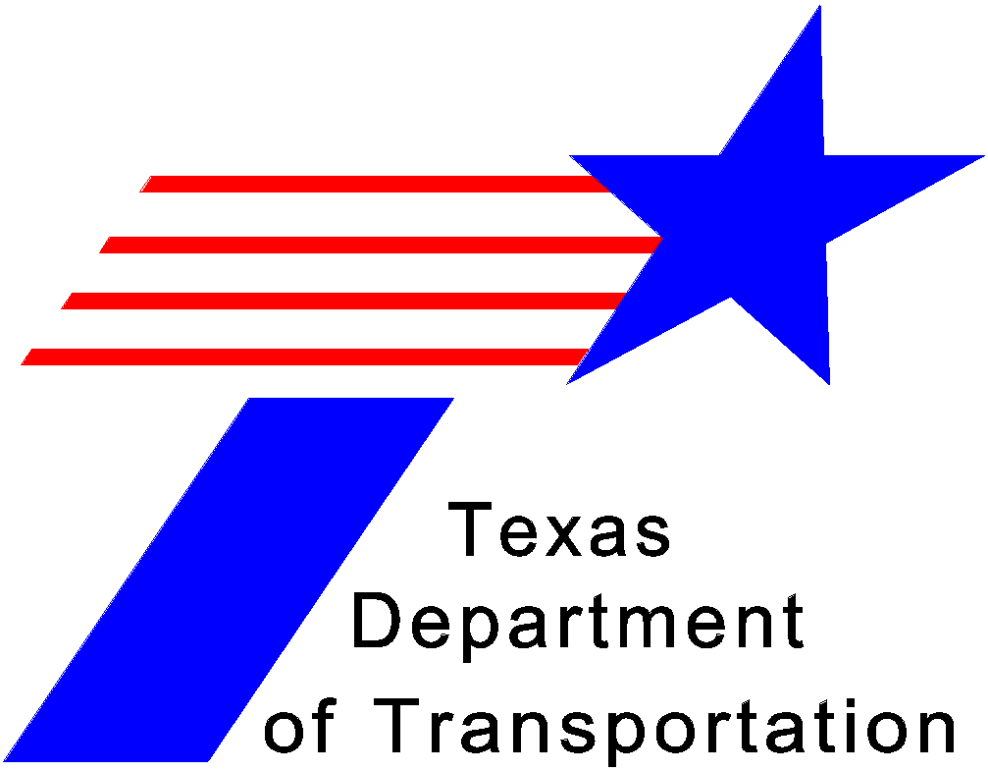
Traffic Data and Analysis Manual



September 2001

Traffic Data and Analysis Manual

September 2001

Manual Notices

Manual Notice 2001-1

To: Districts, Divisions and Offices

From: Kirby W. Pickett, P.E.

Manual: *Traffic Data and Analysis Manual*

Effective Date: June 1, 2001

Purpose

To issue the *Traffic Data and Analysis Manual*. This manual is contained in the Planning and Programming Collection of the TxDOT Online Manual System.

Contents

The *Traffic Data and Analysis Manual* contains the following chapters:

- Traffic Estimation and Forecasting
- Urban Travel Demand Forecasting
- Project Level Traffic Data Development
- Database Management.

Supersedes

Portions of the *Transportation Planning Division Operations Manual* dated April 4, 1985.

Instructions

Please remove and recycle the *Transportation Planning Division Operations Manual* dated April 4, 1985.

The *Traffic Data and Analysis Manual* will be distributed online only. Manual distributors may print and distribute a hardcopy from the PDF online version for employees not on the TxDOT wide-area-network or those preferring to retain a hardcopy. In this case, manual distributors must retain a distribution list and must also print and distribute all revisions.

Contact

Refer questions or suggestions to the Special Projects and Policy Analysis Branch of the Administration Section of the Transportation Planning and Programming Division (TPP).

Chapter 1
Traffic Estimation and Forecasting

Contents:

Section 1

Overview

Traffic estimation and forecasting involve traffic data collection, traffic estimates, and projections based on historic traffic data, corridor analysis for projects, and urban travel demand modeling. The process involves the Texas Department of Transportation (TxDOT), metropolitan planning organizations (MPOs), and local governments.

Transportation professionals use the results of traffic data collection, estimation, and forecasting to develop transportation plans and programs; analyze project alternatives; complete environmental analyses; prepare roadway geometric, intersection, and pavement design; and select projects.

Section 2
Traffic Data Collection and Reporting

Overview

TxDOT performs traffic and other data collection programs on a continuous basis. Data collection programs include:

- automatic traffic recorder volume data
- accumulative count recorder traffic data
- highway performance monitoring system traffic data
- five year count program
- vehicle classification data
- truck weigh-in-motion data
- vehicle speed data
- long-term pavement performance data
- border trend traffic data

The data are used to support the planning, design, and programming functions of TxDOT, MPOs, and local government agencies.

Section 3
Automatic Traffic Recorder Volume Data

ATR Data Collection

TPP collects traffic data using permanent automatic traffic recorder (ATR) equipment at approximately 160 permanent sites (see Table 1-1 or Section 14) around the state. (To see a map of TxDOT districts, link to http://www.dot.state.tx/insdtdot/geodist/geodist.htm .) ATR locations are selected by TPP and TxDOT districts in accordance with the FHWA *Traffic Monitoring Guide* (TMG) (accessible from a link on the TxDOT Internet at http://www.dot.state.tx.us/insdtdot/orgchart/tpp/links.htm) and approved and implemented by TPP.

The ATRs collect data 24 hours a day, 365 days annually, for each lane. The equipment records traffic volumes as total and as directional traffic for each station. TPP retrieves the data via modem daily, Monday through Sunday, to develop seasonal factors and estimate vehicle miles of travel (VMT).

Table 1-1: Permanent ATR Locations by District

Click on district name to access location listing		
Abilene District	Dallas District	Paris District
Amarillo District	El Paso District	Pharr District
Atlanta District	Fort Worth District	San Angelo District
Austin District	Houston District	San Antonio District
Beaumont District	Laredo District	Tyler District
Brownwood District	Lubbock District	Waco District
Bryan District	Lufkin District	Wichita Falls District
Childress District	Odessa District	Yoakum District
Corpus Christi District		

ATR Data Analysis

TPP analyzes hourly volumes and daily totals using historical patterns for controls. Seasonal variation factors developed by TPP are applied to accumulative count recorder (ACR) axle counts to develop average annual daily traffic (AADT) figures. Statewide VMT is estimated from these data. TPP also derives directional factors and K-factors from the data collected at each ATR site.

ATR Data Reporting

TPP prepares monthly reports for each site. Monthly reports provide the actual hourly counts and a percent variation in traffic for each ATR site. Access to monthly reports is made via the DOTS mainframe. The year-end report contains more detailed information including annual average hourly volumes by days of the week, highest hours of the year, average daily traffic by month, day and season, AADT percent variation by years, and AADT by year for each site. TPP produces annual reports in Excel format.

Section 4
Accumulative Count Recorder Traffic Data

ACR Data Collection

ACR data collection includes short-term traffic volume counts. TPP makes or contracts out between 60,000 and 80,000 counts each year. TPP performs counts on Highway Performance Monitoring System (HPMS) samples and on-system roads annually and off-system counts on county roads and in urbanized areas on five-year cycles. TPP determines annual count locations and contractors perform the counts. Contractor acquisition of special counts such as turning movements and vehicle classification may begin in FY2000. Additional manual counts may be requested by TxDOT district offices by submitting a request form to TPP.

ACR Data Analysis

Accumulative count recorders collect data in 24-hour samples that include all axles passing a point. TPP uses counted or estimated vehicle classification data at locations to determine the axle-to-vehicle ratio for each axle count. ACR-recorded count volumes are converted into total number of vehicles using these ratios.

ACR Data Reporting

Typically, TPP maintains ten years worth of historic data to provide background information. Anyone who needs traffic data may obtain information from TPP -Traffic or TPP - Data Management.

Section 5
Highway Performance Monitoring System Traffic Data

Overview

The HPMS (accessible from a link on the TxDOT Internet at http://www.dot.state.tx.us/insdtdot/orgchart/tpp/links.htm) is a federally mandated program used by the Federal Highway Administration (FHWA) to provide data to Congress on the nation's streets and highways. Congress uses the data for allocation of funds to states. Every state collects, maintains, and reports certain data to the FHWA each year according to the methods prescribed in the *Highway Performance Monitoring System Field Manual* (accessible from a link on the TxDOT Internet at http://www.dot.state.tx.us/insdtdot/orgchart/tpp/links.htm) for the continuing analytical and statistical database.

HPMS Data Collection

TxDOT uses the data and collection methods set forth in the *HPMS Field Manual* (accessible from a link on the TxDOT Internet at http://www.dot.state.tx.us/insdtdot/orgchart/tpp/links.htm) and the FHWA *Traffic Monitoring Guide*. The data are designed to provide an inventory of all on-system roads and other public roads that are functionally classified. Specific data collected under the HPMS program include location by jurisdiction, the number of lanes, median widths, shoulder widths, and other basic road attributes.

TxDOT district offices collect, update, and submit the required information for roadways within their district to TPP. The data are collected between September 1 and December 31 each year and are submitted to TPP by December 31.

HPMS Data Analysis

TxDOT uses the Texas Reference Marker System (TRM) database, which is a collection of roadway information, to compile the HPMS data. District offices can access the database to view and modify information on specific roads.

HPMS Data Reporting

TxDOT prepares an annual report to FHWA on or before June 15th each year. The *HPMS Field Manual* details how to prepare this report.

Section 6
Five Year Count Program

Overview

The five year count program (previously called urban saturation count program) consists of making ACR traffic counts throughout the 26 urbanized areas within Texas. TPP uses count data from this program for validation of the area travel demand model. TPP makes HPMS off-system counts as part of this program.

Five Year Count Data Collection

The MPOs, in cooperation with the local TxDOT district office and TPP, identify locations for counts to be made. The number of counts made in the urban areas varies from a high of 30,000 to a low of near 2,000. Thus, the number of counts taken annually in urban areas fluctuates between 10,000 and 30,000. Contractors make the counts using accumulative count recorders, Monday through Thursday, for 24 hours each day at each location.

Five Year Count Data Analysis

Analysis of five year count data is the same as that performed for ACR counts. Vehicle classification at locations is either counted or estimated, and TPP uses this information to determine the axle-to-vehicle ratio for each axle count. TPP converts the count volumes recorded into total number of vehicles using these ratios.

Five Year Count Data Reporting

TxDOT publishes the counts made in each urban area on a map and makes these available to the public through map sales at the TxDOT district or TPP division.

Section 7
Vehicle Classification Data

Vehicle Classification Data Collection

TPP makes vehicle classification counts at 650 to 750 locations (see Table 1-2 or Section 15) across the state each year. (To see a map of TxDOT districts, link to http://www.dot.state.tx.us/insdtdot/geodist/geodist.htm .) The number of sites counted each year varies according to the condition of the road counting hardware installed at the sites to collect the data with automated vehicle classifier (AVC) equipment. The number of special requests for vehicle classification counts also affects the number of sites. At AVC sites, TPP has sensors and a loop embedded in the roadway with a cabinet on a pedestal to house the electronics, loop, and piezo sensor leads. If there are problems at the site (construction, bad sensors, or loops), TPP must either repair the equipment or schedule a visual classification contract to collect the data. At locations where there is no stop-and-go traffic, TPP may choose to collect vehicle classification data with road tubes.

Table 1-2: Vehicle Classification Count Locations by District (Incomplete)

Click on district name to access location listing		
Abilene District	Dallas District	Paris District
Amarillo District	El Paso District	Pharr District
Atlanta District	Fort Worth District	San Angelo District
Austin District	Houston District	San Antonio District
Beaumont District	Laredo District	Tyler District
Brownwood District	Lubbock District	Waco District
Bryan District	Lufkin District	Wichita Falls District
Childress District	Odessa District	Yoakum District
Corpus Christi District		

There are three types of vehicle classification data collection:

- automatic (AVC) at approximately 250 sites with 48 hour data collection
- contract visual classification counts at approximately 400 sites with 24-hour data collection
- telemetry (AVC) at 25 border sites with data collection 365 days a year.

TxDOT makes the counts using the currently installed equipment. Where equipment is not available or not suitable, contractors make visual classification counts.

Counts consist of 24-hour samples (midnight to midnight) that categorize vehicle types into 13 classes and unclassified (see Table 1-3 which links to individual figures).

Table 1-3. Texas Vehicle Classification Scheme

Classification Code	Vehicle Type	Link to Figure
1	Motorcycles, passenger vehicles, and small or short-wheel-based pickups	Figure 1-1
2	2 axles, 4-tire single-unit trucks (full-sized pickup trucks)	Figure 1-2
3	Buses (2 and 3 axles)	Figure 1-3
4	2-D, 6-tire single-unit vehicles (includes handicapped-equipped and mini school buses)	Figure 1-4
5	3 axles, single-unit vehicles	Figure 1-5
6	4 or more axles, single-unit vehicles	Figure 1-6
7	3 axles, single trailer (2S1)	Figure 1-7
8	4 axles, single trailer (2S2 or 3S1)	Figure 1-8
9	5 axles, single trailer (3S2, 3S2 split, or 2S3)	Figure 1-9
10	6 or more axles, single trailer (3S3, 3S4, etc.)	Figure 1-10
11	5 or less axles, multi-trailers (2S1-2)	Figure 1-11
12	6 axles, multi-trailers (2S2-2 or 3S1-2)	Figure 1-12
13	7 or more axles, trailers (3S2-2)	Figure 1-13
14	Unclassified (AVC and WIM)	None

Vehicle Classification Data Analysis

TPP uses vehicle classification data in combination with overall volumes to develop a percent of vehicles within the 14 classes (Table 1-3). This information establishes the number of trucks that subsequently is reported as the percent of single and combination trucks in HPMS. TxDOT also uses these data to develop equivalent single axle load (ESAL) calculations for pavement design and to estimate percent of trucks for design, operation analysis, and environmental documentation.

Vehicle Classification Data Reporting

TPP publishes the vehicle classification report annually, generally at the end of the fiscal year. The report summarizes the number of vehicles in each of the 14 classes (Table 1-3) at each count location.

Section 8
Truck Weigh-in-Motion Data

Weigh-in-Motion Data Collection

Weigh-in-motion (WIM) equipment determines vehicle weights while vehicles are moving. The equipment collects traffic volumes by vehicle classification and weight. The data also include date, time, vehicle length by axle spacing, speed, and axle weight. There are two types of WIM systems used: bending plate and piezo.

TPP uses bending plate WIM equipment to collect data at up to 15 sites (see Table 1-4), which are surveyed 48 hours during each quarter of the year**.** Data are polled from all working sites 365 days annually for future reference. The number of WIM locations for which data are available varies each year due to construction, road conditions, and road WIM hardware. Mobile WIM equipment in the form of surface-mounted sensors is being tested and may be available in the future.

Table 1-4. Weigh-in-Motion Locations

Site Number	District	County	Hwy	Location
LW-519	Abilene	Mitchell	IH20	2.1 mi.W of FM 2836
LW-504	Abilene	Nolan	IH20	0.7 mi. E of US 84
LW-520	Amarillo	Randall	IH27	0.5 mi. S of SH 217
LW-507	Bryan	Walker	IH45	2.6 mi. S of PR 40
LW-512	Corpus Christi	Live Oak	IH37	0.7 mi. S of FM 2049
LW-514	Dallas	Kaufman	IH20	0.7 mi. W of SH 429
LW-510	El Paso	El Paso	IH10	2.4 mi. W of LP 375
LW-521	El Paso	El Paso	US 54	At Delta just N of Customs
LW-509	Paris	Hunt	IH30	2.5 mi. W of SH 50
LW-517	Pharr	Hidalgo	US83	0.2 mi. W of FM 1426
LW-522	Pharr	Hidalgo	US281	9.3 mi. N of SH 186
LW-502	San Antonio	Guadalupe	IH10	0.4 mi. E of FM 775
LW-516	San Antonio	Bexar	IH35	5.3 mi. S of LP 1604
LW-518	San Antonio	Kerr	IH10	5.7 mi E of US 290
LW-513	Waco	Bell	IH 35	0.9 mi. N of Williamson Co. line
LW-506	Wichita Falls	Wichita	US 287	1.5 mi. W of LP 11

The FHWA long-term pavement program (LTPP) (see Table 1-5 or Section 16) sites and locations where site-specific WIM are justified for pavement design use piezo systems. Site-specific WIM data collection for pavement design is justified by TPP at locations where:

- roadway sections exist with large volumes of trucks that leave plants full and return empty
- pavements are deteriorating much faster than expected
- pavements are deteriorating in one direction much faster than the other.

Table 1-5: Speed Data Collection Sites by District

Click on district name to access location listing		
Abilene District	Dallas District	Paris District
Amarillo District	El Paso District	Pharr District
Atlanta District	Fort Worth District	San Angelo District
Austin District	Houston District	San Antonio District
Beaumont District	Laredo District	Tyler District
Brownwood District	Lubbock District	Waco District
Bryan District	Lufkin District	Wichita Falls District
Childress District	Odessa District	Yoakum District
Corpus Christi District		

Weigh-in-Motion Data Analysis

TPP collects WIM data via telemetry, processes the data into Card2, Card4, and Card7 formats as detailed in the *Traffic Monitoring Guide*, and submits them to analysis staff and Long-Term Pavement Program (LTPP) coordinator.

Using the RD68 program, TPP calculates ESALs for pavement design from the collected WIM data.

Weigh-in-Motion Data Reporting

TPP reports WIM data using the Vehicle Tracking Recording Information System (VTRIS) developed by FHWA.

Section 9
Vehicle Speed Data

Vehicle Speed Data Collection

TPP collects vehicle speed data at approximately 44 sites (see Table 1-5 or Section 16) throughout the state for seven consecutive days twice annually. Where possible, TPP also collects speed data at WIM sites and at 130 directional AVC sites (not at intersections) for 48 hours annually. TxDOT uses permanent loop or piezo-electric sensors with leads in either a pedestal cabinet or small metal box attached to a guardrail or signpost to collect speed data. Speed data can also be collected with road tubes, but only at locations where there is no stop-and-go traffic.

National Maximum Speed Limit (NMSL) regulations require these data for safety certification. This legislation was repealed, but TxDOT monitors speed to assist in determining the effect of the repeal and the effectiveness of enforcement.

Vehicle Speed Data Analysis

TPP categorizes vehicle speed data into speed bins or speed categories in 5-mph increments. Staff categorizes AVC sites by speed, type, and lane. At the 44 speed location sites (see Table 1-5 or Section 16), TPP categorizes data by volume and speed. TPP stores data by number of vehicles by hour and day within each speed bin and sums by volume within each bin.

Vehicle Speed Data Reporting

TPP compiles the data semi-annually and makes it available upon request.

Section 10
Long-Term Pavement Performance Data

Overview

The long-term pavement performance data program is a federal aid research program that began as part of the Strategic Highway Research Program (SHRP) (accessible from a link on the TxDOT Internet at http://www.dot.state.tx.us/insdtdot/orgchart/tpp/links.htm). The program was initiated in 1987 and is set to run through 2007.

Long-Term Pavement Performance Data Collection

TPP collects LTPP data at 71 sites (see Table 1-6 or Section 17) throughout the state. There are also 7 sites (see Table 1-7) at which data are continuously collected. AVC counts are made continuously during the year with the exception of a one-week period at each site during which weigh-in-motion data are collected. The AVC data are collected in the Texas vehicle classification scheme (see Table 1-3), while the WIM data are collected with FHWA vehicle classification (see Table 1-8) scheme.

TPP uses the data for developing predictive equations for pavement design, pavement management, and sensitivity analysis that determine the effects of loading, material properties, environment, and specific design features on performance of the pavement.

Table 1-6: Long-Term Pavement Program Site Locations by District

Click on district name to access location listing		
Abilene District	Dallas District	Paris District
Amarillo District	El Paso District	Pharr District
Atlanta District	Fort Worth District	San Angelo District
Austin District	Houston District	San Antonio District
Beaumont District	Laredo District	Tyler District
Brownwood District	Lubbock District	Waco District
Bryan District	Lufkin District	Wichita Falls District
Childress District	Odessa District	Yoakum District
Corpus Christi District		

Table 1-7. LTPP Sites with Continuous WIM

District	LTPP ID No.	Highway	No. of Lanes	Direction	County	City
Austin	0001	LP 1	1	NB	Travis	Austin
San Antonio	0900	LP 1604	1	SB	Bexar	San Antonio
Bryan	0800	FM2238	2	EB	Brazos	Bryan
Dallas	1069	US 175	1	EB	Kaufman	Crandall
Pharr (lw-522)	0100	US 281	4	SB	Hidalgo	Falfurrias
Childress	5334	IH 40	4	EB	Wheeler	Shamrock
Amarillo	5336	IH 27	4	SB	Randall	Canyon

Table 1-8: FHWA Vehicle Classification Scheme

Classification Number	Vehicle Type	Link to Figure
1	Motorcycles	Figure 1-14
2	Passenger cars (with 1- or 2-axle trailers)	Figure 1-15
3	2 axles, 4-tire single-unit pickup or van (with 1- or 2-axle trailers)	Figure 1-16
4	Buses	Figure 1-17
5	2D - 2 axles, 6-tire single unit (includes handicapped bus and mini school buses)	Figure 1-18
6	3 axles, single unit	Figure 1-19
7	4 or more axles, single unit	Figure 1-20
8	3 to 4 axles, single trailer	Figure 1-21
9	5 axles, single trailer	Figure 1-22
10	6 or more axles, single trailer	Figure 1-23
11	5 or less axles, multi-trailers	Figure 1-24
12	6 axles, multi-trailers	Figure 1-25
13	7 or more axles, multi-trailers	Figure 1-26

Long-Term Pavement Performance Data Analysis

TPP retrieves data via telemetry nightly and submits them to the LTPP coordinator for analysis, using a C file for classification data and a W file for the WIM data.

Long-Term Pavement Performance Data Reporting

TPP reports LTPP data using the FHWA classification scheme in the format prescribed by the State Highway Research Program (SHRP). Data are reported monthly to the SHRP regional coordinator, who compiles data from several states and submits the compiled data to FHWA.

Section 11
Border Trend Traffic Data

Overview

TPP collects and reports traffic data by vehicle type for the planning and maintenance of the highway system in areas affected by the North American Free Trade Agreement (NAFTA). This data collection effort was initiated in 1993 and is anticipated to continue indefinitely.

Border Trend Traffic Data Collection

Twenty-five sites (see Table 1-9) selected by TxDOT district offices are continuously monitored. Volume and vehicle classification data are collected in hourly increments. Traffic data are collected via telemetry from AVC equipment that categorizes the data into the 14 different vehicle types (see Table 1-3) using automated equipment. The data are used to measure growth in traffic related to NAFTA.

Table 1-9. Border Region Traffic Site Locations

BC#	District	County	City	Location
2403	El Paso	El Paso	El Paso	US 54 .15 mi. S of N. Mexico
2402	El Paso	El Paso	El Paso	US 62 .5 mi. NE of LP 375
2405	El Paso	El Paso	El Paso	IH 10 .8 mi. NW of FM 1281
2401	El Paso	El Paso	Fabens	FM 1109 .4 mi. S of FM 76
2406	El Paso	Hudspeth	Ft. Hancock	FM 1088 .225 mi. S of SH 20
2404	El Paso	Presidio	Presidio	US 67 1.6 mi. N of FM 170
2209	Laredo	Val Verdi	Del Rio	US 277 .1 mi. S of Farley Ln.
2204	Laredo	Maverick	Eagle Pass	US 57 5 mi. NE of US 277
2203	Laredo	Maverick	Eagle Pass	US 277 .2 mi. N of FM 1589
2202	Laredo	Dimmit	Carrizo Springs	US 277 .7 mi. W of FM 191
2207	Laredo	Duval	Freer	US 59 4.1 mi. SW of SH 44
2206	Laredo	Webb	Laredo	IH 35 2.3 mi. S of US 83
2205	Laredo	Webb	Laredo	FM 1472 1 mi. W of FM 3338
2208	Laredo	Webb	Laredo	SH 359 4.9 mi. E of US 83
2101	Pharr	Brooks	Falfurrias	US 281 1.9 mi. S of SH 285
2107	Pharr	Starr	Rio Grande City	FM 755 7.5 mi. NE of US 83
2113	Pharr	Hidalgo	Hidalgo	SH 115 2 mi. N of US 281E
2112	Pharr	Hidalgo	Hidalgo	SH 336 .9 mi. N of US 281 E
2102	Pharr	Hidalgo	McAllen	US 281E 0.4 mi. E of SH 336
2103	Pharr	Hidalgo	Progresso	FM 1015 0.3 mi. S of US 281
2106	Pharr	Cameron	San Benito	US 77 0.6 mi. N of SH 100
2104	Pharr	Cameron	Los Indios	FM 509 0.2 mi. S of US 281
2105	Pharr	Cameron	Brownsville	US 281 0.8 mi. NW of FM 3248
1504	San Antonio	Uvalde	Uvalde	US 90 3.7 mi. W of FM 1022
1505	San Antonio	McMullen	Tilden	SH 16 0.4 mi. S of SH 72

Border Trend Traffic Data Reporting

TPP compiles and publishes results annually. Data published include monthly average truck traffic, monthly station trend summaries for several years, monthly average number of vehicles, annual summaries of stations and directions for several years, and detailed vehicle classification and directional flow data by station.

Section 12

Traffic Data for Special Projects

TPP collects traffic data for special projects when traffic information at a specific location is not available or not current. Such projects may include rail crossing studies, bridge crossing studies, and site impact studies. The type of data collected depends on the type of project.

TxDOT districts request special traffic data using standard forms sent to Traffic Analysis Section of TPP. The requests are then forwarded with a map to Tech Services in TPP to be included as part of regularly scheduled counts. When special traffic data requests cannot be scheduled to coincide with regular count travel, the TxDOT district requesting the count will be required to reimburse TPP for travel and per diem costs.

Section 13
Off-System Traffic Data

Off-System Traffic Data Collection

Off-system traffic data are collected on off-system roads on a five-year cycle. The sites counted are HPMS sites, sites identified by TxDOT districts and MPOs, and sites by functional class developed by random sample. The data are generally collected in conjunction with ACR contract counts.

Off-System Traffic Data Analysis

The data collected count the total number of axles passing a specific point. The number of axles is divided by two to estimate the volume of vehicles on a specific road segment. The information is used to provide area traffic estimates for air quality models and to meet FHWA requirements.

Off-System Traffic Data Reporting

Off-system traffic volumes are reported on a series of maps. These maps are updated and published as counts are performed. Maps are available through map sales at TxDOT district offices and TPP.

Section 14

Permanent ATR Locations by District

ATR Locations

Permanent ATR Locations - Abilene District

Recorder No.	Location	City	County
A325	IH 20 – 1.8 mi. west of FM 644	Colorado City	Mitchell
S018	US 83 – 3.9 mi. south of FM 707	Abilene	Taylor
S023	US 277 – 4.4 mi. south of US 380	Haskell	Haskell
S047	SH 351 – 0.2 mi. northeast of FM 604	Albany	Shackelford
S153	IH 20 – At Junction FM 903	Abilene	Callahan

Permanent ATR Locations - Amarillo District

Recorder No.	Location	City	County
S 060	SH 207 – 2.3 mi. south of US 287	Claude	Armstrong
S 120	US 287 – 2.5 mi. east of IH 40	Amarillo	Potter
S136	SH 15 – 1.0 mi. NE of Hansford Co.line	Perryton	Ochiltree
S158	US 87 – 6.9 mi. N of US 60	Amarillo	Potter
S218	IH 40 – 0.4 mi. E of US 287	Amarillo	Potter

Permanent ATR Locations - Atlanta District

Recorder No.	Location	City	County
S043	US 59 – 1.8 mi S of SH 155	Linden	Cass
S 085	FM 557 – 2.1 mi. E of US 271	Pittsburg	Camp
S150	IH 20 – 1.0 mi. E of FM 31	Marshall	Harrison
S199	IH 30 – 0.4 mi. E of US 59	Texarkana	Bowie

Permanent ATR Locations - Austin District

Recorder No.	Location	City	County
S004	IH 35 – 0.3 mi. S of FM 1626	S. Austin	Travis
S038	SH 95 – 2.1 mi. N of SH 71	Bastrop	Bastrop
S052	US 87 – 5.0 mi. S of SH 29	Mason	Mason
S053	SH 71 – 3.8 mi. E of US 183	Austin	Travis
S063	FM 535 – 2.1 mi SW of SH 95	Smithville	Bastrop
S119	SH 16 – 8.9 mi. SW of US 87	Fredericksburg	Gillespie
S131	US 183 – 3.3 mi. S of SH 71	Austin	Travis
S132	IH 35 – N. of Town Lake Bridge	Austin	Travis
S190	IH 35 – 1.9 mi. S of FM 1825	Austin	Travis
S209	LP 1 – Under 35th Street Overpass	Austin	Travis

Permanent ATR Locations - Austin District

Recorder No.	Location	City	County
S216	US 290 – 4.2 mi W of FM 1826	Austin	Travis

Permanent ATR Locations - Beaumont District

Recorder No.	Location	City	County
S020	US 69 – 4.0 mi. S of US 190	Woodville	Tyler
S086	FM 92 – 3.7 mi. N of FM 1122	Silsbee	Hardin
S087	FM 562 – 0.5 mi. S of SH 65	Anahauc	Chambers
S117	IH 10 – E. end of Neches River Bridge	Beaumont	Orange
S205	IH 10 – S. Calder Street Overpass	Beaumont	Jefferson

Permanent ATR Locations - Brownwood District

Recorder No.	Location	City	County
S015	US 281 – 1.9 mi. S of US 183	Lampasas	Lampasas
S046	US 183 – 14.7 mi. S of US 180	Breckenridge	Stephens
S096	US 67 – 4.6 mi. NE of US 183	Brownwood	Brown

Permanent ATR Locations - Bryan District

Recorder No.	Location	City	County
S010	US 79 – 2.8 mi. SW of Brazos River	Hearne	Milam
S037	SH 90 – 2.6 mi. N of FM 149	Anderson	Grimes
S177	SH 6 – 1.0 mi. S of BS 6	College Station	Brazos
S200	IH 45 – 1.0 mi. S of SP 67	Madisonville	Madison

Permanent ATR Locations - Childress District

Recorder No.	Location	City	County
S024	SH 70 – 1.2 mi. S of US 62	Matador	Motley
S025	US 83 – 1.9 mi. N of IH 40	Shamrock	Wheeler
S198	IH 40 – 8.7 mi. W of US 83	Shamrock	Wheeler
S202	US 287 – 0.8 mi. E of FM 2875	Childress	Childress
S222	IH 40 – 1.6 mi. E of US 83	Shamrock	Wheeler

Permanent ATR Locations – Corpus Christi District

Recorder No.	Location	City	County
A329	US 181 –4.9 mi. N Harbor Bridge	Corpus Christi	San Patricio
S034	SH 35 – 11.1 mi. S of FM 774	Rockport	Aransas
S054	IH 37 – 0.5 mi. SE of US 59	George West	Live Oak

Permanent ATR Locations – Corpus Christi District

Recorder No.	Location	City	County
S091	FM 665 – 1.7 mi. W of FM 43	Corpus Christi	Nueces
S149	IH 37 – 0.3 mi. E of SH 286	Corpus Christi	Nueces
S161	PR 22 – 2.6 mi. E of SH 358	Corpus Christi	Nueces

Permanent ATR Locations - Dallas District

Recorder No.	Location	City	County
S017	US 175 – 1.2 mi. SE of IH 635	Dallas	Dallas
S026	SH 5 – 2.3 mi. S of FM 1378	McKinney	Collin
S027	FM 428 – 1.0 mi. NE of LP 288	Denton	Denton
S040	IH 45 – 5.6 mi. S of SH 31	Corsicana	Dallas
S055	SH 183 – 0.4 mi. W of SH 356	Dallas	Dallas
S121	US 75 – w.5 mi. S of SH 121	McKinney	Collin
S126	IH 35E – 1.6 mi. SE of SH 356	Dallas	Dallas
S133	US 80 – 2.3 mi. E of SH 34	Terrell	Kaufman
S145	IH 20 – 3.0 mi. E of SH 34	Terrell	Kaufman
S148	IH 35E – 0.3 mi. N of US 67	Dallas	Dallas
S169	US 75 – 0.5 mi. N of SP 366	Dallas	Dallas
S170	IH 635 – 3.1 mi. E of IH 35E	Dallas	Dallas
S171	IH 635 – 2.0 mi. NE of IH 20	Dallas	Dallas
S191	IH 20 – 0.4 mi. E of Tarrant Co. line	Dallas	Dallas
S220	IH 45 – 1.5 mi N of LP 12	Dallas	Dallas
S221	IH 30 – 0.5 mi. W of LP 635	Dallas	Dallas

Permanent ATR Locations – El Paso District

Recorder No.	Location	City	County
S007	US 90 – 3.6 mi. W of US 67	Marfa	Presidio
S070	FM 258 – 2.7 mi. W of FM 1110	Ysleta	El Paso
S123	IH 10 – 1.2 mi. S of LP 375	El Paso	El Paso
S152	IH 10 – 6.6 mi. W of SH 54	Van Horn	Hudspeth
S162	IH 10 – 1.1 mi W of US 54	El Paso	El Paso
S189	US 54 – 0.2 mi. N of IH 10	El Paso	El Paso

Permanent ATR Locations – Fort Worth District

Recorder No.	Location	City	County
A301	SH 180 – 2.7 mi. W of FM 157	Arlington	Tarrant
S016	US 281 – 1.9 mi. NW of SH 199	Jacksboro	Jack
S109	IH 35W – 0.5 mi. S of IH 30	Ft. Worth	Tarrant
S122	IH 20 – 4.1 mi. W of IH 35 W	Ft. Worth	Tarrant
S130	IH 30 – 3.2 mi. W of IH 35W	Ft. Worth	Tarrant

Permanent ATR Locations – Fort Worth District

Recorder No.	Location	City	County
S192	IH 30 – 0.1 mi. W of Dallas Co. line	Arlington	Tarrant
S193	IH 820 – W.end of Lake Worth Bridge	Ft. Worth	Tarrant
S208	IH 20 – 4.6 mi. W Tarrant Co. line	Weatherford	Parker

Permanent ATR Locations - Houston District

Recorder No.	Location	City	County
A316	IH 45 – 0.5 mi. N of FM 1960	Houston	Harris
S003	US 290 – 4.8 mi. W of FM 1960	Houston	Harris
S107	SH 146 – 0.6 mi. No of SH 225	La Porte	Harris
S125	IH 10 – 8.7 mi. W of SH 146	Houston	Harris
S139	US 59 – 1.6 mi. S of SH 288	S. Houston	Harris
S140	US 59 – 0.6 mi. S of IH 610	S. Houston	Harris
S155	IH 10 – 0.8 mi. W of IH 610	E. Houston	Harris
S156	IH 610 – 1.6 mi. S of IH 10	W. Houston	Harris
S157	IH 610 – 0.7 mi. W of IH 45	N. Houston	Harris
S165	IH 10 – 1.0 mi. W of IH 45	S. Houston	Harris
S166	IH 610 – 0.3 mi. W of US 90A	Houston	Harris
S174	US 59 – 4.0 mi. S of FM 1314	Houston	Montgomery
S182	IH 610 – N. end Ship Channel Bridge	Houston	Harris
S203	SH 288 – 0.8 mi. N of SH 227	Angleton	Brazoria
S204	IH 45 – S end Galveston Causeway	Galveston	Galveston

Permanent ATR Locations - Laredo District

Recorder No.	Location	City	County
A308	IH 35 – 0.7 mi. N of FM 1472	Laredo	Webb
S028	SH 359 – 4.9 mi. E of US 83	Laredo	Webb
S029	US 277 7.1 mi. S of SH 131	Eagle Pass	Maverick
S103	US 90 – 0.3 mi. NW of US 377	Del Rio	Val Verde
S219	IH 35 – 2.3 mi. S of US 83	Laredo	Webb

Permanent ATR Locations - Lubbock District

Recorder No.	Location	City	County
S019	US 180 – 2.4 mi. W of FM 829	Lamesa	Dawson
S049	SH 86 – 4.3 mi. SE of US 87	Tulia	Swisher
S128	US 84 – 7.6 mi. NW of US 82	Lubbock	Lubbock
S138	SH 114 - 0.3 mi. E of Hockley Co. line	Lubbock	Lubbock
S194	IH 27 – 0.3 mi. S of FM 1294	Lubbock	Lubbock

Permanent ATR Locations - Lufkin District

Recorder No.	Location	City	County
A318	SH 21 – 0.7 mi. W of US 59	Nacogdoches	Nacogdoches
S036	US 287 – 2.8 mi. N of SH 7	Crockett	Houston
S175	US 59 – 2.4 mi. S of LP 224	Nacogdoches	Nacogdoches
S223	US 190 - 4.4 mi. E of SH 146	Livingston	Polk

Permanent ATR Locations - Odessa District

Recorder No.	Location	City	County
S072	US 285 – 1.3 mi. S of IH 10	Ft. Stockton	Pecos
S195	IH 20 – 0.2 mi. W of Midland Co. line	Odessa	Ector
S196	BI 20 – 0.6 mi. E of Midland Co. line	Odessa	Midland
S211	SH 191 – 3.0 mi. E of LP 338	Odessa	Midland
S212	US 385 – 9.2 mi. S of SH 176	Andrews	Andrews
S213	SH 176 – 0.1 mi. W of FM 1788`	Andrews	Andrews
S214	SH 18 – 0.2 mil. S of FM 1233	Monahans	Ward

Permanent ATR Locations - Paris District

Recorder No.	Location	City	County
S013	IH 30 – 4.3 mi. W of SH 19	Sulphur Springs	Hopkins
S084	FM 271 - 2.0 mi. SE of SH 78	Bonham	Fannin
S178	US. 82 - 11.8 mi. W of LP 286	Paris	Lamar
S179	SH 154 – 9.1 mi. S of IH 30	Sulphur Springs	Hopkins

Permanent ATR Locations - Pharr District

Recorder No.	Location	City	County
A327	BU 83 – 1.3 mi. E of US 281	Pharr	Hildalgo
S069	SH 336 – 3.5 mi. S of SH 107	McAllen	Hildalgo
S074	US 77 – 0.1 mi. N of Sarita	Sarita	Kennedy
S097	US 281 – 1.9 mi. S of SH 285	Falfurrias	Brooks
S143	US 83 – 0.2 mi. W of FM 1426	Pharr	Hildalgo
S159	US 83 – 0.2 mi. W of US 83	Mission	Hildalgo
S163	SH 100 – W end of Causeway	Port Isabel	Cameron
S173	US 281 – 7.4 mi. S of US 83	Pharr	Hildalgo
S181	SH 48 – 1.0 mi. E of FM 511	Brownsville	Cameron
S201	US 83 – 0.6 mi. N of SH 100	San Benito	Cameron

Permanent ATR Locations – San Angelo District

Recorder No.	Location	City	County

Permanent ATR Locations – San Angelo District

Recorder No.	Location	City	County
S006	US 67 – 2.8 mi. SW of FM 2288	San Angelo	Tom Green
S014	IH 10 – 6.0 mi. W of US 277N	Sonora	Sutton
S051	US 277 – 0.6 mi. S of US 87	San Angelo	Tom Green
S135	SH 158 – 3.3 mi. NW of FM 2111	Ballinger	Runnels
S217	IH 10 – 1.0 mi. W of US 83S	Junction	Kimble

Permanent ATR Locations – San Antonio District

Recorder No.	Location	City	County
S071	SH 16 – 1.1 mi. SW of SH 72	Tilden	McMullen
S102	US 90 – 4.0 mi. NE of US 83	Uvalde	Uvalde
S146	IH 410 – 1.1 mi. SW of SH 16	San Antonio	Bexar
S160	US 181 – 0.6 mi. SE of LP 1604	San Antonio	Bexar
S180	SH 123 – 3.0 mi. N of Wilson Co. line	Seguin	Guadalupe
S184	IH 10 – 0.6 mi. E of IH 35	San Antonio	Bexar
S185	IH 37 – 0.3 mi. S of IH 35	San Antonio	Bexar
S186	IH 410 – 0.8 mi. W of US 281	San Antonio	Bexar
S188	US 281 – 1.0 mi. S of IH 410	San Antonio	Bexar
S206	IH 10 – 1.4 mi. SW Kendall Co. line	San Antonio	Bexar
S207	IH 10 – 0.4 mi. E of FM 775	Seguin	Guadalupe
S210	IH 35 – 1.8 mi. N of Atascosa Co. line	San Antonio	Bexar

Permanent ATR Locations - Tyler District

Recorder No.	Location	City	County
S076	FM 747- 1.5 mi. S of US 79	Jacksonville	Cherokee
S083	FM 47 – 2.8 mi. N of US 80	Wills Point	Van Zandt
S137	SH 31 – 3.9 mi. E of LP 323	Tyler	Smith

Permanent ATR Locations - Waco District

Recorder No.	Location	City	County
S039	SH 6 – 0.7 mi. SE of FM 185	Waco	McLennan
S065	FM 147 – 3.2 mi. NE of SH 7	Marlin	Falls
S088	FM 218 – 1.1 mi. SW of SH 36	Hamilton	Hamilton
S118	IH 35 – 1.1 mi. N of BU 77	N. Waco	McLennan
S197	IH 35 – S of Bell Co. line	Temple	Bell
S215	IH 35 – 3.2 mi. N of FM 487	Belton	Bell

Permanent ATR Locations – Wichita Falls District

Recorder No.	Location	City	County
A328	US 70 – 0.9 mi. W of FM 433	Vernon	Wilbarger
S044	US 82 – 3.3 mi. E LP 510	Henrietta	Clay
S077	FM 372 – 4.5 mi. SE of US 82	Gainesville	Cooke
S134	US 82 – 3.6 mi. SW of SH 25	Archer City	Archer
S167	IH 44 – S end Wichita River Bridge	Wichita Falls	Wichita

Permanent ATR Locations – Yoakum District

Recorder No.	Location	City	County
S022	SH 60 – 6.5 mi. S of LP 183	Wharton	Wharton
S033	US 183 – 1.9 mi. N of FM 1447	Cuero	DeWitt
S066	FM 102 – 6.4 mi. NW of US 59	Wharton	Wharton
S116	US 59 – 0.2 mi. E of LP 175	Victoria	Victoria
S164	IH 10 – 4.2 mi. E of US 77	Schulenburg	Fayette

Section 15
Vehicle Classification Count Locations

Count Locations

Vehicle Classification Count Locations – Abilene District

Station	Location	Direction	County	Type of Site
M-1105	SH 350	Northeast	Howard	Leg
M-1105	FM 820	South	Howard	Leg
M-1105	SH 350	Southwest	Howard	Leg
M-1106	US 84	Southeast	Nolan	Leg
M-1106	FM 1982	West	Nolan	Leg
M-1107	US 83	South	Jones	Leg
M-1107	FM 540	West	Jones	Leg
M-1107	US 83	Northwest	Jones	Leg
M-1108	US 180	East	Shackelford	Leg
M-1108	US 180	West	Shackelford	Leg
M-1108	SH 6	Northwest	Shackelford	Leg
M-1275	FM 1584	North	Howard	Leg
M-1275	US 87	Southeast	Howard	Leg
M-1275	US 87	Northwest	Howard	Leg
M-1276	US 180	East	Scurry	Leg
M-1276	FM 1606	South	Scurry	Leg
M-1276	US 180	West	Scurry	Leg
M-1277-A	SH 6	North	Haskell	Leg
M-1277-A	SH 283	Northwest	Haskell	Leg
M-1278	FM 2407	North	Haskell	Leg
M-1278	US 380	Southeast	Haskell	Leg
M-1278	US 380	West	Haskell	Leg
M-1760	IH 20		Callahan	Directional
MA-325	IH 20		Mitchell	Directional
MS-23-A	US 277	Northeast	Haskell	Leg
MS-23-A	US 277	Southwest	Haskell	Leg
MS-23-A	FM 1225	West	Haskell	Leg
MS-153	IH 20		Callahan	Directional

Vehicle Classification Count Locations – Amarillo District

Station	Location	Direction	County	Type of Site
M-1013	SH 136		Hutchinson	Directional
M-1078	US 60		Lipscomb	Directional
M-1079	US 83		Ochiltree	Directional
M-1080	FM 119	South	Sherman	Leg
M-1080	US 54	Southwest	Sherman	Leg

Vehicle Classification Count Locations – Amarillo District

Station	Location	Direction	County	Type of Site
M-1081	US 287	Southeast	Dallam	Leg
M-1081	FM 807	South	Dallam	Leg
M-1093	US 83	Southeast	Ochiltree	Leg
M-1093	SH 70	South	Ochiltree	Leg
M-1094	US 385	North	Deaf smith	Leg
M-1094	FM 1062	East	Deaf smith	Leg
M-1094	US 385	South	Deaf smith	Leg
M-1094	FM 1057	West	Deaf smith	Leg
M-1261	US 385	North	Hartley	Leg
M-1261	SH 354	East	Hartley	Leg
M-1261	US 385	South	Hartley	Leg
M-1261	FM 767	West	Hartley	Leg
M-1262	FM 687	North	Hutchison	Leg
M-1262	SH 136	East	Hutchison	Leg
M-1262	SH 136	Southwest	Hutchison	Leg
MS-120	US 287		Potter	Directional
U-11	IH 40		Potter	Directional

Vehicle Classification Count Locations – Atlanta District

Station	Location	Direction	County	Type of Site
M-1031	US 259	North	Upshur	Leg
M-1031	SH 155	Northeast	Upshur	Leg
M-1031	US 259	South	Upshur	Leg
M-1031	SH 155	Southwest	Upshur	Leg
M-1063	US 79		Panola	Directional
M-1064	US 59		Cass	Directional
M-1065	IH 30		Bowie	Directional
M-1066	SH 8		Bowie	Directional
M-1067	FM 2735	Northeast	Bowie	Leg
M-1067	US 259	Southeast	Bowie	Leg
M-1067	FM 114	Southwest	Bowie	Leg
M-1067	US 259	Northwest	Bowie	Leg
M-1153	SH 11	East	Cass	Leg
M-1153	SH 49	Southeast	Cass	Leg
M-1153	FM 2612	Southwest	Cass	Leg
M-1153	SH 11	Northwest	Cass	Leg
M-1154	SH 43	North	Marion	Leg
M-1154	SH 49	East	Marion	Leg
M-1154	SH 43	South	Marion	Leg
M-1154	SH 49	West	Marion	Leg
M-1233	US 259	North	Morris	Leg

Vehicle Classification Count Locations – Atlanta District

Station	Location	Direction	County	Type of Site
M-1233	US 259	South	Morris	Leg
M-1233	SH 49	Northwest	Morris	Leg
M-1234	US 59		Panola	Directional
M-1296	US 271	North	Upshur	Leg
M-1296	FM 593	East	Upshur	Leg
M-1296	US 271	South	Upshur	Leg
M-1296	COUNTY RD.	West	Upshur	Leg
M-1940	IH 30		Titus	Directional
M-1941	IH 20		Harrison	Directional
MS-43	US 59		Cass	Directional
MS-150	IH 20		Harrison	Directional
MS-199	IH 30		Bowie	Directional

Vehicle Classification Count Locations – Austin District

Station	Location	Direction	County	Type of Site
M-1001	SH 29	East	Llano	Leg
M-1001	SH 29	West	Llano	Leg
M-1001	SH 71	Northwest	Llano	Leg
M-1126	SH 95	North	Williamson	Leg
M-1126	SH 29	West	Williamson	Leg
M-1128	County rd.	North	Gillespie	Leg
M-1128	US 290	East	Gillespie	Leg
M-1128	FM 1623	South	Gillespie	Leg
M-1128	US 290	West	Gillespie	Leg
M-1289	FM 141	North	Lee	Leg
M-1289	FM 1697	Southeast	Lee	Leg
M-1289	FM 141	West	Lee	Leg
M-1860	IH 35		Travis	Directional
MS-4	IH 35		Travis	Directional
MS-52	US 87		Mason	Directional
MS-119	SH 16		Gillespie	Directional
MS-132	IH 35		Travis	Directional

Vehicle Classification Count Locations – Beaumont District

Station	Location	Direction	County	Type of Site
M-1038	SH 146	North	Liberty	Leg
M-1038	SH 105	East	Liberty	Leg
M-1038	SH 146	South	Liberty	Leg
M-1038	SH 105	West	Liberty	Leg
M-1058	SH 12		Newton	Directional

Vehicle Classification Count Locations – Beaumont District

Station	Location	Direction	County	Type of Site
M-1059-A	US 190	East	Newton	Leg
M-1059-A	FM 363	Southwest	Newton	Leg
M-1059-A	US 190	Northwest	Newton	Leg
M-1060	SH 87	North	Newton	Leg
M-1060	SH 63	Northeast	Newton	Leg
M-1060	SH 87	South	Newton	Leg
M-1060	SH 63	Southwest	Newton	Leg
M-1155	US 96		Hardin	Directional
M-1214	SH 146	North	Liberty	Leg
M-1214	SH 146	South	Liberty	Leg
M-1214	FM 1413	West	Liberty	Leg
M-1216	IH 10		Orange	Directional
M-1253	IH 10		Jefferson	Directional
M-1255	SH 62	North	Orange	Leg
M-1255	SH 105	East	Orange	Leg
M-1255	SH 62	South	Orange	Leg
M-1255	SH 105	West	Orange	Leg
M-1303	SH 87		Jefferson	Directional
M-1499	IH 10		Orange	Directional
MS-20	US 69		Tyler	Directional
MS-86	FM 92		Hardin	Directional
MS-117	IH 10		Orange	Directional

Vehicle Classification Count Locations – Brownwood District

Station	Location	Direction	County	Type of Site
M-1161	US 377	Northeast	Brown	Leg
M-1161	US 377	Southwest	Brown	Leg
M-1161	FM 586	Northwest	Brown	Leg
M-1162	US 67	Northeast	Comanche	Leg
M-1162	SH 36	Southeast	Comanche	Leg
M-1162	US 67	West	Comanche	Leg
M-1163	US 183	North	Brown	Leg
M-1163	FM 1467	East	Brown	Leg
M-1163	US 183	South	Brown	Leg
M-1164	SH 279	North	Brown	Leg
M-1164	PR 15	East	Brown	Leg
M-1164	SH 279	Southeast	Brown	Leg
M-1297	FM 2126	Northeast	Brown	Leg
M-1297	FM 45	West	Brown	Leg
M-1298	US 283	North	Coleman	Leg
M-1298	SH 206	Northeast	Coleman	Leg

Vehicle Classification Count Locations – Brownwood District

Station	Location	Direction	County	Type of Site
M-1298	US 84	South	Coleman	Leg
M-1298	US 84	Northwest	Coleman	Leg
M-1299	US 281	North	Lampasas	Leg
M-1299	US 281	South	Lampasas	Leg
M-1299	US 183	Northwest	Lampasas	Leg
M-1497	SH 16	North	Mills	Leg
M-1497	US 84/183	South	Mills	Leg
M-1497	US 84/183	Northwest	Mills	Leg
MS-15	US 281		Lampasas	Directional
MS-46	US 183		Stephens	Directional
MS-96	US 67		Brown	Directional

Vehicle Classification Count Locations – Bryan District

Station	Location	Direction	County	Type of Site
M-977	SH 36		Burleson	Directional
M-1054	FM 50	North	Washington	Leg
M-1054	SH 105	Northeast	Washington	Leg
M-1054	SH 105	Southwest	Washington	Leg
M-1139	FM 390	Northeast	Washington	Leg
M-1139	SH 36	Southeast	Washington	Leg
M-1139	FM 390	Southwest	Washington	Leg
M-1139	SH 36	Northwest	Washington	Leg
M-1143	SH OSR	North	Brazos	Leg
M-1143	SH 21	East	Brazos	Leg
M-1143	SH 21	West	Brazos	Leg
M-1144	SH 14	Northeast	Robertson	Leg
M-1144	SH 6	South	Robertson	Leg
M-1144	SH 6	Northwest	Robertson	Leg
M-1145	FM 489	North	Freestone	Leg
M-1145	US 84	East	Freestone	Leg
M-1145	FM 489	South	Freestone	Leg
M-1145	US 84	West	Freestone	Leg
M-1291	SH 21	Southwest	Burleson	Leg
M-1291	FM 908	Northwest	Burleson	Leg
M-1292	SH 36	Southeast	Burleson	Leg
M-1292	FM 976	Southwest	Burleson	Leg
M-1292	SH 36	Northwest	Burleson	Leg
M-1312	FM 2038	Southeast	Brazos	Leg
M-1312	US 190	Southwest	Brazos	Leg
M-1314	US 84	Northeast	Freestone	Leg
M-1314	US 79	Southwest	Freestone	Leg

Vehicle Classification Count Locations – Bryan District

Station	Location	Direction	County	Type of Site
M-1314	US 84	Northwest	Freestone	Leg

Vehicle Classification Count Locations – Childress District

Station	Location	Direction	County	Type of Site
M-1015-A	FM 2734	North	Collingsworth	Leg
M-1015-A	SH 203	East	Collingsworth	Leg
M-1015-A	SH 203	West	Collingsworth	Leg
M-1169	SH 70	Southeast	Dickens	Leg
M-1169	SH 208	South	Dickens	Leg
M-1169	SH 70	Northwest	Dickens	Leg
M-1170	FM 264	North	Dickens	Leg
M-1170	US 82	West	Dickens	Leg
M-1172	SH 6	North	Knox	Leg
M-1172	SH 6	South	Knox	Leg
M-1301	SH 70	North	Donley	Leg
M-1301	US 287	Southeast	Donley	Leg
M-1301	US 287	Northwest	Donley	Leg
M-1302	US 62	North	Childress	Leg
M-1302	US 287	East	Childress	Leg
M-1302	US 62	South	Childress	Leg
M-1302	US 287	Northwest	Childress	Leg
MS-24	SH 70		Motley	Directional

Vehicle Classification Count Locations – Corpus Christi District

Station	Location	Direction	County	Type of Site
M-1133	SH 72	Northeast	Karnes	Leg
M-1133	SH 239	Southeast	Karnes	Leg
M-1133	SH 72	West	Karnes	Leg
M-1134	US 59	Northeast	Goliad	Leg
M-1134	US 59	Southwest	Goliad	Leg
M-1134	SH 239	West	Goliad	Leg
M-1136	US 77	Northeast	San Patricio	Leg
M-1136	FM 1944	East	San Patricio	Leg
M-1136	US 77	Southwest	San Patricio	Leg
M-1137	SH 359	Northeast	Jim Wells	Leg
M-1137	SH 359	Southwest	Jim Wells	Leg
M-1137	FM 534	Northwest	Jim Wells	Leg
M-1243	IH 37		Nueces	Directional
M-1244-A	US 281		Jim Wells	Directional
M-1254	FM 1353	North	Karnes	Leg

Vehicle Classification Count Locations – Corpus Christi District

Station	Location	Direction	County	Type of Site
M-1254	US 181	Southeast	Karnes	Leg
M-1254	US 181	Northwest	Karnes	Leg
MA-329	US 181		San Patricio	Directional
MS-34	SH 35		Aransas	Directional
MS-54	IH 37		Live oak	Directional
MS-91	FM 665		Nueces	Directional

Vehicle Classification Count Locations – Dallas District

Station	Location	Direction	County	Type of Site
M-1149	IH 35W		Denton	Directional
M-1150	IH 35E		Denton	Directional
M-1151	FM 2478	North	Collin	Leg
M-1151	US 380	East	Collin	Leg
M-1151	FM 2478	South	Collin	Leg
M-1151	US 380	West	Collin	Leg
M-1908	IH 35		Denton	Directional
MS-55	SH 183		Dallas	Directional
MS-121	US 75		Collin	Directional
MS-191	IH 20		Dallas	Directional
TM-30	IH 30		Dallas	Directional

Vehicle Classification Count Locations – El Paso District

Station	Location	Direction	County	Type of Site
M-1165	US 67	Northeast	Brewster	Leg
M-1165	US 90	Southeast	Brewster	Leg
M-1166	SH 17	Southwest	Jeff Davis	Leg
M-1166	SH 166	West	Jeff Davis	Leg
M-1680	IH 10		El Paso	Directional
MS-7	US 90		Presidio	Directional
MS-152	IH 10		Hudspeth	Directional
MS-162	IH 10		El Paso	Directional
MT-600	US 67		Presidio	Directional
MT-640	FM 1109		El Paso	Directional
MT-680	IH 110		El Paso	Directional
MT-700	US 62	South	El Paso	Leg
MT-704	US 62	North	El Paso	Leg

Vehicle Classification Count Locations – Fort Worth District

Station	Location	Direction	County	Type of Site
M-1019	County Rd.	North	Palo Pinto	Leg
M-1019	US 180	East	Palo Pinto	Leg
M-1019	FM 919	South	Palo Pinto	Leg
M-1019	US 180	West	Palo Pinto	Leg
M-1020	US 281	Southeast	Erath	Leg
M-1020	SH 6	West	Erath	Leg
M-1020	US 281	Northwest	Erath	Leg
M-1089	US 81		Wise	Directional
M-1090	US 377	Northeast	Hood	Leg
M-1090	FM 167	Southeast	Hood	Leg
M-1090	US 377	Southwest	Hood	Leg
M-1090	County Rd.	Northwest	Hood	Leg
M-1092	US 281	Southeast	Jack	Leg
M-1092	SH 114	West	Jack	Leg
M-1092	US 281	Northwest	Jack	Leg
M-1217	FM 730	Northeast	Parker	Leg
M-1217	US 80	East	Parker	Leg
M-1217	US 80	West	Parker	Leg
M-1218	SH 114	East	Wise	Leg
M-1218	FM 51	South	Wise	Leg
M-1218	SH 114	Northwest	Wise	Leg
M-1219	SH 360		Tarrant	Directional
M-1220	US 67	East	Johnson	Leg
M-1220	US 67	West	Johnson	Leg
M-1220	FM 2738	Northwest	Johnson	Leg
M-1256	FM 113	North	Parker	Leg
M-1256	US 180	East	Parker	Leg
M-1256	US 180	West	Parker	Leg
M-1257	IH 35W		Johnson	Directional
M-1258	FM 3136	Northeast	Johnson	Leg
M-1258	FM 4	Southeast	Johnson	Leg
M-1258	FM 4	West	Johnson	Leg
MA-301	US 80		Tarrant	Directional
MS-16	SH 199	Southeast	Jack	Leg
MS-16	US 281	South	Jack	Leg
MS-16	US 281	Northwest	Jack	Leg
MS-192	IH 30		Tarrant	Directional
MS-193	IH 820		Tarrant	Directional

Vehicle Classification Count Locations – Houston District

Station	Location	Direction	County	Type of Site
M-1040	SH 35	Northeast	Brazoria	Leg
M-1040	FM 1459	South	Brazoria	Leg
M-1040	SH 35	West	Brazoria	Leg
M-1040	FM 1459	Northwest	Brazoria	Leg
M-1200	IH 10		Fort bend	Directional
M-1207	US 90A		Fort bend	Directional
M-1208	US 59		Fort bend	Directional
M-1209	FM 1462	Northeast	Brazoria	Leg
M-1209	SH 36	Southeast	Brazoria	Leg
M-1209	SH 36	Northwest	Brazoria	Leg
M-1211	SH 35		Harris	Directional
M-1212	SH 146		Harris	Directional
M-1213	SH 330		Harris	Directional
M-1252	SH 6		Galveston	Directional
M-1320	SH 288		Brazoria	Directional
MA-316	IH 45		Harris	Directional
MS-3	US 290		Harris	Directional
MS-107	SH 146		Harris	Directional
MS-125	IH 10		Harris	Directional
MS-174	US 59		Montgomery	Directional
MS-203	SH 288		Brazoria	Directional
MS-204	IH 45		Galveston	Directional
TR-100	San Luis Pass		Galveston	Directional
TR-101	Ship Channel Toll		Harris	Directional
TR-102	Sam Houston Toll		Harris	Directional
TR-103	Sam Houston Toll		Harris	Directional
TR-104	Hardy Toll		Harris	Directional

Vehicle Classification Count Locations – Laredo District

Station	Location	Direction	County	Type of Site
M-956	SH 131	Northeast	Maverick	Leg
M-956	US 277	Northwest	Maverick	Leg
M-1048	FM 191	East	Dimmit	Leg
M-1159	US 83	North	Zavala	Leg
M-1159	FM 1025	East	Zavala	Leg
M-1160	US 90	Southeast	Val Verde	Leg
M-1160	SH 349 SPUR	Southwest	Val Verde	Leg
M-1160	US 90	Northwest	Val Verde	Leg
M-1186	SH 339	Southeast	Duval	Leg
M-1186	SH 16	South	Duval	Leg

Vehicle Classification Count Locations – Laredo District

Station	Location	Direction	County	Type of Site
M-1601	IH 35		La Salle	Directional
M-1602	IH 35		Webb	Directional
M-1603	IH 35		Webb	Directional
M-1604	FM 1472		Webb	Directional
MA-308-A	IH 35		Webb	Directional
MT-420	IH 35		Webb	Directional
MT-440	IH 35A		Webb	Directional
MT-480	FM 255		Webb	Directional
MT-520	US 57		Maverick	Directional
MT-540	US 277 SPUR		Val Verde	Directional

Vehicle Classification Count Locations – Lubbock District

Station	Location	Direction	County	Type of Site
M-1007	US 385	North	Terry	Leg
M-1007	FM 211	East	Terry	Leg
M-1007	US 385	South	Terry	Leg
M-1007	FM 211	West	Terry	Leg
M-1084	FM 2396	North	Parmer	Leg
M-1084	US 60	Northeast	Parmer	Leg
M-1084	US 60	Southwest	Parmer	Leg
M-1085	US 70	Southeast	Bailey	Leg
M-1085	FM 1760	West	Bailey	Leg
M-1085	US 70	Northwest	Bailey	Leg
M-1096	US 70	Southeast	Hale	Leg
M-1221	SH 349	Northeast	Dawson	Leg
M-1221	FM 829	Southeast	Dawson	Leg
M-1221	SH 349	Southwest	Dawson	Leg
M-1221	FM 829	Northwest	Dawson	Leg
M-1222	FM 303	North	Lamb	Leg
M-1222	US 70	East	Lamb	Leg
M-1222	FM 303	South	Lamb	Leg
M-1222	US 70	West	Lamb	Leg
M-1223	IH 27		Swisher	Directional
M-1263	SH 194	North	Hale	Leg
M-1265	US 62/82	Northeast	Lubbock	Leg
M-1265	US 62/82	Southwest	Lubbock	Leg
M-1265	FM 1585	West	Lubbock	Leg
MS-19	US 180		Dawson	Directional
MS-138	SH 114		Lubbock	Directional

Vehicle Classification Count Locations – Lufkin District

Station	Location	Direction	County	Type of Site
M-1035	SH 87	Southeast	Shelby	Leg
M-1035	SH 147	South	Shelby	Leg
M-1035	SH 87	Northwest	Shelby	Leg
M-1036	US 96	North	Sabine	Leg
M-1036	FM 1	East	Sabine	Leg
M-1036	US 96	South	Sabine	Leg
M-1061	SH 87	North	Sabine	Leg
M-1061	SH 21	East	Sabine	Leg
M-1061	SH 87	South	Sabine	Leg
M-1061	SH 21	West	Sabine	Leg
M-1062	US 84		Shelby	Directional
M-1121	US 69		Angelina	Directional
M-1122	FM 2743	Northeast	Angelina	Leg
M-1122	SH 63	Southeast	Angelina	Leg
M-1122	SH 63	West	Angelina	Leg
M-1229	FM 83	East	San Augustine	Leg
M-1229	FM 705	South	San Augustine	Leg
M-1229	FM 83	West	San Augustine	Leg
M-1229	FM 705	Northwest	San Augustine	Leg
M-1283	SH 21	East	Nacogdoches	Leg
M-1283	FM 226	South	Nacogdoches	Leg
M-1283	SH 21	West	Nacogdoches	Leg
M-1284	SH 150	North	San Jacinto	Leg
M-1284	FM 2025	South	San Jacinto	Leg
M-1284	SH 150	West	San Jacinto	Leg
M-1285	US 59	North	Polk	Leg
M-1285	FM 62	East	Polk	Leg
M-1285	US 59	Southwest	Polk	Leg
MA-318	SH 21		Nacogdoches	Directional
MS-36	US 287		Houston	Directional

Vehicle Classification Count Locations – Odessa District

Station	Location	Direction	County	Type of Site
M-1100	SH 158	Northeast	Ector	Leg
M-1100	SH 302	Southeast	Ector	Leg
M-1100	SH 302	Southwest	Ector	Leg
M-1100	FM 181	Northwest	Ector	Leg
M-1101	SH 18	North	Ward	Leg
M-1101	SH 18	South	Ward	Leg
M-1101	FM 1776	Southwest	Ward	Leg
M-1102	US 67	Northeast	Upton	Leg

Vehicle Classification Count Locations – Odessa District

Station	Location	Direction	County	Type of Site
M-1102	US 67	Southwest	Upton	Leg
M-1184	SH 176	Southeast	Andrews	Leg
M-1184	FM 181	South	Andrews	Leg
M-1184	SH 176	West	Andrews	Leg
M-1184	FM 181	Northwest	Andrews	Leg
M-1185	SH 115	Northeast	Andrews	Leg
M-1185	SH 115	Southwest	Andrews	Leg
M-1269	SH 329	West	Crane	Leg
M-1269	FM 1053	Northwest	Crane	Leg
M-1660	IH 20		Reeves	Directional
MS-195	IH 20		Ector	Directional
MS-196	US 80		Midland	Directional
MS-211	SH 191		Ector	Directional

Vehicle Classification Count Locations – Paris District

Station	Location	Direction	County	Type of Site
M-1068	US 271	Northeast	Lamar	Leg
M-1068	US 271	South	Lamar	Leg
M-1068	FM 1499	West	Lamar	Leg
M-1071	US 377	North	Grayson	Leg
M-1071	US 377	South	Grayson	Leg
M-1071	FM 901	West	Grayson	Leg
M-1088	FM 410	North	Red river	Leg
M-1088	US 271	Southeast	Red river	Leg
M-1088	FM 410	South	Red river	Leg
M-1088	US 271	Northwest	Red river	Leg
MS-178	US 82		Lamar	Directional

Vehicle Classification Count Locations – Pharr District

Station	Location	Direction	County	Type of Site
M-1046	FM 649	North	Starr	Leg
M-1046	US 83	East	Starr	Leg
M-1046	US 83	West	Starr	Leg
M-1235	LOOP 448	North	Willacy	Leg
M-1235	LOOP 448	South	Willacy	Leg
M-1235	FM 1761	West	Willacy	Leg
M-1239	FM 1425	North	Hidalgo	Leg
M-1239	FM 1425	South	Hidalgo	Leg
M-1241	FM 494	North	Hidalgo	Leg
M-1241	FM 1924	East	Hidalgo	Leg

Vehicle Classification Count Locations – Pharr District

Station	Location	Direction	County	Type of Site
M-1241	FM 494	South	Hidalgo	Leg
M-1317	US 281	East	Hidalgo	Leg
M-1317	FM 1015	South	Hidalgo	Leg
MA-327	LOOP 374		Hidalgo	Directional
MS-69	SH 336		Hidalgo	Directional
MS-74	US 77		Kenedy	Directional
MT-140	US 77	North	Cameron	Leg
MT-141	US 77	South	Cameron	Leg
MT-160	B&M RR BRDG		Cameron	Directional
MT-180	FM 509		Cameron	Directional
MT-200	FM 1015		Hidalgo	Directional
MT-240	US 281		Hidalgo	Directional
MT-280	SPUR 241	North	Hidalgo	Leg
MT-281	SPUR 241	South	Hidalgo	Leg
MT-340	FM 886		Hidalgo	Directional
MT-360	CAMARGO BRDG		Starr	Directional
MT-380	SH 200 SPUR		Starr	Directional
MT-400	FM 2098 SPUR		Starr	Directional

Vehicle Classification Count Locations – San Angelo District

Station	Location	Direction	County	Type of Site
M-1002	US 377	South	Kimble	Leg
M-1003	US 277	North	Edwards	Leg
M-1003	US 277	South	Edwards	Leg
M-1103	SH 137	North	Glasscock	Leg
M-1103	SH 158	East	Glasscock	Leg
M-1103	SH 137	South	Glasscock	Leg
M-1103	SH 158	West	Glasscock	Leg
M-1104	SH 208	South	Coke	Leg
M-1104	FM 2034	West	Coke	Leg
M-1104	SH 208	Northwest	Coke	Leg
M-1271	SH 153	East	Runnels	Leg
M-1271	FM 2111	South	Runnels	Leg
M-1271	FM 384	West	Runnels	Leg
M-1271	SH 153	Northwest	Runnels	Leg
M-1272	US 67	Northeast	Runnels	Leg
M-1272	FM 381	South	Runnels	Leg
M-1272	US 67	Southwest	Runnels	Leg
MS-6	US 67		Tom green	Directional
MS-14	IH 10		Sutton	Directional
MS-51	US 277		Tom green	Directional

Vehicle Classification Count Locations – San Angelo District

Station	Location	Direction	County	Type of Site
MS-135	SH 158		Runnels	Directional
MS-217	IH 10		Kimble	Directional

Vehicle Classification Count Locations – San Antonio District

Station	Location	Direction	County	Type of Site
M-1232	SH 16	North	Mcmullen	Leg
M-1232	FM 624	East	Mcmullen	Leg
M-1232	SH 16	South	Mcmullen	Leg
M-1232	FM 624	West	Mcmullen	Leg
M-1245	LOOP 1604		Bexar	Directional
M-1246	IH 10		Bexar	Directional
M-1247	US 281		Bexar	Directional
M-1248	LOOP 1604		Bexar	Directional
M-1315	IH 35		Guadalupe	Directional
M-1498	SH 123	North	Wilson	Leg
M-1498	FM 1681	Southeast	Wilson	Leg
M-1498	SH 123	South	Wilson	Leg
M-1620	IH 35		Comal	Directional
M-1621	IH 37		Bexar	Directional
M-1622	IH 410		Bexar	Directional
M-1623	IH 410		Bexar	Directional
M-1624	IH 10		Bexar	Directional

Vehicle Classification Count Locations – Tyler District

Station	Location	Direction	County	Type of Site
M-1033	US 79	Northeast	Rusk	Leg
M-1033	FM 1798	Southeast	Rusk	Leg
M-1033	US 79	Southwest	Rusk	Leg
M-1033	SH 42	Northwest	Rusk	Leg
M-1114	FM 804	North	Henderson	Leg
M-1114	US 175	Southeast	Henderson	Leg
M-1114	County Rd.	Southwest	Henderson	Leg
M-1114	US 175	Northwest	Henderson	Leg
M-1115	SH 155	Northeast	Smith	Leg
M-1115	FM 344	Southeast	Smith	Leg
M-1115	SH 155	Southwest	Smith	Leg
M-1115	FM 2661	Northwest	Smith	Leg
M-1116	FM 314	North	Van Zandt	Leg
M-1116	SH 64	Southeast	Van Zandt	Leg
M-1116	FM 314	South	Van Zandt	Leg

Vehicle Classification Count Locations – Tyler District

Station	Location	Direction	County	Type of Site
M-1116	SH 64	Northwest	Van Zandt	Leg
M-1117	SH 19	North	Van Zandt	Leg
M-1117	US 80	East	Van Zandt	Leg
M-1117	SH 19	South	Van Zandt	Leg
M-1117	US 80	West	Van Zandt	Leg
M-1118	FM 69	North	Wood	Leg
M-1118	SH 37	Northeast	Wood	Leg
M-1118	SH 37	South	Wood	Leg
M-1119	FM 1804	North	Smith	Leg
M-1119	US 69	Southeast	Smith	Leg
M-1119	US 69	Northwest	Smith	Leg
M-1120	FM 225	North	Rusk	Leg
M-1120	US 84	East	Rusk	Leg
M-1120	FM 225	South	Rusk	Leg
M-1120	US 84	West	Rusk	Leg
M-1205	FM 321	East	Anderson	Leg
M-1205	SH 19	Southeast	Anderson	Leg
M-1205	SH 19	Southwest	Anderson	Leg
M-1205	SH 19	Northwest	Anderson	Leg
M-1226	US 69	North	Smith	Leg
M-1226	FM 346	East	Smith	Leg
M-1226	US 69	South	Smith	Leg
M-1226	FM 346	West	Smith	Leg
M-1227	US 259	North	Rusk	Leg
M-1227	US 259	Southeast	Rusk	Leg
M-1227	FM 918	West	Rusk	Leg
M-1228	SH 315	Northeast	Rusk	Leg
M-1228	US 259	South	Rusk	Leg
M-1228	US 259	Northwest	Rusk	Leg
M-1280	SH 31	Northeast	Henderson	Leg
M-1280	FM 317	East	Henderson	Leg
M-1280	SH 31	West	Henderson	Leg
M-1281	FM 22	East	Cherokee	Leg
M-1281	US 69	Southeast	Cherokee	Leg
M-1281	County Rd.	West	Cherokee	Leg
M-1281	US 69	Northwest	Cherokee	Leg
M-1319	SH 31	East	Smith	Leg
M-1319	LOOP 364	Southeast	Smith	Leg
M-1319	SH 31	West	Smith	Leg
M-1960	IH 20		Van Zandt	Directional
MS-137	SH 31		Smith	Directional

Vehicle Classification Count Locations – Waco District

Station	Location	Direction	County	Type of Site
M-1022	FM 147	Southwest	Limestone	Leg
M-1109	US 84	East	Coryell	Leg
M-1109	FM 1996	South	Coryell	Leg
M-1109	US 84	West	Coryell	Leg
M-1110	US 190		Bell	Directional
M-1111	US 77	North	McLennan	Leg
M-1111	FM 2643	East	McLennan	Leg
M-1111	US 77	South	McLennan	Leg
M-1111	FM 2643	West	McLennan	Leg
M-1112	IH 35E		Hill	Directional
M-1113	SH 174	Northeast	Hill	Leg
M-1113	FM 933	Southeast	Hill	Leg
M-1113	SH 174	Southwest	Hill	Leg
M-1182	SH 31	Northeast	McLennan	Leg
M-1182	SH 31	Southwest	McLennan	Leg
M-1182	FM 2311	Northwest	McLennan	Leg
M-1183	US 84	East	McLennan	Leg
M-1183	FM 939	Southeast	McLennan	Leg
M-1183	US 84	Southwest	McLennan	Leg
M-1183	FM 939	Northwest	McLennan	Leg
M-1279	SH 53	Northeast	Bell	Leg
M-1279	SH 53	West	Bell	Leg
MS-39	SH 6		McLennan	Directional
MS-197	IH 35		Bell	Directional

Vehicle Classification Count Locations – Wichita Falls District

Station	Location	Direction	County	Type of Site
M-1072	IH 35		Cooke	Directional
M-1073	US 81		Montague	Directional
M-1074	SH 79	Northeast	Clay	Leg
M-1074	COUNTY RD.	South	Clay	Leg
M-1074	SH 79	Southwest	Clay	Leg
M-1074	County Rd.	Northwest	Clay	Leg
M-1076	FM 924	East	Wilbarger	Leg
M-1259	US 82		Clay	Directional
M-1800	IH 44		Wichita	Directional
MA-328	US 70		Wilbarger	Directional
MS-44	US 82		Clay	Directional
MS-167	IH 44		Wichita	Directional

Vehicle Classification Count Locations – Yoakum District

Station	Location	Direction	County	Type of Site
M-1052	US 90A	East	Gonzales	Leg
M-1052	SH 80	South	Gonzales	Leg
M-1052	US 90A	West	Gonzales	Leg
M-1123	SH 111	East	Jackson	Leg
M-1123	SH 172	South	Jackson	Leg
M-1123	SH 111	West	Jackson	Leg
M-1124	SH 159	Southeast	Fayette	Leg
M-1125	SH 304	North	Gonzales	Leg
M-1125	SH 97	Northeast	Gonzales	Leg
M-1125	SH 97	Southwest	Gonzales	Leg
M-1201	US 77	North	Fayette	Leg
M-1201	FM 155	Southeast	Fayette	Leg
M-1201	US 77	Southwest	Fayette	Leg
M-1201	7	West	Fayette	Leg
M-1202	FM 109	North	Colorado	Leg
M-1202	BS 71	Southeast	Colorado	Leg
M-1202	BS 71	Northwest	Colorado	Leg
M-1203	FM 3013	Northeast	Colorado	Leg
M-1203	FM 1093	East	Colorado	Leg
M-1203	FM 3013	Southwest	Colorado	Leg
M-1204	FM 616	Northeast	Victoria	Leg
M-1204	US 87	Southeast	Victoria	Leg
M-1204	US 87	Northwest	Victoria	Leg
M-1250	SH 71		Colorado	Directional
M-1305	US 77	North	Fayette	Leg
M-1305	FM 2145	Northeast	Fayette	Leg
M-1305	US 77	South	Fayette	Leg
M-1306	SH 71		Fayette	Directional
M-1310	US 290	East	Fayette	Leg
M-1310	FM 1291	South	Fayette	Leg
M-1310	US 290	West	Fayette	Leg
M-1311	US 87	Southeast	Victoria	Leg
M-1311	FM 447	Southwest	Victoria	Leg
M-1311	US 87	Northwest	Victoria	Leg
MS-116	US 59		Victoria	Directional
MS-164	IH 10		Fayette	Directional

Section 16
Speed Data Collection Sites

Speed Collection Sites

Speed Data Collection Sites – Abilene District		
Site Number	**County**	**Location**
SP0622	Runnels	US 67 2.0 mi. W of Coleman Co.
SP0766	Fisher	SH 70 3.4 mi. S of US 80
SP0644	Jones	FM 1661 0.5 mi. N of FM 2834
SP 0757	Callahan	SH 206 0.7 mi. N of FM 880

Speed Data Collection Sites – Amarillo District		
Site Number	**County**	**Location**
SP0784	Gray	FM 2857 3.4 mi. N FM 1321
SP0735	Randall	IH 27 0.1 mi. N of FM 2219

Speed Data Collection Sites – Atlanta District		
Site Number	**County**	**Location**
SP0630	Cass	FM 74 0.4 mi. W of FM 251
SP0602	Bowie	IH 30 at US 59 Overpass
SP0733	Titus	IH 30 1 mi. W of US 67

Speed Data Collection Sites – Austin District		
Site Number	**County**	**Location**
SP0781	Gillespie	US 87 5.8 mi. N of FM 648
SP0626	Llano	SH 71 2.5 mi. E of SH 16

Speed Data Collection Sites – Brownwood District		
Site Number	**County**	**Location**
SP0627	Brown	US 67 4.2 mi. E of US 183

Speed Data Collection Sites – Bryan District

Site Number	County	Location
SP0740	Madison	IH 45 0.6 mi. S of Spur 67

Speed Data Collection Sites – Dallas District

Site Number	County	Location
SP0742	Rockwall	SH 205 0.7 mi. S FM 550

Speed Data Collection Sites – El Paso District

Site Number	County	Location
SP0712	El Paso	IH 10 1.0 mi. N SH 20
SP0608	El Paso	US 54 3.3 mi. E IH 10 @ Fred W

Speed Data Collection Sites – Fort Worth District

Site Number	County	Location
SP0779	Jack	US 281 1.6 mi. S FM 2190
SP0777	Tarrant	US 287 0.7 mi. N of Johnson Co. line
SP0703	Johnson	IH 35W 0.1 mi. N of Spur 50

Speed Data Collection Sites – Houston District

Site Number	County	Location
SP0796	Galveston	IH 45 0.1 mi. S of Causeway

Speed Data Collection Sites – Laredo District

Site Number	County	Location
SP0745	Webb	US 83 8.9 mi. N SH 44
SP0621	Val Verde	US 277 6.5 mi. N of US 90
SP0632	Duval	FM 716 3 mi. W FM 1329

Speed Data Collection Sites – Lubbock District

Site Number	County	Location
SP0756	Hockley	US 385 4.0 mi. S of FM 300
SP0741	Castro	US 385 5.0 mi. N of SH 86
SP0601	Lubbock	IH 27 @ FM 2641 Overpass
SP0762	Swisher	FM 1424 1.0 mi. S of SH 86
SP0753	Lamb	US 84 0.7 mi. W of FM 37

Speed Data Collection Sites – Lubbock District

Site Number	County	Location
SP0783	Gaines	FM 1429 7.0 mi. N US 180

Speed Data Collection Sites – Odessa District

Site Number	County	Location
SP0613	Midland	Bus. 20 0.8 mi. E of FM 1788
SP0738	Reeves	IH 10 2 mi. E of FM 2448

Speed Data Collection Sites – Paris District

Site Number	County	Location
SP0640	Hopkins	SH 19 1.0 mi. N FM 1567
SP0623	Hunt	US 69 0.5 mi. S FM 2194

Speed Data Collection Sites – San Angelo District

Site Number	County	Location
SP0628	Irion	US 67 9.5 mi. E of SH 163

Speed Data Collection Sites – San Antonio District

Site Number	County	Location
SP0711	Bexar	LP 410 2 mi S of US 87
SP0704	Bexar	LP 410 @ SH 122, .8 mi. W of IH 37
SP0734	Guadalupe	IH 10 0.4 mi. E of FM 775
SP0603	Kerr	IH 10 0.7 mi. W of SH 16

Speed Data Collection Sites – Tyler District

Site Number	County	Location
SP0751	Smith	SH 31 3.0 mi. E of FM 757
SP0749	Wood	SH 154 0.3 mi. N of FM 2225

Speed Data Collection Sites – Waco District

Site Number	County	Location
SP0752	Hamilton	US 281 3.8 mi. N of US 84

Section 17

Long-Term Pavement Program Site Locations

Pavement Program Sites

Long-Term Pavement Program Site Locations – Amarillo District

Site ID	Direction	County	Highway	City
1047	WB	Carson	IH 40	Groom
1056	SB	Ochiltree	US 83	Perryton
3875	NB	Sherman	US 287	Stratford
5323	EB	Carson	IH 40	Groom
5335	EB	Gray	IH 40	Groom
5336	SB	Randall	IH 27	Canyon
6079	WB	Deaf Smith	IH 40	Grenrio

Long-Term Pavement Program Site Locations – Austin District

Site ID	Direction	County	Highway	City
0001	SB	Travis	LP1 N	Austin

Long-Term Pavement Program Site Locations – Beaumont District

Site ID	Direction	County	Highway	City
3010	SB	Chambers	SH 146	Baytown
3719	SB	Jefferson	US 69	Beaumont
4142	NB	Jasper	US 96	Jasper
4143	EB	Jefferson	US 90	Nome
4146	EB	Chambers	SP 55	Baytown
4152	SB	Liberty	SH 146	Liberty

Long-Term Pavement Program Site Locations – Brownwood District

Site ID	Direction	County	Highway	City
3865	NB	Mills	US 183	Mullin

Long-Term Pavement Program Site Locations – Bryan District

Site ID	Direction	County	Highway	City
1109	NB	Walker	SH 19	Huntsville
3559	EB	Walker	IH 30	Huntsville
3835	NB	Brazos	SH 6	Bryan
0800	EB	Brazos	FM 2223	Bryan

Long-Term Pavement Program Site Locations - Childress District

Site ID	Direction	County	Highway	City
5334	EB	Wheeler	IH 40	Shamrock

Long-Term Pavement Program Site Locations – Corpus Christi District

Site ID	Direction	County	Highway	City
1060	NB	Refugio	US77	Refugio
1181	NB	Live Oak	IH 37	Three Rivers
6086	NB	Live Oak	IH 37	Three Rivers

Long-Term Pavement Program Site Locations – Dallas District

Site ID	Direction	County	Highway	City
1039	NB	Ellis	US 287	Waxahachie
1069	EB	Kaufman	US 175	Crandall
3003	WB	Dallas	SP 348	Dallas
5035	EB	Dallas	IH 30	Dallas
9167	NB	Navarro	IH 45	Richland
9355	SB	Ellis	IH 35	Waxahachie

Long-Term Pavement Program Site Locations – El Paso District

Site ID	Direction	County	Highway	City
3769	EB	El Paso	US 62	El Paso
3779	SB	El Paso	US 54	El Paso

Long-Term Pavement Program Site Locations – Fort Worth District

Site ID	Direction	County	Highway	City
5274	EB	Tarrant	IH 20	Arlington
5283	NB	Tarrant	SH 121	Fort Worth
5284	NB	Tarrant	SH 121	Grapevine
5287	WB	Tarrant	IH 820	Fort Worth
5301	NB	Tarrant	IH 20	Fort Worth
5310	EB	Wise	US 380	Decatur
5317	NB	Tarrant	US 287	Mansfield

Long-Term Pavement Program Site Locations – Houston District

Site ID	Direction	County	Highway	City
2108	NB	Galveston	LP 197	Texas City
3699	NB	Fort Bend	US59	Sugarland
5026	NB	Brazoria	FM 2004	Lake Jackson
7165	WB	Harris	LP 610	Houston

Long-Term Pavement Program Site Locations – Lubbock District

Site ID	Direction	County	Highway	City
1076	NB	Terry	US 62	Brownfield
1111	EB	Lubbock	LP 289	Lubbock
2176	SB	Hale	IH 27B	Plainview
6179	WB	Parmer	US 84	Lariat

Long-Term Pavement Program Site Locations – Lufkin District

Site ID	Direction	County	Highway	City
3669	EB	Angelina	SH 94	Lufkin
3689	EB	Polk	US 190	Livingston

Long-Term Pavement Program Site Locations – Odessa District

Site ID	Direction	County	Highway	City
5278	WB	Midland	US 80	Midland

Long-Term Pavement Program Site Locations – Paris District

Site ID	Direction	County	Highway	City
1068	NB	Lamar	SH 19	Paris
3569	WB	Hopkins	IH 30	Brashear

Long-Term Pavement Program Site Locations – Pharr District

Site ID	Direction	County	Highway	City
3729	SB	Cameron	US 83	Harlingen
3739	NB	Kenedy	US 77	Armstrong
0100	SB	Hidalgo	US 281	Falfurrias

Long-Term Pavement Program Site Locations – San Antonio District

Site ID	Direction	County	Highway	City
0900	SB	Bexar	LP 1604	San Antonio
1092	WB	Medina	US 90	Hondo
1093	NB	Atascosa	IH 37	San Antonio
1094	WB	Bexar	SH 16	San Antonio
1096	WB	Bexar	US 90	Castroville
1122	NB	Wilson	US 181	Floresville
1130	NB	Guadalupe	SH 123	Seguin
9005	SB	Bexar	FM 1560	San Antonio

Long-Term Pavement Program Site Locations – Tyler District

Site ID	Direction	County	Highway	City
1087	NB	Smith	US 69	Tyler
1113	NB	Rusk	US 259	Mt. Enterprise
1116	NB	Rusk	US 259	Mr. Enterprise
1119	EB	Cherokee	US 79	Jacksonville
1168	SB	Wood	FM 56	Mineola
1169	NB	Rusk	SH 322	Henderson
3579	NB	Van Zandt	SH 19	Canton

Long-Term Pavement Program Site Locations – Waco District

Site ID	Direction	County	Highway	City
2133	SB	Bell	SH 36	Temple

Long-Term Pavement Program Site Locations – Wichita Falls District

Site ID	Direction	County	Highway	City
3589	SB	Wilbarger	US 287	Vernon
3845	SB	Cooke	IH 35	Gainsville
5328	SB	Cooke	US 287	Bowie

Long-Term Pavement Program Site Locations – Yoakum District

Site ID	Direction	County	Highway	City
3855	WB	Fayette	SH 71	La Grange
5024	.SB	Colorado	SH 71	Columbus
5154	WB	Gonzales	IH 10	Wealder

Section 18

Texas 6 Vehicle Classification Figures

Texas 6 Vehicle Classifications

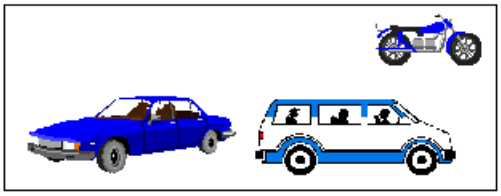


Figure 1-1: Texas 6 Class 1 — Motorcycles and Passenger Vehicles

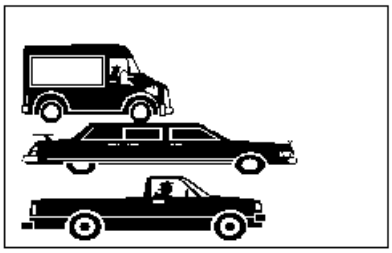


Figure 1-2: Texas 6 Class 2 — 2 Axles, 4-Tire Single Units

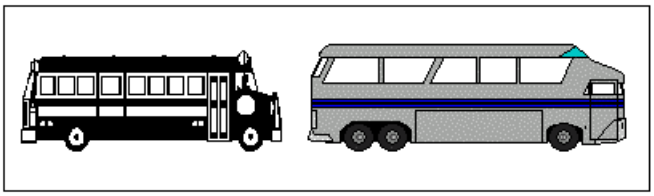


Figure 1-3: Texas 6 Class 3 — Buses

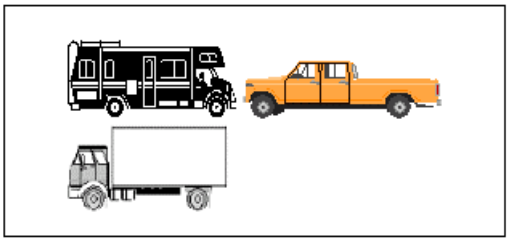


Figure 1-4: Texas 6 Class 4 — 2D, 6-Tire Single Unit (Includes Handicapped-Equipped and Mini School Buses)

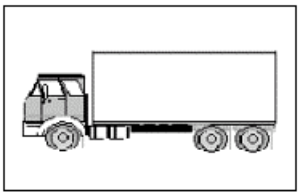


Figure 1-5: Texas 6 Class 5 — 3 Axles, Single Unit

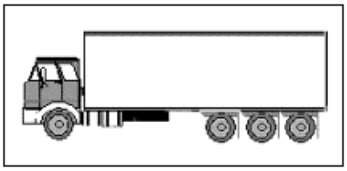


Figure 1-6: Texas 6 Class 6 — 4 or More Axles, Single Unit

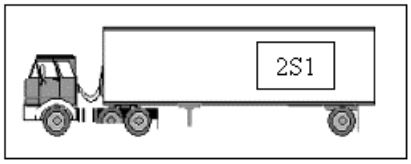


Figure 1-7: Texas 6 Class 7 — 3 Axles, Single Trailer

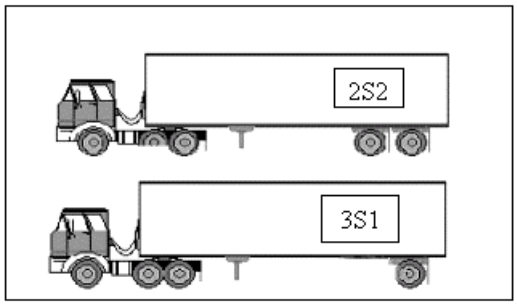


Figure 1-8: Texas 6 Class 8 — 4 Axles, Single Trailer

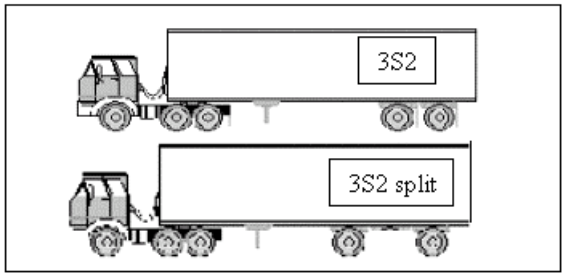


Figure 1-9: Texas 6 Class 9 — 5 Axles, Single Trailer

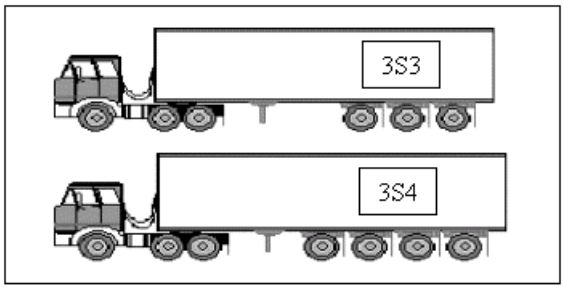


Figure 1-10: Texas 6 Class 10 — 6 or More Axles, Single Trailer

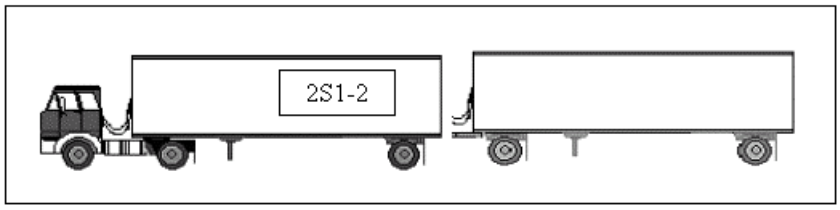


Figure 1-11: Texas 6 Class 11 — 5 or Less Axles, Multi-Trailers

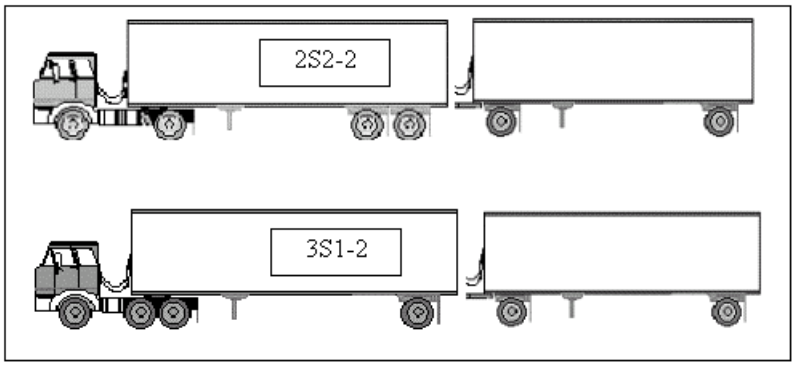


Figure 1-12: Texas 6 Class 12 — 6 Axles, Multi-Trailers

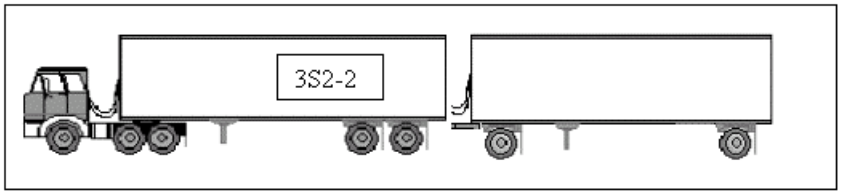


Figure 1-13: Texas 6 Class 13 — 7 or More Axles, Multi-Trailers

Section 19
FHWA Vehicle Classification Figures

FHWA Vehicle Classifications

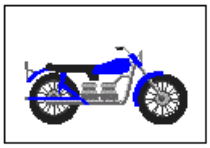


Figure 1-14: FHWA Class 1 — Motorcycles

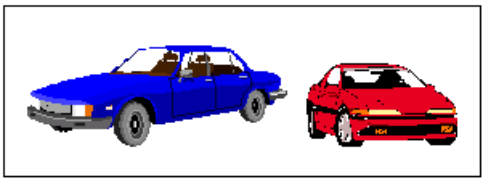


Figure 1-15: FHWA Class 2 — Passenger Cars (With 1- or 2-Axle Trailers)

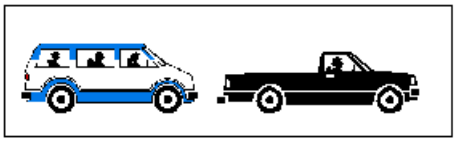


Figure 1-16: FHWA Class 3 — 2 Axles, 4-Tire Single Units, Pickup or Van (With 1- or 2-Axle Trailers)

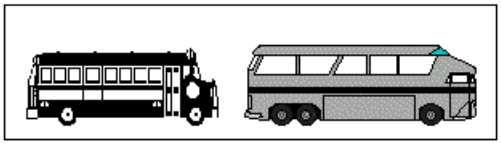


Figure 1-17: FHWA Class 4 — Buses

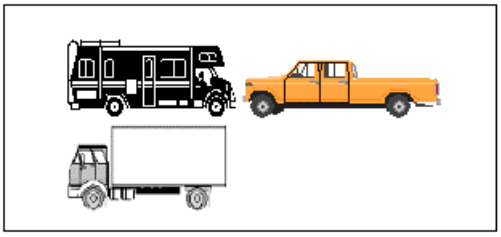


Figure 1-18: FHWA Class 5 — 2D - 2 Axles, 6-Tire Single Units (Includes Handicappe-Equipped Bus and Mini School Bus)

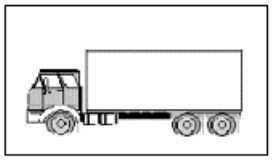


Figure 1-19: FHWA Class 6 — 3 Axles, Single Unit

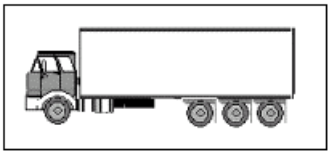


Figure 1-20: FHWA Class 7 — 4 or More Axles, Single Unit

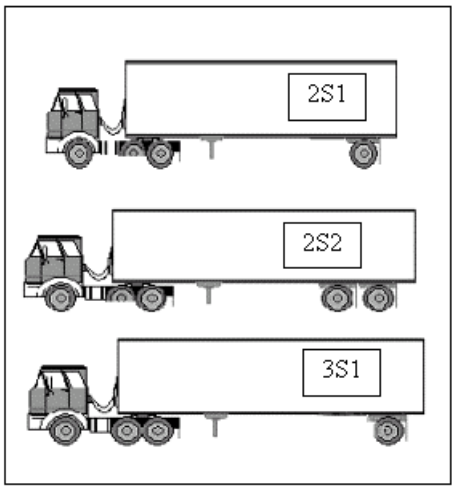


Figure 1-21: FHWA Class 8 — 3 to 4 Axles, Single Trailer

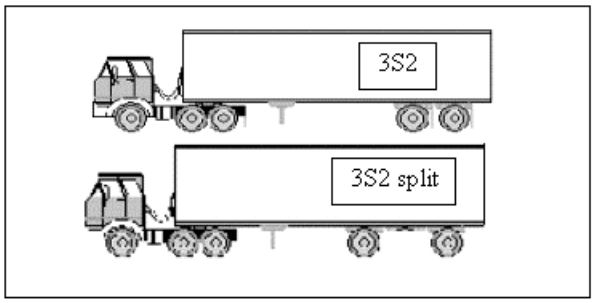


Figure 1-22: FHWA Class 9 — 5 Axles, Single Trailer

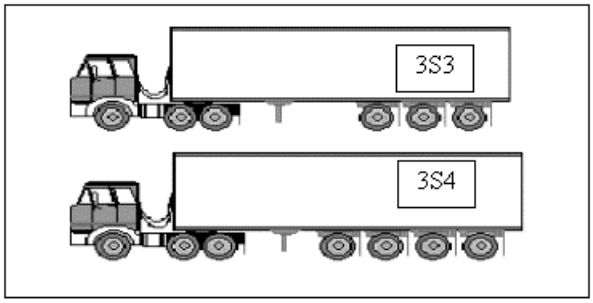


Figure 1-23: FHWA Class 10 — 6 or More Axles, Single Trailer

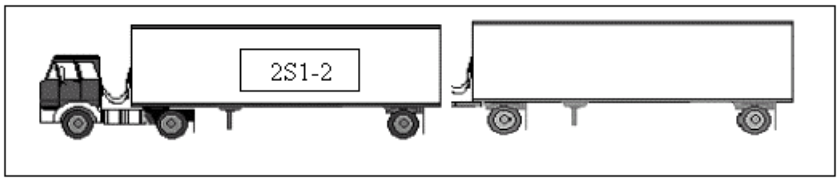


Figure 1-24: FHWA Class 11 — 5 or Less Axles, Multi-Trailers

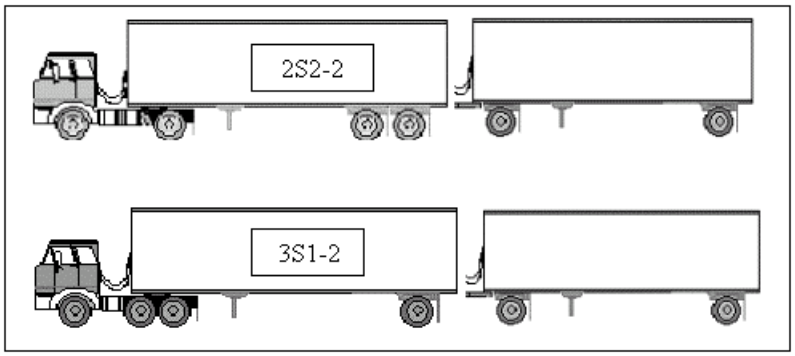


Figure 1-25: FHWA Class 12 — 6 Axles, Multi-Trailers

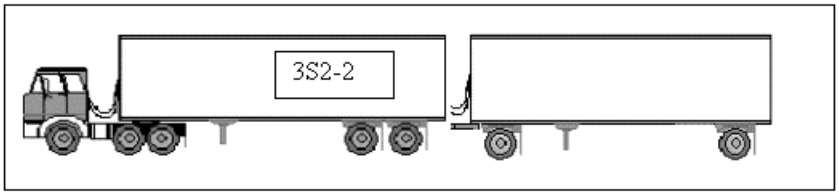


Figure 1-26: FHWA Class 13 — 7 or More Axles, Multi-Trailers

Chapter 2
Urban Travel Demand Forecasting

Contents:

Section 1
Overview

Forecasts Guide Planning

The federal planning regulations (accessible from a link on the TxDOT Internet at http://www.dot.state.tx.us/insdtdot/orgchart/tpp/links.htm) require that metropolitan planning organizations (MPOs) in areas over 200,000 population, in cooperation with the state, develop long-range transportation plans for all urbanized areas within the state. The development of long-range transportation plans relies on the regional computer travel demand forecasting performed in each urban area within the state.

Transportation professionals use forecasts to develop information to evaluate the effects that known and projected changes in population, employment, development patterns, and other socioeconomic conditions may have on the demand for travel on the urban area's major roadway and transit systems. The output of the travel forecasts prepared for system planning is used by TxDOT, the MPOs, and local governments to develop and/or update the transportation plan, to program projects for additional study, and to rank transportation improvements in order of priority in the Transportation Improvement Program.

Thus, the information developed in a system forecast ultimately guides the expenditure of state, local, and federal transportation funds. Estimates of travel demand are also required for air quality conformity determination and environmental analyses.

Section 2
Texas Travel Demand Model Package

Overview

TPP uses the Texas Travel Demand Model Package (Texas Package) to prepare travel forecasts for urban areas in Texas. It is a set of computer modules based on the traditional four-step travel demand forecasting process that includes trip generation, trip distribution , mode choice , and traffic assignment . The Texas Package contains three models: trip generation , trip distribution , and traffic assignment . A mode choice model is not used due to the modest public transportation systems in most Texas urban areas, although Houston, Dallas-Fort Worth, San Antonio, and Austin have developed mode choice models for use in their areas.

Trip Generation

The trip generation module used in the Texas package is TRIPCAL5 (version September 1999). TRIPCAL5 is a multifunctional program that estimates trip productions and attractions for up to ten trip purposes and 9,999 traffic analysis zones. This program includes features that allow input of user-specified data or use of default models for the disaggregation of data at the traffic analysis zone level (TAZ). Program options include trip production models, trip attraction models, disaggregation models, multiple trip purposes, and user-selected data inputs.

The sub-programs within TRIPCAL5 are designed to use the socioeconomic data normally used in trip generation. The trip production models use estimates of the number of households stratified by household size and household income or auto ownership for each zone. Trip attraction models employ estimates of each zone's employment stratified by employment type and area type . The specific data elements recommended for running TRIPCAL5 include population, number of households, median household income, and number of employees in the basic, service, and retail categories for each traffic analysis zone.

Trip Purposes. Up to 10 trip purposes may be used in TRIPCAL5 with specific trip rates for each. Typical trip purposes include:

- home-based work
- home-based school
- home-based shopping
- home-based other
- non-home-based work
- non-home-based other
- truck and taxi

- external-local .

For most urban areas in Texas the following trip purposes are used:

- home-based work
- home-based non-work
- non-home-based
- truck and taxi
- external local

Trip Productions. Three trip production models are included in TRIPCAL5 :

- A Two-Way Cross-Classification Model, which allows trip rates stratified for up to six categories for each independent variable.
- A Three-Way Cross-Classification Model, which allows trip rates to be stratified for up to six categories for two of the independent variables and up to four categories for the third independent variable.
- A Linear Regression Model with up to six independent variables.

The recommended trip production model is a Two-Way Cross-Classification Model with person trips (or auto-driver trips) per household cross-classified by up to six row categories and up to six column categories. Although the program is developed to allow the user to input any independent variables for the cross-classification model, the recommended independent variables are median household income and household size.

Trip Attractions. Five trip attraction models are available to estimate trip attractions:

- A Two-Way Cross-Classification Model may be selected and attraction trip rates stratified for up to six categories for each independent variable.
- A Three-Way Cross-Classification Model with trip rates stratified for up to six categories for two of the independent variables and up to four categories of the third independent variable.
- A Cross-Classification/Regression Model with trip rates stratified for up to 24 generation areas by households and employment type.
- A Linear Regression Model with up to six independent variables.
- A Two-Tier Regression Model with six independent variables.

The recommended trip attraction model is a regression type cross-classification model for each trip purpose stratified for up to 24 generation areas. The recommended independent variables are employment and households.

Disaggregation Models. Disaggregation models in TRIPCAL5© produce planning year estimates of the number of households classified by household size, household income, or auto ownership for each traffic analysis zone. These estimates are required in trip

production. For any of these three variables (household size, household income, or auto ownership), the base year marginal distribution of each zone, a disaggregation curve for the urban area, or defaults built into the model may be used.

Special Generators. Trip production and trip attraction models are for average or usual conditions and development types. Certain developments, however, are considered unique and are considered special generators . For each identified special generator within an urban area, trip productions and attractions are considered separately using individual trip production and attraction rates for that generator. The special generator model input data (see Table 2-1) are more detailed that the usual zone input data. Common special generators include:

- major regional amusement parks
- major sports facilities
- major regional airports
- military bases
- colleges, universities, communities colleges
- high schools

Additional information for high schools and universities/colleges that should be obtained if at all possible includes:

- number of students who drive to school
- number of students who walk to school
- number of students who ride public transportation to school
- number of students with jobs (high school only).

Table 2-1. Special Generator Information

Data Item	Description
Employment Type	The type of employment at the special generator: *basic*, *service*, or *retail*
Zone Number	Traffic analysis zone where the special generator is located
Name	Name of special generator
Hours of Operation	Number of hours in operation during a normal weekday
Total Employment	Total number of persons (full and part time) employed at the special generator
On Base Military	If special generator is a military base, this is the total number of military personnel living on base.
Off Base Military	If special generator is a military base, this is the number of military personnel living off base.
Off Base Civilians	If special generator is a military base, this is the number of civilian employees who live off base and work on base.
Number of Shifts	The number of work shifts at the special generator.
Employees per Shift	Number of employees per work shift.
Student Enrollment	If special generator is a school, this is the total number of students enrolled in the school.
Living On-Campus	If special generator is a school, this is the total number of students living on campus.
Hospital Beds	If special generator is a hospital, this is the total number of hospital beds in the hospital.
Number of Flights	If special generator is an airport, this is the number of flights per day served at the airport.
Airline Passengers	If special generator is an airport, this is the number of deplaning passengers per day.

Trip Balancing. Trip productions and attractions, including external trips, must *balance* within each area. TRIPCAL5© contains an option that allows regional control of total trip productions or attractions for each trip purpose. The trips are then scaled to the control total. There is also an option to balance trip productions to attractions, or attractions to productions. Generally, trip attractions are balanced to productions for each trip purpose.

Trip Distribution

TPP uses the ATOM II© (version September 1999) module, a spatially disaggregate trip distribution modeling technique, to perform trip distribution. ATOM II© loosely parallels the gravity model in its basic formulation, but contains an interaction constraint option that limits the number of attraction zones eligible to receive productions from a given zone. It is considered a spatially disaggregate technique in that it provides for the assignment of spatial attributes to zonal activities rather than concentrating zonal activity within a zone cen0037 centroid .

ATOM II© requires the zonal trip productions and attractions by trip purpose produced in trip generation and the zone-to-zone travel times for the minimum time paths estimated using the highway network and 24-hour speeds. Additional input required includes: a zonal parameter that provides the distance in minutes of travel time from the center point of the zonal centroid to the nearest network point on the perimeter of the zone, estimates of the trip length frequency distribution by trip purpose, and estimates of bias factors by trip purpose.

igh Occupancy Vehicle (HOV)

An HOV module is available in the Texas package. The Texas HOV model combines adaptations of three models: a travel time ratio model, a logic model, and a travel time savings model. Together the three models use an area's travel demand model data to estimate the shift in corridor travel to the HOV. The final results are a weighted average from the three individual models.

The input required for the Texas HOV model includes the expected percent transit and the average auto occupancy at the sector level. Options to input auto occupancy estimates by separation and the expected percent trips by school bus are available.

Traffic Assignment

The technique used for traffic assignment is the Texas Large Network Package. This package accommodates 4,800 zones, 20,000 links, and a maximum link impedance of 10.23 minutes. A program within the model set provides an iterative cycle of assignments with capability to adjust link impedance between assignment iterations. This balancing capability is accomplished by a comparison of the previously assigned link volume with the link capacity . Where a link is over- or under-assigned, the original link impedance is adjusted prior to the next assignment iteration.

Input into the assignment program includes a network; specific link data such as direction, speed, and number of lanes; and a trip table that is the product of trip distribution. An option also exists to input turn penalties at entrance and exit ramps to prevent the program from assigning short trips to major freeways.

Section 3
Travel Demand Modeling Process

Overview

The Texas Package modeling process (see Figure 2-1) involves:

- development of traffic analysis zones, districts, and sectors
- network development
- trip generation data development
- trip distribution data development
- model calibration
- model validation .

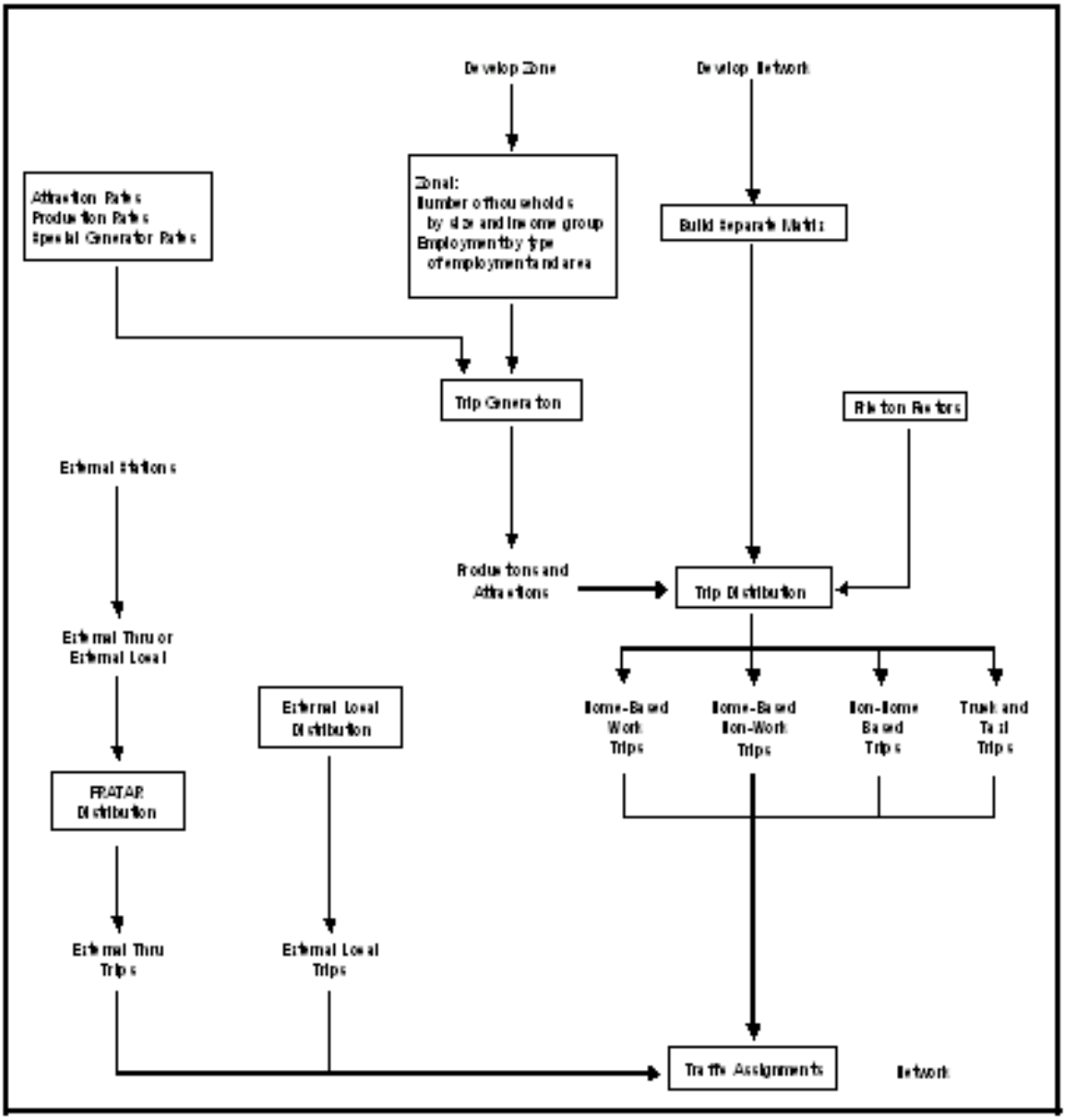


Figure 2-1: Traveling Demand Modeling Process. To see a PDF file of the process, click tda_2-1.

Traffic Analysis Zones, Districts, and Sectors

The area MPO and TxDOT cooperatively develop traffic analysis zones (TAZs). TAZs are modified prior to each decennial census and may be modified during each travel model update when a new base year is established. Zones also may be modified between the base and the forecast years if anticipated development warrants change to the base year zone structure.

Subsequent to development of traffic analysis zones, TPP aggregates zones into districts and combines the districts into sectors. TPP geocodes and maps zones, districts, and sectors using TransCAD and provides maps to the MPO and local district office.

Network Development

The development of the network involves identifying major roadways to be included, mapping those roadways, and collecting and developing data required to code the network. A base year and a forecast year network are required. The base year network includes roadways and conditions as they exist in the base year. The forecast year network will include the existing base year network plus committed network improvements. In subsequent model runs other network changes may be included for alternative analysis.

Network Preparation. The computerized network of the regional roadway system, zone centroids, and centroid connectors is developed cooperatively by TPP, the MPO, and local district office. TPP develops the computerized network from county road maps drawn from a United States Geological Survey (USGS) map and provides copies of the network maps to the MPO and local district office.

Network Data Collection. The MPO conducts a roadway inventory and collects the following data for each link in the roadway network:

- number of lanes
- posted speed limit
- one-way or two-way facility
- divided or undivided facility
- legal parking conditions
- 24-hour non-directional traffic volumes.

TPP develops additional roadway descriptive characteristics for each network link:

- ***Link speed and capacity*** – The traffic assignment process uses roadway link speeds and capacity. TPP develops speed/capacity tables for network roadways based on area type, functional classification , and facility types.
- ***Area types*** - Area type is one characteristic used to assign network speeds and capacities to individual roadway links. The coded network speeds and capacities within a given roadway functional classification vary by area type.
  TxDOT computes area types for each traffic analysis zone based on a density measure (see Figure 2-2) calculated on the zone population, employment, and area in acres provided by the MPO. Typically, five area types are used: CBD (Central Business District), Urban, Urban Fringe, Suburban, and Rural. In some areas a six area types are used, typically CBD, CBD Fringe, Urban, Suburban, Suburban Fringe, and Rural.

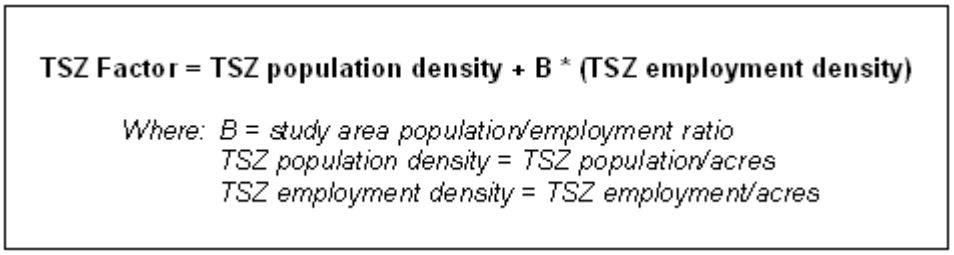


Figure 2-2: Density Measure for Area Type Determination

- ***Functional classification and facility types*** - Each link of network roadways is identified by a functional class. The functional classification used for travel demand forecasting is not always consistent with the functional classification used by FHWA of funding allocation. Typical functional classifications (see Table 2-2) include Interstate highway, freeway, expressway, major and minor arterial, collector, local, ramp, and frontage road. Facility type such as divided or undivided roadway further subdivides functional classes. Functional and facility type classification schemes vary among urban areas.
- ***Distance*** - The length of each network link is required in determining link travel time. TPP calculates distance during the process of digitizing the network from USGS maps.
- ***Capacity and speed*** - The capacity assigned to each network link is cross-classified by functional classification, facility type, and area type. The capacities typically used are based on a service volume at level of service C and are derived from the Transportation Research Board *Highway Capacity Manual*. In some less congested urban areas, a threshold capacity level of service A or B may be used in the modeling process.
  The trip distribution process uses network link distance and speed to produce an estimate of link travel time, from which minimum path routes between all traffic analysis zones are developed. TPP develops a speed/capacity look-up table (see Table 2-3) for each urban area modeled. TPP derives the speeds found in this table from two sources: speed surveys of observed travel speeds and speed and typical roadway speed for facilities based on functional classification and level of service as found in the *Highway Capacity Manual*.

Table 2-2. Two Typical Functional Classification Schemes

TxDOT Functional Class Code	Typical Facility Description	Alternate Facility Description
0	Centroid Connector	Interstate
1	Interstate, Expressway or Freeway	Major Arterial, 4 Lanes Divided
2	Multi-lane Highway or Rural Highway	Major Arterial, 4 Lanes Undivided
3	Divided Principal Arterial	Major Arterial, 2 Lanes
4	Undivided Principal Arterial	Minor arterial, 6 Lanes Divided
5	Divided Minor Arterial	Minor Arterial, 4 Lanes Divided
6	Undivided Minor Arterial	Minor Arterial, 4 Lanes Undivided
7	Collector	Minor Arterial, 2 Lanes Undivided
8	Frontage Road	Collector, 2 Lanes
9	Ramp	Local
A	None	Frontage Road
B	None	Ramp
C	None	Centroid Connector

Table 2-3. Typical Speed/Capacity Look-up Table

Description	Lanes	Functional Class	CBD	Urban	Suburban	Suburban Fringe	Rural
Interstate	4D	0	45 103500	50 75000	55 49700	55 28400	60 23600
Major Arterial	4D	1	40 N/A	45 N/A	50 25600	50 25600	55 28400
	4U	2	40 N/A	45 N/A	50 22800	50 22800	55 27000
	2U	3	40 N/A	45 N/A	50 10600	50 5800	55 5200
Minor Arterial	6D	4	37 64200	42 44700	47 28300	47 17700	52 N/A
	4D	5	36 42800	41 29800	46 18900	46 11800	51 N/A
	4U	6	33 3800	38 26500	43 16800	43 10300	48 N/A
	2U	7	30 15800	35 11000	40 6900	40 4200	45 N/A
Collector	2U	8	25 14100	30 9700	35 5900	35 3500	40 2300
Local	2U	9	20 14100	25 9700	30 5900	30 3500	35 2300
Frontage	2U	A	35 16900	40 12100	45 10600	45 5800	50 5200
Ramps	2U	B	35 16900	40 12100	45 10600	45 5800	50 5200
Centroid Connector		C	15	20	25	25	30

Trip Generation Data Development

Trip generation requires two types of data: socioeconomic data and travel behavior data.

Socioeconomic Data. The MPO, in cooperation with TPP, develops the following socioeconomic data for each traffic analysis zone in the urban area for the base year and the forecast year:

- ***Total Population*** - The total population for each traffic analysis zone in the urban area for the base year and the forecast year.
- ***Number of Households*** - The total number of households for each traffic analysis zone in the urban area for the base year and the forecast year.
- ***Average Household Size*** - The average household size for each traffic analysis zone in the urban area for the base year and the forecast year.
- ***Total Employment*** - The total employment for each traffic analysis zone in the urban area for the base year and the forecast year.
- ***Basic Employment*** – The total employment in *standard industrial classification* (SIC) categories of mining, construction, manufacturing, wholesale trade, transportation, communication, and public utility groups.
- ***Retail Employment*** – The total employment in SIC retail industry groups.
- ***Service Employment*** – The total employment in SIC financial, insurance, real estate, education, government, and service industry groups.
- ***Median Household Income*** – Median household income not adjusted for inflation.
- ***Regional or Zone Distribution of Households by Household Size and Median Household Income*** – The number of households in each size and income category.
- ***Special generator data*** (see Table 2-1) - The specific information needed for identified special generators.

Travel Behavior Data. TxDOT obtains information on travel behavior from travel surveys and uses it to develop trip generation and trip attraction rates for each urban area. A typical travel survey in Texas contains a household survey, a workplace survey, external station survey, commercial vehicle survey, special generator survey, and, where needed, an on-board public transit survey. In some non-attainment or near non-attainment areas an air quality survey may be conducted.

- ***Household Survey*** – In households selected at random throughout the urban area, interviewers ask people who agree to participate to record in a diary the activities and travel by each person over the age of five years during a 24-hour period. For each trip, interviewers ask participants to record the time, activity, place the trip began and ended, mode of travel, number of passengers, purpose of the trip, and other descriptive information. In addition to the data on travel, participants record characteristics of the household such as number and age of persons in the household, number of household members employed, household income, and number of vehicles available. TPP uses data from the household survey to develop trip production rates for the urban area.

- ***Workplace Survey*** - A workplace survey collects information on travel at the destination end of trips. This type of survey consists of two primary parts: one part designed to collect travel information and household characteristics (such as income, vehicle availability by type/make of vehicle, household size, etc.) of employees at the work sites, and one designed to collect travel data on visitors (non-employees) traveling to/from the workplace during the day.
  For the workplace survey, TPP cross-classifies employment establishments by industry type (basic, service, or retail), area type, and freestanding or non-freestanding business. Interviewers provide employees at participating workplaces with a survey and ask them to record all of their trips on a specified day. Data include the origin and destination for each trip, arrival and departure times, travel mode, reason for trip (trip purpose), vehicle occupancy , vehicle make/model/year, and transit and parking costs. Interviews with randomly selected non-employees arriving at the workplace during that day ask them to identify trip origin, trip purpose, mode of travel, vehicle occupancy, and arrival/departure times. TPP uses the data collected from the workplace surveys in conjunction with traffic or person counts at the specific workplace to develop attraction rates for basic, service, and retail employment for each area type.

- ***External Station Survey*** - At each external station location, surveyors randomly select vehicles and interview the drivers to determine information on the trip purpose, the trip origin and destination, and the vehicle occupancy. TPP uses this information to estimate the number of trips originating outside the study area and traveling to a point inside the area, the number of trips beginning and ending at a point outside the study area (through trips), and trips originating inside the study area and destined to a point outside the study area.

- ***Commercial Vehicle Survey*** – In some areas, TxDOT conducts a separate commercial truck survey to develop a more comprehensive database of travel patterns, vehicle weights and fuel types for commercial trucks operating in the urban area. TPP uses information collected from this survey to develop truck trip rates for trip production and in modeling for air quality conformity analysis. Participating firms provide data for each trip taken during one day's travel. Information collected includes departure and arrival times, an address for each destination, truck types, truck weight, fuel type, and truck routes traveled.

- ***Special Generator Survey*** - Special generator surveys collect information on travel patterns for employees and visitors at sites that exhibit special trip generating characteristics. TPP uses data obtained in the surveys to develop trip attraction rates by trip purpose for each site.

- ***On-Board Public Transit Survey*** - An on-board survey of bus passengers collects information on current bus rider characteristics and to provide data to develop a representative origin-destination trip table for use in the travel demand models. Data collected include trip origins and destinations, mode of travel to/from bus stop, trip purpose, bus routes taken for trip, ridership frequency, fare paid and method of payment, vehicle availability, household size, and income.

- ***Air Quality Survey*** – In some non-attainment or near non-attainment areas, TxDOT conducts air quality travel surveys to collect speed, delay and vehicle classification.

TPP uses the data from such surveys to validate the travel model trip assignment speeds used in air quality conformity analysis.

TxDOT conducts travel surveys in cooperation with MPOs. TxDOT analyzes data from the surveys to develop trip production and attraction rates used in trip generation. The conduct of travel surveys is determined by TxDOT on an annual basis and is dependent on need and funding. Travel surveys have been completed in 12 urban areas (see Table 2-4) since 1990.

Table 2-4. Travel Surveys Completed Since 1990

Urban Area	Survey Year	Household	Workplace	External	Commercial Vehicle	Air Quality Data	On-Board Transit	Special Generator
Amarillo	1990	X	X	X	X			X
Austin	1997/98	X	X	X	X	X	X	X
Beaumont/Port Arthur	1993	X		X	X	X	X	X
Brownsville	1991	X	X	X	X			X
Corpus Christi	1996	X		X	X		X	X
Dallas	1994/95	X	X	X				
El Paso	1994	X	X	X	X	X	X	X
Houston	1994	X	X	X	X	X	X	X
San Antonio	1990	X	X	X	X		X	X
Sherman/Denison	1991	X	X	X	X			X
Tyler	1990/91	X	X	X	X			X
Victoria	1995/96			X				

Trip Distribution Data Development

In addition to the network data, trip distribution data require: trip length frequency distribution curves for each trip purpose, a zone radii parameter that provides the distance in minutes of travel time from the center point of the zone centroid to the nearest network point on the perimeter of the zone, and estimates of bias factors by trip purpose.

- ***Trip Length Frequency Distribution*** - A trip length frequency distribution (TLFD) model is available as a part of the trip distribution model set. Input needed for the TLFD includes an estimate of the mean trip length and the maximum trip length.
- ***Zone Radii (Centroid Distance Parameter)*** - This measures the distance in minutes of travel time from the center point of the zone centroid to the nearest point on the perimeter of the zone.
- ***Bias Factors*** - Certain social and economic factors other than travel time affect travel patterns within individual urban areas. TPP develops these factors for each trip purpose as needed based on data from survey results and gravity model results.

Model Calibration

Model calibration is an attempt to duplicate travel for the year in which the field data (i.e. travel survey, network, and other data) are collected. In urban areas without recent travel surveys, TPP estimates values for trip rates, bias factors, mean trip lengths, and trip length frequency distribution. The calibration process includes intuitive tests of the models to see if the variables and coefficients are reasonable. TPP compares the output of each model individually to base year data.

Model Validation

Validation is the process of applying the calibrated models sequentially in the base year. TPP validates a model for the base year to determine its predictive ability to replicate observed traffic counts using the trip rates, bias factors, and other variables estimated in calibration. If the series of models cannot produce traffic volumes similar to what is observed in the base year, then TPP re-evaluates the models and makes appropriate adjustments until validation is accomplished.

Section 4
Travel Demand Model Output

Overview

TPP develops information in the travel demand modeling process to provide data useful in developing regional transportation plans and programs. TPP provides a statistical summary of the data developed in the modeling process to each area. This summary may also provide comparative data from urban areas of similar size and/or characteristics. Data and information most generally available include:

- ***Summary of Trip Generation Data*** - A comparison of percent change and growth rates between base year and forecast year population, households, household size, household income, employment, and urban area size.
- ***Volume/Capacity Analysis*** – A comparison of the assigned volume to the roadway capacity for each network link.
- ***Traffic Assignment*** – A base year and forecast year network map plotted with assigned volumes on each link.
- ***Turning Movements*** – A summary of base year and forecast year node-to-node turning movements for each intersection in the network.
- ***Trip Length Summary by Trip Purpose*** – A comparison of percent change and annual growth rates for urban area trip lengths by trip purpose between the base year and forecast year.
- ***Twenty-four Hour Trip Volumes by Trip Purpose*** – A comparison of percent change and annual growth rates for urban area 24-hour trip volumes between the base year and forecast year.
- ***External Trips Summary*** – A comparison of percent change and annual growth rates for urban area external local and *external through trips* between the base year and the forecast year.
- ***Vehicle Miles of Travel (VMT) Summary*** – A summary of total VMT , VMT by functional class, VMT per capita, and VMT per household for the base and forecast years.
- ***Sector and/or District Assigned Volumes*** – A comparison of total assigned traffic volumes within each sector and/or district for the base year and forecast year.

In addition, TxDOT makes available to each MPO a coded network file and 24-hour trip table in TRANPLAN formats. The MPO can use this information to perform analysis of alternatives at the system or project level.

Section 5
Air Quality Conformity Modeling

Overview

Environmental Protection Agency (EPA) regulations require that non-attainment area transportation plans are in conformity with the National Ambient Air Quality Standards (NAAQS) (accessible from a link on the TxDOT Internet at http://www.dot.state.tx.us/insdtdot/orgchart/tpp/links.htm). Areas classified as non-attainment under the CAAA of 1990 must conduct modeling as specified in the federal air quality conformity regulations (accessible from a link on the TxDOT Internet at http://www.dot.state.tx.us/insdtdot/orgchart/tpp/links.htm). The modeling requirements specify that plans must be based on:

- travel demand models to estimate how much travel will occur in the region based on the latest travel characteristics and growth assumptions
- the latest emissions models to estimate regional emissions based on the output of the travel model
- air quality dispersion models to evaluate localized impacts of carbon monoxide emissions.

For areas classified as serious, severe, and extreme ozone non-attainment and/or as serious CO non-attainment areas, there are additional specific modeling requirements:

- Planners must validate the network-based model against ground counts for a base year that is not more than 10 years prior to the date of the conformity determination.
- The model must employ a capacity sensitive assignment technique for peak-hour or peak-period traffic assignments.
- Analyses must base free-flow speeds of network links on empirical observations.
- The model must provide peak and off-peak travel demand and travel times.
- Zone-to-zone travel times used to distribute trips between origin and destination pairs must be in reasonable agreement with the travel times resulting from the assignment of trips to the network links.

Subsequent to travel demand modeling, TxDOT uses a series of computer programs to perform the required air quality conformity analysis. These are discussed below.

Air Quality Conformity Modeling Process and Programs

The air quality modeling process (see Figure 2-3) involves a series of computer programs in conjunction with output from the travel demand models. The process uses a loaded network file and 24-hour trip table, both output from the travel demand modeling process, in conjunction with additional data inputs to develop gridded emissions for urban areas classified as non-attainment. The following paragraphs summarize specific model components and data inputs.

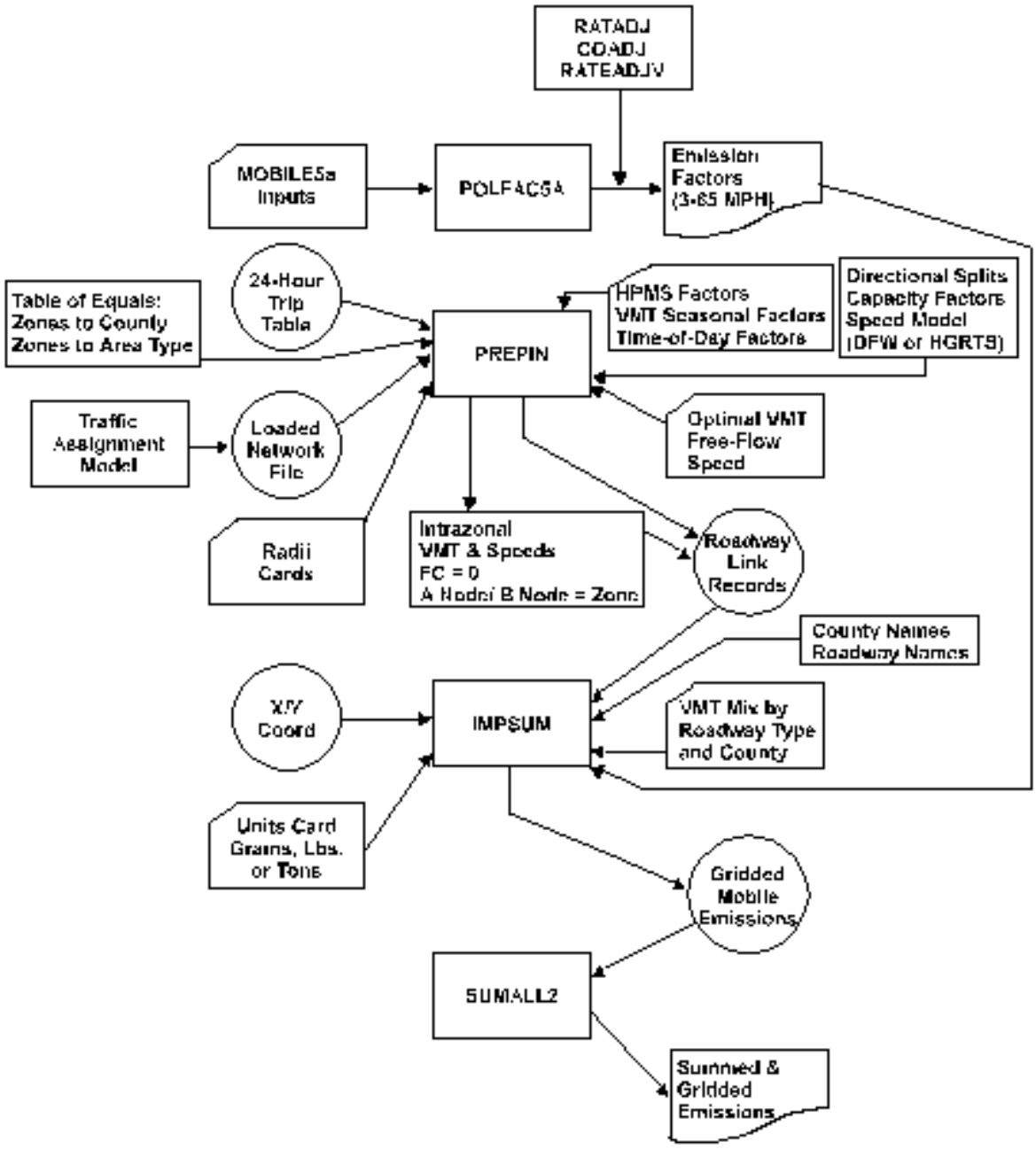


Figure 2-3: Air Quality Modeling Process. To see a PDF file of the process, click tda_2-3.

PREPIN. This program prepares the travel model and VMT related data for use by subsequent programs in air quality modeling. PREPIN requires the following data sets:

- Transportation system network – A build and a no-build network
- Origin-destination vehicle trip table from trip distribution in travel demand model
- Equilibrium traffic assignment from traffic assignment from travel demand model
- Zone radii cards (developed for trip distribution in travel demand model)
- Zone to area type table of equals
- Zone to county table of equals
- VMT seasonal scale factor – Used to scale the estimated weekday traffic from the travel model to weekday traffic in the month of July. These factors are developed from ATR data.
- HPMS scale factor – Base year travel model VMT must be scaled to the base year HPMS VMT. This factor is developed using county HPMS VMT and is applied to all forecasts prepared using the travel model.
- Directional split factor – A factor used to split the total link volume for a particular time period into the link volume in each direction.
- Time-of-day factor – Used to disaggregate the 24-hour link volume from the traffic assignment into time periods.
- Link speed estimation model – Link volume, link capacity, the link free flow speed, and the link facility type are used by the speed model to estimate link speed. There are two models used in Texas: the Houston-Galveston Area Council model used in the Houston area and the North Central Texas Council of Governments (NCTCOG) model used in Dallas-Fort Worth, El Paso, and Beaumont-Port Arthur.

MOBILE5A. (see link on the TxDOT Internet at http://www.dot.state.tx.us/insdtdot/orgchart/tpp/links.htm) The EPA's highway vehicle emission factor model used by TxDOT is MOBILE5A Hybrid. This is a FORTRAN program that provides average in-use fleet emission factors for volatile organic compounds (VOCs), carbon monoxide (CO), and oxides of nitrogen (NOx) for each of eight categories of vehicles. (see Table 2-5). The program develops emission factors for calendar years between 1970 and 2020 for various conditions affecting in-use emission levels such as ambient temperatures, average traffic speeds, and gasoline volatility. TPP uses this program in evaluating control strategies for highway mobile sources and in the development of emission inventories and control strategies for State Implementation Plans (SIPs) (link to SIP manual section) and in the development of environmental impact statements.

The output from the model is in the form of emission factors expressed as grams of pollutant per vehicle mile traveled (g/mi.). Emission factors from MOBILE5 are combined with estimates of total vehicle miles traveled to develop highway vehicle emission inventories in terms of tons per day, per month, per season, and per year. The model also provides a number of estimates of non-exhaust (non-tailpipe) VOC emission sources from gasoline-powered vehicles. These include diurnal emissions , hot soak emissions ,

running loss emissions , resting loss emissions , and refueling emissions . The program provides non-exhaust emissions in either g/mi. units or other units as appropriate for more detailed modeling requirements.

Table 2-5. Eight Categories of EPA Vehicle Types

Category	Description	Gross Vehicle Weight Range
LDGV	Light duty gasoline vehicle	< 6,000
LDGT1	Light duty gasoline truck	< 6,000
LDGT2	Light duty gasoline truck	6,001 - 8,500
HDGV	Heavy duty gasoline vehicle	> 8,500
LDDV	Light duty diesel vehicle	< 6,000
LDDT	Light duty diesel truck	6,001 - 8,500
HDDV	Heavy duty diesel vehicle	> 8,500
MC	Motorcycle	All

POLFAC5A. TPP uses this program with EPA's MOBILE5A program to develop emission rates for eight vehicle types and 63 speeds (3 mph through 65 mph) for each of the three primary pollutants:

- carbon monoxide (CO)
- volatile organic compounds (VOC)
- nitrous oxide (NOx).

The appropriate model inputs to represent factors such as the inspection and maintenance program, reformulated gasoline, and low emission vehicles for MOBILE are determined cooperatively between the Texas Natural Resource Conservation Commission (TNRCC) and the MPO. TPP develops vehicle registration data from the TxDOT vehicle registration database for counties. VMT mix is developed from vehicle classification data.

IMPSUM. This program reads VMT records output from PREPIN, emission rate records output by POLFC5A, temperature rise records, VMT totals by county and time period, the node coordinates, and the county name records. The outputs of this program are emissions by county and grid square, and the sums of VMT, VHT, and average speed by county.

SUMALLA. This program reads the emissions for each time period and sums the emissions from all time periods to produce 24-hour emission summaries.

VMTSUM. This program reads the link records from all time periods and sums the VMT by time period and county.

RATADJ and RATEADJV. TPP uses these two programs when multiple runs of MOBILE5 are required to obtain the appropriate emission rate. Analysts select RATADJ when emission rates for all eight vehicle types are to be adjusted. They choose RATEADJV when some, but not all, of the eight vehicle type emission rates need to be adjusted.

Section 6
Travel Demand Forecasting Organization

Responsible Organizations

There are 26 designated urban areas in Texas, four of which are classified as non-attainment areas under the Clean Air Act Amendments of 1990. TxDOT performs travel demand modeling for all urban areas except Dallas-Fort Worth and Houston under a cooperative arrangement with the MPOs. The Texas Travel Demand Package is used in all areas modeled by TxDOT. The Dallas-Fort Worth Travel Model, which is maintained by the North Central Texas Council of Governments in cooperation with TxDOT, is used for travel demand modeling in the Dallas-Fort Worth urban area. The Houston-Galveston Area Council performs the Houston area modeling using the Texas Package.

Under a cooperative arrangement TxDOT develops and maintains the travel demand models, conducts travel surveys, and performs five-year traffic counts in the urban areas it models. MPOs provide the network, socioeconomic, and special generator data for the designated base year and forecast year.

Section 7
Travel Demand Modeling Procedures

Review and Update

Federal regulations (accessible from a link on the TxDOT Internet at http://www.dot.state.tx.us/insdtdot/orgchart/tpp/links.htm) require that MPOs and TxDOT review and update transportation plans at least every 5 years in attainment areas and every 3 years in non-attainment areas and Transportation Management Areas (TMAs). As a result, TPP now performs travel demand model updates on either a 5-year or a 3-year cycle (see Table 2-6).

Table 2-6. Travel Demand Model Update Cycle for TxDOT Modeling in Texas Urban Areas

Urban Area	Non-Attainment Area	Transportation Management Area	Model Cycle
Abilene	No	No	5 Years
Amarillo	No	No	5 Years
Austin	No	Yes	3 Years
Beaumont/Port Arthur	Yes	Yes	3 Years
Brownsville	No	No	5 Years
Bryan/College Station	No	No	5 Years
Corpus Christi	No	Yes	3 Years
Dallas/Ft. Worth	Yes	Yes	3 Years
El Paso	Yes	Yes	3 Years
Harlingen-San Benito	No	No	5 Years
Houston/Galveston	Yes	Yes	3 Years
Killeen-Temple	No	No	5 Years
Laredo	No	No	5 Years
Longview	No	No	5 Years
Lubbock	No	No	5 Years
McAllen-Pharr-Misson	No	No	5 Years
Midland	No	No	5 Years
Odessa	No	No	5 Years
San Angelo	No	No	5 Years
San Antonio	No	Yes	3 Years
Sherman-Denison	No	No	5 Years
Texarkana	No	No	5 Years
Tyler	No	No	5 Years
Victoria	No	No	5 Years
Waco	No	No	5 Years
Wichita Falls	No	No	5 Years

The modeling cycle is staggered such that during each calendar year approximately 5 urban areas undergo a travel demand forecast update. Approximately 6 months prior to the conduct of the five-year traffic counts, TxDOT notifies the MPO that the counts will be made. MPOs prepare the network data, trip generation inputs, special generator data, a TAZ to census tract table of equals, and the identification of TAZs considered to be CBD zones for the base and forecast years.

TxDOT performs the model calibration and validation and travel demand forecast for the urban area and provides the model output to the MPO. TxDOT also provides the network and trip table files to the MPO so additional alternatives can be tested.

Chapter 3
Project Level Traffic Data Development

Contents:

Section 1
Feasibility Studies

Overview

TxDOT performs feasibility studies to determine the engineering and economic feasibility of a proposed project. A feasibility study is the first level of study required for projects under consideration by TxDOT for long-range project authorization (LRP).

TxDOT uses traffic forecasts in feasibility studies to analyze a preliminary facility alignment, cross-section, and access scheme to determine the effectiveness of the project to serve the projected demand. They also use traffic studies to estimate the financial feasibility of the project through cost-benefit analysis.

Traffic Data Provided

TPP provides the following traffic data for a feasibility study:

- design year non-directional average daily traffic (ADT) with estimates of the directional distribution, peak hour traffic, and truck percentages
- base year non-directional ADT with estimates of the directional distribution and peak hour and truck percentages
- base year and design year daily VMT for the system and the corridor
- base year and design year daily vehicle hours of travel for the system and the corridor
- base year and design year vehicle hours of delay for the system and the corridor
- base year and design year average vehicle speed for the system and the corridor.

Section 2
Advanced Planning

Overview

Once a project has LRP status, the Texas Transportation Commission authorizes advanced planning activities to proceed. This phase of project development involves the environmental and public involvement process of project planning to consider reasonable alternatives, prepare preliminary schematic design for the preferred alternative, and determine right-of-way requirements. Advanced planning identifies the improvement that best addresses the design year travel demand, is cost-effective, and is publicly and environmentally acceptable.

Depending on the location, the type of project, and the number of reasonable alternatives, advanced planning may consist of one or more stages of analysis. Ultimately, however, TPP develops the directional design-hour volumes (DDHV) required to analyze the preliminary schematic plan.

Three series of traffic forecasts may be needed during this stage of project development. Each successive stage of analysis requires an increasing level of detail and accuracy.

- Forecasts for the initial evaluation of alternatives - Traffic detail required for this stage of analysis is sufficient to identify the typical cross-sections and prepare the horizontal alignment of various alternatives on aerial photography.
- Forecasts for the evaluation of selected alternatives - Traffic detail required for this stage of analysis is sufficient to evaluate design variations between the selected alternatives, including variations such as location and design of access and intersections with cross streets. The traffic provided should enable an accurate definition of the cross-section of the preferred alternative and any reasonable variations at the conclusion of this stage of project development.
- A forecast for the preferred alternative - Traffic detail required for this stage is sufficient to form the basis for preparing design-hour volumes for use in preparing a preliminary schematic design and determining right-of-way requirements.

Traffic Data Provided

The exact traffic data provided will depend on the range of improvements considered and the evaluation criteria set for the project. The following lists show typical traffic data provided in each stage.

Initial Evaluation of Alternatives. Data typically includes:

- base year traffic assignment
- build and design year unadjusted directional or non-directional ADT
- estimates of the peak-hour percentage for the build and design years
- estimates of the percentage of trucks for the build and design years
- average speed, travel time, and/or delay for the build and design years
- daily VMT for the build and design years
- daily vehicle hours of travel for the build and design years

Evaluation of Selected Alternatives. Data typically includes:

- build and design year directional or non-directional ADT including ramp, interchange, and intersection volumes
- build and design year daily and peak-hour average speed, travel time, and/or delay
- build and design year daily or peak-hour VMT
- build and design year daily or peak-hour vehicle hours of travel

Evaluation of Preferred Alternative. Data typically includes:

- build and design year directional ADT including ramp, interchange, and intersection volumes and turning movements
- build and design year peak hour volumes including ramp, interchange, and intersection volumes and turning movements.

Section 3
Environmental Documentation

Overview

TxDOT performs assessment of the social, economic, and environmental impacts of a transportation project in varying stages of detail during the project planning and design process as required by the National Environmental Policy Act. (For more information, see the TxDOT *Environmental Procedures in Project Development Manual*.)

Traffic data are needed for environmental analyses and documentation to describe the project need and to assess the noise, air quality, and water quality impacts associated with each project. Each of these types of analysis requires a somewhat different type and level of detail in traffic data.

Traffic Data Provided

Description of Project Need. The need for a new facility or improvements to an existing facility is based on forecasted travel within the corridor or along the facility. Traffic data are used to show that the existing capacity is not sufficient to handle the forecasted traffic or that a new facility is needed to relieve congestion within the corridor. The traffic data required for most added capacity improvements include:

- base year AADT for the existing facility or for major facilities in the corridor for a new facility
- forecast year AADT for no-build alternative.

Analysis of Noise Impacts. Noise impact analysis requires the following traffic data for each link on the facility and major cross-streets of the alternatives under consideration, including the no-build:

- existing average weekday traffic with peak hour and directional factors, or existing directional peak-hour traffic
- design year average weekday traffic with peak hour and directional factors, or design year directional peak-hour traffic
- existing and design year average travel speeds
- vehicle mix volumes or percentages for the peak hour for autos, medium duty trucks (two-axle, six-tire), and heavy-duty trucks (three-axle and above).

Air Quality Impacts. Air quality analysis for project level environmental work requires the following data for each link for all alternatives, existing and no-build:

- average weekday traffic with peak hour and directional percentages or directional peak-hour volumes for the estimated time of project completion (ETC), ETC + 10 years, and ETC + 20 years
- average speeds for ETC, ETC + 10 years, and ETC + 20 years
- vehicle mix volumes or percentages for ETC, ETC + 10 years, and ETC + 20 years for eight classes of vehicles:
  - light duty gas vehicles
  - light duty gas truck 1
  - light duty gas truck 2
  - heavy duty gas vehicle
  - heavy duty diesel vehicle
  - light duty diesel vehicle
  - light duty diesel truck
  - motorcycle.

Section 4
Project Design

Overview

Plans, specifications, estimates, and right-of-way acquisition may proceed once a project has Priority 2 authorization. In this stage of project development, TxDOT completes the design of a facility and acquires right-of-way. Traffic data are required for geometric, pavement, and signalized intersection design.

Geometric Design

For most facility types (controlled access highways, multi-lane non-controlled access highways, two-lane rural highways, and urban arterials), certain aspects of the design are controlled by traffic volumes. Those design features controlled by volume are specific to each project type and are usually determined through a process called design analysis. TxDOT uses design analysis to select the appropriate laneage and lane configurations to ensure that the facility will accommodate the forecast traffic at the desired level of service. The traffic data needed to complete a design analysis include:

- design year traffic forecast of the average weekday daily traffic on detailed network
- design year Directional Design Hour Volumes (DDHV) for each link on the facility including cross streets, and ramps
- design year DDHV turning movement volumes for each intersection
- design year facility peak-hour factor
- percentage of trucks, recreational vehicles, and/or buses for the 24-hour period or for the peak hour.

Traffic Data Provided

- Design year traffic forecast of the average weekday daily traffic on detailed network
- design year AWDT turning movements
- percentage of traffic in the design hour
- directional distribution in the design hour
- percentage of trucks
- design year facility peak-hour factor.

Section 5
Pavement Design

Overview

Pavement is designed based on the traffic loadings expected in the highway's design lane, the lane expected to experience the greatest number of 18,000 pound equivalent single axle loads (18K ESALs) over the design period (usually 20 years). The traffic data required to calculate the ESALS include:

- base year ADT
- ADT traffic growth rate for the design year
- percentage trucks, including dual-rear-tire pickups and buses, for each classification category
- directional distribution for the design period
- lane distribution factor for the design period.

Traffic Data Provided

- ADT traffic growth rate for the design year
- percentage trucks, including dual-rear-tire pickups and buses, for each classification category
- directional distribution for the design period.

Section 6
Bridge Design

Overview

Design of structures is performed in conjunction with the design of the approach roadway, and traffic forecast requirements for bridges are the same as those for the geometric design of roadways. Traffic volumes are not used to determine the design load of the structure.

Traffic Data Provided

To be added later

Section 7
Signalized Intersection Design

Overview

The design of signalized intersections involves consideration of traffic, roadway and signalization conditions. Traffic data are needed to determine if the proposed intersection design will provide an acceptable level of service (LOS) in the design year.

Traffic Data Provided

- DDHVs for each movement (through traffic, right and left turns) on each approach
- design year peaking factor used to adjust the design-hour volume to the peak 15-minute flow rate
- design year percentage of trucks and other heavy vehicles.

Section 8
Traffic Data for Special Projects

Transportation Commission Requests

To be added later

Project Calls

To be added later

Major Investment Studies

A major investment study (MIS) is undertaken when the need for a major investment that involves significant federal funding is identified. Each MIS is required to evaluate the effectiveness and cost-effectiveness of alternative investments or strategies in attaining the local, state, and national goals and objectives. The analysis must consider the direct and indirect costs of reasonable alternatives; the social, economic and environmental effects; operating efficiencies; land use and economic development impacts; and energy consumption.

Most MISs involve the analysis of a number of alternatives in an effort to find the strategy that is most cost-effective and efficient to serve projected travel and is environmentally and publicly acceptable. Traffic data requirements for MISs are similar to those required in the advanced planning alternative analysis and environmental documentation.

Traffic Data Provided

To be added later

Section 9
Traffic Data and Forecast Request Procedures

Requested Information

A request for a traffic feasibility study should include the following information:

- base year and design year for the project
- current land use maps for the area surrounding the proposed project
- location and type of major traffic generators
- past and current traffic counts for an existing facility
- major cross-streets
- map giving general project alignment
- identification of proposed facility type
- one- or two-way operation
- number of lanes
- preliminary schematic or straight-line map
- length (in feet) for each link of the proposed facility (new location projects, only).

Chapter 4
Database Management

Contents:

Section 1
Overview

Functional Responsibilities

This chapter of the manual describes two functional areas of TxDOT's Transportation Planning and Programming Division (TPP):

- data file creation/maintenance and reporting
- mapping.

These functional areas provide support to the overall project development process.

Primary responsibility for these functional areas lies in the Data Management Section of TPP. The Data Management Section (DMS) is responsible for collecting, archiving, and supplying public roadway data to various TxDOT divisions, sections, and districts as well as to other state agencies. These data are used for a variety of purposes, including planning and project development. Automation support for the entire TPP Division comes from DMS.

Section 2
Data File Creation/Maintenance

Texas Reference Marker

The Texas Reference Marker (TRM) system is an automated system that documents the past, present, and future state-maintained highway network . It contains all physical features on the state highway system such as signs, culverts, and intersections. Markers, similar to mileposts, are installed at various locations along state highways and are numbered relative to the statewide TRM grid. Physical features are referenced to the markers in terms of mileage displacement from the nearest marker.

Data Collection. TRM accomplished analyzing preliminary and final construction plans from the General Services Division. DMS staff reviews these plans to determine if any specific project is going to affect the highway network mileage or design. Staff determines if any other administrative functions of TRM will be affected. This investigation includes reviewing city maps, functional classification maps, or any other map source that correctly depicts approved administrative data.

All functions of the TRM system are conducted in headquarters or district offices, with the exception of ad-hoc reviews. In these cases, field crews are sent to check specific physical features of a highway. Staff enters data at computer terminals using codes such as those related to the Highway Performance Monitoring System (HPMS).

The TRM section in each district helps maintain the TRM files, primarily related to surface elements of the highways. The TRM section within TPP is responsible for maintaining the highway network and administrative data required for HPMS.

DMS staff assists the district offices with requests for changes to the state highway network by preparing Minute Orders for approval by the Texas Transportation Commission. The staff secures concurrences from Traffic Operations and Design Divisions for each change request. All districts and divisions are notified of Commission-approved changes.

TRM is a major link to the state highway system geographic information system (GIS), particularly related to distance from origin (DFO) data.

Mile Point Reference Marker Equivalency. The Mile Point Reference Marker Equivalency (MPRME) file was developed as a conversion tool to allow cross-reference and data reporting from TRM and from files keyed on control-section-milepoints. The MPRME file matches reference markers and control-section-milepoint data.

- ***Data Source:*** TRM is the source for reference marker locations for MPRME, and the Roadway Inventory (RI) file is the source for control-section-milepoint locations.
- ***Data Update:*** The MPRME file is created from TRM and RI data on a monthly cycle.
- ***Load to RIS:*** The MPRME file is loaded to the Roadway Information System, commonly referred to as the RIS, on a monthly basis.

State Railroad File

The State Railroad File is a current, active list of only open, on-system railroad crossings. This is an in-house TxDOT file, created and updated solely by TxDOT staff. TxDOT has control over this file, making it an accurate file; therefore, TxDOT has a high degree of confidence in it.

Data Reception. Private railroads, the Traffic Operations Division, and TxDOT districts provide the State Railroad File data to DMS.

Update Files In-house. Data Management Section staff updates the State Railroad File in-house, using data provided by the various sources.

Roadway Information System. The RIS provides mainframe computer access for districts and divisions.

RI File

The RI file consists of six subfiles of roadway information and is maintained by update transactions. This information is keyed by control-section and beginning milepoint. Following is a list of the subfiles and the type of information each contains:

- ***Subfile 1*** - On-system roadways which are either state-maintained (equates to TRM) or under local maintenance. MPRME is the tie between control-section-milepoint and reference marker.
- ***Subfile 2*** - County roads
- ***Subfile 3*** - Functionally classified city streets
- ***Subfile 4*** - Unclassified city streets
- ***Subfile 8*** - Frontage roads: created from TRM using MPRME to convert reference marker to control-section-milepoint data. Traffic on these roads travels in ascending reference marker direction.
- ***Subfile 9*** - Frontage roads on which traffic travels in descending reference marker direction

DMS has a goal to have all city streets in one file. It will accomplish this goal through the future city street inventory project.

Accident File

Data for the Accident File originate from the Texas Department of Public Safety (DPS) via mainframe computer cartridge tapes. DMS staff runs the data against the RI to update the milepoints. A report is given back to DPS with documentation of mismatched data.

Highway Performance Monitoring System

The Highway Performance Monitoring System (HPMS) is a federally mandated data reporting system providing roadway/traffic data to the Federal Highway Administration (FHWA) from TxDOT. The HPMS data are vital to TxDOT as these data influence federal apportionments to the state. Roadway mileages and vehicle miles traveled (VMT) are directly related to the apportionment formulas. Part of the federal funding distribution formula is based on traffic volumes reported by HPMS. Therefore, the ability to program and develop projects is related to HPMS.

While the HPMS may have the appearance of a database, it is actually a file comprised of data from various TxDOT databases. HPMS is created from the RI files, TRM, and the pavement management information system (PMIS). TxDOT divisions and districts update these databases in order to provide the most current data available. The HPMS submittal reflects the state data as of December 31 each year. DMS performs the update at the end of each calendar year by taking a computer tape template and reading in new RI data. This timing is dependent upon receiving some data elements from TxDOT districts, other sections within TPP, and other divisions.

DMS updates TRM and RI reports year-round. The December 31 data set is a snapshot of files taken after the final updates are made. During a four-month processing period, the Traffic Section applies its most current data (traffic data file, ADT design data, percent trucks, etc.) and PMIS (IRI - a roughness index for road surface that develops a score to rate the condition of the road). The Traffic Section takes the tape and enters the data. This process follows the year-end update. The final HPMS version is due each year to FHWA by June 15.

The Data Management Section is responsible to FHWA for certifying the public road mileage. This certification reports the total public road mileages (on and off the state highway system) as a part of the HPMS requirements.

HPMS Mileage Certification

- ***On-system*** - certified through districts
- ***County roads*** - recently inventoried to validate data; in future years, counties will advise DMS of new or closed roads and DMS will verify using distance measuring instruments (DMIs) and a global positioning system (GPS), then input the data into electronic files
- ***City streets*** - will be validated and treated similarly to county roads.

Linear Reference System

The Linear Reference System (LRS) accompanies the HPMS report and is required by FHWA, who provides the computer software. LRS identifies a network of roads by functional classification. The goal is to identify all HPMS data collection sites by functional classification. In rural areas this system identifies roads functionally classified as "major collector" and above. LRS identifies roads in urban areas with functional classifications of "principal arterial" and higher. Staff assigns nodes to break points, such as intersections and county lines, along roads.

Data Collection. The majority of the data collection necessary to support LRS comes from district offices. The districts notify DMS when an off-system road becomes part of the statewide system, when a new on-system facility is opened to the public, or when an on-system road's functional classification changes. These changes require modifications to the subfile designation and/or location attributes.

Contractors and DMS staff, under the direction of the Data Management Section, collected county road mileage and other data for the County Road Inventory Project (CRIP). DMS crews provided quality control by inspecting the work. Section staff was responsible for checking the accuracy of county road inventory data to ensure that mileages were reported accurately. County road mileages are updated annually by the counties through official mileage certifications.

Data Users. There are several users of the CRIP database. The State Comptroller's Office uses the information to disburse the Lateral Road and Bridge Fund. TxDOT Vehicle Title and Registration Division distributes funds to counties according to mileages recorded for each county. Budget and Finance Division calculates overweight permit fees using the county road inventory. Bridge Division assigns bridge structure identifications in its BRINSAP database using county road numbers from the inventory. Other data users include the Information Systems Division (related to GIS issues), county 911 coordinators, county officials (such as judges and commissioners), and the Texas Transportation Commission (for Minute Orders designating new highways and highway relocations).

The Data Management Section is responsible for the certification of county road mileage (off-system only) to the State Comptroller. This information is used for dispensing funds from the Lateral Road and Bridge Fund, which consists of approximately $7.3 million each year. This information is also used for dispensing a portion of the fees collected from overweight permits, vehicle titles, and vehicle registrations.

TT Tables. DMS publishes TT Tables annually and places them on the online document viewing system (ODVS) as a status report of the state highway system. The ODVS is available to all departmental users and contains such information as mileage, vehicle miles, lane miles, etc.

Ad Hoc Reports. The Data Management Section receives requests for data from the general public, the TxDOT Public Information Office, the Legislature, and other agencies or individuals. Data Management staff uses its databases to respond to these inquiries. Staff prioritizes responses and routine work based on the urgency of data requests.

Section 3
Mapping

State Base Map Updates - Data Collection

DMS staff, with the assistance of other division staff and Design and Information Systems Divisions, gathers mapping information using sources such as CRIP data and United States Geological Service (USGS) maps. Other important data sources are aerial photographs from Design and Information Systems Divisions and construction plans from Design Division.

Two main products result from this functional area: the statewide base map and the railroad map, from which DMS produces the:

- General Highway Map (includes on-system and off-system facilities)
- Departmental Map (includes on-system roads only)
- Railroad Map (references the General Highway Map and labels all railroad crossings).

When these maps are updated, ten copies are sent to FHWA, per its requirements.

The General Highway Map is created by compiling 732 county road maps.

The control/section map, intended for internal departmental use, is the map equivalent to the RIS. It drives establishment of construction projects.

The maps are public domain data used by all of the national mapping companies, USGS, and the strategic mapping initiative for state GIS.