TXDOT USES OF REAL-TIME COMMERCIAL TRAFFIC DATA:

OPPORTUNITY MATRIX

by

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DISCLAIMER

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INTRODUCTION

Based on a TxDOT survey, a review of other state DOTs, and researcher understanding of Intelligent Transportation System (ITS) needs, the Texas Transportation Institute (TTI) team developed a comprehensive list of opportunities for TxDOT to consider pertaining to future use of private sector (PS) data. Specific opportunities for applying private data were reviewed in light of accuracy of the data, coverage areas, data availability, cost, and control of the data stream. The list of opportunities considered included:

- Enhance traveler information in urban areas such as:
  - Travel time information.
  - Levels of congestion.
  - Speed measurement.
  - Alternate routes.
- Introduce traveler information in areas where ITS deployment is not cost-effective.
- Improve continuity of data based on existing ITS coverage across jurisdictions.
- Develop a statewide 511 system.
- Reduce ITS deployment costs by limiting deployment of fixed data collection devices.

TxDOT has deployed a variety of field devices to relay traveler information to motorists and other users. These devices include dynamic message signs, highway advisory radio, and others. In many urban areas, Transportation Management Centers (TMCs) receive data from vehicle sensors and cameras, and the data are processed and converted to useful information to be disseminated to the traveling public. However, there are situations where gaps in coverage exist and where private sector data could fill the gaps. For example, when TMCs detour traffic from freeways to surface streets, there might not be any means of monitoring the congestion levels on the streets without private data. The same could be true of rural areas where the deployment of ITS is minimal.

If private agencies have coverage on these roadways and have sufficient data, TxDOT could purchase the data and provide traveler information without making huge investments to deploy ITS. Even with much of the desired coverage in place through past TxDOT efforts, it is conceivable that data from private providers could fill in gaps that would be difficult or unfeasible using traditional methods.

BASIC FINDINGS

To gather information on providers and consumers of private sector data, the research team conducted a survey of the providers and consumers listed in Table 1.

Table 2 summarizes the results of the consumer survey, and Table 3 summarizes the provider survey.

Table 1. Providers and Consumers Providing Input.

Private Data Providers	Consumers of Private Data
Air Sage	Houston-Galveston Area Council
ATRI	Maricopa Association of Governments
INRIX	Michigan Department of Transportation
NAVTEQ	San Francisco Bay Area 511 Program
TomTom	Texas Department of Transportation
TrafficCast.com	Wisconsin Department of Transportation

Table 2. Summary of Historical Data Consumer Survey Results.

	Wisconsin DOT	HGAC	Michigan DOT	TxDOT [d]	Phoenix MPO (MAG)
Status	RFI	Purchased	Purchased	Purchased	Purchased
Service Purchased [a]	H	H	H	H	H
Aggregation Level	Hourly day-of-week averages	15 min	5 min	Hourly day-of-week averages	Weekday
Data Purchased [b]	S/TT, PM	S/TT	S/TT	S/TT, PM	PM
Applications [c]	PM, TM	PM, TM, OD	PM	PM	PM
Coverage	All arterials	Houston region	MI Freeways	Statewide TMC network	Region
Timeframe	1–2 years	1 year	5 years	2009	1 year
Validation Criteria	Not yet established	Not yet established	Avail 99.5% Accuracy less than ± 10 mph	None	Not yet established
Validation techniques	N/A	N/A	Probe, fixed point, re-id	None	Probe, fixed point.
Pricing (in thousands)	$80K (Est.)	$77K	$200K per year	$28K	Negotiating
Licensing	Multiple Use	Multiple Use	Single Use	Single Use	Multiple Use

[a] Service Purchased: H = Historical, RT = Real-time
[b] Data Purchased: S/TT = Speed or Travel Time, PM = Performance Measures
[c] Applications: PM = Performance or Congestion Monitoring, TM = Traffic Model Validation or Calibration, OD = Origin-Destination Studies
[d] See http://apps.dot.state.tx.us/apps/rider56/list.htm for actual study results.

Table 3. Summary of Historical Data Available by Provider.

Factor	AirSage	ATRI	INRIX	NAVTEQ	TomTom	TrafficCast
Data Available [(a)]	S, TT, I, Q, V	S, TT, Q	S, TT, I, Q, V	S, TT, I, Q, V (portion of network)	S, TT, I, Q	S, TT, I, Q
Services Available [(b)]	D, A, PM	D, A, PM	D, A	D, A	D, A, PM	A,PM
Data Source [(e)]	Cell phone, 911, traffic counts.	GPS on commercial truck-only fleets.	State installed sensors, commercial fleets, consumer GPS.	State installed sensors, commercial fleets, consumer GPS.	Consumer GPS, Fleet GPS.	State installed sensors, commercial fleets, consumer GPS, Bluetooth systems.
Aggregation Levels for Historical Usage	None; as captured	1 mile, 1 minute	15–60 minutes	15 minutes	1 hour	15 minutes
Accuracy Checks Performed	Visual camera count, Probe vehicles.	Anomaly checking done, routines not disclosed.	Independently verified in large-scale testing.	Data checks prior to map matching. Comprehensive drive testing.	Data checks prior to map matching.	Simple-adjacent points compared, some clients doing accuracy checks.
Documented Quality Levels	None provided. Stated they meet Section 511 requirements.	None-burden is on receiver of data.	Accuracy above 95% Availability above 99.9.	None provided.	None provided. Stated they can meet Section 511 requirements.	None provided. Stated they can meet Section 511 requirements.
Pricing	Specific pricing information not provided.	Specific pricing information not provided. Not for profit.	Full use open licensing is \$800 per mile per year plus \$200 per mile one-time setup fee. 25% discount on other roads purchased in conjunction.	Specific pricing information not provided.	Specific pricing information not provided.	Specific pricing information not provided.

[a] Data Available: S = Speed, TT = Travel Time, I = Incidents, Q = Quality, V = Volumes, GPS = GPS fleet
[b] Services Available: D = Discrete Data (individual data points), A = Aggregate Data, PM = Performance Measures
[c] National Coverage: Not listed in table. All providers indicated national coverage, except TrafficCast which is currently in urban areas.
[d] Map Matching: Not listed in table. All providers except ATRI indicated a minimum use of TMC. ATRI uses mileposts. INRIX, NAVTEQ, and TomTom also use proprietary segmentation smaller than TMC.

Preliminary TxDOT Input

The research team conducted a webinar to provide information on private sector data providers and consumers, then ask for participant feedback by having TxDOT engineers (mostly districts) complete a survey. Feedback from 20 TxDOT participants indicated the following:

- TxDOT responders on average ranked accuracy and cost-effectiveness higher than availability and quick turnaround.
- For enhancement of traveler information, speed/travel time measurement ranked slightly higher on average than alternate route information or levels of congestion.
- On average, creating uniform coverage rated higher than cost-effectiveness and reduction of TxDOT's reliance on fixed sensors.
- Assuming data purchased from PS providers, all 20 responders said TxDOT forces would continue to collect count data since PS providers do not typically provide counts.
- Per lane data were not critical to 10 responders but it was to seven.
- On average, TxDOT responders said that if fixed sensors reach a 60 percent failure rate, they would purchase real-time data from the PS.
- If responders purchased PS historical data, they would use it for origin-destination studies and for model calibration.
- Using the Traffic Message Channel was not a deterrent to using PS data for seven responders, but it was to four.
- Responders suggested the following examples of long-term opportunities for PS data:
    - Tolling.
    - Operational validation.
    - Hurricane evacuation.
    - Other evacuations (non-hurricane).
    - Flooding.
    - International POEs.
    - Border violence (causing traffic anomalies).
    - Work zones (two comments).
    - O-D freight (re: rail).
    - Real-time system management.
    - USDOT mandate for real-time monitoring systems (Sec 1201).
    - Incident avoidance.
    - Special events (two comments).
    - Travel time comparison I-35/SH 130.

FACTORS CRITICAL TO TXDOT

The key factors that appear to be most important to the Texas Department of Transportation (TxDOT) in deciding whether to purchase private sector data are:

- Meeting Federal Requirements for data coverage (SAFETEA-LU).
- Data accuracy and availability (includes consideration of the data source).
- Life-cycle cost.
- Network coverage.
- Control of the data stream.

SAFETEA-LU Requirements

Section 1201 of the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU), published on November 8, 2010, establishes the provisions and minimum parameters for the Real-Time System Management Information Program to be established by state DOTs, other responsible agencies, and partnerships with other commercial entities. SAFETEA-LU mandates that the program be established on all Interstate routes within four years (November 8, 2014) and on other significant roadways as identified by the states and local agencies within six years (November 8, 2016). Table 4 identifies the key requirements of the information delivery timeframes.

Table 4. Information Delivery Requirements of Section 1201.

Information Type	Metropolitan Area (Minutes)	Non-Metropolitan Area (Minutes)	Availability (Percent)	Accuracy (Percent)
Implementation or removal of lane closure	10	20	90	85
Roadway- or lane-blocking traffic incident information	10	20	90	85
Roadway weather observation updates	20	20	90	85
Travel time along highway segments	10	N/A	90	85

Data Accuracy and Availability

The options being considered in this analysis are: use of fixed sensors (e.g., inductive loops or non-intrusive technologies), use of private sector data, or a combination of the two. Fixed sensors that TxDOT uses for collecting real-time data include the following primary technologies:

- Inductive loops.
- Video imaging detectors.
- Radar detectors.
- Magnetometers.

Consideration of strengths and weaknesses of fixed sensors versus private sector data is appropriate to maximize the use of known information about each approach. Each source of data has its own inherent strengths and weaknesses, so TxDOT should weigh each of the metrics in terms of its importance in TxDOT practice.

TxDOT-Maintained Fixed Sensors

Detection Accuracy. Inductive loops are the most mature of the technologies listed, so installers know much about how to install them. The best count accuracy for vehicle detection assuming proper installation and maintenance of inductive loops indicates ±2 percent error. A more realistic range for count accuracy is ±5 percent. Speed errors are often in the ±5–10 percent range.

Video imaging accuracy is a function of lighting and weather conditions, and their position beside and above the roadway. Occlusion is a function of the mounting height and lateral distance from lanes being monitored, and it compromises accuracy in most situations. The best count accuracy for vehicle detection using video (assuming perfect weather and daylight conditions) is about ±5 percent error. Count accuracy for nighttime conditions and/or poor weather and with a high percentage of tall vehicles falls within ±10–20 percent. Speed errors are usually in the ±5–10 percent range.

Radar detectors (typically mounted side-fire) are not affected significantly by weather or light conditions but are affected by occlusion, which (like video) is a function of the mounting height and lateral offset from detected lanes. The best count accuracy for vehicle detection using radar is in the ±2–5 percent error range but can be as high as ±5–10 percent with high truck percentages. Speed errors are usually in the ±5–8 percent range.

Magnetometers mounted in the pavement are becoming more prevalent as loop replacements and are about as consistent as loops for detection of most vehicles. Problematic vehicles include motorcycles and large trucks. Of course, no weather or light conditions affect their performance and occlusion is not an issue. The best count accuracy for vehicle detection with Sensys Networks magnetometers is ±2 percent error. A more realistic range for count accuracy is ±5 percent. Using single magnetometers (two stations per lane spaced a known distance apart longitudinally) often results in speed errors within the ±2–10 percent range.

Performance improves (e.g., motorcycle detection) by using multiple magnetometers instead of just one. Software enhancements improve truck detection.

Data Source. With fixed sensors, TxDOT usually has full control of the data source and determines the quality of the data and whether the data are useful. TMC control in larger urban areas usually means that the data coming into the center goes through a Q/C algorithm. Out-of-bounds data usually result in the sensor being flagged and perhaps taken off line and eventually replaced. However, limited resources result in some of the field devices running for long periods of time, especially in smaller urban areas, without adequate Q/C checks. Some problems are intermittent and difficult to diagnose. One of the downsides to any problem or failure is that TxDOT is responsible for remedying the problem.

Private Sector Data

Private sector providers collect data that are generally limited to speeds and travel times. From these values, one can identify incidents and bottlenecks. The data do not usually contain vehicle counts, but private sector providers sometimes enter into arrangements with public sector agencies to access count data from the public sector's fixed sensors. These shared arrangements have implications on the price negotiated with private sector providers.

Detection Accuracy. For private sector data, the accuracy is a function of the number of probes in the traffic stream. Data from the largest PS providers have multiple sources, but the primary source is based on GPS devices. These devices are known to generate accurate speeds under almost all conditions. Based on this research, the speed accuracy of PS data is usually within the bounds of ±5 to 10 percent and is expected to improve with time since additional probes are being added daily through voluntary incentive programs. Private providers have algorithms that provide the necessary Q/C, so the result is an accuracy level with such a modest difference that the average driver will not be affected.

Data Source. Table 5 indicates the source of data for various providers. The use of GPS devices has grown substantially in recent years due to improved device accuracy and reasonable cost. Meanwhile, the use of cellular probes alone is not viewed as having the same accuracy as the GPS, assuming the PS provider determines speed based on cell tower 'hand-offs.' This process would not generate location information between towers; for roadways with adjacent frontage roads, there would be no way to distinguish between vehicles on the main line and those on the frontage roads (which usually have different speeds). SpeedInfo uses Doppler radar, which is a reliable speed detection device. Bluetooth is also known to generate accurate speeds as long as there are sufficient sources of data.

Table 5. Provider Primary Data Sources.

Provider	GPS-Enabled Vehicles	Cellular Probes	Fixed Point Sensors	Others
AirSage		Yes		
CellInt		Yes		
Delcan		Yes		
Inrix	Yes	Yes	Yes	
NAVTEQ	Yes	Yes	Yes	
OnStar	Yes			
SpeedInfo			Yes (radar)	
TomTom	Yes	Yes	Yes	
Total Traffic Network	Yes	Yes	Yes	Airborne/Mobile Spotters, Cameras
TrafficCast	Yes		Yes	Bluetooth

Life Cycle Cost

TxDOT-Maintained Fixed Sensors

Determining the life-cycle cost of fixed sensors is challenging at best. Most agencies do not maintain the foundational cost data to be able to calculate life-cycle costs. TTI has developed guidance based on the Utah DOT's previous research and calculations. UDOT costs might be different from TxDOT costs, at least in terms of the replacement cycle of some in-pavement sensors or due to differences in weather patterns. For detectors not affected by weather, this factor is not usually an issue. For purposes of this analysis, these differences will be considered minimal. TTI used the UDOT data and other sources to develop a life-cycle cost comparison. A later section in this chapter provides this comparison.

Private Sector Data

As noted elsewhere, the cost of some private sector data will not be known to a prospective DOT until that agency negotiates a price with a provider. One exception is SpeedInfo. This company installs and maintains autonomous Doppler radar units alongside the roadway and uses its own solar power and wireless communications to generate data for the operating agency. The cost of this service is $110 per month per bi-directional station.

The other advertised cost is from INRIX. It amounts to $800 per mile per year with an additional first-year cost of $200 per mile. There are also discounts available for some of the network, but few details are available. An additional up-front cost that TxDOT must consider is the cost of its own independent verification of PS data. One low-cost option would be the use of Bluetooth systems interspersed along major routes with update frequencies similar to that of PS providers.

Network Coverage

TxDOT Maintained Fixed Sensors

With fixed sensors, the data coverage is whatever TxDOT considers feasible within the limited resources available. Sensor spacing and the parameters defining the data stream are based on TxDOT design although, again, based on limited resources. The resulting coverage is typically limited to the most congested portions of urban systems, with outlying areas not covered as well. Reaching these lesser congested areas is often desirable, but limited resources do not allow or delay the expansion until the problem worsens.

Private Sector Data

The data coverage that TxDOT could expect would include the Traffic Message Channel network throughout the state. This would involve all major freeways and other major roadways throughout the state and most urban arterials. Coverage on lower volume roadways is a function of the number of probes that are generating data. These probes include fleet vehicles such as trucks and taxi cabs, so areas with a sufficient number of trucks such as commercial zones and industrial areas should have sufficient coverage. Based on the survey of TxDOT personnel, the TMC network is not necessarily a hindrance to using private sector data. However, TxDOT must realize that the segments in rural areas could be longer than the spacing between fixed sensors such as Bluetooth.

TxDOT Control of the Data Stream

TxDOT Maintained Fixed Sensors

TxDOT control means that there is less doubt about the data source and how the data might have been filtered or processed before use. Having full control involves a higher confidence level than having partial or no control. However, TxDOT can build confidence in a low-control data source if initial experience gained is positive or with extended use. Besides outsourcing data collection, DOTs in general also begin to lose control over data quality through not having sufficient resources to properly maintain equipment and/or quality check the data.

Private Sector Data

With the use of PS data, TxDOT has little or no control over the data stream. While this might appear to be an issue at the beginning of some future contract period, TxDOT will need to weigh the pros and cons then decide whether the merits are worth the risk. Since TxDOT has the denser urban areas covered with fixed sensors, the best approach might be to test PS data in urban fringe or rural areas to see how any apprehensions might play out. One precedent in this decision has been TxDOT’s use of toll tag systems in Houston and other urban areas where there are sufficient vehicles with tags to serve as probes. In some cases, the data stream was provided by others.

Summary Comparison of Data Sources

Table 6 provides a summary of the factors cited above, with the exception of life-cycle cost. The cost discussion follows. The comparison includes two different types and orientations of radar detectors: side-fire and parallel to the traffic stream. TxDOT uses products from two manufacturers in side-fire to cover freeways as a fixed sensor. Doppler radar is oriented parallel (or approximately parallel) to traffic and is a proven technology for accurate speed detection.

As noted elsewhere, Bluetooth readers detect devices passing in vehicles that generate a sufficiently strong signal. Each device (e.g., cell phones) generates a unique MAC address that can be read at two points with known separation distance. The link travel time is the difference in the timestamps at the two detection points.

Table 6. Summary Comparison of Data Sources.

Measure of Performance	Private Sector Data	Bluetooth	Loops	Video	Side Fire Radar	Magnetometers
Speed Accuracy (%)	±5–10	±5–10	±5–10	±5–20	±5–10	±2–10
Count Accuracy (%)	N/A (w/o TxDOT sensors)	N/A	±2–5	±5–20	±2–5	±2–5
Data Source	GPS: High Doppler Radar: High Bluetooth: High	High	High	Medium	High	High
TxDOT Control of Data Stream	Low	Low	High	High	High	High
Uses of data -Speed/TT -Counts -Occupancy	 Yes No No	 Yes No No	 Yes Yes Yes	 Yes Yes Yes	 Yes Yes Yes	 Yes Yes Yes
Coverage	TMC Network	As TxDOT determined				

Note: N/A = Not Applicable

In most cases, TxDOT will not know the exact cost of private sector data without entering into a negotiation phase with a provider. However, INRIX's specific cost information for low-latency real-time data indicates a first-year cost of $800/mi plus a one-time setup fee of $200/mi. SpeedInfo provides a self-contained Doppler radar system costing $110 per bidirectional station. Figure 1 shows an example comparison for one year of data for a 20 mile segment and sensors at 3- to 5-mile spacings. The first three sensors (moving left to right) represent PS providers, and the fourth is a side-fire radar fixed sensor. Of course, the radar offers a richer dataset—per-lane data including speeds, counts, and vehicle lengths across at least eight lanes. An additional cost that TxDOT must consider for PS data, at least at the beginning, is the cost of a verification mechanism.

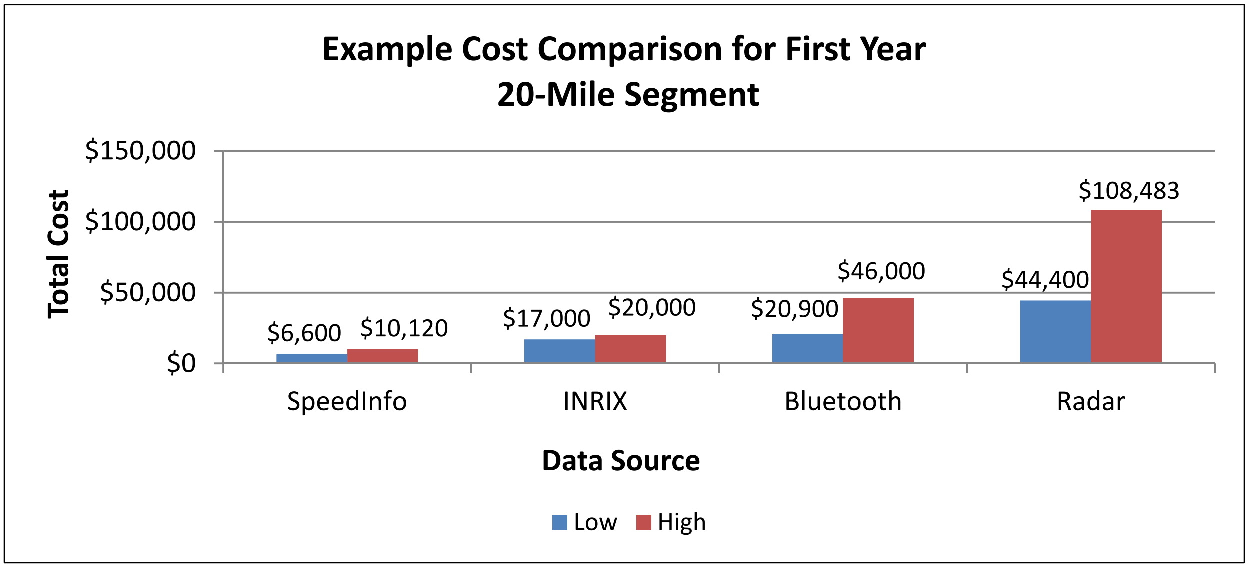

Figure 1. Cost Comparison for PS versus Radar Fixed Sensor.

OPPORTUNITY MATRIX

Sources of Information

Based on input from the TxDOT survey, a review of other state DOTs, and researcher understanding of ITS needs, the TTI team developed a comprehensive list of opportunities for TxDOT to consider pertaining to future use of private sector data. Researchers hope that opportunity matrices presented in this research will provide TxDOT with qualitative tools to determine the appropriateness of implementing private sector data to achieve its intended goals and objectives.

ITS Application Areas

Specific opportunities for applying private data were reviewed in light of accuracy of the data, coverage areas, data availability, cost, and control of the data stream. The list of ITS application areas considered includes the list shown in Table 7. Application areas are by no means exhaustive but rather originated from TxDOT staff's survey.

Table 7. List of Opportunities Considered in the Study.

ITS Application Group	ITS Application Area
Traveler information	Enhance coverage of traveler information in urban areas
	Enhance traveler information in rural areas
	Statewide 511 system
	Emergency evacuation
	Work zone information
System planning	Performance measurement
	Model input and calibration
System operation	Faster identification of congested areas
	Predictive information

As policy makers consider the strengths and weaknesses of using commercial data versus continuing to deploy their own systems, they might find that consideration of each ITS application area and how private sector might fit each need is useful in the overall process. Table 8 provides an evaluation of strengths, weaknesses, and opportunities when using private sector data in different ITS application areas. Even though the evaluation is entirely subjective, it provides an excellent starting point for TxDOT to build an understanding of the private sector data. Researchers not only used results from the survey performed among TxDOT staff, but also considered scope and cost of private sector data in developing these evaluations. As a precautionary note, researchers believe that the evaluations provided in Table 8 could change over time as private sector data improves along with changes in the needs of TxDOT.

The research also identified six governing factors that would come into play while making decisions to use private sector data. These governing factors do not exert equal influence in making the decision to use private sector data and vary depending on the application area as well as the urgency of implementing them. Hence, the relative importance of these governing factors may also vary between districts due to the district's regional needs, funding availability, and so forth. Table 9 presents the relative importance of six governing factors in relation to specific application areas based on the survey and researchers' knowledge of TxDOT's needs. The importance is presented on a scale of 1–3, with 1 being less important (less concerning) and 3 being of highest importance (most concerning).

Table 8. Strength, Weaknesses, and Opportunities of the Private Sector Data in Relation with ITS Application Areas.

Application Area	Strength	Weakness	Opportunities
Enhance coverage of traveler information in urban areas	Where TxDOT has ITS deployments, private sector data can be used to improve the information provided to travelers.	Close coordination of city and the state is required regarding sustained funding for procurement of data on arterials maintained by the city but are on TxDOT ROW—who will pay for what and where?	Provide traveler information on arterials and state highways where there is limited ITS deployment and be able to meet SEC 1201 requirements.
Enhance traveler information in rural areas	Acquiring private sector data could be more cost-effective than TxDOT deploying and maintain the fixed point sensors.	Complex procurement language may be necessary to cover for data gaps and availability in case enough probe vehicles are not available.	Enhance coverage of rural areas where ITS is not available and not cost-effective to deploy fixed point sensors and also meet SEC 1201 requirements.
Statewide 511 system	TxDOT can quickly deploy a 511 system using private sector data and show traffic conditions on rural as well as urban roadways throughout the state.	Covering the entire state will still be expensive. Complex procurement language may be necessary to cover data gaps, data availability.	The statewide 511 system will show traffic conditions in rural areas where ITS is not available and not cost-effective to deploy; also fuse traffic data from existing ITS in urban areas.
Emergency evacuation	Private sector data will serve as an additional source of traffic information.	Private sector may not be able to report traffic conditions on all roadways and all hours due to absence of probe vehicles.	Determine alternate routes in dynamic environment and provide that information to traveling public and emergency personnel.
Work zone information	Identify alternate routes, proliferation of congested links around work zones.	Per lane information is not available, hence private sector data may not be effective for traffic routing within the work zone in a smaller area.	Traffic management operators can monitor how and where the congestion is moving and expanding at and around the work zone.

Application Area	Strength	Weakness	Opportunities
Performance measurement	Private sector data can be both cost-effective and efficient while reporting performance on a continuous basis (year after year).	Since volume is typically not available from private sectors, MPOs have to fuse private sector data with volume data from fixed sensors if performance measures use combination of volume and speed.	Many districts (and even MPOs) in Texas have not been able to establish congestion-related performance measures mainly due to lack of continuous data source to measure performance. There is a growing trend among states and MPOs to use private sector data to fill that void.
Model input and calibration	Private sector data such as historic snapshots of traffic conditions can be helpful when simulating and modeling wider areas (regional or corridor wide).	Mesoscopic and microscopic modeling need highly granular traffic conditions data, which may not be available from private sector data.	Mostly beneficial while comparing results of the macroscopic modeling with historic traffic conditions provided by the private sector data.
Faster identification of congested areas	Private sector data could provide the needed coverage when failures occur in other systems.	Private sector data may be viewed as just another redundant data source if there is already coverage by other ITS.	Traffic management operators can be provided with a regional view of traffic conditions that will allow them to quickly identify where the congestion is building and point surveillance cameras to the area.
Predictive information	Short-term prediction of travel time and speed on roadway segments is already provided by some private sector agencies.	Prediction models used by private sector agencies are not transparent to data subscribers and hence performance is difficult to ascertain.	Traffic management operators can monitor, proactively, where congestion will build up and focus ITS resources in that area.

Note: ROW = Right of Way, MPO = Metropolitan Planning Organization

Table 9. Relative Importance of Various Governing Factors.

Application Area	Spatial Coverage	Cost Effectiveness	Information Accuracy	Data Reliability	Control of Data Stream	Quick Procurement
Enhance coverage of traveler information in urban areas	1	2	2	1	2	3
Enhance traveler information in rural areas	3	2	1	1	3	3
Statewide 511 system	3	3	2	1	2	2
Emergency evacuation	3	1	3	3	3	2
Work zone information	1	2	3	3	2	3
Performance measurement	3	2	3	2	1	2
Model and calibration	3	1	3	2	1	2
Faster identification of congested areas	3	1	3	2	3	1
Predictive information	1	1	3	2	3	1

Note: 1: Less concerned with, 2: Neutral, 3: More concerned with.

CONCLUSIONS AND RECOMMENDATIONS

The initial steps to implement the findings of this research should provide further guidance to TxDOT on meeting the SAFETEA-LU Section 1201 requirements. During the initial portion of that period, say one year, researchers recommend that TxDOT select two or more providers of PS data and select a trial network that already has a means of verification or could easily be modified to serve that purpose. This might be a corridor with sufficient fixed sensors, probe vehicles, toll readers, or Bluetooth devices. The authors believe that this effort could be conducted as an Implementation Project since it could be initiated immediately and provide the timely results TxDOT needs to continue planning for meeting the Section 1201 requirements. If TxDOT accepts the results of this proposed evaluation, the research team recommends moving forward with a more significant purchase of private sector data to fill gaps in the TxDOT network.

Recommended key tasks in the pilot project are:

- Assessment of needs and requirements of districts and identify the role of private sector data to meet those needs—tie with regional ITS architecture and ITS strategic plans of the districts.

- Conduct workshops statewide and provide vendors with opportunities to demonstrate current capabilities of their offerings.

- Identify case study sites and/or corridors for the pilot test. The sites should include regions/corridors with varying degrees of ITS deployment and traffic conditions—both rural and urban.

- At the case study sites, procure real-time as well as archived data from multiple private sector agencies.

- At the case study sites, implement one or more ITS applications (e.g., displaying travel time on DMS) by applying the private sector data.

- Perform detailed evaluation of procurement issues, quality, accuracy, and reliability issues pertaining to application of private sector data at case study sites to implement specific ITS application areas.

- Perform detailed evaluation of life-cycle costs (deployment, installation, license costs, evaluation, maintenance, etc.) to use private sector data at case study sites to implement specific ITS application areas.

- Develop a guidebook for districts and TxDOT partner agencies to perform pre procurement planning, procurement, and deployment of private sector data.