



State of Texas
Regional ITS Architectures and Deployment Plans

Waco Region

Regional ITS Architecture Report

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LIST OF ACRONYMS

| | |
|---------|--------------------------------------------------------------------|
| AASHTO | American Association of State Highway and Transportation Officials |
| ADMS | Archived Data Management System |
| APC | Automated Passenger Counters |
| ASTM | American Society for Testing and Materials |
| ATIS | Advanced Travel Information System |
| ATMS | Advanced Traffic Management System |
| AVL | Automated Vehicle Location |
| BRINSAP | Bridge Inventory Inspection System |
| CAD | Computer-Aided Dispatch |
| CC | Control Center |
| CCTV | Closed-Circuit Television |
| CEA | Consumer Electronics Association |
| CPT | Common Public Transportation |
| CV | Commercial Vehicle |
| CVISN | Commercial Vehicle Information Systems and Networks |
| DARC | Data Radio Channel |
| DMS | Dynamic Message Sign |
| DMV | Department of Motor Vehicles |
| DPS | Department of Public Safety |
| DSRC | Dedicated Short Range Communications |
| EIA | Electronic Industries Association |
| EMC | Emergency Management Center |
| EOC | Emergency Operations Center |
| ETMC | East Texas Medical Center |
| ETMCC | External TMC Communication |
| EV | Emergency Vehicle |
| FC | Fare Collection |
| FHWA | Federal Highway Administration |
| HAZMAT | Hazardous Materials |

LIST OF ACRONYMS

| | |
|--------|---------------------------------------------------------|
| HCRS | Highway Condition Reporting System |
| HOTCOG | Heart of Texas Council of Governments |
| HRI | Highway-Rail Intersections |
| I/F | Interface |
| IEEE | Institute of Electrical and Electronics Engineers |
| IM | Incident Management |
| IMMS | Incident Management Message Sets |
| ISP | Information Service Provider |
| ITE | Institute of Transportation Engineers |
| ITS | Intelligent Transportation System |
| K-TUTS | Killeen-Temple Urban Transportation Study |
| MCM | Maintenance and Construction Management |
| MCV | Maintenance and Construction Vehicle |
| MOU | Memorandum of Understanding |
| MPO | Metropolitan Planning Organization |
| MS | Message Sets |
| NAFTA | North America Free Trade Agreement |
| NEMA | National Electrical Manufacturers Association |
| NOAA | National Oceanic and Atmospheric Administration |
| NTCIP | National Transportation Communications for ITS Protocol |
| OB | Onboard |
| PI | Passenger Information |
| PTMS | Public Transportation Management System |
| PWD | Public Works Department |
| RWIS | Road Weather Information System |
| SAE | Society of Automotive Engineers |
| SDO | Standards Development Organization |
| SP | Spatial Representation |
| STIC | Subcarrier Traffic Information Channel |



LIST OF ACRONYMS

| | |
|--------|------------------------------------------------|
| TCIP | Transit Communication Interface Protocol |
| TEA-21 | Transportation Equity Act for the 21st Century |
| TM | Traffic Management |
| TMC | Traffic Management Center |
| TMDD | Traffic Management Data Directory |
| TxDOT | Texas Department of Transportation |
| USDOT | United States Department of Transportation |
| VIVDS | Video Image Vehicle Detection Systems |



SUMMARY

In January 2001, the Federal Highway Administration (FHWA) issued a final rule to implement Section 5206(e) of the Transportation Equity Act for the 21st Century (TEA-21) requiring that Intelligent Transportation System (ITS) projects funded through the Highway Trust Fund conform to the National ITS Architecture and applicable standards.

To meet these requirements, in 2001 the Texas Department of Transportation (TxDOT) initiated the development of Regional ITS Architectures and Deployment Plans throughout the State of Texas. The Waco Region was the twelfth in the series of Regional ITS Architectures to be prepared as part of this initiative.

The Waco Region is located in central Texas. The Waco Region is bordered by the TxDOT Dallas and Fort Worth Districts to the north, the TxDOT Austin District to the south, the TxDOT Bryan District to the east, and the TxDOT Brownwood District to the west.

The Architecture for the Waco Region followed a comprehensive process focused on stakeholder outreach and education, identifying market packages and interfaces tailored to the needs of the Waco Region, and developing a consensus-based architecture for the Region. This architecture provides a framework for ITS infrastructure to be deployed and integrated in the Waco Region over the next 20 years.

Stakeholders from throughout the Region participated in the development of the Regional ITS Architecture, including representatives from FHWA, TxDOT, cities, counties, the metropolitan planning organizations (MPOs), council of governments, and transit agencies. These stakeholders provided input and review at key steps in the architecture development process, including a project kick-off meeting, architecture development and review workshops, and final review of the architecture documentation.

An inventory of existing and planned ITS infrastructure in the Region provided the basis for the architecture development. Stakeholder needs that could be addressed by ITS technologies guided the selection of market packages, data flows, and integration requirements. A diverse range of needs were identified by stakeholders in the Region. High priority needs focused on traffic management, traffic information dissemination, and incident management. Emergency vehicle signal preemption was also identified as a priority.

Market packages were selected that corresponded to the desired services and functions identified for the Region, and were customized for Waco Region agencies and equipment. These market packages included high priority 'foundation' services and functions, such as network surveillance and traveler information, as well as market packages to address coordination needs, including incident management and regional emergency response. Stakeholders then prioritized these market packages as high, medium, and low. These priorities were used in the second phase of the project to develop the ITS Deployment Plan for the Waco Region.

An interconnect, or "Sausage Diagram" was developed for the Waco Region which provided a top-level overview of system functions and primary interconnects. More detailed interfaces were then developed which identified the connectivity between the systems and elements. Each element identified in the ITS architecture for the Waco Region was mapped to the other elements that it must interface with. These interfaces were further defined by architecture data flows between individual elements that specify the information to be exchanged. These data flows could include requests for information, alerts and messages, status requests, confirmations, and other information requirements.



Functional requirements for the Waco Region were identified through customized market packages and data flows, and the equipment packages that deliver specific capabilities. The equipment packages that were identified provide more detailed descriptions of functionality and can be deployed incrementally. Standards that could apply to the Waco Region also were identified as part of the architecture development process.

An Operational Concept for the Waco Region was developed to illustrate how systems, components, and agencies will be integrated and function as a result of the framework provided by the Regional ITS Architecture. The purpose of the Operational Concept is to demonstrate the roles and responsibilities of the various stakeholders in the Waco Region. Potential agreements that could be required for maintenance and operations, data sharing (among agencies and with the private sector), or joint operations are listed.

The Regional ITS Architecture for the Waco Region is documented in the final report. In addition, a companion web site was developed that contains all of the architecture information, stakeholders, regional inventory, customized market packages, interfaces, and standards.



1. INTRODUCTION

1.1 Project Overview

In January 2001, FHWA issued a final rule to implement Section 5206(e) of the TEA-21. This rule required that ITS projects funded through the Highway Trust Fund conform to the National ITS Architecture and applicable standards. The rule requests that the National ITS Architecture be used to develop a local implementation of the National ITS Architecture, which is referred to as a “Regional ITS Architecture.”

In order to meet these requirements, TxDOT initiated the development of regional ITS architectures and deployment plans throughout the State of Texas. In addition to meeting the federal requirements for funding, the development of regional ITS architectures provides a framework for implementing ITS on a regional level, encourages interoperability and resource sharing, identifies applicable standards, and allows for cohesive long range planning among stakeholders in the Region. Although not required by the FHWA final rule, TxDOT also sought to have an ITS deployment plan developed for each Region. An ITS deployment plan identifies and prioritizes projects that are needed to implement the ITS architecture on a short-, medium-, and long-term basis.

A key goal in the development of the regional ITS architectures was to develop a consensus-based architecture with as many stakeholders as possible involved. Each stakeholder had an equal voice in determining the direction of the architecture for the Region. Stakeholders included representatives from FHWA, TxDOT, cities, counties, the metropolitan planning organizations, council of governments, and transit agencies. A series of five meetings were held with the ITS stakeholders to discuss the development and gather input into the Waco Regional ITS Architecture and Deployment Plan. In addition, a project web site was developed which contains all of the information on the Waco Regional ITS Architecture and provides stakeholders with an opportunity to review and comment on the architecture directly from the web.

The result is an ITS architecture that establishes a vision and direction for the Region. ITS needs of the Waco Region were established early in the project. Existing and planned elements of the architecture have been identified and the key agencies required to develop the ITS services, or market packages as they are referred to in the National ITS Architecture, for the Waco Region have also been identified. An operational concept has been developed that focuses on the roles and responsibilities of the various agencies involved in the Waco Region. A separate ITS Deployment Plan was developed that identifies projects in the Waco Region that are required to implement the architecture.

1.2 Document Overview

The Waco Regional ITS Architecture report is organized into five key sections:

Section 1 – Introduction

This section provides an overview of the State of Texas ITS Architectures and Deployment Plan Program, the ITS Architecture for the Waco Region, as well as an overview of some of the key features and stakeholders in the Waco Region.



Section 2 – Integration Strategy

This section discusses Waco Region stakeholder needs and issues, regional ITS initiatives and potential regional ITS programs, and opportunities for integration to achieve regional goals and contribute to regional and national ITS interoperability. Stakeholders and their contact information are also included.

Section 3 – Regional ITS Architecture Development Process

An overview of the key steps involved in developing the ITS architecture for the Waco Region is provided in this section. It includes a discussion of the methodology, stakeholder involvement, architecture workshops, and architecture development process.

Section 4 – Conceptual Design

The conceptual design contains the key sections of the Waco Regional ITS Architecture. The inventory of existing and planned systems is presented in Section 4, and is sorted by stakeholder as well as by entity for easy reference. The market packages that were selected for the Waco Region are also included in this section, as are the system functional requirements. The Waco Region interconnects are presented, including the “Sausage Diagram” showing the relationships of the key subsystems and elements in the Region, system interfaces, and the physical subsystem architecture flows. Standards that apply to the Waco Regional ITS Architecture also are listed.

Section 5 – Operational Concept

An Operational Concept has been prepared that discusses the key functions and services of the envisioned ITS for the Waco Region. As part of this concept, operational scenarios are described and roles and responsibilities of stakeholders are discussed. Potential public-public and public-private agreements also have been identified.

The Waco Regional ITS Architecture also contains two appendices:

- Appendix A – Customized Market Packages; and
- Appendix B – Interface Diagrams.

A web site has been established that contains the architecture documentation, inventories, interconnects, market packages, interfaces, and functional requirements. This web site can be accessed from www.consystem.com, and by selecting the link to the Texas Regional ITS Architecture Home Page, and then Waco Region. The web site provides hyperlinks to more detailed information about the Waco Regional ITS Architecture than what could feasibly be included in the printed document. In certain sections of the document, readers are referred to the web site for additional information and details. At the time this report was published, the Waco Regional ITS Architecture web site was being hosted at www.consystem.com. TxDOT plans to permanently host the site in the future at www.dot.state.tx.us/trf/its.



1.3 The Waco Region

1.3.1 Geographic Overview

The Waco Region is bordered by the TxDOT Dallas and Fort Worth Districts to the north, the TxDOT Austin District to the south, the TxDOT Bryan District to the east, and the TxDOT Brownwood District to the west. For the Waco Regional ITS Architecture and Deployment Plan, the study area included all eight counties that comprise the TxDOT Waco District as well as Freestone County which is part of the Bryan District. The geographic boundaries of the Waco Region are highlighted in **Figure 1**.

The counties included in the Waco Region area are:

- Bell;
- Bosque;
- Coryell;
- Falls;
- Freestone;
- Hamilton;
- Hill;
- Limestone; and
- McLennan.

TxDOT partners with local governments for roadway construction, maintenance, and traffic operations support, and serves as the responsible agency for on-system roadways in cities with populations less than 50,000. The Cities of Waco, Temple, and Killeen are the only cities in the project Region with populations that exceed the 50,000 threshold.

1.3.2 Transportation Infrastructure

As illustrated in **Figure 1**, the Waco Region has an extensive transportation infrastructure. The primary roadway facilities include I-35, US-77, US-84, US-190, SH-6, and SH-95.

I-35 is a north-south, divided interstate highway. The effective operation of this highway is critical to the movement of goods and people through the State of Texas and the United States. I-35 is a North American Free Trade Agreement (NAFTA) corridor and extends from the border with Mexico in Laredo to the Canadian border. Blockages along I-35 can have serious implications on drive-time for commercial vehicles and motorists alike due to the lack of obvious alternate routes. Knowing the road and travel conditions within this transportation corridor and having the ability to disseminate this information to motorists are important elements for this project. For example, if I-35 has been closed due to a major incident or weather, and motorists are informed of the closure in advance, they can modify their travel plans with an alternate route or wait to begin their travels.

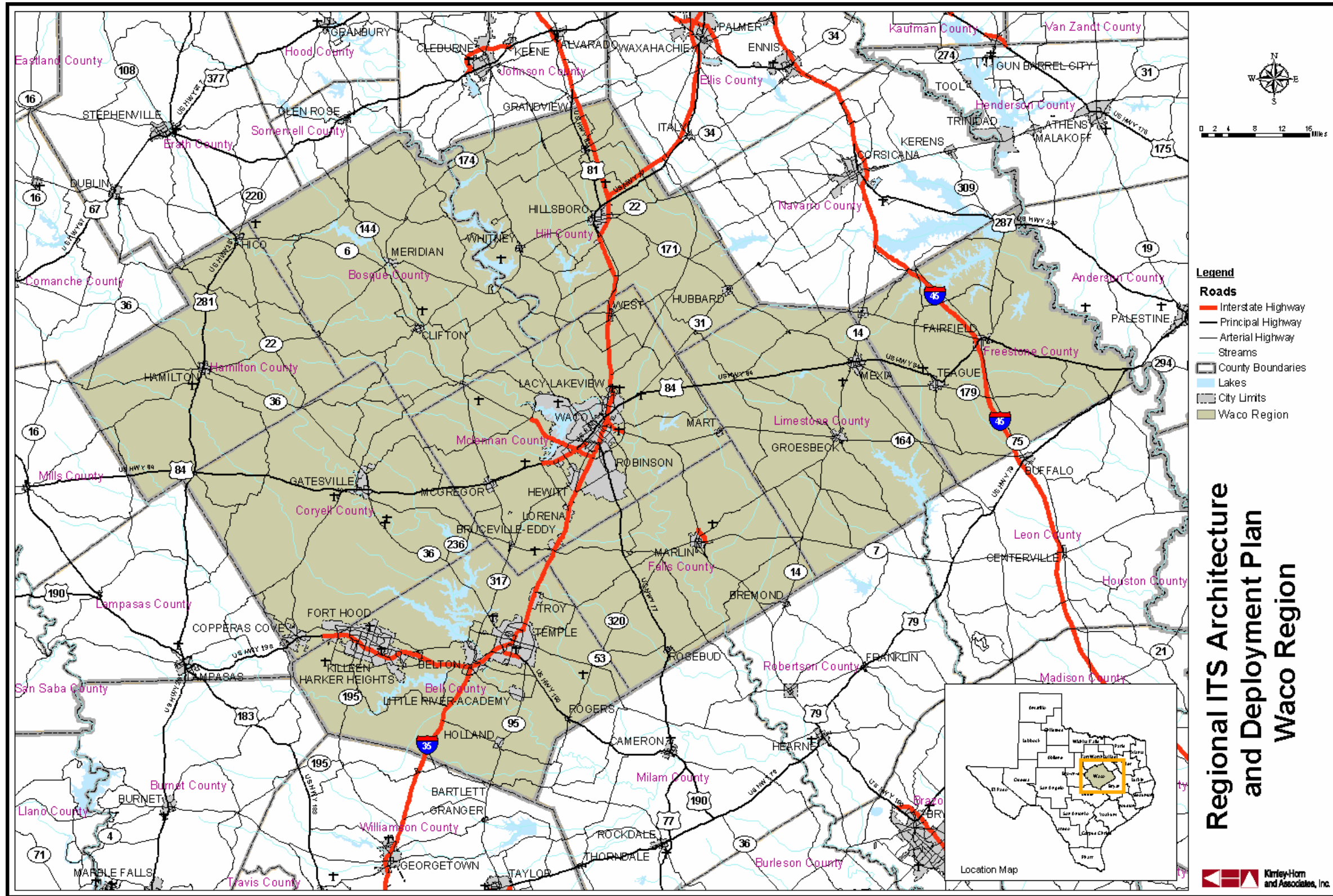


Figure 1 – Waco Region Map

1.3.3 Waco Region ITS Plans

There are several agencies in the Waco Region that have already deployed ITS components. It is important to recognize the initial deployment of ITS infrastructure in a Region because in order for that Region to receive federal funding for ITS projects, the U.S. Department of Transportation (USDOT) requires that the Region have an ITS architecture by April 2005. This requirement is only for Regions with existing ITS infrastructure deployed. For Regions that do not have any ITS infrastructure deployed, the USDOT requires that they have an ITS architecture within four years of their first ITS project entering final design. As the Waco Region pursues funding opportunities for proposed projects, it will be necessary to show that the proposed project fits within the architecture developed for the Region as part of this project.

Currently, the Waco Region has several ITS components deployed in the field including closed loop signal systems with video image vehicle detection systems (VIVDS), signal preemption for emergency vehicles, computer aided dispatch (CAD), and portable dynamic message signs (DMS). The following sections discuss these deployments.

Video Detection

TxDOT is using VIVDS at several intersections within the Region. Unlike loop detection, VIVDS will not be affected by paving operations, and the detection zone of a VIVDS can be quickly changed to accommodate lane shifts during construction. VIVDS can detect vehicles approaching or stopping at a signalized intersection, and, under actuated conditions, place a call for the service of the appropriate phase for that vehicle.

Signal Preemption for Emergency Vehicles

Currently, the City of Waco has signal preemption installed at intersections within the city limits for fire vehicles. Emergency vehicle preemption works when a vehicle equipped with a preemption emitter approaches an intersection and the detector activates a change in signal timing to allow fast and safe passage.

Computer Aided Dispatch

Several emergency management and transit agencies in the Region have implemented CAD systems. CAD systems enhance dispatch capabilities and allow dispatch records and any incident information entered by the dispatcher to be saved for future reference in a dispatch log.

Portable Dynamic Message Signs

TxDOT currently has several portable DMS in the Waco Region. These are controlled by the TxDOT Waco District Traffic Office and are used to display incident and construction related messages.

1.3.4 Stakeholders

Stakeholder coordination and involvement is one of the key elements to the development of a Regional ITS Architecture and Deployment Plan. Because ITS often transcends traditional transportation infrastructure, it is important to involve non-traditional stakeholders in the architecture development and visioning process. Input from these stakeholders, both public



and private, is a critical part of defining the interfaces, integration needs, and overall vision for ITS in the Waco Region.

The following is a list of stakeholders in the Waco Region who have participated in the project workshops or provided input to the study team as to the needs and issues that should be considered as part of the Waco Regional ITS Architecture.

- Bell County;
- City of Waco;
- Federal Highway Administration;
- Fort Hood;
- Heart of Texas Council of Governments (HOTCOG);
- Hill Country Transit District;
- Killeen-Temple Urban Transportation Study (K-TUTS)/Central Texas Council of Governments;
- McLennan County;
- TxDOT Public Transportation Division (Austin);
- TxDOT Traffic Operations Division (Austin);
- TxDOT Waco District;
- Waco MPO; and
- Waco/McLennan County Emergency Management.

2. INTEGRATION STRATEGY

2.1 Integration Purpose

The purpose of the integration strategy is to identify the needs, stakeholders, and strategy for regional integration in the Waco Region.

For each operating agency or stakeholder entity identified through the development of the Regional ITS Architecture, there are operations that currently exist as a normal practice in order to accomplish the primary business goals and objectives for each stakeholder. As an example, a primary operation of the Waco/McLennan County dispatch is to dispatch emergency personnel to the appropriate locations when a call for help is placed within the county. The integration of the dispatch with any of the other stakeholders will not change this primary function of the dispatch or disrupt typical business practices. The integration of Waco/McLennan County dispatch with another agency, such as the TxDOT Waco District, will require that the data that will be exchanged between the two entities (such as the blockage of a lane of traffic due to a crash) meet certain requirements for that particular data type. Identifying the need for this connection between agencies and the opportunities for integration and interoperability in the Region are key purposes of this section.

This section will provide an overview of the major issues and stakeholders' needs within the Waco Region and the primary areas of concern that were uncovered in the preparation of the Waco Regional ITS Architecture. This section will also discuss the need for interregional integration with agencies external to the Waco Region, such as the need for integration with other TxDOT Districts.

A key step in developing any regional ITS architecture is the identification of major stakeholders in the Region. Key stakeholder agencies that participated in the development of the Waco Regional ITS Architecture are listed in **Table 1**. A number of other stakeholders were identified and invited to participate. In many cases, these stakeholders were not able to attend due to time constraints. Minutes of meetings, copies of reports, and access to the project web site was provided to these stakeholders to encourage their participation as much as possible.

Table 1 – Waco Stakeholder Agencies and Contacts

| Stakeholder Agency | Contact | Address | Phone Number | E-Mail |
|-----------------------------------------------|----------------|--------------------------------------------------------------------|--------------|----------------------------|
| Bell County | Richard Macchi | P.O. Box 264 Belton, Texas 76513-0568 | 254-933-5275 | rmacchi@vwm.com |
| City of Waco | Rick Charlton | P.O. Box 2570 Waco, Texas 76702 | 254-750-6634 | rickc@ci.waco.tx.us |
| City of Waco Transit | Matt Penney | 421 Columbus Avenue Waco, Texas 76701-1417 | 254-750-1617 | N/A |
| Federal Highway Administration Texas Division | Mark Olson | 300 East 8 th Street Room 826 Austin, Texas 78701 | 512-536-5972 | mark.olson@fhwa.dot.gov |
| Federal Highway Administration Texas Division | Kevin Spohrer | 300 East 8 th Street Room 826 Austin, Texas 78701 | 512-536-5958 | kevin.spohrer@fhwa.dot.gov |

Table 1 – Waco Stakeholder Agencies and Contacts (continued)

| Stakeholder Agency | Contact | Address | Phone Number | E-Mail |
|---------------------------------------------------------------------|---------------------|----------------------------------------------------------------------------|----------------------------|----------------------------------|
| Fort Hood Master Planning | Philip Marley | Fort Hood, Texas 76544 | 254-287-3528 | philip.marley@hood.army.mil |
| Heart of Texas Council of Governments | Lee Ann Donaldson | 300 Franklin Avenue Waco, Texas 76701 | 254-756-7822 | leann@hot.cog.tx.us |
| Heart of Texas Council of Governments/Rural Transportation District | Russ Harman | 300 Franklin Avenue Waco, Texas 76701-2297 | 254-756-7822 | russ@hot.cog.tx.us |
| Hill Country Transit District | Robert Ator | 5200 S General Bruce Dr Temple, Texas 76502 | 254-791-0252 | rator@takethehop.com |
| Hill Country Transit District | Carole Warlick | P.O. Box 217 San Saba, Texas 76877 | 325-372-4677 | hctd@hccaa.com |
| K-TUTS | Technical Committee | 550 East Second Avenue Courthouse Annex, Box 729 Belton, Texas 76513 | N/A | N/A |
| K-TUTS/Central Texas Council of Governments | Shannon Mattingly | 550 East Second Avenue Courthouse Annex, Box 729 Belton, Texas 76513 | 254-933-7075 | N/A |
| K-TUTS/Central Texas Council of Governments | Steve Smith | 550 East Second Avenue Courthouse Annex, Box 729 Belton, Texas 76513 | 254-933-7075 (ext. 210) | ssmith@ctcogmpo.org |
| McLennan County | Steve Hendrick | P.O. Box 648 Waco, Texas 76703-1728 | 254-757-5028 | steve.hendrick@co.mclennan.tx.us |
| TxDOT Public Transportation Division | Ben Herr | 125 E. 11th Street Austin, Texas 78701-2483 | 512-416-2812 | lherr@dot.state.tx.us |
| TxDOT Waco District | James Bailey | 100 S. Loop Dr. Waco, Texas 76704 | 254-867-2802 | jbailey@dot.state.tx.us |
| TxDOT Waco District | Larry Colclasure | 100 South Loop Drive Waco, Texas 76704 | 254-867-2800 | lcolcla@dot.state.tx.us |
| TxDOT Waco District | Edward Kabobel | 100 S. Loop Drive Waco, Texas 76704 | 254-867-2731 | ekabobe@dot.state.tx.us |
| TxDOT Traffic Operations Division | Fabian Kalapach | Attn: TRF-Cedar Park #51 125 E. 11th Street Austin, Texas 78701-2483 | 512-506-5112 | fkalapa@dot.state.tx.us |
| TxDOT Traffic Operations Division | Roland Merz | Attn: TRF-Cedar Park #51 125 E. 11th Street Austin, Texas 78701-2483 | 512-506-5152 | rmerz@dot.state.tx.us |
| Waco/McLennan County Emergency Mgmt | Frank Patterson | P.O. Box 2570 Waco, Texas 76702 | 254-750-5911 | frankp@ci.waco.tx.us |
| Waco MPO | Christopher Evilia | P.O. Box 2570 Waco, Texas 76702 | 254-750-5666 | cevilia@ci.waco.tx.us |



2.2 Regional Needs

Needs from the Region were identified in the project kick-off meeting held on September 11, 2003. Stakeholders participating in that meeting identified the needs in the Region according to the eight user service areas defined in the National ITS Architecture. The needs identified in the project kick-off meeting are documented in **Table 2**.

Table 2 – Waco Region: Summary of ITS Needs

| Waco Region Summary of ITS Needs Waco Regional ITS Architecture and Deployment Plan Kick-Off Meeting September 11, 2003 |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Travel and Traffic Management Needs</p> <ul style="list-style-type: none"> ▪ Need TMC Expansion for City of Waco ▪ Need to share information between TxDOT and the City of Waco ▪ Need DMS in the City of Waco ▪ Need detour planning ▪ Need travel time information (vehicle detection and DMS) ▪ Need to continue to integrate fiber optics in other transportation projects ▪ Need automated vehicle credentialing for entry to Ft. Hood ▪ Need DMS for traffic information at Ft. Hood entrances ▪ Need event management plans for Ft. Hood ▪ Need improved incident information dissemination in Bell County |
| <p>Public Transportation Management Needs</p> <ul style="list-style-type: none"> ▪ Need electronic fare payment for City of Waco Transit ▪ Need real time access to video feeds from buses for City of Waco Transit ▪ Need automated vehicle location (AVL) and security cameras in new buses as fleet is replaced for City of Waco Transit ▪ Need automated scheduling expansion for HOTCOG ▪ Need AVL for HOTCOG, City of Waco and Hill Country Transit vehicles ▪ Need mobile data terminals (MDTs) for Hill Country Transit ▪ Need CAD for Hill Country Transit ▪ Need automated passenger counters for Hill Country Transit |
| <p>Electronic Payment Needs</p> <p>None Identified</p> |
| <p>Commercial Vehicle Operations Needs</p> <p>None identified</p> |
| <p>Emergency Management Needs</p> <ul style="list-style-type: none"> ▪ Need EOC connection to the Department of Public Safety (DPS) ▪ Need AVL on emergency vehicles ▪ Need flood detection |
| <p>Advanced Vehicle Safety Systems Needs</p> <p>None Identified</p> |
| <p>Information Management Needs (Data Archiving)</p> <p>None Identified</p> |
| <p>Maintenance and Construction Management Needs</p> <p>None Identified</p> |

2.3 Regional Integration and Interoperability

A vision for the Waco Region is to integrate systems both on an intra-regional and an inter-regional basis. Within the Waco Region, nearly every stakeholder identified is involved in emergency management. Incidents that occur on major roadways either in the Waco Region or on roadways that could impact the movement of people and goods in the Waco Region should be shared. The integration of the State EOC and the local EOC can facilitate the clearing of such an incident more efficiently. As an example, a chemical spill along I-35 between Temple and Waco would require a major clean-up in addition to other emergency personnel on site. Coordination between the two EOCs could identify the closest clean-up crew that could respond to the spill and dispatch them to the scene. Similarly, once on scene, the response team could provide the State EOC and the local EOCs with status reports on the clean-up and potential timing for return to normal operations.

The Waco Region is bordered by five other TxDOT Districts. Improved coordination with these surrounding Districts for incident management and roadway closures is a very important need.

Road closures due to maintenance or incidents also lead to a number of opportunities for improved operations through integration. TxDOT and other transportation agencies would like to be able to share this information throughout the Region so that as soon as one agency is aware of a closure, whether planned or unplanned, other agencies can also be made aware of the closure and make appropriate plans.

Operators of the transportation system have many opportunities to improve performance through integration. The City of Waco Transit and Hill Country Transit can improve performance and schedule adherence by integrating closure information from operators of the transportation network.

Systems such as TxDOT's Highway Condition Reporting System (HCRS) provide an integrated method to gather consistent traveler information on a statewide basis. This type of system could eventually feed into a 511 traveler information number that would provide consistent traveler information throughout the state.

The headquarters of TxDOT maintains a database of traffic counts and accident records for roadways throughout the State of Texas. On occasion, agencies within the Waco Region will need access to these databases either to retrieve data or supply data to the database. These data exchanges also will require integrating the agencies' data flows such that neither of the agencies' normal business operations is disturbed to share this data.

One of the primary purposes of the development of an ITS architecture is to ensure that while various agencies are deploying ITS components, there are some commonalities between them that will allow and facilitate the exchange of data fairly seamlessly and automatically. This is not to say that all technologies or media that are used by the various agencies will be the same, but that there is an acknowledgement that the data that is being collected and disseminated is valuable to many different agencies; therefore, the integration strategy has to be implemented to ensure the data exchange is possible.

3. REGIONAL ITS ARCHITECTURE DEVELOPMENT PROCESS

Development of the Regional ITS Architecture and Deployment Plan for the Waco Region relied heavily on stakeholder input to ensure that the architecture reflected local needs. A series of five meetings was held with stakeholders to gather input, and a web site with the components of the regional architecture as well as hard copies of documents were made available to stakeholders for review and comment.

3.1 Waco Process

The process followed for the Waco Region was designed to ensure that stakeholders could provide input and review to the development of the Region’s ITS Architecture.

Prior to the project kick-off meeting with the contractor and stakeholders, TxDOT identified relevant stakeholders in the Region to begin discussions on the development of a Regional ITS Architecture and Deployment Plan. Stakeholders signed a memorandum of understanding (MOU) stating that they would work together in the Region to develop the ITS architecture.

After selecting a contractor, the process shown in **Figure 2** was used to develop the Region’s ITS Architecture. In addition to the architecture, an ITS Deployment Plan for the Region also was developed to identify projects needed to implement the architecture.

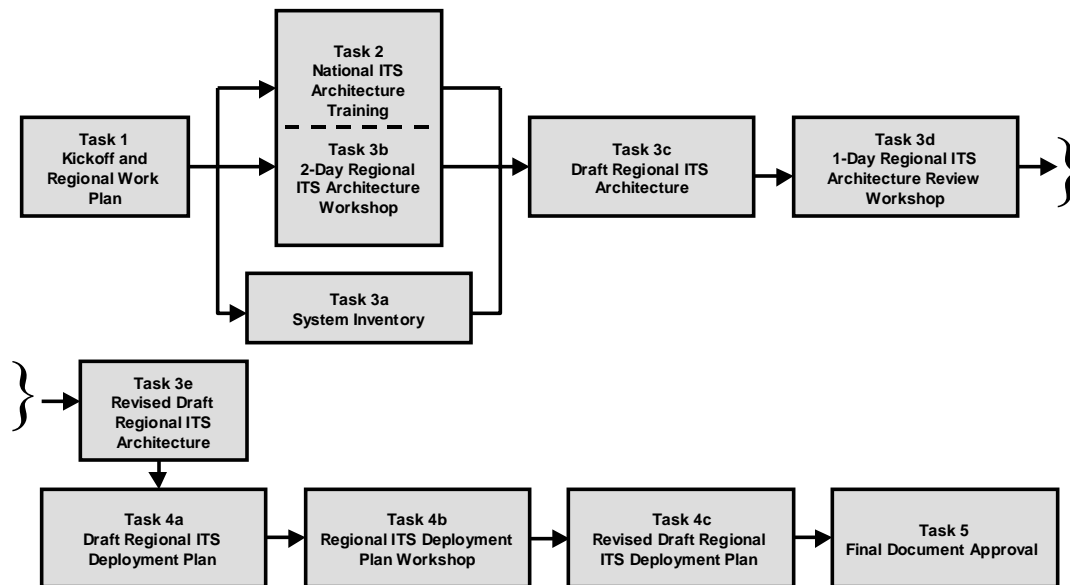


Figure 2 – Waco Regional ITS Architecture and Deployment Plan Development Process

A total of five meetings and workshops with stakeholders over a period of eleven months were used to develop the Waco Regional ITS Architecture and Deployment Plan. These meetings and workshops included:

- Kick-off and Regional Work Plan Meeting;
- 2-Day Regional ITS Architecture Workshop;
- 1-Day Regional ITS Architecture Review Workshop;
- ITS Deployment Plan Workshop; and
- Final Comment Resolution Meeting.

Key components of the process are described below:

Task 1 – Kick-Off and Regional Work Plan: Based on the initial stakeholder meeting and MOU that was signed, a number of key stakeholders were identified. Additional stakeholders that did not sign the initial MOU also were identified and invited to the project kick-off meeting. At this meeting, the regional work plan was presented to stakeholders for review and comment. Subsequent meeting dates were identified and agreed upon by the stakeholders.

As part of this meeting, a workshop was held with the stakeholders to identify three additional areas of information:

- Additional stakeholders to invite to participate in the process;
- Needs of the stakeholders in the Region; and
- Existing and planned ITS elements in the Region.

Task 2 – National ITS Architecture Training: Task 2 was the development and presentation of training on the National ITS Architecture. The purpose of the training was to familiarize stakeholders with the architecture terminology to the extent needed to allow them to provide input and review on the Waco Region's ITS Architecture. The National ITS Architecture training was presented in conjunction with the 2-Day Regional ITS Architecture Workshop described in Task 3B.

Task 3A – System Inventory: Collecting information for the system inventory began at the kick-off meeting through the workshop with the stakeholders to determine existing and planned ITS elements in the Region. After the kick-off meeting, follow-up calls were conducted with a number of local stakeholders to gather additional input for the architecture. To complete the inventory, stakeholders were presented with the results of the inventory in the 2-Day Regional ITS Architecture Workshop described in Task 3B.

Task 3B – 2-Day Regional ITS Architecture Workshop: The purpose of the 2-Day Regional ITS Architecture Workshop was to review the inventory with stakeholders and begin the development of the Waco Regional ITS Architecture. Training on the National ITS Architecture also was integrated into the workshop so that key elements of the architecture, such as market packages, could be explained prior to the selection and editing of these elements. The result of the 2-Day Regional ITS Architecture Workshop was a Regional ITS Architecture for Waco, which included a system inventory, interconnect diagram, customized market packages, identification of functional requirements through process specifications, system interfaces, and relevant ITS standards.

Task 3C – Draft Regional ITS Architecture: After the 2-Day Regional ITS Architecture Workshop was completed, a web site was developed with a dedicated link to the Texas Regional ITS Architecture program. Stakeholders were asked to review the web site and provide comments through an email link set up on the site. A hard copy of the Draft Regional ITS Architecture for the Waco Region was sent to stakeholders prior to the 1-Day Regional ITS Architecture Review Workshop.

Task 3D – 1-Day Regional ITS Architecture Review Workshop: The 1-Day Regional ITS Architecture Review workshop was designed to allow stakeholders to review the draft architecture and provide comments. The primary focus of the workshop was to review the architecture flows between elements in the market packages. Training on architecture flows as well as ITS standards also was completed.

Task 3E – Revised Draft Regional ITS Architecture: Input from stakeholders in the 1-Day Regional ITS Architecture Review Workshop, as well as comments from stakeholders reviewing the web site and hard copy document, were used to revise the Draft Regional ITS Architecture. The revisions were incorporated into the web site as well as into the hard copy document. The Revised Draft Regional ITS Architecture was mailed to stakeholders for additional review.

Task 4A – Draft Regional ITS Deployment Plan: A Draft Regional ITS Deployment Plan was developed based on the prioritization of market packages and needs expressed by the stakeholders in the Region. The Draft Regional ITS Deployment Plan included a list of recommended projects in a 5-year, 10-year, and 20-year timeframe. Each project was linked to one or more market packages from the Waco Regional ITS Architecture.

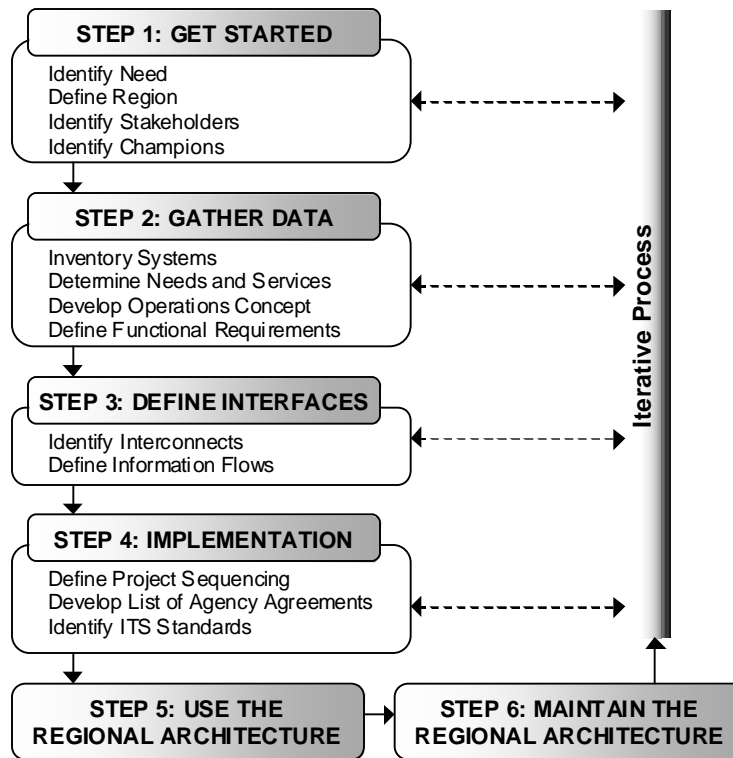
Task 4B – Regional ITS Deployment Plan Workshop: The Draft Regional ITS Deployment Plan was presented to stakeholders at the Regional ITS Deployment Plan Workshop. Stakeholders were asked to provide input on the recommended projects, priority, and deployment timeframe.

Task 4C – Revised Draft Regional ITS Deployment Plan: Based on the review and input from stakeholders at the Regional ITS Deployment Plan Workshop, as well as review comments received from stakeholders outside of the workshop, a Revised Draft Regional ITS Deployment Plan was developed and sent to stakeholders.

Task 5 – Final Document Approval: A comment resolution meeting was held with stakeholders to review the Revised Draft Regional ITS Architecture and the Revised Draft Regional ITS Deployment Plan. Next steps for the Region were also discussed. Comments were incorporated and a final Regional ITS Architecture and Regional ITS Deployment Plan were developed.

3.2 USDOT Regional ITS Architecture Guidance

On October 12, 2001, the U.S. Department of Transportation (USDOT) issued guidance on development of a regional ITS architecture through the document “Regional ITS Architecture Guidance: Developing, Using, and Maintaining an ITS Architecture for Your Region.” **Figure 3** summarizes the guidance provided by the USDOT.



(Source: Regional ITS Architecture Guidance: Developing, Using, and Maintaining an ITS Architecture for Your Region, USDOT)

Figure 3 – USDOT Guidance on Regional ITS Architecture Development

The process used to develop the Waco Regional ITS Architecture and Deployment Plan follows Steps 1 through 4 of the guidance. Steps 5 and 6 are designed to provide guidance upon the completion of the development of the Regional ITS Architecture.

Step 1, Get Started, of the guidance was completed in Task 1 – Kick-off and Regional Work Plan, as well as preliminary work completed by TxDOT to identify initial stakeholders and the need to complete the architecture for the Waco Region. Through these efforts, the need for an architecture, appropriate stakeholders, and the Region was defined.

Step 2, Gather Data, was completed through Task 1 – Kick-off and Regional Work Plan, Task 3A – System Inventory, and Task 3B – 2-Day Regional ITS Architecture Workshop. These efforts allowed the inventory for the Waco Region to be completed, identified ITS needs in the Region, and led to the development of an operational concept and definition of functional requirements.



Step 3, Define Interfaces, was completed in Task 3B – 2-Day Regional ITS Architecture Workshop and Task 3D – 1-Day Regional ITS Architecture Review Workshop. These workshops engaged stakeholders in customizing Market Packages for the Region, which included identifying interconnects among elements in the architecture and reviewing and selecting data flows between elements.

Step 4, Implementation, was completed in Task 3D – 1-Day Regional ITS Architecture Review Workshop through the prioritization of market packages. Sequencing of projects began in this process and was completed in the ITS Deployment Plan. Applicable ITS standards to match the identified data flows also were identified through the 1-Day ITS Architecture Review Workshop. Based on the envisioned information exchanges and integration outlined in the Regional ITS Architecture, potential agreements were identified.

4. CONCEPTUAL DESIGN

4.1 Systems Inventory

An important initial step in the architecture development process is to establish an inventory of existing ITS elements. At the project kick-off meeting and through subsequent discussions with agency representatives throughout the Region, Waco stakeholders provided the team with a list of existing, planned, and future systems that would play a role in the Region's ITS architecture. "Planned" is defined as a system with funding identified while "future" is defined as a system that does not yet have funding identified.

Existing, planned, and future systems in the Waco Region were identified in the following categories:

- ***Travel and Traffic Management*** – includes the TxDOT Waco TMC, center-to-center links, detection systems, closed-circuit television (CCTV), fixed and portable dynamic message signs, broadcast traveler information, railroad operations coordination, and other related technologies.
- ***Public Transportation Management*** – includes transit and paratransit automated vehicle location, and transit travel information systems.
- ***Commercial Vehicle Operations*** – includes hazardous materials (HAZMAT) permitting and coordination with TexView (CVISN) efforts.
- ***Emergency Management*** – includes emergency operations/management centers and improved information sharing among traffic and emergency services.
- ***Information Management*** – includes electronic data management and archiving systems.
- ***Maintenance and Construction Management*** – includes maintenance and construction vehicle tracking, roadway maintenance and construction information, and work zone management.

The System Inventory is a valuable task for several reasons. First, it provides a baseline of existing and planned ITS projects and systems in the Region. Second, it outlines which agencies are currently deploying and operating ITS, as well as those that are planning to implement ITS programs. Third, it provides a foundation for identifying needed elements or agency participation for the regional ITS, which will be important for subsequent tasks including the market package identification and prioritization, system interface and integration requirements in the Region, and ultimately the ITS Deployment Plan.

4.1.1 Subsystems and Terminators

Each identified system or component in the Waco Regional ITS inventory was mapped to a subsystem or terminator in the National ITS Architecture. Subsystems and terminators are the 'entities' that represent systems in ITS. Subsystems are the highest level building blocks of the physical architecture, and the National ITS Architecture groups them into four major classes: Centers, Roadside, Vehicles, and Travelers. Each of these major classes includes various subsystems that represent a set of transportation functions (or processes) that are likely to be collected together under one agency, jurisdiction, or location, and correspond to physical elements, such as traffic operations centers, traffic signals, vehicles, and so on. **Figure 4** shows the National ITS Architecture subsystems. This figure, also known as the

“sausage diagram” is a standard interconnect diagram, showing the relationships of the various subsystems within the architecture; a customized interconnect diagram for the Waco Region is included in Section 4.3.1 of this report. Communication functions between the subsystems are represented in the ovals. It should be noted that “wireline” communication refers to fixed-point to fixed-point communications, which include not only twisted pair and fiber optic technologies, but also such wireless technologies as microwave and spread spectrum.

Terminators are the people, systems, other facilities, and environmental conditions outside of ITS that need to communicate or interface with ITS subsystems. They help to define the boundaries of the National ITS Architecture as well as a regional system. Examples of terminators include drivers, traffic operations personnel, information service providers, weather effects (snow, rain, ice), telecommunications systems, and government reporting systems, among others.

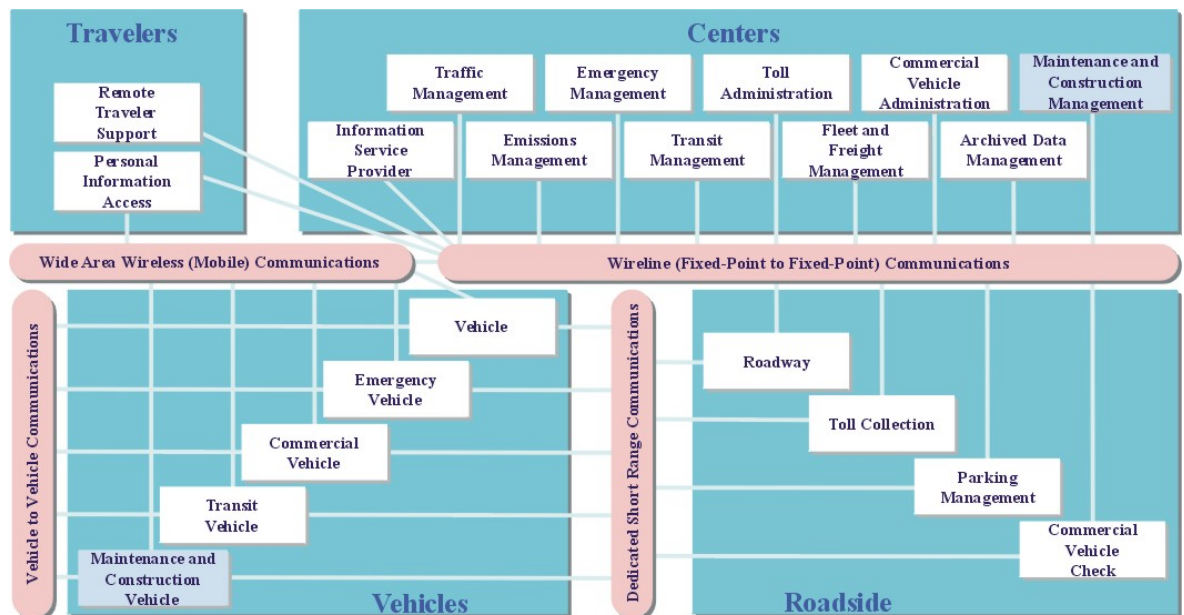


Figure 4 – Physical Subsystem Interconnect Diagram

4.1.2 Waco ITS Inventory by Stakeholder

Each stakeholder is associated with one or more systems or elements (subsystems and terminators) that make up the transportation system in the Waco Region. **Table 3** sorts the inventory by stakeholder, so each stakeholder can easily identify and review all their relevant assets that are identified in the Waco Regional ITS Architecture.

The information in **Table 3** also is included on the Waco ITS Architecture web site, which is accessible by selecting the link to the Texas Regional ITS Architecture, the Waco Region, and then selecting the “Inventory by Stakeholder” button which will open the stakeholder list. Each element in the list contains a hyperlink to more detailed information, including status, description, stakeholder, and other elements within the inventory with which it interfaces. (At the time this report was published, the Waco Regional ITS



Architecture web site was being hosted at www.consystem.com. TxDOT plans to permanently host the site in the future at www.dot.state.tx.us/trf/its.)

4.1.3 *Waco ITS Inventory by Entity*

The Waco Regional ITS Architecture inventory is made up of the transportation and communications centers, the field equipment, the vehicles, and other systems in the regional transportation system. These components have been assigned to an entity (subsystem or terminator) as defined by the National ITS Architecture. **Table 4** presents the Waco Region inventory using the associated National ITS Architecture subsystem or terminator. This sorts elements that perform similar functions together, so elements of a particular type can be easily identified. This inventory also can be accessed from the Waco Regional ITS Architecture web site by selecting the “Inventory by Entity” button.

Table 3 – Waco Inventory of Regional Subsystems/Terminators (sorted by Stakeholder)

| Stakeholder | Element | Entity | Status |
|--------------------------------------|------------------------------------------------|---------------------------------------------------|----------|
| Baylor University | Baylor University Traveler Information Website | Information Service Provider Subsystem | Existing |
| Bell County | Bell County Communications Center/EOC | Emergency Management Subsystem | Existing |
| | Bell County Public Safety Vehicles | Emergency Vehicle Subsystem | Existing |
| City of Killeen | City of Killeen PWD | Maintenance and Construction Management Subsystem | Existing |
| | City of Killeen PWD Vehicles | Maintenance and Construction Vehicle Subsystem | Existing |
| City of Temple | City of Temple Automated Calling System | Emergency Management Subsystem | Planned |
| | City of Temple PWD | Maintenance and Construction Management Subsystem | Existing |
| | City of Temple PWD Vehicles | Maintenance and Construction Vehicle Subsystem | Existing |
| City of Waco | City of Waco Equipment Repair | Equipment Repair Facility | Existing |
| | City of Waco Public Works Divisions | Maintenance and Construction Management Subsystem | Existing |
| | City of Waco Public Works Vehicles | Maintenance and Construction Vehicle Subsystem | Existing |
| | City of Waco Website | Information Service Provider Subsystem | Existing |
| Commercial Vehicle Operators | Commercial Vehicles | Commercial Vehicle Subsystem | Existing |
| | Commercial Vehicles | Vehicle Subsystem | Existing |
| | Private Fleet Management Systems | Fleet and Freight Management Subsystem | Future |
| Correctional Facilities | Correctional Facilities Operations | Emergency Management Subsystem | Existing |
| County Emergency Management Agencies | County EOC | Emergency Management Subsystem | Existing |
| County Road and Bridge | County Road and Bridge | Maintenance and Construction Management Subsystem | Existing |
| | County Road and Bridge Equipment Repair | Equipment Repair Facility | Existing |
| | County Road and Bridge Field Equipment | Roadway Subsystem | Existing |



Table 3 – Waco Inventory of Regional Subsystems/Terminators (sorted by Stakeholder) (continued)

| Stakeholder | Element | Entity | Status |
|--------------------------------------|--------------------------------------------------|------------------------------------------------|----------|
| County Road and Bridge (continued) | County Road and Bridge Vehicles | Maintenance and Construction Vehicle Subsystem | Existing |
| DPS | DPS Administration | Emergency Management Subsystem | Existing |
| | DPS Communications Service | Emergency Management Subsystem | Existing |
| | DPS Emergency Vehicles | Emergency Vehicle Subsystem | Existing |
| | Statewide Crash Records Information System | Archived Data Management Subsystem | Existing |
| | Statewide Crash Records Information System Users | Archived Data User Systems | Existing |
| DPS Division of Emergency Management | State EOC | Emergency Management Subsystem | Existing |
| East Texas Medical Center | East Texas Medical Center EMS Dispatch | Emergency Management Subsystem | Existing |
| | ETMC EMS Vehicles | Emergency Vehicle Subsystem | Existing |
| Financial Institution | Financial Institution | Financial Institution | Future |
| Hill Country Transit District | Hill Country Paratransit Vehicles | Transit Vehicle Subsystem | Existing |
| | Hill Country Rural Transit Vehicles | Transit Vehicle Subsystem | Existing |
| | Hill Country Transit Dispatch | Transit Management Subsystem | Existing |
| | Hill Country Transit District Ridership Database | Archived Data Management Subsystem | Existing |
| | Hill Country Transit Maintenance Database | Archived Data Management Subsystem | Existing |
| | Hill Country Transit Rural Dispatch | Transit Management Subsystem | Existing |
| | Hill Country Transit Vehicles | Transit Vehicle Subsystem | Existing |
| | Hill Country Transit Website | Information Service Provider Subsystem | Existing |
| HOTCOG | HOTCOG Transit Dispatch | Transit Management Subsystem | Existing |
| | HOTCOG Transit Ridership database | Archived Data Management Subsystem | Existing |
| | HOTCOG Transit Vehicles | Transit Vehicle Subsystem | Existing |
| | HOTCOG Website | Information Service Provider Subsystem | Existing |
| | Regional Transit Card | Traveler Card | Future |
| Independent School Districts | Independent School District Buses | Transit Vehicle Subsystem | Existing |
| | Independent School District Dispatch | Transit Management Subsystem | Existing |

Table 3 – Waco Inventory of Regional Subsystems/Terminators (sorted by Stakeholder) (continued)

| Stakeholder | Element | Entity | Status |
|------------------------------------------|----------------------------------------------|---------------------------------------------------|----------|
| Killeen Traffic Services | City of Killeen ITS Field Equipment | Roadway Subsystem | Existing |
| | City of Killeen Traffic Operations Center | Traffic Management Subsystem | Future |
| K-TUTS MPO | K-TUTS Archived Database Users | Archived Data User Systems | Existing |
| | K-TUTS Traffic Counts Database | Archived Data Management Subsystem | Existing |
| | K-TUTS Website | Information Service Provider Subsystem | Planned |
| Local Media | Local Print and Broadcast Media | Media | Existing |
| Municipal Convention and Visitors Bureau | City of Waco Event Scheduling | Event Promoters | Existing |
| Municipal or County Government | Municipal or County Permitting System | Commercial Vehicle Administration Subsystem | Existing |
| | Municipal Traveler Information Websites | Information Service Provider Subsystem | Future |
| Municipal or County Public Safety | County Emergency Vehicles | Emergency Vehicle Subsystem | Existing |
| | County Public Safety Dispatch | Emergency Management Subsystem | Existing |
| | County Public Safety Dispatch | Enforcement Agency | Existing |
| | Municipal Emergency Vehicles | Emergency Vehicle Subsystem | Existing |
| | Municipal ITS Field Equipment | Roadway Subsystem | Future |
| | Municipal Public Safety Dispatch | Emergency Management Subsystem | Existing |
| Municipal Public Works Department | Municipal PWD | Maintenance and Construction Management Subsystem | Existing |
| | Municipal PWD Vehicles | Maintenance and Construction Vehicle Subsystem | Existing |
| | Municipal Traffic Operations Center | Traffic Management Subsystem | Future |
| NOAA | National Weather Service | Weather Service | Existing |
| Private Ambulance | Private Ambulance Dispatch | Emergency Management Subsystem | Existing |
| | Private Ambulance Vehicle | Emergency Vehicle Subsystem | Existing |
| Private Information Service Providers | Private Sector Traveler Information Services | Information Service Provider Subsystem | Future |
| Private Maintenance Contractor | Private Maintenance Contractor | Maintenance and Construction Management Subsystem | Existing |



Table 3 – Waco Inventory of Regional Subsystems/Terminators (sorted by Stakeholder) (continued)

| Stakeholder | Element | Entity | Status |
|-----------------------------------------------|----------------------------------------------|---------------------------------------------------|----------|
| Private Taxi Providers | Private Taxi Provider Dispatch | Transit Management Subsystem | Existing |
| Private Tow/Wrecker Providers | Private Tow/Wrecker Dispatch | Emergency Management Subsystem | Existing |
| | Private Tow/Wrecker Vehicles | Emergency Vehicle Subsystem | Existing |
| Private Transit Providers | Other Transit Systems | Transit Management Subsystem | Existing |
| | Private Transit Systems | Transit Management Subsystem | Existing |
| Private Travelers | Driver | Driver | Existing |
| | Private Travelers Personal Computing Devices | Personal Information Access Subsystem | Future |
| | Private Vehicles | Vehicle Subsystem | Existing |
| Rail Operators | Rail Operations Centers | Archived Data User Systems | Existing |
| | Rail Operations Centers | Fleet and Freight Management Subsystem | Existing |
| | Rail Operations Centers | Rail Operations | Existing |
| | Rail Operators Wayside Equipment | Wayside Equipment | Existing |
| Regional Airport Operators | Regional Airports | Multimodal Transportation Service Provider | Existing |
| Regional Emergency and Public Safety Agencies | Waco Region Incident and Mutual Aid Network | Other EM | Future |
| Regional Medical Center | Regional Medical Center | Care Facility | Existing |
| State of Texas | Service Agencies | Information Service Provider Subsystem | Existing |
| Temple Traffic Services | City of Temple ITS Field Equipment | Roadway Subsystem | Existing |
| | City of Temple Traffic Operations Center | Traffic Management Subsystem | Existing |
| Texas Department of Motor Vehicles | Texas DMV | DMV | Existing |
| Texas Excavation Safety System | Utility Location Companies | Maintenance and Construction Management Subsystem | Existing |
| TxDOT | Other TxDOT District Maintenance Sections | Maintenance and Construction Management Subsystem | Existing |
| | Other TxDOT District TMCs | Traffic Management Subsystem | Existing |
| | TxDOT 511 System | Information Service Provider Subsystem | Planned |



Table 3 – Waco Inventory of Regional Subsystems/Terminators (sorted by Stakeholder) (continued)

| Stakeholder | Element | Entity | Status |
|------------------------------------------------------|-------------------------------------------------------------------|-----------------------------------------------------|----------|
| TxDOT (continued) | TxDOT BRINSAP | Asset Management | Existing |
| | TxDOT Fort Worth TMC (TransVision) | Traffic Management Subsystem | Existing |
| | TxDOT Highway Conditions Reporting System | Maintenance and Construction Management Subsystem | Existing |
| | TxDOT Motor Carrier Routing Information | Information Service Provider Subsystem | Existing |
| | TxDOT Public Transportation Division | Archived Data User Systems | Existing |
| | TxDOT Rest Areas/Visitor Centers/Truck Stops/Service Plaza Kiosks | Remote Traveler Support Subsystem | Future |
| | TxDOT Statewide Pavement Management System | Archived Data Management Subsystem | Existing |
| | TxDOT Transportation Planning and Programming Division | Traffic Management Subsystem | Existing |
| | TxDOT Waco District Area Engineers Office | Maintenance and Construction Administrative Systems | Existing |
| | TxDOT Waco District Area Engineers Office | Maintenance and Construction Management Subsystem | Existing |
| | TxDOT Waco District CCTV | Roadway Subsystem | Future |
| | TxDOT Waco District DMS | Roadway Subsystem | Existing |
| | TxDOT Waco District Field Sensors | Roadway Subsystem | Existing |
| | TxDOT Waco District Freeway Frontage Road Signals | Roadway Subsystem | Existing |
| | TxDOT Waco District Lane Control Signals | Roadway Subsystem | Future |
| | TxDOT Waco District Maintenance Sections | Maintenance and Construction Management Subsystem | Existing |
| | TxDOT Waco District Maintenance Vehicles | Maintenance and Construction Vehicle Subsystem | Existing |
| | TxDOT Waco District Pavement Management System | Archived Data Management Subsystem | Existing |
| | TxDOT Waco District Pavement Management System | Asset Management | Existing |
| TxDOT Waco District Pavement Management System Users | Archived Data User Systems | Existing | |



Table 3 – Waco Inventory of Regional Subsystems/Terminators (sorted by Stakeholder) (continued)

| Stakeholder | Element | Entity | Status |
|----------------------|--------------------------------------------------------------------|---------------------------------------------------|----------|
| TxDOT (continued) | TxDOT Waco District Public Information Office | Information Service Provider Subsystem | Existing |
| | TxDOT Waco District Public Transportation Management System (PTMS) | Archived Data Management Subsystem | Existing |
| | TxDOT Waco District RWIS Sensors | Roadway Subsystem | Future |
| | TxDOT Waco District School Pager System | Roadway Subsystem | Existing |
| | TxDOT Waco District Shop | Equipment Repair Facility | Existing |
| | TxDOT Waco District Traffic Office | Traffic Management Subsystem | Existing |
| | TxDOT Waco District Traffic Signals | Roadway Subsystem | Existing |
| | TxDOT Waco District Web Page | Information Service Provider Subsystem | Existing |
| | TxDOT Waco District Work Zone Equipment | Roadway Subsystem | Existing |
| | TxDOT Water Level Sensors | Roadway Subsystem | Future |
| US Army | Fort Hood Archived Data Users | Archived Data User Systems | Existing |
| | Fort Hood Electronic Clearance Database | Commercial Vehicle Administration Subsystem | Future |
| | Fort Hood Entrance Vehicle Inspection Station | Commercial Vehicle Check | Future |
| | Fort Hood Field Equipment | Roadway Subsystem | Existing |
| | Fort Hood Operations Center | Emergency Management Subsystem | Existing |
| | Fort Hood Traffic Count Database | Archived Data Management Subsystem | Future |
| | Fort Hood Traffic Signal System | Traffic Management Subsystem | Existing |
| | Fort Hood Traveler Info Website | Information Service Provider Subsystem | Planned |
| Utility Companies | Utility Companies | Maintenance and Construction Management Subsystem | Future |
| Waco Fire Department | City of Waco Fire Dispatch | Emergency Management Subsystem | Existing |
| | City of Waco Fire Vehicles | Emergency Vehicle Subsystem | Existing |



Table 3 – Waco Inventory of Regional Subsystems/Terminators (sorted by Stakeholder) (continued)

| Stakeholder | Element | Entity | Status |
|-------------------------------------------|------------------------------------------|----------------------------------------|----------|
| Waco MPO | Waco MPO Archived Data Users | Archived Data User Systems | Existing |
| | Waco MPO Regional Traffic Count Database | Archived Data Management Subsystem | Existing |
| | Waco MPO Website | Information Service Provider Subsystem | Existing |
| Waco Police Department | City of Waco Police Vehicles | Emergency Vehicle Subsystem | Existing |
| | Waco-McLennan County Dispatch | Emergency Management Subsystem | Existing |
| | Waco-McLennan County Dispatch | Enforcement Agency | Existing |
| Waco Traffic Services | City of Waco CCTV | Roadway Subsystem | Future |
| | City of Waco Crash Database | Archived Data Management Subsystem | Existing |
| | City of Waco DMS | Roadway Subsystem | Future |
| | City of Waco Environmental Sensors | Roadway Subsystem | Existing |
| | City of Waco Red Light Running Camera | Roadway Subsystem | Future |
| | City of Waco Red Light Running System | Traffic Management Subsystem | Future |
| | City of Waco School Pager System | Roadway Subsystem | Existing |
| | City of Waco Traffic Operations Center | Traffic Management Subsystem | Planned |
| | City of Waco Traffic Signals | Roadway Subsystem | Existing |
| | City of Waco Vehicle Detectors | Roadway Subsystem | Existing |
| | City of Waco Work Zone Equipment | Roadway Subsystem | Existing |
| Waco Transit | City of Waco Regional Smart Card | Traveler Card | Future |
| | City of Waco Transit Kiosks | Remote Traveler Support Subsystem | Future |
| | City of Waco Transit Operations Center | Transit Management Subsystem | Existing |
| | City of Waco Transit Ridership Database | Archived Data Management Subsystem | Existing |
| | City of Waco Transit Stations | Remote Traveler Support Subsystem | Existing |
| | City of Waco Transit Vehicles | Transit Vehicle Subsystem | Existing |
| | Transit Database Users | Archived Data User Systems | Existing |
| Waco-McLennan County Emergency Management | Waco-McLennan County EOC | Emergency Management Subsystem | Existing |



Table 4 – Waco Inventory of Regional Subsystems/Terminators (sorted by Entity)

| Entity | Element | Stakeholder | Status |
|------------------------------------|--------------------------------------------------------------------|-------------------------------|----------|
| Archived Data Management Subsystem | City of Waco Crash Database | Waco Traffic Services | Existing |
| | City of Waco Transit Ridership Database | Waco Transit | Existing |
| | Fort Hood Traffic Count Database | US Army | Future |
| | Hill Country Transit District Ridership Database | Hill Country Transit District | Existing |
| | Hill Country Transit Maintenance Database | Hill Country Transit District | Existing |
| | HOTCOG Transit Ridership database | HOTCOG | Existing |
| | K-TUTS Traffic Counts Database | K-TUTS MPO | Existing |
| | Statewide Crash Records Information System | DPS | Existing |
| | TxDOT Statewide Pavement Management System | TxDOT | Existing |
| | TxDOT Waco District Pavement Management System | TxDOT | Existing |
| | TxDOT Waco District Public Transportation Management System (PTMS) | TxDOT | Existing |
| | Waco MPO Regional Traffic Count Database | Waco MPO | Existing |
| Archived Data User Systems | Fort Hood Archived Data Users | US Army | Existing |
| | K-TUTS Archived Database Users | K-TUTS MPO | Existing |
| | Rail Operations Centers | Rail Operators | Existing |
| | Statewide Crash Records Information System Users | DPS | Existing |
| | Transit Database Users | Waco Transit | Existing |
| | TxDOT Public Transportation Division | TxDOT | Existing |
| | TxDOT Waco District Pavement Management System Users | TxDOT | Existing |
| | Waco MPO Archived Data Users | Waco MPO | Existing |
| Asset Management | TxDOT BRINSAP | TxDOT | Existing |
| | TxDOT Waco District Pavement Management System | TxDOT | Existing |
| Care Facility | Regional Medical Center | Regional Medical Center | Existing |



Table 4 – Waco Inventory of Regional Subsystems/Terminators (sorted by Entity) (continued)

| Entity | Element | Stakeholder | Status |
|---------------------------------------------|-----------------------------------------------|--------------------------------------|----------|
| Commercial Vehicle Administration Subsystem | Fort Hood Electronic Clearance Database | US Army | Future |
| | Municipal or County Permitting System | Municipal or County Government | Existing |
| Commercial Vehicle Check | Fort Hood Entrance Vehicle Inspection Station | US Army | Future |
| Commercial Vehicle Subsystem | Commercial Vehicles | Commercial Vehicle Operators | Existing |
| DMV | Texas DMV | Texas Department of Motor Vehicles | Existing |
| Driver | Driver | Private Travelers | Existing |
| Emergency Management Subsystem | Bell County Communications Center/EOC | Bell County | Existing |
| | City of Temple Automated Calling System | City of Temple | Planned |
| | City of Waco Fire Dispatch | Waco Fire Department | Existing |
| | Correctional Facilities Operations | Correctional Facilities | Existing |
| | County EOC | County Emergency Management Agencies | Existing |
| | County Public Safety Dispatch | Municipal or County Public Safety | Existing |
| | DPS Administration | DPS | Existing |
| | DPS Communications Service | DPS | Existing |
| | East Texas Medical Center EMS Dispatch | East Texas Medical Center | Existing |
| | Fort Hood Operations Center | US Army | Existing |
| | Municipal Public Safety Dispatch | Municipal or County Public Safety | Existing |
| | Private Ambulance Dispatch | Private Ambulance | Existing |
| | Private Tow/Wrecker Dispatch | Private Tow/Wrecker Providers | Existing |
| | State EOC | DPS Division of Emergency Management | Existing |
| | Waco-McLennan County Dispatch | Waco Police Department | Existing |
| Waco-McLennan County EOC | Waco-McLennan County Emergency Management | Existing | |



Table 4 – Waco Inventory of Regional Subsystems/Terminators (sorted by Entity) (continued)

| Entity | Element | Stakeholder | Status |
|----------------------------------------|------------------------------------------------|------------------------------------------|----------|
| Emergency Vehicle Subsystem | Bell County Public Safety Vehicles | Bell County | Existing |
| | City of Waco Fire Vehicles | Waco Fire Department | Existing |
| | City of Waco Police Vehicles | Waco Police Department | Existing |
| | County Emergency Vehicles | Municipal or County Public Safety | Existing |
| | DPS Emergency Vehicles | DPS | Existing |
| | ETMC EMS Vehicles | East Texas Medical Center | Existing |
| | Municipal Emergency Vehicles | Municipal or County Public Safety | Existing |
| | Private Ambulance Vehicle | Private Ambulance | Existing |
| | Private Tow/Wrecker Vehicles | Private Tow/Wrecker Providers | Existing |
| Enforcement Agency | County Public Safety Dispatch | Municipal or County Public Safety | Existing |
| | Waco-McLennan County Dispatch | Waco Police Department | Existing |
| Equipment Repair Facility | City of Waco Equipment Repair | City of Waco | Existing |
| | County Road and Bridge Equipment Repair | County Road and Bridge | Existing |
| | TxDOT Waco District Shop | TxDOT | Existing |
| Event Promoters | City of Waco Event Scheduling | Municipal Convention and Visitors Bureau | Existing |
| Financial Institution | Financial Institution | Financial Institution | Future |
| Fleet and Freight Management Subsystem | Private Fleet Management Systems | Commercial Vehicle Operators | Future |
| | Rail Operations Centers | Rail Operators | Existing |
| Information Service Provider Subsystem | Baylor University Traveler Information Website | Baylor University | Existing |
| | City of Waco Website | City of Waco | Existing |
| | Fort Hood Traveler Info Website | US Army | Planned |
| | Hill Country Transit Website | Hill Country Transit District | Existing |
| | HOTCOG Website | HOTCOG | Existing |
| | K-TUTS Website | K-TUTS MPO | Planned |
| | Municipal Traveler Information Websites | Municipal or County Government | Future |



Table 4 – Waco Inventory of Regional Subsystems/Terminators (sorted by Entity) (continued)

| Entity | Element | Stakeholder | Status |
|--------------------------------------------------------|-----------------------------------------------|---------------------------------------|----------|
| Information Service Provider Subsystem (continued) | Private Sector Traveler Information Services | Private Information Service Providers | Future |
| | Service Agencies | State of Texas | Existing |
| | TxDOT 511 System | TxDOT | Planned |
| | TxDOT Motor Carrier Routing Information | TxDOT | Existing |
| | TxDOT Waco District Public Information Office | TxDOT | Existing |
| | TxDOT Waco District Web Page | TxDOT | Existing |
| | Waco MPO Website | Waco MPO | Existing |
| Maintenance and Construction Administrative Systems | TxDOT Waco District Area Engineers Office | TxDOT | Existing |
| Maintenance and Construction Management Subsystem | City of Killeen PWD | City of Killeen | Existing |
| | City of Temple PWD | City of Temple | Existing |
| | City of Waco Public Works Divisions | City of Waco | Existing |
| | County Road and Bridge | County Road and Bridge | Existing |
| | Municipal PWD | Municipal Public Works Department | Existing |
| | Other TxDOT District Maintenance Sections | TxDOT | Existing |
| | Private Maintenance Contractor | Private Maintenance Contractor | Existing |
| | TxDOT Highway Conditions Reporting System | TxDOT | Existing |
| | TxDOT Waco District Area Engineers Office | TxDOT | Existing |
| | TxDOT Waco District Maintenance Sections | TxDOT | Existing |
| | Utility Companies | Utility Companies | Future |
| | Utility Location Companies | Texas Excavation Safety System | Existing |
| Maintenance and Construction Vehicle Subsystem | City of Killeen PWD Vehicles | City of Killeen | Existing |
| | City of Temple PWD Vehicles | City of Temple | Existing |
| | City of Waco Public Works Vehicles | City of Waco | Existing |
| | County Road and Bridge Vehicles | County Road and Bridge | Existing |



Table 4 – Waco Inventory of Regional Subsystems/Terminators (sorted by Entity) (continued)

| Entity | Element | Stakeholder | Status |
|------------------------------------------------------------|-------------------------------------------------------------------|-----------------------------------------------|----------|
| Maintenance and Construction Vehicle Subsystem (continued) | Municipal PWD Vehicles | Municipal Public Works Department | Existing |
| | TxDOT Waco District Maintenance Vehicles | TxDOT | Existing |
| Media | Local Print and Broadcast Media | Local Media | Existing |
| Multimodal Transportation Service Provider | Regional Airports | Regional Airport Operators | Existing |
| Other EM | Waco Region Incident and Mutual Aid Network | Regional Emergency and Public Safety Agencies | Future |
| Personal Information Access Subsystem | Private Travelers Personal Computing Devices | Private Travelers | Future |
| Rail Operations | Rail Operations Centers | Rail Operators | Existing |
| Remote Traveler Support Subsystem | City of Waco Transit Kiosks | Waco Transit | Future |
| | City of Waco Transit Stations | Waco Transit | Existing |
| | TxDOT Rest Areas/Visitor Centers/Truck Stops/Service Plaza Kiosks | TxDOT | Future |
| Roadway Subsystem | City of Killeen ITS Field Equipment | Killeen Traffic Services | Existing |
| | City of Temple ITS Field Equipment | Temple Traffic Services | Existing |
| | City of Waco CCTV | Waco Traffic Services | Future |
| | City of Waco DMS | Waco Traffic Services | Future |
| | City of Waco Environmental Sensors | Waco Traffic Services | Existing |
| | City of Waco Red Light Running Camera | Waco Traffic Services | Future |
| | City of Waco School Pager System | Waco Traffic Services | Existing |
| | City of Waco Traffic Signals | Waco Traffic Services | Existing |
| | City of Waco Vehicle Detectors | Waco Traffic Services | Existing |
| | City of Waco Work Zone Equipment | Waco Traffic Services | Existing |
| | County Road and Bridge Field Equipment | County Road and Bridge | Existing |
| | Fort Hood Field Equipment | US Army | Existing |
| | Municipal ITS Field Equipment | Municipal or County Public Safety | Future |
| TxDOT Waco District CCTV | TxDOT | Future | |



Table 4 – Waco Inventory of Regional Subsystems/Terminators (sorted by Entity) (continued)

| Entity | Element | Stakeholder | Status |
|-------------------------------|--------------------------------------------------------|-----------------------------------|----------|
| Roadway Subsystem (continued) | TxDOT Waco District DMS | TxDOT | Existing |
| | TxDOT Waco District Field Sensors | TxDOT | Existing |
| | TxDOT Waco District Freeway Frontage Road Signals | TxDOT | Existing |
| | TxDOT Waco District Lane Control Signals | TxDOT | Future |
| | TxDOT Waco District RWIS Sensors | TxDOT | Future |
| | TxDOT Waco District School Pager System | TxDOT | Existing |
| | TxDOT Waco District Traffic Signals | TxDOT | Existing |
| | TxDOT Waco District Work Zone Equipment | TxDOT | Existing |
| | TxDOT Water Level Sensors | TxDOT | Future |
| Traffic Management Subsystem | City of Killeen Traffic Operations Center | Killeen Traffic Services | Future |
| | City of Temple Traffic Operations Center | Temple Traffic Services | Existing |
| | City of Waco Red Light Running System | Waco Traffic Services | Future |
| | City of Waco Traffic Operations Center | Waco Traffic Services | Planned |
| | Fort Hood Traffic Signal System | US Army | Existing |
| | Municipal Traffic Operations Center | Municipal Public Works Department | Future |
| | Other TxDOT District TMCs | TxDOT | Existing |
| | TxDOT Fort Worth TMC (TransVision) | TxDOT | Existing |
| | TxDOT Transportation Planning and Programming Division | TxDOT | Existing |
| | TxDOT Waco District Traffic Office | TxDOT | Existing |
| Transit Management Subsystem | City of Waco Transit Operations Center | Waco Transit | Existing |
| | Hill Country Transit Dispatch | Hill Country Transit District | Existing |
| | Hill Country Transit Rural Dispatch | Hill Country Transit District | Existing |
| | HOTCOG Transit Dispatch | HOTCOG | Existing |
| | Independent School District Dispatch | Independent School Districts | Existing |



Table 4 – Waco Inventory of Regional Subsystems/Terminators (sorted by Entity) (continued)

| Entity | Element | Stakeholder | Status |
|---------------------------------------------|-------------------------------------|-------------------------------|----------|
| Transit Management Subsystem (continued) | Other Transit Systems | Private Transit Providers | Existing |
| | Private Taxi Provider Dispatch | Private Taxi Providers | Existing |
| | Private Transit Systems | Private Transit Providers | Existing |
| Transit Vehicle Subsystem | City of Waco Transit Vehicles | Waco Transit | Existing |
| | Hill Country Paratransit Vehicles | Hill Country Transit District | Existing |
| | Hill Country Rural Transit Vehicles | Hill Country Transit District | Existing |
| | Hill Country Transit Vehicles | Hill Country Transit District | Existing |
| | HOTCOG Transit Vehicles | HOTCOG | Existing |
| | Independent School District Buses | Independent School Districts | Existing |
| Traveler Card | City of Waco Regional Smart Card | Waco Transit | Future |
| | Regional Transit Card | HOTCOG | Future |
| Vehicle Subsystem | Commercial Vehicles | Commercial Vehicle Operators | Existing |
| | Private Vehicles | Private Travelers | Existing |
| Wayside Equipment | Rail Operators Wayside Equipment | Rail Operators | Existing |
| Weather Service | National Weather Service | NOAA | Existing |



4.2 Regional Market Packages

Upon completion of the system inventory, the next step in the development of the architecture was to identify the transportation services that are important to the Waco Region. In the National ITS Architecture, services are referred to as market packages. Market packages could include several stakeholders and elements that work together to provide a service in the Region. Examples of market packages from the National ITS Architecture include Network Surveillance, Traffic Information Dissemination, and Transit Vehicle Tracking. There are a total of 75 market packages identified in the National ITS Architecture Version 4.0.

In the Waco Region, the National ITS Architecture market packages were reviewed by the stakeholders and selected based on the relevance of the service that the market package could provide to the Region. All of the market packages that stakeholders in the Waco Region selected for implementation in the Region are identified in **Table 5**, as well as the elements in the Region that serve a role in providing the market package service and the primary stakeholders responsible for implementing the market packages.

In several cases, there are multiple stakeholders in the Region that provide the same service at different levels. For example, Surface Street Control (ATMS03) could be provided on arterials by the City of Waco and by TxDOT on highways throughout the Waco District. The market packages status is identified as existing, planned, or future for each of the primary stakeholders in the Region. In many cases market packages classified as existing might still need to be enhanced to increase the service that the market package provides and establish all of the elements associated with it.

Upon selecting the market packages that were applicable for the Region, stakeholders then reviewed each market package and the elements that could be included to customize it for the Region. This customization is discussed further in the following section.

Table 5 – Waco Region Selected Market Packages

| Market Package | Market Package Name | Elements Associated with Market Package | Primary Stakeholders Responsible for Implementation | Market Package Status |
|----------------|----------------------------------------------|-------------------------------------------|-----------------------------------------------------|-----------------------|
| ATMS01 | Network Surveillance | City of Killeen ITS Field Equipment | City of Killeen | Existing |
| | | City of Killeen Traffic Operations Center | City of Temple | Existing |
| | | City of Temple ITS Field Equipment | City of Waco | Existing |
| | | City of Temple Traffic Operations Center | Fort Hood | Existing |
| | | City of Waco CCTV | Municipalities | Future |
| | | City of Waco Traffic Operations Center | TxDOT Waco | Existing |
| | | City of Waco Vehicle Detectors | | |
| | City of Waco Website | | | |
| | Fort Hood Field Equipment | | | |
| | Fort Hood Traffic Signal System | | | |
| | K-TUTS Website | | | |
| | Municipal ITS Field Equipment | | | |
| | Municipal Traffic Operations Center | | | |
| | Private Sector Traveler Information Services | | | |

Table 5 – Waco Region Selected Market Packages (continued)

| Market Package | Market Package Name | Elements Associated with Market Package | Primary Stakeholders Responsible for Implementation | Market Package Status |
|-----------------------|-------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|-----------------------|
| ATMS01 (continued) | Network Surveillance (continued) | TxDOT Waco District CCTV TxDOT Waco District Field Sensors TxDOT Waco District Traffic Office TxDOT Waco District Web Page Waco MPO Website | | |
| ATMS02 | Probe Surveillance | Commercial Vehicles Private Vehicles TxDOT Waco District Field Sensors TxDOT Waco District Traffic Office | TxDOT Waco | Future |
| | | | | |
| ATMS03 | Surface Street Control | City of Killeen ITS Field Equipment City of Killeen Traffic Operations Center City of Temple ITS Field Equipment City of Temple Traffic Operations Center City of Waco CCTV City of Waco Traffic Operations Center City of Waco Traffic Signals Fort Hood Field Equipment Fort Hood Traffic Signal System Municipal ITS Field Equipment Municipal Traffic Operations Center TxDOT Waco District CCTV TxDOT Waco District Field Sensors TxDOT Waco District Freeway Frontage Road Signals TxDOT Waco District Traffic Office TxDOT Waco District Traffic Signals | City of Killeen | Existing |
| | | | City of Temple | Existing |
| | | | City of Waco | Existing |
| | | | Fort Hood | Existing |
| | | | Municipalities | Future |
| | | | TxDOT Waco | Existing |
| | | | | |
| ATMS04 | Freeway Control | TxDOT Waco District CCTV TxDOT Waco District Field Sensors TxDOT Waco District Lane Control Signals TxDOT Waco District Traffic Office | TxDOT Waco | Future |
| | | | | |
| ATMS06 | Traffic Information Dissemination | Bell County Communications Center/EOC City of Killeen ITS Field Equipment City of Killeen Traffic Operations Center City of Temple ITS Field Equipment City of Temple Traffic Operations Center City of Waco DMS City of Waco Fire Dispatch City of Waco Public Works Divisions City of Waco Traffic Operations Center | City of Killeen | Future |
| | | | City of Temple | Future |
| | | | City of Waco | Future |
| | | | Fort Hood | Future |
| | | | TxDOT Waco | Future |
| | | | | |

Table 5 – Waco Region Selected Market Packages (continued)

| Market Package | Market Package Name | Elements Associated with Market Package | Primary Stakeholders Responsible for Implementation | Market Package Status |
|-----------------------|--------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|-----------------------|
| ATMS06 (continued) | Traffic Information Dissemination (continued) | City of Waco Transit Operations Center City of Waco Website County Public Safety Dispatch County Road and Bridge DPS Communications Service East Texas Medical Center EMS Dispatch Fort Hood Field Equipment Fort Hood Operations Center Fort Hood Traffic Signal System Hill Country Transit Dispatch Hill Country Transit Rural Dispatch HOTCOG Transit Dispatch Independent School District Dispatch K-TUTS Website Local Print and Broadcast Media Municipal Public Safety Dispatch Municipal PWD Private Sector Traveler Information Services Private Transit Systems TxDOT 511 System TxDOT Waco District DMS TxDOT Waco District Maintenance Sections TxDOT Waco District Traffic Office TxDOT Waco District Public Information Office TxDOT Waco District Web Page Waco MPO Website Waco-McLennan County Dispatch | | |
| ATMS07 | Regional Traffic Control | City of Killeen Traffic Operations Center City of Temple Traffic Operations Center City of Waco Traffic Operations Center Municipal Traffic Operations Center Other TxDOT District TMCs TxDOT Fort Worth TMC (TransVision) TxDOT Waco District Traffic Office | Traffic Management Agencies | Future |
| | | | | |

Table 5 – Waco Region Selected Market Packages (continued)

| Market Package | Market Package Name | Elements Associated with Market Package | Primary Stakeholders Responsible for Implementation | Market Package Status |
|----------------|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|-----------------------|
| ATMS08 | Incident Management System | Bell County Communications Center/EOC Bell County Public Safety Vehicles City of Killeen PWD City of Killeen Traffic Operations Center City of Temple Automated Calling System City of Temple PWD City of Temple Traffic Operations Center City of Waco Environmental Sensors City of Waco Event Scheduling City of Waco Fire Dispatch City of Waco Fire Vehicles City of Waco Police Vehicles City of Waco Public Works Divisions City of Waco Traffic Operations Center County Emergency Vehicles County EOC County Public Safety Dispatch County Road and Bridge DPS Communications Service DPS Emergency Vehicles East Texas Medical Center EMS Dispatch ETMC EMS Vehicles Fort Hood Operations Center Hill Country Transit Dispatch Hill Country Transit Rural Dispatch HOTCOG Transit Dispatch Municipal Emergency Vehicles Municipal Public Safety Dispatch Municipal PWD Municipal Traffic Operations Center Other TxDOT District Maintenance Sections Private Ambulance Dispatch Private Ambulance Vehicle Private Maintenance Contractor Private Tow/Wrecker Dispatch Private Tow/Wrecker Vehicles Rail Operations Centers State EOC TxDOT Waco District Maintenance Sections | Transportation and Emergency Management Agencies | Future |

Table 5 – Waco Region Selected Market Packages (continued)

| Market Package | Market Package Name | Elements Associated with Market Package | Primary Stakeholders Responsible for Implementation | Market Package Status |
|-----------------------|---------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|------------------------------|
| ATMS08 (continued) | Incident Management System (continued) | TxDOT Waco District Traffic Office Waco-McLennan County Dispatch Waco-McLennan County EOC | | |
| ATMS13 | Standard Railroad Grade Crossing | City of Killeen ITS Field Equipment City of Killeen Traffic Operations Center City of Temple ITS Field Equipment City of Temple Traffic Operations Center Rail Operations Centers Rail Operators Wayside Equipment TxDOT Waco District Traffic Office TxDOT Waco District Traffic Signals | City of Killeen | Existing |
| | | | City of Temple | Existing |
| | | | TxDOT Waco | Existing |
| | | | | |
| ATMS15 | Railroad Operations Coordination | City of Killeen Traffic Operations Center City of Temple Traffic Operations Center Rail Operations Centers TxDOT Waco District Traffic Office | City of Killeen | Future |
| | | | City of Temple | Future |
| | | | TxDOT Waco | Future |
| | | | | |
| ATMS19 | Speed Monitoring | City of Killeen ITS Field Equipment City of Killeen Traffic Operations Center City of Temple ITS Field Equipment City of Temple Traffic Operations Center City of Waco School Pager System City of Waco Traffic Operations Center Driver Municipal ITS Field Equipment Municipal Traffic Operations Center TxDOT Waco District Traffic Office TxDOT Waco District School Pager System | City of Killeen | Future |
| | | | City of Temple | Future |
| | | | City of Waco | Existing |
| | | | Municipalities | Future |
| | | | TxDOT Waco | Existing |
| | | | | |
| ATMS22 | Red Light Running | City of Waco Red Light Running Camera City of Waco Red Light Running System Texas DMV Waco-McLennan County Dispatch | City of Waco | Future |
| | | | | |
| ATMS23 | Military Base Entrance Electronic Clearance | Fort Hood Electronic Clearance Database Fort Hood Entrance Vehicle Inspection Station Vehicles | Fort Hood | Future |
| | | | | |

Table 5 – Waco Region Selected Market Packages (continued)

| Market Package | Market Package Name | Elements Associated with Market Package | Primary Stakeholders Responsible for Implementation | Market Package Status |
|-----------------------|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|------------------------------|
| EM01 | Emergency Response | Bell County Communications Center/EOC City of Waco Fire Dispatch Correctional Facilities Operations County EOC County Public Safety Dispatch DPS Administration DPS Communications Service East Texas Medical Center EMS Dispatch Fort Hood Operations Center Municipal Public Safety Dispatch Private Ambulance Dispatch Private Tow/Wrecker Dispatch State EOC Waco-McLennan County Dispatch Waco-McLennan County EOC Waco Region Incident and Mutual Aid Network | Emergency Management Agencies | Future |
| EM02 | Emergency Routing | Bell County Communications Center/EOC Bell County Public Safety Vehicles City of Killeen ITS Field Equipment City of Killeen Traffic Operations Center City of Temple ITS Field Equipment City of Temple Traffic Operations Center City of Waco Fire Dispatch City of Waco Fire Vehicles City of Waco Traffic Operations Center City of Waco Traffic Signals County Emergency Vehicles County Public Safety Dispatch East Texas Medical Center EMS Dispatch ETMC EMS Vehicles Municipal Emergency Vehicles Municipal ITS Field Equipment Municipal Public Safety Dispatch Municipal Traffic Operations Center Private Ambulance Dispatch Private Ambulance Vehicle Regional Medical Center | Transportation and Emergency Management Agencies | Future |

Table 5 – Waco Region Selected Market Packages (continued)

| Market Package | Market Package Name | Elements Associated with Market Package | Primary Stakeholders Responsible for Implementation | Market Package Status |
|-----------------------|--------------------------------------------------|---------------------------------------------------------------------------|------------------------------------------------------------|------------------------------|
| EM02 (continued) | Emergency Routing (continued) | TxDOT Waco District Traffic Office TxDOT Waco District Traffic Signals | | |
| MC01 | Maintenance and Construction Vehicle Tracking | City of Killeen PWD | City of Killeen | Future |
| | | City of Killeen PWD Vehicles | City of Temple | Future |
| | | City of Temple PWD | City of Waco | Future |
| | | City of Temple PWD Vehicles | County Road and Bridge | Future |
| | | City of Waco Public Works Divisions | Municipalities | Future |
| | | City of Waco Public Works Vehicles | TxDOT Waco | Future |
| | | County Road and Bridge | | |
| | | County Road and Bridge Vehicles | | |
| MC02 | Maintenance and Construction Vehicle Maintenance | City of Killeen PWD | City of Killeen | Future |
| | | City of Killeen PWD Vehicles | City of Temple | Future |
| | | City of Temple PWD | City of Waco | Future |
| | | City of Temple PWD Vehicles | County Road and Bridge | Future |
| | | City of Waco Equipment Repair | Municipalities | Future |
| | | City of Waco Public Works Divisions | TxDOT Waco | Future |
| | | City of Waco Public Works Vehicles | | |
| | | County Road and Bridge | | |
| MC03 | Road Weather Data Collection | National Weather Service | TxDOT Waco | Future |
| | | Other TxDOT District TMCs | | |
| | | TxDOT Waco District Maintenance Sections | | |
| | | TxDOT Waco District RWIS Sensors | | |
| | | TxDOT Waco District Traffic Office | | |
| | | TxDOT Water Level Sensors | | |
| | | | | |

Table 5 – Waco Region Selected Market Packages (continued)

| Market Package | Market Package Name | Elements Associated with Market Package | Primary Stakeholders Responsible for Implementation | Market Package Status |
|-----------------------|-------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|------------------------------|
| MC04 | Weather Information Processing and Distribution | Bell County Communications Center/EOC City of Killeen PWD City of Killeen Traffic Operations Center City of Temple PWD City of Temple Traffic Operations Center City of Waco Public Works Divisions City of Waco Traffic Operations Center City of Waco Transit Operations Center County EOC County Road and Bridge DPS Communications Service Hill Country Transit Dispatch Hill Country Transit Rural Dispatch HOTCOG Transit Dispatch Independent School District Dispatch Municipal PWD Municipal Traffic Operations Center National Weather Service TxDOT Waco District Maintenance Sections TxDOT Waco District Traffic Office Waco-McLennan County EOC | Emergency Management Agencies | Future |
| | | | Maintenance Agencies | Future |
| | | | Traffic Management Agencies | Future |
| | | | Transit Management Agencies | Future |
| MC07 | Roadway Maintenance and Construction | City of Killeen PWD City of Killeen PWD Vehicles City of Killeen Traffic Operations Center City of Temple PWD City of Temple PWD Vehicles City of Temple Traffic Operations Center City of Waco Public Works Divisions City of Waco Public Works Vehicles City of Waco Traffic Operations Center County Road and Bridge County Road and Bridge Field Equipment County Road and Bridge Vehicles Municipal PWD Municipal PWD Vehicles TxDOT BRINSAP TxDOT Waco District Area Engineers Office TxDOT Waco District Maintenance Sections | City of Killeen | Future |
| | | | City of Temple | Future |
| | | | City of Waco | Future |
| | | | County Road and Bridge | Future |
| | | | Municipalities | Future |
| | | | TxDOT Waco | Future |
| | | | | |



Table 5 – Waco Region Selected Market Packages (continued)

| Market Package | Market Package Name | Elements Associated with Market Package | Primary Stakeholders Responsible for Implementation | Market Package Status |
|-------------------------------------------|-----------------------------------------------------|--------------------------------------------------------------------------------------------|------------------------------------------------------------|------------------------------|
| MC07 (continued) | Roadway Maintenance and Construction (continued) | TxDOT Waco District Maintenance Vehicles TxDOT Waco District Pavement Management System | | |
| MC08 | Work Zone Management | Bell County Communications Center/EOC | City of Killeen | Future |
| | | City of Killeen ITS Field Equipment | City of Temple | Future |
| | | City of Killeen PWD | City of Waco | Future |
| | | City of Killeen PWD Vehicles | County Road and Bridge | Future |
| | | City of Killeen Traffic Operations Center | Municipalities | Future |
| | | City of Temple ITS Field Equipment | TxDOT Waco | Future |
| | | City of Temple PWD | | |
| | | City of Temple PWD Vehicles | | |
| | | City of Temple Traffic Operations Center | | |
| | | City of Waco Fire Dispatch | | |
| | | City of Waco Public Works Divisions | | |
| | | City of Waco Public Works Vehicles | | |
| | | City of Waco Traffic Operations Center | | |
| | | City of Waco Transit Operations Center | | |
| | | City of Waco Work Zone Equipment | | |
| | | County EOC | | |
| | | County Public Safety Dispatch | | |
| | | County Road and Bridge | | |
| | | County Road and Bridge Field Equipment | | |
| | | County Road and Bridge Vehicles | | |
| DPS Communications Service | | | | |
| East Texas Medical Center EMS Dispatch | | | | |
| Hill Country Transit Dispatch | | | | |
| Hill Country Transit Rural Dispatch | | | | |
| HOTCOG Transit Dispatch | | | | |
| Independent School District Dispatch | | | | |
| Municipal Public Safety Dispatch | | | | |
| Municipal PWD | | | | |
| Municipal PWD Vehicles | | | | |
| Other TxDOT District Maintenance Sections | | | | |
| Private Tow/Wrecker Dispatch | | | | |
| State EOC | | | | |
| TxDOT Highway Conditions Reporting System | | | | |
| TxDOT Waco District Area Engineers Office | | | | |
| TxDOT Waco District Maintenance Sections | | | | |



Table 5 – Waco Region Selected Market Packages (continued)

| Market Package | Market Package Name | Elements Associated with Market Package | Primary Stakeholders Responsible for Implementation | Market Package Status |
|-----------------------|----------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|------------------------------|
| MC08 (continued) | Work Zone Management (continued) | TxDOT Waco District Maintenance Vehicles TxDOT Waco District Traffic Office TxDOT Waco District Web Page TxDOT Waco District Work Zone Equipment Waco-McLennan County Dispatch Waco-McLennan County EOC | | |
| MC09 | Work Zone Safety Monitoring | City of Killeen ITS Field Equipment City of Killeen PWD City of Killeen PWD Vehicles City of Temple ITS Field Equipment City of Temple PWD City of Temple PWD Vehicles City of Waco Public Works Divisions City of Waco Public Works Vehicles City of Waco Work Zone Equipment County Road and Bridge County Road and Bridge Field Equipment County Road and Bridge Vehicles Municipal ITS Field Equipment Municipal PWD Municipal PWD Vehicles TxDOT Waco District Maintenance Sections TxDOT Waco District Maintenance Vehicles TxDOT Waco District Work Zone Equipment | City of Killeen | Future |
| | | | City of Temple | Future |
| | | | City of Waco | Future |
| | | | County Road and Bridge | Future |
| | | | Municipalities | Future |
| | | | TxDOT Waco | Future |
| | | | | |
| MC10 | Maintenance and Construction Activity Coordination | Bell County Communications Center/EOC City of Killeen PWD City of Killeen Traffic Operations Center City of Temple Automated Calling System City of Temple PWD City of Temple Traffic Operations Center City of Waco Fire Dispatch City of Waco Public Works Divisions City of Waco Traffic Operations Center City of Waco Transit Operations Center County Public Safety Dispatch County Road and Bridge DPS Communications Service East Texas Medical Center EMS Dispatch Fort Hood Traffic Signal System | City of Killeen | Future |
| | | | City of Temple | Future |
| | | | City of Waco | Future |
| | | | County Road and Bridge | Future |
| | | | Municipalities | Future |
| | | | TxDOT Waco | Future |
| | | | | |

Table 5 – Waco Region Selected Market Packages (continued)

| Market Package | Market Package Name | Elements Associated with Market Package | Primary Stakeholders Responsible for Implementation | Market Package Status |
|--------------------------------------|----------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|------------------------------|
| MC10 (continued) | Maintenance and Construction Activity Coordination (continued) | Hill Country Transit Dispatch Hill Country Transit Rural Dispatch Hill Country Transit Website HOTCOG Transit Dispatch HOTCOG Website Independent School District Dispatch K-TUTS Website Municipal Public Safety Dispatch Municipal PWD Municipal Traffic Operations Center Other TxDOT District Maintenance Sections Private Maintenance Contractor Private Sector Traveler Information Services Private Tow/Wrecker Dispatch TxDOT Highway Conditions Reporting System TxDOT Waco District Area Engineers Office TxDOT Waco District Maintenance Sections TxDOT Waco District Traffic Office TxDOT Waco District Public Information Office TxDOT Waco District Web Page Utility Companies Utility Location Company Waco MPO Website Waco-McLennan County Dispatch | | |
| APTS1 | Transit Vehicle Tracking | City of Waco Transit Operations Center | City of Waco Transit | Future |
| | | City of Waco Transit Vehicles | Hill Country Transit | Future |
| | | Hill Country Paratransit Vehicles | HOTCOG Transit | Future |
| | | Hill Country Rural Transit Vehicles | Independent School Districts | Future |
| | | Hill Country Transit Dispatch | | |
| Hill Country Transit Rural Dispatch | | | | |
| Hill Country Transit Vehicles | | | | |
| HOTCOG Transit Dispatch | | | | |
| HOTCOG Transit Vehicles | | | | |
| Independent School District Buses | | | | |
| Independent School District Dispatch | | | | |

Table 5 – Waco Region Selected Market Packages (continued)

| Market Package | Market Package Name | Elements Associated with Market Package | Primary Stakeholders Responsible for Implementation | Market Package Status |
|-------------------------------------|------------------------------------|------------------------------------------------|------------------------------------------------------------|------------------------------|
| APTS2 | Transit Fixed-Route Operations | Baylor University Traveler Information Website | City of Waco Transit | Future |
| | | City of Killeen PWD | Hill Country Transit | Future |
| | | City of Killeen Traffic Operations Center | Independent School Districts | Future |
| | | City of Temple PWD | | |
| | | City of Temple Traffic Operations Center | | |
| | | City of Waco Public Works Divisions | | |
| | | City of Waco Traffic Operations Center | | |
| | | City of Waco Transit Operations Center | | |
| | | City of Waco Transit Vehicles | | |
| | | City of Waco Website | | |
| | | County Road and Bridge | | |
| | | Fort Hood Traveler Info Websites | | |
| | | Hill Country Transit Dispatch | | |
| | | Hill Country Transit Vehicles | | |
| | | Hill Country Transit Website | | |
| | | Independent School District Buses | | |
| | | Independent School District Dispatch | | |
| | | Municipal PWD | | |
| | | Municipal Traffic Operations Center | | |
| | | Municipal Traveler Information Websites | | |
| | | Private Sector Traveler Information Services | | |
| | | TxDOT 511 System | | |
| | | TxDOT Waco District Maintenance Sections | | |
| | | TxDOT Waco District Traffic Office | | |
| | | TxDOT Waco District Web Page | | |
| APTS3 | Demand Response Transit Operations | City of Killeen Traffic Operations Center | City of Waco Transit | Future |
| | | City of Temple PWD | Hill Country Transit | Future |
| | | City of Temple Traffic Operations Center | HOTCOG Transit | Future |
| | | City of Waco Public Works Divisions | | |
| | | City of Waco Traffic Operations Center | | |
| | | City of Waco Transit Operations Center | | |
| | | City of Waco Transit Vehicles | | |
| | | City of Waco Website | | |
| | | County Road and Bridge | | |
| | | Hill Country Paratransit Vehicles | | |
| Hill Country Rural Transit Vehicles | | | | |
| Hill Country Transit Dispatch | | | | |
| Hill Country Transit Rural Dispatch | | | | |

Table 5 – Waco Region Selected Market Packages (continued)

| Market Package | Market Package Name | Elements Associated with Market Package | Primary Stakeholders Responsible for Implementation | Market Package Status |
|-----------------------|------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|------------------------------|
| APTS3 (continued) | Demand Response Transit Operations (continued) | Hill Country Transit Website HOTCOG Transit Dispatch HOTCOG Transit Vehicles HOTCOG Website Municipal PWD Municipal Traffic Operations Center Private Sector Traveler Information Services Service Agencies TxDOT 511 System TxDOT Fort Worth TMC (TransVision) TxDOT Waco District Area Engineers Office TxDOT Waco District Traffic Office TxDOT Waco District Web Page | | |
| APTS4 | Transit Passenger and Fare Management | City of Waco Regional Smart Card City of Waco Transit Kiosks City of Waco Transit Operations Center City of Waco Transit Vehicles Financial Institution Hill Country Paratransit Vehicles Hill Country Rural Transit Vehicles Hill Country Transit Dispatch Hill Country Transit Rural Dispatch Hill Country Transit Vehicles HOTCOG Transit Dispatch HOTCOG Transit Vehicles Regional Transit Card Service Agencies | City of Waco Transit | Future |
| | | | Hill Country Transit | Future |
| | | | HOTCOG Transit | Future |
| APTS5 | Transit Security | Bell County Communications Center/EOC City of Waco Transit Kiosks City of Waco Transit Operations Center City of Waco Transit Stations City of Waco Transit Vehicles County Public Safety Dispatch DPS Communications Service Hill Country Paratransit Vehicles Hill Country Rural Transit Vehicles Hill Country Transit Dispatch Hill Country Transit Rural Dispatch Hill Country Transit Vehicles | City of Waco Transit | Future |
| | | | Hill Country Transit | Future |
| | | | HOTCOG Transit | Future |

Table 5 – Waco Region Selected Market Packages (continued)

| Market Package | Market Package Name | Elements Associated with Market Package | Primary Stakeholders Responsible for Implementation | Market Package Status |
|-----------------------|---------------------------------|-------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|------------------------------|
| APTS5 (continued) | Transit Security (continued) | HOTCOG Transit Dispatch HOTCOG Transit Vehicles Municipal Public Safety Dispatch Waco-McLennan County Dispatch | | |
| APTS6 | Transit Maintenance | City of Waco Transit Operations Center | City of Waco Transit | Future |
| | | City of Waco Transit Vehicles | Hill Country Transit | Future |
| | | Hill Country Paratransit Vehicles | HOTCOG Transit | Future |
| | | Hill Country Rural Transit Vehicles | | |
| | | Hill Country Transit Dispatch | | |
| | | Hill Country Transit Rural Dispatch | | |
| | | Hill Country Transit Vehicles | | |
| | | HOTCOG Transit Dispatch | | |
| | | HOTCOG Transit Vehicles | | |
| APTS7 | Multi-modal Coordination | City of Waco Transit Operations Center | City of Waco Transit | Future |
| | | Hill Country Transit Dispatch | Hill Country Transit | Future |
| | | Hill Country Transit Rural Dispatch | HOTCOG Transit | Future |
| | | HOTCOG Transit Dispatch | | |
| | | Other Transit Systems | | |
| | | Private Taxi Provider Dispatch | | |
| | | Private Transit Systems | | |
| | | Regional Airports | | |
| APTS8 | Transit Traveler Information | City of Waco Transit Kiosks | City of Waco Transit | Future |
| | | City of Waco Transit Operations Center | Hill Country Transit | Future |
| | | City of Waco Website | HOTCOG Transit | Future |
| | | Hill Country Transit Rural Dispatch | | |
| | | Hill Country Transit Website | | |
| | | HOTCOG Transit Dispatch | | |
| | | HOTCOG Website | | |
| | | Private Travelers Personal Computing Devices | | |
| | | TxDOT 511 System | | |
| | | TxDOT Rest Areas/Visitor Centers/Service/Truck Stops/ Plaza Kiosks | | |

Table 5 – Waco Region Selected Market Packages (continued)

| Market Package | Market Package Name | Elements Associated with Market Package | Primary Stakeholders Responsible for Implementation | Market Package Status |
|-----------------------|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|------------------------------|
| CVO04 | CV Administrative Processes | Bell County Communications Center/EOC City of Killeen Traffic Operations Center City of Temple Traffic Operations Center City of Waco Traffic Operations Center County Public Safety Dispatch DPS Communications Service Municipal or County Permitting System Municipal Public Safety Dispatch Municipal Traffic Operations Center Private Fleet Management Systems TxDOT Waco District Traffic Office Waco-McLennan County Dispatch | Municipalities and Counties | Future |
| | | | | |
| CVO10 | HAZMAT Management | Bell County Communications Center/EOC Commercial Vehicles County Public Safety Dispatch DPS Communications Service Municipal Public Safety Dispatch Private Fleet Management Systems Waco-McLennan County Dispatch | Emergency Management Agencies | Future |
| | | | | |
| ATIS1 | Broadcast Traveler Information | City of Killeen PWD City of Killeen Traffic Operations Center City of Temple PWD City of Temple Traffic Operations Center City of Waco Public Works Divisions City of Waco Traffic Operations Center City of Waco Transit Operations Center City of Waco Website County Road and Bridge Fort Hood Traffic Signal System K-TUTS Website Local Print and Broadcast Media Municipal PWD Municipal Traffic Operations Center Private Travelers Personal Computing Devices TxDOT 511 System TxDOT Rest Areas/Visitor Centers/Service/Truck Stops/ Plaza Kiosks TxDOT Waco District Maintenance Sections | City of Waco | Future |
| | | | K-TUTS | Future |
| | | | TxDOT Waco | Future |
| | | | | |

Table 5 – Waco Region Selected Market Packages (continued)

| Market Package | Market Package Name | Elements Associated with Market Package | Primary Stakeholders Responsible for Implementation | Market Package Status |
|--------------------------------------------------|-----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|------------------------------|
| ATIS1 (continued) | Broadcast Traveler Information (continued) | TxDOT Waco District Traffic Office TxDOT Waco District Public Information Office TxDOT Waco District Web Page | | |
| ATIS5 | ISP Based Route Guidance | City of Killeen Traffic Operations Center City of Temple Traffic Operations Center City of Waco Traffic Operations Center Fort Hood Traffic Signal System Private Fleet Management Systems TxDOT Motor Carrier Routing Information TxDOT Rest Areas/Visitor Centers/Service/Truck Stops/ Plaza Kiosks TxDOT Waco District Maintenance Sections TxDOT Waco District Traffic Office | TxDOT Motor Carrier Division | Future |
| AD1 | ITS Data Mart | City of Killeen Traffic Operations Center | City of Waco | Future |
| | | City of Temple Traffic Operations Center | City of Waco Transit | Future |
| | | City of Waco Crash Database | DPS | Future |
| | | City of Waco Traffic Operations Center | Fort Hood | Future |
| | | City of Waco Transit Operations Center | Hill Country Transit | Future |
| | | City of Waco Transit Ridership Database | HOTCOG Transit | Future |
| | | DPS Administration | K-TUTS | Future |
| | | Fort Hood Archived Data Users | TxDOT Waco | Future |
| | | Fort Hood Traffic Count Database | | |
| | | Fort Hood Traffic Signal System | | |
| Hill Country Transit Dispatch | | | | |
| Hill Country Transit District Ridership Database | | | | |
| Hill Country Transit Maintenance Database | | | | |
| Hill Country Transit Rural Dispatch | | | | |
| HOTCOG Transit Dispatch | | | | |
| HOTCOG Transit Ridership database | | | | |
| K-TUTS Archived Database Users | | | | |
| K-TUTS Traffic Counts Database | | | | |
| Municipal Traffic Operations Center | | | | |
| Statewide Crash Records Information System | | | | |
| Statewide Crash Records Information System Users | | | | |
| Transit Database Users | | | | |
| TxDOT Public Transportation Division | | | | |

Table 5 – Waco Region Selected Market Packages (continued)

| Market Package | Market Package Name | Elements Associated with Market Package | Primary Stakeholders Responsible for Implementation | Market Package Status |
|--------------------|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|-----------------------|
| AD1 (continued) | ITS Data Mart (continued) | TxDOT Statewide Pavement Management System TxDOT Transportation Planning and Programming Division TxDOT Waco District Maintenance Sections TxDOT Waco District Pavement Management System TxDOT Waco District Pavement Management System Users TxDOT Waco District Public Transportation Management System (PTMS) Waco MPO Archived Data Users Waco MPO Regional Traffic Count Database Waco-McLennan County Dispatch | | |
| AD2 | ITS Data Warehouse | City of Waco Traffic Operations Center City of Waco Transit Operations Center Rail Operations Centers Waco MPO Archived Data Users Waco MPO Regional Traffic Count Database | Waco MPO | Future |

4.3 Interconnections

4.3.1 Top Level Regional System Interconnect Diagram

A system interconnect diagram, or sausage diagram (shown previously in **Figure 4**), shows the systems and primary interconnects in the Region. The National ITS Architecture interconnect diagram has been customized for the Waco Region based on the information gathered from the stakeholders and system inventory. **Figure 5** summarizes the existing, planned, and future ITS elements for the Waco Region in the context of a physical interconnect. Subsystems and elements specific to Waco are called out in the boxes surrounding the main interconnect diagram, and these are color-coded to the subsystem to which they are associated.

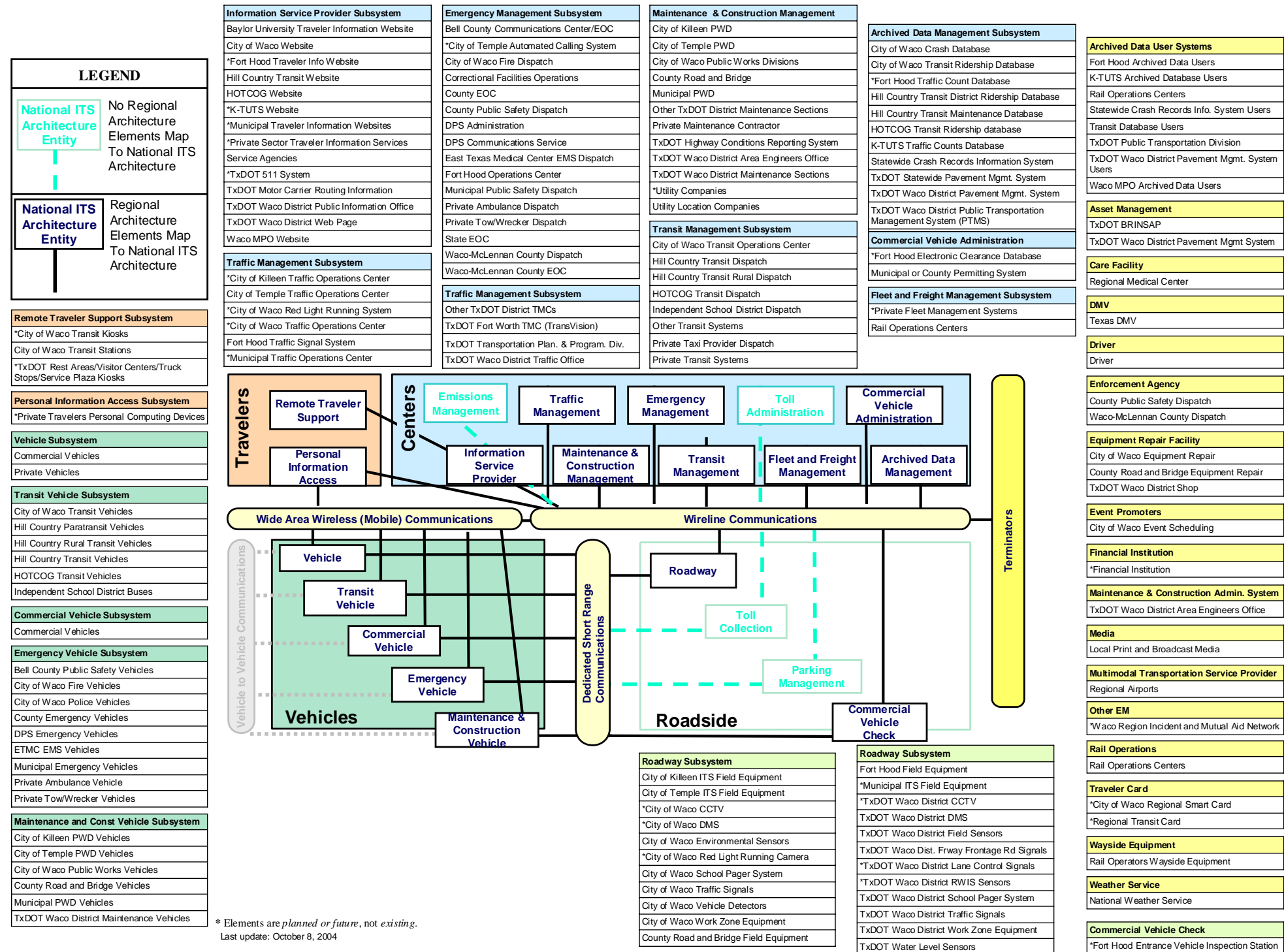


Figure 5 – Waco Regional System Interconnect Diagram

4.3.2 Customized Market Packages

The market packages in the National ITS Architecture were customized to reflect the unique systems, subsystems, and terminators in the Waco Region. Each market package is shown graphically, with the market package name, Waco-specific element, and the unique agency and system identifiers within the subsystems and terminators. Market packages represent a service that will be deployed as an integrated capability. Market packages often are comprised of one or more equipment packages, which are functional capabilities that could be deployed at a specific time. Equipment packages are the most basic functions that will be developed or bought by implementers.

Figure 6 is an example of an Advanced Traffic Management System (ATMS) market package for Surface Street Control that has been customized for the Waco Region. This market package shows the two subsystems, Traffic Management and Roadway, and the associated entities (TxDOT Waco District Traffic Signals, TxDOT Waco District Field Sensors, etc.) for both the TxDOT Waco District signal system and other municipal traffic signal systems in the Region. Data flows between the subsystems indicate what information is being shared.

Market packages that were customized for the Waco Region are shown in **Appendix A**. These market packages also are included on the Waco Regional ITS Architecture web site by selecting the “Market Package” button. Market packages are grouped by functional area (Traffic Management, Maintenance and Construction, Public Transportation, etc.), and each of the customized market packages can be viewed by clicking on the Market Package Diagram icon under each area heading. It is important to note that while the market package table on the web site shows all of the available market packages from the National ITS Architecture, only those selected for the Waco Region are included in the diagrams. The selected market packages on the web site also are highlighted in the table with bold print, and are indicated as existing or planned.

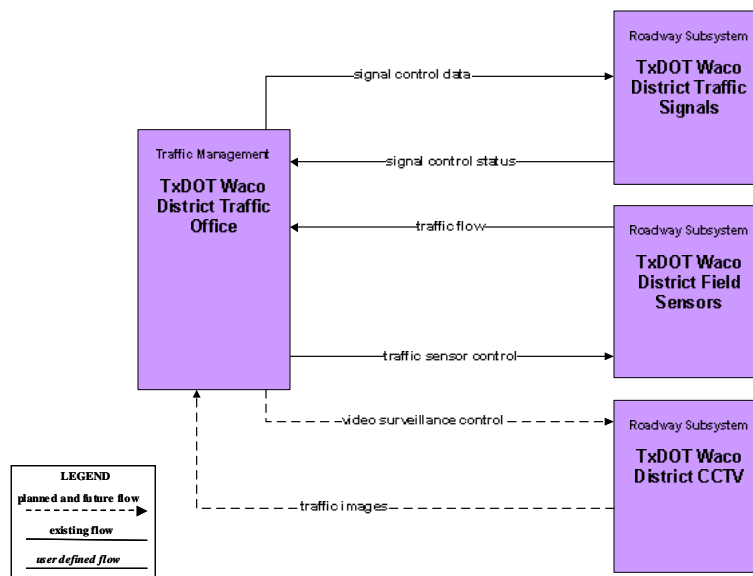


Figure 6 – Custom Market Package for Surface Street Control



4.3.3 Waco Architecture Interfaces

While it is important to identify the various systems and stakeholders as part of a regional ITS, a primary purpose of the architecture is to identify the connectivity between transportation systems in the Waco Region. The interconnect diagram shown previously in **Figure 5** showed the high-level relationships of the subsystems and terminators in the Waco Region and the associated local projects and systems. The customized market packages represent services that can be deployed as an integrated capability, and the market package diagrams show the information flows between the subsystems and terminators that are most important to the operation of the market packages. How these systems interface with each other is an integral part of the overall ITS architecture.

There are 151 different elements identified as part of the Waco Regional ITS Architecture. These elements include traffic management centers, transit vehicles, dispatch systems, emergency management agencies, media outlets, and others – essentially, all of the existing and planned physical components that contribute to the regional intelligent transportation system. Interfaces have been identified for each element in the Waco Regional ITS Architecture, and each element has been mapped to those other elements with which it must interface. For example, the TxDOT Waco District Traffic Office has existing or planned interfaces with 48 other elements in the Waco Region, ranging from field equipment and dispatch centers, to other TxDOT District TMCs. Other interfaces are far less complex, such as the interface between the DPS vehicles and the DPS Communications Dispatch.

An example of one of the system interfaces is shown in **Figure 7**. This graphic shows the TxDOT Waco District Traffic Signals and the existing and planned interfaces with other elements throughout the Region. These interfaces are shown as existing, planned, or future. Interfaces defined as planned have funding identified, while future interfaces are desired by stakeholders but funding has not yet been identified.

Each element and its defined interfaces are listed in **Appendix B**. Elements and their interfaces also are accessible via the Waco Regional ITS Architecture web site by clicking on the “Interfaces” button. Elements are listed alphabetically in the column on the left, and each entry in the Interfacing Element column on the right is a link to more detailed information about the particular interface. The architecture flows between the individual element interfaces are described in more detail in the following section.

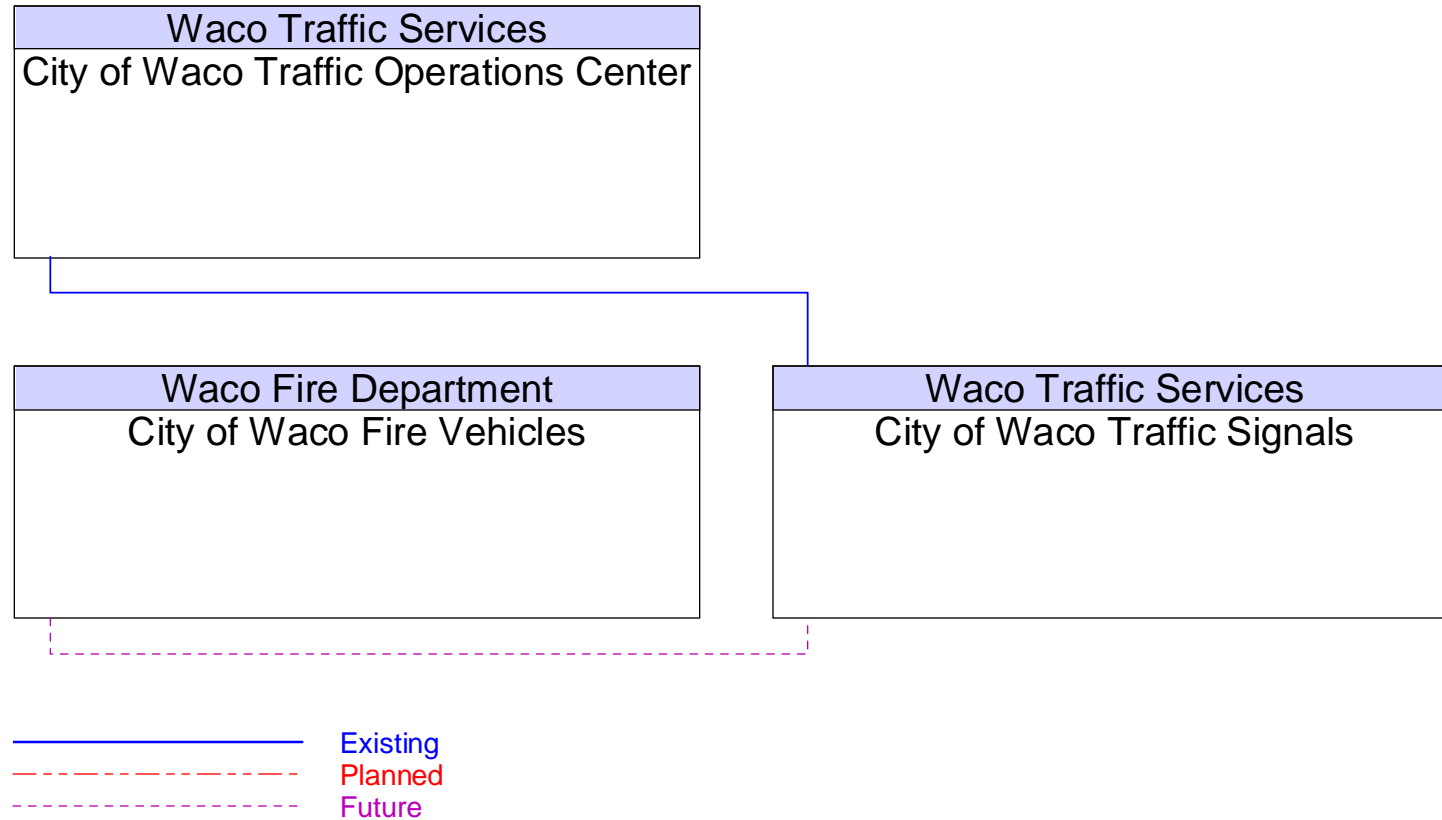


Figure 7 – City of Waco Traffic Signals Interfaces

4.3.4 Physical Subsystem Architecture Flows

Architecture flows between the subsystems and terminators define the specific information (data) that is exchanged between subsystems and terminators. Each architecture flow has one or more data flows that specify what information is exchanged and the direction of the exchange. These data flows could be requests for information, alerts and messages, status requests, broadcast advisories, event messages, confirmations, electronic credentials, and other key information requirements. These architecture flows define the interface requirements between the various elements in the Waco Regional ITS Architecture.

An example of the architecture flows between two elements is shown in **Figure 8**. In this interface, the flows between the TxDOT Waco District Traffic Office and City of Killeen Traffic Operations Center show information that must go from the Waco District Office to other traffic operations centers, as well as information that the District Office needs from devices. Similar to the interfaces, architecture flows also are defined as existing, planned, or future.

Each of the individual element interfaces can be accessed on the Waco Regional ITS Architecture web site by clicking on the “Interfaces” button. Selecting any of the interfacing elements from the column on the right will display an interface diagram and architecture flows between two specific elements, similar to the diagram shown in **Figure 8**. Each data flow is defined, and any standards associated with that data flow are noted. Standards as they apply to the Waco Region are discussed in more detail in Section 4.5.

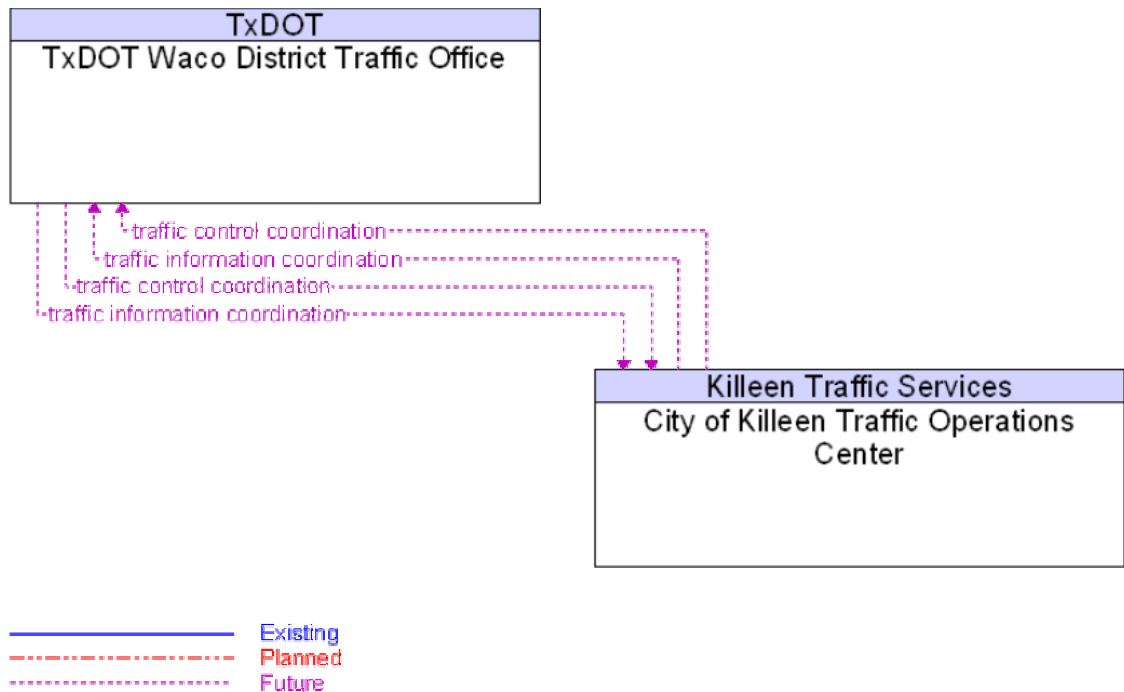


Figure 8 – TxDOT Waco District Traffic Office to City of Killeen Traffic Operations Center Architecture Flows

4.4 Functional Requirements

Functions are a description of what the system has to do. In the National ITS Architecture, functions are defined at several different levels, ranging from general subsystem descriptions to somewhat more specific equipment package descriptions to Process Specifications that include substantial detail. Guidance from the USDOT on developing a Regional ITS Architecture recommends that each Region determine the level of detail of the functional requirements for their Region. In the Waco Region, it is recommended that the development of detailed functional requirements such as the “shall” statements included in Process Specifications for a system be developed at the project level. These detailed “shall” statements identify all functions that a project or system needs to perform.

For the Waco Regional ITS Architecture, functional requirements have been identified at two levels. The customized market packages, discussed previously in Section 4.3.2, describe the services that ITS needs to provide in the Region and the architecture flows between the elements. These market packages and data flows describe what the ITS system in Waco has to do and the data that needs to be shared among elements.

At a more detailed level, functional requirements for the Waco Region also are described in terms of equipment packages that are associated with one or more subsystems in the Waco Regional ITS Architecture as shown in **Table 6**. An equipment package is a functional capability that could be deployed at a specific time. Each equipment package can be linked in the National ITS Architecture to the Process Specifications that might be applicable. It is recommended that during the design concept stage of a project, the applicable equipment package and associated Process Specifications from the National ITS Architecture be reviewed by the implementer to determine the appropriate functional requirements for the project. A link for each equipment package is available on the Waco Regional ITS Architecture web site by clicking on the “Functions” button.

Table 6 – Waco Region Equipment Packages

| Subsystem | Equipment Package |
|---------------------------------------------|--------------------------------------|
| Archived Data Management Subsystem | Government Reporting Systems Support |
| | ITS Data Repository |
| | On-Line Analysis and Mining |
| | Traffic and Roadside Data Archival |
| Commercial Vehicle Administration Subsystem | Credentials and Taxes Administration |
| | CV Data Collection |
| | CV Information Exchange |
| Commercial Vehicle Subsystem | On-board Cargo Monitoring |
| Emergency Management Subsystem | Emergency Call-Taking |
| | Emergency Data Collection |
| | Emergency Dispatch |
| | Emergency Environmental Monitoring |
| | Emergency Response Management |
| | Mayday Support |

Table 6 – Waco Region Equipment Packages (continued)

| Subsystem | Equipment Package |
|---------------------------------------------------|------------------------------------------------------|
| Emergency Vehicle Subsystem | On-board EV En Route Support |
| | On-board EV Environmental Monitoring |
| | On-board EV Incident Management Communication |
| Emissions Management Subsystem | Emissions Data Collection |
| Fleet and Freight Management Subsystem | Fleet Administration |
| | Fleet Credentials and Taxes Management and Reporting |
| | Fleet HAZMAT Management |
| Information Service Provider Subsystem | Basic Information Broadcast |
| | Infrastructure Provided Route Selection |
| | Interactive Infrastructure Information |
| | ISP Data Collection |
| | ISP Probe Information Collection |
| Maintenance and Construction Management Subsystem | MCM Data Collection |
| | MCM Environmental Information Collection |
| | MCM Environmental Information Processing |
| | MCM Incident Management |
| | MCM Maintenance Decision Support |
| | MCM Roadway Maintenance and Construction |
| | MCM Speed Monitoring |
| | MCM Vehicle and Equipment Maintenance Management |
| | MCM Vehicle Tracking |
| | MCM Work Activity Coordination |
| | MCM Work Zone Management |
| | MCM Work Zone Safety Management |
| Maintenance and Construction Vehicle Subsystem | MCV Environmental Monitoring |
| | MCV Infrastructure Monitoring |
| | MCV Roadway Maintenance and Construction |
| | MCV Vehicle Location Tracking |
| | MCV Vehicle Safety Monitoring |
| | MCV Vehicle System Monitoring and Diagnostics |
| MCV Work Zone Support | |
| Parking Management Subsystem | Parking Data Collection |
| Personal Information Access Subsystem | Personal Basic Information Reception |
| | Personal Interactive Information Reception |
| | Personal Location Determination |
| | Personal Provider-Based Route Guidance |
| Remote Traveler Support Subsystem | Remote Basic Information Reception |
| | Remote Interactive Information Reception |
| | Remote Mayday I/F |

Table 6 – Waco Region Equipment Packages (continued)

| Subsystem | Equipment Package |
|--------------------------------------------------|--------------------------------------------------|
| Remote Traveler Support Subsystem (continued) | Remote Transit Fare Management |
| | Remote Transit Information Services |
| | Secure Area Monitoring |
| Roadway Subsystem | Roadside Data Collection |
| | Roadside Signal Priority |
| | Roadway Basic Surveillance |
| | Roadway Environmental Monitoring |
| | Roadway Equipment Coordination |
| | Roadway Freeway Control |
| | Roadway Incident Detection |
| | Roadway Infrastructure Monitoring |
| | Roadway Probe Beacons |
| | Roadway Signal Controls |
| | Roadway Speed Monitoring |
| | Roadway Traffic Information Dissemination |
| | Roadway Work Zone Safety |
| | Roadway Work Zone Traffic Control |
| | Standard Rail Crossing |
| Toll Administration Subsystem | Toll Data Collection |
| Traffic Management Subsystem | Collect Traffic Surveillance |
| | HRI Traffic Management |
| | Rail Operations Coordination |
| | TMC Environmental Monitoring |
| | TMC Freeway Management |
| | TMC Incident Detection |
| | TMC Incident Dispatch Coordination/Communication |
| | TMC Multimodal Coordination |
| | TMC Probe Information Collection |
| | TMC Regional Traffic Control |
| | TMC Signal Control |
| | TMC Speed Monitoring |
| | TMC Traffic Information Dissemination |
| | TMC Work Zone Traffic Management |
| | Traffic Data Collection |
| | Traffic Maintenance |
| Transit Management Subsystem | Transit Center Fare and Load Management |
| | Transit Center Fixed-Route Operations |
| | Transit Center Information Services |
| | Transit Center Multi-Modal Coordination |

Table 6 – Waco Region Equipment Packages (continued)

| Subsystem | Equipment Package |
|------------------------------------------|-------------------------------------------|
| Transit Management Subsystem (continued) | Transit Center Paratransit Operations |
| | Transit Center Security |
| | Transit Center Tracking and Dispatch |
| | Transit Data Collection |
| | Transit Environmental Monitoring |
| | Transit Garage Maintenance |
| | Transit Garage Operations |
| Transit Vehicle Subsystem | On-board Environmental Monitoring |
| | On-board Fixed Route Schedule Management |
| | On-board Maintenance |
| | On-board Paratransit Operations |
| | On-board Transit Fare and Load Management |
| | On-board Transit Information Services |
| | On-board Transit Security |
| | On-board Transit Signal Priority |
| On-board Transit Trip Monitoring | |
| Vehicle Subsystem | Basic Vehicle Reception |
| | Smart Probe |
| | Vehicle Location Determination |
| | Vehicle Mayday I/F |
| | Vehicle Probe Support |
| | Vehicle Provider-Based Route Guidance |
| | Vehicle Safety Monitoring System |

4.5 Standards

Standards are an important tool that will allow efficient implementation of the elements in the Waco Regional ITS Architecture over time. Standards facilitate deployment of interoperable systems at local, regional, and national levels without impeding innovation as technology advances, vendors change, and as new approaches evolve. The USDOT’s ITS Joint Program Office is supporting Standards Development Organizations (SDOs) with an extensive, multi-year program of accelerated, consensus-based standards development to facilitate successful ITS deployment in the United States. **Table 7** identifies each of the ITS standards that could apply to the Waco Regional ITS Architecture. These standards are based on the physical subsystem architecture flows previously identified in Section 4.3.4. The connection of each standard to the applicable architecture flows between elements can be viewed on the Waco Regional ITS Architecture web site by clicking on the “Interfaces” or “Standards” buttons.

Table 7 – Applicable ITS Standards for the Waco Region

| SDO | Document ID | Title | Type |
|-----------------|----------------------|----------------------------------------------------------------------------------------------------------------------|---------------|
| AASHTO/ITE/NEMA | NTCIP 1201 | Global Object Definitions | Message |
| | NTCIP 1202 | Object Definitions for Actuated Traffic Signal Controller Units | Message |
| | NTCIP 1203 | Object Definitions for Dynamic Message Signs | Message |
| | NTCIP 1204 | Object Definitions for Environmental Sensor Stations and Roadside Weather Information System | Message |
| | NTCIP 1205 | Data Dictionary for Closed Circuit Television (CCTV) | Message |
| | NTCIP 1206 | Data Collection and Monitoring Devices | Message |
| | NTCIP 1207 | Ramp Meter Controller Objects | Message |
| | NTCIP 1208 | Object Definitions for Video Switches | Message |
| | NTCIP 1209 | Transportation System Sensor Objects | Message |
| | NTCIP 1210 | Objects for Signal Systems Master | Message |
| | NTCIP 1211 | Objects for Signal Control Priority | Message |
| | NTCIP 1301 | Message Set for Weather Reports | Message |
| | NTCIP 1401 | TCIP – Common Public Transportation (CPT) Business Area Standard | Message |
| | NTCIP 1402 | TCIP – Incident Management (IM) Business Area Standard | Message |
| | NTCIP 1403 | TCIP – Passenger Information (PI) Business Area Standard | Message |
| | NTCIP 1404 | TCIP – Scheduling/Runcutting (SCH) Business Area Standard | Message |
| | NTCIP 1405 | TCIP – Spatial Representation (SP) Business Area Standard | Message |
| | NTCIP 1406 | TCIP – Onboard (OB) Business Area Standard | Message |
| | NTCIP 1407 | TCIP – Control Center (CC) Business Area Standard | Message |
| | NTCIP 1408 | TCIP – Fare Collection (FC) Business Area Standard | Message |
| | View List | NTCIP Center-to-Center Standards Group | Communication |
| | View List | NTCIP Center-to-Field Standards Group | Communication |
| ASTM | ASTM 5 GHz Data Link | Standard Specification for 5.9 GHz Data Link Layer | Communication |
| | ASTM 5 GHz Phys | Standard Specification for 5.9 GHz Physical Layer | Communication |
| | ASTM DD 17.54.00.2 | ADMS Data Dictionary Specifications | Data |
| | ASTM PS 105-99 | Specification for Dedicated Short Range Communication (DSRC) Data Link Layer: Medium Access and Logical Link Control | Communication |
| | ASTM PS 111-98 | Specification for Dedicated Short Range Communication (DSRC) Physical Layer using Microwave in the 902-928 MHz | Communication |
| EIA/CEA | CEA/EIA-794 | Data Radio Channel (DARC) System | Communication |
| | CEA/EIA-795 | Subcarrier Traffic Information Channel (STIC) System | Communication |

Table 7 – Applicable ITS Standards for the Waco Region (continued)

| SDO | Document ID | Title | Type |
|------|--------------------|------------------------------------------------------------------------------------------------------------|---------------|
| IEEE | IEEE P1512.1 | Standard for Traffic Incident Management Message Sets for Use by EMCs | Message |
| | IEEE P1512.2 | Standard for Public Safety IMMS for use by EMCs | Message |
| | IEEE P1512.3 | Standard for Hazardous Material IMMS for use by EMCs | Message |
| | IEEE P1512.a | Standard for Emergency Management Data Dictionary | Data |
| | IEEE P1512-2000 | Standard for Common Incident Management Message Sets (IMMS) for use by EMCs | Message |
| | IEEE P1556 | Security/Privacy of Vehicle/RS Communications including Smart Card Communications | Communication |
| | IEEE P1570 | Standard for Interface Between the Rail Subsystem and the Highway Subsystem at a Highway Rail Intersection | Message |
| | IEEE Std 1455-1999 | Standard for Message Sets for Vehicle/Roadside Communications | Message |
| ITE | ITE TM 1.03 | Standard for Functional Level Traffic Management Data Dictionary (TMDD) | Data |
| | ITE TM 2.01 | Message Sets for External TMC Communication (MS/ETMCC) | Message |
| SAE | SAE J1746 | ISP-Vehicle Location Referencing Standard | Data |
| | SAE J2313 | On-board Land Vehicle Mayday Reporting Interface | Message |
| | SAE J2353 | Data Dictionary for Advanced Traveler Information System (ATIS) | Data |
| | SAE J2354 | Message Set for Advanced Traveler Information System (ATIS) | Message |
| | SAE J2369 | Standard for ATIS Message Sets Delivered Over Bandwidth Restricted Media | Message |
| | SAE J2529 | Rules for Standardizing Street Names and Route IDs | Message |
| | SAE J2540 | Messages for Handling Strings and Look-Up Tables in ATIS Standards | Message |

4.6 Phases of Implementation

The Regional ITS Architecture will be implemented through a series of projects led by both public sector and private sector agencies. Key foundation systems will need to be implemented in order to support other systems that have been identified in the Regional ITS Architecture. The deployment of all of the systems required to achieve the final Regional ITS Architecture build out will occur over many years.

A sequence of projects and their respective time frames have been identified in the Waco Regional ITS Deployment Plan. These projects have been sequenced over a 20-year period, with projects identified for deployment in 5-, 10- and 20-year timeframes.



Some of the key market packages that will provide the functions for the key foundation systems in the Waco Region are listed below. Projects associated with these and other market packages identified for the Region have been included in the Waco Regional ITS Deployment Plan.

- Network Surveillance;
- Surface Street Control;
- Traffic Information Dissemination;
- Transit Vehicle Tracking; and
- Broadcast Traveler Information.

5. OPERATIONAL CONCEPT

The operational concept for the Waco Region provides a description of the stakeholders' roles and responsibilities in the operation of the systems that currently exist or that are being proposed. This operational concept provides an "executive summary" view of the way the Waco Region's systems will work together, and it documents the roles and responsibilities for each of the services that ITS will provide. The approach to describing the operational concept is to present specific operational scenarios that describe and define the stakeholders' general roles in providing the services.

In addition to the operational scenarios that illustrate the roles and responsibilities of each agency, a list of the key agencies that are responsible for operations in the eight ITS areas is presented. This list will serve as a high level overview of the different roles and responsibilities in this operational concept. In addition, specific roles and coordination requirements for operations are illustrated through the customized market package diagrams presented in **Appendix A**.

With the integration, information sharing, and in some cases joint operations of systems, there will likely be a requirement for agency agreements. Descriptions of potential agreements that may be needed in the Waco Region are included in Section 5.3.

5.1 Operational Scenarios

Scenario 1

The first operational scenario describes how ITS technologies may be used during a multi-vehicle crash on I-35 within the City of Waco city limits on Thanksgiving weekend. Motorists call 911 from cellular telephones and the City of Waco Public Safety Dispatch is quickly informed of the crash. An alert is automatically sent from the City of Waco Public Safety Dispatch to the TxDOT Waco District Traffic Office. TxDOT activates DMS and monitors the situation with a CCTV camera that is near the crash. The City of Waco Fire Department uses the video feed from TxDOT to determine the severity of the accident and the number and type of fire and rescue vehicles to dispatch. Using AVL on the fire vehicles, those vehicles that are closest to the scene with the appropriate equipment are dispatched.

Northbound I-35 is completely closed and the City of Waco Police, in coordination with the TxDOT Waco District, begin setting up a closure and detour. The City of Waco uses their closed-loop signal system to implement a modified timing plan from their TMC on alternate routes along the arterials to accommodate the large increases in traffic volume. The TxDOT Waco District Traffic Office also contacts the TxDOT Austin District TMC, TransVision and DalTrans so that motorists on I-35 approaching the area can be forewarned of the impending delay along northbound I-35 as a result of the accident as well as of delays southbound from increased traffic in the area and congestion resulting from onlookers.

TxDOT enters the closure on the Highway Condition Reporting System, which also feeds the statewide 511 traveler information number. DMS and Highway Advisory Radio continue to warn motorists that northbound I-35 is closed. The CCTV camera feed, which has been turned away from the crash to focus on the traffic condition on the interstate, is shared with the media which broadcasts the live shots of I-35 on the evening news to warn motorists that I-35 remains closed.

Scenario 2

Road construction along I-35 just north of the City of Waco is expected to result in the long-term closure of one lane of traffic as well as the shoulders. The TxDOT Waco District Traffic Office reports the closure to the City of Waco TMC. The City of Waco TMC implements detour timing plans on its closed-loop signal system and resets signal detectors using their VIVDS to account for changes in approaches to the signalized intersections since there are several signals along the frontage roads outside the city limits that the City of Waco controls for TxDOT. The TxDOT Waco District Traffic Office posts messages on the DMS along I-35 alerting motorists of the construction and potential detour routes.

The City of Waco TMC also sends a message to the Waco-McLennan County Dispatch so that when emergency vehicles are dispatched the drivers are cognizant of the closures and can take the appropriate detours. Additionally, Hill Country Transit Dispatch is also notified in case the closure will have an impact on the transit system.

Once the construction is complete, the TxDOT Waco District TMC sends out a message to the City of Waco TMC that all lanes are once again open. The City of Waco TMC then sends out a message to the Waco-McLennan County Dispatch and the Hill Country Transit Dispatch regarding the re-opening of the lanes.

5.2 Roles and Responsibilities

The operational scenarios described in the previous section illustrate the interagency cooperation and coordination that is required in two situations that might occur in the Waco Region. During any operational scenario, a number of agencies will be required to coordinate closely to perform their operational responsibilities. The key agencies that have a lead role or responsibility during operations are listed below for each ITS area. It is recognized that a number of other agencies will also need to be involved during a scenario in addition to the ones listed below, although it is not expected that these agencies will play as critical a role in operations.

Travel and Traffic Management

- Bell County
- City of Killeen
- City of Temple
- City of Waco
- County Road and Bridge
- Texas Department of Transportation Waco District
- Other Texas Department of Transportation Districts
- Texas Department of Public Safety

Public Transportation Management

- Hill Country Transit
- HOTCOG
- Independent School Districts
- Waco Transit



Electronic Payment

- Waco Transit
- Service Providers

Commercial Vehicle Operations

- Texas Department of Public Safety
- Texas Department of Transportation

Emergency Management

- Bell County Communications Center/EOC
- City of Killeen (Police, Fire, Traffic)
- City of Temple (Police, Fire, Traffic)
- City of Waco (Police, Fire, Traffic)
- County Public Safety (Sheriff's Office, Emergency Operations Center)
- Regional Hospitals
- Texas Department of Public Safety
- Texas Department of Transportation
- Waco-McLennan County EOC

Advanced Vehicle Safety System Needs

- Not Applicable

Information Management

- City of Waco
- Department of Public Safety
- HOTCOG
- K-TUTS
- Texas Department of Transportation
- Waco MPO

Maintenance and Construction Management

- City of Killeen
- City of Temple
- City of Waco
- County Road and Bridge
- Texas Department of Transportation



5.3 Waco Agreements

The Regional ITS Architecture for the Waco Region has identified several agency interfaces, information exchanges, and integration strategies that would be needed to provide the ITS services and systems identified by the stakeholders in the Region. Interfaces and data flows among public and private entities in the Waco Region will require agreements among agencies that establish parameters for sharing agency information to support traffic management, incident management, provide traveler information, and other functions identified in the Regional ITS Architecture.

Currently, there are no formal agreements in place in the Waco Region with regards to ITS. Stakeholders indicated that while there is a high degree of cooperation among agencies, there hasn't been a need for formal agreements to facilitate multi-jurisdictional resource sharing and cooperation. With the implementation of ITS technologies, integrating systems from one or more agencies, the anticipated level of information exchange identified in the architecture, it is likely that more formal agreements will be needed. These agreements, while perhaps not requiring a financial commitment from agencies in the Region, should outline specific roles, responsibilities, data exchanges, levels of authority, and other facets of regional operations. Some agreements will also outline specific funding responsibilities, where appropriate and applicable.

Table 8 provides a list of potential agreements for the Waco Region based on the interfaces identified in the Regional Architecture. It is important to note that as ITS services and systems are implemented in the Region, part of the planning and review process for those projects should include a review of potential agreements that would be needed for implementation or operations.

Table 8 – Potential Agreements for the Waco Region

| Agreement and Agencies | Status | Agreement Description | Considerations |
|------------------------------------------------------------------------------------------------------------------------|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Data Sharing and Usage (Public) TxDOT Waco District and Public Agencies within the Region</p> | <p>Future</p> | <p>This agreement would define the parameters, guidelines, and policies for inter- and intra-agency ITS data sharing. This data sharing would support regional activities related to traffic management, incident management, and traveler information, and other functions. The terms of this agreement should generally address such items as:</p> <ul style="list-style-type: none"> ▪ Types of data and information to be shared ▪ Repository for information (i.e., TxDOT Waco District Traffic Office as central hub) ▪ How the information will be used (traffic incident management, displayed on web site for travel information, distributed to private media, etc.) ▪ Parameters for data format, quality, security | <p>These agreements are typically zero-dollar agreements, in that there is no charge among agencies for the actual data, although there might be some cost incurred for infrastructure, systems or fiber to enable communications between agencies.</p> |



Table 8 – Potential Agreements for the Waco Region (continued)

| Agreement and Agencies | Status | Agreement Description | Considerations |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Data Sharing and Usage (Public-Private) TxDOT Waco District and Private Media/Information Service Providers</p> | <p>Future</p> | <p>This agreement would define the parameters, guidelines, and policies for private media use of regional ITS-related information from TxDOT Waco. This type of agreement is recommended between TxDOT (data provider) and the media (data user) to define terms of use for broadcasting public-agency information regarding traffic conditions, closures, restrictions, as well as video images. Agreements can also include requirements for the media to 'source' the information (i.e., using the TxDOT logo on all video images broadcast).</p> | <p>These agreements can be zero-dollar agreements, although some agencies have stipulated identifying the information, public service announcements by the media, or other requirements as a term of use. The private media entity is typically responsible for paying any necessary costs for access (i.e., communications infrastructure to link to the TxDOT database or video switch). These agreements also typically include a sunset clause to allow the agency to periodically review the agreement and make any modifications prior to renewal.</p> |
| <p>Shared Video Monitoring (Public) TxDOT Waco District, City of Waco, State EOC, DPS</p> | <p>Future</p> | <p>This agreement would enable shared video monitoring of TxDOT CCTV cameras by public safety and emergency services agencies in the Waco Region for incident management purposes. This agreement would define the parameters and policies for public safety agencies to access video images via the TxDOT video switch. It is recommended that the agreement include any TxDOT policies relating to video images (including archiving, privacy, disclaimers, use of video and redistribution) as well as processes for agency requests for specific views. Shared video monitoring does not address shared use or shared control of video equipment functions.</p> | <p>These agreements are typically zero-dollar agreements, in that there is no charge among agencies for the actual data, although there might be some cost incurred for infrastructure, systems or fiber to enable communications between agencies, particularly with the high bandwidth required for transmitting live video images.</p> |
| <p>Mutual Aid Agreements (Public) DPS, TxDOT Waco District, Waco Police, Waco Fire, Killeen Police, Killeen Fire, Temple Police, Temple Fire, County Sheriffs, Rural Volunteer Fire</p> | <p>Existing (Informal)</p> | <p>Mutual aid agreements currently exist as informal arrangements in the Waco Region, although they are a routine practice among public safety and emergency services agencies. Formal mutual aid agreements will become more important as agencies integrate systems and capabilities, particularly automated dispatch and notification.</p> | <p>These agreements are typically zero-dollar agreements, although there might be some funding required to support regional incident management activities. The agreement also would outline resource commitments that would be part of any mutual aid arrangement (personnel, equipment, facilities, etc.).</p> |



Table 8 – Potential Agreements for the Waco Region (continued)

| Agreement and Agencies | Status | Agreement Description | Considerations |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Joint Operations/Shared Control Agreements (Public)</p> <p>TxDOT Waco District, City of Waco, City of Temple, City of Killeen, DPS (potential)</p> | <p>Future</p> | <p>These agreements are formal arrangements to allow joint operations or control of certain systems and equipment. The agreement would need to define the terms of this arrangement, such as hours of operation and time of day/time of week where shared control would take effect, circumstances or incidents where shared control would take effect, notification procedures between the agencies agreeing to shared control arrangements, etc. Additional agencies (such as DPS) could be part of a joint operations/shared control agreement for certain types of devices.</p> | <p>Joint operations/shared control agreements could consider some form of mutual funding for certain system elements, primarily communication links.</p> |