State of Texas
ITS Architectures and Deployment Plans

Lubbock Region

Executive Summary

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TABLE OF CONTENTS

EXECUTIVE SUMMARY

TABLE OF CONTENTS
EXECUTIVE SUMMARY

LIST OF FIGURES

LIST OF TABLES

PROJECT APPROACH

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) in January of 2001. This final rule requires that Intelligent Transportation System (ITS) projects funded through the Highway Trust Fund conform to the National ITS Architecture and applicable standards. FHWA has further established a deadline of April 2005 for regions to have an ITS architecture in place.

To meet these requirements and ensure future federal funding eligibility for ITS, the Texas Department of Transportation (TxDOT) initiated the development of regional ITS architectures and deployment plans throughout the State of Texas. There are several metropolitan areas in the state that already have ITS architectures in place or under development. The focus of the State of Texas Regional ITS Architectures and Deployment Plans program is to develop architectures in those areas outside of the Austin, Houston, Dallas, Fort Worth, and San Antonio Regions. TxDOT expanded upon the ITS architecture requirements outlined in the FHWA Final Rule, and included an ITS deployment plan as part of the regional efforts. The regional ITS architecture provides a framework for ITS systems, services, integration, and interoperability, and the regional ITS deployment plan identifies specific projects and timeframes for ITS implementation to support the vision developed by stakeholders in the architecture.

TxDOT's process for developing the regional ITS architectures and deployment plans followed a consensus-based approach to meeting the requirements in the FHWA Final Rule and supporting guidelines. This process was further tailored to meet the specific multi-agency needs of these regional plans, and was structured around stakeholder input and involvement. The addition of an ITS deployment plan provides a tangible road map for regional ITS deployment and integration. **Figure 1** shows the development process for each of the State of Texas Regional ITS Architectures and Deployment Plans.
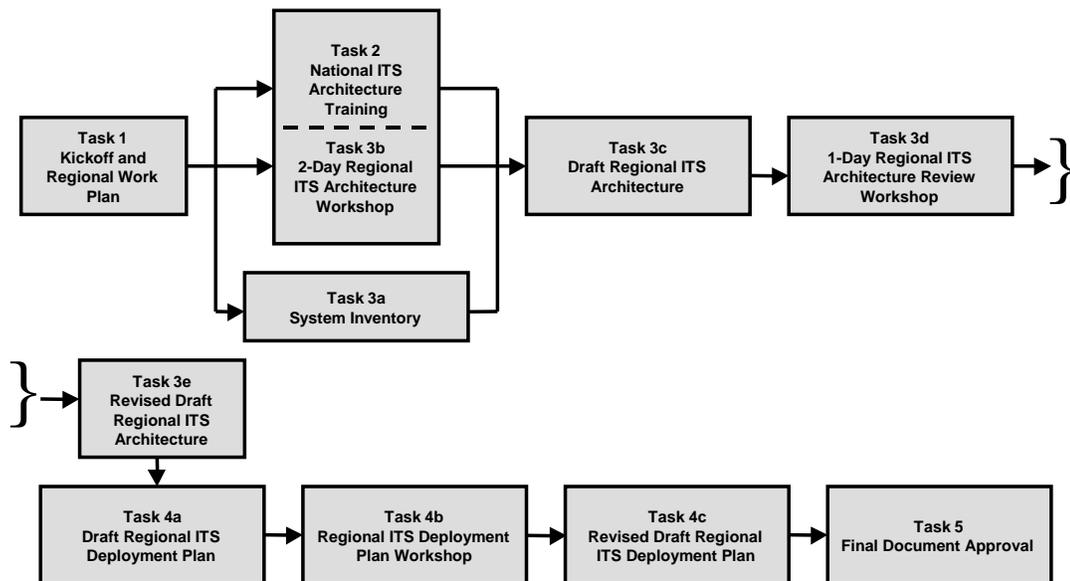

Figure 1 – Lubbock Regional ITS Architecture and Deployment Plan Development Process

OVERVIEW OF THE LUBBOCK REGION

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. **Figure 2** illustrates the Regional boundaries.

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. The Lubbock District 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 needs that will be considered as part of this plan. 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 use an alternate route or wait to begin their travels.
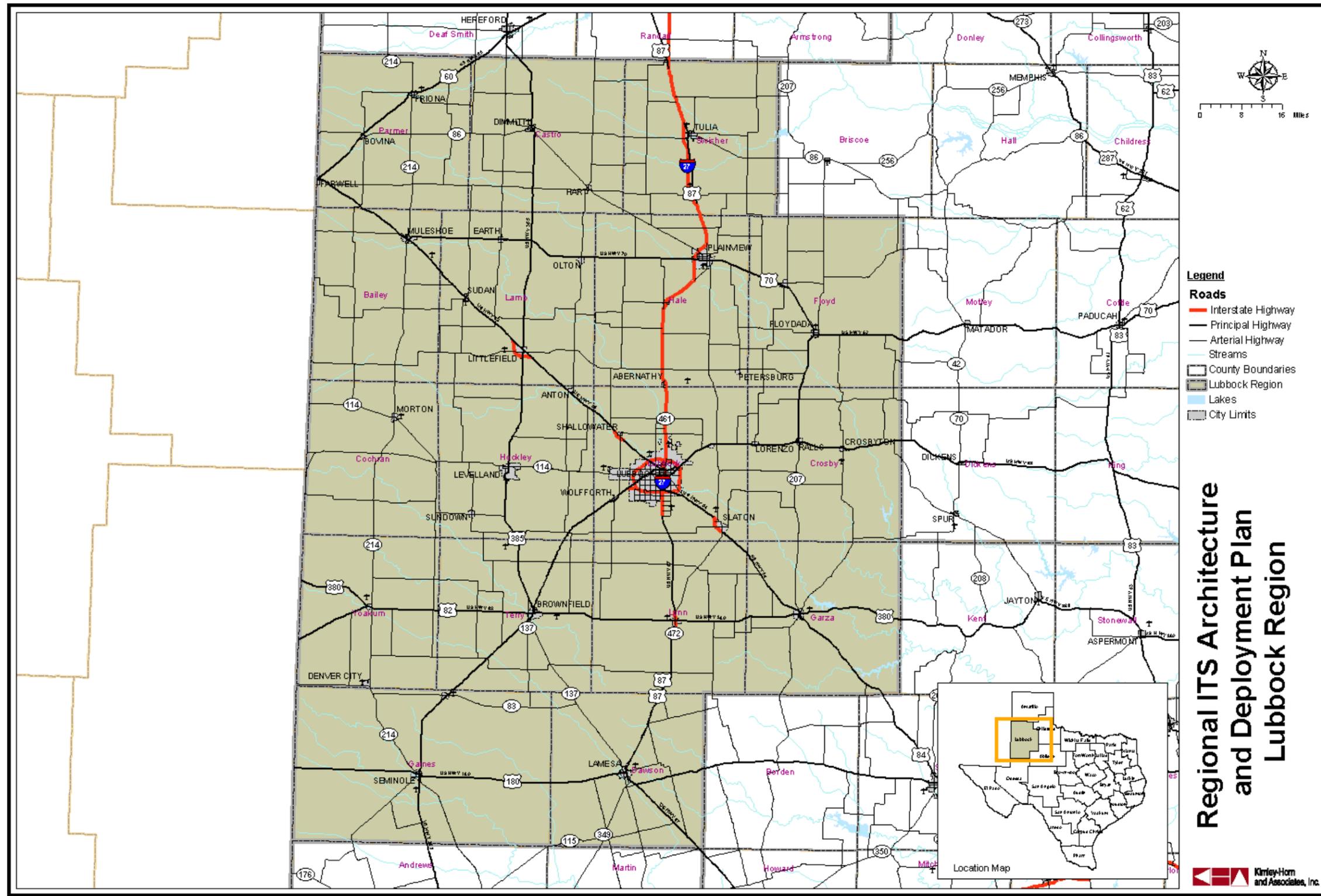
Figure 2 – Lubbock Region Map

LUBBOCK REGION STAKEHOLDERS

Involving a range of perspectives in the development of a regional ITS architecture and deployment plan, and obtaining consensus on the vision and recommendations are key components to the process. Stakeholders from throughout the Lubbock Region participated in the development of the Lubbock Regional ITS Architecture and Deployment Plan. Participants included representatives from TxDOT, cities, counties, public safety, transit, and metropolitan planning organizations (MPOs). These stakeholders provided input and review at key steps in the development process, including a project kick-off meeting, architecture development and review workshops, a deployment plan workshop, and review of the final project documentation.

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).

LUBBOCK REGIONAL ITS ARCHITECTURE

The process for developing the Regional ITS Architecture for the Lubbock Region included several key steps:

- Preparing an inventory of planned and existing systems in the Region;
- Identifying needs in the Region that could be addressed by ITS deployment or integration;
- Customizing and prioritizing market packages to address the specific needs and services identified by stakeholders;
- Developing interconnects and interfaces for system elements to map out data flows and agency links;
- Preparing an operational concept to illustrate how the systems, components, and agencies will be integrated and function as a result of the architecture framework;
- Identifying high-level functional requirements;
- Identifying standards that could be applicable to the Lubbock Region; and
- Outlining potential agreements that would be needed to facilitate information or resource sharing as a result of ITS implementation.

Inventory and Needs in the Region

The Lubbock Regional ITS Architecture began with a project kick-off meeting in January 2004. At that meeting, stakeholders provided information about existing and planned ITS elements in the Region. A diverse range of needs were identified by stakeholders who attended. The inventory of planned and existing ITS infrastructure provided the basis for the architecture development. Needs that could be addressed by ITS technologies guided the selection of market packages, data flows, and integration requirements.

The needs identified by the Lubbock Region stakeholders were categorized into functional areas and are shown in **Table 1**.

Table 1 – Lubbock Region: Summary of ITS Needs

Lubbock Region
Summary of ITS Needs
Lubbock Regional ITS Architecture and Deployment Plan Kick-Off Meeting
January 15, 2004

Institutional Issues/Needs

- Need to coordinate among TxDOT Districts (primarily Amarillo, but also Childress, Abilene and Odessa) as well as with New Mexico, particularly for weather and other major incidents
- Need statewide communication network

Travel and Traffic Management Needs

- Need improved congestion mitigation on key corridors during peak travel times, events, and incidents
- Need weather alerts for high winds, snow, ice, dust storms, flooding
- Need lane control signals
- Need ramp metering on metro area freeways
- Need closed loop signal systems

Table 1 – Lubbock Region: Summary of ITS Needs (continued)

Travel and Traffic Management Needs (continued)

- Need special event management (coordination with Texas Tech)
- Need video surveillance capabilities on arterials to support congestion mitigation/management
- Need CCTV/video surveillance on freeways
- Need to do a better job of disseminating information to the public about incidents, closures, weather hazards (pre-trip, en-route)
- Need to provide up-to-date, accurate information to the public
- Need highway advisory radio in the Region to provide traveler info in the more rural areas
- Need additional dynamic message signs – AMBER Alert, construction info, incident info, special event traffic info

Public Transportation Management Needs

- Need accurate weather and road closure information
- Need weather radios for transit
- Need common radio frequency for transit (multiple providers)
- Need cameras on buses for security/monitoring
- Need multi-modal coordination among transit agencies, taxis, etc.
- Need automated vehicle location for rural/demand response transit fleets
- Need to involve and coordinate with transit (fixed route and demand-response) for evacuation planning

Electronic Payment Needs

None identified

Commercial Vehicle Operations Needs

- Need improved HAZMAT routing, tracking, and incident notification, including rail HAZMAT

Emergency Management Needs

- Need AMBER Alert processes, policies
- Need to coordinate with other Districts for evacuations
- Need emergency alerting system
- Need NOAA radios – beyond weather. Need public awareness and increased coverage
- Need to be able to track/monitor high risk areas
- Need to improve incident management, multi-agency coordination during incidents/emergencies
- Need HAZMAT evacuation/detour routes
- Need advance warning of water/flooding on road
- Need to improve coordination among public safety, medical transport, and area hospitals
- Need to improve incident management on key corridors – US 84 bypass detour information
- Need incident management on freeways – events, accidents

Advanced Vehicle Safety Systems Needs

None identified

Information Management Needs (Data Archiving)

None identified

Maintenance and Construction Management Needs
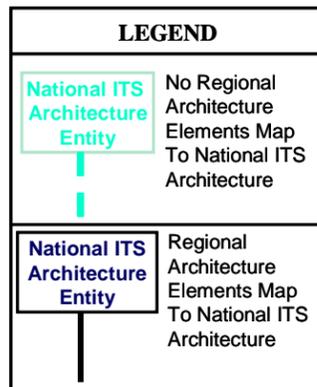
None identified

Market Packages

A 2-Day ITS Architecture Workshop was held in Lubbock in March 2004. At this workshop, stakeholders were provided with architecture training that included background information about the National ITS Architecture and the process that would be used to develop the Lubbock Regional ITS Architecture.

The next step in developing the Lubbock Regional ITS Architecture was to identify the services that would be needed to address stakeholder needs. In the National ITS Architecture, services are referred to as market packages. Market packages can include several stakeholders and elements that work together to provide a service in the Region. Examples of market packages from the National ITS Architecture include Network Surveillance, Traffic Information Dissemination, and Transit Vehicle Tracking. There are a total of 75 market packages identified in Version 4.0 of the National ITS Architecture.

At the 2-Day ITS Architecture Workshop, stakeholders selected the market packages that corresponded to the desired services and functions identified for the Region, and then customized these market packages. They included services and functions such as Network Surveillance, Traffic Information Dissemination, and Emergency Response as well as market packages to address coordination needs, including Incident Management System and Regional Traffic Control and Coordination Services. Because market packages are groups of services and functions, they can be deployed incrementally and over time. Of the 75 market packages in the National ITS Architecture Version 4.0, stakeholders identified 35 as being applicable to the Lubbock Region.

Interconnects, Interfaces, and Standards

Stakeholders also began the process of mapping existing and planned ITS elements in the Lubbock Region to the subsystems in the National ITS Architecture at the 2-Day ITS Architecture Workshop. These elements included agencies, systems, and essentially all of the ITS components in the Region. Subsystems are the highest level building blocks of the physical architecture, and the National ITS Architecture groups them into four major classes: Centers, Roadside, Vehicles, and Travelers. This mapping resulted in an interconnect diagram for the Lubbock Region that is shown in **Figure 3**. This architecture diagram, also referred to as the "sausage diagram" shows the relationship of existing, planned, and future systems in the Lubbock Region.

LEGEND

| National ITS Architecture Entity | No Regional Architecture Elements Map To National ITS Architecture |

| National ITS Architecture Entity | Regional Architecture Elements Map To National ITS Architecture |

Remote Traveler Support Subsystem
- Citibus Information Display / Point of Sale*
- TxDOT Rest Area/Visitor Center/Service Plaza/Truck Stop Kiosks*

Personal Information Access Subsystem
- Private Travelers Personal Computing Devices

Transit Vehicle Subsystem
- CapTrans Transit Vehicles
- Citibus Demand Response Vehicles
- Citibus Transit Vehicles
- Independent School District Buses
- SPARTAN Vehicles

Vehicle Subsystem
- Commercial Vehicles

Commercial Vehicle Subsystem
- Commercial Vehicles
- Rail Operators Rail Cars

Maintenance and Const Vehicle Subsystem
- City of Lubbock Vehicles
- County Road and Bridge Vehicles
- Lubbock Automated Roadway Information System*
- Municipal PWD Vehicles
- TxDOT Lubbock District Maintenance and Construction Vehicles

Emergency Vehicle Subsystem
- City of Lubbock Emergency Vehicles
- City of Plainview Emergency Vehicles
- DPS Emergency Vehicles
- Municipal or County Emergency Vehicles
- Private Ambulance Vehicles
- TTU Police Vehicles
- UMC Emergency Vehicles

Maintenance & Construction Management
- City of Lubbock Transportation Division and Public Works Department
- County Road and Bridge
- Municipal PWD
- New Mexico Maintenance Sections
- Other TxDOT District Area Engineers Office
- Other TxDOT District Maintenance Sections
- TTU Facilities and Maintenance Department
- TxDOT Highway Conditions Reporting System
- TxDOT Lubbock District Area Engineers Office
- TxDOT Lubbock District Maintenance Management Office
- TxDOT Lubbock District Maintenance Sections

Emergency Management Subsystem
- Cannon AFB EOC
- City of County of Lubbock EOC
- City of Lubbock Fire Dispatch
- City of Lubbock Police/911 Dispatch
- City of Plainview EOC
- City of Plainview Police/Fire/EMS Dispatch
- County EOC

Emergency Management Subsystem (Cont.)
- County Volunteer Fire Departments Dispatch
- DPS Administration
- DPS Communications Service
- DPS/District Disaster Committee EOC
- Municipal or County Public Safety Dispatch and PSAP
- New Mexico State Police Dispatch
- Private Ambulance Dispatch
- Private Tow/Wrecker Dispatch
- Regional Medical Centers
- State Operations Center
- TDCJ-ID Regional Dispatch
- TTU Police Department Dispatch
- UMC EMS Dispatch

Fleet and Freight Management Subsystem
- Private Fleet Management Systems*
- Rail Operations Centers

Information Service Provider Subsystem
- CapTrans Website
- Citibus Website
- City of Lubbock Website
- Municipal Websites
- Private Sector Traveler Information Services*
- SPARTAN Website*
- TxDOT 511 System*
- TxDOT Highway Conditions Reporting System
- TxDOT Lubbock District TMC
- TxDOT Lubbock District Website*
- TxDOT Motor Carrier Routing Information

Archived Data Management Subsystem
- Lubbock MPO Archive*
- Statewide Crash Records Information System
- TxDOT Lubbock District Pavement Management System
- TxDOT Odessa District Public Transportation Management System (PTMS)
- TxDOT Statewide Pavement Management System

Transit Management Subsystem
- CapTrans Transit Dispatch
- Citibus District Dispatch
- Independent School District Dispatch
- Lubbock Region Transit Reconciliation Network*
- Private Taxi Provider Dispatch
- SPARTAN Transit Dispatch

Traffic Management Subsystem
- City of Lubbock Traffic Management Center
- City of Plainview Traffic Operations Center*
- Municipal TOCs*
- New Mexico DOT TMC
- Other TxDOT District TMCs
- TTU Traffic Operations Center*
- TxDOT Fort Worth TMC (TransVision)
- TxDOT Lubbock District TMC

Archived Data User Systems
- Lubbock MPO Archive Data User Systems*
- Statewide Crash Records Information System Users
- TxDOT Lubbock District Pavement Management System Users
- TxDOT PTMS Archive Data Users Systems

Asset Management
- City of Lubbock Pavement Management System
- TxDOT BRINSAP
- TxDOT Lubbock District Pavement Management System
- TxDOT Lubbock District Roadway Asset Inventory*

Care Facility
- Regional Medical Centers

Driver
- Driver

Equipment Repair Facility
- City of Lubbock Central Services Garage
- County Road and Bridge Equipment Repair
- Municipal PWD Garage
- TxDOT Lubbock District Equipment Repair Garage

Event Promoters
- Municipal Convention and Visitors Bureau*
- TTU Event Planning Office*

Financial Institution
- Financial Institution

Maintenance & Construction Admin
- TxDOT Lubbock District Area Engineers Office

Media
- Local Print and Broadcast Media

Other EM
- Lubbock Regional Incident and Mutual Aid Network*

Rail Operations
- Rail Operations Centers

Traveler Card
- Lubbock Regional Smart Card*

Wayside Equipment
- Rail Operators Wayside Equipment

Weather Service
- National Weather Service

Parking Management
- TTU Parking System*

Travelers — Remote Traveler Support; Personal Information Access

Centers — Emissions Management; Traffic Management; Emergency Management; Toll Administration; Commercial Vehicle Administration; Information Service Provider; Maintenance & Construction Management; Transit Management; Fleet and Freight Management; Archived Data Management

Wide Area Wireless (Mobile) Communications

Wireline Communications

Terminators

Vehicles — Vehicle; Transit Vehicle; Commercial Vehicle; Emergency Vehicle; Maintenance & Construction Vehicle

Vehicle to Vehicle Communications

Dedicated Short Range Communications

Roadside — Roadway; Toll Collection; Parking Management; Commercial Vehicle Check

Roadway Subsystem
- City of Lubbock Field Equipment
- City of Plainview Field Equipment
- County Road and Bridge Field Equipment*
- Municipal ITS Field Equipment*
- TTU Field Equipment
- TTU Parking System DMS*
- TxDOT Lubbock District Anti-Icing Equipment*
- TxDOT Lubbock District CCTV*
- TxDOT Lubbock District DMS
- TxDOT Lubbock District Field Sensors

Roadway Subsystem
- TxDOT Lubbock District Flood Detection*
- TxDOT Lubbock District HAR*
- TxDOT Lubbock District Lane Use Control Signals*
- TxDOT Lubbock District Ramp Metering*
- TxDOT Lubbock District RWIS Sensors*
- TxDOT Lubbock District School Flashers
- TxDOT Lubbock District Speed Monitoring
- TxDOT Lubbock District Traffic Signals
- TxDOT Lubbock District Work Zone Equipment*

* Elements are *planned or future*, not *existing*.

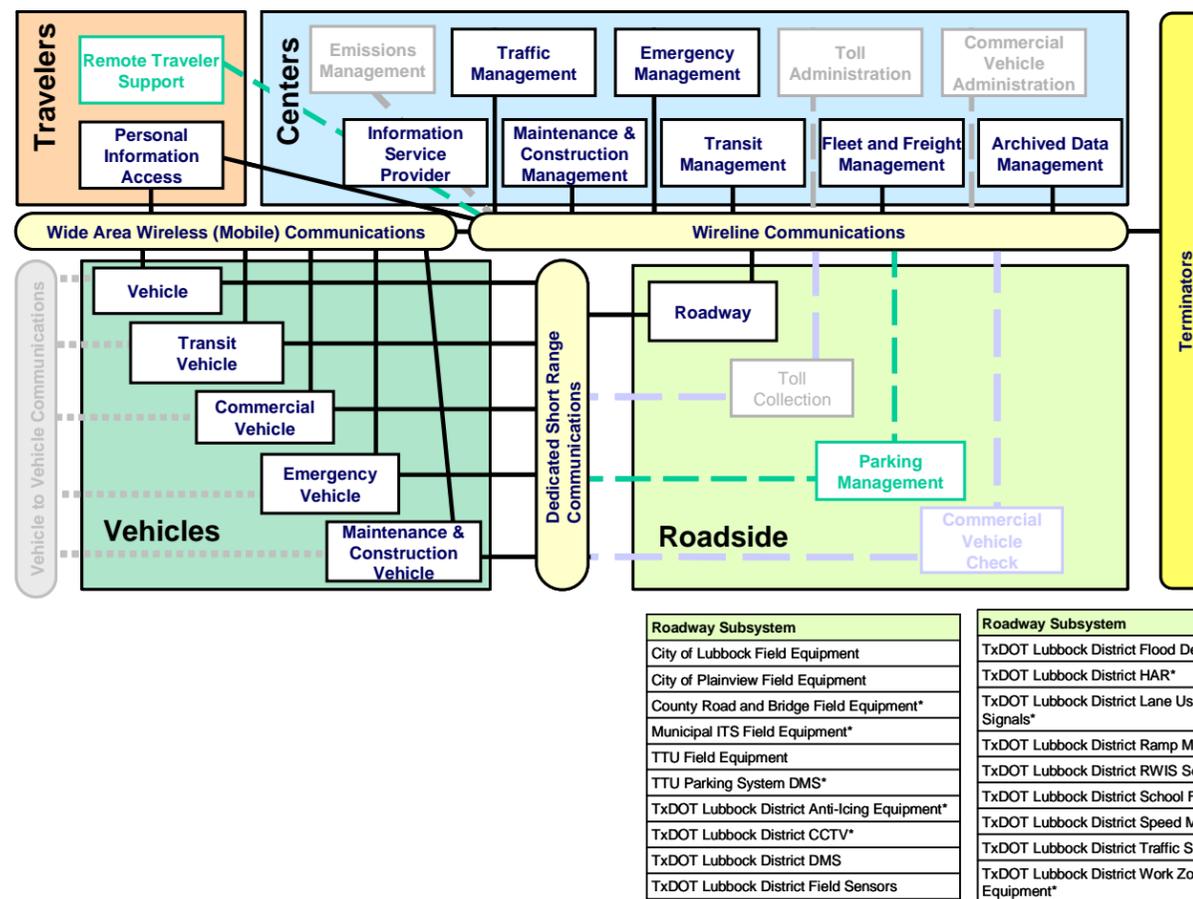Last Updated: February 15, 2005

Figure 3 – Lubbock Regional System Interconnect Diagram

The market packages in the National ITS Architecture were customized to reflect the unique systems, subsystems, and terminators in the Lubbock Region. Each market package was shown graphically, with the market package name, Lubbock Region specific element, and the unique agency and system identifiers within the subsystems and terminators.

Figure 4 is an example of an advanced traffic management system (ATMS) market package for Surface Street Control that has been customized for the Lubbock Region. This market package shows the two subsystems, Traffic Management and Roadway, and the associated entities (TxDOT Lubbock District Traffic Signals, TxDOT Lubbock District Field Sensors, etc.) for the TxDOT Lubbock District signal system. The dashed data flow lines in this market package indicate planned or future information flows. If there were any existing flows they would be shown with solid lines. All of the Lubbock Region market package diagrams are included in the Regional ITS Architecture report.
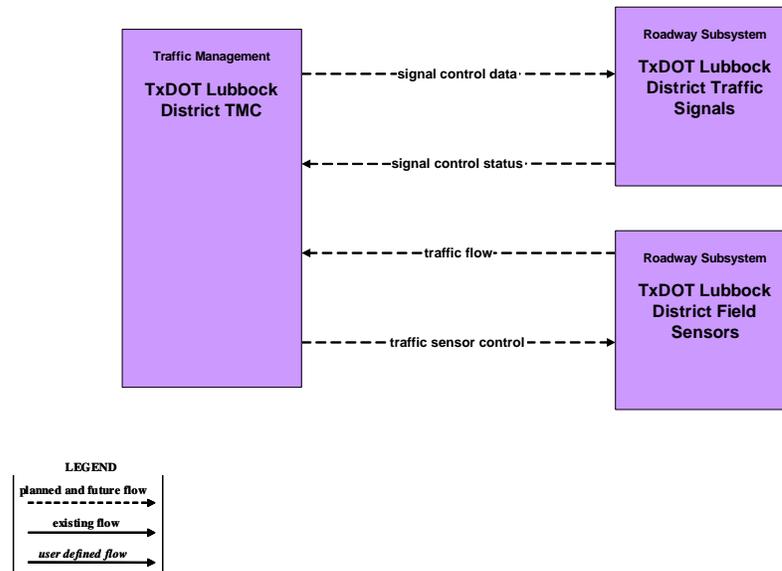

Figure 4 – Lubbock Surface Street Control Customized Market Package

More detailed interfaces were developed which identify the connectivity between the systems and elements. Each element identified in the ITS architecture for the Lubbock Region was mapped to the other elements that it must interface with. These interfaces were further defined by architecture data flows between individual elements that specify the information to be exchanged. The data flows include requests for information, alerts and messages, status requests, confirmations, and other information requirements.

While it is important to identify the various systems and stakeholders as part of a regional ITS, a primary purpose of the architecture is to identify the connectivity between transportation systems in the Lubbock Region. There are 123 different elements identified as part of the Lubbock Regional ITS Architecture. These elements include local and state traffic management/operations centers, transit vehicles, dispatch systems, emergency management agencies, and others – essentially all of the existing and planned physical components that contribute to a Regional ITS.

Interfaces have been identified for each element in the Lubbock Regional ITS Architecture, and each element has been mapped to those other elements with which it must interface.

An example of one of the system interfaces is included as **Figure 5**. This graphic shows the TxDOT Lubbock District Traffic Signals and the existing and planned interfaces with other elements throughout the Region. These interfaces are shown as existing, planned, or future. Interfaces defined as planned have funding identified, while future interfaces are desired by stakeholders but funding has not yet been identified.

Architecture flows between the subsystems and terminators define the specific information (data) that is exchanged between subsystems and terminators. Each architecture flow has one or more data flows that specify what information is exchanged and the direction of the exchange.

An example of the architecture flows between two elements is shown in **Figure 6**. In this interface, the flows between the TxDOT Lubbock District TMC and Other TxDOT District TMCs show information that must go from the Lubbock District TMC to other Texas TMCs, as well as information that the District TMC needs from devices. Similar to the interfaces, architecture flows also are defined as existing, planned, or future. Diagrams of all of the architecture flows between elements have been included on the project website.

With the required interfaces and interconnections identified, standards that could potentially be applied to the Lubbock Region were identified. Standards are an important tool that will allow efficient implementation of the elements in the Lubbock Regional ITS Architecture over time. They facilitate deployment of interoperable systems at local, regional, and national levels without impeding innovation as technology advances, vendors change, and as new approaches evolve.
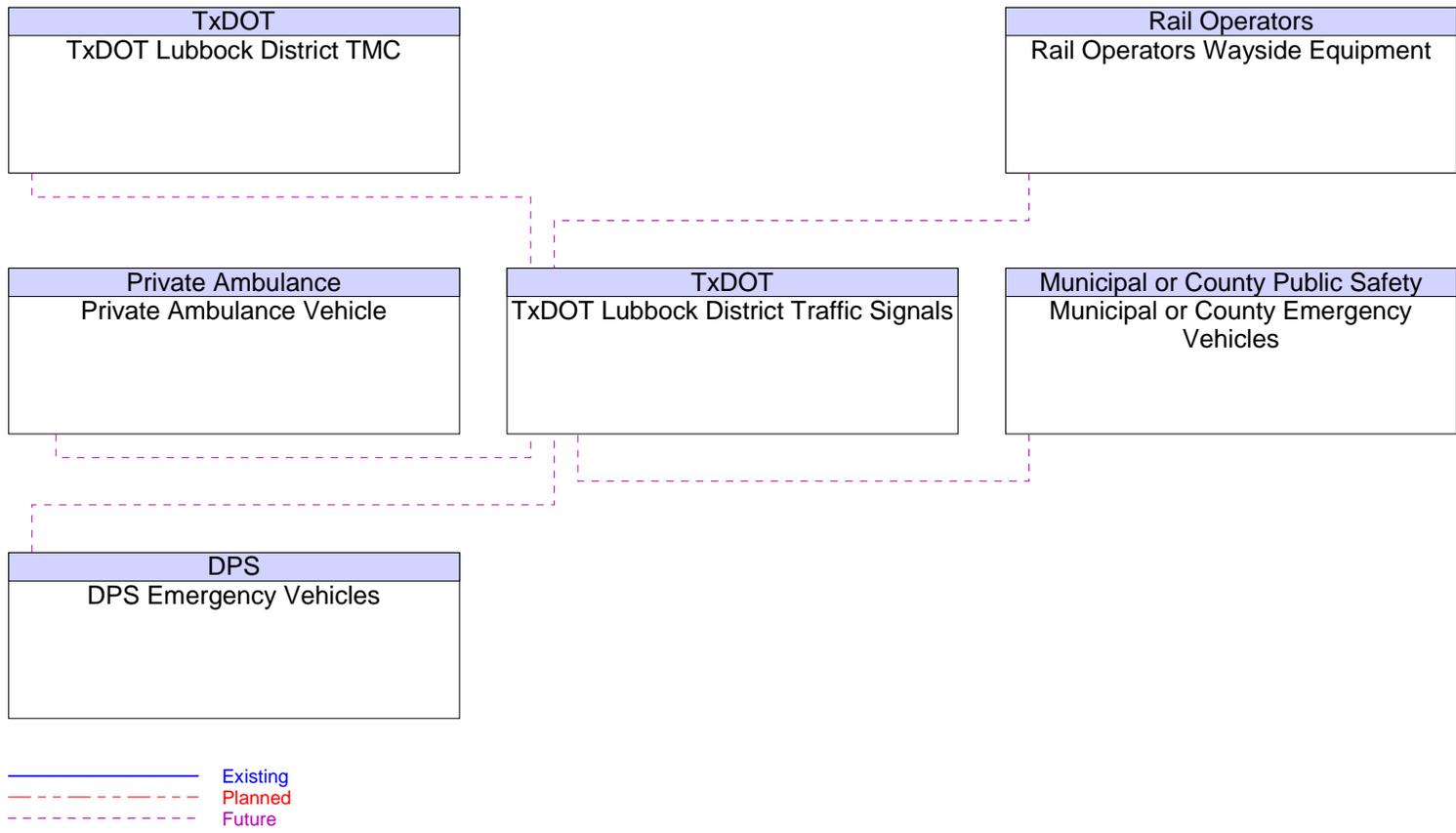
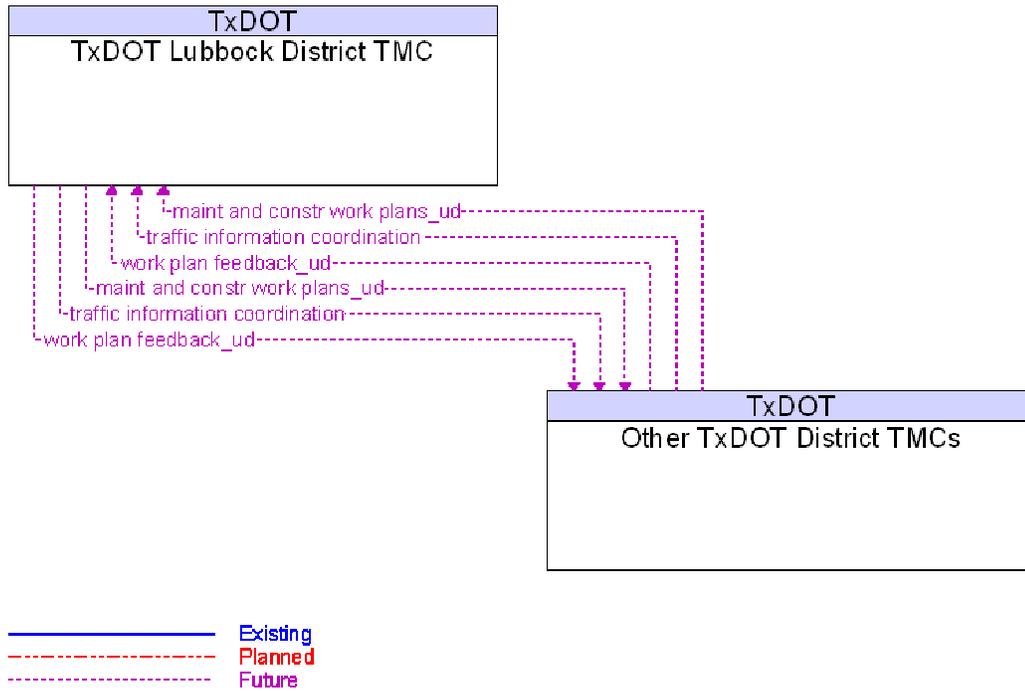**Figure 5 – TxDOT Lubbock District Traffic Signals Interfaces**

Figure 6 – TxDOT Lubbock District TMC to Other TxDOT District TMCs Architecture Flows

Operational Concept and Scenarios

An operational concept for the Lubbock Region was developed as part of the architecture process to illustrate how systems, components, and agencies will be integrated and function as a result of the framework provided by the Regional ITS Architecture. For the Lubbock Region, two concepts were illustrated. The first describes how ITS technologies could be used to manage road flooding as a result of a severe rainstorm moving through the Region. This scenario and operational concept shows how ITS technologies are used to monitor flood conditions on roadways, facilitate multi-agency notification and coordination, and warn motorists of hazardous driving conditions and road closures. The second scenario describes technologies and strategies that could be used to support special event traffic management and motorist information for a large event at the Jones SBC Stadium at Texas Tech.

Agreements

Interfaces and data flows among public and private entities in the Lubbock Region will require agreements among agencies that establish parameters for sharing agency information to support traffic and incident management, provide traveler information, and perform other functions identified in the Regional ITS Architecture. Recommended projects will result in systems and interfaces that will require inter-agency agreements, both public and private, to facilitate the exchange of information.

Currently, there are some agreements in place in the Region, primarily for mutual aid (these are more common practice and informal) as well as more formal agreements for traffic signal operations and maintenance. With the implementation of ITS technologies, integration of systems

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from one or more agencies, and the anticipated level of information exchange identified in the architecture, it is likely that additional formal agreements will be needed in the future.

The following is a list of potential agreements for the Lubbock Region based on the interfaces identified in the Regional ITS Architecture and recommended ITS projects in the Deployment Plan:

- Data sharing and usage agreements among public agencies;
- Data sharing and usage agreements among public agencies and private media and information service providers;
- Joint operations/shared control agreements, potentially between TxDOT, the City of Lubbock, and Texas Tech; and
- Mutual aid agreements among public sector agencies, primarily fire, police, emergency services, DPS, and TxDOT.

It is important to note that as ITS services and systems are implemented in the Region, part of the planning and review process for those projects should include a review of potential agreements that would be needed for implementation or operations.

ITS Architecture Documentation

The Regional ITS Architecture for the Lubbock Region is documented in a final report. Stakeholders were brought together to review the Regional ITS Architecture and provide feedback. The final architecture report was not prepared until after completion of the Lubbock Regional ITS Deployment Plan to allow for modifications based on information and input received during development of the ITS Deployment Plan.

A website with all of the Regional ITS Architectures also was maintained. The website allowed stakeholders to review the architecture and provide comments directly to the project team through the website. At the time this report was published, the Lubbock Regional ITS Architecture website was being hosted at www.consystec.com. The site can be accessed by selecting the link to Texas Regional, and then the link to Lubbock. TxDOT plans to permanently host the site in the future at www.dot.state.tx.us/trf/its.

LUBBOCK REGIONAL ITS DEPLOYMENT PLAN

Although development of an ITS deployment plan was not required by the FHWA Final Rule for the architecture, the Final Rule does request a sequence of projects required for implementation. Capitalizing on the momentum and interagency dialogue established during the development of the Lubbock Regional ITS Architecture, TxDOT chose to expand on the project sequence requirement to develop a formal ITS deployment plan for the Region.

The Lubbock Regional ITS Architecture provided the framework and prioritized the key functions and services desired by stakeholders in the Region. The Lubbock Regional ITS Deployment Plan builds on the architecture by prioritizing market packages, 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 Regional ITS Deployment Plan.

Prioritized Market Packages

Market packages for the Lubbock Region previously identified as part of the architecture were categorized into high, medium, and low priorities by stakeholders. 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 Region, as well as the interfaces that need to be established to provide integrated functionality and establish communication between elements.

It is important to note that the high, medium, and low priorities were not directly related to anticipated deployment timeframes (such as 5, 10, or 20 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 was another factor for prioritizing the market packages. Because market packages often represent groups of technologies or services to deliver a particular functionality, certain components of the market package could be identified as a high priority or existing capability, while other components would have a lower priority. Other considerations included whether or not the market package was better suited for deployment and operations by the private sector rather than public agencies in the Region.

Table 2 shows the prioritization of the selected market packages for the Lubbock Region. The majority of these market packages fall into the high priority category. This category also includes market packages (or portions of market packages) that are already deployed in the Lubbock Region, such as surface street control and traffic information dissemination.

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

High Priority	Medium Priority	Low Priority
▪ Network Surveillance	▪ Parking Facility Management	▪ Standard Railroad Grade Crossing
▪ Surface Street Control	▪ Work Zone Management	▪ Railroad Operations Coordination
▪ Freeway Control	▪ Work Zone Safety Monitoring	▪ Maintenance and Construction Vehicle Tracking
▪ Traffic Information Dissemination	▪ Transit Passenger and Fare Management	▪ Maintenance and Construction Vehicle Maintenance
▪ Regional Traffic Control	▪ Transit Security	▪ Winter Maintenance
▪ Incident Management System	▪ Multi-modal Coordination	▪ Roadway Maintenance and Construction
▪ Speed Monitoring	▪ HAZMAT Management	▪ ISP-based Route Guidance
▪ Emergency Response	▪ Interactive Traveler Information	
▪ Emergency Routing	▪ ITS Data Mart	
▪ Road Weather Data Collection	▪ ITS Data Warehouse	
▪ Weather Information Processing and Distribution		
▪ Roadway Automated Treatment		
▪ Maintenance and Construction Activity Coordination		
▪ Transit Vehicle Tracking		
▪ Transit Fixed-Route Operations		
▪ Demand Response Transit Operations		
▪ Transit Traveler Information		
▪ Broadcast Traveler Information		

Each of the prioritized market packages was assessed from the perspective of deployment status (which components, if any, were already existing in the Region), as well as any planned projects or additional new projects needed to fully implement the market package in the Lubbock Region. Each market package analysis included:

▪ A brief definition of the market package (modified from the National ITS Architecture definitions);

▪ Any infrastructure or components 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.

ITS Project Recommendations for the Lubbock Region

Using the needs, market package priorities, and any planned projects identified by the stakeholders during the architecture process, a list of recommended ITS projects for the Lubbock Region was developed. These projects were refined and additions and deletions were made by the Regional stakeholders at the ITS Deployment Plan Workshop in July 2004.

Recommended ITS projects for the Lubbock Region were categorized into short-, medium-, and long-term timeframes for programming in the 5, 10, and 20 year horizons. This was done based on current status if the project had previously been identified and planned by the Region, market package priority, and dependency on other project completions. The majority of the short term or 5-year recommendations serve as "foundation" projects to implement basic functionality, infrastructure, and interfaces, with the intent of continuing to build out those foundation projects over the 10 and 20 year timeframes. Most projects for the Lubbock Region are infrastructure based; however, there are some recommendations that focus more on institutional practices and interconnectivity to enhance coordination and communications.

Each recommended project for the Lubbock Region was included in a short-, medium-, or long-term table in the deployment plan. These tables provided the name of the project, primary operating/implementing agency, a planning level estimate of probable cost, an indication of whether or not funding had been identified for that specific project, and an estimated project duration. Following each table, detailed descriptions of each project were developed that also included associated market packages and any pre-requisite project requirements.

Table 3 summarizes the ITS projects recommended for the Lubbock Region. This summary is divided into the major program areas and subdivided by timeframe. As can be seen from this summary, the majority of the project recommendations focus on the Travel and Traffic Management category which would implement surface street traffic management, traveler information, and inter-agency coordination elements.

Table 3 – Recommended ITS Projects for the Lubbock Region

Project Time Frame	Project Name	Funding Identified (Funding Agency if Applicable)
Travel and Traffic Management		
Short Term Projects 5-year Horizon	TxDOT Lubbock TMC and ATMS Implementation	No
	TxDOT Loop 289 Freeway Management System	No
	TxDOT Marsha Sharp Freeway Management System	No
	TxDOT Lubbock TMC/City of Lubbock TMC Communications Connection	No
	TxDOT Highway Advisory Radio	No
	TxDOT Center-to-Center Communications	Yes (TxDOT Statewide)
	TxDOT Traffic Signal System Upgrades and Expansion Phase 1	Yes (TxDOT)
	TxDOT Portable Speed Monitoring/Warning System	No
	City of Lubbock Traffic Signal System Upgrades and Expansion Phase 1	Yes (City of Lubbock)
	City of Lubbock Traffic Signal Communications Upgrade	Yes (City of Lubbock)
	City of Lubbock CCTV Implementation	No
	City of Lubbock TMC Expansion	No
	City of Lubbock Speed Monitoring/Warning System	No
	City of Lubbock TMC/Media Communications Connection	No
	Texas Tech University Traffic and Parking Management Center	No
	Texas Tech University Traffic Management System Implementation	No
	Texas Tech University Parking Security System Implementation	No
	Texas Tech University Enhanced Pedestrian and Vehicle Signalization Upgrades (Including Crosswalks)	No
Mid Term Projects 10-year Horizon	TxDOT Freeway Management System Expansion	No
	TxDOT 511 Traveler Information System Server	No
	TxDOT Lubbock District Website	No
	TxDOT Travel Information Kiosks	No
	TxDOT Lubbock TMC/Media Communications Connection	No
	TxDOT Traffic Signal System Upgrades and Expansion Phase 2	No
	TxDOT Lane Control Signals	No
	TxDOT School Flasher System Enhancements	No

Table 3 – Recommended ITS Projects for the Lubbock Region (continued)

Project Time Frame	Project Name	Funding Identified (Funding Agency if Applicable)
Travel and Traffic Management (continued)		
Mid Term Projects 10-year Horizon (continued)	TxDOT Ramp Meters	No
	TxDOT Rural DMS	No
	City of Lubbock Smart Corridors Phase 1	No
	City of Lubbock Website	No
	City of Lubbock TMC/Texas Tech University Communications Connection	No
	City of Lubbock Traffic Signal System Upgrades and Expansion Phase 2	No
	City of Lubbock Speed Monitoring/Warning System Expansion	No
	City of Lubbock School Flasher System Upgrade	No
	Texas Tech University Parking Management System	No
Long Term Projects 20-year Horizon	Interstate Coordination	No
	TxDOT Lubbock TMC/City of Plainview TOC Communications Connection	No
	TxDOT Lubbock TMC Expansion	No
	TxDOT Traffic Signal System Upgrades and Expansion Phase 3	No
	City of Lubbock Smart Corridors Phase 2	No
	City of Lubbock Traffic Signal System Upgrades and Expansion Phase 3	No
	City of Plainview TOC	No
	City of Plainview Traffic Signal System Upgrades and Expansion	No
	City of Plainview CCTV Implementation	No
Emergency Management		
Short Term Projects 5-year Horizon	TxDOT Lubbock TMC/DPS Communications Connection	No
	TxDOT Emergency Vehicle Signal Preemption Phase 1	No
	City of Lubbock Emergency Vehicle Signal Preemption Expansion	Partial (City of Lubbock)
	City of Lubbock TMC/City of Lubbock Fire Dispatch Interface	No
	City of Lubbock TMC/City of Lubbock Police (911) Interface	No

Table 3 – Recommended ITS Projects for the Lubbock Region (continued)

Project Time Frame	Project Name	Funding Identified (Funding Agency if Applicable)
Emergency Management (continued)		
Mid Term Projects 10-year Horizon	TxDOT Emergency Vehicle Signal Preemption Phase 2	No
	TxDOT Lubbock TMC/County Sheriff Communications Connection	No
	Texas Tech 911 PSAP/City of Lubbock Police Communications Connection	No
	Texas Tech 911 PSAP/City of Lubbock Fire Communications Connection	No
Long Term Projects 20-year Horizon	City of Plainview Emergency Vehicle Signal Preemption	No
	City of Lubbock Emergency Vehicle Signal Preemption Upgrade and Expansion	No
Maintenance and Construction Management		
Short Term Projects 5-year Horizon	TxDOT RWIS Phase 1	No
	TxDOT Flood Detection Phase 1	No
	TxDOT Portable DMS Phase 1	No
	TxDOT I-27/US 289 Anti-Icing Automated Treatment	Yes (TxDOT)
	TxDOT Marsha Sharp Freeway Anti-Icing Automated Treatment	No
	TxDOT HCRS Enhancements	Yes (TxDOT Statewide)
Mid Term Projects 10-year Horizon	TxDOT Portable DMS Phase 2	No
	TxDOT RWIS Phase 2	No
	TxDOT Flood Detection Phase 2	No
	Regional Maintenance Coordination System	No
	City of Lubbock Flood Detection Phase 1	No
	TxDOT Smart Work Zones	No
	City of Lubbock Smart Work Zones	No
Long Term Projects 20-year Horizon	TxDOT Maintenance Vehicle AVL	No
	TxDOT Winter Maintenance Decision Support System	No
	City of Lubbock Maintenance Vehicle AVL	No
	City of Lubbock Flood Detection Phase 2	No
	City of Lubbock Winter Maintenance Decision Support System	No
	County and Municipal Maintenance Vehicle AVL	No
	County Winter Maintenance Decision Support System	No

Table 3 – Recommended ITS Projects for the Lubbock Region (continued)

Project Time Frame	Project Name	Funding Identified (Funding Agency if Applicable)
Public Transportation Management		
Short Term Projects 5-year Horizon	Citibus AVL for Fixed Route Vehicles	No
	Citibus Webpage Enhancements	Partial (Citibus)
	Citibus Transit Signal Priority	No
	Citibus On-board Security System	No
	Citibus Real-Time Traveler Information	No
	CapTrans AVL	No
	CapTrans Dispatch Center Enhancements	No
	SPARTAN AVL	No
	SPARTAN Dispatch Center Enhancements	No
	SPARTAN Web-based Scheduling and Transit Information	No
Mid Term Projects 10-year Horizon	Citibus Automated Fare Payment System	No
	Citibus Traveler Information Kiosks	No
	Citibus Automated Passenger Counters	No
	CapTrans On-board Security System	No
	CapTrans Web-based Scheduling and Transit Information	No
	SPARTAN On-board Security System	No
	Regional Demand Response Transit Network	No
	CapTrans Automated Fare Payment System	No
	SPARTAN Automated Fare Payment System	No
	Regional Transit Smart Card	No
Long Term Projects 20-year Horizon	Independent School District Bus AVL	No
	Independent School District Bus Dispatch Center Enhancements	No
Commercial Vehicle Operations		
Short Term Projects 5-year Horizon	None identified at this time	N/A
Mid Term Projects 10-year Horizon	HAZMAT Tracking and Information Exchange	No
Long Term Projects 20-year Horizon	None identified at this time	N/A

Table 3 – Recommended ITS Projects for the Lubbock Region (continued)

Project Time Frame	Project Name	Funding Identified (Funding Agency if Applicable)
Archived Data		
Short Term Projects 5-year Horizon	Lubbock MPO Data Archive	No
Mid Term Projects 10-year Horizon	None identified at this time	N/A
Long Term Projects 20-year Horizon	None identified at this time	N/A

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.

MEMORANDUM OF UNDERSTANDING

As a final step in the development of the Lubbock Regional ITS Architecture and Deployment Plan, a Memorandum of Understanding (MOU) was prepared for the participating stakeholder agencies. The MOU was developed for stakeholders to acknowledge their participation and approval of the plan, and pledge their support in the implementation and operation of ITS in the Lubbock Region. Also included in the MOU was a pledge to provide TxDOT with the information necessary to maintain the Regional ITS Architecture and ITS Deployment Plan.

Those stakeholders that were asked to sign the MOU represented agencies that participated in the planning process. In most cases these agencies will have the greatest impact in the Region in terms of ITS deployments and system operations. Stakeholder agencies that were asked to sign the MOU for the Lubbock Regional ITS Architecture and Deployment Plan included the following:

- Caprock Community Action Association, Inc.;
- Citibus;
- City of Levelland;
- City of Lubbock:
- City of Plainview;
- City of Slaton;
- City of Wolfforth;
- Lubbock Metropolitan Planning Organization;
- SPARTAN Rural Public Transportation;
- Texas Department of Public Safety;
- Texas Tech University; and
- TxDOT.