State of Texas
Regional ITS Architectures and Deployment Plans

Corpus Christi Region

Regional ITS Deployment Plan

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REGIONAL ITS DEPLOYMENT PLAN

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LIST OF ACRONYMS

AD	Archived Data
ADART	Autonomous Dial-a-Ride Transit
APTS	Advanced Public Transportation Systems
ATIS	Advanced Travel Information System
ATMS	Advanced Traffic Management System
AVL	Automatic Vehicle Location
C2C	Center-to-Center
CAA	Community Action Agency
CAD	Computer Aided Dispatch
CBCOG	Coastal Bend Council of Governments
CCTV	Closed-Circuit Television
DMS	Dynamic Message Sign
EM	Emergency Management
EMS	Emergency Medical Services
EOC	Emergency Operations Center
FHWA	Federal Highway Administration
FMS	Freeway Management System
GIS	Geographic Information System
GPS	Global Positioning System
HAR	Highway Advisory Radio
HCRS	Highway Conditions Reporting System
HOV	High Occupancy Vehicle
HRI	Highway-Rail Intersection
ISP	Information Service Provider
ITS	Intelligent Transportation System
LED	Light Emitting Diode

LIST OF ACRONYMS

MC	Maintenance and Construction
MDT	Mobile Data Terminals
MPO	Metropolitan Planning Organization
NTCIP	National Transportation Communications for ITS Protocol
PSAP	Public Safety Access Point
PTZ	Pan/Tilt/Zoom
REAL	Rural Economic Assistance League
RFID	Radio Frequency Identification
RTA	Regional Transportation Authority
RWIS	Road Weather Information System
SPID	South Padre Island Drive
TAMU	Texas A&M University
TCOON	Texas Coastal Ocean Observation Network
TEA-21	Transportation Equity Act for the 21st Century
TM	Traffic Management
TMC	Traffic Management Center
TOC	Traffic Operations Center Transit Operations Center
TxDOT	Texas Department of Transportation
TxDPS	Texas Department of Public Safety
VIVDS	Video Image Vehicle Detection System
VTS	Vessel Traffic 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 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 Corpus Christi Region was the second in the series of regional ITS architectures and deployment plans to be prepared as part of this initiative.

The Corpus Christi 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, FHWA, Texas Department of Public Safety (TxDPS), cities, counties, transit agencies, police, fire, Port of Corpus Christi, and the U.S. Coast Guard.

Building on the dialogue, consensus, and vision outlined in the Regional ITS Architecture, stakeholders in the Corpus Christi 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 Corpus Christi Region were identified in the following key areas:

- Traffic and Travel 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 Corpus Christi 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. Stakeholders agreed that both the Regional ITS Architecture and the ITS Deployment Plan would need to be periodically reviewed and potentially updated in order to reflect current deployment status as well as re-evaluate priorities. A two-year timeframe was selected by the stakeholders for this update to correspond with the Region's Transportation Improvement Plan update. The stakeholders also agreed that the ITS Deployment Plan should be reviewed on a quarterly basis, with the TxDOT Corpus Christi District taking the lead on organizing the reviews and recording any changes to the plan.

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 Corpus Christi Regional ITS Deployment Plan was developed using the Regional ITS Architecture developed in 2002. 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 deployment plan, and identified the required interfaces to provide the desired level of integration of systems and agencies within the Corpus Christi Region.

The Corpus Christi Regional ITS Architecture provided the framework and prioritized the key functions and services desired by stakeholders in the Region. The Corpus Christi Regional 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 Corpus Christi Regional ITS Deployment Plan is organized into four key sections:

Section 1 – Introduction

This section provides a brief overview of the State of Texas Regional ITS Architectures and Deployment Plans Program, the ITS Deployment Plan for the Corpus Christi Region, as well as an overview of some of the key features and stakeholders in the Corpus Christi Region.

Section 2 – Prioritization of Market Packages

Section 2 contains the prioritized market packages for the Corpus Christi 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 Planned Projects

Project recommendations have been developed for the Corpus Christi Region to provide an incremental, phased build-out of the Region's ITS. These projects are categorized into 5, 10, and 20-year deployment timeframes. Each project recommendation includes a brief description, responsible agency, associated market packages, pre-requisite projects or systems, and an estimate of probable cost. These recommendations took into consideration existing as well as planned ITS deployments in the Corpus Christi Region.

Section 4 – Maintaining the Regional ITS Architecture and Deployment Plan

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

1.3 The Corpus Christi Region

1.3.1 Geography and Regional Characteristics

The Corpus Christi Region is bordered by the Gulf of Mexico to the east, TxDOT Yoakum and San Antonio Districts to the north, the TxDOT Laredo District to the west, and the TxDOT Pharr District to the south. For the Corpus Christi Regional ITS Architecture and Deployment Plan, the study area included all ten counties that are a part of the TxDOT Corpus Christi District. In addition, the twelve county Coastal Bend Council of Governments (CBCOG) was also included in the study area. CBCOG includes eight counties that lie in the TxDOT Corpus Christi District and four counties that lie in other TxDOT Districts.

Counties included in the Corpus Christi Region are:

- Aransas;
- Bee;
- Brooks;
- Duval;
- Goliad;
- Jim Wells;
- Karnes;
- Kenedy;
- Kleberg;
- Live Oak;
- McMullen;
- Nueces;
- Refugio; and
- San Patricio.

TxDOT partners with local governments for roadway construction, maintenance, and traffic operations support. For cities with a population of less than 50,000, TxDOT is the responsible agency for on-system roadways. The City of Corpus Christi, with a population of 277,454, is the only city in the Region with a population that exceeds the TxDOT 50,000 threshold.

1.3.2 Transportation Infrastructure

The Corpus Christi Region has an extensive transportation infrastructure. The primary facilities include I-37, US 281, US 77, US 183, US 181, US 59, the Port of Corpus Christi, and the Corpus Christi International Airport.

One of the most heavily traveled truck routes in southern Texas is the I-37 corridor. I-37 is a north/south, four-lane divided interstate highway, and within the City of Corpus Christi,

this roadway expands to six lanes. The effective operation of this highway is critical to the movement of goods and people to the Port of Corpus Christi from San Antonio. I-37 extends only from San Antonio to Corpus Christi. Given the rural setting for most of I-37 outside these two cities and the relatively short distance (143 miles), overnight facilities are very limited. Knowing the road and travel conditions within this transportation corridor and having the ability to get this information to the motorist is an important element for this project. For example, if I-37 has been closed down 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.

1.3.3 Existing ITS in the Corpus Christi Region

Within the Corpus Christi Region there are currently several ITS programs that are underway or are planned for deployment. The TxDOT Corpus Christi District Office is planning to add a traffic management center (TMC) at the District Office. The TMC will use the Advanced Traffic Management System (ATMS) software being developed by the TxDOT Traffic Operations Division in Austin, and will integrate various field components into the center. Existing field components include dynamic message signs (DMS), closed circuit television (CCTV) cameras, video image vehicle detection systems (VIVDS) at intersections, weather detection, and highway advisory radio (HAR). More of these components, as well as detectors and lane control signals will be deployed as part of TxDOT's freeway management system.

The City of Corpus Christi operates closed loop signal systems and has a Traffic Operations Center (TOC) which it plans to expand. Signal preemption is used at intersections for emergency vehicles. The City also has a CCTV camera and uses VIVDS at intersections.

Automatic vehicle location (AVL) has been deployed by the Regional Transportation Authority (RTA) as well as the City of Corpus Christi Police and Fire/Emergency Medical Services (EMS) and the Nueces County Sheriff and Constable. The RTA uses AVL technology to provide bus location and determine route and schedule adherence. Additionally, the AVL has enabled the agency to implement Autonomous Dial-a-Ride Transit (ADART) for its para-transit and on-demand transit services. Use of the AVL technology for public safety agencies can quicken response time to incidents during emergencies.

1.3.4 Corpus Christi 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 Corpus Christi Region.

The following is a list of stakeholders in the Corpus Christi 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 Corpus Christi Regional ITS Architecture:

- City of Corpus Christi Fire Department;
- City of Corpus Christi Management Information Systems;
- City of Corpus Christi Office of Emergency Management;

- City of Corpus Christi Police Department;
- City of Corpus Christi Street Department;
- Coastal Bend Council of Governments;
- Corpus Christi Chamber of Commerce;
- Corpus Christi Metropolitan Planning Organization (MPO);
- FHWA Southern Resource Center;
- FHWA Texas Division;
- Local Emergency Planning Committee;
- Nueces County Emergency Management;
- Nueces County Public Works;
- Port of Corpus Christi;
- Regional Transportation Authority;
- Texas Department of Public Safety;
- TxDOT Corpus Christi District;
- TxDOT Traffic Operations Division (Austin); and
- US Coast Guard.

Key stakeholder agencies that are participating in the development of the Corpus Christi Regional ITS Deployment Plan are listed in **Table 1**.

Table 1 – Corpus Christi Stakeholder Agencies and Contacts

Stakeholder Agency	Key Contact	Address	Phone Number	E-mail
City of Corpus Christi	Andy Leal	P.O. Box 9277 Corpus Christi, Texas 78469	(361) 857-1940	andyl@ci.corpus-christi.tx.us
City of Corpus Christi Fire Department	Tod Gates	201 North Chaparral, Suite 300 Corpus Christi, Texas 78401	(361) 880-3932	gates22@juno.com
City of Corpus Christi MIS	Jim Russell	P.O. Box 9277 Corpus Christi, Texas 78469	(361) 880-3740	jim_r@ci.corpus-christi.tx.us
City of Corpus Christi Office of Emergency Management	Juan Ortiz	1201 Leopard Street Corpus Christi, Texas 78469	(361) 880-3700	juano@ci.corpus-christi.tx.us
City of Corpus Christi Police Department	Robert MacDonald	P.O. Box 9016 Corpus Christi, Texas 78469	(361) 886-2686	rfmacd@hotmail.com
City of Corpus Christi Police Department	Michael McKinney	P.O. Box 9016 Corpus Christi, Texas 78469	(361) 886-2802	mlm0380@hotmail.com
City of Corpus Christi Police Department	Don Nattinger	321 John Sartain Corpus Christi, Texas 78401	(361) 886-2686	d-natt@worldnet.att.net
City of Corpus Christi Police Department	Leonard Scott	P.O. Box 9016 Corpus Christi, Texas 78469	(361) 886-2746	leonard@ci.corpus-christi.tx.us
City of Corpus Christi Traffic Signals	Tony Salinas	P.O. Box 9277 Corpus Christi, Texas 78469	(361) 857-1610	tons@ci.corpus-christi.tx.us
Coastal Bend Council of Governments	Richard Bullock	2910 Leopard Street Corpus Christi, Texas 78469	(361) 883-5743	richard@cbcog98.org
Coastal Bend Council of Governments	Sonia Vasquez	2910 Leopard Street Corpus Christi, Texas 78469	(361) 883-5743	sonia@cbcog98.org
Corpus Christi MPO	Mohammad Farhan	1305 North Shoreline, Suite 310 Corpus Christi, Texas 78401	(361) 884-0687	mfarhan@swbell.net
Corpus Christi MPO	Muhammad Amin Ulkarim	1305 North Shoreline, Suite 310 Corpus Christi, Texas 78401	(361) 884-0687	amin_mpo@swbell.net
Federal Motor Carrier Administration	Rodney Baumgartner	826 Federal Building, Suite 865 300 East 8th Street Austin, Texas 78701	(512) 536-5980	rodney.baumgartner@fmcsa.dot.gov
FHWA Southern Resource Center	Daniel Grate, Jr.	61 Forsyth St., Suite 17T26 Atlanta, GA 30303-3104	(404) 562-3912	daniel.grate@fhwa.dot.gov
Local Emergency Planning Committee	Henry Gonzales	201 North Chaparral, Suite 300 Corpus Christi, Texas 78401	(361) 880-3960	henrygo@cctexas.com
Nueces County Public Works	Bill Roberts	901 Leopard, Suite 103 Corpus Christi, Texas 78401	(361) 888-0513	brobert@nueces.esc2.net
Port of Corpus Christi	Tony Alejandro	222 Power Street Corpus Christi, Texas 78401	(361) 885-6188	tony@pocca.com
Regional Transportation Authority	Eduardo Carrion	5658 Bear Lane Corpus Christi, Texas 78405	(361) 289-2712	ecarrion@ccrta.org
Regional Transportation Authority	Fred Haley	5658 Bear Lane Corpus Christi, Texas 78405	(361) 289-2712	fhaley@ccrta.org
Texas Department of Public Safety	Robert Haiyasoso	1922 South Padre Island Drive Corpus Christi, Texas 78416	(361) 698-5618	robert.haiyasoso@txdps.state.tx.us
Texas Transportation Institute	Russell Henk	2500 NW Loop 410, Suite 315 San Antonio, TX 78229	(210) 731-9938	r-henk@tamu.edu
TxDOT Corpus Christi District	Charlie Cardenas	1701 South Padre Island Drive Corpus Christi, Texas 78416	(361) 808-2381	jcarde1@dot.state.tx.us
TxDOT Corpus Christi District	Stephen Ndima	1701 South Padre Island Drive Corpus Christi, Texas 78416	(361) 808-2351	sndima@dot.state.tx.us

Table 1 – Corpus Christi Stakeholder Agencies and Contacts (continued)

Stakeholder Agency	Key Contact	Address	Phone Number	E-mail
TxDOT Corpus Christi District	Tony Parlamas	1701 South Padre Island Drive Corpus Christi, Texas 78416	(361) 808-2312	aparlama@dot.state.tx.us
TxDOT Corpus Christi District	Bill Randall	1701 South Padre Island Drive Corpus Christi, Texas 78416	(361) 808-2213	wrandall@dot.state.tx.us
TxDOT Corpus Christi District	Ismael Soto	1701 South Padre Island Drive Corpus Christi, Texas 78416	(361) 808-2225	isoto@dot.state.tx.us
TxDOT Public Transportation Division (Austin)	Ben Herr	125 East 11th Street Austin, Texas 78701-2483	(512) 416-2812	lherr@dot.state.tx.us
TxDOT Traffic Operations Division (Austin)	Clint Jumper	Attn: TRF-TM 125 East 11th Street Austin, Texas 78701-2483	(512) 416-2215	cjumper@dot.state.tx.us
TxDOT Traffic Operations Division (Austin)	Janie Light	Attn: TRF-TM 125 East 11th Street Austin, Texas 78701-2483	(512) 416-3258	jlight@dot.state.tx.us
U.S. Coast Guard	Thomas Hopkins	MSO Corpus Christi 555 North Carancahua Street, Suite 500 Corpus Christi, Texas 78478	(361) 888-3162	thopkins@msocorpuschristi.uscg.mill

2. PRIORITIZATION OF MARKET PACKAGES

2.1 Prioritization Process

Of the 75 available market packages in the National ITS Architecture, 35 were selected and customized for deployment in the Corpus Christi Region. A 36th market package, Emergency Response-Hurricane Preparation and Evacuation Coordination, which does not currently exist in the National ITS Architecture, was created for the Corpus Christi Region to address the needs of the stakeholders. 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 Corpus Christi Region. These priorities identified the key needs and services that are desired in the Corpus Christi 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 Corpus Christi 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 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 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, Information Service Provider (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 Corpus Christi 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 Corpus Christi Region

High Priority	Medium Priority	Low Priority
▪ Network Surveillance ▪ Surface Street Control ▪ Freeway Control ▪ Traffic Information Dissemination ▪ Regional Traffic Control ▪ Incident Management System ▪ Reversible Lane Management ▪ Road Weather Data Collection ▪ Weather Information Processing and Distribution ▪ Work Zone Management ▪ Maintenance and Construction Activity Coordination ▪ Transit Vehicle Tracking ▪ Transit Fixed-Route Operations ▪ Demand Response Transit Operations ▪ Transit Passenger and Fare Management ▪ Transit Traveler Information ▪ Broadcast Traveler Information ▪ Emergency Response ▪ Emergency Response – Hurricane Preparation and Evacuation Coordination ▪ ITS Data Warehouse	▪ Standard Railroad Grade Crossing ▪ Railroad Operations Coordination ▪ Work Zone Safety Monitoring ▪ Transit Security ▪ Transit Coordination ▪ Emergency Routing ▪ ITS Data Mart	▪ High Occupancy Vehicle (HOV) Lane Management ▪ Emissions Monitoring and Management ▪ Parking Facility Management ▪ Regional Parking Management ▪ Maintenance and Construction Vehicle Tracking ▪ Maintenance and Construction Vehicle Maintenance ▪ Roadway Maintenance and Construction ▪ ISP Route Guidance ▪ Mayday Support

2.2 High Priority Market Packages

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

Many of these high priority market packages have components that are in various stages of deployment and operation in the Corpus Christi Region; that is, there are already systems and technologies deployed to deliver some of these high priority services and functions. For example, the TxDOT Corpus Christi District has deployed surveillance cameras and dynamic message signs along selected freeway corridors which is a key component of the Freeway Control market package. Although these devices are in place, this market package is still listed as a high priority. There are additional capabilities and functionality as part of 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 Corpus Christi Region.

Stakeholders identified a need for a new market package for the Region to support evacuations, particularly for hurricane related evacuations. Although this market package is not defined in the National ITS Architecture, a customized market package (Emergency Evacuation/Hurricane Coordination) was developed and included in the high priorities.

Table 3 – High Priority Market Packages for the Corpus Christi Region

Network Surveillance (ATMS01)	**High Priority**
This market package includes traffic detectors, other surveillance equipment, the supporting field equipment, and wireline 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.	
Existing Infrastructure ▪ TxDOT CCTV Cameras ▪ TxDOT VIVDS ▪ City of Corpus Christi CCTV ▪ City of Corpus Christi VIVDS	**Agency** ▪ TxDOT ▪ City of Corpus Christi
Planned Projects ▪ TxDOT Traffic Management Center and Advanced Traffic Management System Implementation ▪ City of Corpus Christi VIVDS expansion ▪ TxDOT Phase 1 Freeway Management System (FMS) implementation ▪ TxDOT Phase 2 FMS Implementation ▪ TxDOT Phase 3 FMS Implementation ▪ Port Aransas Ferry Queue Management ▪ TxDOT Evacuation Route Instrumentation (US 77) ▪ City of Corpus Christi TOC/TxDOT TMC Fiber Connection ▪ City of Corpus Christi Flood Detection Stations ▪ TxDOT Closed Loop Signal System Expansion	
Additional Needs ▪ City of Corpus Christi TOC Expansion ▪ TxDOT Highway/Rail Intersection Warnings ▪ TxDOT Additional Phases of FMS Implementation ▪ TxDOT Evacuation Route Instrumentation Expansion ▪ City of Corpus Christi CCTV Camera Deployment ▪ City of Corpus Christi Highway/Rail Intersection Warnings ▪ TxDOT Flood Detection Stations ▪ City of Corpus Christi Closed Loop Signal System Expansion ▪ Naval Air Station and Coast Guard/TxDOT TMC Connection	

Table 3 – High Priority Market Packages for the Corpus Christi Region (continued)

Surface Street Control (ATMS03)	**High Priority**
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.	
Existing Infrastructure ▪ TxDOT Signal Interconnect at Diamond Interchanges ▪ City of Corpus Christi TOC ▪ City of Corpus Christi Traffic Signal System ▪ City of Corpus Christi Signal Pre-emption for Fire and Police ▪ City of Corpus Christi and TxDOT Corpus Christi pager-controlled school zone flashing signs	**Agency** ▪ TxDOT ▪ City of Corpus Christi
Planned Projects ▪ TxDOT TMC and ATMS Implementation ▪ City of Corpus Christi VIVDS expansion ▪ TxDOT Evacuation Route Instrumentation (US 77) ▪ City of Corpus Christi TOC/TxDOT TMC Fiber Connection ▪ TxDOT Closed Loop Signal System Expansion	
Additional Needs ▪ City of Corpus Christi TOC Expansion ▪ TxDOT Highway/Rail Intersection Warnings ▪ City of Corpus Christi Closed Loop Signal System Expansion ▪ City of Corpus Christi CCTV Camera Deployment ▪ City of Corpus Christi Highway/Rail Intersection Warnings ▪ City of Corpus Christi Emergency Vehicle Traffic Signal Preemption	

Table 3 – High Priority Market Packages for the Corpus Christi Region (continued)

Freeway Control (ATMS04)	**High Priority**
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.	
Existing Infrastructure ▪ TxDOT CCTV Cameras ▪ TxDOT DMS ▪ TxDOT Signal Interconnect at Diamond Interchanges	**Agency** ▪ TxDOT
Planned Projects ▪ TxDOT Phase 1 FMS implementation ▪ TxDOT Phase 2 FMS Implementation ▪ TxDOT Phase 3 FMS Implementation ▪ TxDOT TMC and ATMS implementation ▪ TxDOT Evacuation Route Instrumentation (US 77)	
Additional Needs ▪ City of Corpus Christi TOC Expansion ▪ TxDOT Additional Phases of FMS Implementation ▪ TxDOT Evacuation Route Instrumentation Expansion ▪ Regional 511 Advanced Travel Information System Server and Highway Condition Reporting System (HCRS) Enhancements	

Table 3 – High Priority Market Packages for the Corpus Christi Region (continued)

Traffic Information Dissemination (ATMS06)	**High Priority**
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. 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.	
Existing Infrastructure ▪ TxDOT DMS ▪ TxDOT Portable DMS ▪ TxDOT HAR	**Agency** ▪ TxDOT
Planned Projects ▪ TxDOT TMC and ATMS Implementation ▪ TxDOT Phase 1 FMS Implementation ▪ TxDOT Phase 2 FMS Implementation ▪ TxDOT Phase 3 FMS Implementation ▪ Port Aransas Ferry Queue Management ▪ TxDOT evacuation route instrumentation (US 77) ▪ City of Corpus Christi TOC/TxDOT TMC Fiber Connection ▪ Media Liaison and Coordination ▪ City of Corpus Christi EOC/TxDOT TMC Connection	
Additional Needs ▪ City of Corpus Christi TOC Expansion ▪ TxDOT Highway/Rail Intersection Warnings ▪ City of Corpus Christi Metrocomm/TxDOT TMC Connection ▪ TxDPS/TxDOT TMC Connection ▪ City of Corpus Christi Intranet Access to Video ▪ TxDOT Evacuation Route Instrumentation Expansion ▪ City of Corpus Christi CCTV Camera Deployment ▪ Regional 511 Advanced Travel Information System Server and HCRS Enhancements ▪ TxDOT Additional Phases of FMS Implementation ▪ RTA Connection to City of Corpus Christi TOC ▪ City of Corpus Christi Highway/Rail Intersection Warnings	

Table 3 – High Priority Market Packages for the Corpus Christi Region (continued)

Regional Traffic Control (ATMS07)	**High Priority**
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. At the request of stakeholders in the Corpus Christi Region, this market package was expanded to include coordination and information sharing with TxDOT Districts and neighboring cities impacted by evacuations inland.	
Existing Infrastructure	**Agency**
▪ City of Corpus Christi TOC	▪ City of Corpus Christi
Planned Projects	
▪ TxDOT Center-to-Center Communication (Statewide) ▪ TxDOT TMC and ATMS Implementation ▪ TxDOT Phase 3 FMS Implementation ▪ City of Corpus Christi TOC/TxDOT TMC Fiber Connection ▪ TxDOT Evacuation Route Instrumentation (US 77)	
Additional Needs	
▪ City of Corpus Christi TOC Expansion ▪ City of Corpus Christi Metrocomm/TxDOT TMC Connection ▪ TxDPS/TxDOT TMC Connection ▪ City of Corpus Christi Intranet Access to Video ▪ TxDOT Evacuation Route Instrumentation Expansion ▪ City of Corpus Christi CCTV Camera Deployment ▪ Regional 511 Advanced Travel Information System Server and HCRS Enhancements	

Table 3 – High Priority Market Packages for the Corpus Christi Region (continued)

Incident Management System (ATMS08)	**High Priority**
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 are collected and correlated by this market package to detect and verify incidents and implement an appropriate response. The response may include traffic control strategy modifications or resource coordination between center subsystems. The coordination with emergency management might be through a computer aided dispatch (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. Incident response also includes presentation of information to affected travelers using the Traffic Information Dissemination, Broadcast Traveler Information or Interactive Traveler Information market packages.	
Existing Infrastructure ▪ City of Corpus Christi EOC ▪ Corpus Christi Naval Air Stations EOC ▪ City of Corpus Christi TOC	**Agency** ▪ City of Corpus Christi ▪ US Navy
Planned Projects ▪ TxDOT freeway management system implementation Phase 1 and 2 ▪ TxDOT TMC and ATMS implementation ▪ TxDOT Center-to-Center Communication ▪ City of Corpus Christi EOC/TxDOT TMC Connection ▪ Port of Corpus Christi Security Center	
Additional Needs ▪ City of Corpus Christi Metrocomm/TxDOT TMC Connection ▪ TxDPS/TxDOT TMC Connection ▪ Inter-agency Common Radio Frequency and System Expansion ▪ TxDPS Computer Aided Dispatch (CAD) ▪ Regional 511 Advanced Travel Information System Server and HCRS Enhancements ▪ Port of Corpus Christi Harbor Master's Office Traffic Management ▪ Port of Corpus Christi Harbor Master's Office/Port of Corpus Christi Security Center Fiber Connection	

Table 3 – High Priority Market Packages for the Corpus Christi Region (continued)

Reversible Lane Management (ATMS18)	**High Priority**
This market package provides for the management of reversible lane facilities. In addition to standard surveillance capabilities, this market package includes sensory functions that detect wrong-way vehicles and other special surveillance capabilities that mitigate safety hazards associated with reversible lanes. The package includes the field equipment, physical lane access controls, and associated control electronics that manage and control these special lanes. This market package also includes the equipment used to electronically reconfigure intersections and manage right-of-way to address dynamic demand changes and special events.	
Existing Infrastructure None Identified at this time	**Agency** Not applicable
Planned Projects ▪ TxDOT Phase 1 FMS implementation ▪ TxDOT Phase 2 FMS Implementation	
Additional Needs None identified at this time	

Road Weather Data Collection (MC03)	**High Priority**
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.	
Existing Infrastructure ▪ Texas Coastal Weather Sensors (non-roadway)	**Agency** ▪ TCOON/TAMU
Planned Projects ▪ TxDOT TMC and ATMS Implementation ▪ City of Corpus Christi Flood Detection Stations	
Additional Needs ▪ TxDOT Flood Detection Stations ▪ City of Corpus Christi TOC Expansion	

Table 3 – High Priority Market Packages for the Corpus Christi Region (continued)

Weather Information Processing and Distribution (MC04)	**High Priority**
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 decision 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.	
Existing Infrastructure None identified at this time	**Agency**
Planned Projects ▪ TxDOT TMC and ATMS Implementation ▪ TxDOT Center-to-Center Communication ▪ City of Corpus Christi TOC/TxDOT TMC Fiber Connection ▪ Media Liaison and Coordination ▪ City of Corpus Christi EOC/TxDOT TMC Connection ▪ City of Corpus Christi Flood Detection Stations	
Additional Needs ▪ City of Corpus Christi TOC Expansion ▪ TxDOT Flood Detection Stations	

Workzone Management (MC08)	**High Priority**
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.	
Existing Infrastructure ▪ TxDOT Portable DMS ▪ TxDOT CCTV Cameras	**Agency** ▪ TxDOT
Planned Projects ▪ TxDOT Phase 1 FMS Implementation ▪ TxDOT Phase 2 FMS Implementation ▪ TxDOT Center-to-Center Communication ▪ City of Corpus Christi TOC/TxDOT TMC Fiber Connection ▪ Media Liaison and Coordination	
Additional Needs ▪ TxDOT Workzone Speed Trailers	

Table 3 – High Priority Market Packages for the Corpus Christi Region (continued)

Maintenance and Construction Activity Coordination (MC10)	**High Priority**
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.	
Existing Infrastructure ▪ TxDOT Construction/Closure Information Web Site, phone system, and local media notification	**Agency** ▪ TxDOT
Planned Projects ▪ TxDOT Center-to-Center Communication ▪ City of Corpus Christi TOC/TxDOT TMC Fiber Connection	
Additional Needs ▪ Regional 511 Advanced Travel Information System Server and HCRS Enhancements ▪ Maintenance and Construction Vehicle AVL	

Transit Vehicle Tracking (APTS01)	**High Priority**
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.	
Existing Infrastructure ▪ RTA AVL	**Agency** ▪ RTA
Planned Projects None Identified at this time	
Additional Needs ▪ Rural Transit TOC with CAD System ▪ Rural Transit AVL and Mobile Data Terminals ▪ RTA Web-based Travel Data and Route Guidance ▪ ADART Phase 3	

Table 3 – High Priority Market Packages for the Corpus Christi Region (continued)

Transit Fixed-Route Operations (APTS02)	**High Priority**
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 at 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.	
Existing Infrastructure ▪ RTA AVL ▪ Autonomous Dial-A-Ride Transit (ADART)	**Agency** ▪ RTA
Planned Projects None Identified at this time	
Additional Needs ▪ Rural Transit TOC with CAD System ▪ Rural Transit AVL and Mobile Data Terminals ▪ RTA Web-based Travel Data and Route Guidance ▪ RTA Electronic Fare Payment ▪ RTA Connection to City of Corpus Christi TOC ▪ RTA Transit Traveler Information	

Table 3 – High Priority Market Packages for the Corpus Christi Region (continued)

Demand Response Transit Operations (APTS03)	**High Priority**
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 ISP Subsystem.	
Existing Infrastructure ▪ RTA AVL ▪ Autonomous Dial-A-Ride Transit (ADART)	**Agency** ▪ RTA
Planned Projects None Identified at this time	
Additional Needs ▪ Rural Transit TOC with CAD System ▪ Rural Transit AVL and Mobile Data Terminals ▪ RTA Web-based Travel Data and Route Guidance ▪ ADART Phase 3 ▪ RTA Electronic Fare Payment System ▪ Rural Transit Electronic Fare Collection ▪ RTA Connection to City of Corpus Christi TOC ▪ Rural Transit Traveler Information System/Travel Data and Route Guidance ▪ RTA Transit Traveler Information	

Table 3 – High Priority Market Packages for the Corpus Christi Region (continued)

Transit Passenger and Fare Management (APTS04)	**High Priority**
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.	
Existing Infrastructure None identified at this time	**Agency**
Planned Projects None identified at this time	
Additional Needs ▪ RTA Electronic Fare Payment System ▪ Rural Transit Electronic Fare Collection ▪ Rural Transit Automatic Passenger Counters	

Transit Traveler Information (APTS08)	**High Priority**
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.	
Existing Infrastructure ▪ Phone-based Traveler Information (static schedules)	**Agency** ▪ RTA
Planned Projects None Identified at this time	
Additional Needs ▪ Rural Transit AVL and Mobile Data Terminals ▪ RTA Real-time Bus Information Travel Kiosks ▪ RTA Web-based Travel Data and Route Guidance ▪ RTA Connection to City of Corpus Christi TOC ▪ Rural Transit Traveler Information/Travel Data and Route Guidance ▪ RTA Transit Traveler Information	

Table 3 – High Priority Market Packages for the Corpus Christi Region (continued)

Broadcast Traveler Information (ATIS01)	**High Priority**
This market package collects traffic conditions, advisories, general public transportation, 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. 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.	
Existing Infrastructure ▪ Media Broadcast Emergency Warning System ▪ Emergency Alert System ▪ 911- call-out	**Agency** ▪ Private Sector Radio and Television Stations ▪ MetroComm
Planned Projects ▪ TxDOT TMS and ATMS Implementation ▪ TxDOT Phase 1 FMS Implementation ▪ TxDOT Phase 2 FMS Implementation ▪ TxDOT Phase 3 FMS Implementation ▪ TxDOT Evacuation Route Instrumentation (US 77) ▪ Media Liaison and Coordination	
Additional Needs ▪ City of Corpus Christi TOC Expansion ▪ City of Corpus Christi Intranet Access to Video ▪ TxDOT Evacuation Route Instrumentation Expansion ▪ City of Corpus Christi CCTV Camera Deployment ▪ Regional 511 Advanced Travel Information System Server and HCRS Enhancements ▪ RTA Connection to City of Corpus Christi TOC ▪ TxDOT Additional Phases of FMS Implementation ▪ ISP-Based Route Guidance	

Table 3 – High Priority Market Packages for the Corpus Christi Region (continued)

Emergency Response (EM01)	**High Priority**
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.	
Existing Infrastructure ▪ Two-way radio communication between DPS Dispatch and Highway Patrol Vehicles ▪ City of Corpus Christi Police AVL, CAD Dispatch and Mobile Data Terminals ▪ City of Corpus Christi Fire AVL and CAD Dispatch ▪ Christus Spohn EMS CAD Dispatch and Mobile Data Terminals	**Agency** ▪ TxDPS ▪ City of Corpus Christi ▪ Christus Spohn Health System ▪ Refinery Terminal Fire Company ▪ Private Ambulance ▪ Halo Flight
Planned Projects ▪ Port of Corpus Christi Security Center	
Additional Needs ▪ Hospital-to-Hospital Communications ▪ Corpus Christi EOC/Hospitals Communications ▪ Metrocomm Information to Mobile Command Vehicles ▪ Inter-agency Common Radio Frequency and System Expansion ▪ TxDPS CAD ▪ Additional Agency Connections to TxDOT TMC ▪ Lifelink System ▪ Port of Corpus Christi Harbor Master's Office Traffic Management ▪ Port of Corpus Christi Harbor Master's Office/Port of Corpus Christi Security Center Fiber Connection	

Table 3 – High Priority Market Packages for the Corpus Christi Region (continued)

Emergency Response – Hurricane Preparation and Evacuation Coordination (Created for the Corpus Christi Region)	**High Priority**
This market package was requested by stakeholders in the Corpus Christi Region to address emergency evacuation and coordination needed due to hurricane evacuations. This market package draws upon resources deployed as part of the Network Surveillance, Freeway Control, Surface Street Control, Incident Management System, Emergency Response, Emergency Routing, and Traffic Information Dissemination market packages. As part of this market package, existing emergency response and notification strategies used by Metrocomm and local public safety entities would be enhanced through interconnections of key Traffic Management, Emergency Operations, and Dispatch Centers to coordinate emergency traffic routing plans and implement appropriate control and advisory strategies.	
Existing Infrastructure ▪ City of Corpus Christi EOC ▪ City of Corpus Christi Fire and Police Dispatch ▪ City of Corpus Christi TOC ▪ TxDOT TMC ▪ State EOC ▪ Naval Air Stations EOC ▪ Private Sector Radio/Television Emergency Broadcast Warning Systems	**Agency** ▪ City of Corpus Christi ▪ TxDOT ▪ Texas Department of Emergency Management ▪ TxDPS ▪ US Navy ▪ Counties ▪ Local News Media
Planned Projects ▪ TxDOT Center-To-Center Communications ▪ TxDOT Evacuation Route Instrumentation (US 77) ▪ TxDOT TMC and ATMS Implementation ▪ TxDOT Freeway Management System Implementation Phase 1 and 2 ▪ TxDOT Phase 3 FMS Implementation ▪ City of Corpus Christi TOC/TxDOT TMC Fiber Connection ▪ Media Liaison and Coordination ▪ City of Corpus Christi EOC/TxDOT TMC Connection ▪ Port of Corpus Christi Security Center	
Additional Needs ▪ City of Corpus Christi TOC Expansion ▪ City of Corpus Christi Metrocomm/TxDOT TMC Connection ▪ TxDPS/TxDOT TMC Connection ▪ Incident Detour Plans ▪ City of Corpus Christi Intranet Access to Video ▪ Inter-agency Common Radio Frequency and System Expansion ▪ TxDOT Evacuation Route Instrumentation Expansion ▪ City of Corpus Christi CCTV Camera Deployment ▪ TxDOT Additional Phases of FMS Implementation	

Table 3 – High Priority Market Packages for the Corpus Christi Region (continued)

ITS Data Warehouse (AD02)	**High Priority**
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.	
Existing Infrastructure ▪ Property Information Data Warehouse	**Agency** ▪ City of Corpus Christi and Nueces County
Planned Projects None Identified at this time	
Additional Needs ▪ ITS Data Warehouse	

2.3 Medium Priority Market Packages

Table 4 outlines market packages that were deemed medium priority by stakeholders in the Corpus Christi 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 are planned over the next few years. The feasibility of funding for these market packages also was a factor in the prioritization as was the availability and maturity of technology.

Table 4 – Medium Priority Market Packages for the Corpus Christi Region

Standard Railroad Grade Crossing/ Railroad Operations Coordination (ATMS13/ATMS15)	**Medium Priority**
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. 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. 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.	
Existing Infrastructure None identified at this time	**Agency**
Planned Projects None identified at this time	
Additional Needs ▪ TxDOT Highway/Rail Intersection Warnings ▪ City of Corpus Christi Highway/Rail Intersection Warnings	

Table 4 – Medium Priority Market Packages for the Corpus Christi Region (continued)

Work Zone Safety Monitoring (MC09)	**Medium Priority**
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. 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).	
Existing Infrastructure None identified at this time	**Agency**
Planned Projects None identified at this time	
Additional Needs ▪ TxDOT Work Zone Safety Monitoring	

Transit Security (APTS05)	**Medium Priority**
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. 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.	
Existing Infrastructure None identified at this time	**Agency**
Planned Projects None identified at this time	
Additional Needs ▪ RTA On-board Transit Security Cameras ▪ RTA On-board Security Cameras Expansion ▪ RTA Transfer Station Security Cameras ▪ Rural Transit On-board Video Security System	

Table 4 – Medium Priority Market Packages for the Corpus Christi Region (continued)

Multi-modal Coordination (APTS07)	**Medium Priority**
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.	
Existing Infrastructure ▪ Transit priority at signals	**Agency** ▪ City of Corpus Christi/RTA
Planned Projects None identified at this time	
Additional Needs ▪ RTA Connection to City of Corpus Christi TOC	

Table 4 – Medium Priority Market Packages for the Corpus Christi Region (continued)

Emergency Routing (EM02)	**Medium Priority**
This market package supports automated vehicle location and dynamic routing of emergency vehicles. The service also supports coordination with the Traffic Management Subsystem, collecting detailed road network conditions and requesting special priority or other specific emergency traffic control strategies on the selected route(s). The service provides for information exchange between care facilities and both the Emergency Management Subsystem and emergency vehicles.	
Existing Infrastructure ▪ TxDOT CCTV ▪ City of Corpus Christi Emergency Vehicle Signal Preemption	**Agency** ▪ TxDOT ▪ City of Corpus Christi
Planned Projects ▪ TxDOT Phase 1 FMS implementation ▪ TxDOT Phase 2 FMS implementation ▪ TxDOT Phase 3 FMS Implementation ▪ TxDOT Evacuation Route Instrumentation (US 77) ▪ City of Corpus Christi TOC/TxDOT TMC Fiber Connection ▪ City of Corpus Christi EOC/TxDOT TMC Connection	
Additional Needs ▪ TxDPS/TxDOT TMC Connection ▪ City of Corpus Christi Metrocomm/TxDOT TMC Connection ▪ Incident Detour Plans ▪ Hospital-to-Hospital Communications ▪ Corpus Christi EOC/Hospitals Communications ▪ Metrocomm Information to Mobile Command Vehicles ▪ TxDOT Evacuation Route Instrumentation Expansion ▪ City of Corpus Christi CCTV Camera Deployment ▪ Additional Agency Connections to TxDOT TMC ▪ TxDOT Additional Phases of FMS Implementation ▪ City of Corpus Christi Emergency Vehicle Traffic Signal Preemption ▪ Lifelink System	

Table 4 – Medium Priority Market Packages for the Corpus Christi Region (continued)

ITS Data Mart (AD01)	Medium Priority
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. 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.	
Existing Infrastructure ▪ Electronic data storage (7 days) ▪ Traffic Volumes/Counts Database ▪ TxDOT Crash Record Information System	**Agency** ▪ City of Corpus Christi/Nueces County/RTA ▪ TxDOT (Austin) – Provided to Corpus Christi District
Planned Projects ▪ TxDOT TMC and ATMS Implementation	
Additional Needs ▪ City of Corpus Christi TOC Expansion	

2.4 Low Priority Market Packages

Nine market packages were identified and customized for the Corpus Christi Region, but 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. Stakeholders also did not want to preclude these market packages from future deployment in the Region, so it was decided to keep these market packages as part of the Regional ITS Architecture.

Some of these market packages were identified as candidates for private sector deployment and operations, including the ISP-Based Route Guidance and Mayday Support. Other market packages might be more feasible for future implementation, such as Parking Facility Management. Another market package, HOV Lane Management, is not as likely to be useful in the near term; however, with the growth in congestion in the Corpus Christi area expected to continue, the feasibility of HOV lanes and HOV Lane Management should be reviewed in the future.

Table 5 – Low Priority Market Packages for the Corpus Christi Region

Market Package Name	Description	Comments
HOV Lane Management (ATMS02)	This market package manages HOV lanes by coordinating freeway ramp meters and connector signals with HOV lane usage signals. Preferential treatment is given to HOV lanes using special bypasses, reserved lanes, and exclusive rights-of-way that may vary by time of day. Vehicle occupancy detectors may be installed to verify HOV compliance and to notify enforcement agencies of violators.	As plans for HOV facilities come to fruition in the Corpus Christi Region, this market package may increase in its priority.
Emissions Monitoring and Management (ATMS11)	This market package monitors individual vehicle emissions and provides general air quality monitoring using distributed sensors to collect the data. The collected information is transmitted to the emissions management subsystem for processing. Both area wide air quality monitoring and point emissions monitoring are supported by this market package. For area wide monitoring, this market package measures air quality, identifies sectors that are non-compliant with air quality standards, and collects, stores, and reports supporting statistical data. For point emissions monitoring, this market package measures tail pope emissions and identifies vehicles that exceed emissions standards. The gathered information can be used to implement environmentally sensitive time division multiplexing (TDM) programs, policies, and regulations.	Although the Corpus Christi Region is not currently a non-attainment area for air quality, the stakeholders realize the importance of maintaining that status. While projects satisfying the requirements of this market package are not expected to be completed in the near term, this market package should remain in the Region's architecture.

Table 5 – Low Priority Market Packages for the Corpus Christi Region (continued)

Market Package Name	Description	Comments
Parking Facility Management (ATMS16)	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.	Deployment of this market package will be limited to facility-specific parking operators (i.e., parking lots/garages in central business districts, major event venues, airports). Information gathered would support parking guidance and information systems' components of Advanced Travel Information System (ATIS). This market package was included in the architecture because of the planned construction of the Bayfront Arena.
Regional Parking Management (ATMS17)	This market package supports coordination between parking facilities to enable regional parking management strategies.	Regional parking management allows coordination between multiple parking facilities and provide information to visitors on available parking. This market package would be deployed at the same time or after deployment of parking facility management (ATMS16).
Maintenance and Construction Vehicle Tracking (MC01)	This market package will track the location of maintenance and construction 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 was not identified as needed for the Corpus Christi Region at this time. However it was expected that the information from Maintenance and Construction Vehicle Tracking may be useful to the Region some time in future if these activities were to become more automated. Included in this market package would be instrumentation of maintenance and construction vehicles with AVL.
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.	The Corpus Christi Region did not have a need for this market package based on the current state of technology. As technology evolves, the Region may consider implementation in the future.

Table 5 – Low Priority Market Packages for the Corpus Christi Region (continued)

Market Package Name	Description	Comments
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, routine maintenance activities, and repair and maintenance of both ITS and non-ITS equipment on the roadway. Environmental conditions information is also received from various weather sources to aid in scheduling maintenance and construction activities.	The Corpus Christi Region may consider this market package as a future deployment to assist with maintenance functions.
ISP-Based Route Guidance (ATIS06)	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. 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 best suited for deployment and ongoing operations by a private sector ISP. Fee-based subscription services are typically required for delivery of this service. Because this market package is deemed a private sector initiative, it is not recommended that the public sector play a significant role, other than as a data provider to private ISPs.
Mayday Support (EM03)	This market package allows the user (driver or non-driver) to initiate a request for emergency assistance and enables the Emergency Management Subsystem to locate the user and determine the appropriate response. This market package also includes general surveillance capabilities that enable the Emergency Management Subsystem to remotely monitor public areas (e.g., rest stops, parking lots) to improve security in these areas. The Emergency Management Subsystem may be operated by the public sector or by a private sector provider. The request from the traveler needing assistance may be manually initiated or automated and linked to vehicle sensors. The surveillance data and any requests for assistance are sent to the Emergency Management subsystem using both data and voice communications.	This market package is best suited for deployment and ongoing operations by a private sector ISP. Fee-based subscription services are typically required for delivery of this service.

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 in the deployment of those projects 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 every mile 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 Corpus Christi Region on September 4, 2002 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. For example, the City of Corpus Christi Fire Department may provide funding for arterial signal preemption within the City of Corpus Christi, but the City of Corpus Christi Street Services will operate and maintain the signals.

Following each table, a more detailed description of individual projects is included. This section also includes the market packages associated with the 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 Corpus Christi 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
Travel and Traffic Management					
TxDOT TMC and ATMS Implementation	Expand current TxDOT Corpus Christi TMC and implement TxDOT ATMS	TxDOT	N/A	Yes	2 years
TxDOT Phase 1 Freeway Management System Implementation	Implement nine CCTV cameras and nine DMS in the Corpus Christi Region (three at the South Padre Island Drive [SPID]/Crosstown Interchange, two on JFK, two on US 181 and two on US 77)	TxDOT	$1,350,000	Yes	2 years
TxDOT Phase 2 Freeway Management System Implementation	Instrument remaining SPID corridor with CCTV cameras, DMS, detectors, and lane control signals	TxDOT	$2,000,000	Yes	3 years
TxDOT Evacuation Route Instrumentation (US 77)	Connect existing fiber to VIVDS along US 77 in Refugio, bring video feed back to TxDOT TMC via Northside TxDOT Maintenance Office, and deploy DMS on I-37	TxDOT	$250,000	Yes	1 year
TxDOT Center-to-Center Communication (Statewide)	Enhance coordination with other TxDOT Districts through implementation of center-to-center communications between each TxDOT TMC	TxDOT	N/A	Yes	1 year
Port Aransas Ferry Queue Management	Implement four CCTV cameras and four DMS around the Port Aransas Ferry. CCTV cameras will monitor queue lengths and wait times. This information will be automatically displayed on DMS signs with interaction from the TxDOT Corpus Christi TMC and provided on TxDOT's internet site. A communications connection will be established with the Port Aransas Ferry Managers Office.	TxDOT/Port Aransas Ferry	$2,135,000	Yes	6 months
City of Corpus Christi TOC/TxDOT TMC Fiber Connection	Implement a fiber connection between the City of Corpus Christi TOC and the TxDOT TMC to allow video sharing and control, traffic data sharing, and other joint functions	TxDOT/City of Corpus Christi Street Services	$100,000	Yes	1 year

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

Program Area/Project	Description	Responsible Agency*	Probable Cost**	Funding Identified	Estimated Project Duration
Travel and Traffic Management (continued)					
City of Corpus Christi Closed Loop Signal System Expansion	Expand City of Corpus Christi closed loop signal system on signalized intersections in City of Corpus Christi	City of Corpus Christi Street Services	$600,000	No	2 years
City of Corpus Christi VIVDS Expansion	Implement VIVDS on additional 12 signalized intersections in Corpus Christi	City of Corpus Christi Street Services	$240,000	Yes	6 months
City of Corpus Christi TOC Expansion	Implement end equipment to allow video feed and control for VIVDS and CCTV camera pan/tilt/zoom (PTZ) at TOC	City of Corpus Christi Street Services	$50,000	No	6 months
Media Liaison and Coordination	Develop agreements/enhanced coordination with local media to improve information sharing and dissemination. Provide CCTV camera feeds to media.	TxDOT/City of Corpus Christi Street Services/Metrocomm	N/A	N/A	6 months
TxDOT Highway/Rail Intersection Warnings	Implement warning system to alert drivers of approaching trains and expected wait times	TxDOT/Railroad operators	$500,000	No	2 years
Emergency Management					
City of Corpus Christi EOC/TxDOT TMC Connection	Install connection between City of Corpus Christi EOC and TxDOT TMC to allow for CCTV camera and DMS shared monitoring and control, data sharing, and weather sensor data sharing	City of Corpus Christi EOC/TxDOT	$40,000	No (Goal is to use earmark funding if possible)	6 months
City of Corpus Christi Metrocomm/TxDOT TMC Connection	Install connection between City of Corpus Christi Police and TxDOT TMC for CCTV camera shared monitoring and control and data sharing (The opinion of probable cost does not include additional fiber, if necessary)	TxDOT/City of Corpus Christi Police	$30,000	No	3 months
TxDPS/TxDOT TMC Connection	Install connection between TxDPS and TxDOT TMC for CCTV camera shared monitoring and control and data sharing	TxDOT/TxDPS	$230,000	No	3 months

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

Program Area/Project	Description	Responsible Agency*	Probable Cost**	Funding Identified	Estimated Project Duration
Emergency Management (continued)					
Naval Air Station and Coast Guard/TxDOT TMC Connection	Connection of Naval Air Station and Coast Guard to TxDOT TMC, and deployment of CCTV cameras along inland waterways	TxDOT/NAS/Coast Guard	$250,000	No	1 year
Incident Detour Plans	Develop incident detour plans for interstate, state, and local routes and arterials	TxDOT/TxDPS/City of Corpus Christi Street Services/Counties	$100,000	No	1 year
City of Corpus Christi EOC/Hospitals Communications	Install connection between regional hospitals and City of Corpus Christi EOC	Christus Spohn Health System/Hospitals/EOC	$100,000	No	6 months
Hospital to Hospital Communications	Install connection between regional hospitals to share information regarding hospital status	Regional Hospitals	$100,000	No	1 year
City of Corpus Christi Intranet Access to Video	Provide access to CCTV camera video feeds and possible control via City intranet to Corpus Christi Police, Fire, EMS, and EOC (Project costs do not include network expansion, if necessary)	City of Corpus Christi MIS	$50,000	No	3 months
Metrocomm Information to Mobile Command Vehicles	Provide direct video feeds to mobile command vehicles working the scene of major incidents	Metrocomm	$250,000	No	1.5 years
Inter-Agency Common Radio Frequency and System Expansion	Implement common radio frequency by multiple agencies and expand system to Kleberg and San Patricio Counties (San Patricio County has funding)	TxDOT/City of Corpus Christi/County/TxDPS	$2,000,000	Partial (San Patricio County has funding)	2 years
TxDPS CAD	Implement CAD system for TxDPS	TxDPS	$500,000	No	6 months
Port of Corpus Christi Security Center	Installation of CCTV cameras and lighting along the Inner Harbor west of the Harbor Bridge, including video feed and control provided to the Port of Corpus Christi Security Center	Port of Corpus Christi	$3,300,000	Yes	1 year

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

Program Area/Project	Description	Responsible Agency*	Probable Cost**	Funding Identified	Estimated Project Duration
Maintenance and Construction Operations					
TxDOT Work Zone Speed Trailers	Procure 10 work zone speed trailers for use by TxDOT maintenance crews	TxDOT	$170,000	No	3 months
City of Corpus Christi Flood Detection Stations	Implement flood detection stations at arterial street locations prone to flooding	City of Corpus Christi Stormwater/EOC	$100,000	Yes	6 months
Public Transportation Management					
Rural Transit TOC with CAD System	Hardware and software applications to optimize route and schedule planning used in a TOC for routine and emergency operations	Bee CAA, Kleberg County, San Patricio CAA, REAL Inc.	$400,000 ($100,000 for 4 agencies)	No	6 months
Rural Transit Automatic Vehicle Locator and Mobile Data Terminals	Transit vehicle mounted devices provide voice and/or digital communications and location information between the vehicle and the operations center	Bee CAA, Kleberg County, San Patricio CAA, REAL Inc.	$620,000 ($10,000 x 62 buses)	No	6 months
RTA On-board Transit Security Cameras	Install security cameras on RTA fixed route buses and paratransit vehicles	RTA	$500,000	No	6 months
RTA Transfer Station Security Cameras	Install security cameras at RTA transfer stations (three stations remain that need security cameras)	RTA	$50,000	No	9 months
RTA Real-time Bus Information Travel Kiosks	Provide real-time bus information at RTA transfer stations (three remaining stations) including time to next bus, and install communication to dispatch	RTA	$50,000 + (Does not include communication)	No	9 months
RTA Web-based Travel Data and Route Guidance	Provide real-time travel data and route guidance via the internet	RTA	$100,000	No	3 months
ADART Phase 3	Expand ADART service to entire fleet for demand responsive transit	RTA	$1,000,000	Yes	2 years

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

Program Area/Project	Description	Responsible Agency*	Probable Cost**	Funding Identified	Estimated Project Duration
Information Management					
ITS Data Warehouse	Expand joint City/County/RTA data warehouse to include automated archival of data from City of Corpus Christi TOC, Nueces County, RTA and TxDOT TMC	Corpus Christi MPO/Coastal Bend COG	$200,000	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.

Travel and Traffic Management

TxDOT Traffic Management Center and Advanced Traffic Management System Implementation

Associated Market Packages:

- ITS Data Mart (AD1)
- Network Surveillance (ATMS01)
- Surface Street Control (ATMS03)
- Freeway Control (ATMS04)
- Traffic Information Dissemination (ATMS06)
- Regional Traffic Control (ATMS07)
- Incident Management System (ATMS08)
- Broadcast Traveler Information (ATIS01)
- Emergency Response – Hurricane Preparation and Evacuation Coordination (created for the Corpus Christi Region)
- Road Weather Data Collection (MC03)
- Weather Information Processing and Distribution (MC04)

Prerequisite Projects: Implemented concurrently with TxDOT Phase 1 FMS Implementation

Description: Currently, the TxDOT Corpus Christi TMC exists as a facility that only controls traffic signals and has feedback to the center from traffic signal controllers. This project includes the expansion of this facility to include control of DMS, CCTV cameras and other TxDOT field equipment.

The TxDOT ATMS is a software and hardware based platform developed by the TxDOT Traffic Operations Division. The function of this software is to provide a platform for the 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 a loops, video image detection, etc.;
- Data archiving;
- Graphical map with traffic information;
- Status information, command and control for DMS, ramp metering and CCTV;
- 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 HAR and environmental sensors (such as RWIS or flood detection systems). An integrated maintenance database management module is also under development. Lastly, several modules are currently being upgraded to support recently approved National Transportation Communications for ITS Protocol (NTCIP) standards for CCTV, Center-to-Center (C2C) 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.

TxDOT Phase 1 Freeway Management System Implementation

Associated Market Packages:

- Network Surveillance (ATMS01)
- Freeway Control (ATMS04)
- Traffic Information Dissemination (ATMS06)
- Incident Management System (ATMS08)
- Reversible Lane Management (ATMS18)
- Work Zone Management (MC08)
- Broadcast Traveler Information (ATIS01)
- Emergency Response – Hurricane Preparation and Evacuation Coordination (created for the Corpus Christi Region)
- Emergency Routing (EM2)

Prerequisite Projects: Implemented concurrently with TxDOT TMC and Advanced Traffic Management System Implementation.

Description: Phase 1 of the TxDOT FMS program in Corpus Christi is deploying nine CCTV cameras and nine DMS in the Corpus Christi Region. Additionally, the project will also include the deployment of HAR. The project will also install the communication infrastructure necessary to integrate the field devices with the ATMS at the Corpus Christi TxDOT TMC.

The cameras are strategically located at high accident and/or high traffic volume interchanges. Each camera will also be equipped with PTZ capabilities (zoom lenses provide a viewing range of one to one and one-half miles). Full-duplex communications to all cameras will be accommodated through ISDN dial-up telephone lines. The locations of cameras being deployed as part of Phase 1 are as follows: three at the SPID/Crosstown Interchange, two along JFK, two along US 181 and two along US 77.

TxDOT will utilize DMS primarily to alert motorists of severe weather and/or roadway conditions and also to display Amber Alert messages. In addition to conditions within the Corpus Christi Region, roadway conditions on major evacuation routes will be disseminated to motorists via the DMS (and future HAR). DMS are being installed along the SPID, Crosstown, and JFK at critical decision making points such that motorists can alter their path, if necessary.

This project is currently under construction and is planned to be completed in 2004 at an estimated cost of $1,350,000.

TxDOT Phase 2 Freeway Management System Implementation

Associated Market Packages:

- Network Surveillance (ATMS01)
- Freeway Control (ATMS04)
- Traffic Information Dissemination (ATMS06)
- Incident Management System (ATMS08)
- Reversible Lane Management (ATMS18)
- Work Zone Management (MC08)
- Broadcast Traveler Information (ATIS01)
- Emergency Response – Hurricane Preparation and Evacuation Coordination (created for the Corpus Christi Region)
- Emergency Routing (EM2)

Prerequisite Projects: TxDOT TMC and ATMS Implementation, TxDOT Phase 1 FMS Implementation

Description: Phase 2 of the TxDOT ITS will implement additional CCTV cameras and DMS, as well as traffic detectors, lane controls, and HAR transmitters along the SPID corridor in the Corpus Christi Region. The traffic detectors are expected to be inductive loops, which will add the capability of real-time vehicle detection at high accident and/or high traffic volume segments along SPID. HAR will allow operators at the Corpus Christi 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. Phase 2 is only partially funded at this time but has not been included on the three-year letting schedule.

TxDOT Evacuation Route Instrumentation (US 77)

Associated Market Packages:

- Network Surveillance (ATMS01)
- Surface Street Control (ATMS03)
- Freeway Control (ATMS04)
- Traffic Information Dissemination (ATMS06)
- Regional Traffic Control (ATMS07)
- Broadcast Traveler Information (ATIS01)
- Emergency Response – Hurricane Preparation and Evacuation Coordination (created for the Corpus Christi Region)
- Emergency Routing (EM2)
- Network Surveillance (ATMS01)
- Surface Street Control (ATMS03)

Prerequisite Projects: TxDOT TMC and ATMS Implementation

Description: US 77 has been identified as an emergency evacuation route in the Corpus Christi Region for hurricane evacuations or other emergencies. Currently, VIVDs is installed at intersections along US 77 in Refugio. This project will be to connect the existing fiber to the VIVDs along US 77 and terminate the fiber at the TxDOT Northside Maintenance Office. The video images from the VIVDs can then be

viewed from the TxDOT TMC. Additionally, as part of this project, a DMS will be installed on I-37 prior to the exit for US 77 to alert motorists of roadway conditions along US 77.

Funding is currently available for this project. The duration is expected to be one year.

TxDOT Center-to-Center Communication (Statewide)

Associated Market Packages:

- Regional Traffic Control and Coordination (ATMS07)
- Incident Management System (ATMS08)
- Weather Information Processing and Distribution (MC04)
- Work Zone Management (MC08)
- Maintenance and Construction Activity Coordination (MC10)
- Emergency Response – Hurricane Preparation and Evacuation Coordination (created for the Corpus Christi Region)

Prerequisite Projects: TxDOT TMC and ATMS Implementation

Description: The Center-to-Center Communications project is a logical extension of the TxDOT ATMS and field equipment deployments. The project will enhance coordination with TxDOT Districts (and potentially other agencies) through connection to the statewide C2C core infrastructure. A communication backbone must be developed with sufficient capacity between the TxDOT Corpus Christi TMC and existing C2C infrastructure. Determination of whether the backbone should be TxDOT owned, leased, or a combination thereof, should be coordinated with the Corpus Christi Regional Communications Master Plan that is currently under way. The software required to support C2C 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 Corpus Christi TMC and statewide C2C facilities. As part of connecting to the statewide C2C infrastructure, the Corpus Christi District 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.

Port Aransas Ferry Queue Management

Associated Market Packages:

- Network Surveillance (ATMS01)
- Traffic Information Dissemination (ATMS06)

Prerequisite Projects: TxDOT TMC and ATMS Implementation

Description: At the Port Aransas Ferry loading point, TxDOT currently operates CCTV cameras and has deployed a portable DMS. This project includes the monitoring of the queue lengths at the ferry through the use of the CCTV cameras. Four additional cameras and four DMS signs will be installed as part of this project. The information gathered with the CCTV cameras will be processed at the TxDOT TMC and appropriate messages will be displayed on DMS signs, providing motorists with anticipated wait times. This information will also be provided via the TxDOT internet site.

As part of this project, a communications link will also be established between the TxDOT TMC and the Port Aransas Ferry Manager's Office. Funding is currently available for this project.

City of Corpus Christi TOC/TxDOT TMC Fiber Connection

Associated Market Packages:

- Network Surveillance (ATMS01)
- Surface Street Control (ATMS03)
- Traffic Information Dissemination (ATMS06)
- Regional Traffic Control and Coordination (ATMS07)
- Weather Information Processing and Distribution (MC04)
- Work Zone Management (MC08)
- Maintenance and Construction Activity Coordination (MC10)
- Emergency Routing (EM2)
- Emergency Response – Hurricane Preparation and Evacuation Coordination (created for the Corpus Christi Region)

Prerequisite Projects: TxDOT TMC and ATMS Implementation, TxDOT Phase 1 FMS Implementation, City of Corpus Christi TOC Expansion

Description: Implement a broadband, fiber-based connection between the City of Corpus Christi TOC on Hygeia Street and the TxDOT Corpus Christi TMC SPID to allow shared viewing of video, traffic information, and other mutually beneficial data. Shared monitoring and control capabilities provided through the connection could also allow for joint operations of City equipment (i.e., traffic signals) by TxDOT TMC staff, such as for after-hours or on weekends, if the TxDOT TMC serves as a 24/7 facility. Data/video sharing and other joint operation policies need to be developed and agreed upon between TxDOT and the City of Corpus Christi, preferably before final design of the systems begins, because some policies may have a direct impact on design strategies.

This project is key because it will directly impact several other projects and be a prerequisite project for many subsequent projects identified in this deployment plan. Funding for this project has been identified by TxDOT.

City of Corpus Christi Closed Loop Signal System Expansion

Associated Market Packages:

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

Prerequisite Projects: None

Description: Expand the closed loop signal system by converting existing signalized intersections to the closed-loop signal system. New signals that are installed as part of other projects will become part of the closed loop signal system. In the near future, the Corpus Christi Regional Communications Master Plan will be complete and will be useful in establishing locations and routing of communications infrastructure between traffic signals and the City of Corpus Christi TOC. Implementation of VIVDS is discussed in more detail under the VIVDS project description.

City of Corpus Christi Video Image Vehicle Detectors Expansion

Associated Market Packages:

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

Prerequisite Projects: VIVDS to be installed in conjunction with traffic signals

Description: Implement VIVDS at signalized intersections in Corpus Christi. VIVDS will provide Corpus Christi flexibility to determine traffic detector placement at signalized intersections by installing cameras and processors that can determine change in gray scale over a predetermined detection zone within the field of vision. Typically a camera is mounted at approximately 20-30 feet above the roadway and is positioned to look at oncoming vehicles. A processor is then connected to the traffic signal controller and as detection zones are activated, the controller recognizes the inputs as traditional induction loops. Many agencies operating closed loop signal systems install VIVDS and do not transport that data or video to a central location. As sufficient communications bandwidth becomes available at VIVDS field locations, both raw (without detection zones) and processed (with detection zones) video could be sent to the City of Corpus Christi TOC to provide information to support better operational decisions, enhanced traveler information, and improved signal maintenance. Another capability of VIVDS includes various alarm features. In addition to drawing vehicle detection zones in the camera field of vision, additional zones can be created and tied to alarms. For example, if a VIVDS was located near a high vandalism area, an alarm zone could be created to assist public safety officials in protecting public property.

The City of Corpus Christi has VIVDS at some of its signalized intersections. This project includes the implementation of VIVDS at twelve existing signalized intersections. As new signals are installed at currently unsignalized intersections, VIVDS will also be implemented. The city is implementing VIVDS at ten intersections, currently, and anticipates completion of this deployment in November of 2002.

City of Corpus Christi TOC Expansion

Associated Market Packages:

- ITS Data Mart (AD1)
- Network Surveillance (ATMS01)
- Surface Street Control (ATMS03)
- Freeway Control (ATMS04)
- Traffic Information Dissemination (ATMS06)
- Regional Traffic Control and Coordination (ATMS07)
- Broadcast Traveler Information (ATIS01)
- Emergency Response – Hurricane Preparation and Evacuation Coordination (created for the Corpus Christi Region)
- Road Weather Data Collection (MC03)
- Weather Information Processing and Distribution (MC04)

Prerequisite Projects: None

Description: This project includes the expansion of the capabilities of the Corpus Christi TOC. Currently, the City of Corpus Christi TOC is used primarily to monitor the operations of the controllers and detectors at signalized intersections. Additionally, VIVDS video images are not currently being transmitted to the TOC. The planned expansion of the TOC would include the implementation of end equipment to allow the transmission of the video feed from the VIVDS in the field back to the TOC. This project would also include the capabilities to control the VIVDS remotely from the TOC as well as control of the PTZ of the planned CCTV cameras to be located along city arterials.

Media Liaison and Coordination

Associated Market Packages:

- Traffic Information Dissemination (ATMS06)
- Broadcast Traveler Information (ATIS01)
- Weather Information Processing and Distribution (MC04)
- Work Zone Management (MC08)
- Emergency Response – Hurricane Preparation and Evacuation Coordination (created for the Corpus Christi Region)

Prerequisite Projects: TxDOT TMC and ATMS Implementation, TxDOT Phase 1 FMS Implementation

Description: Develop stronger liaison and coordination with local media to disseminate traveler information. Develop a link for local media to tap into CCTV camera images for dissemination of traffic and weather advisories to the public via television and radio news broadcasts. Most television and radio stations typically already have microwave licenses and infrastructure in place to support wireless transmission of video. Therefore, TxDOT should provide a connection point at the TMC for media providers (e.g., video switch including video images and traffic conditions map), but not design and install the entire connection between the TMC and the media. An initial task in the project will be to meet with interested news providers to determine information needs to support media interface design activities. It is possible that the media link could come through Metrocomm. Each agency that will be

sharing information directly with the media will likely need an agreement or policy in place to determine what type of information will be shared. A subgroup of the stakeholders will need to work on the process of sharing data with the media to attempt to provide similar data to the media from each individual stakeholder.

TxDOT Highway/Rail Intersection Warnings

Associated Market Packages:

- Network Surveillance (ATMS01)
- Surface Street Control (ATMS03)
- Traffic Information Dissemination (ATMS06)
- Standard Railroad Grade Crossing (ATMS13)
- Railroad Operations Coordination (ATMS15)

Prerequisite Projects: TxDOT TMC and ATMS Implementation

Description: This project will include highway/rail intersection warning systems that will alert motorists of arriving trains, amount of time the train will occupy the crossing, and the length of time a motorist can expect to be delayed. The deployment of instrumentation will be along TxDOT roadways at railroad grade crossings. Information will be gathered either directly from the railroad operators or from sensors placed along the railroad right-of-way that monitor train length and speed. Data will be transferred from the field sensors to the TxDOT TMC where operators can make decisions regarding changes in signal operations to facilitate flow around the closed crossing or to clear traffic once the train has passed the crossing.

Emergency Management

City of Corpus Christi Emergency Operation Center (EOC)/TxDOT TMC Connection

Associated Market Packages:

- Traffic Information Dissemination (ATMS06)
- Incident Management System (ATMS08)
- Weather Information Processing and Distribution (MC04)
- Emergency Routing (EM2)
- Emergency Response – Hurricane Preparation and Evacuation Coordination (created for the Corpus Christi Region)

Prerequisite Projects: TxDOT TMC and ATMS Implementation, TxDOT Phase 1 FMS Implementation, City of Corpus Christi TOC/TxDOT TMC Fiber Connection

Description: Install a telecommunications connection from the City of Corpus Christi EOC located in the Frost Bank Building to TxDOT TMC to share weather sensor, CCTV and DMS data. The connection will also provide information on current road conditions that could assist with incident/emergency management and evacuation routing. It would be beneficial to design this connection upon completion of the Corpus Christi Regional Communications Master Plan.

City of Corpus Christi Metrocomm/TxDOT TMC Connection

Associated Market Packages:

- Traffic Information Dissemination (ATMS06)
- Regional Traffic Control and Coordination (ATMS07)
- Incident Management System (ATMS08)
- Emergency Routing (EM02)
- Emergency Response – Hurricane Preparation and Evacuation Coordination (created for the Corpus Christi Region)

Prerequisite Projects: TxDOT TMC and ATMS Implementation, TxDOT Phase 1 FMS Implementation, City of Corpus Christi TOC/TxDOT TMC Fiber Connection

Description: Install a telecommunications connection from the City of Corpus Christi Metrocomm dispatch center to the TxDOT TMC to share weather sensor, CCTV and DMS data. The connection will also provide information on current road conditions that could assist with incident/emergency management. In addition to sharing data between the TMC and the Police Dispatch Center, it may be beneficial to extract incident location data as it is logged into the Corpus Christi CAD System. Software modifications will be required to develop the extraction of data from the Corpus Christ CAD. The connection of Metrocomm to the TxDOT TMC would also provide data to Corpus Christi fire dispatch as well as the Nueces County dispatch as they are dispatched from the same facility as Metrocomm. It would be beneficial to design this connection upon completion of the Corpus Christi Regional Communications Master Plan.

Note: It may be necessary to add fiber to the existing network to provide adequate capacity for the sharing of the aforementioned data. The addition of the fiber to this project will require a considerable increase in its cost.

TxDPS/TxDOT TMC Connection

Associated Market Packages:

- Traffic Information Dissemination (ATMS06)
- Regional Traffic Control and Coordination (ATMS07)
- Incident Management System (ATMS08)
- Emergency Routing (EM2)
- Emergency Response – Hurricane Preparation and Evacuation Coordination (created for the Corpus Christi Region)

Prerequisite Projects: TxDOT TMC and ATMS Implementation, TxDOT Phase 1 FMS Implementation

Description: Install telecommunications connection and end equipment from the TxDPS dispatch center to TxDOT TMC to share weather sensor, CCTV and DMS data. The connection will also provide information on current road conditions that could assist with incident/emergency management. This project will also include the installation of fiber as required to achieve this connection. It would be beneficial to design this connection upon completion of the Corpus Christi Regional Communications Master Plan.

Naval Air Station and Coast Guard/TxDOT TMC Connection

Associated Market Packages:

- Network Surveillance (ATMS01)

Prerequisite Projects: TxDOT TMC and ATMS Implementation

Description: This project would include the connection of the Navel Air Station and Coast Guard facilities to the TxDOT TMC, and the deployment of CCTV along inland waterways for security monitoring and for the monitoring of bridges across these roadways. The communication connection could be made either directly to the TxDOT TMC or to some point along the TxDOT fiber backbone. The inclusion of this project in the deployment plan provides opportunities for funding sources through Homeland Security funds.

Incident Detour Plans

Associated Market Packages:

- Emergency Routing (EM2)
- Emergency Response – Hurricane Preparation and Evacuation Coordination (created for the Corpus Christi Region)

Prerequisite Projects: None

Description: This project will identify detour routes for the interstate, state, and local arterials to be used during times of major incidents on the respective roadways. Once an incident has been detected and verified along an instrumented roadway, the Corpus Christi TOC or TxDOT TMC can post a message to a DMS along the subject roadway providing information not only on the incident (expected duration and delay) but also provide potential alternate routes. Additionally, if the detour routes are designated, the owning agency can provide alternate signal timing (from the typical timing plans) that will help move detoured traffic efficiently through the detour route.

City of Corpus Christi EOC/Hospitals Communications

Associated Market Packages:

- Emergency Response (EM1)
- Emergency Routing (EM2)

Prerequisite Projects: Hospital to Hospital Communications

Description: This project is to include the connections between the City of Corpus Christi EOC located at the Frost Bank Building and the regional hospitals. The intent of this project is to be able to ascertain the status of the various regional hospitals. Understanding the demand at a certain facility during a time of a major incident can help emergency dispatchers at the EOC direct medical care providers to the appropriate medical facilities.

Hospital-to-Hospital Communications

Associated Market Packages:

- Emergency Response (EM1)
- Emergency Routing (EM2)

Prerequisite Projects: None

Description: This project is intended to implement connections between regional hospitals for the sharing of data for day-to-day operations. The project will enable hospitals to communicate through an automated process their status and willingness to accept various types of injuries and will broadcast this information to the hospitals that will be most directly affected by it. This information, in turn, can be shared with public safety dispatch to more efficiently dispatch emergency personnel.

City of Corpus Christi Intranet Access to Video

Associated Market Packages:

- Traffic Information Dissemination (ATMS06)
- Regional Traffic Control and Coordination (ATMS07)
- Broadcast Traveler Information (ATIS01)
- Emergency Response – Hurricane Preparation and Evacuation Coordination (created for the Corpus Christi Region)

Prerequisite Projects: City of Corpus Christi TOC Expansion

Description: This project will provide expansion of the City of Corpus Christi's Network (if necessary) to provide adequate bandwidth to provide access to CCTV camera video feeds and possible control of CCTV cameras to Corpus Christi Police, Fire, EMS, and EOC via the City's intranet.

Metrocomm Information to Mobile Command Vehicles

Associated Market Packages:

- Emergency Response (EM1)
- Emergency Routing (EM2)

Prerequisite Projects: City of Corpus Christi TOC Expansion, City of Corpus Christi Metrocomm/TxDOT TMC Connection

Description: This project will provide direct feeds to the mobile command vehicles as they work the scene of a large incident. The data that can be provided to the mobile unit will include video images that are captured by the CCTV cameras deployed on city or TxDOT facilities. These video images can help the mobile command unit determine the hazards that emergency personnel may be facing and to make decisions regarding the deployment of proper equipment and personnel.

Inter-Agency Common Radio Frequency and System Expansion

Associated Market Packages:

- Incident Management System (ATMS08)
- Emergency Response (EM1)
- Emergency Response – Hurricane Preparation and Evacuation Coordination (created for the Corpus Christi Region)

Prerequisite Projects: None

Description: Implement common radio frequency for use by multiple agencies for incident and emergency management. A high-capacity, shared radio frequency among emergency first responders is critical to fast, efficient response. There are currently some shared frequencies in use in the Corpus Christi Region, including TxDPS with TxDOT maintenance, and TxDPS with counties (DPS is able to use county frequency, but not vice versa). This project includes the expansion of the system to San Patricio and Kleberg Counties.

TxDPS has been legislatively mandated to implement a statewide communications frequency to support interagency communications, especially during major emergencies. There could be other initiatives and requirements under Homeland Security mandates yet to be defined.

TxDPS, sheriff, police departments, emergency management personnel, transit/transportation agencies, and fire departments should analyze the feasibility of and benefits of radio system interoperability. If a common, interoperable radio frequency is deemed beneficial to the Region, this project will design and implement a system that supports a common frequency and provides sufficient capacity and coverage to handle cross-jurisdictional and cross-boundary voice and data traffic. The communications system design would include development of an operations, management, and maintenance plan, a standard operating procedures manual and a memorandum of understanding signed by all involved agencies. Common issues in the design of interagency radio projects include finding the correct technology to support the needs of individual partners.

It should be noted that San Patricio County has funding to contribute to its portion of this project. Funding to expand the system to Kleberg County has not been identified.

TxDPS Computer Aided Dispatch

Associated Market Packages:

- Incident Management System (ATMS08)
- Emergency Response (EM1)

Prerequisite Projects: None

Description: Implement a CAD system for dispatch of TxDPS vehicles in the Corpus Christi Region. Because TxDPS is a state agency, a CAD system would need to be a statewide initiative. A CAD system for TxDPS would be most effective in conjunction with AVL units on-board each of the TxDPS vehicles, to allow for vehicles in the field and their locations to be displayed on a map of the Region. When emergency calls come in through 911 or another agency, dispatchers would create an incident entry in the CAD system, including the incident location, type/nature of the incident, the CAD system would identify the nearest officer based on location information from AVL units, and generate an appropriate dispatch. The CAD system would be able to maintain records of all communications and

responses between the dispatch center and the responding officer(s), and in effect, 'track' the incident from beginning to end.

Based on specifications created by TxDPS, there can be functions built in to the CAD to prioritize incidents (or assign priority) based on the type, severity, and other factors. A centralized, automated CAD system will allow TxDPS to manage multiple incidents, and could potentially interface with other agencies that would need to be contacted with incident details. During a major event that requires a multi-agency response, all involved agencies in the Corpus Christi Region would be able to work from the same incident data and immediately know what resources have been committed. The records management function of a CAD system allows for all of the incident details to be stored in a consistent format, clearly identifies the dispatcher, responding officer(s), other agencies involved, duration of the incident, actions taken, and other pertinent details.

Port of Corpus Christi Security Center

Associated Market Packages:

- Incident Management System (ATMS08)
- Emergency Response (EM01)
- Emergency Response – Hurricane Preparation and Evacuation Coordination (Created for the Corpus Christi Region)

Prerequisite Projects: None

Description: Installation of CCTV cameras and lighting along the Inner Harbor west of the Harbor Bridge, generally following a parallel path to I-37, with a video feed and control provided to the Port of Corpus Christi Security Center. Funding has been identified for this project at $3.3 million.

Maintenance and Construction Operations

TxDOT Work Zone Speed Trailers

Associated Market Packages:

- Workzone Management (MC08)

Prerequisite Projects: None

Description: Procure work zone speed trailers for use by TxDOT Maintenance crews. Speed trailers are portable traffic control devices that are relatively easy to implement, operate, and dismantle. With a large 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.

Costs will very depending on the number of speed zone trailers purchased. For planning purposes, 10 speed zone trailers at $17,000 each was used to arrive at the estimate.

City of Corpus Christi Flood Detection Stations

Associated Market Packages:

- Network Surveillance (ATMS01)
- Road Weather Data Collection (MC03)
- Road Weather Information Processing and Distribution (MC04)

Prerequisite Projects: City of Corpus Christi TOC Expansion

Description: Implement flood detection stations at arterial street locations prone to flooding. The systems will be remotely monitored from the City of Corpus Christi TOC. This will enable faster response times by maintenance crews to close roadway segments as necessary. Automated gates to close the roadway are a supplementary device that could be implemented. The classic flood detection station is composed of a stream gauge, a rain gauge, a temperature sensor, a wind speed sensor, and 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. Communications between the flood detection stations and the TOC can be achieved through a variety of wireless and wireline telemetry methods.

Costs will vary depending on the number of flood detection stations purchased. For planning purposes, four stations at $25,000 each was used. This cost does not include automated gates, which could be up to $100,000 per location.

Public Transportation Management

Rural Transit Operations Center (TOC) with Computer Aided Dispatch (CAD) System

Associated Market Packages:

- Transit Vehicle Tracking (APTS01)
- Transit Fixed-Route Operations (APTS02)
- Demand-Response Transit Operations (APTS03)

Prerequisite Projects: None

Description: Implement a centralized transit management and operations center for Bee Community Action Agency (CAA), Kleberg County, San Patricio CAA and Rural Economic Assistance League (REAL) Inc. rural transit systems. A centralized transit management center will serve as the hub for transit operations, dispatch, transit travel information (including customer call center) and other functions. Upgrading to CAD will streamline communications between dispatchers and drivers. Used in conjunction with AVL and mobile data terminals, dispatchers can assess vehicle locations, status, route adherence, as well as communicate with one or several vehicles that are in the field. A CAD system also improves the system reporting functions, by automatically logging all communications between the dispatch center and the driver, including time, vehicle/driver, nature of the communication, and response.

Rural Transit Automated Vehicle Locator and Mobile Data Terminals (MDT)

Associated Market Packages:

- Transit Vehicle Tracking (APTS01)
- Transit Fixed-Route Operations (APTS02)
- Demand-Response Transit Operations (APTS03)
- Transit Traveler Information (APTS08)

Prerequisite Projects: Rural Transit TOC with CAD System

Description: Install AVL and MDT units on 62 transit vehicles in Bee CAA, Kleberg County, San Patricio CAA and REAL Inc. rural transit systems. 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 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 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. These functions are particularly desirable for the above listed counties transit operations, due to the large, rural geographic area that is covered by these transit providers, as well as the demand-response nature of the transportation services provided. 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.

Mobile data terminals allow bus operators to send and receive digital messages. Mobile data terminals can be used by dispatchers to notify drivers of adverse conditions, route changes, or other impacts to the scheduled route for both fixed-route and demand-response transit operations. MDTs can also transmit information from the driver to the dispatch center, including status, disruptions, or silent alarms. An additional feature that can be built-in to the MDT is the ability for vehicle-to-vehicle digital communications, in addition to the vehicle-to-center communications.

Cost will vary depending on the number of vehicles equipped with AVL/MDT systems, as well as the functions and features designed into the systems (above the basic location and digital communication functions). For planning purposes, 62 vehicles were used at $10,000 per vehicle.

RTA On-board Transit Security Cameras

Associated Market Packages:

- Transit Security (APTS05)

Prerequisite Projects: None

Description: This project will include the installation of security cameras on RTA fixed route buses and paratransit vehicles. Cameras will be for on-board recording only, and are not envisioned to be monitored remotely from the RTA Transit Dispatch. Video will be stored for a pre-determined amount

of time via video tape or emerging digital video recording technology. While the main objective of on-board surveillance projects has been to identify individuals committing criminal acts or creating disturbances on buses, there have been noticeable maintenance benefits such as a reduction of litter and debris.

RTA Transfer Station Security Cameras

Associated Market Packages:

- Transit Security (APTS05)

Prerequisite Projects: None

Description: This project will include the installation of security cameras at three of RTA's transfer. Cameras will be for recording only, but will likely be monitored at the RTA Transit Dispatch. Video will be stored for a pre-determined amount of time via video tape or emerging digital video recording technology. The main objective of this project will be to provide increased security for RTA's patrons waiting at a transfer station.

RTA Real-time Bus Information Travel Kiosks

Associated Market Packages:

- Transit Traveler Information (APTS08)

Prerequisite Projects: None

Description: Install static and real-time transit and traveler information devices at three RTA transit transfer stations in Corpus Christi. The project will build on information available from the transit AVL project. Either kiosks, monitors, or dynamic signs will relay information on current bus operating conditions (e.g., Next bus – 5 minutes, on schedule, delayed 10 minutes, etc.). Communications from the kiosks or other traveler information devices to the RTA dispatch will also need to be included as part of this project.

RTA Web-based Travel Data and Route Guidance

Associated Market Packages:

- Transit Vehicle Tracking (APTS01)
- Transit Fixed-Route Operations (APTS02)
- Demand Response Transit Operations (APTS03)
- Transit Traveler Information (APTS08)

Prerequisite Projects: None

Description: This project will include the publishing of real-time transit data on the RTA website. Patrons of the RTA fixed-route and demand responsive transit operations will benefit from real-time as well as static information presented on this website. Users of the system will be able to enter their origination and destination addresses and the system will identify the best routes and times for arrivals for the trip.

ADART Phase 3

Associated Market Packages:

- Demand Response Transit Operations (APTS03)
- Transit Vehicle Tracking (APTS01)

Prerequisite Projects: None

Description: ADART allows patrons of the RTA's demand response transit system to "call" the bus for pick-up and scheduling. The system is connected to the RTA's CAD and AVL system and is able to locate the bus that would best fit the need. ADART has been tested in a sample of the demand response vehicles in Phase 1 and 2 which are nearing completion. ADART Phase 3 would include the expansion of ADART service to the entire fleet of demand responsive transit. Funding for this project has already been identified.

Information Management

ITS Data Warehouse

Associated Market Packages:

- ITS Data Warehouse (AD02)

Prerequisite Projects: TxDOT TMC and ATMS Implementation, City of Corpus Christi TOC/TxDOT TMC Fiber Connection

Description: Implement a system to archive ITS data from multiple agencies. A central archived data server will be developed at the TxDOT Corpus Christi District TMC that will collect, process, store and provide access to historical ITS data from throughout the Region. Communications links will be necessary between TxDOT and the other data sources, such as the City of Corpus Christi TOC, Nueces County, and RTA. This project will design the frequency, quantity, and quality of data to be collected and stored. User interfaces will be required at each "user" 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
Traffic and Travel Management					
TxDOT Phase 3 Freeway Management System Implementation	Implement CCTV cameras, DMS, detectors and lane control signals on I-37 between US 77 and Harbor Bridge	TxDOT	$2,000,000	Yes	2 years
TxDOT Additional Phases of Freeway Management System Implementation	Implement additional CCTV cameras, DMS, detectors, and HARs in the Corpus Christi Region along as needed	TxDOT	$2,000,000	No	5 years
TxDOT Closed Loop Signal System Expansion	Continue expansion of closed loop signal system on TxDOT intersections throughout the Region	TxDOT	$300,000	No	1 year
TxDOT Evacuation Route Instrumentation Expansion	Instrument major interchanges (VIVDS or CCTV cameras) for surveillance and deploy DMS for use during times of evacuation or detours	TxDOT	$300,000	No	2 years
City of Corpus Christi Closed Loop Signal System Expansion	Continue implementation of closed loop signal system in City of Corpus Christi	City of Corpus Christi	$500,000	Yes	2 years
City of Corpus Christi VIVDS Expansion	Continue implementation of VIVDS on signalized intersections in City of Corpus Christi	City of Corpus Christi	$200,000	Yes	2 years
City of Corpus Christi CCTV Camera Deployment	Deploy CCTV cameras at major intersections along detour routes	City of Corpus Christi	$150,000	No	1 years
Parking and Event Management System	Implement parking and event management system at Bayfront Arena/Baseball Stadium	Private Sector/City of Corpus Christi	$500,000	No	2 years
Regional 511 ATIS Server and TxDOT HCRS Enhancements (Statewide)	Implement enhancements to the HCRS and regionwide 511	TxDOT (Austin)	N/A	N/A	1 year

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

Program Area/Project	Description	Responsible Agency*	Probable Cost**	Funding Identified	Estimated Project Duration
Emergency Management					
Additional Agency Connections to TxDOT TMC	Connect additional agencies as needed to TxDOT TMC for CCTV camera shared monitoring and control and data sharing	TxDOT/Other Agencies	$150,000	No	3 months
Port of Corpus Christi Harbor Master's Office Traffic Management	Installation of Vessel Traffic System (VTS), including radar, CCTV cameras, computerized charts, Automated Identification System (AIS) transponders, and radio	Port of Corpus Christi	$4,375,000	No	2 years
Port of Corpus Christi Harbor Master's Office/Port of Corpus Christi Security Center Fiber Connection	Provide a fiber connection between the Port of Corpus Christi Harbor Master's Office and the Port of Corpus Christi Security Center Fiber	Port of Corpus Christi	To Be Determined	No	6 months
Maintenance and Construction Operations					
TxDOT Work Zone Safety Monitoring	Implement portable work zone safety monitoring equipment at workzones	TxDOT	$500,000	No	1 year
TxDOT Flood Detection Stations	Implement flood detection systems on Interstates and State Routes in the Corpus Christi Region	TxDOT	$100,000	No	6 months
Public Transportation Management					
RTA On-board Security Cameras Expansion	Install additional security cameras on buses	RTA	$100,000	No	1 year
RTA Electronic Fare Payment System	Install electronic fare payment system on fixed route buses	RTA	$500,000	No	1 year
RTA Connection to City of Corpus Christi TOC	Implement a link between RTA and City of Corpus Christi TOC providing ability to access information such as road closures, maintenance activity, weather conditions, etc.	City of Corpus Christi/RTA	$20,000	No	1 year
Rural Transit Electronic Fare Collection	A continuation and upgrade to an existing AVL/MDT system enabling the use of smart card and electronic swipe technology	Bee CAA, Kleberg County, San Patricio CAA, REAL Inc.	$93,000 ($1,500 per bus, 62 buses)	No	3 months

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

Program Area/Project	Description	Responsible Agency*	Probable Cost**	Funding Identified	Estimated Project Duration
Public Transportation Management (continued)					
Rural Transit On-Board Video Security System	Stand alone security cameras installed on board buses. System does not transmit video images to an operations center	Bee CAA, Kleberg County, San Patricio CAA, REAL Inc.	$930,000 ($15,000 per bus, 62 buses)	No	6 months

*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.

Corpus Christi Region
Mid-Term Projects (10-Year)

Travel and Traffic Management

TxDOT Phase 3 Freeway Management System Implementation

Associated Market Packages:

- Network Surveillance (ATMS01)
- Freeway Control (ATMS04)
- Traffic Information Dissemination (ATMS06)
- Regional Traffic Control and Coordination (ATMS07)
- Broadcast Traveler Information (ATIS01)
- Emergency Routing (EM02)
- Emergency Response – Hurricane Preparation and Evacuation Coordination (created for the Corpus Christi Region)

Prerequisite Projects: TxDOT TMC and ATMS Implementation, TxDOT Phase 1 FMS Implementation, TxDOT Phase 2 FMS Implementation

Description: Phase 3 of the TxDOT FMS in the Corpus Christi Region will implement additional CCTV cameras and DMS, as well as traffic detectors, lane control signals, and HAR transmitters in the Corpus Christi Region. The traffic detectors are expected to be inductive loops. Costs will vary based on the amount of field equipment deployed and the required communications infrastructure. TxDOT's current plans for Phase 3 include the implementation of CCTV cameras, DMS, detectors, and lane control signals on I-37 between US 77 and Harbor Bridge. Furthermore, it is anticipated that HAR will be deployed district-wide during Phase 3 of the TxDOT Corpus Christi FMS Implementation.

TxDOT Additional Phases of Freeway Management System Implementation

Associated Market Packages:

- Network Surveillance (ATMS01)
- Freeway Control (ATMS04)
- Traffic Information Dissemination (ATMS06)
- Broadcast Traveler Information (ATIS01)
- Emergency Response – Hurricane Preparation and Evacuation Coordination (created for the Corpus Christi Region)
- Emergency Routing (EM02)

Prerequisite Projects: TxDOT TMC and ATMS Implementation, TxDOT Phase 1 FMS Implementation, TxDOT Phase 2 FMS Implementation

Description: Next phases of the Corpus Christi FMS will implement additional CCTV cameras and DMS, as well as traffic detectors and HAR transmitters in the Corpus Christi Region.

TxDOT Closed Loop Signal System Expansion

Associated Market Packages:

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

Prerequisite Projects: None

Description: Expand the closed loop signal system by integrating additional signals and implementing VIVDS at select TxDOT intersections throughout the Region.

TxDOT Evacuation Route Instrumentation Expansion

Associated Market Packages:

- Network Surveillance (ATMS01)
- Freeway Control (ATMS04)
- Traffic Information Dissemination (ATMS06)
- Regional Traffic Control and Coordination (ATMS07)
- Broadcast Traveler Information (ATIS01)
- Emergency Routing (EM02)
- Emergency Response – Hurricane Preparation and Evacuation Coordination (created for the Corpus Christi Region)

Prerequisite Projects: TxDOT Evacuation Route Instrumentation (US 77), TxDOT TMC and ATMS Implementation

Description: This project will include the instrumentation of the major interchanges that are directly impacted by evacuation traffic. The project will include the deployment of VIVDS or CCTV cameras at major interchanges prior to the point at which a driver would divert from a main facility to an evacuation route. Additionally, DMS will be deployed in advance of the decision-making points such that drivers can make the best decision regarding the route they choose to take. Implementation has begun between Portland and the Nueces Bay Causeway with the installation of two CCTV cameras and two DMS. The communication from these field devices back to the TxDOT TMC will likely be wireless due to the restrictions along the Harbor Bridge and the Causeway.

City of Corpus Christi Closed Loop Signal System Expansion

Associated Market Packages:

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

Prerequisite Projects: City of Corpus Christi TOC Expansion

Description: Continue expansion and implementation of the City of Corpus Christi closed-loop signal system.

City of Corpus Christi Video Image Vehicle Detectors Expansion

Associated Market Packages:

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

Prerequisite Projects: None

Description: Continue conversion of existing signalized intersections to VIVDS and continue installing VIVDS at newly constructed signalized intersections in Corpus Christi.

City of Corpus Christi CCTV Camera Deployment

Associated Market Packages:

- Network Surveillance (ATMS01)
- Surface Street Control (ATMS03)
- Traffic Information Dissemination (ATMS06)
- Regional Traffic Control and Coordination (ATMS07)
- Broadcast Traveler Information (ATIS01)
- Emergency Routing (EM02)
- Emergency Response – Hurricane Preparation and Evacuation Coordination (created for the Corpus Christi Region)

Prerequisite Projects: City of Corpus Christi TOC Expansion, City of Corpus Christi TOC/TxDOT TMC Fiber Connection, Incident Detour Plans

Description: This project includes the deployment of CCTV cameras at major City of Corpus Christi intersections that will be impacted by detoured or re-routed traffic during times of incidents. The CCTV cameras can also be used to monitor congestion associated with recurring events and signal control adjusted according to the vehicular demand. The information gathered by the CCTV cameras (video feed) can be shared with the TxDOT TMS for dissemination.

Parking and Event Management System

Associated Market Packages:

- Parking Facility Management (ATMS16)

Prerequisite Projects: None

Description: Install a parking and event management system that directs motorists to available spaces. Potential installation locations include the planned Bayfront Arena and proposed baseball stadium. Parking management systems have proven to reduce delays/congestion and improve air quality around areas where motorists may "circle" a venue in search of an available parking location. Parking and event management systems area composed of two subsystems. The first subsystem monitors the availability of parking spaces at a facility based on gate counts of vehicles entering and exiting the facility. More sophisticated subsystems count how many spaces are available based on individual parking stall presence detectors. The second major subsystem provides motorists with dynamic parking

information on the major streets approaching the venue(s). The information is routinely disseminated using a combination of static and dynamic signing. At this time, it is assumed that this project will be implemented and operated by a private entity.

Regional 511 Advanced Travel Information System Server and Highway Condition Reporting System Enhancements (Statewide)

Associated Market Packages:

- Traffic Information Dissemination (ATMS06)
- Broadcast Traveler Information (ATIS01)
- Freeway Control (ATMS04)
- Regional Traffic Control and Coordination (ATMS07)
- Incident Management System (ATMS08)
- Maintenance and Construction Activity Coordination (MC010)

Prerequisite Projects: TxDOT TMC and ATMS Implementation, TxDOT Center-to-Center Communications, Media Liaison and Coordination

Description: Install a server dedicated to ATIS in the TxDOT Corpus Christi 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 also web and to private partners who desire access to information in the Corpus Christi 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's HCRS will be enhanced on a statewide basis. The HCRS will use data from the Corpus Christi TMC, 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; Corpus Christi 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.

Emergency Management

Additional Agency Connections to TxDOT TMC

Associated Market Packages:

- Emergency Response (EM01)
- Emergency Routing (EM02)

Prerequisite Projects: TxDOT TMC and ATMS Implementation

Description: This project includes the connecting of various agencies within the emergency management field to the TxDOT TMC. Such agencies may include regional hospitals outside the more densely populated areas of the Corpus Christi Region and local EOCs (other than the Corpus Christi EOC). The information these agencies can obtain from the TxDOT TMC will aid in the dispatch of emergency vehicles and routing of these vehicles in case of incidents.

Port of Corpus Christi Harbor Master's Office Traffic Management

Associated Market Packages:

- Incident Management System (ATMS08)
- Emergency Response (EM01)

Prerequisite Projects: None

Description: This project includes the installation of the VTS, including radar, CCTV cameras, computerized charts, AIS transponders, and radio to manage vessel traffic the full length of the ship channel. The Port of Corpus Christi has estimated this project to cost $4,375,000.

Port of Corpus Christi Harbor Master's Office/Port of Corpus Christi Security Center Fiber Connection

Associated Market Packages:

- Incident Management System (ATMS08)
- Emergency Response (EM01)

Prerequisite Projects: Port of Corpus Security Center

Description: This project will provide a fiber connection between the Port of Corpus Christi Harbor Master's Office and the Port of Corpus Christi Security Center Fiber. A cost for this project has not yet been determined, and will be dependent on the construction of the Port of Corpus Christi Security Center.

Maintenance and Construction Operations

TxDOT Work Zone Safety Monitoring

Associated Market Packages:

- Work Zone Safety Monitoring (MC09)

Prerequisite Projects: None

Description: This project will include the use of advanced warning systems to detect unauthorized vehicles that have entered the perimeter of the work zone. The intent of such systems is to help decrease the number of accidents in work zones due to motorists getting too close to workers or their equipment. Intrusion detection devices can alert construction workers and the motorist that the motorist has entered the safe zone and should take evasive action. It is anticipated that this project will be conducted on and possibly required by TxDOT on a per-project basis.

TxDOT Flood Detection Stations

Associated Market Packages:

- Network Surveillance (ATMS01)
- Road Weather Data Collection (MC03)
- Road Weather Information Processing and Distribution (MC04)

Prerequisite Projects: TxDOT TMC and ATMS Implementation

Description: Implement flood detection stations at arterial street locations prone to flooding. The systems will be remotely monitored from the TxDOT TMC. This will enable faster response times by maintenance crews to close roadway segments as necessary. Automated gates to close the roadway are a supplementary device that could be implemented. The classic flood detection station is composed of a stream gauge, a rain gauge, a temperature sensor, a wind speed sensor, and 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. Communications between the flood detection stations and the TMC can be achieved through a variety of wireless and wireline telemetry methods.

Costs will vary depending on the number of flood detection stations purchased. For planning purposes, four stations at $25,000 each was used. This cost does not include automated gates, which could be up to $100,000 per location.

Public Transportation Management

RTA On-board Security Cameras Expansion

Associated Market Packages:

- Transit Security (APTS05)

Prerequisite Projects: RTA On-board Security Cameras

Description: This project will continue the installation of security cameras on RTA fixed route buses and paratransit vehicles. Cameras will be for on-board recording only, and are not envisioned to be monitored remotely from the RTA Transit Dispatch. Video will be stored for a pre-determined amount of time via video tape or emerging digital video recording technology. While the main objective of on-board surveillance projects has been to identify individuals committing criminal acts or creating disturbances on buses, there have been noticeable maintenance benefits such as a reduction of litter and debris.

RTA Electronic Fare Payment System

Associated Market Packages:

- Transit Fixed-Route Operations (APTS02)
- Demand-Response Transit Operations (APTS03)
- Transit Passenger and Fare Management (APTS04)

Prerequisite Projects: None

Description: Continuation and upgrade of existing AVL/MDT system to add automated fare payment capabilities to RTA 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. The system will build on hardware and software previously provided under the transit AVL projects. Specifically, 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 several technological considerations will need to be examined, such as standards for smart cards and interoperability issues.

RTA Connection to City of Corpus Christi TOC

Associated Market Packages:

- Traffic Information Dissemination (ATMS06)
- Transit Fixed-Route Operations (APTS02)
- Demand Response Transit Operations (APTS03)
- Transit Traveler Information (APTS08)
- Broadcast Traveler Information (ATIS01)

Prerequisite Projects: City of Corpus Christi TOC Expansion

Description: This project will connect the RTA Transit Operations Center to the City of Corpus Christi TOC such that the RTA TOC can obtain data not only directly from the City of Corpus Christi TOC, but also from the TxDOT TMC. Data that will be of benefit for the RTA will be information regarding road closures, maintenance activity, weather conditions, or other events that may alter the fixed-routes or headways of the buses. The information obtained through this connection can then be passed on to the RTA patrons so that they can better plan their transit trips.

Rural Transit Electronic Fare Collection System

Associated Market Packages:

- Transit Fixed-Route Operations (APTS02)
- Demand-Response Transit Operations (APTS03)
- Transit Passenger and Fare Management (APTS04)

Prerequisite Projects: Rural Transit AVL and Mobile Data Terminals

Description: Equip Bee CAA, Kleberg County, San Patricio CAA and REAL Inc. transit buses with automated fare payment systems. 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. The system will build on hardware and software previously provided under the transit AVL projects. Specifically, 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 several technological considerations will need to be examined, such as standards for smart cards and interoperability issues.

This project is applicable for RTA and Bee, Kleberg, and San Patricio Counties under initiatives within the respective agencies. Cost are estimated for the county buses at $1,500 per bus for 62 buses.

Rural Transit On-Board Video Security

Associated Market Packages:

- Transit Security (APTS05)

Prerequisite Projects: None

Description: Install CCTV cameras on board transit fleet for Bee CAA, Kleberg County, San Patricio CAA and REAL Inc. These cameras will allow for on-board recording only, and are not envisioned to be monitored remotely from the Transit TOC. Video will be stored for a pre-determined amount of time via video tape or emerging digital video recording technology. While the main objective of on-board surveillance projects has been to identify individuals committing criminal acts or creating disturbances on buses, there have been noticeable maintenance benefits such as a reduction of litter and debris.

Costs will vary depending on number of on-board cameras installed. For planning purposes, security cameras for 62 vehicles at $15,000 each was used.

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

Program Area/Project	Description	Responsible Agency*	Probable Cost**	Funding Identified	Estimated Project Duration
Traffic and Travel Management					
City of Corpus Christi Closed Loop Signal System Expansion	Continue expansion of closed loop system in the City of Corpus Christi	City of Corpus Christi	$500,000	No	5 years
Parking and Event Management System Expansion	Implement/expand parking and event management systems as needed	Private Sector/City of Corpus Christi	$500,000	No	2 years
ISP-Based Route Guidance	Provided direct support to Information Service Provider-Based route guidance systems through sharing of traveler information	Public Agencies/Private Sector	Public: $100,000	No	1 year
Emissions Monitoring	Implement systems to allow emissions monitoring of vehicles and areas	TxDOT/City of Corpus Christi	$250,000	No	2 years
City of Corpus Christi Highway/Rail Intersection Warnings	Implement warning system to alert drivers of approaching trains and expected wait times	City of Corpus Christi/Railroad operators	$500,000	No	2 years
Emergency Management					
Mayday Support	Provide support to Mayday Service providers through sharing of traffic information, emergency dispatch information, etc.	Transportation and Emergency Services Agencies/Private Sector	$100,000	No	1 year
City of Corpus Christi Emergency Vehicle Traffic Signal Preemption	Install signal preemption for Corpus Christi Fire	Implementation: City of Corpus Christi Fire Operations: City of Corpus Christi Street Services Maintenance: City of Corpus Christi Street Services	$1,500,000	No	1 year
Lifelink System	Implement system to share video between emergency response vehicles and hospitals	TxDOT/City of Corpus Christi Street Services/Christus Spohn Health System	$1,000,000	No	5 years

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

Program Area/Project	Description	Responsible Agency*	Probable Cost**	Funding Identified	Estimated Project Duration
Maintenance and Construction Operations					
Maintenance and Construction Vehicle AVL	Installation of automatic vehicle location system on maintenance and construction vehicles	TxDOT/Other Maintenance Agencies	$100,000	No	1 year
Public Transportation Management					
RTA Transit Traveler Information	Provide improved transit traveler information through web based and kiosks to be located at major transfer centers or hubs	RTA	$500,000	No	2 years
Rural Transit Automatic Passenger Counters	Passive system to accurately count ridership	Bee CAA, Kleberg County, San Patricio CAA, REAL Inc.	$124,000 ($2,000 per bus x 62 buses)	No	6 months
Rural Transit Traveler Information System/Travel Data and Route Guidance	Dial-a-Ride and Internet based website systems providing automated information to passengers seeking route guidance	Bee CAA, Kleberg County, San Patricio CAA, REAL Inc.	$2,000,000 ($500,000 x 4 agencies)	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.

Corpus Christi Region
Long-Term Projects (20-Year)

Travel and Traffic Management

City of Corpus Christi Closed Loop Signal System Expansion

Associated Market Packages:
- Network Surveillance (ATMS01)
- Surface Street Control (ATMS03)

Prerequisite Projects: None

Description: Continue expansion of the City of Corpus Christi's closed loop signal system. As new intersections are constructed and signalized, they will be included in the closed-loop system. The primary purpose of this project is to convert existing signalized intersections.

Parking and Event Management System Expansion

Associated Market Packages:
- Parking Facility Management (ATMS16)

Prerequisite Projects: Parking and Event Management System

Description: Install or expand parking and event management systems as needed. This will possibly be a private sector project.

ISP-Based Route Guidance

Associated Market Packages:
- Broadcast Traveler Information (ATIS01)
- ISP-Based Route Guidance (ATIS06)

Prerequisite Projects: TxDOT TMC and ATMS Implementation, TxDOT Phase 1 FMS Implementation, City of Corpus Christi TOC Expansion, City of Corpus Christi TOC/TxDOT TMC Fiber Connection.

Description: Provide Information Service Providers (ISPs) with data relative to current travel conditions. The project extends current static capabilities of the OnStar, in-vehicle route guidance systems (or equivalent) currently being equipped in new vehicles (OnStar is equipped on some GM, Acura, Audi, Saab, and Subaru models). Currently, the OnStar system will help guide a motorist to a location based on static information. By providing real-time traveler information to ISPs, the guidance systems could modify the recommended route based on dynamic roadway conditions (e.g., variation on congestion levels, accidents, roadwork, etc.). The project will require a public/private sector partnership, because route guidance and navigation services are typically subscription services.

Emissions Monitoring

Associated Market Packages:
- Emissions Monitoring and Management (ATMS11)

Prerequisite Projects: TxDOT TMC and ATMS Implementation, City of Corpus Christi TOC Expansion, City of Corpus Christi TOC/TxDOT TMC Fiber Connection

Description: This project would include the deployment of field sensors to monitor emissions of individual vehicles and the area as a whole. The data collected by the field sensors will be transmitted to the City of Corpus Christi TOC or TxDOT TMC depending on the facility on which the sensor is deployed. The data will then be processed and measured against established air quality standards to determine the Region's status on air quality.

City of Corpus Christi Highway/Rail Intersection Warnings

Associated Market Packages:
- Network Surveillance (ATMS01)
- Surface Street Control (ATMS03)
- Traffic Information Dissemination (ATMS06)
- Standard Railroad Grade Crossing (AMS13)
- Railroad Operations (ATMS15)

Prerequisite Projects: City of Corpus Christi TOC Expansion

Description: This project will include highway/rail intersection warning systems that will alert motorist of arriving trains, amount of time the train will occupy the crossing, and length of time a motorist can expect to be delayed. The deployment of instrumentation will be along City of Corpus Christi roadways at railroad grade crossings. Information will be gathered either directly from the railroad operators or from sensors placed along the railroad right-of-way that monitor train length and speed. Data will be transferred from the field sensors to the Corpus Christi TOC where operators can make decisions regarding changes in signal operations to facilitate flow around the closed crossing or to clear traffic once the train has passed the crossing.

Emergency Management

Mayday Support

Associated Market Packages:
- Mayday Support (EM03)

Prerequisite Projects: TxDOT TMC and ATMS Implementation, TxDOT Phase 1 FMS Implementation, TxDOT Phase 2 FMS Implementation, TxDOT Phase 3 FMS Implementation, TxDOT Additional Phases of FMS Implementation

Description: Provide real-time travel data to Mayday Service Providers. One of the features inherent to the emerging in-vehicle navigation systems is the use of Mayday Systems. Mayday systems send automated signals for help when sensors are activated (e.g., flat tire, collision, etc.). Alternatively, a

driver can request assistance manually. Mayday calls typically are not routed to the nearest Public Safety Answering Point (PSAP), rather they are sent to private dispatch centers that coordinate requests for help. By providing real-time data from the TxDOT ATMS to the private dispatch centers, Mayday Support services will be enhanced. For example, a dispatcher will be able to provide the best route to an incident based on current travel conditions to a responding towing service.

City of Corpus Christi Emergency Vehicle Traffic Signal Preemption

Associated Market Packages:
- Surface Street Control (ATMS03)
- Emergency Routing (EM02)

Prerequisite Projects: Corpus Christi TOC Expansion

Description: Equip intersections and City of Corpus Christi Fire and EMS vehicles 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.

Lifelink System

Associated Market Packages:
- Emergency Response (EM01)
- Emergency Routing (EM02)

Prerequisite Projects: Hospital-to-Hospital Connections

Description: This project will enable the ambulances to communicate directly to the accepting hospital during transport of a patient. The project will include the installation of video equipment in the emergency vehicles and establishment of a communications link to the various hospitals. Physicians at the accepting hospitals can be updated on a patient's status and provide guidance, if necessary, to emergency personnel as to the care of the patient.

Maintenance and Construction Operations

Maintenance and Construction Vehicle AVL

Associated Market Packages:
- Maintenance and Construction Vehicle Tracking (MC01)
- Maintenance and Construction Activity Coordination (MC10)

Prerequisite Projects: None

Description: Similar to the transit AVL project, the maintenance and construction AVL project includes equipping TxDOT and potentially other maintenance or construction related vehicles with global

positioning system (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. This project has been included in the deployment plan as a project that may be considered in the future; however, no serious consideration is being given to this project at this time.

Public Transportation Management

RTA Transit Traveler Information

Associated Market Packages:
- Transit Fixed Route Operations (APTS02)
- Demand-Response Transit Operations (APTS03)
- Transit Traveler Information (APTS08)

Prerequisite Projects: None

Description: Provide up-to-date transit information for RTA on the Internet, by phone and at transfer stations. This project will implement web-based transit traveler information that can be accessed by patrons pre-trip to identify routes, schedules, status (delays, bus arrival times, etc. from AVL data) and other pertinent information. An integrated transit traveler information system will make this information accessible from the Internet, at kiosks or other displays at transfer stations, and via phone. This project also should provide for an interactive trip planner to allow patrons to map out their trips, including bus arrival/departure times, transfers, and help them to identify optimum routes and schedules. This trip planning system will enhance current efforts by customer service call center staff that already provide trip planning assistance to patrons by phone. Coordination with TxDOT and the City of Corpus Christi would allow for current traffic conditions, incidents, closures, special events, and other impacts to the roadway network to be displayed with the transit route and status information.

An on-board element of the transit traveler information system could provide passengers already on the bus with information about bus arrival, name of stop, next bus arrival, and transfer requirements. These on-board enunciators support Americans with Disabilities Act requirements.

Rural Transit Automatic Passenger Counters

Associated Market Packages:
- Transit Passenger and Fare Management (APTS04)

Prerequisite Projects: Rural Transit AVL and Mobile Data Terminals

Description: Install on-board devices to collect data on passenger boardings and alightings on Bee CAA, Kleburg County, San Patricio CAA and REAL Inc. rural transit vehicles. In conjunction with an AVL system, passenger data can be collected by time and bus location. There are three basic elements to a passenger counter system:

- A counter capable of counting each passenger as they board or alight (and the ability to distinguish between boardings and alightings);

- Location technology to determine the vehicle's location when the boardings and alightings occur; and
- A data management system to store passenger information which will then be transferred to the TOC.

There are two common forms of automatic passenger counters: treadle mats and infrared beams. Treadle mats consist of at least two mats placed on the stairs into the vehicle. Placement of the mats enables the system to detect passengers boarding or leaving the bus. While this is a fairly reliable technology, the mats are subject to wear and tear, water or slush leaking into the mats, or have difficulty getting accurate counts if more than one person steps on the mat simultaneously. Infrared beams operate using essentially the same principal, although instead of mats, a pair of horizontal beams is set up in the path of boarding and alighting passengers. This technology is not as prone to wear and tear from foot traffic or weather elements as the treadle mats, but poses the same difficulty in getting accurate passenger counts if more than one person passes through the beams at any given time.

Passenger data can be transferred to the Transit Operations Center via disk (most economical), physical data connection, or long-range wireless connection. Because this information is typically used for planning, scheduling and analysis, it is not recommended that the counties consider real-time or near-real-time passenger count data transmission. Many agencies have barely enough radio capacity to transmit AVL data in real time, which typically yields more benefit for transit operations and traveler information than passenger counts.

Rural Transit Traveler Information System/Travel Data and Route Guidance

Associated Market Packages:
- Demand-Response Transit Operations (APTS03)
- Transit Traveler Information (APTS08)

Prerequisite Projects: Rural Transit AVL and Mobile Data Terminals, Rural Transit TOC with CAD System

Description: Provide enhanced transit related traveler information to Bee CAA, Kleberg County, San Patricio CAA and REAL Inc. transit customers. The on-demand nature of the counties' 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 TOC 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 counties' vehicles in near-real-time. This real-time information also would be available at the counties' dispatch/call center for passengers who do not have access to the Internet. Coordination with TxDOT and the City of Corpus Christi 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.

4. MAINTAINING THE REGIONAL ITS ARCHITECTURE AND DEPLOYMENT PLAN

The Corpus Christi Regional ITS Deployment Plan is a living document. The recommended projects and their timeframe 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.

New market packages are added to the National ITS Architecture every few years, and with the increasing emphasis on homeland security issues, it is envisioned that there will be additional market packages focused on addressing homeland security and emergency management. New federal initiatives, such as Amber Alert and 511, could also generate new or updated categories of market packages within the National ITS Architecture. Corpus Christi stakeholders agreed that it would be beneficial to review any modifications to the National ITS Architecture as well as any USDOT/FHWA guidance on an as-needed basis, and identify any additions or modifications that should be considered for the Corpus Christi Regional ITS Architecture.

At the Comment Resolution Meeting held in Corpus Christi in January 2003, stakeholders in the Region placed a strong emphasis on reviewing the Regional ITS Deployment Plan in order to determine which of the short-term projects have the highest priority for the Region, as well as to update the status of short-term projects. The group felt that a quarterly meeting to discuss these changes would be beneficial. Input would be gathered at these meetings by TxDOT and incorporated into the next update of the documents. This review would be particularly beneficial if funding opportunities arise. As part of the review, projects can be removed that are already underway or deployed, and priorities can be assessed again as more ITS infrastructure is put in place.

Stakeholders also agreed that both the Regional ITS Architecture and the ITS Deployment Plan will need to be periodically updated in order to reflect current deployment status as well as re-evaluate priorities. A two-year timeframe was selected by the stakeholders for this update to correspond with the Corpus Christi MPO's Transportation Improvement Plan (TIP) updates. The TxDOT Corpus Christi District was identified as the agency that should take the lead in maintaining and updating the Region's ITS Architecture and Deployment Plan, with support from a multijurisidictional committee in the Region. This group also would provide input to the Corpus Christi MPO TIP planning process.