Traffic Data Request Guide

FOR *Highway Pavement and Geometric Design*

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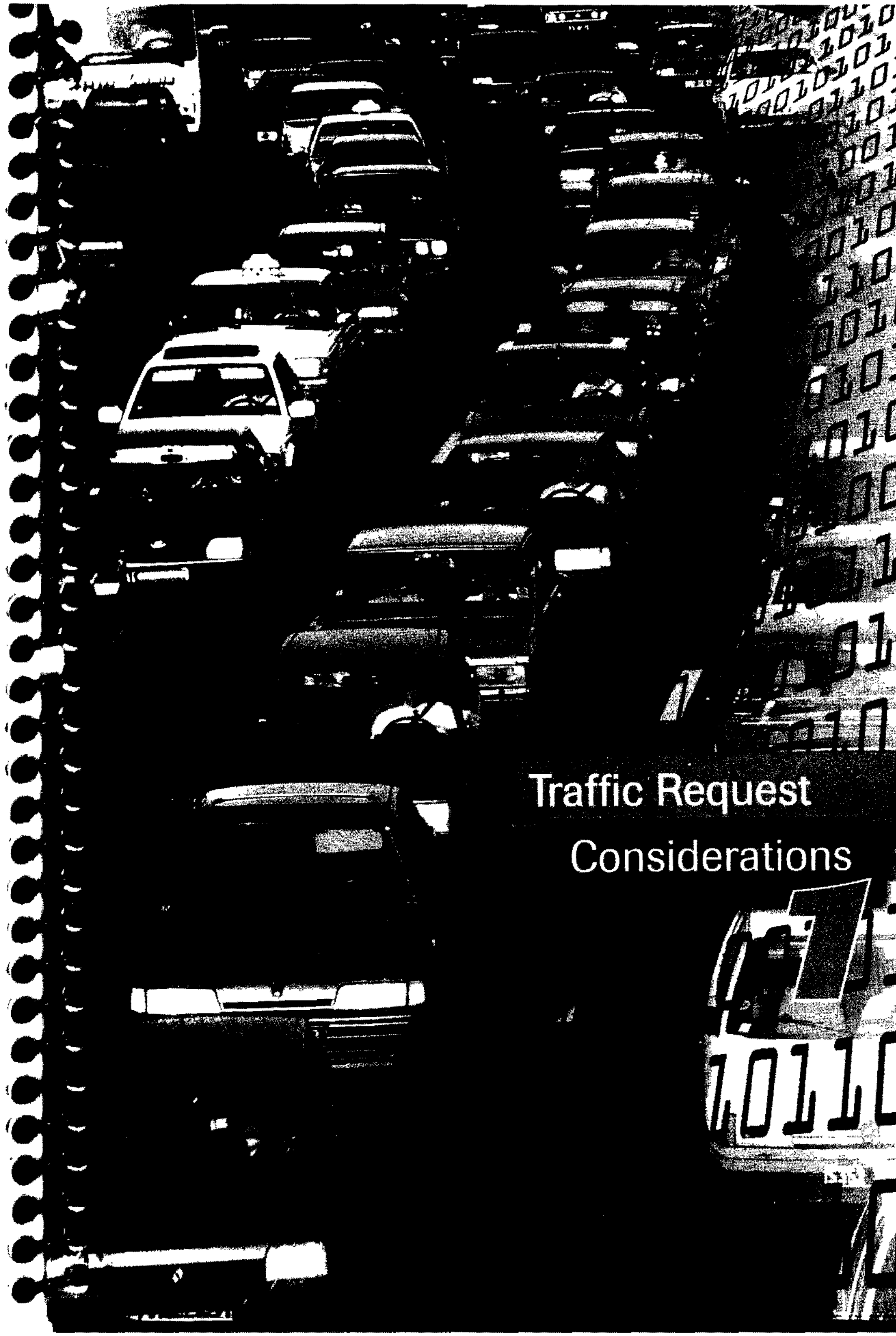
The purpose of this guide is to aid the Texas Department of Transportation (TxDOT) in developing the level of traffic data needed to support both highway pavement and geometric design and analysis of traffic for district, state, and federal requirements. This guide will provide you, the highway pavement or geometric designer and district personnel, with a better understanding of the considerations that need to be taken when submitting a request for traffic data. Better traffic data can save millions of taxpayer dollars, but the needless collection of traffic data can be a large waste of taxpayer dollars. Each project has to be evaluated separately.

Your requests for pavement design traffic data should be submitted through the district director of Transportation Planning and Development to the Traffic Analysis Section of the Transportation Planning & Programming (TPP) Division of TxDOT. The collection, analysis, and forecasting of site-specific traffic data are time-consuming processes that are scheduled and thus should be requested in the early stages of project development. This process is especially true if site-specific weigh-in-motion (WIM) data are needed because a smooth, good pavement surface is required for data collection, and the traffic should be sampled during the heavy traffic load period.

A fundamental finding of TxDOT Project 0-1801, "Evaluate and Develop an Improved System for Collecting and Reporting Traffic Loads to Better Meet the Needs of Bridge and Pavement Designers," was that not only did the TxDOT districts have a poor understanding of how to request the traffic information needed to support a pavement design, but TPP did not have a process for ensuring that the traffic information being provided was sufficient to meet the pavement design needs. This guide promotes better communication and coordination between the highway pavement and geometric designers and the traffic analysts.

The current edition of the Federal Highway Administration's (FHWA) *Traffic Monitoring Guide* (TMG) places great emphasis on truck weight and classification data. TPP supports and will promote this emphasis as described in Chapter 3.



Traffic Request Considerations

Some general level indicators can suggest the need for traffic data requests by a district. These indicators include:

- increased traffic safety issues,
- air quality issues in nonattainment or near nonattainment areas, and
- toll road proposals.

There are several site-specific indicators obvious to districts that may warrant the need for traffic data requests, whether short-term tube counts or permanent automated traffic recorder (ATR), automated vehicle classification (AVC), WIM, or speed counts. These site-specific indicators include:

- directional rutting in asphalt pavements,
- increased truck traffic,
- high proportions of trucks,
- proximity to special truck traffic generators, and
- seasonal influences of heavy loads.

If one direction of a road has distinct rutting in the pavement, it may indicate that heavily loaded vehicles are traveling in that direction more so than in the opposite direction, and it may indicate a volume and type of vehicle not anticipated in the initial design of the pavement. Directional rutting may be evidence of changing truck traffic patterns and suggest the need for monitoring the roadway.

The road may not show signs of pavement wear, but increased truck traffic may still occur. Local TxDOT engineers should use their best professional judgment based upon their knowledge of local traffic conditions to determine if a significant increase in truck traffic is occurring.

A road carrying a higher percentage of truck traffic relative to automobiles than other roads in the district may justify a WIM site. Area engineers should be able to identify these roadways in their district, along with potential site characteristics.

Traffic volume and vehicle classification distributions vary by season. Agricultural areas may have marked increases in truck traffic at harvest time as goods are taken from areas of production to market areas. Resort and tourist areas can experience dramatic changes in the number and types of vehicles in the summer and winter. District personnel should ensure that data collection occurs during these periods in order to provide an accurate assessment of future traffic characteristics along the roadway.

WIM Thresholds

Pavement designers place the threshold for initiating site-specific WIM data collection on a roadway at 3 million cumulative equivalent single-axle loads (ESALs). This threshold number of ESALs can conceivably occur substantially in advance of the prescribed design life (e.g., 20 years). If the traffic information log, commonly referred to as the Tlog in the TPP Traffic Analysis Section database, indicates that a road has reached this level of pavement wear, it is a candidate for a WIM site.

Finally, if a road has less than 3 million cumulative ESALs but possesses one or more of the site indicators noted above, then a site-specific WIM installation may still be considered. Unusual pavement wear should not always be attributed solely to an increase in applied loads. Poor construction materials or faulty construction techniques could have contributed to signs of premature failure. Further evaluation by district staff and the Pavements Section of the Design Division may be warranted.

Traffic Data Collection Efficiency

Even though many factors can justify traffic data collection, it is incumbent upon the districts to avoid unnecessary requests. For example, if the traffic volume is expected to be low on a road, then there is no need for new data collection. If the pavement is designed to a certain specification that will more than handle the projected traffic, then there is no need for the time and expense of collecting traffic data to verify it. When districts submit a request to the Traffic Analysis Section, the district should try to provide as accurately as possible the expected types of traffic on the road.

Districts should also be aware of the advantages and disadvantages of different types of traffic data collection. They are listed in **Appendix A**. Districts should not request a type of count that would prove more costly and complex than required for the needed analysis. The district Transportation Planning and Development (TPD) engineer should consult with Traffic Analysis Section personnel in choosing the best count type.

Greater awareness of the data collection process can help districts avoid unnecessary expenditure of time and money by the department. Enhanced communication and coordination between your district and the Traffic Analysis Section can result in higher quality data and significant cost savings to your district. **Appendix B** provides an overview of the typical installation costs of the various types of automated traffic data collection systems.

Field Inspection

Local level TxDOT engineers should conduct an inspection of a potential site or review the design for new construction for traffic data collection capabilities.

- Does the site possess the minimum traffic parameters to be a candidate site?
- Are there other characteristics about the location that may affect the traffic on the particular road?
- Is the site conducive to traffic data collection based on the criteria noted for each type of data collection?

Only on-site visual inspection or review of a new construction design plan by local TxDOT engineers can confirm the potential of a site for data collection.

Pavement Performance Review

This information is useful in identifying trends in traffic at the site and can determine whether pavement performance at the site is following the expected traffic or may be a failure in pavement design. Area engineers in TxDOT districts have access through the mainframe to data used by the Pavements Section for its Pavements Performance Review. District personnel may also run reports on pavement review on the mainframe if they want to do so. Although interpretation of the data can be a specialized skill, there are usually one or two district personnel capable of analyzing the data. If this analysis is not possible at the district level, Pavements Section personnel are available to create reports and interpret the results.

Current and Future Traffic Generators

District personnel should remain aware of current and future traffic generators at or near a candidate site. Future traffic generators may create levels of truck traffic that are atypical compared to the surrounding area. These traffic generators may produce increased truck traffic not accounted for in pavement design. A need for better monitoring is then warranted at these locations.

SITE REQUIREMENTS FOR COLLECTING TRAFFIC DATA

A candidate site for traffic data collection should possess several characteristics in order to acquire good data. Each method of data collection requires the same basic considerations for a site but with varying degrees of importance. For example, less importance is given to the geometrics of a site for ATR and AVC compared to WIM systems. The major factors for a traffic data collection site are listed below by type of collection.

If there are any questions or concerns about a candidate site for traffic data collection, you may contact:

Traffic Analysis Section
TPP Division
512-486-5000

Speed Counts

Visibility	Operators of the system should have an unobstructed view across the entire roadway.
Power Source	The site must have an adequate power source for longer term counts. It requires an 110V, AC, 60-Hz electrical power supply. Twenty amps must be available for a modem.
Data Communication	The site must also have an adequate data communication link between the site and the remote host computer where data are transmitted and processed. The availability of power and communications allows for extended operation of the automated system. It allows TxDOT to collect longer duration data as needed.
Pavement Condition	No rutting should be evident in the roadway surface. Rutting will degrade the accuracy of the data.
Curvature	The horizontal curvature of the roadway lane in advance of and beyond the sensors should be minimal.
Pavement Cross-Slope	The cross-slope of the road surface shall be minimal and must be constant in advance of and beyond the sensors.
Lane Width	The width of the paved roadway lane in advance of and beyond the sensors shall be between 10 feet and 14 feet.
Vehicle Speeds	The speed limit must be constant in the vicinity of the sensors. Vehicles must be traveling at 25 mph or more. The site should be located away from intersections or entry/exit ramps.
Safety	Sites should be analyzed with safety of personnel and equipment in mind. Can personnel safely access the site for installation and maintenance?

Automated Traffic Recorder (ATR)

Visibility	Operators of the system should have an unobstructed view across the entire roadway.
Traffic	The traffic mix, to include the number and type of trucks, is an important consideration. The site's truck-loading patterns need to be representative of a particular group of roadway types.
Power Source	The site must have an adequate power source for longer term counts. This means an 110V, AC, 60-Hz electrical power supply. Twenty amps must be available for a modem.
Data Communication	The site must also have an adequate data communication link between the site and the remote host computer where data are transmitted and processed. The availability of power and communications allows for extended operation of the automated system. It allows TxDOT to collect longer duration data as needed.
Pavement Condition	No rutting should be evident in the roadway surface. Rutting will degrade the accuracy of the data.

Lane Width — The width of the paved roadway lane in advance of and beyond the sensors shall be between 10 feet and 14 feet.

Safety — Sites should be analyzed with safety of personnel and equipment in mind. Can personnel safely access the site for installation and maintenance?

Automated Vehicle Classification (AVC)

Visibility — Operators of the system should have an unobstructed view across the entire roadway.

Traffic — The traffic mix, to include the number and type of trucks, is an important consideration. The site's truck-loading patterns need to be representative of a particular group of roadway types.

Power Source — The site must have an adequate power source for longer term counts. It requires an 110V, AC, 60-Hz electrical power supply. Twenty amps must be available for a modem.

Data Communication — The site must also have an adequate data communication link between the site and the remote host computer where data are transmitted and processed. The availability of power and communications allows for extended operation of the automated system. It allows TxDOT to collect longer duration data as needed.

Pavement Condition — No rutting should be evident in the roadway surface. Rutting will degrade the accuracy of the data.

Curvature — The horizontal curvature of the roadway lane in advance of and beyond the sensors should be minimal.

Pavement Cross-Slope — The cross-slope of the road surface shall be minimal and must be constant in advance of and beyond the sensors.

Lane Width — The width of the paved roadway lane in advance of and beyond the sensors shall be between 12 feet and 14 feet.

Vehicle Speeds — Vehicles must be traveling at 25 mph or more. The speed limit must be constant in the vicinity of the sensors. The site should be located away from intersections or entry/exit ramps.

Safety — Sites should be analyzed with safety of personnel and equipment in mind. Can personnel safely access the site for installation and maintenance?

Weigh-in-Motion (WIM)

Visibility — Operators of the system should have an unobstructed view across the entire roadway.

Traffic — The traffic mix, to include the number and type of trucks, is an important consideration. The site's truck-loading patterns need to be representative of a particular group of roadway types.

Power Source — The site must have an adequate power source for longer term counts. It requires an 110V, AC, 60-Hz electrical power supply. Twenty amps must be available for a modem.

Data Communication — The site must also have an adequate data communication link between the site and the remote host computer where data are transmitted and processed. The availability of power and communications allows for extended operation of the automated system. It allows TxDOT to collect longer duration data as needed. It also allows a WIM site to be used as an ATR or classification site while truck weight data are not being collected.

Grade — The longitudinal gradient of the road surface in advance of and beyond the sensors should not exceed 2 percent for permanent or site-specific WIM installations.

Pavement Condition No rutting should be evident in the roadway surface. Rutting will degrade the accuracy of the data.

Curvature The horizontal curvature of the roadway lane in advance of and beyond the sensors should be minimal. Load shifts cause variation in the data.

Pavement Cross-Slope The cross-slope of the road surface shall be minimal and must be constant in advance of and beyond the WIM sensors.

Lane Width The width of the paved roadway lane in advance of and beyond the sensors shall be between 12 feet and 14 feet. At least 3 feet of additional clear space for wide loads shall be provided on each side of the collection lane.

Safety Sites should be analyzed with safety of personnel and equipment in mind. Can personnel safely access the site for installation, maintenance, and routine calibration?

Surface Smoothness The surface of the paved roadway 400 feet in advance of and 100 feet beyond the WIM sensors shall be smooth before sensor installation and maintained in a condition so that a 6 inch diameter circular plate 0.125 inch thick cannot be passed beneath a 20 foot long straightedge. The surface of the roadway should be ground smooth after curing and before installing the WIM sensors. Skid resistance of the roadway surface after grinding should be as good as the adjacent surfaces. Smooth, flat pavements that reduce vehicle dynamics significantly improve WIM accuracy.

Pavement Structure A Portland cement concrete pavement structure generally retains its surface smoothness over a longer period of time than a flexible pavement structure under heavy traffic conditions. Installations in pavements likely to rut are a poor investment of limited resources. A 500 foot long, 12 inch thick continuously reinforced concrete pavement (CRCP) or jointed concrete pavement with transverse joints spaced 20 feet or less apart, or asphalt pavement 10 inches thick, is desired for permanent WIM sites on highways and principal arterial highways.

Calibration A significant and recurring calibration effort is required each time WIM equipment is placed at a site. If the system is not calibrated, its static weight estimates can be very inaccurate, even if it accurately reports the vertical forces applied to its surface. Desired calibration circuit time is ≤ 15 minutes. Because pavement conditions change over time, and because those changes affect WIM performance, even permanently installed WIM sensors need periodic calibration. This generally means annual or quarterly calibration of the WIM system as well as following any maintenance or relocation of the site.

Manual Classification Counts

The two primary requirements for manual counts are safety and location of personnel:

Safety This requirement is of paramount concern if data collection is to be done by personnel. The site cannot be in a high crime area, and personnel must be able to park a safe distance off the road on which they are to collect data.

Location Manual count personnel must have a parking spot off the road that provides adequate visibility of the road or lane they are to count.

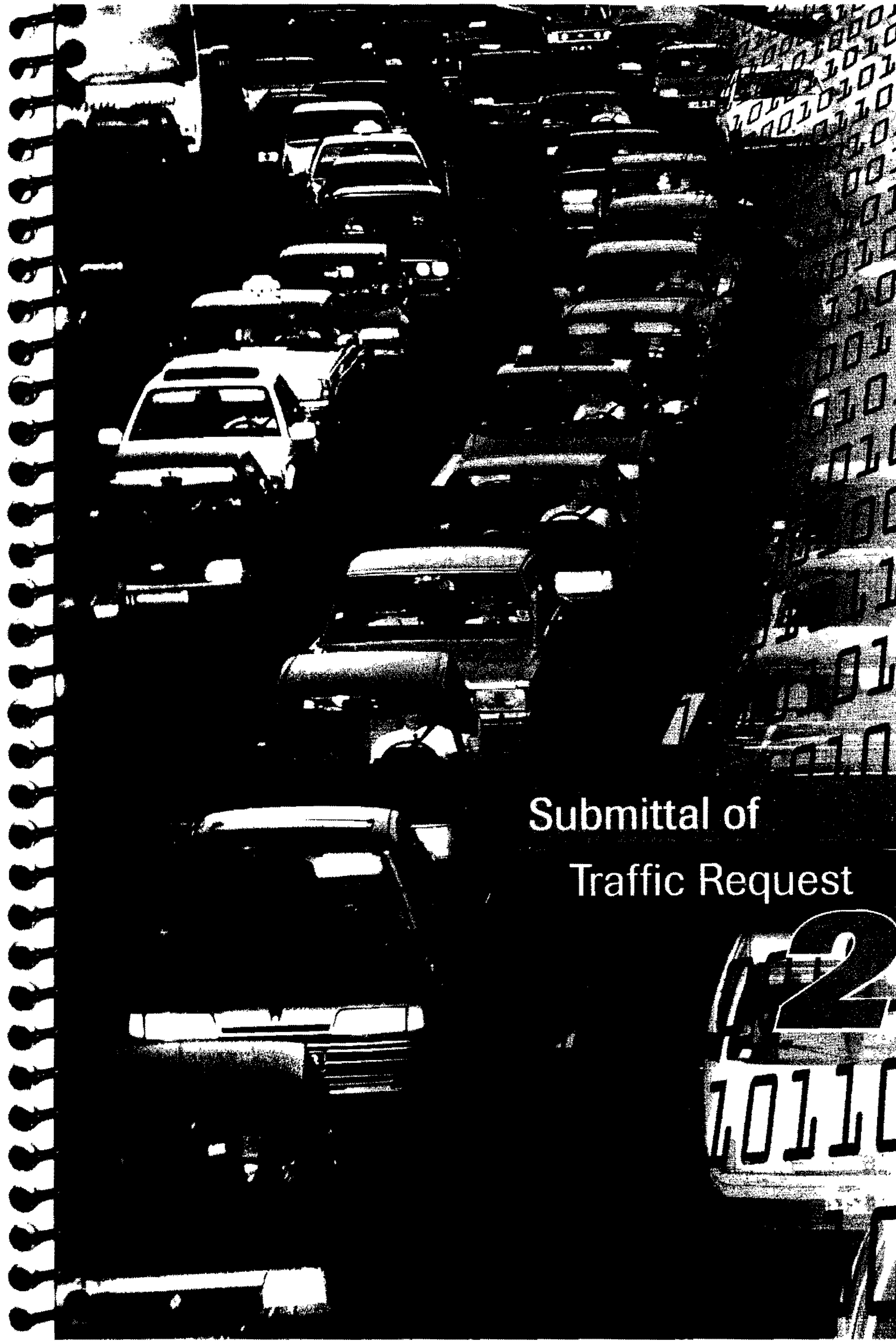
Accumulative Count Recorder (ACR) Tube Counts

Safety

This requirement is of paramount concern if data collection is to be done by personnel. The site cannot be in a high crime area, and personnel must be able to park a safe distance off the road on which they are to collect data.

Coordination

Efforts should be made to coordinate with local city agencies to avoid unnecessary equipment loss.



Traffic data requests require a coordinated effort between districts and the Traffic Analysis Section to accomplish the desired data collection efficiently and accurately. Both the district and TPP have a need for the data. The district needs the data for either a design project or for ongoing truck weight data needs, or both. TPP needs the data as part of its comprehensive statewide data collection plan. Still other TxDOT districts and divisions, as well as other agencies, likewise benefit from an improved statewide plan. Simply stated, coordination of this effort means shared responsibility for the end result and shared costs between the district and TPP.

In light of the other required tasks performed by the Traffic Analysis Section, district personnel should be aware of the amount of time and personnel required to complete traffic data requests at all times. It is the desire of the section to fulfill all requests at the highest professional level. Cooperation between the section and the requestor of data, with awareness of any limitations involved, will ensure a high level of satisfaction with the resulting analysis.

How to Submit Traffic Requests

The request form must be submitted through the District Director of Transportation Planning and Development to the Traffic Analysis Section of the Transportation Planning & Programming Division of TxDOT [TPP(T)]. **Appendix C** shows an organizational chart of the Traffic Analysis Section.

The "Request for Traffic Data" form is used for corridor analysis, pavement design, and environmental studies. The request entails a greater depth of analysis by the Traffic Analysis Section. A "Request for Traffic Counts" form is for more project-specific, short term counts.

If a district would like a permanent data collection site, the "Request for Data Collection Site" form should be submitted. This form is used for all types of traffic data collected at permanent sites. If a WIM site is requested and TPP(T) concurs, then the "WIM Validation Form" will be used to analyze and validate the candidate site.

The request forms are available in **Appendix D** of this guide, the CD-ROM companion, and on the TxDOT intranet. Districts should submit traffic data requests electronically whenever possible.

When to Submit Traffic Requests

The rule of thumb for any traffic data request should be as much advance notice as possible. Shorter lead times will impact resource allocation within the Traffic Analysis Section and strain the data collection process.

What to Submit in Traffic Requests

Districts must supply the Traffic Analysis Section staff with information related to the project location and special circumstances that may affect traffic loading characteristics at the site. Any information from districts regarding new activity centers that generate substantial numbers of truck trips will significantly improve the pavement load forecasting accuracy.

The following items are typical of the preliminary information that must be provided by districts or divisions at the time of the traffic data request:

- TxDOT district,
- county,
- control section job (CSJ) number,
- highway name/limits,
- existing number of traffic lanes,
- proposed number of traffic lanes,
- contact person at the district,
- telephone number of the contact person,
- 8.5 inch by 11 inch site location map,
- traffic schematic diagram if a complete corridor analysis is desired, and
- information regarding existing or proposed traffic generators at or near the project site.

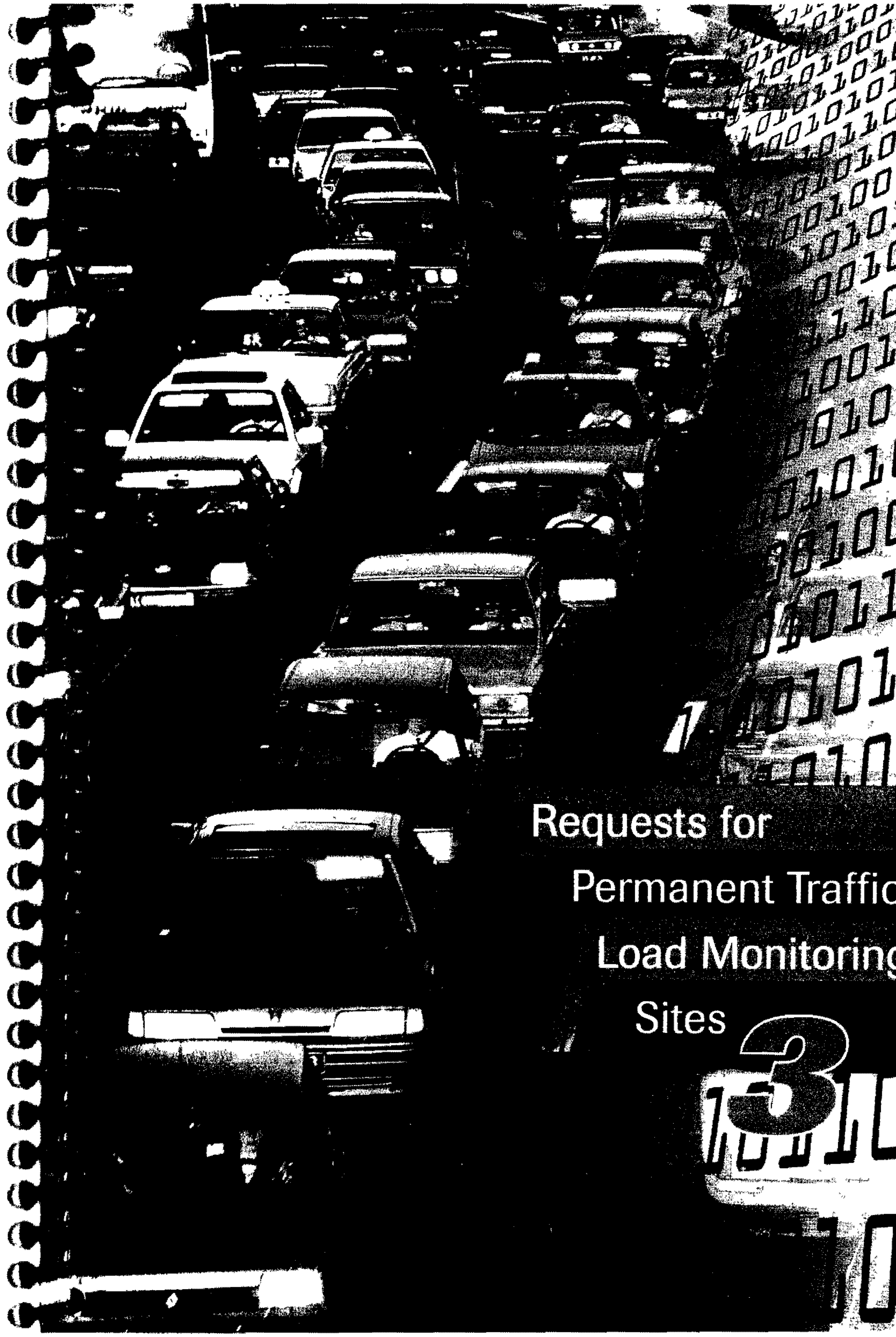
The traffic data provided by the Traffic Analysis Section depend on the type of project and the information requested by the project engineer. The traffic data and related information that are provided to districts by the Traffic Analysis Section for pavements include:

- basic highway traffic data for pavement design, with no line diagram analysis, including:
  - base year average daily traffic (ADT),
  - 20 year ADT forecast (flexible pavement design or signal design),
  - 30 year ADT forecast (rigid pavement design),
  - directional distribution,
  - K-factor,
  - Percent trucks ADT/design hourly volume (DHV),
  - Average ten heaviest wheel loads (ATHWLD),
  - percent tandem axles in the ATHWLD,
  - one direction cumulative 18 Kip ESALs at the end of 20 years (flexible pavement) and 30 years (rigid pavement),
  - slab thickness (8 inches, unless otherwise specified), and
  - structural number (3, unless otherwise specified);
- vehicle classification for environmental studies (air and noise analysis);
- line diagram analysis (straight line turning movements); and
- complete corridor analysis:
  - basic highway traffic data for pavement design,
  - air and noise analysis, and
  - detailed schematic turning movements.

District Financial Responsibilities

The TxDOT district may be responsible for a minimum number of associated costs of selecting, installing, and maintaining a traffic data collection site. The costs for a data collection site are listed by type in **Appendix B**. The costs to the district will vary depending on the type of site.

For ATR, AVC, speed counts, and WIM sites, the district is responsible for traffic control, power installation, road bore, and telephone installation.



Requests for Permanent Traffic Load Monitoring Sites

3

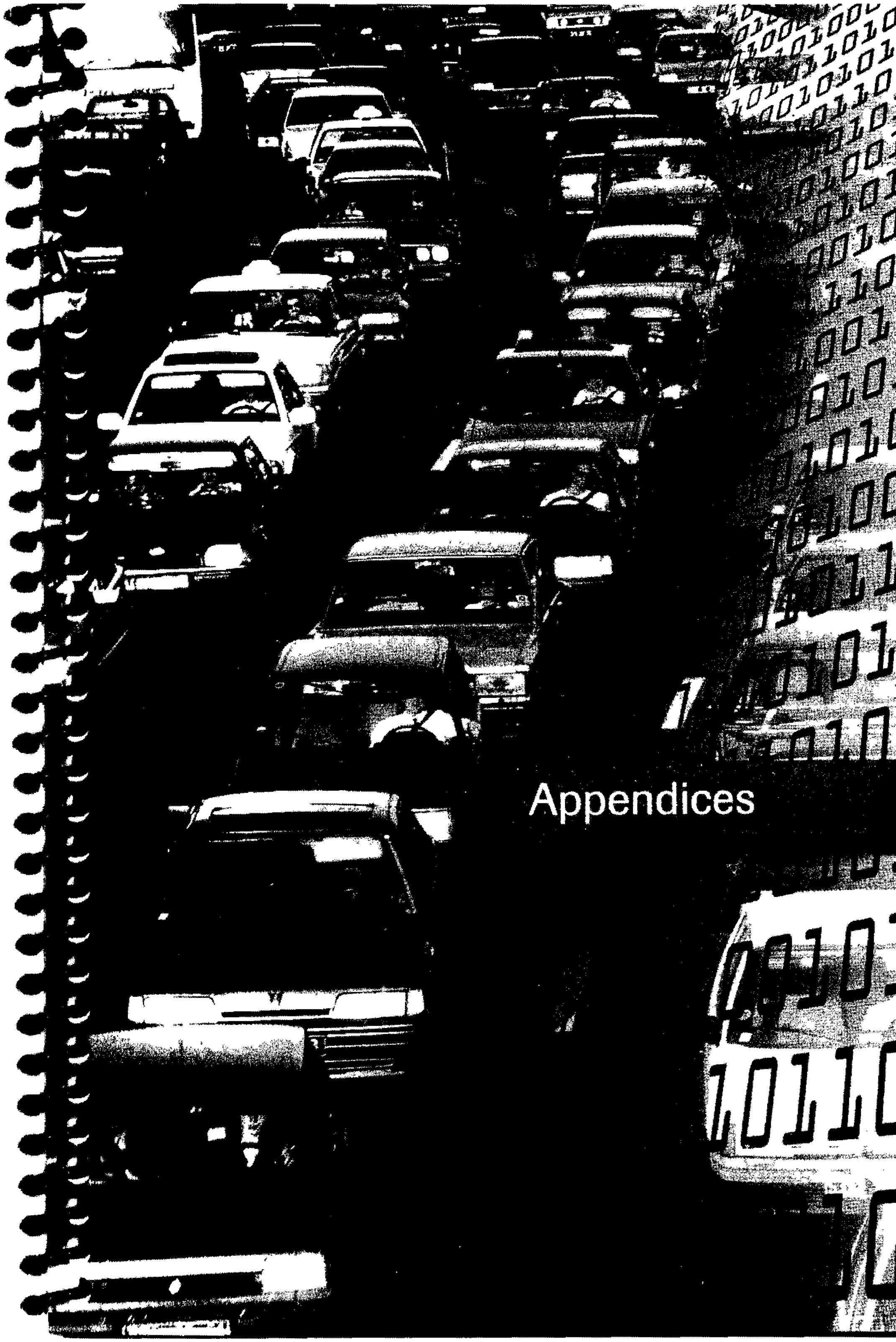
PERMANENT TRAFFIC LOAD MONITORING SITE CONSIDERATIONS

It is vital for TxDOT to have permanent traffic load monitoring sites that operate continuously at locations throughout the state of Texas (see **Appendix E**). These sites are needed to provide a representation of the critical loads traveling over Texas roadways to support both the department's pavement design process and the Pavement Management Information System effort. The Federal Highway Administration now supports the installation of strategically located, as opposed to randomly selected, permanent traffic load monitoring (WIM) sites.

It is very important to know what the critical traffic loads are and to understand why we need to know the critical traffic loads. The critical traffic loads are the worst-case loads that can reasonably be expected to travel over a roadway. Characterization of the critical traffic loads is necessary to prevent premature failure of the roadway pavements.

What locations would be good candidates for WIM? The answer begins with a section of roadway that has relatively high or unusual traffic load conditions based on its functional class and volume group and has the roadway geometry that will allow WIM to function correctly. WIM also requires a smooth pavement surface and utilities to support continuous operation (see pages 11–13). If there is a question regarding the viability of a site, it may be prudent to install and monitor a temporary WIM system to make a more informed decision regarding permanent WIM in 500 feet of CRCP 12 inches thick or asphalt pavement at least 10 inches thick.

Districts that have candidate WIM sites should contact either the director of the Transportation Planning and Programming Division or the engineer of Traffic Analysis through their district engineer or their director of Transportation Planning and Development.



Appendices

Traffic Monitoring Methods, Capabilities, and Limitations

Accumulative Count Recorder (ACR) Tube Counts

Limitations
- Road tubes are not as accurate as permanently installed sensors.
- Multiple lane data collection is less accurate.

Automated Traffic Recorder (ATR)

Capabilities
- least expensive collection method in the long term,
- less stringent site requirements, and
- can yield accurate data in urban areas.

Limitations
- Data are important, but ATR does not provide more qualitative data than other methods.
- Weather can damage equipment.

Automated Vehicle Classification (AVC)

Capabilities
- Classification is separated by direction and stratified using Highway Performance Monitoring System (HPMS) functional classes and area type.
- Traffic speed of 45 mph is optimum.
- AVC can also be used to collect traffic volume data.
- It stores data by specific lane or for all lanes.
- Data are downloaded daily.

Limitations
- Equipment provides for only 14 bins for classifying traffic.
- Rutted pavement creates less accurate data.
- Traffic that is too slow or too fast will create mis-counts.
- Adjacent lane traffic can create false signals to the equipment.
- Weather can damage equipment.
- It cannot be used accurately on congested urban roadways.

Manual Classification Counts

Capabilities

- 24-hour monitoring cycle,
- no site preparation or equipment installation,
- more flexible scheduling, and
- visual identification of vehicles can be more accurate for unusual vehicles.

Limitations

- It is more expensive in the long term and can become cost prohibitive if utilized more than two days.
- Split-second classification decisions required by human counter increases possibility of error.
- Subjectivity between counters may create variability in data.
- Placing data on hard copy every hour distracts counter from the roadway.

Weigh-in-Motion (WIM) Bending Plate and Piezoelectric Class One Sensors

Capabilities

- more accurate data (bending plate is ±10 percent gross vehicle weight [GVW] and piezoelectric is ±15 percent GVW);
- record volume, classification, and weight; and
- piezoelectric can be both permanent and temporary at a site.

Limitations

- requires greater investment for equipment and installation,
- stringent site requirements,
- requires most amount of site preparation, and
- recalibration needs greater than other methods.

Estimated Installation Costs of Automated Traffic Data Collection Systems

Table B-1.
Cost to Install a New Automated Vehicle Classifier (AVC) in Four Lanes.

Item	Unit Cost	Total Cost
ADR 2000	1 machine @ $ 1,855	$ 1,855
ATR Cabinet	1 cabinet @ $ 950	$ 950
Loop Wire	1 roll @ $ 100	$ 100
Loop Sealant	24 tubes @ $ 10	$ 240
Piezoelectric Sensors	8 sensors @ $ 167	$ 1,336
Epoxy	4 cans @ $ 50	$ 200
Misc. Parts (conduit, etc.)	$ 150	$ 150
Labor	10 hours @ $ 30	$ 300
Travel	mileage/per diem for 2 FTE	$ 250
Traffic Control	*4 lanes @ $ 1,000*	*$ 4,000*
Power Installation	*1 power pole & meter @ $ 280*	*$ 280*
Road Bore	*$ 5,000*	*$ 5,000*
Telephone Installation	*$ 50*	*$ 50*
	Total Cost	**$14,711**

District costs in *italics*.
* Traffic control costs vary based on local district contract pricing.
** The costs for power and telephone are estimates based on the use of landlines. Solar power and cellular communications are options.

Table B-2.

Cost to Install an Automated Traffic Recorder (ATR) in Four Lanes.

Item	Unit Cost	Total Cost
ADR 2000	1 machine @ $ 1,615	$ 1,615
ATR Cabinet	1 cabinet @ $ 950	$ 950
Loop Wire	1 roll @ $ 100	$ 100
Loop Sealant	18 tubes @ $ 10	$ 180
Misc. Parts (conduit, etc.)	$ 50	$ 50
Labor	7 hours @ $ 30	$ 210
Travel	mileage/per diem for 2 FTE	$ 250
Traffic Control	*4 lanes @ $ 1,000**	*$ 4,000*
Power Installation	*1 power pole and meter $ 280*	*$ 280*
Road Bore	*$ 5,000*	*$ 5,000*
Telephone Installation	*$ 50***	*$ 50*
	Total Cost	**$12,685**

District costs in *italics*.
* Traffic control costs vary based on local district contract pricing.
** The costs for power and telephone are estimates based on the use of landlines. Solar power and cellular communications are options.

Table B-3.

Comparison of ATR and AVC Installation Costs in Four Lanes.

Item	ATR	AVC
ADR 2000	$ 1,615	$ 1,855
ATR Cabinet	$ 950	$ 950
Loop Wire	$ 100	$ 100
Loop Sealant	$ 180	$ 240
Piezoelectric Sensors	n/a	$ 1,336
Epoxy	$ 180	$ 200
Misc. Parts (conduit, etc.)	$ 50	$ 150
Labor	$ 210	$ 300
Travel	$ 250	$ 250
Traffic Control	*$ 4,000*	*$ 4,000*
Power Installation (1 power pole & meter)	*$ 280*	*$ 280*
Road Bore	*$5,000*	*$ 5,000*
Telephone Installation	*$ 50*	*$ 50*
Total Cost	**$12,685**	**$ 14,711**

District costs in *italics*.
* Traffic control costs vary based on local district contract pricing.
** The costs for power and telephone are estimates based on the use of landlines. Solar power and cellular communications are options.

Table B-4.

Cost to Install Bending Plate WIM in Four Lanes.

Item	Unit Cost	Total Cost
PAT 4-Lane System	$ 65,000	$65,000
ATR Cabinet	1 cabinet @ $ 950	$ 950
Loop and Weigh Pad Wire	4 spools @ $ 100	$ 400
Loop Sealant	24 tubes @ $ 10	$ 240
Epoxy	150 cans @ $ 25	$ 3,750
Misc. Parts (conduit, etc.)	$ 300	$ 300
Labor	6/10 hr days @ $ 60 hr	$ 3,600
Travel	mileage + 4 FTE × 80 × 6 days	$ 2,000
Traffic Control	*4 lanes @ $ 1,000 × 4 days*	*$16,000*
Power Installation	*1 power pole & meter @ $ 280*	*$ 280*
Road Bore	*$ 5,000*	*$ 5,000*
Telephone Installation	*$ 50*	*$ 50*
	Total Cost	**$97,570**

District costs in *italics*.
* Traffic control costs vary based on local district contract pricing.
** The costs for power and telephone are estimates based on the use of landlines. Solar power and cellular communications are options.

Table B-5.

Cost to Install Piezoelectric WIM in Four Lanes.

Item	Unit Cost	Total Cost
ECM Hesita Portable CPU	$ 8,606	$ 8,606
ATR Cabinet	1 cabinet @ $ 950	$ 950
Loop Wire	1 roll @ $ 100	$ 100
Loop Sealant	24 tubes @ 10	$ 240
Piezoelectric Sensors	8 sensors @ $ 925	$ 7,400
Epoxy	48 cans @ $ 50	$ 2,400
Misc. Parts (conduit, etc.)	$ 150	$ 150
Labor	10 hours @ $ 30	$ 300
Travel	mileage/per diem for 2 FTE	$ 250
Traffic Control	*4 lanes @ $ 1,000*	*$ 4,000*
Power Installation	*1 power pole & meter @ $ 280*	*$ 280*
Road Bore	*$ 5,000*	*$ 5,000*
Telephone Installation	*$ 50*	*$ 50*
	Total Cost	**$27,326**

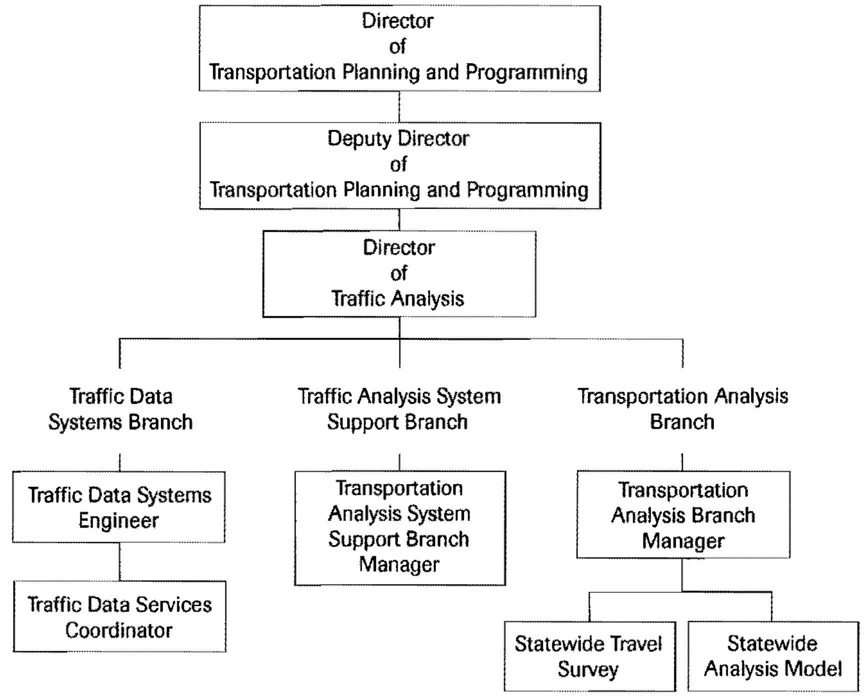
District costs in *italics*.
* Traffic control costs vary based on local district contract pricing.
** The costs for power and telephone are estimates based on the use of landlines. Solar power and cellular communications are options.

Table B-6.

Optional CRCP Pad for Weighing in Four Lanes.

Item	Unit Cost	Total Cost
CRCP	$ 400,000	$400,000
Surface Grinding	$ 15,000	$ 15,000
	Total Cost	**$415,000**

Organizational Chart of TPP(T)



Traffic Data Request Forms

Request for Traffic Data

Request for Traffic Counts

Request for Data Collection Site

WIM Validation Form

WIM VALIDATION FORM

WIM Validation Form

Date:	**Surveyed by:**					
State: TX **County:**	**Site #:** (provided by TPP)					
Route: **Functional class:**	**Mile marker:** Distance between crossover/turnaround: Both directions:					
Location description:						
Average daily traffic: **Year:**	**Daily number of trucks:** **Year:**					
Existing pavement type:	**Approx. age:**					
Conditions 400' before And 100' after the scale		Lane				
		1	2	3	4	
No cracks (in scale/sensor area only)						
No horizontal curves						
Roadway grades less than 2%						
Wheel path ruts less than ¼" for piezo WIM 1/8" for bending plate WIM						
Smoothness criteria: a 6" dia., 1/8" thick plate cannot pass beneath a 20' long straightedge (ASTM E-1318-02 6.1.5)						
Trucks not seen bouncing at scale site and up to 75' before						
Other remarks: Attach digital pictures: Distance to telephone: For solar powered stations: 94% of sunshine on panel: Electronic cabinet distance between shoulder-cabinet: Shoulder type and width: Median type and width: Recommended corrective actions:	 Distance to power:					
TPP use only Site approved:	 Site not approved:					

TPP(T) Form 2125

Request for Data Collection Site

Date: ______________________

FROM: ____

TO: ____

District____

County____

Highway(s): ______________________ Functional Classification: ______________________

Site Description/Physical Address (Please reference closest intersection): ______________________

____

Please include a map of the potential site to process this request.

Data Collection Site Type:

_______ Traffic Recorder (ATR) _______ Speed Data Collection Site

_______ Automatic Vehicle Classification (AVC) _______ Weigh-in-Motion (WIM)

Site Assessment/Condition:

Is the proposed site new construction or on an existing roadway? ______________________

Is there an available utility (power) source at or near the site location? ☐ Yes ☐ No

Utilities Co./Contact: ______________________ Phone No. ______________________

Is there an available phone (landline) source at or near the site location? ☐ Yes ☐ No

Phone Co./Contact: ______________________ Phone No. ______________________

Is there an available 911 (House) Address? ☐ Yes ☐ No If yes, please specify: ______________________

Traffic Flow Conditions:

Is the traffic condition at site: ☐ Free-flowing ☐ Congested/Stop and Go

Special Traffic Generators (Please Specify): ______________________

____

Additional Info: ____

____

Requestor Contact Info: ______________________ Contact Phone No. ______________________

For questions or assistance pertaining to this request please call (512) 465-7545.

REQUEST FOR TRAFFIC COUNTS

TPP(T) Form 2123

Request for Traffic Counts

Date: ______________________

FROM: ____

TO: ____

County (s) ____

Highway (s) ____

Limits of Project: ____

____

____

Maps must be included to process this request.

Volume counts indicated on attached maps: V001, V002, V003, etc......

Classification counts indicated on attached maps: C001, C002, C003, etc.....

Length of requested counts: ☐ 24 hour ☐ 48 hour ☐ Other______________________ *Please Specify*

Type and Number of counts requested: Volume # ______ Classification # ______ Other ______________ *Please Specify*

Information needed by: ______________________ *Date*

Transportation Analysis Contact Person: ______________________ *Phone*

Please note special traffic generators:

____

____

Additional Information

____

____

____

Data collected by: ______________________ Phone Number ______________________

REQUEST FOR TRAFFIC DATA

TPP(T) Form 2124

Request for Traffic Data

Date: ____________________

District: ________ County: ________ CSJ: ________

Highway: _______ Limits: _______

Texas Reference Marker System:

From Marker: ____________________ From Displacement: ____________________

To Marker: ____________________ To Displacement: ____________________

From DFO: ____________________ To DFO: ____________________

Is it in the UTP: ______ District Priority: ______ Est. Letting Date: ______

Existing Number of Lanes: ______________

Proposed Number of Lanes: ______________

District Contact Person: ____

Telephone Number: ____________________

Please attach an 8 1/2" × 11" location map and make note of any existing or proposed development that will be a traffic generator.

The following to be completed: (please mark information to be provided)

☐ 1. Basic Highway Traffic Data for pavement design (no line diagram analysis required)
- Base year/Beginning year: ______________
- Forecasted 20 year
- Forecasted 30 year
- Directional Distribution
- K-factor
- Percent Trucks ADT/DHV
- Average Ten Heaviest Wheel Loads (ATHWLD)
- Percent Tandem Axles in the ATHWLD
- One Directional Cumulative 18 KSA at the end of the **20 years/30 years**
- Slab Thickness (8" unless otherwise specified): ______________
- Structural Number (3 unless otherwise specified): ______________

☐ 2. Vehicle classification for environmental studies **(Air and Noise Analysis)**

☐ 3. Line diagram analysis (straight line turning movements: **please provide diagram)**

☐ 4. Complete corridor analysis (includes basic highway traffic data for pavement design, environmental studies, and detailed schematic turning movements) (*please provide detailed schematic*)

Note: If complete corridor analysis is requested, please attach a traffic schematic diagram.

MAPS

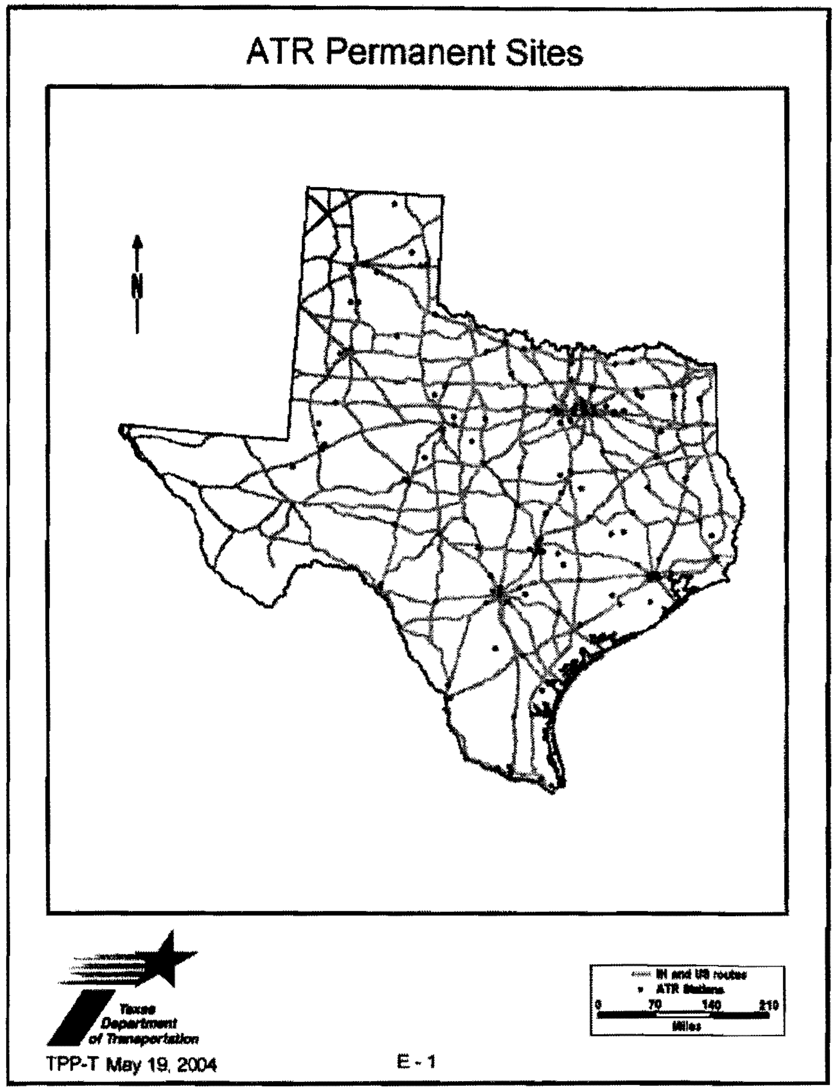


Figure E-1. Automated Traffic Recorder Sites.

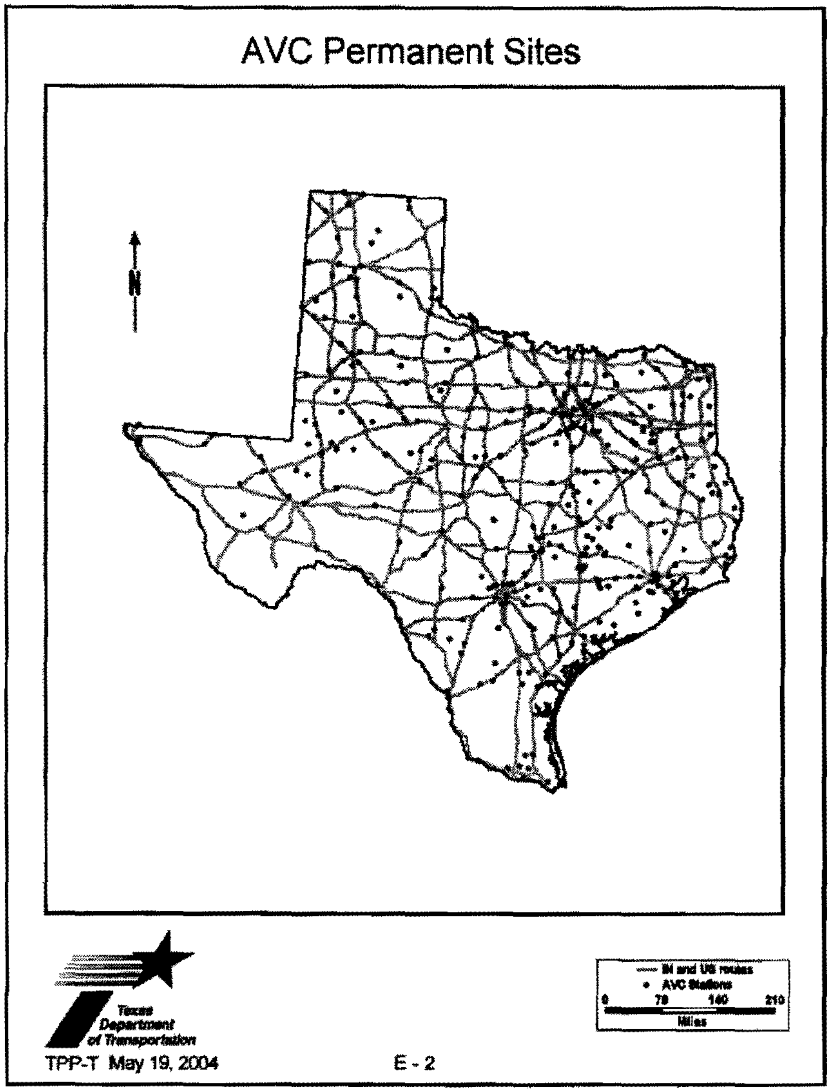


Figure E-2. Automated Vehicle Classification Sites.

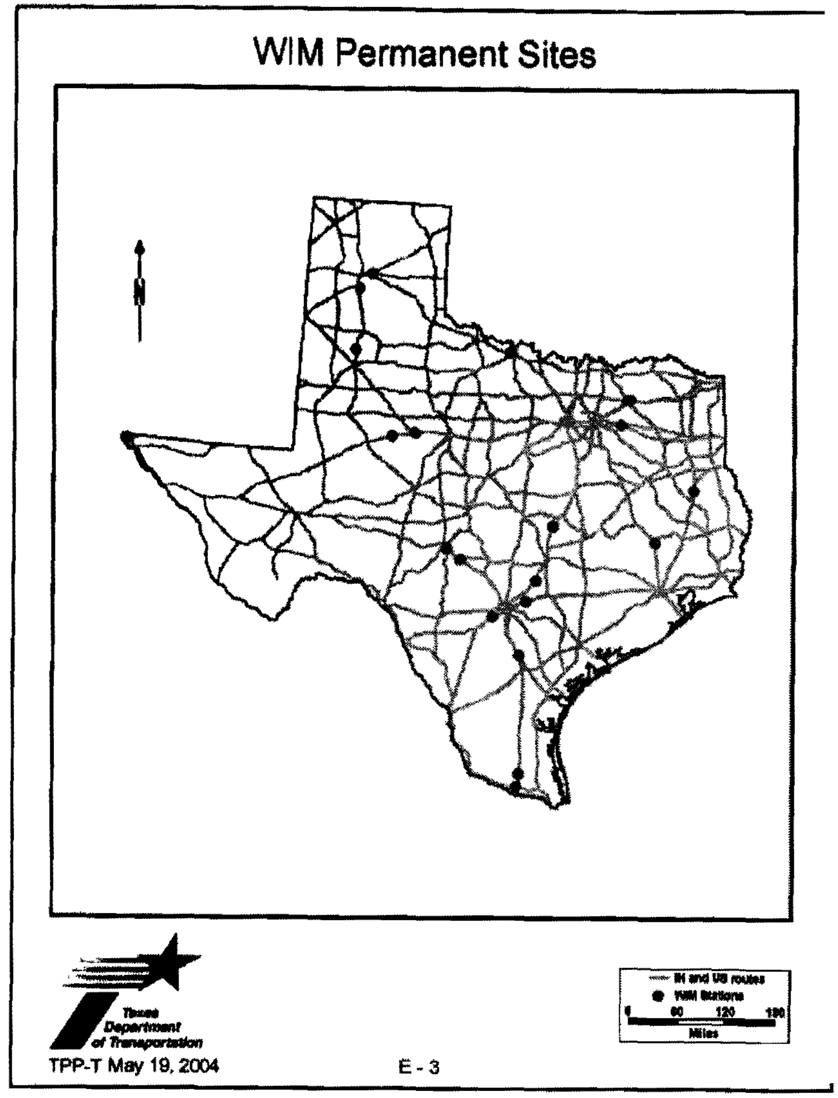


Figure E-3. Weigh-in-Motion Sites (Bending Plate and Piezoelectric).

CONTACT INFORMATION

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