of oldest MY covered; vehicles age 25 years old and older are exempt. • The third value is the newest MY covered. Vehicles less than two years old are exempt. • The next 14 values are on/off toggles identifying the vehicle types covered (1 = no, 2 = yes), in order: LDGV, LDGT1, LDGT2, LDGT3, and LDGT4; HDGV2B, HDGV3, HDGV4, HDGV5, HDGV6, HDGV7, HDGV8A, and HDGV8B; and GAS BUS. • The next entry must be "1" (EPA no longer supports additional credit for test only program, or "2"). • The next data parameter is the program inspection frequency (1 = annual, 2 = biennial). • The next number is the program compliance rate in percent (the I/M compliance rate is assumed). • The last eight data parameters are on/off toggles (1 = no, 2 = yes) indicating checks performed: 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 disablement; and 8) missing gas cap. Notes: 1) MOBILE6 no longer applies tampering or tampering reduction effects for diurnal and hot soak emissions controls (M6.IM.003, EPA, October 2001); thus, the MOBILE6 ATP check numbers 6 and 8 have no effect on results; 2) Check 2, catalyst removal, applies only to 1984 and later MYs under the Texas annual safety inspection program; and 3) MOBILE6 includes no tampering effects or tampering reduction benefits for 1996 and newer vehicles.

El Paso County I/M Inputs to MOBILE6

Year of Evaluation: 2008.

The commands (in bold) and corresponding data parameters values are described below. Except for the I/M EFFECTIVENESS command, the first data value following each command identifies the program (i.e., 1 through 7) to which the command and its associated parameters apply. The variable "#" following a command thus takes program number values 1 through 7, except for I/M Stringency, which applies only to exhaust I/M programs.

I/M GRACE PERIOD:	# 2	(age at which vehicles are first subject to mandatory I/M requirements)
I/M EXEMPTION AGE:	# 25	(age at which vehicles are no longer subject to mandatory I/M requirements)
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 1987 2050 1 TRC 2500/IDLE	1 1950 2050	1 11111 22222222 2
2 1987 2050 1 TRC 2500/IDLE	2 1950 1995	2 22222 11111111 1
3 1987 2050 1 TRC OBD I/M	3 1996 2050	3 22222 11111111 1
4 1997 2050 1 TRC GC	4 1950 2006	4 11111 22222222 2
5 1997 2050 1 TRC EVAP OBD & GC	5 2007 2050	5 11111 22222222 2
6 1997 2050 1 TRC GC	6 1950 1995	6 22222 11111111 1
7 1997 2050 1 TRC EVAP OBD & GC	7 1996 2050	7 22222 11111111 1

Explanation of command data parameters:

- **I/M PROGRAM** command input parameters are defined as:
  The first number is the I/M program number;
  The second and third numbers are the program beginning and ending years, respectively;
  The fourth number is the program frequency (1 = annual);
  The fifth entry is the program type (TRC = test and repair computerized); and
  The sixth entry is the inspection type (2500/IDLE = test at idle, 2500 rpm; OBD I/M and EVAP OBD and GC are on-board diagnostic exhaust and evaporative I/M with GC; and GC = gas cap pressure check).
  NOTE: for HDGV Bus classes, MOBILE6 applies the same exhaust I/M benefit regardless of I/M test type. Although HDGV Buses with OBD systems are intended for ODB I/M-testing, they will be modeled only under the 2500/idle test – this allows for the full I/M program to be modeled in one MOBILE6 run, at the MOBILE6 limit of seven I/M programs per run.
- **I/M MODEL YEARS** command:
  The first entry is the I/M program number; and
  The second and third entries are the first MY covered and last MY covered, respectively.
  Vehicles less than two years old and greater than or equal to 25 years old are exempt from testing. Modeling this "2-through-24 year age-coverage window" is accomplished using the I/M GRACE PERIOD and I/M EXEMPTION AGE commands (described above).
- **I/M VEHICLES** command: The first parameter is I/M program number; the next 14 data parameters are on/off toggles (1 = no, 2 = yes) indicating which vehicle types are subject to inspection. The 14 vehicle types, in input order are: LDGV, LDGT1, LDGT2, LDGT3, and LDGT4; HDGV2B, HDGV3, HDGV4, HDGV5, HDGV6, HDGV7, HDGV8A, and HDGV8B; and GAS BUS.

HGB I/M and ATP MOBILE6 Modeling Parameters for 2008

The emissions factors for the five counties that administered exhaust I/M programs included both ATP and I/M program modeling. The five I/M counties are Harris County and the Urban County Group (Brazoria, Fort Bend, Galveston, and Montgomery). The following tables show the MOBILE6 ATP and I/M descriptive inputs used. In MOBILE6 no tampering effects or tampering reduction benefits are applied for 1996 and newer vehicles.

HGB County MOBILE6 ATP Descriptive Inputs for 2008

Counties	MOBILE6 ATP (ANTI-TAMP PROG*) Parameters
Harris Brazoria, Fort Bend, Galveston, Montgomery	84 84 06 22222 22222222 2 11 096. 22112222 03 84 06 22222 22222222 2 11 096. 22112222

* **ANTI-TAMP PROG command data parameter definitions**:

- The first value is the last two digits of the beginning year for the program (for new I/M counties, the I/M beginning year is used).
- Next value is last two digits of oldest MY covered; vehicles age 25 years old and older are exempt.
- The third value is the newest MY covered. Vehicles less than two years old are exempt.
- The next 14 values are on/off toggles identifying the vehicle types covered (1 = no, 2 = yes), in order: LDGV, LDGT1, LDGT2, LDGT3, and LDGT4; HDGV2B, HDGV3, HDGV4, HDGV5, HDGV6, HDGV7, HDGV8A, and HDGV8B; and GAS BUS.
- The next entry must be "1" (EPA no longer supports additional credit for test only program, or "2").
- The next data parameter is the program inspection frequency (1 = annual, 2 = biennial).
- The next number is the program compliance rate in percent (the I/M compliance rate is assumed).
- The last eight data parameters are on/off toggles (1 = no, 2 = yes) indicating checks performed: 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 disablement; and 8) missing gas cap.

  Notes: 1) MOBILE6 no longer applies tampering or tampering reduction effects for diurnal and hot soak emissions controls (M6.IM.003, EPA, October 2001); thus, the MOBILE6 ATP check numbers 6 and 8 have no effect on results; 2) Check 2, catalyst removal, applies only to 1984 and later MYs under the Texas annual safety inspection program; and 3) MOBILE6 includes no tampering effects or tampering reduction benefits for 1996 and newer vehicles.

MOBILE6 I/M Descriptive Inputs for the HGB I/M Counties[1]

Counties: Harris (H); Urban County Group: Brazoria, Fort Bend, Galveston, Montgomery (HU).

MOBILE6 inputs: Except for I/M EFFECTIVENESS, the first data value (i.e., 1-7, #, or $) following each command is the program number to which the command and related parameters apply (see programs under I/M PROGRAM command, below). I/M STRINGENCY applies to exhaust I/M programs (i.e., $ takes values 1-3). Commands with "#" for program number apply to all I/M programs (i.e., # takes values 1-7).

I/M GRACE PERIOD:	# 2	(exempts vehicles less than two years old)
I/M EXEMPTION AGE:	# 25	(exempts vehicles greater than or equal to 25 years old)
I/M STRINGENCY:	$ 20	(percent stringency level for pre-1981 cars 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 1950 2050	1 11111 22222222 2
2 **YYYY** 2050 1 TRC ASM 2525/5015 PHASE-IN	2 1950 1995	2 22222 11111111 1
3 **YYYY** 2050 1 TRC OBD I/M	3 1996 2050	3 22222 11111111 1
4 **YYYY** 2050 1 TRC GC	4 1950 2006	4 11111 22222222 2
5 **YYYY** 2050 1 TRC EVAP OBD & GC	5 2007 2050	5 11111 22222222 2
6 **YYYY** 2050 1 TRC GC	6 1950 1995	6 22222 11111111 1
7 **YYYY** 2050 1 TRC EVAP OBD & GC	7 1996 2050	7 22222 11111111 1

Explanation of command data parameters:

I/M PROGRAM command parameters:

1st is I/M program number; 2nd/3rd are program begin/end years (see "**YYYY**" below); 4th is program frequency (1 = annual); 5th is program type (TRC = test/repair computerized); 6th 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 and GC are on-board diagnostic exhaust and evaporative I/M; GC = gas cap pressure check). "**YYYY**" is the beginning year of the program, which varies by county group and by I/M program emissions type as follows:

county/begin year for exhaust programs (1 - 3) are: H/1997, HU/2003; and
county/begin year for evaporative programs (4 - 7) are: H/1997; HU/2000.

NOTE: for HDGV-Bus classes, MOBILE6 applies the same exhaust I/M benefit regardless of inspection type. Thus, although these classes with OBD are to be OBD-tested, they all will be modeled under 2500/idle test to allow the full set of inspection types to be modeled in one run (the limit is seven I/M programs per run).

I/M MODEL YEARS command parameters:

1st is the program number; 2nd and 3rd are first and last MYs. Vehicles less than two years old and greater than or equal to 25 years old are exempt from testing. The I/M GRACE PERIOD and I/M EXEMPTION AGE commands/parameters, described above, are used to model this "2-through-24 year old coverage window."

I/M VEHICLES command parameters:

The14 data parameters after the program number are on/off toggles (1 = no, 2 = yes) indicating vehicle types subject to inspection. The input order is: LDGV, LDGT1, LDGT2, LDGT3, LDGT4, HDGV2B, HDGV3, HDGV4, HDGV5, HDGV6, HDGV7, HDGV8A, HDGV8B, and GAS BUS.

[1] Note that the Urban County Group exhaust I/M Program was implemented on May 1, 2003, whereas MOBILE6 assumes implementation occurred on January 1. For the purpose of this application, the model I/M beginning year assumptions were used.

APPENDIX K:
TXDOT DISTRICT 24-HOUR VMT MIX

TxDOT 24-Hour VMT Mix

Vehicle Class	Abilene District Functional Class			Amarillo District Functional Class			Atlanta District Functional Class		
	Art	Col	Fwy	Art	Col	Fwy	Art	Col	Fwy
LDGV	0.4391525	0.4460048	0.3392742	0.4465834	0.5393582	0.5065094	0.4994755	0.5298679	0.4133688
LDGT1	0.0483976	0.0491511	0.0374154	0.0374130	0.0451679	0.0424221	0.0536481	0.0569060	0.0444180
LDGT2	0.1611181	0.1636264	0.1245576	0.1245497	0.1503663	0.1412254	0.1785972	0.1894428	0.1478696
LDGT3	0.0663356	0.0673684	0.0512829	0.0559239	0.0675158	0.0634115	0.0576522	0.0611532	0.0477331
LDGT4	0.0305038	0.0309787	0.0235820	0.0257161	0.0310465	0.0291592	0.0265108	0.0281207	0.0219496
HDGV2b	0.0131568	0.0179744	0.0088954	0.0124309	0.0119858	0.0067974	0.0065534	0.0079305	0.0056759
HDGV 3	0.0055711	0.0076111	0.0037667	0.0058224	0.0056139	0.0031838	0.0025420	0.0030763	0.0022017
HDGV 4	0.0011689	0.0015970	0.0007903	0.0015968	0.0015397	0.0008732	0.0006763	0.0008185	0.0005858
HDGV 5	0.0012187	0.0016649	0.0008240	0.0012038	0.0011607	0.0006582	0.0005014	0.0006068	0.0004343
HDGV 6	0.0023628	0.0032279	0.0015975	0.0021128	0.0020371	0.0011553	0.0009095	0.0011007	0.0007878
HDGV 7	0.0005472	0.0007475	0.0003699	0.0005650	0.0005448	0.0003090	0.0002099	0.0002540	0.0001818
HDGV8a	0.0007213	0.0009854	0.0004876	0.0007124	0.0006869	0.0003896	0.0002565	0.0003104	0.0002222
HDGV8b	0.0001244	0.0001699	0.0000841	0.0001228	0.0001184	0.0000672	0.0000117	0.0000141	0.0000101
LDDV	0.0004179	0.0004244	0.0003231	0.0004250	0.0005131	0.0004819	0.0004752	0.0005041	0.0003934
LDDT12	0.0000191	0.0000194	0.0000147	0.0000147	0.0000178	0.0000167	0.0000211	0.0000224	0.0000175
HDDV2b	0.0546798	0.0747018	0.0369693	0.0347884	0.0335428	0.0190229	0.0325779	0.0394241	0.0282160
HDDV 3	0.0079549	0.0108678	0.0053784	0.0067388	0.0064975	0.0036849	0.0058695	0.0071029	0.0050836
HDDV 4	0.0023446	0.0032031	0.0015852	0.0025343	0.0024435	0.0013858	0.0007735	0.0009360	0.0006699
HDDV 5	0.0023446	0.0032031	0.0015852	0.0021887	0.0021103	0.0011968	0.0010920	0.0013215	0.0009458
HDDV 6	0.0060290	0.0082367	0.0040763	0.0047229	0.0045538	0.0025826	0.0023205	0.0028081	0.0020098
HDDV 7	0.0040193	0.0054911	0.0027175	0.0020159	0.0019437	0.0011023	0.0010920	0.0013215	0.0009458
HDDV8a	0.0063640	0.0086942	0.0043027	0.0046077	0.0044428	0.0025196	0.0017745	0.0021474	0.0015369
HDDV8b	0.1336567	0.0808171	0.3411339	0.2200143	0.0794953	0.1668635	0.1215708	0.0589007	0.2693816
MC	0.0010000	0.0010000	0.0010000	0.0010000	0.0010000	0.0010000	0.0010000	0.0010000	0.0010000
HDGB	0.0007979	0.0009148	0.0005877	0.0004410	0.0004355	0.0002506	0.0002230	0.0003008	0.0002782
HDDBT	0.0031523	0.0036139	0.0023217	0.0017423	0.0017204	0.0009902	0.0008810	0.0011885	0.0010990
HDDBS	0.0057884	0.0066360	0.0042631	0.0031993	0.0031590	0.0018183	0.0016177	0.0021824	0.0020180
LDDT34	0.0010526	0.0010690	0.0008138	0.0008137	0.0009824	0.0009227	0.0011668	0.0012377	0.0009661

Vehicle Class	Austin District Functional Class			Beaumont District Functional Class			Brownwood District Functional Class		
	Art	Col	Fwy	Art	Col	Fwy	Art	Col	Fwy
LDGV	0.6504718	0.6381040	0.6438427	0.4894115	0.4974764	0.4325745	0.4333423	0.4618929	0.2626084
LDGT1	0.0424384	0.0416328	0.0420066	0.0628727	0.0639066	0.0555860	0.0613926	0.0654281	0.0372600
LDGT2	0.1412797	0.1385976	0.1398421	0.2093063	0.2127484	0.1850484	0.2043790	0.2178134	0.1240404
LDGT3	0.0489476	0.0480183	0.0484495	0.0736020	0.0748124	0.0650718	0.0897206	0.0956182	0.0544527
LDGT4	0.0225081	0.0220808	0.0222791	0.0338452	0.0344018	0.0299226	0.0412572	0.0439691	0.0250395
HDGV2b	0.0073721	0.0095222	0.0058380	0.0069318	0.0070957	0.0062049	0.0096264	0.0101176	0.0086507
HDGV 3	0.0026841	0.0034669	0.0021255	0.0022805	0.0023344	0.0020414	0.0027622	0.0029032	0.0024822
HDGV 4	0.0006315	0.0008157	0.0005001	0.0004403	0.0004507	0.0003941	0.0003804	0.0003998	0.0003419
HDGV 5	0.0002915	0.0003765	0.0002308	0.0002822	0.0002889	0.0002526	0.0009428	0.0009909	0.0008472
HDGV 6	0.0007409	0.0009569	0.0005867	0.0008128	0.0008321	0.0007276	0.0017367	0.0018253	0.0015607
HDGV 7	0.0001822	0.0002353	0.0001443	0.0002258	0.0002311	0.0002021	0.0004631	0.0004868	0.0004162
HDGV8a	0.0002186	0.0002824	0.0001731	0.0002935	0.0003005	0.0002628	0.0006120	0.0006432	0.0005500
HDGV8b	0.0000243	0.0000314	0.0000192	0.0000226	0.0000231	0.0000202	0.0000165	0.0000174	0.0000149
LDDV	0.0006186	0.0006068	0.0006123	0.0004656	0.0004733	0.0004117	0.0004124	0.0004395	0.0002503
LDDT12	0.0000167	0.0000164	0.0000165	0.0000248	0.0000252	0.0000219	0.0000242	0.0000258	0.0000147
HDDV2b	0.0232575	0.0300406	0.0184178	0.0325765	0.0333468	0.0291606	0.0531737	0.0558872	0.0477844
HDDV 3	0.0039847	0.0051468	0.0031555	0.0047248	0.0048366	0.0042294	0.0056046	0.0058906	0.0050366
HDDV 4	0.0017077	0.0022058	0.0013524	0.0016910	0.0017310	0.0015137	0.0009107	0.0009572	0.0008184
HDDV 5	0.0015044	0.0019432	0.0011914	0.0014921	0.0015273	0.0013356	0.0011209	0.0011781	0.0010073
HDDV 6	0.0043100	0.0055670	0.0034131	0.0034317	0.0035129	0.0030719	0.0034328	0.0036080	0.0030849
HDDV 7	0.0022363	0.0028885	0.0017709	0.0014423	0.0014764	0.0012911	0.0024520	0.0025771	0.0022035
HDDV8a	0.0036594	0.0047267	0.0028979	0.0043767	0.0044802	0.0039178	0.0033628	0.0035344	0.0030219
HDDV8b	0.0353692	0.0351087	0.0565093	0.0632535	0.0442456	0.1695181	0.0766638	0.0172533	0.4085544
MC	0.0010000	0.0010000	0.0010000	0.0010000	0.0010000	0.0010000	0.0010000	0.0010000	0.0010000
HDGB	0.0002967	0.0004689	0.0002222	0.0003135	0.0005778	0.0004105	0.0003175	0.0003376	0.0006676
HDDBT	0.0011723	0.0018526	0.0008777	0.0012386	0.0022829	0.0016218	0.0012543	0.0013336	0.0026376
HDDBS	0.0021527	0.0034017	0.0016117	0.0022744	0.0041919	0.0029780	0.0023032	0.0024488	0.0048432
LDDT34	0.0009230	0.0009055	0.0009136	0.0013674	0.0013899	0.0012090	0.0013353	0.0014230	0.0008104

Vehicle Class	Bryan District Functional Class			Childress District Functional Class			Corpus Christi District Functional Class		
	Art	Col	Fwy	Art	Col	Fwy	Art	Col	Fwy
LDGV	0.4679396	0.5012334	0.4291592	0.3974301	0.4641970	0.2474524	0.5075835	0.5296171	0.5625721
LDGT1	0.0530801	0.0568487	0.0486905	0.0482798	0.0563703	0.0301063	0.0484258	0.0505238	0.0536617
LDGT2	0.1767064	0.1892522	0.1620931	0.1607259	0.1876596	0.1002252	0.1612120	0.1681962	0.1786424
LDGT3	0.0804176	0.0861271	0.0737672	0.0724923	0.0846402	0.0452046	0.0569701	0.0594383	0.0631298
LDGT4	0.0369793	0.0396047	0.0339212	0.0333349	0.0389210	0.0207869	0.0261972	0.0273321	0.0290297
HDGV2b	0.0075427	0.0089811	0.0058745	0.0070274	0.0126941	0.0062958	0.0117032	0.0140998	0.0076637
HDGV 3	0.0023461	0.0027934	0.0018272	0.0025863	0.0046718	0.0023171	0.0042485	0.0051186	0.0027821
HDGV 4	0.0006180	0.0007359	0.0004814	0.0005355	0.0009674	0.0004798	0.0008654	0.0010427	0.0005667
HDGV 5	0.0003784	0.0004506	0.0002947	0.0005355	0.0009674	0.0004798	0.0005901	0.0007109	0.0003864
HDGV 6	0.0010217	0.0012165	0.0007957	0.0011886	0.0021471	0.0010649	0.0013178	0.0015877	0.0008630
HDGV 7	0.0002901	0.0003454	0.0002259	0.0007315	0.0013213	0.0006553	0.0004721	0.0005687	0.0003091
HDGV8a	0.0003910	0.0004656	0.0003045	0.0003919	0.0007079	0.0003511	0.0004131	0.0004976	0.0002705
HDGV8b	0.0000252	0.0000300	0.0000196	0.0000653	0.0001180	0.0000585	0.0000590	0.0000711	0.0000386
LDDV	0.0004453	0.0004769	0.0004084	0.0003783	0.0004417	0.0002359	0.0004829	0.0005038	0.0005351
LDDT12	0.0000209	0.0000224	0.0000192	0.0000190	0.0000222	0.0000119	0.0000191	0.0000199	0.0000211
HDDV2b	0.0438490	0.0522109	0.0341513	0.0338021	0.0610593	0.0302833	0.0438640	0.0528467	0.0287239
HDDV 3	0.0065742	0.0078279	0.0051203	0.0057116	0.0103172	0.0051170	0.0080894	0.0097460	0.0052972
HDDV 4	0.0011164	0.0013293	0.0008695	0.0028558	0.0051586	0.0025585	0.0024408	0.0029406	0.0015983
HDDV 5	0.0011784	0.0014031	0.0009178	0.0019212	0.0034703	0.0017212	0.0019526	0.0023525	0.0012786
HDDV 6	0.0032251	0.0038401	0.0025118	0.0025442	0.0045959	0.0022794	0.0044631	0.0053771	0.0029226
HDDV 7	0.0020467	0.0024370	0.0015940	0.0020250	0.0036579	0.0018142	0.0028592	0.0034447	0.0018723
HDDV8a	0.0040314	0.0048002	0.0031398	0.0030635	0.0055338	0.0027446	0.0060670	0.0073095	0.0039729
HDDV8b	0.1045635	0.0306438	0.1890761	0.2169557	0.0431119	0.4912500	0.1020201	0.0478442	0.0483101
MC	0.0010000	0.0010000	0.0010000	0.0010000	0.0010000	0.0010000	0.0010000	0.0010000	0.0010000
HDGB	0.0002506	0.0003840	0.0002194	0.0002743	0.0004115	0.0003975	0.0004613	0.0005499	0.0002773
HDDBT	0.0009900	0.0015172	0.0008668	0.0010838	0.0016256	0.0015705	0.0018226	0.0021725	0.0010956
HDDBS	0.0018178	0.0027860	0.0015917	0.0019902	0.0029850	0.0028837	0.0033468	0.0039892	0.0020118
LDDT34	0.0011545	0.0012364	0.0010590	0.0010501	0.0012260	0.0006548	0.0010532	0.0010989	0.0011671

Vehicle Class	Dallas District Functional Class			El Paso District Functional Class			Fort Worth District Functional Class		
	Art	Col	Fwy	Art	Col	Fwy	Art	Col	Fwy
LDGV	0.6908006	0.6312159	0.6567335	0.6890334	0.6948408	0.6615684	0.6114828	0.5623049	0.6338903
LDGT1	0.0391310	0.0357607	0.0372041	0.0420017	0.0423552	0.0403300	0.0416912	0.0383437	0.0432164
LDGT2	0.1302691	0.1190491	0.1238542	0.1398259	0.1410027	0.1342605	0.1387920	0.1276480	0.1438696
LDGT3	0.0440188	0.0402275	0.0418511	0.0376059	0.0379224	0.0361091	0.0497754	0.0457788	0.0515964
LDGT4	0.0202416	0.0184982	0.0192448	0.0172927	0.0174383	0.0166044	0.0228888	0.0210510	0.0237261
HDGV2b	0.0094091	0.0224212	0.0109446	0.0059465	0.0069664	0.0057285	0.0073444	0.0104062	0.0054614
HDGV 3	0.0018329	0.0043678	0.0021321	0.0025880	0.0030319	0.0024932	0.0023086	0.0032710	0.0017167
HDGV 4	0.0010590	0.0025236	0.0012319	0.0008185	0.0009589	0.0007885	0.0005861	0.0008305	0.0004358
HDGV 5	0.0002444	0.0005824	0.0002843	0.0005778	0.0006769	0.0005566	0.0003588	0.0005084	0.0002668
HDGV 6	0.0007196	0.0017148	0.0008370	0.0014926	0.0017487	0.0014379	0.0008732	0.0012372	0.0006493
HDGV 7	0.0001222	0.0002912	0.0001421	0.0002648	0.0003102	0.0002551	0.0002273	0.0003220	0.0001690
HDGV8a	0.0001629	0.0003882	0.0001895	0.0003250	0.0003808	0.0003131	0.0002392	0.0003390	0.0001779
HDGV8b	0.0000272	0.0000647	0.0000316	0.0000241	0.0000282	0.0000232	0.0000239	0.0000339	0.0000178
LDDV	0.0006569	0.0006003	0.0006245	0.0006552	0.0006607	0.0006291	0.0005816	0.0005349	0.0006028
LDDT12	0.0000154	0.0000141	0.0000146	0.0000165	0.0000167	0.0000159	0.0000164	0.0000151	0.0000170
HDDV2b	0.0100824	0.0240257	0.0117278	0.0129034	0.0151166	0.0124303	0.0243717	0.0345320	0.0181233
HDDV 3	0.0028314	0.0067470	0.0032934	0.0025090	0.0029393	0.0024170	0.0050202	0.0071131	0.0037331
HDDV 4	0.0017955	0.0042786	0.0020885	0.0007885	0.0009238	0.0007596	0.0021883	0.0031006	0.0016273
HDDV 5	0.0010819	0.0025781	0.0012585	0.0009319	0.0010918	0.0008977	0.0017163	0.0024318	0.0012763
HDDV 6	0.0042816	0.0102027	0.0049803	0.0030108	0.0035272	0.0029004	0.0045911	0.0065051	0.0034141
HDDV 7	0.0011510	0.0027427	0.0013388	0.0012187	0.0014277	0.0011740	0.0015876	0.0022494	0.0011806
HDDV8a	0.0017955	0.0042786	0.0020885	0.0025329	0.0029673	0.0024400	0.0034326	0.0048637	0.0025526
HDDV8b	0.0341664	0.0632670	0.0745883	0.0302315	0.0199544	0.0716076	0.0759822	0.1234600	0.0591574
MC	0.0010000	0.0010000	0.0010000	0.0010000	0.0010000	0.0010000	0.0010000	0.0010000	0.0010000
HDGB	0.0001846	0.0001952	0.0001235	0.0004499	0.0001468	0.0001952	0.0001650	0.0001053	0.0000968
HDDBT	0.0007291	0.0007712	0.0004877	0.0017774	0.0005800	0.0007713	0.0006518	0.0004162	0.0003825
HDDBS	0.0013388	0.0014160	0.0008956	0.0032637	0.0010651	0.0014163	0.0011968	0.0007642	0.0007024
LDDT34	0.0008511	0.0007778	0.0008092	0.0009135	0.0009212	0.0008772	0.0009068	0.0008340	0.0009399

Vehicle Class	Houston District Functional Class			Laredo District Functional Class			Lubbock District Functional Class		
	Art	Col	Fwy	Art	Col	Fwy	Art	Col	Fwy
LDGV	0.6205742	0.5910363	0.6231928	0.4601319	0.4558341	0.5210782	0.5390858	0.5039113	0.5225683
LDGT1	0.0469804	0.0447479	0.0471783	0.0510563	0.0505804	0.0578042	0.0480436	0.0449146	0.0465742
LDGT2	0.1564001	0.1489678	0.1570590	0.1699689	0.1683848	0.1924332	0.1599394	0.1495229	0.1550479
LDGT3	0.0614518	0.0585316	0.0617107	0.0612554	0.0606845	0.0693514	0.0570791	0.0533616	0.0553334
LDGT4	0.0282580	0.0269152	0.0283771	0.0281677	0.0279052	0.0318906	0.0262473	0.0245378	0.0254445
HDGV2b	0.0089253	0.0142199	0.0069002	0.0109184	0.0161452	0.0057276	0.0097036	0.0161021	0.0094377
HDGV 3	0.0022862	0.0036424	0.0017675	0.0058538	0.0086561	0.0030708	0.0051179	0.0084927	0.0049777
HDGV 4	0.0006458	0.0010289	0.0004993	0.0009647	0.0014265	0.0005061	0.0010441	0.0017325	0.0010154
HDGV 5	0.0002325	0.0003704	0.0001797	0.0006797	0.0010050	0.0003565	0.0013307	0.0022081	0.0012942
HDGV 6	0.0004650	0.0007408	0.0003595	0.0021924	0.0032420	0.0011501	0.0021086	0.0034990	0.0020508
HDGV 7	0.0001292	0.0002058	0.0000999	0.0006797	0.0010050	0.0003565	0.0007165	0.0011890	0.0006969
HDGV8a	0.0002067	0.0003293	0.0001598	0.0005700	0.0008429	0.0002990	0.0003685	0.0006115	0.0003584
HDGV8b	0.0000258	0.0000412	0.0000200	0.0000658	0.0000973	0.0000345	0.0000819	0.0001359	0.0000796
LDDV	0.0005902	0.0005621	0.0005927	0.0004378	0.0004338	0.0004957	0.0005128	0.0004794	0.0004971
LDDT12	0.0000185	0.0000176	0.0000186	0.0000201	0.0000199	0.0000228	0.0000189	0.0000177	0.0000183
HDDV2b	0.0178766	0.0284813	0.0138205	0.0412135	0.0609430	0.0216200	0.0238051	0.0395022	0.0231527
HDDV 3	0.0044423	0.0070775	0.0034344	0.0066888	0.0098908	0.0035088	0.0041712	0.0069216	0.0040568
HDDV 4	0.0021137	0.0033675	0.0016341	0.0020269	0.0029972	0.0010633	0.0011797	0.0019576	0.0011474
HDDV 5	0.0018629	0.0029680	0.0014402	0.0018918	0.0027974	0.0009924	0.0015589	0.0025869	0.0015162
HDDV 6	0.0042990	0.0068492	0.0033236	0.0053375	0.0078926	0.0028000	0.0039184	0.0065021	0.0038110
HDDV 7	0.0016479	0.0026255	0.0012740	0.0039862	0.0058945	0.0020911	0.0026965	0.0044746	0.0026226
HDDV8a	0.0035825	0.0057077	0.0027696	0.0064185	0.0094911	0.0033671	0.0048032	0.0079703	0.0046715
HDDV8b	0.0319666	0.0428598	0.0390460	0.1331210	0.0830659	0.0726434	0.1010834	0.1099891	0.1273530
MC	0.0010000	0.0010000	0.0010000	0.0010000	0.0010000	0.0010000	0.0010000	0.0010000	0.0010000
HDGB	0.0002455	0.0005517	0.0002553	0.0003476	0.0015293	0.0004162	0.0002737	0.0006065	0.0003491
HDDBT	0.0009701	0.0021795	0.0010088	0.0013733	0.0060416	0.0016442	0.0010812	0.0023962	0.0013794
HDDBS	0.0017813	0.0040020	0.0018523	0.0025218	0.0110938	0.0030191	0.0019854	0.0043999	0.0025328
LDDT34	0.0010218	0.0009732	0.0010261	0.0011104	0.0011001	0.0012572	0.0010449	0.0009769	0.0010130

Vehicle Class	Lufkin District Functional Class			Odessa District Functional Class			Paris District Functional Class		
	Art	Col	Fwy	Art	Col	Fwy	Art	Col	Fwy
LDGV	0.4433680	0.4759527	0.6086915	0.4713804	0.4101307	0.3679593	0.4992342	0.5425037	0.4733036
LDGT1	0.0544757	0.0584703	0.0441758	0.0532358	0.0463332	0.0415806	0.0525933	0.0571426	0.0498670
LDGT2	0.1813524	0.1946506	0.1470636	0.1772247	0.1542454	0.1384238	0.1750858	0.1902304	0.1660098
LDGT3	0.0628311	0.0674384	0.0526710	0.1010218	0.0879232	0.0789045	0.0588656	0.0639574	0.0558142
LDGT4	0.0288923	0.0310109	0.0242202	0.0464539	0.0404306	0.0362835	0.0270688	0.0294102	0.0256656
HDGV2b	0.0073282	0.0070323	0.0072402	0.0149726	0.0260247	0.0120757	0.0090656	0.0077137	0.0058021
HDGV 3	0.0025796	0.0024755	0.0020569	0.0046321	0.0080514	0.0037359	0.0026530	0.0022573	0.0016979
HDGV 4	0.0003979	0.0003818	0.0006887	0.0009826	0.0017079	0.0007925	0.0005609	0.0004773	0.0003590
HDGV 5	0.0004749	0.0004557	0.0002958	0.0005615	0.0009759	0.0004528	0.0003790	0.0003225	0.0002426
HDGV 6	0.0011936	0.0011454	0.0007172	0.0014037	0.0024398	0.0011321	0.0014857	0.0012641	0.0009508
HDGV 7	0.0004620	0.0004434	0.0001678	0.0004913	0.0008539	0.0003962	0.0005609	0.0004773	0.0003590
HDGV8a	0.0003850	0.0003695	0.0002013	0.0003041	0.0005286	0.0002453	0.0004093	0.0003483	0.0002620
HDGV8b	0.0000128	0.0000123	0.0000226	0.0000468	0.0000813	0.0000377	0.0000455	0.0000387	0.0000291
LDDV	0.0004219	0.0004529	0.0005789	0.0004485	0.0003904	0.0003503	0.0004750	0.0005161	0.0004504
LDDT12	0.0000215	0.0000230	0.0000174	0.0000210	0.0000182	0.0000164	0.0000207	0.0000225	0.0000196
HDDV2b	0.0452327	0.0434062	0.0168511	0.0374371	0.0650717	0.0301937	0.0391690	0.0333280	0.0250688
HDDV 3	0.0059730	0.0057318	0.0035389	0.0105006	0.0182518	0.0084690	0.0044887	0.0038193	0.0028728
HDDV 4	0.0013066	0.0012538	0.0015643	0.0026089	0.0045346	0.0021041	0.0010687	0.0009094	0.0006840
HDDV 5	0.0014932	0.0014329	0.0012614	0.0025436	0.0044212	0.0020515	0.0011756	0.0010003	0.0007524
HDDV 6	0.0039198	0.0037615	0.0036127	0.0052177	0.0090692	0.0042082	0.0032596	0.0027735	0.0020862
HDDV 7	0.0016799	0.0016121	0.0014335	0.0030002	0.0052148	0.0024197	0.0016031	0.0013640	0.0010260
HDDV8a	0.0026132	0.0025076	0.0027293	0.0039133	0.0068019	0.0031561	0.0026718	0.0022734	0.0017100
HDDV8b	0.1476571	0.0943040	0.0755018	0.0536408	0.0970700	0.2584327	0.1140065	0.0509391	0.1806518
MC	0.0010000	0.0010000	0.0010000	0.0010000	0.0010000	0.0010000	0.0010000	0.0010000	0.0010000
HDGB	0.0003067	0.0002789	0.0002243	0.0004751	0.0006081	0.0003829	0.0001565	0.0003825	0.0001828
HDDBT	0.0012116	0.0011018	0.0008860	0.0018772	0.0024023	0.0015129	0.0006182	0.0015110	0.0007220
HDDBS	0.0022247	0.0020232	0.0016270	0.0034469	0.0044111	0.0027780	0.0011351	0.0027746	0.0013257
LDDT34	0.0011848	0.0012717	0.0009608	0.0011578	0.0010077	0.0009044	0.0011439	0.0012428	0.0010846

Vehicle Class	Pharr District Functional Class			San Angelo District Functional Class			San Antonio District Functional Class		
	Art	Col	Fwy	Art	Col	Fwy	Art	Col	Fwy
LDGV	0.5870290	0.6142302	0.5918216	0.4707011	0.4231335	0.3128164	0.6085619	0.6169555	0.6033907
LDGT1	0.0542207	0.0567288	0.0546626	0.0589234	0.0529814	0.0392010	0.0467902	0.0474345	0.0463932
LDGT2	0.1805034	0.1888531	0.1819745	0.1961589	0.1763777	0.1305019	0.1557668	0.1579117	0.1544454
LDGT3	0.0507553	0.0531031	0.0511689	0.0826479	0.0743135	0.0549845	0.0518441	0.0525580	0.0514043
LDGT4	0.0233393	0.0244190	0.0235296	0.0380049	0.0341723	0.0252841	0.0238400	0.0241683	0.0236378
HDGV2b	0.0051755	0.0048379	0.0060508	0.0108498	0.0189875	0.0133625	0.0086690	0.0093334	0.0057873
HDGV 3	0.0022712	0.0021231	0.0026553	0.0043399	0.0075950	0.0053450	0.0030192	0.0032506	0.0020156
HDGV 4	0.0005628	0.0005261	0.0006579	0.0011729	0.0020527	0.0014446	0.0010164	0.0010943	0.0006785
HDGV 5	0.0005025	0.0004697	0.0005875	0.0007233	0.0012658	0.0008908	0.0005231	0.0005632	0.0003492
HDGV 6	0.0009145	0.0008549	0.0010692	0.0015248	0.0026685	0.0018780	0.0011509	0.0012391	0.0007683
HDGV 7	0.0003216	0.0003006	0.0003760	0.0005278	0.0009237	0.0006501	0.0002690	0.0002897	0.0001796
HDGV8a	0.0002914	0.0002724	0.0003407	0.0003323	0.0005816	0.0004093	0.0002840	0.0003058	0.0001896
HDGV8b	0.0000100	0.0000094	0.0000117	0.0000782	0.0001368	0.0000963	0.0000149	0.0000161	0.0000100
LDDV	0.0005583	0.0005842	0.0005629	0.0004479	0.0004027	0.0002980	0.0005788	0.0005867	0.0005739
LDDT12	0.0000214	0.0000223	0.0000215	0.0000232	0.0000209	0.0000154	0.0000184	0.0000187	0.0000183
HDDV2b	0.0148287	0.0138614	0.0173363	0.0377008	0.0659778	0.0464321	0.0285303	0.0307170	0.0190465
HDDV 3	0.0031776	0.0029703	0.0037149	0.0072912	0.0127599	0.0089798	0.0055921	0.0060208	0.0037332
HDDV 4	0.0014494	0.0013549	0.0016945	0.0017783	0.0031122	0.0021902	0.0022783	0.0024529	0.0015210
HDDV 5	0.0012822	0.0011985	0.0014990	0.0018376	0.0032159	0.0022632	0.0018123	0.0019512	0.0012098
HDDV 6	0.0027037	0.0025274	0.0031609	0.0034974	0.0061206	0.0043074	0.0059028	0.0063553	0.0039406
HDDV 7	0.0014215	0.0013288	0.0016619	0.0024304	0.0042533	0.0029933	0.0026925	0.0028989	0.0017975
HDDV8a	0.0030103	0.0028140	0.0035194	0.0047422	0.0082991	0.0058405	0.0049708	0.0053518	0.0033184
HDDV8b	0.0590765	0.0201915	0.0465405	0.0676732	0.0906613	0.3295565	0.0390558	0.0211039	0.0706786
MC	0.0010000	0.0010000	0.0010000	0.0010000	0.0010000	0.0010000	0.0010000	0.0010000	0.0010000
HDGB	0.0003600	0.0003429	0.0002616	0.0003532	0.0006419	0.0006888	0.0003933	0.0004417	0.0002379
HDDBT	0.0014223	0.0013545	0.0010336	0.0013954	0.0025358	0.0027211	0.0015540	0.0017451	0.0009399
HDDBS	0.0026116	0.0024872	0.0018979	0.0025623	0.0046562	0.0049966	0.0028534	0.0032043	0.0017259
LDDT34	0.0011793	0.0012338	0.0011889	0.0012816	0.0011523	0.0008526	0.0010177	0.0010317	0.0010090

Vehicle Class	Tyler District Functional Class			Waco District Functional Class			Wichita Falls District Functional Class		
	Art	Col	Fwy	Art	Col	Fwy	Art	Col	Fwy
LDGV	0.5462444	0.5609638	0.4914286	0.6077683	0.5852221	0.5337191	0.5369309	0.4197072	0.5264166
LDGT1	0.0552302	0.0567157	0.0496979	0.0497400	0.0478979	0.0436898	0.0539907	0.0422253	0.0529354
LDGT2	0.1838640	0.1888095	0.1654469	0.1655870	0.1594543	0.1454454	0.1797377	0.1405700	0.1762246
LDGT3	0.0624416	0.0641211	0.0561870	0.0545562	0.0525356	0.0479201	0.0622717	0.0487017	0.0610545
LDGT4	0.0287132	0.0294855	0.0258371	0.0250871	0.0241580	0.0220356	0.0286351	0.0223950	0.0280754
HDGV2b	0.0073370	0.0074608	0.0069665	0.0064511	0.0093671	0.0058312	0.0063012	0.0157447	0.0050142
HDGV 3	0.0024247	0.0024657	0.0023023	0.0019629	0.0028501	0.0017743	0.0021624	0.0054031	0.0017207
HDGV 4	0.0007412	0.0007537	0.0007038	0.0006428	0.0009334	0.0005810	0.0006162	0.0015396	0.0004903
HDGV 5	0.0003769	0.0003833	0.0003579	0.0005395	0.0007834	0.0004877	0.0004650	0.0011620	0.0003701
HDGV 6	0.0010804	0.0010987	0.0010259	0.0013201	0.0019168	0.0011932	0.0012905	0.0032245	0.0010269
HDGV 7	0.0003015	0.0003066	0.0002863	0.0003329	0.0004834	0.0003009	0.0003255	0.0008134	0.0002590
HDGV8a	0.0002890	0.0002938	0.0002744	0.0002181	0.0003167	0.0001971	0.0004302	0.0010748	0.0003423
HDGV8b	0.0000126	0.0000128	0.0000119	0.0000115	0.0000167	0.0000104	0.0000349	0.0000871	0.0000278
LDDV	0.0005196	0.0005336	0.0004676	0.0005780	0.0005566	0.0005077	0.0005108	0.0003995	0.0005008
LDDT12	0.0000217	0.0000223	0.0000196	0.0000196	0.0000189	0.0000172	0.0000213	0.0000166	0.0000208
HDDV2b	0.0293666	0.0298623	0.0278837	0.0277483	0.0402909	0.0250818	0.0281455	0.0703270	0.0223970
HDDV 3	0.0057000	0.0057962	0.0054122	0.0041247	0.0059892	0.0037284	0.0051481	0.0128634	0.0040966
HDDV 4	0.0014136	0.0014375	0.0013422	0.0012083	0.0017544	0.0010922	0.0012237	0.0030577	0.0009738
HDDV 5	0.0015048	0.0015302	0.0014288	0.0009999	0.0014519	0.0009039	0.0007595	0.0018979	0.0006044
HDDV 6	0.0035112	0.0035705	0.0033339	0.0026665	0.0038718	0.0024103	0.0021943	0.0054828	0.0017461
HDDV 7	0.0015048	0.0015302	0.0014288	0.0016249	0.0023594	0.0014688	0.0016035	0.0040066	0.0012760
HDDV8a	0.0025992	0.0026431	0.0024680	0.0032915	0.0047792	0.0029752	0.0031226	0.0078024	0.0024848
HDDV8b	0.0603946	0.0349129	0.1504227	0.0375695	0.0464463	0.1523297	0.0770481	0.1697309	0.1071377
MC	0.0010000	0.0010000	0.0010000	0.0010000	0.0010000	0.0010000	0.0010000	0.0010000	0.0010000
HDGB	0.0001807	0.0002504	0.0002610	0.0003170	0.0003690	0.0003563	0.0003979	0.0016263	0.0002174
HDDBT	0.0007140	0.0009894	0.0010310	0.0012525	0.0014580	0.0014077	0.0015720	0.0064249	0.0008587
HDDBS	0.0013111	0.0018168	0.0018932	0.0022999	0.0026772	0.0025849	0.0028866	0.0117975	0.0015768
LDDT34	0.0012012	0.0012335	0.0010809	0.0010818	0.0010418	0.0009502	0.0011743	0.0009184	0.0011513

Vehicle Class	Yoakum District Functional Class		
	Art	Col	Fwy
LDGV	0.3989592	0.4157324	0.3336422
LDGT1	0.0532326	0.0554650	0.0445392
LDGT2	0.1772140	0.1846458	0.1482733
LDGT3	0.0806486	0.0840308	0.0674780
LDGT4	0.0370855	0.0386408	0.0310291
HDGV2b	0.0115340	0.0123667	0.0078731
HDGV 3	0.0044123	0.0047309	0.0030118
HDGV 4	0.0006967	0.0007470	0.0004756
HDGV 5	0.0005225	0.0005602	0.0003567
HDGV 6	0.0013934	0.0014940	0.0009511
HDGV 7	0.0002903	0.0003112	0.0001981
HDGV8a	0.0002903	0.0003112	0.0001981
HDGV8b	0.0000194	0.0000207	0.0000132
LDDV	0.0003798	0.0003957	0.0003177
LDDT12	0.0000210	0.0000218	0.0000175
HDDV2b	0.0584938	0.0627169	0.0399279
HDDV 3	0.0086627	0.0092881	0.0059132
HDDV 4	0.0018975	0.0020345	0.0012953
HDDV 5	0.0025576	0.0027422	0.0017458
HDDV 6	0.0040426	0.0043345	0.0027595
HDDV 7	0.0024751	0.0026537	0.0016895
HDDV8a	0.0043726	0.0046883	0.0029847
HDDV8b	0.1406532	0.1034854	0.2925577
MC	0.0010000	0.0010000	0.0010000
HDGB	0.0006545	0.0005224	0.0008835
HDDBT	0.0025856	0.0020638	0.0034904
HDDBS	0.0047478	0.0037895	0.0064092
LDDT34	0.0011578	0.0012063	0.0009687

APPENDIX L:
FUNCTIONAL CLASS, VMT MIX, AND MOBILE6 DRIVE CYCLE ASSOCIATIONS

HPMS (RIFCREC) Functional Class, VMT Mix, MOBILE6 Drive Cycle Associations

MOBILE6 Drive Cycle	HPMS Functional Class	VMT mix Functional Group
Freeway	Interstate	Freeway
	Freeway	
Arterial	Other Principal Arterial	Arterial
	Minor Arterial	
	Major Collector	Collector
	Minor Collector	
	Local	

Austin TDM Network Functional Class, VMT Mix, MOBILE6 Drive Cycle Associations

MOBILE6 Drive Cycle	Functional Class Name	VMT Mix Functional Group
Freeway	IH 35	Freeway
	Other Freeway	
	Expressway	
	Express Lanes	
	HOV Mainlanes	
	HOV Ramps	
Ramp	Ramps	Arterial
Arterial	Principle Arterial Divided	
	Principle Arterial Undivided	
	Minor Arterial Divided	
	Minor Arterial Undivided	
	Frontage Road	
	Intrazonal[1,2]	Collector
	Centroid Connector[2]	
	Collectors	
	Local Street	

[1] Special links added for application of the intrazonal VMT estimate.
[2] Emissions estimates for Centroid Connector and intrazonal links comprise the Local road type estimate.

BPA Network Facility Type, VMT Mix, MOBILE6 Drive Cycle Associations

MOBILE6 Drive Cycle	Facility Type (Code and Name)	VMT Mix
Freeway	1. Radial IH Freeways - Mainlanes Only	Freeway
	2. Radial IH Freeways - Mainlanes and Frontage Roads	
	3. Circumferential IH Freeways (Loops) - Mainlanes Only	
	4. Circumferential IH Freeways (Loops) - Mainlanes and Frontage Roads	
	5. Radial Other Freeways - Mainlanes Only	
	6. Radial Other Freeways - Mainlanes and Frontage Roads	
	7. Circumferential Other Freeways (Loops) - Mainlanes Only	
	8. Circumferential Other Freeways (Loops) - Mainlanes and Frontage Roads	
	22. Interchange Ramp (Freeway-to-Freeway Interchange Ramps)	
Ramp	21. Ramp (Between Frontage Road and Mainlanes)	Arterial
Arterial	11. Principal Arterial - Divided	
	12. Principal Arterial - Continuous Left Turn Lane	
	13. Principal Arterial - Undivided	
	14. Minor Arterial - Divided	
	15. Minor Arterial - Continuous Left Turn Lane	
	16. Minor Arterial - Undivided	
	20. Frontage Road	
	17. Collector - Divided	Collector
	18. Collector - Continuous Left Turn Lane	
	19. Collector - Undivided	
	39. Centroid Connector[2]	
	40. Intrazonal[1, 2]	

[1] Special links added for application of the intrazonal VMT estimate.
[2] Emissions estimates for Centroid Connector and intrazonal links comprise the Local road type estimate.

El Paso Network Functional Class, VMT Mix, MOBILE6 Drive Cycle Associations

MOBILE6 Drive Cycle	Functional Class		VMT Mix Group
	Code	Name	
Freeway	2	Freeway Radial	Freeway
	14	Freeway Circumferential	
Ramp	12	Ramp	Arterial
Arterial	11	Frontage Road	
	13	Transmountain Road	
	1	Border Highway	
	3	Expressway	
	4	Principal Arterial Divided	
	5	Principal Arterial Undivided	
	6	Divided Arterial	
	7	Undivided Arterial	
	8	Collector Divided	Collector
	9	Collector Undivided	
	0	Centroid Connector [1]	
	40	Intrazonal [1, 2]	

[1] Emissions estimates for Centroid Connector and intrazonal links comprise the Local road type estimate.
[2] Special links added for application of the intrazonal VMT estimate.

HGB TDM Network Functional Class, VMT Mix, MOBILE6 Drive Cycle Associations

MOBILE6 Drive Cycle	TDM Functional Class (Code and Name)	VMT Mix
Freeway	1. Urban Interstate	Freeway
	2. Urban Other Freeway	
	10. Rural Interstate	
	11. Rural Other Freeway	
	3. Toll Roads	
Ramp	4. Ramps (Freeway, Toll Roads, Frontage)	Arterial
Arterial	5. Urban Principal Arterial	
	6. Urban Other Arterial	
	12. Rural Principal Arterial	
	13. Rural Other Arterial	
	7. Urban Collector	Collector
	14. Rural Major Collector	
	15. Rural Collector	
	8. Local (centroid connector)[1]	
	40. Local (intrazonal)[1,2]	

[1] Emissions estimates for Centroid Connector and intrazonal links comprise the Local road type estimate.
[2] Special links added for application of the intrazonal VMT estimate.

San Antonio TDM Network Facility Type, VMT Mix, MOBILE6 Drive Cycle Associations

MOBILE6 Drive Cycle	Facility Type (Code and Name)	VMT Mix
Freeway	1. Radial IH Freeways - Mainlanes Only	Freeway
	3. Circumferential IH Freeways (Loops) - Mainlanes Only	
	5. Radial Other Freeways - Mainlanes Only	
	7. Circumferential Other Freeways (Loops) - Mainlanes Only	
	10. Circumferential Expressways	
	22. Interchange Ramp (Freeway-to-Freeway Interchange Ramps)	
Ramp	21. Ramp (Between Frontage Road and Mainlanes)	Arterial
Arterial	9. Radial Expressways	
	11. Principal Arterial - Divided	
	12. Principal Arterial - Continuous Left Turn Lane	
	13. Principal Arterial - Undivided	
	14. Minor Arterial - Divided	
	15. Minor Arterial - Continuous Left Turn Lane	
	16. Minor Arterial - Undivided	
	20. Frontage Road	
	17. Collector - Divided	Collector
	18. Collector - Continuous Left Turn Lane	
	19. Collector - Undivided	
	0. Centroid Connector[2]	
	40. Intrazonal[1, 2]	

[1] Special links added for application of the intrazonal VMT estimate.
[2] Emissions estimates for Centroid Connector and intrazonal links comprise the Local road type estimate.

Gregg and Smith Counties TDM Facility Type, VMT Mix, MOBILE6 Drive Cycle Associations

MOBILE6 Drive Cycle	Facility Type Code and Name	Gregg	Smith	VMT Mix
Freeway	1. Radial IH Freeways - Mainlanes Only	✓	✓	Freeway
	2. Radial IH Freeways - Mainlanes and Frontage Roads	✓		
Arterial	10. Circumferential Expressways	✓	✓	Arterial
	11. Principal Arterial - Divided	✓	✓	
	12. Principal Arterial - Continuous Left Turn Lane	✓	✓	
	13. Principal Arterial - Undivided	✓	✓	
	14. Minor Arterial - Divided	✓	✓	
	16. Minor Arterial - Undivided	✓	✓	
	18. Collector - Continuous Left Turn Lane	✓	✓	Collector
	19. Collector - Undivided	✓	✓	
	39. Centroid Connector[1]	✓	✓	
	40. Intrazonal[1]	✓	✓	

[1] Emissions estimates for Centroid Connector and intrazonal links comprise the Local road type estimate. Intrazonal links were added via post-processing of TDM data sets, for application of the intrazonal VMT estimate.

APPENDIX M:
NIF APPLICATION

NIFv3.0 (EPA, November 2003) Record Specifications — Application for Texas 2008 MSAT Emissions Estimates

The three NIF record types (TR, PE, EM) were organized and transmitted in three files, one file for each record type:

- 254tx_m62_2008_MTOX_NIFtr.txt (transmittal records file);
- 254tx_m62_2008_MTOX_NIFpe.txt (VMT records file); and
- 254tx_m62_2008_MTOX_NIFem.txt (emissions records file).

Additionally, a file named "254tx_m62_2008_MTOX _NIFreadme.txt" was included that provides a brief description of the MSAT EI analysis.

The following three tables describe the three NIF record types. For each record type, the data elements, positions in the record, and brief data value descriptions are provided. Additional information regarding the record specifications may be found in *NEI Input Format (NIF) Version 3.0, User's Guide Instructions and Conventions for Use,* EPA, November 2003.

Transmittal Record (TR)
There is one transmittal record provided per Texas county. The data elements included are listed in the table.

Column (Begin/End)	Data Element	Value/(Description)
1/2	Record Type	TR
3/7	State and County FIPS Code	(Five-character code for each county – two-digit Texas state code is 48 followed by three-digit county code)
8/87	Organization Name	TCEQ
88/89	Transaction Type	00
90/93	Inventory Year	2008
94/103	Inventory Type Code	HAP
104/111	Transaction Creation Date	(Date that transmittal record was created)
112/115	Incremental Submission #	1
116/120	Reliability Indicator	(Left blank)
121/200	Transaction Comments	See 254tx_ m62_2008_MTOX_NIFreadme.txt for EI description
201/270	Contact Person Name	Anusuya Iyer
271/285	Contact Phone Number	(512) 239-1435
286/295	Telephone Number Type Name	Office
296/395	Electronic Address Text	aiyer@tceq.state.tx.us
396/405	Electronic Address Type Name	E-mail
406/430	Source Type	On-Road Mobile
431/470	Affiliation Type	(Left blank)
471/474	Format Version	3.0
475/477	Tribal Code	000

Emission Period Record (PE)

The PE records contain county VMT values for the period (i.e., the 2008 analysis year) by SCC, which is the combined seven-digit vehicle type code and three-digit road type code, which may also include exhaust, evaporative, brake, and tire emissions process identifiers.

Column (Begin/End)	Data Element	Value/(Description)
1/2	Record Type	PE
3/7	State and County FIPS Code	(Five-character code)
8/17	SCC[1,2]	(10-digit code for source of VMT [Actual Throughput data element] and emissions, comprised of vehicle type and road type codes.[1] The last digit of the road type code, normally zero, is replaced with X, V, T, or B,[2] to designate the associated emissions process.)
18/25	Begin Date	20080101
26/33	End Date	20081231
34/35	(Not used)	
36/39	Begin Time	(Left blank)
40/43	End Time	(Left blank)
44/53	Actual Throughput	(Numeric VMT value), corresponds to begin and end date
54/63	Throughput Unit Numerator	E6MILE (units of millions of miles)
64/67	Submittal Flag	(Left blank)
68/70	Tribal Code	000

[1]

Vehicle Type Codes		Road Type Codes used in 10 digit SCC:	
2201001	LDGV	110	RURAL INTERSTATE: TOTAL
2201020	LDGT12	130	RURAL OTHER PRINCIPAL ARTERIAL: TOTAL
2201040	LDGT34	150	RURAL MINOR ARTERIAL: TOTAL
2201070	HDGV,HDGB	170	RURAL MAJOR COLLECTOR: TOTAL
2201080	MC	190	RURAL MINOR COLLECTOR: TOTAL
2230001	LDDV	210	RURAL LOCAL: TOTAL
2230060	LDDT1-4	230	URBAN INTERSTATE: TOTAL
2230071	HDDV2b	250	URBAN OTHER FREEWAYS AND EXPRESSWAYS: TOTAL
2230072	HDDV3-5	270	URBAN OTHER PRINCIPAL ARTERIAL: TOTAL
2230073	HDDV6-7	290	URBAN MINOR ARTERIAL: TOTAL
2230074	HDDV8a-b	310	URBAN COLLECTOR: TOTAL
2230075	HDDB	330	URBAN LOCAL: TOTAL

[2] The SCC's also employ the X, B, T, and V codes in place of the third "0" digit of the road type code to designate the "emissions process" to which the SCC relates (i.e., exhaust, brake, tire, or evaporative, respectively). For every SCC with emissions in the emissions record, the SCC was included with associated VMT in the PE record.

Emissions Record (EM)

The EM records contain the emissions values for each county, period, pollutant, and SCC in units of pounds. See the following note on conversion of link-based EI data from travel model functional classes to HPMS functional classes.

Column (Begin/End)	Data Element	Value/(Description)
1/2	Record Type	EM
3/7	State and County FIPS Code	(Five-character code)
8/17	SCC	(Same as for PE record)
18/27	(Not used)	
28/35	Begin Date	(Same as for PE record)
36/43	End Date	(Same as for PE record)
44/45	(Not used)	
46/49	Begin Time	(Left blank)
50/53	End Time	(Left blank)
54/62	Pollutant Code	(See tabulated list following this table)
63/143	Emissions Process Description	(Left blank)
144/153	Emissions Numeric Value	(Pollutant/SCC-specific Numeric Value – floating-point decimal and exponential notation for small values.)
154/163	Emissions Unit Numerator	LB
164/165	Emissions Type	30 (for annual)
166/170	EM Reliability Indicator	(Left blank)
171/174	Submittal Flag	(Left blank)
175/177	Tribal Code	000

A note about the travel model link-based counties: Since TDM-based EIs do not use NIF road types (i.e., HPMS road types), TTI developed and applied a method of reallocating EI data from the TDM functional class to the NIF HPMS road type categories.

The 24-hour and annual tab-delimited EI results were converted to EPA's NIF 3.0 format. For each TDM county, the VMT and emissions from the EI tab file were re-categorized from TDM functional classes to an HPMS functional class (NIF road type) scheme. The TDM VMT and emissions were summarized by vehicle class for three roadway group categories: Freeway, Arterial, and Collector/Local. The analysis year and county-specific HPMS road type VMT distributions (from the TxDOT RIFCREC report for the analysis year – or latest available for future years) within each of the three roadway groups were then applied to the VMT and emissions for each vehicle type to distribute these data to the HPMS (NIF) road types. The re-distributed VMT and emissions were then compressed from the 28 MOBILE6 vehicle classes to the 12 NIF vehicle categories (as shown in footnote 1 of the Emission Period Record specifications table).

Mobile Source Air Toxic Pollutants Included in Texas 2008 Annual MSAT EI

Pollutant	NIF Code	Category	Source[1]	Ratio to
1,3-Butadiene	106990	gaseous HC	MOBILE6	NA
Acetaldehyde	75070	gaseous HC	MOBILE6	NA
Acrolein	107028	gaseous HC	MOBILE6	NA
Benzene	71432	gaseous HC	MOBILE6	NA
Formaldehyde	50000	gaseous HC	MOBILE6	NA
MTBE	1634044	gaseous HC	MOBILE6	NA
Lead	7439921	metal	MOBILE6	NA
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562394	dioxin/furan	HAP ratio	mile
1,2,3,4,6,7,8-Heptachlorodibenzo-p-Dioxin	35822469	dioxin/furan	HAP ratio	mile
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673897	dioxin/furan	HAP ratio	mile
1,2,3,4,7,8-Hexachlorodibenzofuran	70648269	dioxin/furan	HAP ratio	mile
1,2,3,4,7,8-Hexachlorodibenzo-p-Dioxin	39227286	dioxin/furan	HAP ratio	mile
1,2,3,6,7,8-Hexachlorodibenzofuran	57117449	dioxin/furan	HAP ratio	mile
1,2,3,6,7,8-Hexachlorodibenzo-p-Dioxin	57653857	dioxin/furan	HAP ratio	mile
1,2,3,7,8,9-Hexachlorodibenzofuran	72918219	dioxin/furan	HAP ratio	mile
1,2,3,7,8,9-Hexachlorodibenzo-p-Dioxin	19408743	dioxin/furan	HAP ratio	mile
1,2,3,7,8-Pentachlorodibenzofuran	57117416	dioxin/furan	HAP ratio	mile
1,2,3,7,8-Pentachlorodibenzo-p-Dioxin	40321764	dioxin/furan	HAP ratio	mile
2,3,4,6,7,8-Hexachlorodibenzofuran	60851345	dioxin/furan	HAP ratio	mile
2,3,4,7,8-Pentachlorodibenzofuran	57117314	dioxin/furan	HAP ratio	mile
2,3,7,8-Tetrachlorodibenzofuran	51207319	dioxin/furan	HAP ratio	mile
2,3,7,8-Tetrachlorodibenzo-p-Dioxin	1746016	dioxin/furan	HAP ratio	mile
Octachlorodibenzofuran	39001020	dioxin/furan	HAP ratio	mile
Octachlorodibenzo-p-dioxin	3268879	dioxin/furan	HAP ratio	mile
2,2,4-Trimethylpentane	540841	gaseous HC	HAP ratio	VOC
Ethyl Benzene	100414	gaseous HC	HAP ratio	VOC
Hexane	110543	gaseous HC	HAP ratio	VOC
Propionaldehyde	123386	gaseous HC	HAP ratio	VOC
Styrene	100425	gaseous HC	HAP ratio	VOC
Toluene	108883	gaseous HC	HAP ratio	VOC
Xylene	1330207	gaseous HC	HAP ratio	VOC
Chromium (Cr3+)	16065831	metal	HAP ratio	mile

Pollutant	NIF Code	Category	Source[1]	Ratio to
Chromium (Cr6+)	18540299	metal	HAP ratio	mile
Manganese	7439965	metal	HAP ratio	mile
Nickel	7440020	metal	HAP ratio	mile
Arsenic and Compounds	93	metal	HAP ratio	mile
Mercury (elemental gaseous)	200	metal	HAP ratio	mile
Mercury (divalent gaseous)	201	metal	HAP ratio	mile
Mercury (divalent particulate)	202	metal	HAP ratio	mile
Acenaphthene	83329	PAH	HAP ratio	PM-10
Acenaphthylene	208968	PAH	HAP ratio	PM-10
Anthracene	120127	PAH	HAP ratio	PM-10
Benz(a)anthracene	56553	PAH	HAP ratio	PM-10
Benzo(a)pyrene	50328	PAH	HAP ratio	PM-10
Benzo(b)fluoranthene	205992	PAH	HAP ratio	PM-10
Benzo(g,h,i)perylene	191242	PAH	HAP ratio	PM-10
Benzo(k)fluoranthene	207089	PAH	HAP ratio	PM-10
Chrysene	218019	PAH	HAP ratio	PM-10
Dibenzo(a,h)anthracene	53703	PAH	HAP ratio	PM-10
Fluoranthene	206440	PAH	HAP ratio	PM-10
Fluorene	86737	PAH	HAP ratio	PM-10
Indeno(1,2,3,c,d)pyrene	193395	PAH	HAP ratio	PM-10
Phenanthrene	85018	PAH	HAP ratio	PM-10
Pyrene	129000	PAH	HAP ratio	PM-10
Naphthalene	91203	PAH	HAP ratio	VOCPM-10

[1] The HAP ratios are from the latest NMIM NCD (20080727 SCCToxics Table).

ADDENDUM

Following a TCEQ consultation with NCTCOG and TTI, an agreement was reached in which TTI and NCTCOG would coordinate their on-road mobile source EI work under separate contracts with TCEQ, to produce an integrated 2008 criteria and MSAT pollutant annual EI for the 12 DFW CMSA counties. The approach was outlined in the following document (TTI, March 2009).

A separate NCTCOG report provides the details of NCTCOG's development of inventory inputs and base annual emissions estimates for the 12 DFW counties, that NCTCOG provided TTI for the 2008 Texas statewide MSAT annual EI. See *2008 Consolidated Emissions Reporting Rule On-road Mobile Source Emissions Inventory* (NCTCOG Draft, May 2009).

Integrated 2008 Criteria and Hazardous Air Pollutant EIs for 12 DFW CSMA Counties
Alternative Approach Offered by NCTCOG
(TTI, 04 March 2009)

The EPA's 2008 National Emissions Inventory (NEI) is an integrated, annual emissions inventory (EI) that will include criteria air pollutants (CAPs), hazardous air pollutants (HAPs), and greenhouse gases. An integrated on-road mobile source EI is one in which all of the pollutant emissions estimates are derived from the same activity data set (e.g., VMT, speeds). Currently, for the 12 DFW CMSA counties, NCTCOG is under contract to TCEQ to develop the CAP (Consolidated Emissions Reporting Rule [CERR] EI) portion, and TTI is under contract to TCEQ to prepare the HAP portion of the annual EI that TCEQ will submit to EPA as part of the Texas portion of EPA's 2008 NEI. TCEQ has asked NCTCOG and TTI to coordinate their EI work to ensure development of an integrated inventory for the 12 DFW area counties.

The agreed upon process (during a 3/3/2009 conference call between NCTCOG, TTI, and TCEQ) entails that NCTCOG perform a set of EI runs using their CERR EI inputs, but changing the pollutants as needed for the HAP EIs (i.e., six MOBILE6 air toxic pollutants, VOC, and exhaust PM components including lead). NCTCOG would then provide the EI output to TTI in the form required to complete production of the HAP EIs.

The following are the lists of data that TTI and NCTCOG have agreed to provide each other to accomplish this work:

<u>TTI is to provide NCTCOG (by Monday, March 9) with:</u>

- MOBILE6 fuel parameter inputs by county and month;
- sample MOBILE6 command input files; and
- adjustment factors to incorporate the estimated effects of the new federal highway MC emissions standards on MOBILE6 VOC and pertinent MSAT emissions factors.

NCTCOG is to provide TTI (by end-of-April/early May) with:

- tab-delimited annual emissions output files for each of the 12 counties:
  - subcomponent emissions output form is needed; and
  - the MOBILE6 pollutants needed are VOC, exhaust PM components (GASPM, ECARBON, OCARBON, SO4, LEAD) in PM-10 particle size category, and the six MSATs (BENZ, MTBE, BUTA, FORM, ACET, ACRO).