



State of Texas  
Regional ITS Architectures and Deployment Plans

# Lubbock Region

---

## Regional ITS Deployment Plan

*Prepared by:*



Kimley-Horn  
and Associates, Inc.

**February 28, 2005**

068510016

Copyright © 2005 by Texas Department of Transportation. All rights reserved.



# TABLE OF CONTENTS

## REGIONAL ITS DEPLOYMENT PLAN

**SUMMARY ..... iv**

**1. INTRODUCTION .....1-1**

**1.1 Project Overview.....1-1**

**1.2 Document Overview.....1-1**

**1.3 The Lubbock Region.....1-2**

*1.3.1 Geography and Regional Characteristics ..... 1-2*

*1.3.2 Transportation Infrastructure ..... 1-2*

*1.3.3 Existing ITS in the Lubbock Region..... 1-3*

*1.3.4 Lubbock Stakeholders ..... 1-3*

**2. PRIORITIZATION OF MARKET PACKAGES.....2-1**

**2.1 Prioritization Process .....2-1**

**2.2 High Priority Market Packages.....2-3**

**2.3 Medium Priority Market Packages .....2-18**

**2.4 Low Priority Market Packages.....2-24**

**3. PRIORITIZATION OF PROJECTS.....3-1**

**3.1 Short-Term Projects (5-Year) .....3-1**

**3.2 Mid-Term Projects (10-Year).....3-1**

**3.3 Long-Term Projects (20-Year) .....3-2**

**4. MAINTAINING THE REGIONAL ITS ARCHITECTURE AND DEPLOYMENT PLAN .....4-1**

## LIST OF TABLES

Table 1 – Lubbock Stakeholder Agencies and Contacts..... 1-4

Table 2 – Summary of Prioritized Market Packages for the Lubbock Region.....2-2

Table 3 – High Priority Market Packages for the Lubbock Region.....2-3

Table 4 – Medium Priority Market Packages for the Lubbock Region.....2-18

Table 5 – Low Priority Market Packages for the Lubbock Region.....2-24

Table 6 – Short-Term Projects (5-Year) .....3-3

Table 7 – Mid-Term Projects (10-Year) .....3-28

Table 8 – Long-Term Projects (20-Year) .....3-49



## LIST OF ACRONYMS

ADA	Americans with Disabilities Act
APC	Automated Passenger Counter
ATIS	Advanced Travel Information System
ATMS	Advanced Traffic Management System
AVL	Automated Vehicle Location
BRINSAP	Bridge Inventory Inspection System
CAD	Computer Aided Dispatch
CapTrans	Caprock Community Action Association, Inc.
CCTV	Closed-Circuit Television
CVO	Commercial Vehicle Operations
DMS	Dynamic Message Signs
DPS	Department of Public Safety
FHWA	Federal Highway Administration
FMS	Freeway Management System
GIS	Geographic Information System
GPS	Global Positioning System
HAR	Highway Advisory Radio
HAZMAT	Hazardous Materials
HCRS	Highway Condition Reporting System
HRI	Highway-Rail Intersections
ISP	Information Service Provider
ITS	Intelligent Transportation System
LED	Light Emitting Diode
MDT	Mobile Data Terminal
MPO	Metropolitan Planning Organization
NMDOT	New Mexico Department of Transportation



## LIST OF ACRONYMS

PTZ	Pan/Tilt/Zoom
RFID	Radio Frequency Identification
RWIS	Road Weather Information System
SPARTAN	South Plains Area Rural Transportation Assistance Network
TEA-21	Transportation Equity Act for the 21st Century
TMC	Transportation Management Center
TOC	Traffic Operations Center Transit Operations Center
TxDOT	Texas Department of Transportation
VIVDS	Video Image Vehicle Detector System

## 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 the Texas Department of Transportation (TxDOT) initiated the development of regional ITS architectures and deployment plans throughout the State of Texas. Although not required by the FHWA final rule, TxDOT took the opportunity to also develop an ITS deployment plan for each Region. The Lubbock Regional ITS Architecture and Regional ITS Deployment Plan was prepared as part of this initiative.

The Lubbock Regional ITS Deployment Plan outlines a vision for ITS deployment, and identifies and prioritizes projects that are needed to implement the ITS architecture on a short-, medium-, and long-term basis. In doing so, this plan also helps the Region to prioritize funding decisions. As infrastructure is incrementally built-out over a 20-year horizon, integration among key foundation systems in the Region can occur as the system grows and expands.

Stakeholders from throughout the Region participated in the development of the Regional ITS Deployment Plan. Participants included representatives from TxDOT, cities, counties, public safety, transit, and MPOs.

Building on the dialogue, consensus, and vision outlined in the Regional ITS Architecture, stakeholders in the Lubbock Region prioritized market packages and potential ITS projects for deployment in the Region. Projects were identified to correspond to the needs and priorities identified by the regional stakeholders, and were categorized into 5-year, 10-year, and 20-year timeframes.

The majority of ITS projects recommended for the Lubbock Region were identified in the following key areas:

- Travel and Traffic Management;
- Emergency Management; and
- Public Transportation Management.

Recommended ITS projects in the 5-year, 10-year, and 20-year deployment timeframes were summarized in tables for each deployment horizon. This summary included the project name and a brief description, primary responsible agency, a planning level estimate of probable cost, an indication of whether or not funding had been identified for that project, as well as an estimated duration for implementation. For each recommended ITS project, more detailed project descriptions were developed which mapped each project back to applicable market packages and also identified any prerequisite project requirements.

With the substantial amount of effort invested by stakeholders in the Lubbock Region to develop both the Regional ITS Architecture and the Deployment Plan, developing a plan for maintaining these important tools was a key component of the process.

## 1. INTRODUCTION

### 1.1 Project Overview

The FHWA final rule to implement Section 5206(e) of the TEA-21 requires 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. Although not required by the FHWA final rule, TxDOT sought to have an ITS deployment plan developed for each Region. The ITS Deployment Plan outlines a vision for ITS deployment in the Region and identifies and prioritizes projects that are needed to implement the ITS architecture on a short- medium- and long-term basis. In doing so, this plan also helps the Region to prioritize funding decisions by having a comprehensive, phased approach to the regional ITS programs, so that the infrastructure can be incrementally built-out over a 20-year horizon, and integration among key foundation systems in the Region can occur as the system grows and expands.

The Lubbock Regional ITS Deployment Plan was developed using the Regional ITS Architecture developed in 2004. Through the architecture development process, stakeholders reached consensus on the transportation needs in the Region that could be addressed with ITS, worked with the architecture team to customize and prioritize market packages that formed the basis for the ITS Deployment Plan, and identified the required interfaces to provide the desired level of integration of systems and agencies within the Lubbock Region.

The Lubbock Regional ITS Architecture provided the framework and prioritized the key functions and services desired by stakeholders in the Region. The ITS Deployment Plan builds on the architecture by outlining specific ITS project recommendations and strategies for the Region, and identifying deployment timeframes so that the recommended projects and strategies can be implemented over time. Agency responsibilities for implementing and operating the systems also are a key component of the ITS Deployment Plan.

### 1.2 Document Overview

The Lubbock Regional ITS Deployment Plan is organized into four key sections:

#### **Section 1 – Introduction**

This section provides a brief overview of the Lubbock Regional ITS Deployment Plan, as well as an overview of some of the key features and stakeholders in the Lubbock Region.

#### **Section 2 – Prioritization of Market Packages**

Section 2 contains the prioritized market packages for the Lubbock Region. Included in this section is an overview of the prioritization process and detailed descriptions of the high, medium and low priority market packages.

### **Section 3 – Prioritization of Projects**

Project recommendations have been developed for the Lubbock Region to provide an incremental, phased build-out of the Region’s ITS. These projects are categorized into 5-year, 10-year, and 20-year deployment timeframes.

### **Section 4 – Maintaining the Regional ITS Architecture and Deployment Plan**

A procedure for maintaining the ITS Deployment Plan and submitting new projects to add to the plan is recommended in this section.

## **1.3 The Lubbock Region**

### *1.3.1 Geography and Regional Characteristics*

The Lubbock Region is bordered by the TxDOT Amarillo District to the north, the TxDOT Odessa District to the south, the TxDOT Childress and Abilene Districts to the east, and the State of New Mexico to the west. For the Lubbock Regional ITS Architecture and Deployment Plan, the study area included all 17 counties that comprise the TxDOT Lubbock District.

The counties included in the Lubbock Region area are:

- Bailey;
- Castro;
- Cochran;
- Crosby;
- Dawson;
- Floyd;
- Gaines;
- Garza;
- Hale;
- Hockley;
- Lamb;
- Lubbock;
- Lynn;
- Parmer;
- Swisher;
- Terry; and
- Yoakum.

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 City of Lubbock, with a population of over 200,000, is the only city in the project Region with a population that exceeds the 50,000 threshold.

### *1.3.2 Transportation Infrastructure*

The Lubbock Region has an extensive transportation infrastructure. The primary roadway facilities include I-27, US-70, US-84, US-87, US-380/82, and US-385. Lubbock has the most centerline miles of any TxDOT District.

Interstate 27, which terminates in Lubbock, is the only interstate highway in the Region; it provides a vital link to Amarillo. Although I-40 does not traverse the Lubbock Region, any adverse conditions on I-40 that impact Amarillo will likely have an impact on I-27. Within the Lubbock Region, I-27 can be prone to high winds, dust storms, flooding, and snow and ice during the winter months. Within the Lubbock city limits, there are flyovers along I-27 that are particularly prone to icing during severe winter weather. Blockages along I-27 can

have serious implications for drive-time for commercial vehicles and motorists alike due to the lack of north/south alternate routes. Knowing the road and travel conditions within this transportation corridor, coordinating with the Amarillo District for I-27 and I-40 conditions, and having the ability to disseminate this information to motorists are important elements that this project will be considering. For example, if I-27 has been closed due to a major incident or weather, and motorists are informed of the closure in advance, they can alter their travel plans with an alternate route or wait to begin their travels.

### *1.3.3 Existing ITS in the Lubbock Region*

Currently, the Lubbock Region has several ITS components deployed in the field including distributed signal systems with video image vehicle detection systems (VIVDS) as well as loop detection, signal preemption for emergency vehicles, radar speed trailers, automated vehicle location (AVL) and mobile data terminals (MDT) on some transit vehicles, computer aided dispatch (CAD) for emergency vehicles, and portable dynamic message signs (DMS).

The City of Lubbock operates a Traffic Management Center (TMC), which is collocated in the same city building as the Emergency Operations Center. The City also has a traffic signal system, and recently received funding for a traffic signal communications upgrade which will replace some of the existing twisted pair copper cable and spread spectrum communications with fiber. TxDOT also operates several traffic signals in the Region. TxDOT and the City of Lubbock are using VIVDS at several intersections.

Several emergency management agencies in the Region have implemented CAD systems which 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. Emergency vehicle signal preemption is installed on more than half of the intersections in the City of Lubbock; emergency vehicle preemption is also installed on some TxDOT traffic signals.

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

Transit services, including fixed-route and demand response, are provided through several entities in the Region. Citibus operates both fixed-route and demand response services in the Lubbock metro area. Citibus uses AVL/MDT technology on its demand-response vans, and plans to install security cameras on both fixed-route and demand response vehicles. Citibus is also in the process of enhancing its webpage to provide greater Americans with Disabilities Act (ADA) accessibility, and plan to include Next Bus information and trip planning capabilities as part of a future web enhancement.

### *1.3.4 Lubbock 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 Lubbock Region.



The following is a list of stakeholders in the Lubbock 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 Lubbock Regional ITS Architecture and Deployment Plan:

- Caprock Community Action Association, Inc.;
- Citibus;
- City of Levelland;
- City of Lubbock;
- City of Plainview;
- City of Slaton;
- City of Wolfforth;
- Federal Highway Administration;
- Lubbock Metropolitan Planning Organization;
- SPARTAN Rural Public Transportation;
- Texas Department of Public Safety;
- Texas Tech University;
- TxDOT Amarillo District;
- TxDOT Lubbock District; and
- TxDOT Traffic Operations Division (Austin).

Stakeholder agencies that are participating in the development of the Lubbock Regional ITS Deployment Plan are listed in **Table 1** along with contact information for agency representatives that have participated.

**Table 1 – Lubbock Stakeholder Agencies and Contacts**

Stakeholder Agency	Contact	Address	Phone Number	E-Mail
Caprock Community Action Association, Inc.	Claudia Cowley	224 South Berkshire Street Crosbyton, Texas 79322	(806) 675-7307	claudia.cowley@twc.state.tx.us
Caprock Community Action Association, Inc.	Rhonda Thornhill	224 South Berkshire Crosbyton, Texas 79322	(806) 675-7032	rhondat@llano.net
Citibus	Matthew Jacobs	801 Texas Ave Lubbock, Texas 79401	(806) 712-2008	mjacobs@citibus.com
City of Levelland	Rick Osburn	1709 Avenue H Levelland, Texas 79336	(806) 894-0113	rosburn@door.net
City of Lubbock	Jeryl (Jere) Hart, Jr.	915 Avenue J, Room 212 Lubbock, Texas 79457	(806) 775-2130	jhart@mail.ci.lubbock.tx.us
City of Lubbock	Ken Olson	916 Texas Avenue Lubbock, Texas 79401	(806) 775-3052	kolson@mail.ci.lubbock.tx.us
City of Plainview	Brice Clement	901 Broadway Street Plainview, Texas 79072	(806) 296-1151	bclements@ci.plainview.tx.us
City of Plainview	H. Gary Glass	901 Broadway Street Plainview, Texas 79072	(806) 296-1170	hglass@ci.plainview.tx.us



**Table 1 – Lubbock Stakeholder Agencies and Contacts (continued)**

<b>Stakeholder Agency</b>	<b>Contact</b>	<b>Address</b>	<b>Phone Number</b>	<b>E-Mail</b>
City of Slaton	Roger McKinney	130 South 9th Street Slaton, Texas 79364	(806) 828-2000	slatontx@hub.ofthe.net
City of Wolfforth	L.C. Childers	328 East Highway 62/82 Wolfforth, Texas 79382	(806) 866-4215	fpittman@wolfforthtx.us
DPS – Lubbock Region	Steve Shatley	1302 Sixth Street Lubbock, Texas 79401	(806) 472-2761	robert.shatley@txdps.state.tx.us
DPS – Lubbock Region	John Gonzales	1302 Sixth Street Lubbock, Texas 79401	(806) 472-2761	john.gonzales@txdps.state.tx.us
Federal Highway Administration	Mark Olson	300 East 8 <sup>th</sup> Street Room 826 Austin, Texas 78701	(512) 536-5972	mark.olson@fhwa.dot.gov
Lubbock Metropolitan Planning Organization	Craig Farmer	916 Main Street, Suite 706 Lubbock, Texas 79401	(806) 775-2349	N/A
Lubbock Metropolitan Planning Organization	Samuel Woods	916 Main Street, Suite 706 Lubbock, Texas 79401	(806) 755-1676	swoods@mail.ci.lubbock.tx.us
SPARTAN	Brian Baker	411 Austin Street Levelland, Texas 79336	(806) 894-3800	brian.baker@spcaa.org
SPARTAN	Jane McIlroy	411 Austin Street Levelland, Texas 79336	(806) 894-3800	jane.mcilroy@spcaa.org
SPARTAN	Manuel Gonzales	411 Austin Street Levelland, Texas 79336	(806) 894-3800	manuel.gonzales@spcaa.org
Texas Tech University	Arthur Glick	MS2004 Texas Tech University Lubbock, TX 79409	(806) 742-1310	arthur.glick@ttu.edu
TxDOT – Amarillo District	Christopher Freeman	5715 Canyon Drive Amarillo, Texas 79110	(806) 356-3290	cfreema@dot.state.tx.us
TxDOT – Lubbock District	Lynn Castle	135 Slaton Road Lubbock, Texas 79404	(806) 748-4480	lcastle@dot.state.tx.us
TxDOT – Lubbock District	Ted Copeland	135 Slaton Road Lubbock, Texas 79404	(806) 748-4429	tcopela@dot.state.tx.us
TxDOT – Lubbock District	Randy Hopmann	135 Slaton Road Lubbock, Texas 79404	(806) 748-4420	rhopman@dot.state.tx.us
TxDOT – Lubbock District	Ted Moore	135 Slaton Road Lubbock, Texas 79404	(806) 745-4411	tmoore@dot.state.tx.us
TxDOT – Lubbock District	Frank Phillips	135 Slaton Road Lubbock, Texas 79404	(806) 748-4471	fphilli@dot.state.tx.us
TxDOT Austin Traffic Operations	Charles Brindell	Attn: TRF-Cedar Park #51 125 East 11th Street Austin, Texas 78701-2483	(512) 506-5114	cbrinde@dot.state.tx.us
TxDOT Austin Traffic Operations	Alesia Gamboa	Attn: TRF-Cedar Park #51 125 East 11th Street Austin, Texas 78701-2483	(512) 506-5154	agamboa@dot.state.tx.us

## 2. PRIORITIZATION OF MARKET PACKAGES

### 2.1 Prioritization Process

Of the 75 available market packages in the National ITS Architecture Version 4.0, 35 were selected and customized for deployment in the Lubbock Region. Stakeholders were asked to prioritize the market packages into high, medium, and low priorities, based on regional needs, feasibility, and likelihood of deployment, and overall contribution of the market package to the goals and vision for ITS functionality in the Region. A summary of these prioritized market packages is shown in **Table 2**.

The market package prioritization was a key factor in developing recommendations for ITS deployment and integration in the Lubbock Region. These priorities identified the key needs and services that are desired in the Lubbock Region, as well as the interfaces that need to be established to provide integrated functionality and establish communication between elements.

This section includes detailed descriptions of the prioritized market packages for the Lubbock Region. The market packages are organized into high, medium, and low priorities. It is important to note that the high, medium, and low prioritization does not necessarily correspond to any specific time frame (such as five, ten, or twenty year deployment horizon). For example, a market package can be a high priority, but because of funding or prerequisite project requirements, it might not be feasible for deployment for several years. Maturity and availability of technology were other factors for prioritizing the market packages. Other considerations included whether or not the market package was better suited for private deployment and operations rather than public. As an example, ISP-based Route Guidance might be viewed as a valuable traveler information service for motorists in the Region, but stakeholders felt this market package was best suited for deployment by a private service provider, and as such, deemed it a low priority for agencies in the Region.

Each market package in the following subsections includes:

- A brief definition of the market package (which have been modified from the National ITS Architecture definitions);
- Any existing infrastructure from that market package that is already existing in the Lubbock Region;
- Agencies currently operating or maintaining systems that apply to that market package;
- Planned projects that will address some or all of the services that are contained in the market package; and
- Any additional needs to bring the market package to the desired level of deployment or functionality.

**Table 2 – Summary of Prioritized Market Packages for the Lubbock Region**

High Priority	Medium Priority	Low Priority
<ul style="list-style-type: none"> <li>▪ Network Surveillance</li> <li>▪ Surface Street Control</li> <li>▪ Freeway Control</li> <li>▪ Traffic Information Dissemination</li> <li>▪ Regional Traffic Control</li> <li>▪ Incident Management System</li> <li>▪ Speed Monitoring</li> <li>▪ Emergency Response</li> <li>▪ Emergency Routing</li> <li>▪ Road Weather Data Collection</li> <li>▪ Weather Information Processing and Distribution</li> <li>▪ Roadway Automated Treatment</li> <li>▪ Maintenance and Construction Activity Coordination</li> <li>▪ Transit Vehicle Tracking</li> <li>▪ Transit Fixed-Route Operations</li> <li>▪ Demand Response Transit Operations</li> <li>▪ Transit Traveler Information</li> <li>▪ Broadcast Traveler Information</li> </ul>	<ul style="list-style-type: none"> <li>▪ Parking Facility Management</li> <li>▪ Work Zone Management</li> <li>▪ Work Zone Safety Monitoring</li> <li>▪ Transit Passenger and Fare Management</li> <li>▪ Transit Security</li> <li>▪ Multi-modal Coordination</li> <li>▪ HAZMAT Management</li> <li>▪ Interactive Traveler Information</li> <li>▪ ITS Data Mart</li> <li>▪ ITS Data Warehouse</li> </ul>	<ul style="list-style-type: none"> <li>▪ Standard Railroad Grade Crossing</li> <li>▪ Railroad Operations Coordination</li> <li>▪ Maintenance and Construction Vehicle Tracking</li> <li>▪ Maintenance and Construction Vehicle Maintenance</li> <li>▪ Winter Maintenance</li> <li>▪ Roadway Maintenance and Construction</li> <li>▪ ISP-based Route Guidance</li> </ul>

## 2.2 High Priority Market Packages

Market packages that were selected as high priorities for the Lubbock Region are listed and described in **Table 3**. These market packages typically represent systems or functions that serve as foundations on which to build regional ITS programs. Listed in this section are market packages that address baseline control, monitoring and coordination technologies for surface streets and freeways, road/weather conditions data gathering, transit, incident management and emergency response.

Many of these high priority market packages have components that are in various stages of deployment and operation in the Lubbock Region; that is, there are already systems and technologies deployed to deliver some of these high priority services and functions. For example, Citibus already has Automated Vehicle Location capability for its demand-response vehicles. Although these devices are in place, this market package is still listed as a high priority. There are additional capabilities and functionality contained in this market package that are planned for implementation in the near-term, thus building on the existing infrastructure and expanding the services of this particular market package in the Lubbock Region.

**Table 3 – High Priority Market Packages for the Lubbock Region**

<b>Network Surveillance (ATMS01)</b>	<b>High Priority</b>
<p>This market package includes traffic detectors, other surveillance and detection equipment, the supporting field equipment, and communications to transmit the collected data back to the Traffic Management Subsystem. The derived data can be used locally or remotely. The data generated by this market package enables traffic managers to monitor traffic and road conditions, identify and verify incidents, detect equipment faults, and collect census data for traffic strategy development and long range planning. The collected data can also be analyzed and made available to users and the Information Service Provider Subsystem.</p>	
<p><b>Existing Infrastructure</b></p> <ul style="list-style-type: none"> <li>▪ VIVDS</li> <li>▪ City of Lubbock TMC</li> </ul>	<p><b>Agencies with Existing Infrastructure</b></p> <ul style="list-style-type: none"> <li>▪ TxDOT</li> <li>▪ City of Lubbock</li> </ul>
<p><b>Planned Projects</b></p> <ul style="list-style-type: none"> <li>▪ City of Lubbock Traffic Signal System Upgrades and Expansion Phase 1</li> <li>▪ City of Lubbock Traffic Signal Communications Upgrade</li> <li>▪ TxDOT Traffic Signal System Upgrades and Expansion Phase 1</li> </ul>	
<p><b>Additional Needs</b></p> <ul style="list-style-type: none"> <li>▪ City of Lubbock CCTV Implementation</li> <li>▪ City of Lubbock Flood Detection Phase 1</li> <li>▪ City of Lubbock Flood Detection Phase 2</li> <li>▪ City of Lubbock Smart Corridors Phase 1</li> <li>▪ City of Lubbock Smart Corridors Phase 2</li> <li>▪ City of Lubbock Smart Work Zones</li> <li>▪ City of Lubbock Speed Monitoring/Warning System</li> <li>▪ City of Lubbock Speed Monitoring/Warning System Expansion</li> <li>▪ City of Lubbock TMC Expansion</li> </ul>	

**Table 3 – High Priority Market Packages for the Lubbock Region (continued)**

<b>Network Surveillance (ATMS01) (continued)</b>	<b>High Priority</b>
<b>Additional Needs (continued)</b>	
<ul style="list-style-type: none"> <li>▪ City of Lubbock Traffic Signal System Upgrades and Expansion Phase 2</li> <li>▪ City of Lubbock Traffic Signal System Upgrades and Expansion Phase 3</li> <li>▪ City of Plainview CCTV Implementation</li> <li>▪ City of Plainview TOC</li> <li>▪ City of Plainview Traffic Signal System Upgrades and Expansion</li> <li>▪ Texas Tech University Traffic and Parking Management Center</li> <li>▪ Texas Tech University Traffic Management System Implementation</li> <li>▪ Texas Tech University Parking Security System Implementation</li> <li>▪ TxDOT Flood Detection Phase 1</li> <li>▪ TxDOT Flood Detection Phase 2</li> <li>▪ TxDOT Loop 289 Freeway Management System</li> <li>▪ TxDOT Marsha Sharp Freeway Management System</li> <li>▪ TxDOT Freeway Management Expansion</li> <li>▪ TxDOT Lubbock TMC and ATMS Implementation</li> <li>▪ TxDOT Lubbock TMC Expansion</li> <li>▪ TxDOT Lubbock TMC/City of Lubbock TMC Communications Connection</li> <li>▪ TxDOT Portable Speed Monitoring/Warning System</li> <li>▪ TxDOT RWIS Phase 1</li> <li>▪ TxDOT RWIS Phase 2</li> <li>▪ TxDOT Smart Work Zones</li> <li>▪ TxDOT Traffic Signal System Upgrades and Expansion Phase 2</li> <li>▪ TxDOT Traffic Signal System Upgrades and Expansion Phase 3</li> </ul>	

**Table 3 – High Priority Market Packages for the Lubbock Region (continued)**

<b>Surface Street Control (ATMS03)</b>	<b>High Priority</b>
<p>This market package provides the central control and monitoring equipment, communication links, and the signal control equipment that support local surface street control and/or arterial traffic management. A range of traffic signal control systems are represented by this market package ranging from static pre-timed control systems to fully traffic responsive systems that dynamically adjust control plans and strategies based on current traffic conditions and priority requests. This market package is consistent with typical urban traffic signal control systems.</p>	
<p><b>Existing Infrastructure</b></p> <ul style="list-style-type: none"> <li>▪ City of Lubbock TMC</li> <li>▪ Lubbock Traffic Signal System</li> <li>▪ TxDOT Lubbock Traffic Signals</li> <li>▪ Emergency Vehicle Signal Preemption</li> <li>▪ VIVDS</li> </ul>	<p><b>Agencies with Existing Infrastructure</b></p> <ul style="list-style-type: none"> <li>▪ City of Lubbock</li> <li>▪ TxDOT</li> </ul>
<p><b>Planned Projects</b></p> <ul style="list-style-type: none"> <li>▪ City of Lubbock Emergency Vehicle Signal Preemption Expansion</li> <li>▪ City of Lubbock Traffic Signal System Upgrades and Expansion Phase 1</li> <li>▪ City of Lubbock Traffic Signal Communications Upgrade</li> <li>▪ TxDOT Traffic Signal System Upgrades and Expansion Phase 1</li> </ul>	
<p><b>Additional Needs</b></p> <ul style="list-style-type: none"> <li>▪ City of Lubbock CCTV Implementation</li> <li>▪ City of Lubbock Emergency Vehicle Signal Preemption Upgrade and Expansion</li> <li>▪ City of Lubbock School Flasher System Upgrade</li> <li>▪ City of Lubbock Smart Corridors Phase 1</li> <li>▪ City of Lubbock Smart Corridors Phase 2</li> <li>▪ City of Lubbock TMC Expansion</li> <li>▪ City of Lubbock Traffic Signal System Upgrades and Expansion Phase 2</li> <li>▪ City of Lubbock Traffic Signal System Upgrades and Expansion Phase 3</li> <li>▪ City of Plainview CCTV Implementation</li> <li>▪ City of Plainview Emergency Vehicle Signal Preemption</li> <li>▪ City of Plainview TOC</li> <li>▪ City of Plainview Traffic Signal System Upgrades and Expansion</li> <li>▪ Texas Tech University Traffic and Parking Management Center</li> <li>▪ Texas Tech University Traffic Management System Implementation</li> <li>▪ Texas Tech University Enhanced Pedestrian and Vehicle Signalization Upgrades (Including Crosswalks)</li> <li>▪ TxDOT Emergency Vehicle Signal Preemption Phase 1</li> <li>▪ TxDOT Emergency Vehicle Signal Preemption Phase 2</li> <li>▪ TxDOT Lubbock TMC and ATMS Implementation</li> </ul>	

**Table 3 – High Priority Market Packages for the Lubbock Region (continued)**

<b>Surface Street Control (ATMS03) (continued)</b>	<b>High Priority</b>
<b>Additional Needs (continued)</b> <ul style="list-style-type: none"> <li>▪ TxDOT Lubbock TMC Expansion</li> <li>▪ TxDOT Lubbock TMC/City of Lubbock TMC Communications Connection</li> <li>▪ TxDOT School Flasher System Enhancements</li> <li>▪ TxDOT Traffic Signal System Upgrades and Expansion Phase 2</li> <li>▪ TxDOT Traffic Signal System Upgrades and Expansion Phase 3</li> </ul>	

<b>Freeway Control (ATMS04)</b>	<b>High Priority</b>
<p>This market package provides the communications and roadside equipment to support ramp control, lane controls, and interchange control for freeways. This package is consistent with typical urban traffic freeway control systems. This package incorporates the instrumentation included in the Network Surveillance Market Package to support freeway monitoring and adaptive strategies as an option. This market package also includes the capability to utilize surveillance information for detection of incidents.</p>	
<b>Existing Infrastructure</b> None identified	<b>Agencies with Existing Infrastructure</b>
<b>Planned Projects</b> None identified at this time	
<b>Additional Needs</b> <ul style="list-style-type: none"> <li>▪ TxDOT Lane Control Signals</li> <li>▪ TxDOT Ramp Meters</li> <li>▪ TxDOT Lubbock TMC and ATMS Implementation</li> </ul>	



**Table 3 – High Priority Market Packages for the Lubbock Region (continued)**

<b>Traffic Information Dissemination (ATMS06)</b>	<b>High Priority</b>
<p>This market package allows traffic information and road/bridge closures due to construction, maintenance, and weather, to be disseminated to drivers and vehicles using roadway equipment such as dynamic message signs or highway advisory radio.</p> <p>This package also covers the equipment and interfaces that provide traffic information from a traffic management center to the media (for instance via a direct tie-in between a traffic management center and radio or television station computer systems), Transit Management, Emergency Management, and Information Service Providers.</p>	
<b>Existing Infrastructure</b> <ul style="list-style-type: none"> <li>▪ Portable DMS</li> </ul>	<b>Agencies with Existing Infrastructure</b> <ul style="list-style-type: none"> <li>▪ TxDOT</li> </ul>
<b>Planned Projects</b> <ul style="list-style-type: none"> <li>▪ TxDOT HCRS Enhancements</li> </ul>	
<b>Additional Needs</b> <ul style="list-style-type: none"> <li>▪ City of Lubbock Smart Corridors Phase 1</li> <li>▪ City of Lubbock Smart Corridors Phase 2</li> <li>▪ City of Lubbock Smart Work Zones</li> <li>▪ City of Lubbock TMC Expansion</li> <li>▪ City of Lubbock TMC/City of Lubbock Fire Dispatch Interface</li> <li>▪ City of Lubbock TMC/City of Lubbock Police (911) Interface</li> <li>▪ City of Lubbock TMC/Media Communications Connection</li> <li>▪ City of Lubbock TMC/Texas Tech University Communications Connection</li> <li>▪ City of Lubbock Website</li> <li>▪ City of Plainview TOC</li> <li>▪ Interstate Coordination</li> <li>▪ TxDOT 511 Traveler Information System Server</li> <li>▪ TxDOT Freeway Management System Expansion</li> <li>▪ TxDOT Highway Advisory Radio</li> <li>▪ TxDOT Loop 289 Freeway Management System</li> <li>▪ TxDOT Lubbock District Website</li> <li>▪ TxDOT Lubbock TMC and ATMS Implementation</li> <li>▪ TxDOT Lubbock TMC Expansion</li> <li>▪ TxDOT Lubbock TMC/City of Lubbock TMC Communications Connection</li> <li>▪ TxDOT Lubbock TMC/City of Plainview TOC</li> <li>▪ TxDOT Lubbock TMC/County Sheriff Communications Connection</li> <li>▪ TxDOT Lubbock TMC/DPS Communications Connection</li> <li>▪ TxDOT Lubbock TMC/Media Communications Connection</li> <li>▪ TxDOT Marsha Sharp Freeway Management System</li> </ul>	

**Table 3 – High Priority Market Packages for the Lubbock Region (continued)**

<b>Traffic Information Dissemination (ATMS06) (continued)</b>	<b>High Priority</b>
<b>Additional Needs (continued)</b> <ul style="list-style-type: none"> <li>▪ TxDOT Portable DMS Phase 1</li> <li>▪ TxDOT Portable DMS Phase 2</li> <li>▪ TxDOT Rural DMS</li> <li>▪ TxDOT Smart Work Zones</li> <li>▪ TxDOT Travel Information Kiosks</li> </ul>	

<b>Regional Traffic Control (ATMS07)</b>	<b>High Priority</b>
<p>This market package provides for the sharing of traffic information and control among traffic management centers to support a regional control strategy. This package relies on roadside instrumentation supported by the Surface Street Control and Freeway Control Market Packages and adds hardware, software, and communications capabilities to implement traffic management strategies that are coordinated between allied traffic management centers. The extent of information and control sharing is determined through working arrangements between jurisdictions.</p>	
<b>Existing Infrastructure</b>	<b>Agencies with Existing Infrastructure</b>
<ul style="list-style-type: none"> <li>▪ City of Lubbock TMC</li> </ul>	<ul style="list-style-type: none"> <li>▪ City of Lubbock</li> </ul>
<b>Planned Projects</b> <ul style="list-style-type: none"> <li>▪ TxDOT Center-to-Center Communications</li> </ul>	
<b>Additional Needs</b> <ul style="list-style-type: none"> <li>▪ City of Lubbock TMC Expansion</li> <li>▪ City of Plainview TOC</li> <li>▪ Interstate Coordination</li> <li>▪ TxDOT Lubbock TMC and ATMS Implementation</li> <li>▪ TxDOT Lubbock TMC Expansion</li> <li>▪ TxDOT Lubbock TMC/City of Lubbock TMC Communications Connection</li> <li>▪ TxDOT Lubbock TMC/City of Plainview TOC Communications Connection</li> </ul>	

**Table 3 – High Priority Market Packages for the Lubbock Region (continued)**

<b>Incident Management System (ATMS08)</b>	<b>High Priority</b>
<p>This market package manages both unexpected incidents and planned events so that the impact to the transportation network and traveler safety is minimized. The market package includes incident detection capabilities through roadside surveillance devices (e.g. CCTV) and through regional coordination with other traffic management, maintenance and construction management, and emergency management centers as well as weather service entities and event promoters. Information from these diverse sources is collected and correlated by this market package to detect and verify incidents and implement an appropriate response.</p> <p>The response may include traffic control strategy modifications or resource coordination between center subsystems. The coordination with emergency management might be through a CAD system or through other communication with emergency field personnel. The coordination can also extend to tow trucks and other allied response agencies and field service personnel.</p> <p>Incident response also includes presentation of information to affected travelers using the Traffic Information Dissemination, Broadcast Traveler Information, or Interactive Traveler Information market packages.</p>	
<p><b>Existing Infrastructure</b></p> <ul style="list-style-type: none"> <li>▪ Portable DMS</li> <li>▪ Emergency Vehicle Signal Preemption</li> <li>▪ Emergency Vehicle AVL</li> <li>▪ CAD for Emergency Vehicle Dispatch</li> </ul>	<p><b>Agencies with Existing Infrastructure</b></p> <ul style="list-style-type: none"> <li>▪ TxDOT</li> <li>▪ City of Lubbock</li> <li>▪ City of Plainview</li> </ul>
<p><b>Planned Projects</b></p> <ul style="list-style-type: none"> <li>▪ City of Lubbock Emergency Vehicle Signal Preemption Expansion</li> </ul>	
<p><b>Additional Needs</b></p> <ul style="list-style-type: none"> <li>▪ City of Lubbock CCTV Implementation</li> <li>▪ City of Lubbock Emergency Vehicle Signal Preemption Upgrade and Expansion</li> <li>▪ City of Lubbock Flood Detection Phase 1</li> <li>▪ City of Lubbock Flood Detection Phase 2</li> <li>▪ City of Lubbock Smart Corridors Phase 1</li> <li>▪ City of Lubbock Smart Corridors Phase 2</li> <li>▪ City of Lubbock Smart Work Zones</li> <li>▪ City of Lubbock TMC Expansion</li> <li>▪ City of Lubbock TMC/City of Lubbock Fire Dispatch Interface</li> <li>▪ City of Lubbock TMC/City of Lubbock Police (911) Interface</li> <li>▪ City of Lubbock TMC/Media Communications Connection</li> <li>▪ City of Lubbock TMC/Texas Tech University Communications Connection</li> <li>▪ City of Lubbock Website</li> <li>▪ City of Plainview CCTV Implementation</li> <li>▪ City of Plainview Emergency Vehicle Signal Preemption</li> <li>▪ City of Plainview TOC</li> </ul>	

**Table 3 – High Priority Market Packages for the Lubbock Region (continued)**

Incident Management System (ATMS08) (continued)	High Priority
<p><b>Additional Needs (continued)</b></p> <ul style="list-style-type: none"> <li>▪ TxDOT 511 Traveler Information System Server</li> <li>▪ TxDOT Emergency Vehicle Signal Preemption Phase 1</li> <li>▪ TxDOT Emergency Vehicle Signal Preemption Phase 2</li> <li>▪ TxDOT Flood Detection Phase 1</li> <li>▪ TxDOT Flood Detection Phase 2</li> <li>▪ TxDOT Highway Advisory Radio</li> <li>▪ TxDOT Loop 289 Freeway Management System</li> <li>▪ TxDOT Marsha Sharp Freeway Management System</li> <li>▪ TxDOT Freeway Management System Expansion</li> <li>▪ TxDOT Lane Control Signals</li> <li>▪ TxDOT Lubbock District Website</li> <li>▪ TxDOT Lubbock TMC and ATMS Implementation</li> <li>▪ TxDOT Lubbock TMC Expansion</li> <li>▪ TxDOT Lubbock TMC/City of Lubbock TMC Communications Connection</li> <li>▪ TxDOT Lubbock TMC/County Sheriff Communications Connection</li> <li>▪ TxDOT Lubbock TMC/DPS Communications Connection</li> <li>▪ TxDOT Lubbock TMC/Media Communications Connection</li> <li>▪ TxDOT Portable DMS Phase 1</li> <li>▪ TxDOT Portable DMS Phase 2</li> <li>▪ TxDOT Portable Speed Monitoring/Warning System</li> <li>▪ TxDOT RWIS Phase 1</li> <li>▪ TxDOT RWIS Phase 2</li> <li>▪ TxDOT Rural DMS</li> <li>▪ TxDOT Smart Work Zones</li> <li>▪ TxDOT Travel Information Kiosks</li> </ul>	

**Table 3 – High Priority Market Packages for the Lubbock Region (continued)**

<b>Speed Monitoring (ATMS19)</b>	<b>High Priority</b>
<p>This market package monitors the speeds of vehicles traveling through a roadway system. If the speed is determined to be excessive, roadside equipment can suggest a safe driving speed. Environmental conditions may be monitored and factored in to the safe speed advisories that are provided to the motorist. This service can also support notifications to an enforcement Agencies with Existing Infrastructure to enforce the speed limit on a roadway system.</p>	
<p><b>Existing Infrastructure</b></p> <ul style="list-style-type: none"> <li>▪ Radar Speed Trailers</li> </ul>	<p><b>Agencies with Existing Infrastructure</b></p> <ul style="list-style-type: none"> <li>▪ TxDOT</li> <li>▪ City of Lubbock</li> </ul>
<p><b>Planned Projects</b></p> <p>None identified at this time</p>	
<p><b>Additional Needs</b></p> <ul style="list-style-type: none"> <li>▪ City of Lubbock Speed Monitoring/Warning System</li> <li>▪ City of Lubbock Speed Monitoring/Warning System Expansion</li> <li>▪ TxDOT Portable Speed Monitoring/Warning System</li> </ul>	

<b>Emergency Response (EM01)</b>	<b>High Priority</b>
<p>This market package includes emergency vehicle equipment, equipment used to receive and route emergency calls, and wireless communications that enable safe and rapid deployment of appropriate resources to an emergency. Coordination between Emergency Management Subsystems supports emergency notification and coordinated response between agencies.</p>	
<p><b>Existing Infrastructure</b></p> <ul style="list-style-type: none"> <li>▪ Emergency Vehicle AVL</li> <li>▪ CAD for Emergency Vehicle Dispatch</li> <li>▪ Mobile Data Terminals</li> </ul>	<p><b>Agencies with Existing Infrastructure</b></p> <ul style="list-style-type: none"> <li>▪ City of Lubbock</li> <li>▪ City of Plainview</li> </ul>
<p><b>Planned Projects</b></p> <p>None identified at this time</p>	
<p><b>Additional Needs</b></p> <ul style="list-style-type: none"> <li>▪ City of Lubbock TMC/City of Lubbock Fire Dispatch Interface</li> <li>▪ City of Lubbock TMC/City of Lubbock Police (911) Interface</li> <li>▪ Texas Tech 911 PSAP/City of Lubbock Fire Communications Connection</li> <li>▪ Texas Tech 911 PSAP/City of Lubbock Police Communications Connection</li> <li>▪ TxDOT Lubbock TMC/County Sheriff Communications Connection</li> <li>▪ TxDOT Lubbock TMC/DPS Communications Connection</li> </ul>	

**Table 3 – High Priority Market Packages for the Lubbock Region (continued)**

Emergency Routing (EM02)	High Priority
<p>This market package supports automated vehicle location and dynamic routing of emergency vehicles. Traffic information, road conditions, and suggested routing information are provided to enhance emergency vehicle routing. Special priority or other specific emergency traffic control strategies can be coordinated to improve the safety and time-efficiency of responding vehicle travel on the selected route(s). The Emergency Management Subsystem provides the routing for the emergency fleet based on real-time conditions and has the option of requesting a route from the Traffic Management subsystem. The Emergency Vehicle may also be equipped with dedicated short range communications for local signal preemption. The service provides for information exchange between care facilities and both the Emergency Management Subsystem and emergency vehicles.</p>	
<p><b>Existing Infrastructure</b></p> <ul style="list-style-type: none"> <li>▪ Emergency Vehicle AVL</li> <li>▪ CAD for Emergency Vehicle Dispatch</li> <li>▪ Mobile Data Terminals</li> </ul>	<p><b>Agencies with Existing Infrastructure</b></p> <ul style="list-style-type: none"> <li>▪ City of Lubbock</li> <li>▪ City of Plainview</li> </ul>
<p><b>Planned Projects</b></p> <ul style="list-style-type: none"> <li>▪ City of Lubbock Emergency Vehicle Signal Preemption Expansion</li> </ul>	
<p><b>Additional Needs</b></p> <ul style="list-style-type: none"> <li>▪ City of Lubbock Emergency Vehicle Signal Preemption Upgrade and Expansion</li> <li>▪ City of Lubbock TMC/City of Lubbock Fire Dispatch Interface</li> <li>▪ City of Lubbock TMC/City of Lubbock Police (911) Interface</li> <li>▪ City of Plainview Emergency Vehicle Signal Preemption</li> <li>▪ TxDOT Emergency Vehicle Signal Preemption Phase 1</li> <li>▪ TxDOT Emergency Vehicle Signal Preemption Phase 2</li> <li>▪ TxDOT Lubbock TMC/County Sheriff Communications Connection</li> <li>▪ TxDOT Lubbock TMC/DPS Communications Connection</li> </ul>	

**Table 3 – High Priority Market Packages for the Lubbock Region (continued)**

<b>Road Weather Data Collection (MC03)</b>	<b>High Priority</b>
<p>This market package collects current road and weather conditions using data collected from environmental sensors deployed on and about the roadway. In addition to fixed road weather information system (RWIS) stations at the roadside, sensing of the roadway environment can also occur from sensor systems located on Maintenance and Construction Vehicles. The collected environmental data is used by the Weather Information Processing and Distribution Market Package to process the information and help operators make decisions on operations.</p>	
<b>Existing Infrastructure</b>	<b>Agencies with Existing Infrastructure</b>
None identified	
<b>Planned Projects</b>	
<ul style="list-style-type: none"> <li>▪ TxDOT I-27/US 289 Anti-Icing Automated Treatment</li> </ul>	
<b>Additional Needs</b>	
<ul style="list-style-type: none"> <li>▪ City of Lubbock Flood Detection Phase 1</li> <li>▪ City of Lubbock Flood Detection Phase 2</li> <li>▪ TxDOT Marsha Sharp Freeway Anti-Icing Automated Treatment</li> <li>▪ TxDOT Flood Detection Phase 1</li> <li>▪ TxDOT Flood Detection Phase 2</li> <li>▪ TxDOT RWIS Phase 1</li> <li>▪ TxDOT RWIS Phase 2</li> </ul>	

<b>Weather Information Processing and Distribution (MC04)</b>	<b>High Priority</b>
<p>This market package processes and distributes the environmental information collected from the Road Weather Data Collection market package. This market package uses the environmental data to detect environmental hazards such as icy road conditions, high winds, and dense fog, so system operators and decision support systems can make decisions on corrective actions to take. The continuing updates of road condition information and current temperatures can be used by system operators to more effectively deploy road maintenance resources, issue general traveler advisories, issue location specific warnings to drivers using the Traffic Information Dissemination market package, and aid operators in scheduling work activity.</p>	
<b>Existing Infrastructure</b>	<b>Agencies with Existing Infrastructure</b>
<ul style="list-style-type: none"> <li>▪ HCRS</li> </ul>	<ul style="list-style-type: none"> <li>▪ TxDOT</li> </ul>
<b>Planned Projects</b>	
<ul style="list-style-type: none"> <li>▪ TxDOT HCRS Enhancements</li> </ul>	
<b>Additional Needs</b>	
<ul style="list-style-type: none"> <li>▪ City of Lubbock Winter Maintenance Decision Support System</li> <li>▪ County Winter Maintenance Decision Support System</li> <li>▪ TxDOT Winter Maintenance Decision Support System</li> <li>▪ Regional Maintenance Coordination System</li> </ul>	

**Table 3 – High Priority Market Packages for the Lubbock Region (continued)**

<b>Roadway Automated Treatment (MC05)</b>	<b>High Priority</b>
<p>This market package automatically treats a roadway section based on environmental or atmospheric conditions. Treatments include fog dispersion, anti-icing chemicals, etc. The market package includes the environmental sensors that detect adverse conditions, the automated treatment system itself, and driver information systems (e.g., dynamic message signs) that warn drivers when the treatment system is activated.</p>	
<b>Existing Infrastructure</b>	<b>Agencies with Existing Infrastructure</b>
None identified	
<b>Planned Projects</b>	
<ul style="list-style-type: none"> <li>▪ TxDOT I-27/US 289 Anti-Icing Automated Treatment</li> </ul>	
<b>Additional Needs</b>	
<ul style="list-style-type: none"> <li>▪ TxDOT Marsha Sharp Freeway Anti-Icing Automated Treatment</li> </ul>	

<b>Maintenance and Construction Activity Coordination (MC10)</b>	<b>High Priority</b>
<p>This market package supports the dissemination of maintenance and construction activity information to centers which can utilize it as part of their operations, or to the Information Service Providers who can provide the information to travelers.</p>	
<b>Existing Infrastructure</b>	<b>Agencies with Existing Infrastructure</b>
<ul style="list-style-type: none"> <li>▪ HCRS</li> </ul>	<ul style="list-style-type: none"> <li>▪ TxDOT</li> </ul>
<b>Planned Projects</b>	
<ul style="list-style-type: none"> <li>▪ TxDOT HCRS Enhancements</li> <li>▪ TxDOT Center-to-Center Communications</li> </ul>	
<b>Additional Needs</b>	
<ul style="list-style-type: none"> <li>▪ City of Lubbock TMC/Media Communications Connection</li> <li>▪ Regional Maintenance Coordination System</li> <li>▪ TxDOT Lubbock TMC/Media Communications Connection</li> <li>▪ TxDOT Lubbock District Website</li> </ul>	



**Table 3 – High Priority Market Packages for the Lubbock Region (continued)**

<b>Transit Vehicle Tracking (APTS1)</b>	<b>High Priority</b>
This market package monitors current transit vehicle location using an Automated Vehicle Location System. The location data may be used to determine real time schedule adherence and update the transit system's schedule in real-time.	
<b>Existing Infrastructure</b>	<b>Agencies with Existing Infrastructure</b>
<ul style="list-style-type: none"> <li>▪ AVL on Demand-Response Vehicles</li> </ul>	<ul style="list-style-type: none"> <li>▪ Citibus</li> </ul>
<b>Planned Projects</b>	
None identified at this time	
<b>Additional Needs</b>	
<ul style="list-style-type: none"> <li>▪ CapTrans AVL</li> <li>▪ Citibus AVL for Fixed Route Vehicles</li> <li>▪ Independent School District Bus AVL</li> <li>▪ SPARTAN AVL</li> </ul>	

<b>Transit Fixed-Route Operations (APTS2)</b>	<b>High Priority</b>
This market package performs vehicle routing and scheduling, as well as automatic driver assignment and system monitoring for fixed-route transit services. This service determines current schedule performance using AVL data and provides information displays for the Transit Management Subsystem. Static and real time transit data is exchanged with Information Service Providers where it is integrated with that from other transportation modes (e.g. rail, ferry, air) to provide the public with integrated and personalized dynamic schedules.	
<b>Existing Infrastructure</b>	<b>Agencies with Existing Infrastructure</b>
<ul style="list-style-type: none"> <li>▪ Transit Dispatch Center</li> </ul>	<ul style="list-style-type: none"> <li>▪ Citibus</li> </ul>
<b>Planned Projects</b>	
<ul style="list-style-type: none"> <li>▪ Citibus Transit Signal Priority</li> <li>▪ Citibus Webpage Enhancements</li> </ul>	
<b>Additional Needs</b>	
<ul style="list-style-type: none"> <li>▪ Citibus Automated Fare Payment System</li> <li>▪ Citibus AVL for Fixed Route Vehicles</li> <li>▪ Citibus Real-Time Traveler Information</li> <li>▪ Independent School District Bus AVL</li> <li>▪ Independent School District Bus Dispatch Center Enhancements</li> <li>▪ Regional Transit Smart Card</li> </ul>	

**Table 3 – High Priority Market Packages for the Lubbock Region (continued)**

<b>Demand Response Transit Operations (APTS3)</b>	<b>High Priority</b>
<p>This market package performs vehicle routing and scheduling as well as automatic driver assignment and monitoring for demand responsive transit services. This package monitors the current status of the transit fleet and supports allocation of these fleet resources to service incoming requests for transit service while also considering traffic conditions. The Transit Management Subsystem provides the necessary data processing and information display to assist the transit operator in making optimal use of the transit fleet. This service includes the capability for a traveler request for personalized transit services to be made through the Information Service Provider (ISP) Subsystem.</p>	
<p><b>Existing Infrastructure</b></p> <ul style="list-style-type: none"> <li>▪ Transit Dispatch Center</li> <li>▪ AVL on Citibus Demand Response Vehicles</li> </ul>	<p><b>Agencies with Existing Infrastructure</b></p> <ul style="list-style-type: none"> <li>▪ CapTrans</li> <li>▪ SPARTAN</li> <li>▪ Citibus</li> </ul>
<p><b>Planned Projects</b></p> <ul style="list-style-type: none"> <li>▪ Citibus Webpage Enhancements</li> </ul>	
<p><b>Additional Needs</b></p> <ul style="list-style-type: none"> <li>▪ CapTrans Automated Fare Payment System</li> <li>▪ CapTrans AVL</li> <li>▪ CapTrans Dispatch Center Enhancements</li> <li>▪ CapTrans Web-based Scheduling and Transit Information</li> <li>▪ Citibus Automated Fare Payment System</li> <li>▪ Citibus Real-Time Traveler Information</li> <li>▪ Independent School District Bus AVL</li> <li>▪ Independent School District Bus Dispatch Center Enhancements</li> <li>▪ Regional Demand Response Transit Network</li> <li>▪ Regional Transit Smart Card</li> <li>▪ SPARTAN Automated Fare Payment System</li> <li>▪ SPARTAN AVL</li> <li>▪ SPARTAN Dispatch Center Enhancements</li> <li>▪ SPARTAN Web-based Scheduling and Transit Information</li> </ul>	

**Table 3 – High Priority Market Packages for the Lubbock Region (continued)**

<b>Transit Traveler Information (APTS8)</b>	<b>High Priority</b>
<p>This market package provides transit users at transit stops and on-board transit vehicles with ready access to transit information. The information services include transit stop annunciation, imminent arrival signs, and real-time transit schedule displays that are of general interest to transit users. Systems that provide custom transit trip itineraries and other tailored transit information services are also represented by this market package.</p>	
<b>Existing Infrastructure</b> Citibus Webpage	<b>Agencies with Existing Infrastructure</b> Citibus
<b>Planned Projects</b>	
<ul style="list-style-type: none"> <li>▪ Citibus Webpage Enhancements</li> </ul>	
<b>Additional Needs</b>	
<ul style="list-style-type: none"> <li>▪ CapTrans Web-based Scheduling and Transit Information</li> <li>▪ Citibus Real-Time Traveler Information</li> <li>▪ Citibus Traveler Information Kiosks</li> <li>▪ SPARTAN Web-based Scheduling and Transit Information</li> </ul>	

<b>Broadcast Traveler Information (ATIS1)</b>	<b>High Priority</b>
<p>This market package collects traffic conditions, advisories, general public transportation information, toll and parking information, incident information, air quality and weather information, and broadly disseminates this information through existing infrastructure and low cost user equipment (e.g., FM subcarrier, cellular data broadcast). This market package differs from the Traffic Information Dissemination market package, which provides localized HAR and DMS information capabilities.</p> <p>The information may be provided directly to travelers by an information service provider (ISP) or other traveler service providers so that they can better inform travelers of conditions. Successful deployment of this market package relies on availability of real-time traveler information from roadway instrumentation, probe vehicles, or other sources.</p>	
<b>Existing Infrastructure</b> <ul style="list-style-type: none"> <li>▪ HCRS</li> </ul>	<b>Agencies with Existing Infrastructure</b> <ul style="list-style-type: none"> <li>▪ TxDOT</li> </ul>
<b>Planned Projects</b>	
<ul style="list-style-type: none"> <li>▪ TxDOT HCRS Enhancements</li> </ul>	
<b>Additional Needs</b>	
<ul style="list-style-type: none"> <li>▪ City of Lubbock TMC/Media Communications Connection</li> <li>▪ TxDOT Lubbock TMC/Media Communications Connection</li> </ul>	

### 2.3 Medium Priority Market Packages

**Table 4** outlines market packages that were deemed medium priority by stakeholders in the Lubbock Region. These market packages were identified as useful and desirable services and functions for the Region, although very few of these market packages have existing infrastructure in place or planned over the next few years. The feasibility of funding for these market packages was a factor in the prioritization. Availability and maturity of technology also was a consideration, particularly for the maintenance and construction management market packages (many of the maintenance market packages were recently developed and added to the National ITS Architecture, and are not yet widely deployed).

**Table 4 – Medium Priority Market Packages for the Lubbock Region**

<b>Parking Facility Management (ATMS16)</b>	<b>Medium Priority</b>
This market package provides enhanced monitoring and management of parking facilities. It assists in the management of parking operations, coordinates with transportation authorities, and supports electronic collection of parking fees. This market package collects current parking status, shares this data with Information Service Providers and Traffic Management, and collects parking fees using the same in-vehicle equipment utilized for electronic toll collection or contact or proximity traveler cards used for electronic payment. Electronic payment for transit is addressed under a separate market package (APTS4).	
<b>Existing Infrastructure</b> None identified	<b>Agencies with Existing Infrastructure</b>
<b>Planned Projects</b> None identified at this time	
<b>Additional Needs</b> <ul style="list-style-type: none"> <li>▪ Texas Tech University Traffic and Parking Management Center</li> <li>▪ Texas Tech University Parking Security System</li> <li>▪ Texas Tech University Parking Management System</li> </ul>	

**Table 4 – Medium Priority Market Packages for the Lubbock Region (continued)**

<b>Work Zone Management (MC08)</b>	<b>Medium Priority</b>
<p>This market package directs activity in work zones, controlling traffic through portable DMS and informing other groups of activity (e.g., ISP, TM, other maintenance and construction centers) for better coordination management. Work zone speeds and delays are provided to the motorist prior to the work zones.</p>	
<p><b>Existing Infrastructure</b></p> <ul style="list-style-type: none"> <li>▪ Portable DMS</li> </ul>	<p><b>Agencies with Existing Infrastructure</b></p> <ul style="list-style-type: none"> <li>▪ TxDOT</li> </ul>
<p><b>Planned Projects</b></p> <p>None identified at this time</p>	
<p><b>Additional Needs</b></p> <ul style="list-style-type: none"> <li>▪ City of Lubbock Smart Work Zones</li> <li>▪ City of Lubbock TMC/Media Communications Connection</li> <li>▪ Regional Maintenance Coordination System</li> <li>▪ TxDOT 511 Traveler Information System Server</li> <li>▪ TxDOT Highway Advisory Radio</li> <li>▪ TxDOT Lubbock District Website</li> <li>▪ TxDOT Lubbock TMC/Media Communications Connection</li> <li>▪ TxDOT Portable DMS Phase 1</li> <li>▪ TxDOT Portable DMS Phase 2</li> <li>▪ TxDOT Smart Work Zones</li> <li>▪ TxDOT Travel Information Kiosks</li> </ul>	

**Table 4 – Medium Priority Market Packages for the Lubbock Region (continued)**

<b>Work Zone Safety Monitoring (MC09)</b>	<b>Medium Priority</b>
<p>This market package includes systems that improve work crew safety and reduce collisions between the motoring public and maintenance and construction vehicles. This market package detects vehicle intrusions in work zones and warns crew workers and drivers of imminent encroachment or other potential safety hazards. Crew movements are also monitored so that the crew can be warned of movement beyond the designated safe zone. The market package supports both stationary and mobile work zones. The intrusion detection and alarm systems may be collocated or distributed, allowing systems that detect safety issues far upstream from a work zone (e.g., detection of over dimension vehicles before they enter the work zone).</p>	
<b>Existing Infrastructure</b> None identified	<b>Agencies with Existing Infrastructure</b>
<b>Planned Projects</b> None identified at this time	
<b>Additional Needs</b> None identified at this time	

<b>Transit Passenger and Fare Management (APTS4)</b>	<b>Medium Priority</b>
<p>This market package manages passenger loading and fare payments on-board vehicles using electronic means. It allows transit users to use a traveler card or other electronic payment device. Sensors mounted on the vehicle permit the driver and central operations to determine vehicle loads, and readers located either in the infrastructure or on-board the transit vehicle allow electronic fare payment. Data is processed, stored, and displayed on the transit vehicle and communicated as needed to the Transit Management Subsystem.</p>	
<b>Existing Infrastructure</b> <ul style="list-style-type: none"> <li>▪ GFI Farebox Upgrade</li> </ul>	<b>Agencies with Existing Infrastructure</b> <ul style="list-style-type: none"> <li>▪ Citibus</li> </ul>
<b>Planned Projects</b> None identified at this time	
<b>Additional Needs</b> <ul style="list-style-type: none"> <li>▪ CapTrans Automated Fare Payment System</li> <li>▪ Citibus Automated Fare Payment System</li> <li>▪ Citibus Automated Passenger Counters</li> <li>▪ SPARTAN Automated Fare Payment System</li> </ul>	

**Table 4 – Medium Priority Market Packages for the Lubbock Region (continued)**

<b>Transit Security (APTS5)</b>	<b>Medium Priority</b>
<p>This market package provides for the physical security of transit passengers. An on-board security system is deployed to perform surveillance and warn of potentially hazardous situations. Public areas (e.g. stops, park and ride lots, stations) are also monitored.</p> <p>Information is communicated to the Transit Management Subsystem using wireless or wireline infrastructure. Security related information is also transmitted to the Emergency Management Subsystem when an emergency is identified that requires an external response. Incident information is communicated to the Information Service Provider.</p>	
<b>Existing Infrastructure</b>	<b>Agencies with Existing Infrastructure</b>
None identified	
<b>Planned Projects</b>	
None identified at this time	
<b>Additional Needs</b>	
<ul style="list-style-type: none"> <li>▪ CapTrans On-Board Security System</li> <li>▪ Citibus On-Board Security System</li> <li>▪ SPARTAN On-Board Security System</li> </ul>	

<b>Multi-modal Coordination (APTS7)</b>	<b>Medium Priority</b>
<p>This market package establishes two way communications between multiple transit and traffic agencies to improve service coordination. Multimodal coordination between transit agencies can increase traveler convenience at transfer points and also improve operating efficiency. Coordination between traffic and transit management is intended to improve on-time performance of the transit system to the extent that this can be accommodated without degrading overall performance of the traffic network. More limited local coordination between the transit vehicle and the individual intersection for signal priority is also supported by this package.</p>	
<b>Existing Infrastructure</b>	<b>Agencies with Existing Infrastructure</b>
None identified	
<b>Planned Projects</b>	
<ul style="list-style-type: none"> <li>▪ Citibus Transit Signal Priority</li> </ul>	
<b>Additional Needs</b>	
<ul style="list-style-type: none"> <li>▪ Regional Demand Response Transit Network</li> <li>▪ Regional Transit Smart Card</li> </ul>	

**Table 4 – Medium Priority Market Packages for the Lubbock Region (continued)**

<b>HAZMAT Management (CVO10)</b>	<b>Medium Priority</b>
<p>This market package integrates incident management capabilities with commercial vehicle tracking to assure effective treatment of HAZMAT materials and incidents. HAZMAT tracking is performed by the Fleet and Freight Management Subsystem. The Emergency Management Subsystem is notified by the Commercial Vehicle if an incident occurs and coordinates the response. The response is tailored based on information that is provided as part of the original incident notification or derived from supplemental information provided prior to the beginning of the trip or gathered following the incident (depending on the selected policy and implementation).</p>	
<b>Existing Infrastructure</b> None identified	<b>Agencies with Existing Infrastructure</b>
<b>Planned Projects</b> None identified at this time	
<b>Additional Needs</b>	
<ul style="list-style-type: none"> <li>▪ HAZMAT Tracking and Information Exchange</li> </ul>	

<b>Interactive Traveler Information (ATIS2)</b>	<b>Medium Priority</b>
<p>This market package provides tailored information in response to a traveler request. Both real-time interactive request/response systems and information systems that "push" a tailored stream of information to the traveler based on a submitted profile are supported. The traveler can obtain current information regarding traffic conditions, roadway maintenance and construction, transit services, ride share/ride match, parking management, detours and pricing information. A variety of interactive devices may be used by the traveler to access information prior to a trip or en route including phone via a 511-like portal, kiosk, Personal Digital Assistant, personal computer, and a variety of in-vehicle devices. Successful deployment of this market package relies on availability of real-time transportation data from roadway instrumentation, transit, probe vehicles, or other means.</p>	
<b>Existing Infrastructure</b> <ul style="list-style-type: none"> <li>▪ Agency Websites (static information only)</li> </ul>	<b>Agencies with Existing Infrastructure</b> <ul style="list-style-type: none"> <li>▪ TxDOT</li> <li>▪ City of Lubbock</li> <li>▪ Citibus</li> </ul>
<b>Planned Projects</b> <ul style="list-style-type: none"> <li>▪ Citibus Webpage Enhancements</li> </ul>	
<b>Additional Needs</b>	
<ul style="list-style-type: none"> <li>▪ CapTrans Web-based Scheduling and Transit Information</li> <li>▪ Citibus Traveler Information Kiosks</li> <li>▪ City of Lubbock Website</li> <li>▪ SPARTAN Web-based Scheduling and Transit Information</li> <li>▪ TxDOT 511 Traveler Information System Server</li> <li>▪ TxDOT Lubbock District Website</li> <li>▪ TxDOT Travel Information Kiosks</li> </ul>	



**Table 4 – Medium Priority Market Packages for the Lubbock Region (continued)**

<b>ITS Data Mart (AD1)</b>	<b>Medium Priority</b>
<p>This market package provides a focused archive that houses data collected and owned by a single agency, district, private sector provider, research institution, or other organization.</p> <p>This focused archive typically includes data covering a single transportation mode and one jurisdiction that is collected from an operational data store and archived for future use. It provides general query and report access to archive data users.</p>	
<p><b>Existing Infrastructure</b></p> <ul style="list-style-type: none"> <li>▪ BRINSAP</li> <li>▪ City of Lubbock Accident Database</li> <li>▪ Statewide Crash Database</li> </ul>	<p><b>Agencies with Existing Infrastructure</b></p> <ul style="list-style-type: none"> <li>▪ TxDOT</li> <li>▪ City of Lubbock</li> </ul>
<p><b>Planned Projects</b></p> <p>None identified at this time</p>	
<p><b>Additional Needs</b></p> <p>None identified at this time</p>	

<b>ITS Data Warehouse (AD2)</b>	<b>Medium Priority</b>
<p>This market package includes all of the data collection and management capabilities provided by the ITS Data Mart, and adds the functionality and interface definitions that allow the collection of data from multiple agencies and data sources spanning across modal and jurisdictional boundaries. It performs the additional transformations and provides the additional data management features that are necessary so that all the data can be managed in a single repository. The potential for large volumes of carried data suggests additional on-line analysis and data mining features that are also included in this market package in addition to the basic query and reporting user access features offered by the ITS Data Mart.</p>	
<p><b>Existing Infrastructure</b></p> <p>None identified</p>	<p><b>Agencies with Existing Infrastructure</b></p>
<p><b>Planned Projects</b></p> <p>None identified at this time</p>	
<p><b>Additional Needs</b></p> <ul style="list-style-type: none"> <li>▪ Lubbock MPO Data Archive</li> </ul>	

## 2.4 Low Priority Market Packages

Six of the market packages that were identified and customized for the Lubbock Region were ranked as low priority by stakeholders. These market packages are listed in **Table 5**. The services contained in these lower priority market packages were deemed useful and desirable for the Region, but stakeholders did not feel that public agencies should put a strong focus on these market packages in the near-term. These market packages were included as part of the Regional ITS Architecture so as not to preclude them from future deployment in the Region.

Some of these market packages were identified as candidates for private sector deployment and operations, such as ISP-based Route Guidance. Others, such as Maintenance and Construction Vehicle Tracking, are just more feasible for future implementation.

**Table 5 – Low Priority Market Packages for the Lubbock Region**

Market Package Name	Description	Comments
Standard Railroad Grade Crossing/ Railroad Operations Coordination (ATMS13/ATMS15)	<p>This market package manages highway traffic at highway-rail intersections (HRIs) where rail operational speeds are less than 80 miles per hour. Both passive (e.g., the crossbuck sign) and active warning systems (e.g., flashing lights and gates) are supported.</p> <p>These traditional HRI warning systems may also be augmented with other standard traffic management devices. The warning systems are activated on notification by interfaced wayside equipment of an approaching train. The equipment at the HRI may also be interconnected with adjacent signalized intersections so that local control can be adapted to highway-rail intersection activities. Health monitoring of the HRI equipment and interfaces is performed; detected abnormalities are reported to both highway and railroad officials through wayside interfaces and interfaces to the traffic management subsystem.</p> <p>The Railroad Operations Coordination component provides an additional level of strategic coordination between rail operations and traffic management centers. Rail operations provides train schedules, maintenance schedules, and any other forecast events that will result in HRI closures. This information is used to develop forecast HRI closure times and durations that may be used in advanced traffic control strategies or to enhance the quality of traveler information.</p>	Highway/rail crossings were not deemed a high priority for ITS in the Lubbock Region. Stakeholders agreed that as systems are implemented near major rail crossings, coordination with these systems in the future might be feasible.

**Table 5 – Low Priority Market Packages for the Lubbock Region (continued)**

<b>Market Package Name</b>	<b>Description</b>	<b>Comments</b>
Maintenance and Construction Vehicle Tracking (MC01)	This market package will track the location of maintenance vehicles and other equipment to ascertain the progress of their activities. These activities can include ensuring the correct roads are being plowed and work activity is being performed at the correct locations.	This market package is more appropriate for future applications. There may be institutional issues that need to be worked out regarding this market package.
Maintenance and Construction Vehicle Maintenance (MC02)	This market package performs vehicle maintenance scheduling and manages both routine and corrective maintenance activities on vehicles and other maintenance and construction equipment. It includes on-board sensors capable of automatically performing diagnostics for maintenance and construction vehicles, and the systems that collect this diagnostic information and use it to schedule and manage vehicle maintenance.	This market package is more appropriate for future applications. It relies on systems on-board and at maintenance facilities. Stakeholders agreed that it was a longer-term consideration.
Winter Maintenance (MC06)	This market package supports winter road maintenance including snow plow operations, roadway treatments (e.g., salt spraying and other anti-icing material applications), and other snow and ice control activities. This package monitors environmental conditions and weather forecasts and uses the information to schedule winter maintenance activities, determine the appropriate snow and ice control response, and track and manage response operations.	In the future as technology becomes more developed, the Region may want to consider employing features of this market package. At this time, automating winter maintenance is not a high priority for the Region.
Roadway Maintenance and Construction (MC07)	This market package supports numerous services for scheduled and unscheduled maintenance and construction on a roadway system or right-of-way. Maintenance services would include landscape maintenance, hazard removal (roadway debris, dead animals), routine maintenance activities (roadway cleaning, grass cutting), and repair and maintenance of both ITS and non-ITS equipment on the roadway (e.g., signs, traffic controllers, traffic detectors, dynamic message signs, traffic signals, closed-circuit television [CCTV], etc.). Environmental conditions information is also received from various weather sources to aid in scheduling maintenance and construction activities.	This market package was selected for longer-term consideration. Implementing this market package would require coordination among various maintenance groups. Automating these functions or services may require substantial institutional coordination as well as system implementation.



**Table 5 – Low Priority Market Packages for the Lubbock Region (continued)**

<b>Market Package Name</b>	<b>Description</b>	<b>Comments</b>
ISP-based Route Guidance (ATIS5)	This market package offers the user pre-trip route planning and turn-by-turn route guidance services, which are generated by an Information Service Provider (ISP). Routes may be based on static information or reflect real time network conditions. This approach simplifies the user equipment requirements and can provide the infrastructure better information on which to predict future traffic. The package includes two way data communications and optionally also equips the vehicle with the databases, location determination capability, and display technology to support turn by turn route guidance.	This market package is likely the primary responsibility of the private sector, with minimal public sector support.

### 3. PRIORITIZATION OF PROJECTS

In order to achieve the vision of the Regional ITS Architecture, a Region must deploy carefully developed projects that provide the functionality and interoperability identified in the architecture. A key step toward that vision is the development of an ITS Deployment Plan that identifies specific projects, timeframes, and responsible agencies.

Input from all stakeholders is required in order for the stakeholders to have ownership of the ITS Deployment Plan and also to be sure that the plan has realistically identified projects and timeframes for the Region. Cost is another important factor. Cost can vary a great deal for many ITS elements, depending on the level of deployment, maturity of the technology, type of communications, etc. For example, freeway network surveillance could be adequately achieved for one Region by the deployment of still frame CCTV cameras only at freeway interchanges. In another Region, there may be a desire for full motion cameras deployed at one mile intervals to provide complete coverage of the freeway. The infrastructure and telecommunications costs for these two projects would vary a great deal, yet either one could be suitable for a particular Region.

In order to achieve input from stakeholders, a workshop was held in the Lubbock Region on July 15, 2004 to present the draft Regional ITS Deployment Plan and discuss potential projects. Each project recommended for the Regional ITS Deployment Plan was discussed, and consensus was reached by the stakeholders on the project description and the timeframe for implementation.

In the following sections, projects are categorized into short-term projects (5-year deployment timeframe), mid-term projects (10-year deployment timeframe), and long-term projects (20-year deployment timeframe). For each timeframe, a summary table has been included that provides a brief project description, responsible agency, probable cost, an indication as to whether funding has been identified, and an estimated duration for the project to be designed and implemented. The agency identified as the responsible agency will be responsible for implementation, operations, and maintenance unless otherwise noted.

Following each table, a more detailed description of individual projects is included. This section also lists the market packages associated with each project and any pre-requisite projects that are required.

#### 3.1 Short-Term Projects (5-Year)

**Table 6** provides a description of projects for the Lubbock Region in the 5-year timeframe. These projects represent the highest priority for the Region and should be strongly considered for implementation in the short-term. Immediately following **Table 6** are project descriptions for each of the short-term recommendations.

#### 3.2 Mid-Term Projects (10-Year)

**Table 7** provides a description of projects in the 10-year timeframe. Several of these projects are continuations of projects that will begin in the 5-year timeframe. These projects are important to the Region, but will need further review at the time of their deployment to ensure they are still a priority for the Region. Immediately following **Table 7** are project descriptions for each of the mid-term recommendations.

### 3.3 Long-Term Projects (20-Year)

**Table 8** provides a description of projects in the 20-year timeframe. While these projects represent market packages and anticipated future needs identified for the Region, they will need to be closely reviewed prior to implementation. It is expected that a major update to the Region's ITS Deployment Plan will occur prior to year 10 which would allow stakeholders to reassess these long-term projects to be sure that they are still feasible for the Region. Immediately following **Table 8** are project descriptions for each of the long-term recommendations.



Table 6 – Short-Term Projects (5-Year)

Program Area/Project	Description	Responsible Agency*	Probable Cost**	Funding Identified	Estimated Project Duration
<b>Travel and Traffic Management</b>					
TxDOT Lubbock TMC and ATMS Implementation	Implement a Traffic Management Center (TMC) at the TxDOT Lubbock District Office, including Advanced Traffic Management System (ATMS) software	TxDOT	\$200,000	No	2 years
TxDOT Loop 289 Freeway Management System	Implement closed-circuit television (CCTV) cameras, dynamic message signs (DMS), detection and associated communications infrastructure on Loop 289 in the Lubbock metro area	TxDOT	\$2,000,000	No	3 years
TxDOT Marsha Sharp Freeway Management System	As part of the Marsha Sharp Freeway construction, implement CCTV cameras, DMS, detection and associated communications infrastructure	TxDOT	\$2,000,000	No	3 years
TxDOT Lubbock TMC/City of Lubbock TMC Communications Connection	Implement a fiber link between the TxDOT TMC and City of Lubbock TMC to share video, real-time traffic data, and other information. It is envisioned that there would be some level of shared control of TxDOT devices.	TxDOT/City of Lubbock	\$150,000	No	1 year
TxDOT Highway Advisory Radio	Implement highway advisory radio (HAR) to provide en-route information about closures, hazards, incidents, weather advisories and other impacts in the Region	TxDOT	\$20,000/ transmitter	No	6 months
TxDOT Center-to-Center Communications	Enhance coordination with other TxDOT Districts through implementation of center-to-center communications among TxDOT TMCs	TxDOT	N/A (statewide initiative)	Yes	1 year
TxDOT Traffic Signal System Upgrades and Expansion Phase 1	Expand TxDOT traffic signal system at signalized intersections throughout the Region. Also includes the implementation of video image vehicle detector system (VIVDS).	TxDOT	\$1,300,000	Yes	2 years
TxDOT Portable Speed Monitoring/Warning System	Procure portable speed monitoring/warning systems that can be used at key locations in the Region.	TxDOT	\$10,000/each	No	6 months



**Table 6 – Short-Term Projects (5-Year) (continued)**

Program Area/Project	Description	Responsible Agency*	Probable Cost**	Funding Identified	Estimated Project Duration
<b>Travel and Traffic Management (continued)</b>					
City of Lubbock Traffic Signal System Upgrades and Expansion Phase 1	Expand City of Lubbock traffic signal system in the metro Lubbock area, as well as implement fiber for select intersections. Also includes the implementation of VIVDS.	City of Lubbock	\$450,000 (implemented over five years)	Yes	5 years
City of Lubbock Traffic Signal Communications Upgrade	Replace the existing twisted pair copper cable with new fiber, and replace some of the spread spectrum radio communications with fiber	City of Lubbock	\$510,000	Yes	5 years
City of Lubbock CCTV Implementation	Implement CCTV cameras along key corridors in the City of Lubbock, including associated communications, modems and other support infrastructure	City of Lubbock	\$250,000	No	3 years
City of Lubbock TMC Expansion	Expand and enhance the City of Lubbock TMC to support additional capabilities as they become available, enhance incident management capabilities, increased operational hours, and operational interfaces to TxDOT	City of Lubbock	\$200,000	No	2 years
City of Lubbock Speed Monitoring/Warning System	Implement additional speed monitoring/warning capabilities at key locations in the City of Lubbock. Permanent speed monitoring and warning devices can be used on corridors with high accident rates or near school zones to help reduce speeding.	City of Lubbock	\$5,000 – \$10,000/each	No	6 months
City of Lubbock TMC/Media Communications Connection	Establish a connection between the City of Lubbock TMC and the media to be able to share information as well as CCTV video feeds (City would be responsible for video switch, media would be responsible for communications access to switch)	City of Lubbock/Media	\$40,000	No	1 year
Texas Tech University Traffic and Parking Management Center	Add a traffic and parking management center to act a central control facility for the Texas Tech University traffic signal system, parking security system, and parking management system	Texas Tech University/City of Lubbock	\$500,000	No	2 years





**Table 6 – Short-Term Projects (5-Year) (continued)**

Program Area/Project	Description	Responsible Agency*	Probable Cost**	Funding Identified	Estimated Project Duration
<b>Travel and Traffic Management (continued)</b>					
Texas Tech University Traffic Management System Implementation	Implement a traffic management system at Texas Tech University to assist the University in better managing traffic and travel around campus	Texas Tech University/City of Lubbock	\$200,000	No	3 years
Texas Tech University Parking Security System Implementation	Implement a security system including CCTV cameras at University parking facilities	Texas Tech University/City of Lubbock	\$200,000	No	2 years
Texas Tech University Enhanced Pedestrian and Vehicle Signalization Upgrades (Including Crosswalks)	Upgrade existing pedestrian and traffic signal systems at Texas Tech University	Texas Tech University/City of Lubbock	\$75,000	No	2 years
<b>Emergency Management</b>					
TxDOT Lubbock TMC/DPS Communications Connection	Install connection from DPS to TxDOT TMC for CCTV shared video monitoring and incident information coordination	TxDOT/DPS	To Be Determined	No	3 months
TxDOT Emergency Vehicle Signal Preemption Phase 1	Implement preemption at select TxDOT traffic signals in the Lubbock Region. This project would include controller upgrades, sensors, and transmitters. Emergency agencies would be responsible for installing on-board transmitters.	Cities	\$8,000/ intersection \$1,000/ transmitter	No	1 year
City of Lubbock Emergency Vehicle Signal Preemption Expansion	Expand emergency vehicle traffic signal preemption in the City of Lubbock to include additional intersections. This project includes controller upgrades, sensors, and transmitters. Emergency agencies would be responsible for the purchase of on-board transmitters. (The City Council has authorized \$100,000 for emergency signal preemption in the current fiscal year.)	City of Lubbock	\$500,000	Partial	5 years
City of Lubbock TMC/City of Lubbock Fire Dispatch Interface	Establish an interface between the City of Lubbock Fire Dispatch and the City of Lubbock TMC for coordination and sharing of incident and traffic information	City of Lubbock	To Be Determined	No	1 year



**Table 6 – Short-Term Projects (5-Year) (continued)**

Program Area/Project	Description	Responsible Agency*	Probable Cost**	Funding Identified	Estimated Project Duration
<b>Emergency Management (continued)</b>					
City of Lubbock TMC/City of Lubbock Police (911) Interface	Establish an interface between the City of Lubbock Police and the City of Lubbock TMC for coordination and sharing of incident and traffic information	City of Lubbock	To Be Determined	No	1 year
<b>Maintenance and Construction Management</b>					
TxDOT RWIS Phase 1	Install road weather information system sensors at key locations in the Region to provide accurate temperature, pavement conditions, precipitation and wind data as well as detect the presence of ice on the roadway	TxDOT	\$100,000	No	6 months
TxDOT Flood Detection Phase 1	Implement flood monitoring and warning sensors at key locations/near key corridors in the Region that are prone to flooding. High priority locations for the initial phase will likely be on I-27.	TxDOT	\$10,000/station	No	1 year
TxDOT Portable DMS Phase 1	Procure additional portable dynamic message signs for use by TxDOT maintenance crews	TxDOT	\$16,000/sign	No	2 years
TxDOT I-27/US 289 Anti-Icing Automated Treatment	Install pavement/ice detection and implement anti-icing systems at the I-27/US 289 flyover	TxDOT	\$300,000	Yes	2 years
TxDOT Marsha Sharp Freeway Anti-Icing Automated Treatment	As part of the Marsha Sharp Freeway construction and FMS implementation, install pavement/ice detection and implement anti-icing systems at 6 locations on freeway flyovers	TxDOT	\$300,000	No	2 years
TxDOT HCRS Enhancements	Implement enhancements to the Highway Conditions Reporting System (HCRS)	TxDOT	N/A	Yes (statewide initiative)	1 year
<b>Public Transportation Management</b>					
Citibus AVL for Fixed Route Vehicles	Install automated vehicle tracking on Citibus fixed-route vehicles (automated vehicle location [AVL] currently installed on demand-response fleet)	Citibus	\$10,000/vehicle (Includes software)	No	6 months



**Table 6 – Short-Term Projects (5-Year) (continued)**

Program Area/Project	Description	Responsible Agency*	Probable Cost**	Funding Identified	Estimated Project Duration
<b>Public Transportation Management (continued)</b>					
Citibus Webpage Enhancements	Update and expand the Citibus webpage to provide better Americans with Disabilities Act (ADA) accessibility. Additional enhancements to include Next Bus and Trip Planner capabilities (ADA upgrades underway)	Citibus	\$100,000	Partial	2 years
Citibus Transit Signal Priority	Implement transit priority capability at select City of Lubbock and Texas Tech traffic signals	City of Lubbock/Texas Tech University/Citibus	\$100,000	Partial	1 year
Citibus On-Board Security System	Install alarms and video cameras for surveillance on board Citibus fixed route and demand response vehicles	Citibus	\$10,000/veh	No	6 months
Citibus Real-Time Traveler Information	Provide transit travelers information on the next bus arrival via dynamic signage at key bus stops or transfer centers	Citibus	\$500,000	No	2 years
CapTrans AVL	Install automated vehicle tracking on CapTrans vehicles	CapTrans	\$10,000/vehicle (Includes software)	No	6 months
CapTrans Dispatch Center Enhancements	Expand the capabilities of the CapTrans dispatch center to better support systems, automated information sharing and coordination with other transit providers in the Region	CapTrans	\$50,000	No	1 year
SPARTAN AVL	Install automated vehicle tracking on South Plains Area Rural Transportation Assistance Network (SPARTAN) vehicles	SPARTAN	\$10,000/vehicle (Includes software)	No	6 months
SPARTAN Dispatch Center Enhancements	Expand the capabilities of the SPARTAN dispatch center to better support systems, automated information sharing and coordination with other transit providers in the Region	SPARTAN	\$200,000	No	1 year
SPARTAN Web-based Scheduling and Transit Information	Implement a scheduling system to provide web-based ride scheduling and real time travel data via the internet	SPARTAN	\$50,000	No	1 year



**Table 6 – Short-Term Projects (5-Year) (continued)**

Program Area/Project	Description	Responsible Agency*	Probable Cost**	Funding Identified	Estimated Project Duration
<b>Archived Data</b>					
Lubbock MPO Data Archive	Expand the data warehouse to archive data from cities and transit agencies in the Lubbock Metropolitan Planning Organization (MPO) service area	Lubbock MPO	To Be Determined	No	3 years

\*Agency listed is responsible for implementation, operations, and maintenance unless otherwise noted.

\*\*The design has not been undertaken and thus this is only an opinion of probable cost for planning purposes.

## Lubbock Region Short-Term Projects (5-Year)

### Travel and Traffic Management

#### **TxDOT Lubbock TMC and ATMS Implementation**

##### *Associated Market Packages:*

- Network Surveillance (ATMS01)
- Surface Street Control (ATMS03)
- Freeway Control (ATMS04)
- Traffic Information Dissemination (ATMS06)
- Regional Traffic Control (ATMS07)
- Incident Management System (ATMS08)

##### *Prerequisite Projects:* None

*Description:* Implement a TMC at the TxDOT Lubbock District Office. This TMC will serve as the hub of regional traffic management, traveler information, and weather management activities. The TMC will include a workstation, video monitors, and will house the central systems and Advanced Traffic Management System (ATMS) software that manage and receive data from field devices. Video images from the CCTV cameras could be viewed by TMC operators, and a video switch at the TMC could enable video images to be linked to the Lubbock web site. Additional workstations could be added at the TMC to provide for additional operator stations, or to serve as ‘command center’ workstations during major incidents on highways in the Region. The TMC should be implemented concurrently with the freeway management system projects identified in this section.

Lubbock TxDOT staff indicated that there was sufficient space at the District Office to house the TMC, and with some retrofitting of existing office space, it would provide a suitable location for the Lubbock TMC. Costs were estimated based on minor retrofitting needs, and also account for TMC hardware that might not be included as part of the ATMS implementation in the Lubbock Region.

The TxDOT ATMS is a software and hardware based platform developed by TxDOT staff in the Austin Headquarters. ATMS is being implemented in several TxDOT Districts, although Lubbock is not currently on the near-term implementation schedule.

The function of this software is to provide a platform for the operations and integration of various subsystems. The high level functions of the TxDOT ATMS include:

- Collect traffic information (e.g., speed, incidents, lane closures) through a variety of collection methods such as loops, video detection, user entry, etc.;
- Data archiving;
- Graphical map with traffic information;
- Status information, command and control for dynamic message signs, CCTV and other freeway management system components;
- Video switching; and
- User ID/password provided with each transaction for tracking use and establishing device control authority.

Future development efforts include software modules to provide status information and command/control of highway advisory radio (HAR) and environmental sensors (i.e., RWIS). Of particular importance to the Lubbock Region are the ATMS capabilities for DMS, CCTV and future capability for RWIS. An integrated maintenance database management module is also under development. Lastly, several modules are currently being upgraded to support recently approved NTCIP standards for CCTV, center to center communications, and data collection devices

This ATMS implementation project will include the software and hardware necessary to have an operational central system to routinely poll devices and support archiving of data. The estimated cost of this project is \$200,000.

### **TxDOT Loop 289 Freeway Management System**

*Associated Market Packages:*

- Network Surveillance (ATMS01)
- Traffic Information Dissemination (ATMS06)
- Incident Management System (ATMS08)

*Prerequisite Projects:* None

*Description:* This project would implement Freeway Management System (FMS) technologies on West Loop 289, near the Marsha Sharp Freeway Interchange. FMS components would include permanent DMS for traveler information, CCTV cameras for surveillance, detection to monitor traffic volumes on the freeway, and supporting communications infrastructure. The devices would be monitored and controlled from the TxDOT Lubbock TMC, and potentially the City of Lubbock TMC (depending on the operational agreements between those two agencies). Operators at the TxDOT TMC or City of Lubbock TMC could monitor traffic flow via the data coming in from detectors, and could utilize the CCTV cameras to zoom in on specific portions of the freeway. Messages about closures, incidents, or other hazards could be posted on the DMS to warn drivers of upcoming delays or detours. It is envisioned that future phases would expand the FMS to other segments of Loop 289.

The estimated cost of this project is \$2,000,000.

### **TxDOT Marsha Sharp Freeway Management System**

*Associated Market Packages:*

- Network Surveillance (ATMS01)
- Traffic Information Dissemination (ATMS06)
- Incident Management System (ATMS08)

*Prerequisite Projects:* None

*Description:* In conjunction with the Marsha Sharp Freeway Construction (Phases 1 and 2), this project would mainstream FMS components into the freeway construction process. FMS components would include permanent DMS for traveler information, CCTV cameras for surveillance, detection to monitor traffic volumes on the freeway, and supporting communications infrastructure. The devices would be monitored and controlled from the TxDOT Lubbock TMC, and potentially the City of Lubbock TMC

(depending on the operational agreements between those two agencies). Operators at the TxDOT TMC or City of Lubbock TMC could monitor traffic flow via the data coming in from detectors, and could utilize the CCTV cameras to zoom in on specific portions of the freeway. Messages about closures, incidents, or other hazards could be posted on the DMS to warn drivers of upcoming delays or detours. These systems and technologies could be used to assist agencies with managing day-to-day traffic along this important east-west corridor, as well as special event traffic, given the proximity of the freeway to the Texas Tech campus.

The estimated cost of this project is \$2,000,000.

### **TxDOT Lubbock TMC/City of Lubbock TMC Communications Connection**

#### *Associated Market Packages:*

- Network Surveillance (ATMS01)
- Surface Street Control (ATMS03)
- Traffic Information Dissemination (ATMS06)
- Regional Traffic Control (ATMS07)
- Incident Management System (ATMS08)

#### *Prerequisite Projects:* TxDOT Lubbock TMC and ATMS Implementation

*Description:* Install a connection between the TxDOT Lubbock TMC and the City of Lubbock TMC to allow video sharing, traffic data sharing and other joint functions. The type of connection (fiber, wireless, leased line) will need to be determined prior to implementation of this project based on desired band width and cost of technologies available.

The estimated cost of this project is \$150,000.

### **TxDOT Highway Advisory Radio**

#### *Associated Market Packages:*

- Traffic Information Dissemination (ATMS06)
- Incident Management System (ATMS08)
- Work Zone Management (MC08)

#### *Prerequisite Projects:* None

*Description:* This project will implement HAR transmitters at sites throughout the Region. HAR will allow operators at the Lubbock TMC to record travel advisory messages related to traffic, incidents, and weather for transmission at the roadside to vehicles traveling in the vicinity of the HAR transmitter(s).

The cost of the project will depend on the number of transmitters installed as well as the cost and number of accompanying beacon signs that will be needed. A cost of \$20,000 per HAR transmitter is being used for planning purposes.

## **TxDOT Center-to-Center Communications**

### *Associated Market Packages:*

- Regional Traffic Control (ATMS07)
- Maintenance and Construction Activity Coordination (MC10)

### *Prerequisite Projects:* TxDOT Lubbock TMC and ATMS Implementation

*Description:* The Center-to-Center Communications project will enhance coordination with TxDOT Districts through a connection to the statewide center-to-center core infrastructure. A communication backbone must be developed with sufficient capacity between the TxDOT District Office and existing center-to-center infrastructure. Determination of whether the backbone should be TxDOT owned, leased, or a combination thereof will be determined at a later date. The software required to support center-to-center communications is integrated with the TxDOT developed ATMS, so significant software development efforts are not anticipated. Resources will be required to oversee installation of the communications backbone between the TxDOT Lubbock District Office and statewide center-to-center facilities. As part of connecting to the statewide center-to-center infrastructure, the Lubbock Region will provide data to the statewide web server and statewide data archiving database. In return, access to information from other TxDOT Districts (and potentially other agencies) will be available to enhance operations throughout the Region.

## **TxDOT Traffic Signal System Upgrades and Expansion Phase 1**

### *Associated Market Packages:*

- Network Surveillance (ATMS01)
- Surface Street Control (ATMS03)

### *Prerequisite Projects:* None

*Description:* This project includes the expansion of the TxDOT signal system at signalized intersections throughout the Region. It also includes the implementation of VIVDS for vehicle detection.

The estimated cost is \$1,300,000 over two years.

## **TxDOT Portable Speed Monitoring/Warning System**

### *Associated Market Packages:*

- Network Surveillance (ATMS01)
- Incident Management System (ATMS08)
- Speed Monitoring (ATMS19)

### *Prerequisite Projects:* None

*Description:* Procure work zone speed trailers for use by TxDOT Maintenance crews and for spot-speed monitoring locations. Speed trailers are portable traffic control devices that are relatively easy to implement, operate, and dismantle. With a large light emitting diode (LED) speed display run by radar



sitting atop a trailer, speed trailers are routinely used in residential neighborhoods and urban settings to slow drivers. As drivers approach, their speeds are displayed in 24-inch (typ.) numbers. Recent studies have shown speed trailers particularly suited to temporary work zones and are more effective than radar drones. They help reduce speeds throughout work zones of both large trucks and passenger vehicles. These signs can be used at work zones, near school zones, or other locations for detection and to support enforcement of excessive speed violations.

Costs will vary depending on the number of speed zone trailers purchased, but \$10,000 each was used for planning purposes.

### **City of Lubbock Traffic Signal System Upgrades and Expansion Phase 1**

*Associated Market Packages:*

- Network Surveillance (ATMS01)
- Surface Street Control (ATMS03)

*Prerequisite Projects:* None

*Description:* This project includes the expansion of the City of Lubbock signal system at signalized intersections throughout the City. It also includes the implementation of VIVDS.

The estimated cost of this project is \$450,000.

### **City of Lubbock Traffic Signal Communications Upgrade**

*Associated Market Packages:*

- Network Surveillance (ATMS01)
- Surface Street Control (ATMS03)

*Prerequisite Projects:* None

*Description:* This project will result in a substantial communications upgrade for the City of Lubbock's traffic signal control and overall traffic management system. Currently, the traffic signal system operates on a combination of fiber, twisted-pair copper cables, and spread-spectrum radio. Existing twisted pair copper cable will be replaced with new fiber, and fiber will also be installed to replace some of the spread spectrum radio communications. The enhanced communication capabilities of the fiber will enable video feed from the VIVDS to be sent back to the TMC (VIVDS are currently only transmitting vehicle count data, not images). This fiber will also be used for future Smart Corridor applications on major arterials in Lubbock, including CCTV and arterial dynamic message signs.

This project is in the City's current Capital Improvement Plan, and is estimated at \$510,000 over the next five years.

## City of Lubbock CCTV Implementation

### *Associated Market Packages:*

- Network Surveillance (ATMS01)
- Surface Street Control (ATMS03)
- Incident Management System (ATMS08)

### *Prerequisite Projects:* City of Lubbock Traffic Signal Communications Upgrade

*Description:* This project includes the deployment of CCTV cameras along key segments of roadway in the City of Lubbock. The CCTV cameras can be used for incident detection and verification, to monitor congestion and to aid in the dispatch of emergency vehicles. The information gathered by the CCTV cameras (video feed) can be shared with the area emergency management agencies, as well as with the TxDOT Lubbock TMC and local media.

The estimated cost of this project is \$250,000.

## City of Lubbock TMC Expansion

### *Associated Market Packages:*

- Network Surveillance (ATMS01)
- Surface Street Control (ATMS03)
- Traffic Information Dissemination (ATMS06)
- Regional Traffic Control (ATMS07)
- Incident Management System (ATMS08)

### *Prerequisite Projects:* None

*Description:* This project includes the expansion of the capabilities of the City of Lubbock TMC. Currently, the TMC is used primarily to monitor the operations of the controllers and detectors at signalized intersections. It is feasible that the City's TMC will serve as a regional center while the TxDOT TMC is being implemented. With the planned urban transportation management systems envisioned for the City of Lubbock, the TMC will remain a key component of the City's ITS Program, and it will be critical to overall operations to provide for enhanced and expanded capabilities. Additionally, VIVDS video images are not currently being transmitted to the TMC. The planned expansion of the TMC would include the implementation of end equipment to allow the transmission of the video feed from the VIVDS in the field back to the TMC. This project would also include the capabilities to control the VIVDS remotely from the TMC as well as control of the pan/tilt/zoom (PTZ) of the planned CCTV cameras. Traveler information is also likely to be a future function of the City's TMC.

The estimated cost associated with this expansion is \$200,000.

## **City of Lubbock Speed Monitoring/Warning System**

### *Associated Market Packages:*

- Network Surveillance (ATMS01)
- Speed Monitoring (ATMS19)

### *Prerequisite Projects:* None

*Description:* This project would implement additional speed monitoring/warning technology at select locations in the City of Lubbock. Current applications include fixed speed monitoring/warning systems near school zones, and this project would include both fixed and portable devices. With a large LED speed display run by radar sitting atop a trailer or at a fixed sign, these systems are routinely used in residential neighborhoods and urban settings to slow drivers. As drivers approach, their speeds are displayed in 24-inch (typical) numbers. Recent studies have shown speed monitoring and warning systems particularly suited to school zones and temporary work zones and are more effective than radar drones. They help reduce speeds throughout these zones of both large trucks and passenger vehicles.

Costs will vary depending on the number and type (fixed or portable) of speed monitoring/warning systems purchased. For planning purposes, estimates of \$5,000-10,000 each are being used.

## **City of Lubbock TMC/Media Communications Connection**

### *Associated Market Packages:*

- Traffic Information Dissemination (ATMS06)
- Incident Management System (ATMS08)
- Work Zone Management (MC08)
- Maintenance and Construction Activity Coordination (MC10)
- Broadcast Traveler Information (ATIS1)

*Prerequisite Projects:* City of Lubbock CCTV Implementation, TxDOT Marsha Sharp Freeway Management System, TxDOT Loop 289 Freeway Management System

*Description:* This project implements a video switch that will allow local media permissive access to City CCTV camera feeds (media to provide fiber/leased line for access to switch, City to implement switch at the TMC). If the City also serves as an interim regional TMC while the TxDOT Lubbock TMC is being implemented, it is likely that the City would be able to provide media with access to TxDOT CCTV images as well. The estimated cost of this implementation (for the City of Lubbock's portion) is \$40,000.

### **Texas Tech University Traffic and Parking Management Center**

*Associated Market Packages:*

- Network Surveillance (ATMS01)
- Surface Street Control (ATMS03)
- Parking Facility Management (ATMS16)

*Prerequisite Projects:* None

*Description:* Add traffic and parking management center to act a central control facility for the Texas Tech University traffic signal system, parking security system, and parking management system. The cost for this project is approximately \$500,000.

### **Texas Tech University Traffic Management System Implementation**

*Associated Market Packages:* Texas Tech University Traffic and Parking Management Center

- Network Surveillance (ATMS01)
- Surface Street Control (ATMS03)

*Prerequisite Projects:* None

*Description:* Implement a traffic management system at Texas Tech University to assist the University in better managing traffic and travel around campus. The estimated cost for this project is approximately \$200,000.

### **Texas Tech University Parking Security System Implementation**

*Associated Market Packages:* Texas Tech University Traffic and Parking Management Center

- Network Surveillance (ATMS01)
- Parking Facility Management (ATMS16)

*Prerequisite Projects:* None

*Description:* Implement a security system including CCTV cameras at University parking facilities. The estimated cost for this project is approximately \$200,000.

## **Texas Tech University Enhanced Pedestrian and Vehicle Signalization Upgrades (Including Crosswalks)**

*Associated Market Packages:*

- Surface Street Control (ATMS03)

*Prerequisite Projects:* None

*Description:* Upgrade existing pedestrian and traffic signal systems at Texas Tech University. The estimated cost for this project is approximately \$75,000.

### **Emergency Management**

#### **TxDOT Lubbock TMC/DPS Communications Connection**

*Associated Market Packages:*

- Traffic Information Dissemination (ATMS06)
- Incident Management System (ATMS08)
- Emergency Response (EM01)
- Emergency Routing (EM02)

*Prerequisite Projects:* TxDOT Lubbock TMC and ATMS implementation

*Description:* Install telecommunications connection and end equipment from the TxDOT Lubbock TMC to the DPS dispatch center to share CCTV and incident data/images and provide information on current road conditions that could assist with incident/emergency management. The cost for this project will depend on the communications used to implement the connection (i.e., fiber connection or leased lines).

#### **TxDOT Emergency Vehicle Signal Preemption Phase 1**

*Associated Market Packages:*

- Surface Street Control (ATMS03)
- Incident Management System (ATMS08)
- Emergency Routing (EM02)

*Prerequisite Projects:* None

*Description:* Equip TxDOT traffic signals in municipalities in the Lubbock Region with traffic signal preemption equipment. Typical installations include mounting hardware at the intersection and on each vehicle authorized to preempt the signal. The intersection equipment includes a detector(s) positioned at the intersection approach(es) connected to the traffic signal controller. As a vehicle equipped with a preemption emitter approaches an intersection, the detector activates a change in signal timing to allow fast and safe passage. Preemption systems have proven to improve safety of emergency personnel and vehicles en-route to an incident. Although signal preemption will be installed on TxDOT signals, the local municipalities will be responsible for the cost of signal and vehicle equipment.

The estimated cost of this project is \$8,000 per intersection and \$1,000 per vehicle.

### **City of Lubbock Emergency Vehicle Signal Preemption Expansion**

*Associated Market Packages:*

- Surface Street Control (ATMS03)
- Incident Management System (ATMS08)
- Emergency Routing (EM02)

*Prerequisite Projects:* None

*Description:* Install additional signal preemption capability at signalized intersections in the City of Lubbock. Typical installations include mounting hardware at the intersection and on each vehicle authorized to preempt the signal. The intersection equipment includes a detector(s) positioned at the intersection approach(es) connected to the traffic signal controller. As a vehicle equipped with a preemption emitter approaches an intersection, the detector activates a change in signal timing to allow fast and safe passage. Preemption systems have proven to improve safety of emergency personnel and vehicles en-route to an incident.

The estimated cost of this project is \$500,000. Partial funding has been secured (City Council has authorized \$100,000 for FY 2005.)

### **City of Lubbock TMC/City of Lubbock Fire Dispatch Interface**

*Associated Market Packages:*

- Traffic Information Dissemination (ATMS06)
- Incident Management System (ATMS08)
- Emergency Response (EM01)
- Emergency Routing (EM02)

*Prerequisite Projects:* None

*Description:* Establish an interface between the City of Lubbock TMC and the City of Lubbock Fire Department to share CCTV data and images. The connection will also provide information on current road conditions that could assist with incident/emergency management. Both the TMC and the Fire Dispatch are connected via the City of Lubbock's network; a software or system interface would need to be established to enable data sharing.

## **City of Lubbock TMC/City of Lubbock Police (911) Interface**

### *Associated Market Packages:*

- Traffic Information Dissemination (ATMS06)
- Incident Management System (ATMS08)
- Emergency Response (EM01)
- Emergency Routing (EM02)

### *Prerequisite Projects:* None

*Description:* Establish an interface between the City of Lubbock TMC and the City of Lubbock Police Department to share CCTV data and images. The connection will also provide information on current road conditions that could assist with incident/emergency management. Both the TMC and Police/911 center are connected via the City of Lubbock's network; a software or system interface would need to be established.

## **Maintenance and Construction Management**

### **TxDOT RWIS Phase 1**

### *Associated Market Packages:*

- Network Surveillance (ATMS01)
- Incident Management System (ATMS08)
- Road Weather Data Collection (MC03)

### *Prerequisite Projects:* None

*Description:* Install RWIS stations in the Lubbock District. The RWIS will be remotely monitored by the TxDOT Lubbock District Office (and TMC, when implemented). Real time weather information improves maintenance crew and emergency responder response time and increases winter maintenance efficiency. Archived RWIS information also provides valuable historic information for planning purposes. Data including temperature (atmospheric and pavement), precipitation, wind, humidity, visibility (white out/heavy fog) and even pavement surface conditions (i.e., snow, chemical) are collected by sensors placed at the roadside (typically on a 30 foot tower) and embedded in the roadway. Remote processing units placed along the roadway communicate with various types of road and weather sensors. Data from the units are transmitted to the central ATMS server, via dial-up modem or other low bandwidth telecommunications methods, which will be located at the TxDOT Lubbock District Office and TMC. A future module for the ATMS software will support environmental sensor data and provides collection, archiving, and distribution of the data.

The estimated cost for one RWIS station is \$25,000. Total cost for the project is estimated at \$100,000.

### **TxDOT Flood Detection Phase 1**

*Associated Market Packages:*

- Network Surveillance (ATMS01)
- Incident Management System (ATMS08)
- Road Weather Data Collection (MC03)

*Prerequisite Projects:* None

*Description:* Implement flood detection systems on flood-prone segments of roadways in the TxDOT Lubbock District. This will enable faster response times by maintenance crews to close flooded or near flooded roadway segments as necessary. The typical flood detection station consists of a stream gauge, a rain gauge, a temperature sensor, and remote communications support. Other upgrades that may support operational decision making include sensors to measure relative humidity, soil moisture content, solar radiation, and air and water quality. The flood detection systems will be monitored by the TxDOT Lubbock District Office (and TMC, when implemented). Communications between the flood detection stations and TxDOT maintenance personnel can be achieved through a variety of wireless and wireline telemetry methods.

The estimated cost is \$10,000 per location.

### **TxDOT Portable DMS Phase 1**

*Associated Market Packages:*

- Traffic Information Dissemination (ATMS06)
- Incident Management System (ATMS08)
- Work Zone Management (MC08)

*Prerequisite Projects:* None

*Description:* Portable DMS are a valuable tool to communicate existing and future closures, restrictions, detours, alternate routes, and other important information to motorists while they are en-route. These signs can be used at or near work zones to notify motorists of activity and appropriate measures to take (i.e., detour, slow down), but also can be mobilized at specific locations as conditions warrant, such as flooding or other closures. Portable DMS can be stand-alone signs or mounted to the back of a maintenance vehicle. Programming is typically done manually at the sign. The TxDOT Lubbock District Office currently has access to portable DMS that can be used in the Region, and this project will procure additional portable DMS.

The estimated cost is \$16,000 per sign.



## **TxDOT I-27/US 289 Anti-Icing Automated Treatment**

### *Associated Market Packages:*

- Road Weather Data Collection (MC03)
- Roadway Automated Treatment (MC05)
- Winter Maintenance (MC06)

### *Prerequisite Projects:* None

*Description:* Implement anti-icing equipment at the I-27/US 289 flyover. Anti-icing is a snow and ice control practice that attempts to prevent the formation or development of snow and ice that becomes bonded to the roadway by utilizing timely applications of a freezing point depressant.

Anti-icing involves applying a liquid chemical de-icing agent directly onto the surface before the temperature and humidity levels permit an ice bond to occur. This technique requires that chemical de-icing agents be applied in a timely and accurate manner. Permanent auto anti-icing systems must be activated by some means, and the level of service is directly impacted by the method that is used to activate the system. To achieve full autonomous operation (non-human intervention), the anti-icing system must be controlled by input from a road weather information system that measures atmospheric and pavement surface conditions, accurately measures the freeze point of the moisture/chemical solution on the road surface and in turn activates the permanent automated anti-icing system when icing conditions are imminent.

Automated anti-icing systems can be installed as part of a bridge re-decking project where equipment is integrated into overall construction. Alternatively, anti-icing systems can be retrofit to existing bridges. Other features that have been included in anti-icing systems are:

- Integration of DMS in advance of locations to warn motorists of operating spray nozzles;
- CCTV to verify anti-icing operations and to monitor critical infrastructure; and
- Bridge structure monitoring (on bridges that may be forming hairline cracks).

The estimated cost of this project is \$300,000.

## **TxDOT Marsha Sharp Freeway Anti-Icing Automated Treatment**

### *Associated Market Packages:*

- Road Weather Data Collection (MC03)
- Roadway Automated Treatment (MC05)
- Winter Maintenance (MC06)

### *Prerequisite Projects:* TxDOT RWIS Phase 1, TxDOT Marsha Sharp Freeway Management System

*Description:* Implement anti-icing equipment at six flyover locations on the Marsha Sharp Freeway. Anti-icing is a snow and ice control practice that attempts to prevent the formation or development of snow and ice that becomes bonded to the roadway by utilizing timely applications of a freezing point depressant.

Anti-icing involves applying a liquid chemical de-icing agent directly onto the surface before the temperature and humidity levels permit an ice bond to occur. This technique requires that chemical de-

icing agents be applied in a timely and accurate manner. Permanent auto anti-icing systems must be activated by some means, and the level of service is directly impacted by the method that is used to activate the system. To achieve full autonomous operation (non-human intervention), the anti-icing system must be controlled by input from a road weather information system that measures atmospheric and pavement surface conditions, accurately measures the freeze point of the moisture/chemical solution on the road surface and in turn activates the permanent automated anti-icing system when icing conditions are imminent.

Automated anti-icing systems can be installed as part of a bridge re-decking project where equipment is integrated into overall construction. Alternatively, anti-icing systems can be retrofit to existing bridges. Other features that have been included in anti-icing systems are:

- Integration of DMS in advance of locations to warn motorists of operating spray nozzles;
- CCTV to verify anti-icing operations and to monitor critical infrastructure; and
- Bridge structure monitoring (on bridges that may be forming hairline cracks).

The estimated cost of this project is \$300,000.

### **TxDOT HCRS Enhancements**

*Associated Market Packages:*

- Traffic Information Dissemination (ATMS06)
- Weather Information Processing and Distribution (MC04)
- Maintenance and Construction Activity Coordination (MC10)
- Broadcast Traveler Information (ATIS1)

*Prerequisite Projects:* None

*Description:* TxDOT's HCRS will be enhanced on a statewide basis. The HCRS will use data from the Lubbock District Office, both automated (ATMS) and manually entered. It is envisioned that the ATMS software will enhance the data collection and consolidation processes for automated information. This is a statewide effort; Lubbock will be affected by this project, and will contribute information to the HCRS, but will not be responsible for funding the enhancements or for the implementation schedule.

### **Public Transportation Management**

#### **Citibus AVL for Fixed Route Vehicles**

*Associated Market Packages:*

- Transit Vehicle Tracking (APTS1)
- Transit Fixed-Route Operations (APTS2)

*Prerequisite Projects:* None

*Description:* This project includes the implementation of AVL in Citibus fixed-route transit vehicles. Citibus currently has AVL on its demand-response vehicles. The AVL system will convey information regarding real-time vehicle location to the Citibus Transit Operations Center, which will allow for

enhanced system monitoring, scheduling, routing (or re-routing), as well as provide for precise bus location information in the event of a breakdown or emergency situation. AVL systems relay information back to a transit operations center, usually via global positioning system. Used with a geographic information system (GIS) map, bus locations can be displayed for any vehicles in the fleet equipped with the on-board AVL unit. AVL, in conjunction with Computer Aided Dispatch, allows for improved bus tracking capability, as well as archiving and managing historical data. AVL systems also can be equipped with additional features, including tie-ins to alarm/security systems, vehicle component monitoring, and automatic passenger counter and fare payment systems. Information from the AVL/CAD system can be used by transit managers for real-time operations and management as well as for transit traveler information. In areas where AVL technology has been installed on buses, agencies report a 5-25 percent increase in on-time performance, which translates directly to improved efficiency and operations.

The estimated cost is \$10,000 per vehicle. This cost includes software.

### **Citibus Webpage Enhancements**

*Associated Market Packages:*

- Transit Fixed-Route Operations (APTS2)
- Demand Response Transit Operations (APTS3)
- Transit Traveler Information (APTS8)
- Interactive Traveler Information (ATIS2)

*Prerequisite Projects:* None

*Description:* This project includes the enhancement of the current Citibus webpage to provide greater ADA accessibility, and plans to include Next Bus information and trip planning capabilities as part of a future web enhancement.

This project is estimated to cost \$100,000.

### **Citibus Transit Signal Priority**

*Associated Market Packages:*

- Transit Fixed-Route Operations (APTS2)
- Multi-modal Coordination (APTS7)

*Prerequisite Projects:* None

*Description:* This project would implement transit priority on selected arterials/bus routes near Texas Tech University in the City of Lubbock. Transit priority equipment installed at specific traffic signals would receive a signal emitted from the transponder on the bus requesting additional green time to allow the bus to travel through the intersection. "Priority" at a traffic signal differs from "preemption" (which is typically limited to emergency vehicles), in that preemption significantly alters the normal traffic signal operation. By extending the green time on an as-requested basis, transit priority allows transit vehicles to improve schedule adherence.

The estimated cost is \$100,000. Partial funding has been secured.

### **Citibus On-Board Security System**

*Associated Market Packages:*

- Transit Security (APTS5)

*Prerequisite Projects:* None

*Description:* This project will install security cameras on Citibus transit vehicles. It is a possibility that the security cameras would provide video feed from the buses to the transit operations center for monitoring, but the typical application stores video on-board and does not transmit back to an operation center in real-time.

The estimated cost is \$10,000 per vehicle.

### **Citibus Real-Time Traveler Information**

*Associated Market Packages:*

- Transit Fixed-Route Operations (APTS2)
- Demand Response Transit Operations (APTS3)
- Transit Traveler Information (APTS8)

*Prerequisite Projects:* Citibus AVL for Fixed Route Vehicles

*Description:* This project would use the real-time data and location information from AVL units on-board Citibus vehicles to provide up-to-the-minute schedule and location information for dispatchers as well as transit patrons. Real-time information about bus location, next-bus arrival time, or delays could be communicated via the Citibus web site, kiosks, or even audible messages at transit stops. Dynamic messages at transit stops and at transit transfer centers announcing next-bus arrival times have been used with great success in other cities.

The estimated cost of this project is \$500,000.

### **CapTrans AVL**

*Associated Market Packages:*

- Transit Vehicle Tracking (APTS1)
- Demand Response Transit Operations (APTS3)

*Prerequisite Projects:* None

*Description:* This project includes the implementation of AVL in CapTrans transit vehicles. The AVL system will convey information regarding real-time vehicle location to the Transit Operations Center, which will allow for enhanced system monitoring, scheduling, routing (or re-routing), as well as provide for precise bus location information in the event of a breakdown or emergency situation. AVL systems relay information back to a transit operations center, usually via global positioning system. Used with a GIS map, bus locations can be displayed for any vehicles in the fleet equipped with the on-board AVL unit. AVL, in conjunction with Computer Aided Dispatch, allows for improved bus tracking capability, as well as archiving and managing historical data. AVL systems also can be equipped with additional

features, including tie-ins to alarm/security systems, vehicle component monitoring, and automatic passenger counter and fare payment systems. Information from the AVL/CAD system can be used by transit managers for real-time operations and management as well as for transit traveler information. In areas where AVL technology has been installed on buses, agencies report a 5-25 percent increase in on-time performance, which translates directly to improved efficiency and operations.

The estimated cost is \$10,000 per vehicle. This cost includes software.

### **CapTrans Dispatch Center Enhancements**

*Associated Market Packages:*

- Demand Response Transit Operations (APTS3)

*Prerequisite Projects:* None

*Description:* This project includes the implementation of a Transit Operations Center and CAD system to support CapTrans demand-response transit services in the region. The CAD system will provide data processing support to assist the CapTrans dispatchers in managing communications with vehicles and generate management reports. The main goal of this project is to use automation to plan daily optimal routes where origins, destinations, common locations, and client requested times and equipment needs are grouped so that the most efficient routes with the maximum number of shared rides (several clients sharing a vehicle) are created for the paratransit services. Enhancements to the transit operations/dispatch center also will support greater coordination between CapTrans and other transit providers in the region.

The CAD system will provide reporting functions, by automatically logging all communications between the dispatch center and the driver, including time, vehicle/driver ID, nature of the communication, and response.

This project is estimated to cost \$50,000.

### **SPARTAN AVL**

*Associated Market Packages:*

- Transit Vehicle Tracking (APTS1)
- Demand Response Transit Operations (APTS3)

*Prerequisite Projects:* None

*Description:* This project includes the implementation of AVL in SPARTAN transit vehicles. The AVL system will convey information regarding real-time vehicle location to the Transit Operations Center, which will allow for enhanced system monitoring, scheduling, routing (or re-routing), as well as provide for precise bus location information in the event of a breakdown or emergency situation. AVL systems relay information back to a transit operations center, usually via global positioning system. Used with a GIS map, bus locations can be displayed for any vehicles in the fleet equipped with the on-board AVL unit. AVL, in conjunction with Computer Aided Dispatch, allows for improved bus tracking capability, as well as archiving and managing historical data. AVL systems also can be equipped with additional features, including tie-ins to alarm/security systems, vehicle component monitoring, and automatic passenger counter and fare payment systems. Information from the AVL/CAD system can be used by

transit managers for real-time operations and management as well as for transit traveler information. In areas where AVL technology has been installed on buses, agencies report a 5-25 percent increase in on-time performance, which translates directly to improved efficiency and operations.

The estimated cost is \$10,000 per vehicle. This cost includes software.

### **SPARTAN Dispatch Center Enhancements**

*Associated Market Packages:*

- Demand Response Transit Operations (APTS3)

*Prerequisite Projects:* None

*Description:* This project includes the implementation of an enhanced operation/dispatch center and CAD system to support SPARTAN demand-response transit services in the region. The CAD system will provide data processing support to assist the dispatchers in managing communications with vehicles and generate management reports. The main goal of this project is to use automation to plan daily optimal routes where origins, destinations, common locations, and client requested times and equipment needs are grouped so that the most efficient routes with the maximum number of shared rides (several clients sharing a vehicle) are created for the paratransit services. Enhancements to the SPARTAN transit operations/dispatch center also will support greater coordination between SPARTAN and other transit providers in the region.

The CAD system will provide reporting functions, by automatically logging all communications between the dispatch center and the driver, including time, vehicle/driver ID, nature of the communication, and response.

This project is estimated to cost \$200,000.

### **SPARTAN Web-based Scheduling and Transit Information**

*Associated Market Packages:*

- Demand Response Transit Operations (APTS3)
- Transit Traveler Information (APTS8)
- Interactive Traveler Information (ATIS2)

*Prerequisite Projects:* None

*Description:* Provide enhanced transit related traveler information to SPARTAN paratransit network customers. The on-demand nature of the transit services requires that up-to-the minute information about pick-ups, drop-offs, vehicle location, and any disruptions in service be available not only to the dispatch staff, but also to transit passengers pre-trip. General (static) and near-real-time information about dial-a-ride services and status, as well as interactive trip scheduling and reservations could be made available to patrons via Internet-based travel information systems. Web-based maps could show locations of the vehicles in near-real-time. This real-time information also would be available at the dispatch/call center for passengers who do not have access to the Internet. Coordination with TxDOT and the local cities would allow for current traffic conditions, incidents, closures and other impacts to the roadway network to be displayed with the transit route and status information.

The estimated cost for this project is \$50,000.

### **Archived Data**

#### **Lubbock MPO Data Archive**

*Associated Market Packages:*

- ITS Data Warehouse (AD2)

*Prerequisite Projects:* None

*Description:* Implement a system to collect, store and process transportation data from selected locations. This project will design the frequency, quantity, and quality of data to be collected and stored. User interfaces will be required at each local agency to be able to access, search, and upload archived data as needed. The interface will likely be web-based.



**Table 7 – Mid-Term Projects (10-Year)**

Program Area/Project	Description	Responsible Agency*	Probable Cost**	Funding Identified	Estimated Project Duration
<b><i>Travel and Traffic Management</i></b>					
TxDOT Freeway Management System Expansion	Implement additional CCTV cameras, DMS, and vehicle detectors as needed on key freeway corridors in the Lubbock Region. This would include additional freeway management system (FMS) on Loop 289 and Marsha Sharp, and potentially new FMS infrastructure on other corridors, such as I-27	TxDOT	\$4,000,000	No	5 years
TxDOT 511 Traveler Information System Server	Implement an advanced traveler information system (ATIS) server in the TxDOT Lubbock District TMC that will collect, consolidate, and distribute traveler information to a 511 based phone system, web, and private Information Service Providers (ISPs)	TxDOT	To Be Determined	No	1 year
TxDOT Lubbock District Website	Implement a webpage for the Lubbock District to provide travel information, real-time traffic conditions, closures, etc. The site will include TxDOT and local agency information.	TxDOT	\$50,000 plus cost of periodic updates	No	1 year
TxDOT Travel Information Kiosks	Implement interactive, touch-screen kiosks at travel information centers and rest areas in the Lubbock Region. Kiosks would provide access to real-time road and traffic conditions, weather conditions, and points of interest. Cost estimate includes 6 kiosks at \$25,000 each plus software development/interfaces.	TxDOT	\$150,000	No	2 years
TxDOT Lubbock TMC/Media Communications Connection	Establish a connection between the TxDOT TMC and the media to be able to share information as well as CCTV video feeds (TxDOT would be responsible for video switch, media would be responsible for communications access to switch)	TxDOT/Media	\$40,000	No	1 year
TxDOT Traffic Signal System Upgrades and Expansion Phase 2	Expand TxDOT traffic signal system at signalized intersections throughout the Region. Also includes the implementation of VIVDS.	TxDOT	\$1,500,000	No	3 years
TxDOT Lane Control Signals	Implement an automated system that will help TxDOT restrict access to flooded portions of highway using overhead lane closure signals. Cost estimate includes four signals at \$15,000 each.	TxDOT	\$60,000	No	2 years





**Table 7 – Mid-Term Projects (10-Year) (continued)**

Program Area/Project	Description	Responsible Agency*	Probable Cost**	Funding Identified	Estimated Project Duration
<b><i>Travel and Traffic Management (continued)</i></b>					
TxDOT School Flasher System Enhancements	Upgrade the existing school zone flasher pager control system to control flasher timing plans remotely	TxDOT/School Districts	To Be Determined	No	1 year
TxDOT Ramp Meters	Install ramp meters at major freeway on-ramps to help regulate the flow of merging traffic during peak travel times	TxDOT	\$50,000/site	No	1 year
TxDOT Rural DMS	Implement Permanent DMS on selected rural highways/corridors to provide travel information	TxDOT	\$500,000	No	2 years
City of Lubbock Smart Corridors Phase 1	Instrument key arterial corridors in the City of Lubbock with CCTV, detection, coordinated signal timing and other technologies to better monitor and manage traffic	City of Lubbock	\$1,000,000	No	5 years
City of Lubbock Website	Implement a webpage for the City of Lubbock to provide travel information, real-time traffic conditions, closures, etc.	City of Lubbock	\$50,000 plus cost of periodic updates	No	2 years
City of Lubbock TMC/Texas Tech University Communications Connection	Establish a connection between the City of Lubbock TMC and Texas Tech University for coordination and sharing of incident and traffic information	City of Lubbock/Texas Tech University	To Be Determined	No	1 year
City of Lubbock Traffic Signal System Upgrades and Expansion Phase 2	Expand City of Lubbock traffic signal system at signalized intersections in the City of Lubbock. Also includes the implementation of VIVDS.	City of Lubbock	\$100,000 (annual)	No	5 years
City of Lubbock Speed Monitoring/Warning System Expansion	Procure additional fixed and portable speed monitoring and warning devices that can be installed at or temporarily located where needed to better monitor speeding vehicles	City of Lubbock	\$10,000/site	No	3 years
City of Lubbock School Flasher System Upgrade	Upgrade the existing school zone flasher pager control system within the City of Lubbock to control flasher timing plans remotely	City of Lubbock/School Districts	To Be Determined	No	1 year
Texas Tech University Parking Management System	Implement a parking management system at the Texas Tech University campus to better manage day-to-day as well as special event parking needs. Could include dynamic signage, route guidance, detection, and surveillance technologies.	Texas Tech University	\$500,000	No	4 years



**Table 7 – Mid-Term Projects (10-Year) (continued)**

Program Area/Project	Description	Responsible Agency*	Probable Cost**	Funding Identified	Estimated Project Duration
<b>Emergency Management</b>					
TxDOT Emergency Vehicle Signal Preemption Phase 2	Expand preemption to include additional TxDOT traffic signals. This project includes controller upgrades, sensors, and transmitters. Emergency agencies would be responsible for the purchase of on-board transmitters. (\$8,000 per intersection, \$1,000 each on-board transmitter)	Cities	To Be Determined	No	1 year
TxDOT Lubbock TMC/County Sheriff Communications Connection	Implement a connection between county sheriff's offices and the TxDOT TMC	County Sheriffs/TxDOT	To Be Determined	No	5 years
Texas Tech 911 PSAP/City of Lubbock Police Communications Connection	Establish a connection between the Texas Tech Public Safety Answering Points (PSAPs) and the City of Lubbock Police for coordination and sharing of incident and traffic information	Texas Tech University/ City of Lubbock	To Be Determined	No	1 year
Texas Tech 911 PSAP/City of Lubbock Fire Communications Connection	Establish a connection between the Texas Tech 911 PSAP and the City of Lubbock Fire Department for emergency dispatch coordination and sharing of incident information	Texas Tech University/ City of Lubbock	To Be Determined	No	1 year
<b>Maintenance and Construction Management</b>					
TxDOT Portable DMS Phase 2	Procure additional portable dynamic message signs for use by TxDOT maintenance crews	TxDOT	\$16,000/sign	No	2 years
TxDOT RWIS Phase 2	Install additional road weather information system sensors at key locations in the Region to provide accurate temperature, pavement conditions, precipitation and wind data	TxDOT	\$100,000	No	6 months
TxDOT Flood Detection Phase 2	Implement additional flood monitoring and warning sensors at key locations in the Lubbock Region prone to flooding	TxDOT	\$10,000/station	No	1 year
Regional Maintenance Coordination System	Implement a Region wide maintenance coordination system, where TxDOT would serve as a centralized hub for automated information about local maintenance activities impacting roadways in the Region	TxDOT	\$150,000	No	2 years
City of Lubbock Flood Detection Phase 1	Implement flood monitoring and warning sensors at key locations in the Lubbock metro area prone to flooding	City of Lubbock	\$10,000/station	No	1 year



**Table 7 – Mid-Term Projects (10-Year) (continued)**

Program Area/Project	Description	Responsible Agency*	Probable Cost**	Funding Identified	Estimated Project Duration
<b><i>Maintenance and Construction Management (continued)</i></b>					
TxDOT Smart Work Zones	Procure smart work zone equipment for TxDOT, including speed warning trailers, DMS, CCTV, detection and other systems to enhance safety near work zones	TxDOT	\$400,000	No	1 year
City of Lubbock Smart Work Zones	Procure smart work zone equipment for TxDOT, including speed warning trailers, DMS, CCTV, detection and other systems to enhance work zones	City of Lubbock	\$400,000	No	1 year
<b><i>Public Transportation Management</i></b>					
Citibus Automated Fare Payment System	Implement an automated fare payment card system, including on-board card readers	Citibus	\$5,000/veh	No	2 years
Citibus Traveler Information Kiosks	Implement an interactive touch-screen kiosk at the transfer station and other key locations to provide patrons with information about schedules, fares, routes. Could include 'next-bus' arrival information by incorporating AVL data.	Citibus	\$75,000	No	1 year
Citibus Automated Passenger Counters	Implement passenger counters to automatically count boarding and alighting passengers.	Citibus	\$2,000/veh	No	2 years
CapTrans On-Board Security System	Install alarms and video cameras for surveillance on board CapTrans vehicles	CapTrans	\$10,000/veh	No	6 months
CapTrans Web-based Scheduling and Transit Information	Develop web-based ride scheduling program for CapTrans that would allow patrons to schedule their own rides	CapTrans	\$50,000	No	6 months
SPARTAN On-Board Security System	Install alarms and video cameras for surveillance on board SPARTAN vehicles.	SPARTAN	\$10,000/veh	No	6 months
Regional Demand Response Transit Network	Establish a centralized hub in the Lubbock Region for coordinated demand response transit scheduling and customer service	Citibus/SPARTAN/CapTrans	To Be Determined	No	3 years
CapTrans Automated Fare Payment System	Implement an automated fare payment card system, including on-board card readers	CapTrans	\$5,000/veh	No	2 years



**Table 7 – Mid-Term Projects (10-Year) (continued)**

<b>Program Area/Project</b>	<b>Description</b>	<b>Responsible Agency*</b>	<b>Probable Cost**</b>	<b>Funding Identified</b>	<b>Estimated Project Duration</b>
<b><i>Public Transportation Management (continued)</i></b>					
SPARTAN Automated Fare Payment System	Implement an automated fare payment card system, including on-board card readers	SPARTAN	\$5,000/veh	No	2 years
Regional Transit Smart Card	Implement and coordinate a transit fare payment card among the three transit operating agencies in the Region, including City fixed-route and demand response.	City of Lubbock, CapTrans, SPARTAN	To Be Determined	No	3 years
<b><i>Commercial Vehicle</i></b>					
HAZMAT Tracking and Information Exchange	Implement incident notification system for vehicles carrying hazardous materials	DPS/Municipal Public Safety Dispatch/County Public Safety Dispatch	To Be Determined	No	1 year

\*Agency listed is responsible for implementation, operations, and maintenance unless otherwise noted.

\*\*The design has not been undertaken and thus this is only an opinion of probable cost for planning purposes.

## **Lubbock Region Mid-Term Projects (10-Year)**

### **Travel and Traffic Management**

#### **TxDOT Freeway Management System Expansion**

*Associated Market Packages:*

- Network Surveillance (ATMS01)
- Traffic Information Dissemination (ATMS06)
- Incident Management System (ATMS08)

*Prerequisite Projects:* TxDOT Marsha Sharp Freeway Management System, TxDOT US 289 Freeway Management System, TxDOT Lubbock TMC and ATMS Implementation

*Description:* Implement additional CCTV cameras, DMS, and vehicle detectors as needed on key freeway corridors in the Lubbock Region. This would include additional FMS on Loop 289 and Marsha Sharp, and potentially new FMS infrastructure on other corridors, such as I-27.

The estimated cost of this project is \$4,000,000.

#### **TxDOT 511 Traveler Information System Server**

*Associated Market Packages:*

- Traffic Information Dissemination (ATMS06)
- Incident Management System (ATMS08)
- Work Zone Management (MC08)
- Interactive Traveler Information (ATIS2)

*Prerequisite Projects:* TxDOT Lubbock TMC and ATMS Implementation, TxDOT HCRS Enhancements

*Description:* Install a server dedicated to ATIS in the TxDOT Lubbock TMC. This server would be installed as part of a 511 rollout in Texas and would provide a gateway for public and private entities to access current conditions, closures, restrictions, weather, and other valuable travel information. Relevant data from the ATMS and HCRS would be sent to the ATIS server where it would be consolidated and 'packaged' for distribution via phone (511) and web and also to private partners who desire access to information in the Lubbock Region. These private partners could include local media and information service providers, which would link to the ATIS server to download information or obtain real-time feeds, depending on the link provided by the private partner. Appropriate security measures and firewalls could be designed into the server to allow or restrict access to registered, authorized users. By fusing various types of data from a variety of sources (traffic management, incident management, and others), this data can be converted to usable information for travelers as well as other agencies.

## **TxDOT Lubbock District Website**

### *Associated Market Packages:*

- Traffic Information Dissemination (ATMS06)
- Incident Management System (ATMS08)
- Work Zone Management (MC08)
- Maintenance and Construction Activity Coordination (MC10)
- Interactive Traveler Information (ATIS2)

*Prerequisite Projects:* TxDOT Lubbock TMC and ATMS Implementation, TxDOT Marsha Sharp Freeway Management System, TxDOT US 289 Freeway Management System

*Description:* TxDOT Lubbock plans to implement a website that will serve as a traveler information tool for motorists in the Region. This website will be an enhanced version of what Lubbock-area information is currently available via the statewide TxDOT website, and is envisioned to include current closures and restrictions, maintenance activities, hazards, real-time weather and pavement conditions, weather emergencies impacting travel, and motorist alerts and advisories. Additional content and links could include information about traveler services in towns and cities in the Region, or links to Chambers of Commerce. Information on major corridors in neighboring regions as well as New Mexico also could be included. The website will be managed and updated by the Public Information Officer in the TxDOT Lubbock District Office.

The estimated cost of this project is \$50,000.

## **TxDOT Travel Information Kiosks**

### *Associated Market Packages:*

- Traffic Information Dissemination (ATMS06)
- Incident Management System (ATMS08)
- Work Zone Management (MC08)
- Interactive Traveler Information (ATIS2)

*Prerequisite Projects:* TxDOT Lubbock District Website

*Description:* There are limited travel information resources currently available in the Lubbock Region. Rest areas along key highways offer an opportunity to provide static as well as real-time information about travel conditions and weather in the Region. A pilot program is underway for TextBox kiosks at various rest areas in Texas. These kiosks currently provide access to traveler services and directional information. Wireless internet is used. Plans are to connect these kiosks to real-time conditions, closures, and weather information. RWIS data also could be made available. Additional weather data, such as from the National Weather Service, could be accessible via a link. The TextBox pilot kiosk project has installed two kiosks on I-40 in the Amarillo Region, and these kiosks provide more detailed information available from the TxDOT webpage. This pilot kiosk project could be applicable to rest areas or welcome centers in Lubbock.

The estimated cost of this project is \$150,000 (includes 6 kiosks at approximately \$25,000 each.)

## **TxDOT Lubbock TMC/Media Communications Connection**

### *Associated Market Packages:*

- Traffic Information Dissemination (ATMS06)
- Incident Management System (ATMS08)
- Work Zone Management (MC08)
- Maintenance and Construction Activity Coordination (MC10)
- Broadcast Traveler Information (ATIS1)

*Prerequisite Projects:* TxDOT Lubbock TMC and ATMS Implementation, TxDOT Marsha Sharp Freeway Management System, TxDOT US 289 Freeway Management System

*Description:* This project implements a video switch that will allow local media permissive access to Lubbock TMC CCTV camera feeds (media to provide fiber/leased line for access to switch, TxDOT to implement switch at the Lubbock TMC).

The estimated cost of this implementation (for the TxDOT Lubbock portion) is \$40,000.

## **TxDOT Traffic Signal System Upgrades and Expansion Phase 2**

### *Associated Market Packages:*

- Network Surveillance (ATMS01)
- Surface Street Control (ATMS03)

*Prerequisite Projects:* TxDOT Traffic Signal System Upgrades and Expansion Phase 1

*Description:* This project includes the expansion of the TxDOT signal system at signalized intersections throughout the Region. It also includes the implementation of VIVDS.

The estimated cost is \$1,500,000 over three years.

## **TxDOT Lane Control Signals**

### *Associated Market Packages:*

- Freeway Control (ATMS04)
- Incident Management System (ATMS08)

*Prerequisite Projects:* TxDOT Lubbock TMC and ATMS Implementation

*Description:* Install lane control signals on freeway corridors in the Lubbock Region. These signals will indicate upcoming lane closures to motorists. The signals can be utilized to provide drivers with early warning for congested lanes, incidents, or maintenance activities that are obstructing a lane.

The estimated cost of this project is \$60,000 (includes 4 signals at approximately \$15,000 each.)

## **TxDOT School Flasher System Enhancements**

*Associated Market Packages:*

- Surface Street Control (ATMS03)

*Prerequisite Projects:* None

*Description:* This project would install an enhanced paging system for use in programming school zone flashers in the Lubbock Region. The project includes installing a paging and central system(s) to allow remote control of school flashers for schools in rural areas. Two-way paging systems are available for programming and troubleshooting school zone time clocks (AC or solar powered). A two-way paging system will allow programming of times for the new school year, special events, and even turn flashers in the system on during emergencies from a central location. Two-way paging also provides acknowledgement that the flasher received the message and provides routine diagnostic/operational status messages. The main benefit of a paging system is eliminating costly trips to the field to reprogram units or manually operate flashers.

## **TxDOT Ramp Meters**

*Associated Market Packages:*

- Freeway Control (ATMS04)

*Prerequisite Projects:* TxDOT Lubbock TMC and ATMS Implementation

*Description:* This project would install ramp meter technology at select freeway on-ramps that are prone to congestion and back-ups during peak travel times or special events. Ramp meters resemble traffic signals placed at freeway entrances to spread the impact of ramp traffic entering a freeway. Ramp meters allow one or two vehicles to enter the freeway at a time, which is more acceptable to the freeway drivers than five, ten, or more vehicles trying to merge into already-moving freeway traffic. By regulating the flow of traffic entering the freeways during peak traffic hours, the overall flow of traffic on the freeways is shown to be smoother, and safer, in those urban areas where ramp meters have been implemented. Ramp meters can be set to 'time of day' – ramps turn on and turn off at specified times and the red and green cycles are pre-set. Traffic-responsive ramp meters allow the red and green cycles to be more actuated to real-time travel conditions on the freeway; it will extend the red cycle to put more time in between vehicles trying to merge onto the freeways.

The key operational ingredient to a successful ramp meter system is enforcement. Violations will inevitably occur, but without diligent enforcement, the number will grow large enough to not only undo the system's benefit to traffic, but to actually increase traffic flow problems and diminish safety more than the absence of the system.

The estimated cost of this project is approximately \$50,000 per location.



## **TxDOT Rural DMS**

### *Associated Market Packages:*

- Traffic Information Dissemination (ATMS06)
- Incident Management System (ATMS08)

### *Prerequisite Projects:* None

*Description:* Implement Permanent DMS on selected rural highways/corridors to provide travel information. The estimated cost of this project is approximately \$500,000.

## **City of Lubbock Smart Corridors Phase 1**

### *Associated Market Packages:*

- Network Surveillance (ATMS01)
- Surface Street Control (ATMS03)
- Traffic Information Dissemination (ATMS06)
- Incident Management System (ATMS08)

### *Prerequisite Projects:* City of Lubbock Traffic Signal Communications Upgrade

*Description:* This project would instrument key corridors in the City of Lubbock with ITS technologies for enhanced traffic management and en-route travel information. Smart Corridors include coordinated traffic signal timing, CCTV cameras to provide real-time images of current traffic conditions and assist with incident management on the corridors, and arterial DMS to provide motorists with information about travel conditions, closures, or restrictions ahead. Operators at the City of Lubbock TMC could monitor traffic conditions with the CCTV cameras, and provide information to emergency/law enforcement about incidents or traffic conditions near the incident. DMS also could be activated and controlled from the City's TMC. The fiber communications upgrade being installed for the City's Traffic Signal System would provide the necessary communications infrastructure for many of the devices that would be installed as part of the Smart Corridor program.

The estimated cost of this project is approximately \$1,000,000.

## **City of Lubbock Website**

### *Associated Market Packages:*

- Traffic Information Dissemination (ATMS06)
- Incident Management System (ATMS08)
- Interactive Traveler Information (ATIS2)

### *Prerequisite Projects:* TxDOT Lubbock TMC and ATMS Implementation

*Description:* The City of Lubbock plans to implement a website that will serve as a traveler information tool for motorists in the City. This website will be an enhanced version of what Lubbock-area information is currently available via the City's website, and is envisioned to include current closures

and restrictions, maintenance activities, hazards, real-time CCTV camera views, weather emergencies impacting travel, special event traffic information or restrictions, and motorist alerts and advisories.

The estimated cost of this project is \$50,000 plus periodic updates.

### **City of Lubbock TMC/Texas Tech University Communications Connection**

*Associated Market Packages:*

- Traffic Information Dissemination (ATMS06)
- Incident Management System (ATMS08)

*Prerequisite Projects:* None

*Description:* Establish a connection between the City of Lubbock TMC and Texas Tech University for coordination and sharing of incident and traffic information.

### **City of Lubbock Traffic Signal System Upgrades and Expansion Phase 2**

*Associated Market Packages:*

- Network Surveillance (ATMS01)
- Surface Street Control (ATMS03)

*Prerequisite Projects:* City of Lubbock Traffic Signal System Upgrades and Expansion Phase 1

*Description:* This project includes the expansion of the City of Lubbock signal system at signalized intersections throughout the City. It also includes the implementation of VIVDS.

The estimated cost of this project is \$100,000 per year.

### **City of Lubbock Speed Monitoring/Warning System Expansion**

*Associated Market Packages:*

- Network Surveillance (ATMS01)
- Speed Monitoring (ATMS19)

*Prerequisite Projects:* City of Lubbock Speed Monitoring/Warning System Phase 1

*Description:* Implement additional fixed speed monitoring/warning devices at select locations in the City of Lubbock, and procure additional portable speed monitoring/warning devices for temporary use, such as for work zones or at select locations prone to excessive speed violations.

The estimated cost is approximately \$10,000 per location.

## **City of Lubbock School Flasher System Upgrade**

*Associated Market Packages:*

- Surface Street Control (ATMS03)

*Prerequisite Projects:* None

*Description:* This project would install an enhanced paging system for use in programming school zone flashers in the City of Lubbock. The project includes installing a paging and central system(s) to allow remote control of school flashers. Two-way paging systems are available for programming and troubleshooting school zone time clocks (AC or solar powered). A two-way paging system will allow programming of times for the new school year, special events, and even turn flashers in the system on during emergencies from a central location. Two-way paging also provides acknowledgement that the flasher received the message and provides routine diagnostic/operational status messages. The main benefit of a paging system is eliminating costly trips to the field to reprogram units or manually operate flashers.

## **Texas Tech University Parking Management System**

*Associated Market Packages:*

- Parking Facility Management (ATMS16)

*Prerequisite Projects:* None

*Description:* Implement a parking management system at the Texas Tech University campus to better manage day-to-day as well as special event parking needs. Could include dynamic signage, route guidance, detection, and surveillance technologies.

The estimated cost of this project is \$500,000.

## **Emergency Management**

### **TxDOT Emergency Vehicle Signal Preemption Phase 2**

*Associated Market Packages:*

- Surface Street Control (ATMS03)
- Incident Management System (ATMS08)
- Emergency Routing (EM02)

*Prerequisite Projects:* TxDOT Emergency Vehicle Signal Preemption Phase 1

*Description:* Equip additional TxDOT traffic signals in municipalities in the Lubbock Region with traffic signal preemption equipment. Typical installations include mounting hardware at the intersection and on each vehicle authorized to preempt the signal. The intersection equipment includes a detector(s) positioned at the intersection approach(es) connected to the traffic signal controller. As a vehicle equipped with a preemption emitter approaches an intersection, the detector activates a change in signal

timing to allow fast and safe passage. Preemption systems have proven to improve safety of emergency personnel and vehicles en-route to an incident. The local municipalities will be responsible for the cost of signal and vehicle equipment.

The estimated cost of this project is \$8,000 per intersection and \$1,000 per vehicle.

### **TxDOT Lubbock TMC/County Sheriff Communications Connection**

*Associated Market Packages:*

- Traffic Information Dissemination (ATMS06)
- Incident Management System (ATMS08)
- Emergency Response (EM01)
- Emergency Routing (EM02)

*Prerequisite Projects:* TxDOT Lubbock TMC and ATMS Implementation

*Description:* Install a telecommunications connection between the TxDOT Lubbock TMC and the County Sheriff Communications to facilitate emergency management coordination. Cost of this connection will be determined based on the communications method chosen.

### **Texas Tech 911 PSAP/City of Lubbock Police Communications Connection**

*Associated Market Packages:*

- Emergency Response (EM01)

*Prerequisite Projects:* None

*Description:* Install a telecommunications connection between Texas Tech University and the City of Lubbock Police Department Communications to facilitate emergency management coordination. Cost of this connection will be determined based on the communications method chosen.

### **Texas Tech 911 PSAP/City of Lubbock Fire Communications Connection**

*Associated Market Packages:*

- Emergency Response (EM01)

*Prerequisite Projects:* None

*Description:* Install a telecommunications connection between Texas Tech University and the City of Lubbock Fire Department Communications to facilitate emergency management coordination. Cost of this connection will be determined based on the communications method chosen.

## **Maintenance and Construction Management**

### **TxDOT Portable DMS Phase 2**

#### *Associated Market Packages:*

- Traffic Information Dissemination (ATMS06)
- Incident Management System (ATMS08)
- Work Zone Management (MC08)

#### *Prerequisite Projects:* TxDOT Portable DMS Phase 1

*Description:* This project would procure additional portable DMS to communicate existing and future closures, restrictions, detours, alternate routes, and other important information to motorists while they are en-route. Portable DMS can be stand-alone signs or mounted to the back of a maintenance vehicle. The estimated cost is \$16,000 per sign.

### **TxDOT RWIS Phase 2**

#### *Associated Market Packages:*

- Network Surveillance (ATMS01)
- Incident Management System (ATMS08)
- Road Weather Data Collection (MC03)

#### *Prerequisite Projects:* TxDOT RWIS Phase 1

*Description:* RWIS provides real-time weather and pavement condition information to improve response time, enhance winter maintenance functions and activities, and minimize the traveling public's exposure to hazardous weather related roadway conditions. Data including temperature (atmospheric and pavement), precipitation, wind, humidity, visibility (white out/heavy fog) and even pavement surface conditions (i.e., ice, snow, chemical) are collected by sensors placed at the roadside (typically on a 30 foot tower) and embedded in the roadway. Remote processing units placed along the roadway communicate with various types of road and weather sensors. Data from the RPU are transmitted to the central ATMS server, via dial-up modem or other low bandwidth telecommunication methods, which will be located at the TxDOT Lubbock TMC (Note: RWIS data can be gathered via a vendor-supplied program without having to implement ATMS, but a future module of ATMS will include RWIS capability). Archived RWIS information also provides valuable historic information for planning purposes.

In most installations, RWIS devices are installed at problem areas where rapidly changing weather has a direct, negative impact on travel conditions, such as bridges. Pavement sensors are installed in the bridge deck and approach. The variation in pavement temperatures can allow maintenance engineers to better determine appropriate pavement treatments (e.g., salt, bridge deck pre-wetting, other chemicals, etc.) and more efficiently schedule personnel/equipment based on current and forecast weather conditions. More sophisticated RWIS stations are equipped with integrated cameras to transmit snapshots or streaming video to a central control facility. In the event that streaming video is a functional requirement, a telecommunications solution supporting higher bandwidth than standard telephone dial-up is required. RWIS data also can be included as part of web or phone-based travel

information systems, as well as broadcast to motorists via HAR or commercial radio broadcasts (through an Information Service Provider).

The estimated cost of this project is \$100,000.

## **TxDOT Flood Detection Phase 2**

### *Associated Market Packages:*

- Network Surveillance (ATMS01)
- Incident Management System (ATMS08)
- Road Weather Data Collection (MC03)

### *Prerequisite Projects:* TxDOT Flood Detection Phase 1

*Description:* Continue to implement flood detection systems on flood-prone segments of Interstates and state routes in the Lubbock Region. This will enable faster response times by maintenance crews to close flooded or near flooded roadway segments as necessary. The typical flood detection station is composed of a stream gauge, a rain gauge, a temperature sensor, and remote communications support. Other upgrades that may support operational decision making include sensors to measure relative humidity, soil moisture content, solar radiation, and air and water quality. The flood detection systems will be monitored from the TxDOT Lubbock District Office. Communications between the flood detection stations and the District Office can be achieved through a variety of wireless and wireline telemetry methods. Information also could be shared with River Authorities in the Region. There is a future module of the ATMS software planned to support environmental sensors, and development of this module could be extended to include the needs of flood detection stations.

The estimated cost of this project is \$10,000 per location.

## **Regional Maintenance Coordination System**

### *Associated Market Packages:*

- Weather Information Processing and Distribution (MC04)
- Work Zone Management (MC08)
- Maintenance and Construction Activity Coordination (MC10)

### *Prerequisite Projects:* None

*Description:* Implement a decision support system which would allow TxDOT Lubbock District maintenance personnel access to access historic maintenance information, as well as provide tools to predict impacts on road conditions, plan treatment scenarios, and schedule preventive and unplanned maintenance activities. These activities could include ITS-related needs, as well as other maintenance requirements, such as landscape/herbicide, roadway resurfacing, and others. This system is meant to provide the appropriate information to the appropriate personnel so that they can make proactive maintenance activity and scheduling decisions. This system would need to have connections between the Lubbock District Office and Area maintenance offices within the District for collection and dissemination of current and historic maintenance related information, and also allow Area offices to view real-time data coming in from RWIS and flood detection sensors. Maintenance activities from

cities or counties also could be included as part of the database to facilitate further regional coordination of maintenance activities and schedules among TxDOT and local agencies.

The estimated cost of this project is \$150,000.

### **City of Lubbock Flood Detection Phase 1**

#### *Associated Market Packages:*

- Network Surveillance (ATMS01)
- Incident Management System (ATMS08)
- Road Weather Data Collection (MC03)

#### *Prerequisite Projects:* None

*Description:* Implement flood detection systems on flood-prone segments of roadways in the City of Lubbock. This will enable faster response times by maintenance or emergency crews to close flooded or near flooded roadway segments as necessary. The typical flood detection station is composed of a stream gauge, a rain gauge, a temperature sensor, and remote communications support. Other upgrades that may support operational decision making include sensors to measure relative humidity, soil moisture content, solar radiation, and air and water quality. The flood detection systems will be monitored by the City of Lubbock. Communications between the flood detection stations and city maintenance personnel can be achieved through a variety of wireless and wireline telemetry methods.

The estimated cost of this project is \$10,000 per location.

### **TxDOT Smart Work Zones**

#### *Associated Market Packages:*

- Network Surveillance (ATMS01)
- Traffic Information Dissemination (ATMS06)
- Incident Management System (ATMS08)
- Work Zone Management (MC08)

#### *Prerequisite Projects:* None

*Description:* Procure smart work zones for use by TxDOT maintenance crews. A smart work zone is comprised of portable speed trailers, portable CCTV and portable DMS to monitor work zones and provide related information to the traveling public. In addition to being useful for work zone management, the smart work zone components, such as DMS or CCTV, could also have valuable application to managing a large, unplanned incidents and emergencies such as flooded roadways.

The estimated cost of this project is \$400,000.

## **City of Lubbock Smart Work Zones**

### *Associated Market Packages:*

- Network Surveillance (ATMS01)
- Traffic Information Dissemination (ATMS06)
- Incident Management System (ATMS08)
- Work Zone Management (MC08)
- Work Zone Safety Monitoring (MC09)

### *Prerequisite Projects:* None

*Description:* Procure smart work zones for use by the City of Lubbock maintenance crews. A smart work zone is comprised of portable speed trailers, portable CCTV and portable DMS to monitor work zones and provide related information to the traveling public. In addition to being useful for work zone management, the smart work zone components, such as DMS or CCTV, could also have valuable application to managing a large, unplanned incidents and emergencies, or could be used at select locations for special event traffic management.

The estimated cost of this project is \$400,000.

## **Public Transportation Management**

### **Citibus Automated Fare Payment System**

#### *Associated Market Packages:*

- Transit Fixed-Route Operations (APTS2)
- Demand Response Transit Operations (APTS3)
- Transit Passenger and Fare Management (APTS4)

#### *Prerequisite Projects:* None

*Description:* This project implements a system enabling the use of smart cards, an electronic swipe card technology, on transit buses. There are three primary benefits of these electronic fare collection systems. The first is enhanced revenue collection ability. The second is increased security by not having large amounts of cash or tokens on the vehicle. The third is the increased convenience and security for the transit patron. Fare boxes will be upgraded to accept smart cards (i.e., cards with passive radio frequency identification [RFID] technology or a magnetic information strip, such as a credit card) with rider and account information. Electronic fare payment technology is rapidly advancing, and there will be several technological considerations that will need to be examined, such as standards for smart cards and interoperability issues.

The estimated cost of this project is \$5,000 per vehicle.



### **Citibus Traveler Information Kiosks**

*Associated Market Packages:*

- Transit Traveler Information (APTS8)
- Interactive Traveler Information (ATIS2)

*Prerequisite Projects:* None

*Description:* Install transit traveler information kiosks at major transfer centers or hubs (i.e., civic centers and buildings, event venues, Texas Tech Campus, etc.). These kiosks would provide static information about available transit services and routes, fares and schedules, and could include real-time information from transit AVL data. Additional features of the kiosks could include automated fare payment card purchase.

The estimated cost of this project is \$75,000.

### **Citibus Automated Passenger Counters**

*Associated Market Packages:*

- Transit Passenger and Fare Management (APTS4)

*Prerequisite Projects:* None

*Description:* Install Automated Passenger Counter (APC) systems on transit vehicles to accurately count ridership. APC systems collect ridership information and can determine total boardings and alightings at each stop through the use of AVL to determine where those boardings and alightings take place.

This project is estimated to cost \$2,000 per vehicle.

### **CapTrans On-Board Security System**

*Associated Market Packages:*

- Transit Security (APTS5)

*Prerequisite Projects:* None

*Description:* This project will install security cameras on CapTrans transit vehicles. It is a possibility that the security cameras would provide video feed from the buses to the transit operations center for monitoring.

The estimated cost of this project is \$10,000 per vehicle.

## CapTrans Web-based Scheduling and Transit Information

*Associated Market Packages:*

- Demand Response Transit Operations (APTS3)
- Transit Traveler Information (APTS8)
- Interactive Traveler Information (ATIS2)

*Prerequisite Projects:* CapTrans Dispatch Center Enhancements

*Description:* Provide enhanced transit related traveler information to CapTrans paratransit network customers. The on-demand nature of the transit services requires that up-to-the minute information about pick-ups, drop-offs, vehicle location, and any disruptions in service be available not only to the dispatch staff, but also to transit passengers pre-trip. General (static) and near-real-time information about dial-a-ride services and status, as well as interactive trip scheduling and reservations could be made available to patrons via Internet-based travel information systems. Web-based maps could show locations of the vehicles in near-real-time. This real-time information also would be available at the dispatch/call center for passengers who do not have access to the Internet. Coordination with TxDOT and the local cities would allow for current traffic conditions, incidents, closures and other impacts to the roadway network to be displayed with the transit route and status information.

The estimated cost of this project is \$50,000.

## SPARTAN On-Board Security System

*Associated Market Packages:*

- Transit Security (APTS5)

*Prerequisite Projects:* None

*Description:* This project will install security cameras on SPARTAN transit vehicles. It is a possibility that the security cameras would provide video feed from the buses to the transit operations center for monitoring.

The estimated cost of this project is \$10,000 per vehicle.

## Regional Demand Response Transit Network

*Associated Market Packages:*

- Demand Response Transit Operations (APTS3)
- Multi-modal Coordination (APTS7)

*Prerequisite Projects:* CapTrans Dispatch Center Enhancements, SPARTAN Dispatch Center Enhancements

*Description:* This project would be a coordinated, multi-agency network among demand-response transit providers in the Lubbock Region. By enabling SPARTAN, CapTrans and Citibus to share current information about their schedules, available services, fleet status/availability, major disruptions or

incidents involving one of their vehicles, passenger scheduling information and other operational data, each transit operator would have up-to-date information about status and availability of the other operators' fleet and operations. Because of the personalized nature of demand-response transit services, customer service representatives would be able to assist its patrons with information about other transit operators that provide service in their area.

### **CapTrans Automated Fare Payment System**

#### *Associated Market Packages:*

- Demand Response Transit Operations (APTS3)
- Transit Passenger and Fare Management (APTS4)

#### *Prerequisite Projects:* None

*Description:* This project implements a system enabling the use of smart cards, an electronic swipe card technology on transit buses. There are three primary benefits of these electronic fare collection systems. The first is enhanced revenue collection ability. The second is increased security by not having large amounts of cash or tokens on the vehicle. The third is the increased convenience and security for the transit patron. Fare boxes will be upgraded to accept smart cards (i.e., cards with passive RFID technology or a magnetic information strip, such as a credit card) with rider and account information. Electronic fare payment technology is rapidly advancing, and there will be several technological considerations that will need to be examined, such as standards for smart cards and interoperability issues.

The estimated cost of this project is \$5,000 per vehicle.

### **SPARTAN Automated Fare Payment System**

#### *Associated Market Packages:*

- Demand Response Transit Operations (APTS3)
- Transit Passenger and Fare Management (APTS4)

#### *Prerequisite Projects:* None

*Description:* This project implements a system enabling the use of smart cards, an electronic swipe card technology on transit buses. There are three primary benefits of these electronic fare collection systems. The first is enhanced revenue collection ability. The second is increased security by not having large amounts of cash or tokens on the vehicle. The third is the increased convenience and security for the transit patron. Fare boxes will be upgraded to accept smart cards (i.e., cards with passive RFID technology or a magnetic information strip, such as a credit card) with rider and account information. Electronic fare payment technology is rapidly advancing, and there will be several technological considerations that will need to be examined, such as standards for smart cards and interoperability issues.

The estimated cost of this project is \$5,000 per vehicle.

## **Regional Transit Smart Card**

*Associated Market Packages:*

- Transit Fixed-Route Operations (APTS2)
- Demand Response Transit Operations (APTS3)
- Multi-modal Coordination (APTS7)

*Prerequisite Projects:* SPARTAN, CapTrans, and Citibus Automated Fare Payment System

*Description:* This project implements and coordinates a transit fare payment card among the three transit operating agencies in the region, including City fixed-route and demand response providers in the rural areas. There are three primary benefits of these electronic fare collection systems. The first is enhanced revenue collection ability. The second is increased security by not having large amounts of cash or tokens on the vehicle. The third is the increased convenience and security for the transit patron. A private partner will be needed to reconcile the electronic payments.

## **Commercial Vehicle**

### **HAZMAT Tracking and Information Exchange**

*Associated Market Packages:*

- HAZMAT Management (CVO10)

*Prerequisite Projects:* None

*Description:* Implement a coordinated program among rail and CVO private sector transport companies and public safety for HAZMAT tracking. Knowing what hazardous materials are in the Region will make content identification more streamlined, thus minimizing exposure to HAZMAT spills for both the general public and emergency responders. Appropriate mitigation plans can be put in to effect in shorter periods of time thereby minimizing risks.



**Table 8 – Long-Term Projects (20-Year)**

Program Area/Project	Description	Responsible Agency*	Probable Cost**	Funding Identified	Estimated Project Duration
<b><i>Travel and Traffic Management</i></b>					
Interstate Coordination	Establish a link and an interface between TxDOT Lubbock and New Mexico State Department of Transportation (NMDOT) to share pertinent information about closures, restrictions, incident and weather hazards on key corridors that impact both states	TxDOT/NMDOT	To Be Determined	No	1 year
TxDOT Lubbock TMC/City of Plainview TOC Communications Connection	Implement communications connection between the TxDOT Lubbock TMC and the City of Plainview's Traffic Operations Center (TOC) to share information about current conditions, closures, and CCTV images	TxDOT/City of Plainview	To Be Determined	No	3 months
TxDOT Lubbock TMC Expansion	Continue to expand the Lubbock TMC in phases, including additional ATMS capabilities as they become available, increased operational hours and additional interfaces	TxDOT	\$200,000	No	4 years
TxDOT Traffic Signal System Upgrades and Expansion Phase 3	Continue to expand and upgrade TxDOT's traffic signals throughout the Region, including VIVDS	TxDOT	\$3,000,000	No	10 years
City of Lubbock Smart Corridors Phase 2	Instrument additional major corridors in the City of Lubbock with CCTV, detection, coordinated traffic signal timing and other technologies to better monitor and manage traffic on these corridors	City of Lubbock	\$1,000,000	No	5 years
City of Lubbock Traffic Signal System Upgrades and Expansion Phase 3	Continue to expand and upgrade City of Lubbock traffic signal system, including VIVDS	City of Lubbock	\$100,000 (annual)	No	10 years
City of Plainview TOC	Implement a traffic operations center at the City of Plainview to monitor and control traffic signals and other field equipment	City of Plainview	\$100,000	No	2 years
City of Plainview Traffic Signal System Upgrades and Expansion	Implement and upgrade traffic signals at key intersections in Plainview	City of Plainview	To Be Determined	No	5 years



**Table 8 – Long-Term Projects (20-Year) (continued)**

Program Area/Project	Description	Responsible Agency*	Probable Cost**	Funding Identified	Estimated Project Duration
<b><i>Travel and Traffic Management (continued)</i></b>					
City of Plainview CCTV Implementation	Implement CCTV cameras along key routes/near key intersections	City of Plainview	\$200,000	No	2 years
<b><i>Emergency Management</i></b>					
City of Plainview Emergency Vehicle Signal Preemption	Implement preemption at select traffic signals in the City of Plainview. This project includes controller upgrades, sensors, and transmitters. Emergency agencies would be responsible for the purchase of on-board transmitters.	City of Plainview	\$8,000/ intersection \$1,000/ transmitter	No	1 year
City of Lubbock Emergency Vehicle Signal Preemption Upgrade and Expansion	Expand emergency vehicle traffic signal preemption in the City of Lubbock to include additional intersections, and upgrade equipment that needs to be replaced. This project includes controller upgrades, sensors, and transmitters. Emergency agencies would be responsible for the purchase of on-board transmitters.	City of Lubbock	\$8,000/ intersection \$1,000/ transmitter	No	5 years
<b><i>Maintenance and Construction Management</i></b>					
TxDOT Maintenance Vehicle AVL	Install automated vehicle location system on TxDOT maintenance vehicles	TxDOT	\$10,000/vehicle (Includes software)	No	1 year
TxDOT Winter Maintenance Decision Support System	Implement a winter maintenance decision support system, including enhanced resource and scheduling coordination among key city services, counties and TxDOT to better respond to winter weather emergencies and road conditions	TxDOT	\$200,000	No	2 years
City of Lubbock Maintenance Vehicle AVL	Install automated vehicle location system on City of Lubbock maintenance vehicles	City Lubbock	\$10,000/vehicle (Includes software)	No	1 year
City of Lubbock Flood Detection Phase 2	Implement flood monitoring and warning sensors at additional locations in Lubbock prone to flooding	City of Lubbock	\$10,000/per	No	1 year



**Table 8 – Long-Term Projects (20-Year) (continued)**

Program Area/Project	Description	Responsible Agency*	Probable Cost**	Funding Identified	Estimated Project Duration
<b><i>Maintenance and Construction Management (continued)</i></b>					
City of Lubbock Winter Maintenance Decision Support System	Implement a winter maintenance decision support system, including enhanced resource and scheduling coordination among key city services, Lubbock County and TxDOT to better respond to winter weather emergencies and road conditions	City of Lubbock	\$200,000	No	2 years
County and Municipal Maintenance Vehicle AVL	Install automated vehicle location system on city and county maintenance vehicles	County/Municipal	\$10,000/vehicle (Includes software)	No	1 year
County Winter Maintenance Decision Support System	Implement a winter maintenance decision support system, including enhanced resource and scheduling coordination among counties and TxDOT to better respond to winter weather emergencies and road conditions	Counties	\$200,000	No	2 years
<b><i>Public Transportation Management</i></b>					
Independent School District Bus AVL	Install automated vehicle tracking on Independent School District vehicles	Independent School Districts	\$10,000/vehicle (Includes software)	No	6 months
Independent School District Bus Dispatch Center Enhancements	Expand and upgrade the capabilities of the Independent School District Dispatch Center	Independent School Districts	\$200,000	No	1 year

\*Agency listed is responsible for implementation, operations, and maintenance unless otherwise noted.

\*\*The design has not been undertaken and thus this is only an opinion of probable cost for planning purposes.

## **Lubbock Region Long-Term Projects (20-Year)**

### **Travel and Traffic Management**

#### **Interstate Coordination**

*Associated Market Packages:*

- Traffic Information Dissemination (ATMS06)
- Regional Traffic Control (ATMS07)

*Prerequisite Projects:* TxDOT Lubbock TMC and ATMS Implementation

*Description:* Implement communication links and information sharing between TxDOT and New Mexico. Major incidents, weather hazards, or closures and restrictions along common corridors could have significant impacts on interstate travel and commerce. Sharing planned and unplanned incident information is valuable, due to the limited alternate routes and limited resources/facilities in smaller communities positioned along the corridors. The information sharing will require software development to collect data from different systems and sources, convert or translate information (if required) to a common data dictionary, and disseminate packaged information back to partner states. As an alternative, the interstate nature of the project may lend itself to a secure web-based information sharing strategy, rather than direct center-to-center communications among systems in Texas and New Mexico. Initial tasks of the project include meeting with representatives of various partner state agencies and authorities to determine willingness to share data, technical and institutional barriers, data sharing content, transmission frequency, and next steps. Agreements will be required between project partners to clarify use of data, privacy issues, liability issues, and data quality maintenance.

#### **TxDOT Lubbock TMC/City of Plainview TOC Communication Connection**

*Associated Market Packages:*

- Traffic Information Dissemination (ATMS06)
- Regional Traffic Control (ATMS07)

*Prerequisite Projects:* TxDOT Lubbock TMC and ATMS Implementation, City of Plainview TOC

*Description:* Install a connection between the TxDOT Lubbock TMC and the City of Plainview Traffic Operations Center (TOC) to allow video sharing, traffic data sharing and other joint functions. The type of connection (fiber, wireless, leased line) will need to be determined prior to implementation of this project based on desired band width and cost of technologies available.



### **TxDOT Lubbock TMC Expansion**

*Associated Market Packages:*

- Network Surveillance (ATMS01)
- Surface Street Control (ATMS03)
- Traffic Information Dissemination (ATMS06)
- Regional Traffic Control (ATMS07)
- Incident Management System (ATMS08)

*Prerequisite Projects:* TxDOT Lubbock TMC and ATMS Implementation

*Description:* This project includes expanding the capabilities of the TxDOT Lubbock TMC. With the implementation of new devices, particularly freeway management systems (CCTV, DMS, detection and communications), RWIS, and enhancements to the TxDOT traffic signals throughout the Region, the TMC will new as well as updated hardware/software to effectively manage the ITS devices. Coordination among the TxDOT Lubbock TMC, City of Lubbock TMC, emergency management agencies in the Region, and neighboring TxDOT TMCs will likely warrant some upgrades to the Lubbock TMC's central system software. As new technologies and systems are phased in to the overall traffic management, traveler information and incident management processes, TxDOT Lubbock needs to plan for updates to its central control systems and interfaces.

The estimated cost associated with this expansion is \$200,000.

### **TxDOT Traffic Signal System Upgrades and Expansion Phase 3**

*Associated Market Packages:*

- Network Surveillance (ATMS01)
- Surface Street Control (ATMS03)

*Prerequisite Projects:* TxDOT Traffic Signal System Upgrades and Expansion Phases 1 and 2

*Description:* This project includes the expansion of the TxDOT signal system at signalized intersections throughout the Region. It also includes the implementation of VIVDS.

The estimated cost is \$3,000,000 over ten years.

## **City of Lubbock Smart Corridors Phase 2**

### *Associated Market Packages:*

- Network Surveillance (ATMS01)
- Surface Street Control (ATMS03)
- Traffic Information Dissemination (ATMS06)
- Incident Management System (ATMS08)

*Prerequisite Projects:* City of Lubbock Smart Corridors Phase 1, City of Lubbock Traffic Signal Communications Upgrade

*Description:* This project would instrument additional corridors in the City of Lubbock with ITS technologies for enhanced traffic management and en-route travel information. Smart Corridors include coordinated traffic signal timing, CCTV cameras to provide real-time images of current traffic conditions and assist with incident management on the corridors, and arterial DMS to provide motorists with information about travel conditions, closures, or restrictions ahead. Operators at the City of Lubbock TMC could monitor traffic conditions with the CCTV cameras, and provide information to emergency/law enforcement about incidents or traffic conditions near the incident. DMS also could be activated and controlled from the City's TMC. The fiber communications upgrade being installed for the City's Traffic Signal System would provide the necessary communications infrastructure for many of the devices that would be installed as part of the second phase of the City's Smart Corridor program.

The estimated cost of this project is \$1,000,000.

## **City of Lubbock Traffic Signal System Upgrades and Expansion Phase 3**

### *Associated Market Packages:*

- Network Surveillance (ATMS01)
- Surface Street Control (ATMS03)

*Prerequisite Projects:* City of Lubbock Traffic Signal System Upgrades and Expansion Phases 1 and 2

*Description:* This project includes the expansion of the City of Lubbock signal system at signalized intersections throughout the City. It also includes the implementation of VIVDS.

The estimated cost is \$100,000 annually.

## City of Plainview TOC

### *Associated Market Packages:*

- Network Surveillance (ATMS01)
- Surface Street Control (ATMS03)
- Traffic Information Dissemination (ATMS06)
- Incident Management Regional Traffic Control (ATMS07)
- Incident Management System (ATMS08)

### *Prerequisite Projects:* None

*Description:* This project would implement a TOC, including equipment needed to monitor and manage traffic flow in the City of Plainview. Control of traffic signal systems in the City of Plainview as well as CCTV cameras within the City will occur from the TOC.

The estimated cost for this TOC is approximately \$100,000.

## City of Plainview Traffic Signal System Upgrades and Expansion

### *Associated Market Packages:*

- Network Surveillance (ATMS01)
- Surface Street Control (ATMS03)

### *Prerequisite Projects:* None

*Description:* This project includes the implantation and expansion of the City of Plainview signal system at signalized intersections throughout the City. It also includes the implementation of VIVDS for vehicle detection.

## City of Plainview CCTV Implementation

### *Associated Market Packages:*

- Network Surveillance (ATMS01)
- Surface Street Control (ATMS03)
- Incident Management System (ATMS08)

### *Prerequisite Projects:* City of Plainview TOC

*Description:* This project includes the deployment of CCTV cameras along key segments of roadway in the City of Plainview. The CCTV cameras can be used for incident detection and verification, to monitor congestion and to aid in the dispatch of emergency vehicles. The information gathered by the CCTV cameras (video feed) can be shared with the area emergency management agencies, as well as the TxDOT Lubbock TMC.

The estimated cost of this project is \$200,000.

## **Emergency Management**

### **City of Plainview Emergency Vehicle Signal Preemption**

*Associated Market Packages:*

- Surface Street Control (ATMS03)
- Incident Management System (ATMS08)
- Emergency Routing (EM02)

*Prerequisite Projects:* City of Plainview Traffic Signal System Upgrades and Expansion

*Description:* Equip City of Plainview traffic signals with traffic signal preemption equipment. Typical installations include mounting hardware at the intersection and on each vehicle authorized to preempt the signal. The intersection equipment includes a detector(s) positioned at the intersection approach(es) connected to the traffic signal controller. As a vehicle equipped with a preemption emitter approaches an intersection, the detector activates a change in signal timing to allow fast and safe passage. Preemption systems have proven to improve safety of emergency personnel and vehicles en-route to an incident.

The estimated cost of this project is \$8,000 per intersection and \$1,000 per vehicle.

### **City of Lubbock Emergency Vehicle Signal Preemption Upgrade and Expansion**

*Associated Market Packages:*

- Surface Street Control (ATMS03)
- Incident Management System (ATMS08)
- Emergency Routing (EM02)

*Prerequisite Projects:* City of Lubbock Emergency Vehicle Signal Preemption Expansion

*Description:* Install additional signal preemption capability at signalized intersections in the Region and replace outdated preemption equipment. Typical installations include mounting hardware at the intersection and on each vehicle authorized to preempt the signal. The intersection equipment includes a detector(s) positioned at the intersection approach(es) connected to the traffic signal controller. As a vehicle equipped with a preemption emitter approaches an intersection, the detector activates a change in signal timing to allow fast and safe passage. Preemption systems have proven to improve safety of emergency personnel and vehicles en-route to an incident.

The estimated cost of this project is \$8,000 per intersection and \$1,000 per vehicle.

## **Maintenance and Construction Management**

### **TxDOT Maintenance Vehicle AVL**

*Associated Market Packages:*

- Maintenance and Construction Vehicle Tracking (MC01)

*Prerequisite Projects:* None

*Description:* The maintenance and construction AVL project includes equipping TxDOT maintenance vehicles with global position satellite (GPS) based vehicle locators. It is envisioned that the location of the vehicle would be overlaid on a base map showing real-time positions of each equipped vehicle. The main purpose of the system is to assist dispatchers and supervisors to better manage the fleet of vehicles. For example, if a report of a spill occurred on a major roadway, a supervisor could quickly determine what vehicle is closest and best equipped to clean up the spill.

The estimated cost is \$10,000 per vehicle.

### **TxDOT Winter Maintenance Decision Support System**

*Associated Market Packages:*

- Weather Information Processing and Distribution (MC04)
- Winter Maintenance (MC06)

*Prerequisite Projects:* TxDOT RWIS Phases 1 and 2, TxDOT Lubbock TMC and ATMS Implementation

*Description:* This project implements a winter maintenance decision support system, including enhanced resource and scheduling coordination among counties, municipalities and TxDOT to better respond to winter weather emergencies and road conditions. This system is meant to provide the appropriate information to the appropriate personnel so that they can make proactive winter maintenance decisions. The Federal Highway Administration has developed a prototype of such a system, but it must be implemented on a state and/or regional level.

The estimated cost of this project is \$200,000.

### **City of Lubbock Maintenance Vehicle AVL**

*Associated Market Packages:*

- Maintenance and Construction Vehicle Tracking (MC01)

*Prerequisite Projects:* None

*Description:* Similar to the transit AVL project, the maintenance vehicle AVL project includes equipping City of Lubbock maintenance vehicles with GPS based vehicle locators. It is envisioned that the location of the vehicle would be overlaid on a base map showing real-time positions of each equipped vehicle. The main purpose of the system is to assist dispatchers and supervisors to better

manage the fleet of vehicles. For example, if a report of a spill occurred on a major roadway, a supervisor could quickly determine what vehicle is closest and best equipped to clean up the spill.

The estimated cost of this project is \$10,000 per vehicle.

## **City of Lubbock Flood Detection Phase 2**

### *Associated Market Packages:*

- Network Surveillance (ATMS01)
- Incident Management System (ATMS08)
- Road Weather Data Collection (MC03)

### *Prerequisite Projects:* City of Lubbock Flood Detection Phase 1

*Description:* Implement additional flood detection systems on flood-prone segments of roadways in the City of Lubbock. This will enable faster response times by maintenance crews to close flooded or near flooded roadway segments as necessary. The typical flood detection station is composed of a stream gauge, a rain gauge, a temperature sensor, a wind speed sensor, a wind direction sensor, and remote communications support. Other upgrades that may support operational decision making include sensors to measure relative humidity, soil moisture content, solar radiation, and air and water quality. The flood detection systems will be monitored by the City of Lubbock. Communications between the flood detection stations and city maintenance personnel can be achieved through a variety of wireless and wireline telemetry methods.

The estimated cost of this project is \$10,000 per vehicle.

## **City of Lubbock Winter Maintenance Decision Support System**

### *Associated Market Packages:*

- Weather Information Processing and Distribution (MC04)
- Winter Maintenance (MC06)

### *Prerequisite Projects:* None

*Description:* This project implements a winter maintenance decision support system to better respond to winter weather emergencies and road conditions in the City. This system is meant to provide the appropriate information to the appropriate personnel so that they can make proactive winter maintenance decisions. The FHWA has developed a prototype of such a system, but it must be implemented on a state and/or regional level.

The estimated cost of this project is \$200,000.

## **County and Municipal Maintenance Vehicle AVL**

*Associated Market Packages:*

- Maintenance and Construction Vehicle Tracking (MC01)

*Prerequisite Projects:* None

*Description:* The maintenance and construction AVL project includes equipping county and municipal maintenance vehicles with GPS based vehicle locators. It is envisioned that the location of the vehicle would be overlaid on a base map showing real-time positions of each equipped vehicle. The main purpose of the system is to assist dispatchers and supervisors to better manage the fleet of vehicles. For example, if a report of a spill occurred on a major roadway, a supervisor could quickly determine what vehicle is closest and best equipped to clean up the spill.

The estimated cost of this project is \$10,000 per vehicle.

## **County Winter Maintenance Decision Support System**

*Associated Market Packages:*

- Weather Information Processing and Distribution (MC04)
- Winter Maintenance (MC06)

*Prerequisite Projects:* None

*Description:* This project implements a winter maintenance decision support system, including enhanced resource and scheduling coordination among counties, municipalities and TxDOT to better respond to winter weather emergencies and road conditions. This system is meant to provide the appropriate information to the appropriate personnel so that they can make proactive winter maintenance decisions. The Federal Highway Administration has developed a prototype of such a system, but it must be implemented on a state and/or regional level.

The estimated cost of this project is \$200,000.

## **Public Transportation Management**

### **Independent School District Bus AVL**

*Associated Market Packages:*

- Transit Vehicle Tracking (APTS1)
- Transit Fixed-Route Operations (APTS2)
- Demand Response Transit Operations (APTS3)

*Prerequisite Projects:* None

*Description:* Install AVL on school buses. The AVL system will convey information regarding real-time vehicle location to the Bus Operations Management Center, which will allow for enhanced system monitoring, scheduling, routing (or re-routing), as well as provide for precise bus location information

in the event of a breakdown or emergency situation. AVL systems measure actual, real-time position of transit vehicles, and relay that information back to a transit operations center, usually via global positioning system. Used with a GIS map, bus locations can be displayed for any vehicles in the fleet equipped with the on-board AVL unit. AVL systems also can be equipped with additional features, including tie-ins to alarm/security systems, and vehicle component monitoring.

The estimated cost is \$10,000 per vehicle. This cost includes software.

### **Independent School District Bus Dispatch Center Enhancements**

*Associated Market Packages:*

- Transit Fixed-Route Operations (APTS2)
- Demand Response Transit Operations (APTS3)

*Prerequisite Projects:* None

*Description:* Implement a centralized dispatch and operations management center for school districts in the Lubbock Region. A centralized transit management center will serve as the hub for bus operations, dispatch, and other functions. Used in conjunction with AVL, dispatchers can assess vehicle locations, status, and route adherence, as well as communicate with one or several vehicles that are in the field.

The estimated cost of this project is \$200,000.



#### **4. MAINTAINING THE REGIONAL ITS ARCHITECTURE AND DEPLOYMENT PLAN**

The Lubbock Regional ITS Deployment Plan is a living document. The recommended projects and their timeframes for implementation reflect the needs of the Region at the time the plan was developed. It is expected that the needs of the Region will change as ITS deployments are put into place, population, and travel patterns change, and as new technology is developed. In order for the ITS Deployment Plan to remain a useful document for Regional stakeholders, the plan must be updated over time.

TxDOT will serve as the lead agency for maintaining both the Lubbock Regional ITS Architecture and the ITS Deployment Plan, however, these plans will continue to be driven by stakeholder consensus rather than a single stakeholder.

At the ITS Deployment Plan Meeting in July 2004, stakeholders recommended that the group meet every two years to correspond with the Transportation Improvement Plan update process to review the Regional ITS Architecture and Deployment Plan. Any new market packages that have been added to the National Architecture should be reviewed to see if they are applicable to the Lubbock Region. Data flows in existing market packages should also be reviewed to determine if any planned/future flows have been implemented. The Deployment Plan will also be updated at that time to reflect projects that have been deployed, new projects that are necessary, and to reprioritize projects currently shown in the plan. Projects that are added to the ITS Deployment Plan should also be reviewed closely to determine if they fit into the ITS Architecture for the Lubbock Region. If a new project does not fit into the ITS Architecture, then the ITS Architecture will need to be revised to include the necessary links and data flows for the project. Any changes to the geographic scope of the Region should be agreed upon by the stakeholders.

Both the Lubbock Regional ITS Architecture and the ITS Deployment Plan were developed with a consensus approach from the stakeholders. In order for these documents to continue to reflect the needs of the Region, changes in the documents will need to be driven by consensus of all of the stakeholders.