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Project Design of External Station Survey Methodologies  
for High-Volume Locations

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## Summary of High-Volume External Survey Methods for TxDOT

External travel surveys collect important information on local travel needed by the Texas Department of Transportation (TxDOT) and metropolitan planning organizations (MPOs) in Texas for travel demand modeling. These surveys, often termed “roadside” surveys, are typically conducted at or near the boundaries of urbanized areas to collect information on the amount and characteristics of vehicles traveling into, out of, and through a defined study area.

For roadways with low to moderate traffic levels, external surveys can be safely conducted using a roadside interview method as shown in [Figure 1](#). Under this method a traffic control plan is established and field personnel randomly stop and request motorists’ participation in the survey. This “intercept” method cannot be utilized on high-volume facilities, such as shown in [Figure 2](#), due to unsafe conditions and unacceptable levels of delay that it creates. Since high-volume facilities often carry the majority of traffic going into and out of urbanized areas, research was needed to develop a safe and acceptable method for conducting external surveys on these facilities.

How to properly collect travel survey data on high-volume



Figure 1. Roadside Survey on Low-Volume Facility.

facilities is not an issue unique to Texas and TxDOT, but an issue being faced by many state departments of transportation and jurisdictions around the United States. To this end, the objective of the research project was to determine the most viable methodology(s) for collecting external survey data on high-volume facilities that are best suited for use in TxDOT’s Travel Survey Program (TSP).

### What We Did...

The research team reviewed over 25 origin-destination travel surveys from 16 states that were conducted within the past 10 years. The team assessed the

types of high-volume survey methods used, the technology utilized to collect data, and key policies or regulations in place which impacted the methodology used in the survey. The research assessed the state of the practice in high-volume survey methods and examined new and emerging technologies in the collection of travel survey data. The project also researched the legal and privacy issues related to the use of video license capture and state motor vehicle records in travel surveys.

The research reviewed the importance of collecting data at high-volume external station locations within Texas. An



inventory of external stations for each of the state's 25 MPOs determined which areas were most affected by high-volume facilities. Researchers identified and compared survey data elements that are collected with different survey methods and documented use of these elements in travel demand model development and calibration.

Based on years of field observation, TxDOT has had a long-standing policy that roadways with two-way volumes greater than 20,000 annual average daily traffic (AADT) should be surveyed using a high-volume method. To evaluate this policy, the research correlated traffic volume levels on various roadway facility types with queuing and delay. Researchers conducted queuing analyses based on TxDOT traffic control plans (TCP) used for travel surveys. The analyses evaluated the impact of lane reductions and lane blockages and identified maximum traffic volume levels that could be surveyed without creating unacceptable levels of queuing and delay at survey sites.

The research team evaluated all high-volume methods identified from around the country and considered key factors such as safety, disruption/delay, the use of motor vehicle records, data elements collected and not collected, data quality, and potential for negative public feedback. Weighing the advantages and disadvantages of these factors, researchers recommended the most viable high-volume methods for use in TxDOT's travel survey program for both non-commercial and commercial vehicle surveys. To implement the recommendations, researchers detailed the revisions needed to TxDOT's external survey bid specifications.

### What We Found...

The research found that high-volume facilities have a significant impact on travel surveys in Texas. It revealed that while only 8 percent of the survey stations for the state's 25 MPOs are high-volume, these locations account for over 46 percent of the

total traffic traversing MPO study area boundaries. This finding highlights the need and importance of collecting travel survey data on high-volume facilities.

The research identified nine high-volume survey methods in travel surveys, which were consolidated into the four following categories:

- (1) intercept interview,
- (2) intercept postcard mailback,
- (3) license match, and
- (4) license mailout.

Figure 3 shows an example of a typical setup to capture license plates on a high-volume facility using a video camcorder. This setup is commonly used for license match and license mailout surveys.

For non-commercial vehicles, a video license mailout method using state motor vehicle records was the most frequently used high-volume method. Of the 29 travel surveys reviewed in the research, 17 used this method. For commercial vehicles, an intercept interview survey at weigh stations, rest areas, and truck stops was the most frequently cited method.

Several major metropolitan areas in recent years have conducted intercept interview surveys for non-commercial vehicles on or near low-volume interstate off ramps. Additionally, several other surveys used a license match method, but only a few external studies intercepted vehicles to distribute postcard mailback surveys to motorists.



Figure 2. High-Volume Facility.



Figure 3. Video License Capture on High-Volume Facility.



The queuing analysis found that for surveys using a “bottleneck” traffic control plan where a lane is dropped, the 20,000 AADT value currently being utilized by TxDOT is an acceptable threshold when making a high-volume determination. The analysis found that survey queue lengths begin to increase substantially once volumes in the direction of the survey reach approximately 1000 vehicles per hour (vph). Figure 4 shows the effects of a survey station on queue lengths as volumes increase.

### The Researchers Recommend...

Researchers recommend that collecting origin/destination information on high-volume facilities be handled using a flexible approach where a variety of options are available. The approach should allow for the most viable method or combination of methods to be used that best suit the physical conditions of the location and policies of TxDOT and other affected agencies.

For non-commercial vehicle surveys, it is recommended that TxDOT use a license mailout survey method as its primary method to collect the key data elements needed for

travel demand model updates for the following reasons:

- Though data quality is a trade-off, the license mailout survey is safer than intercepts, can collect all key data elements needed for model updates, and is the most viable option.
- Despite being safe and causing no disruption to motorists, license match surveys may not be cost-effective or worth their high level of effort since they only collect one data element.
- While the data quality of mailout surveys is inferior to that of intercept surveys, enough complete and usable mailout survey responses can be obtained by adjusting sample levels. In addition, mailout survey forms can be simplified to improve accuracy and response rates.
- Negative feedback/relations can be addressed and minimized through a combination of proactive public relations measures prior to and during the survey.

If it is decided that a license mailout survey cannot be conducted at a particular location, researchers recommend use of a license match

survey in combination with intercept interview surveys at or near low-volume exit ramps.

For commercial vehicles, TxDOT should continue to use intercept interview surveys at facilities along high-volume routes such as rest areas, truck stops, and weigh stations that are located at or near the survey area boundary. In certain areas of the state, highway border patrol checkpoints may also be used for commercial vehicle surveys.

The research found a number of high-volume survey methods that are viable but typically not feasible for widespread use. Such methods may supplement data collection efforts of license match and mailout survey methods recommended for TxDOT’s TSP. Supplemental high-volume methods recommended for potential use include the following:

- Intercept postcard mailback surveys at/near freeway exit ramps. While an intercept interview survey is recommended over a postcard mailback at these locations, site-specific conditions or local policies could make postcard distribution the preferred method. This method should be used only for non-commercial surveys.
- Intercept interview or postcard mailback surveys at rest areas. When a rest area that is conducive to operating a survey station is located near a survey area boundary, either an intercept or postcard mailback survey could potentially be conducted at such facilities. The use of these methods would be contingent upon the development of a TCP that allows for samples of vehicles to be safely flagged from the freeway and into the site.
- Intercept postcard mailback surveys at toll plazas. This method is limited to only a few survey regions and will be viable only for external surveys when the toll collection facility is near the survey area boundary.

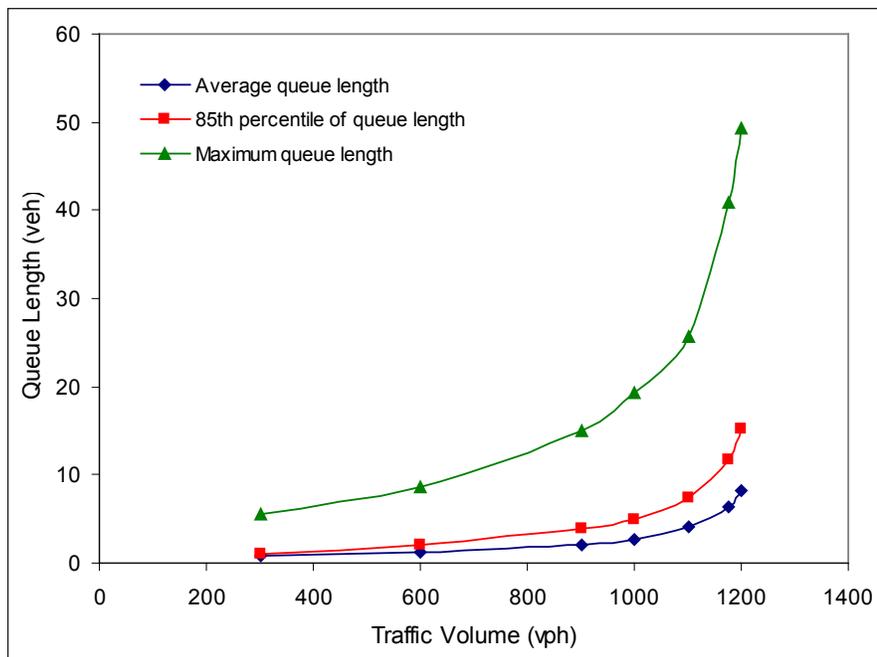


Figure 4. Effect of Bottleneck on Queue Length.



## For More Details...

The research is documented in the following report:

[Report 0-4869-1](#), *Evaluation of External Station Survey Methodologies for High-Volume Locations*

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## Disclaimer

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