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USDOT Integrated Corridor Management (ICM) Initiative

Concept of Operations for the US-75 Integrated Corridor in Dallas, Texas

April 30, 2008
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Concept of Operations for the US-75 Integrated Corridor in Dallas, Texas

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16. Abstract

This Concept of Operations (Con Ops) for the US-75 Integrated Corridor Management (ICM) Program has been developed as part of the Federal Highway Administration, the Federal Transit Administration, and RITA (FHWA/FTA/RITA) Integrated Corridor Management Initiative. This document is intended as a high-level Con Ops for the US-75 Corridor in Dallas consisting of freeway, arterial, bus and rail networks, and serving a central business district. The purpose of this Con Ops is to answer the questions of who, what, when, where, why and how for the application of an Integrated Corridor Management System (ICM) within this corridor. This Con Ops also defines the roles and responsibilities of the participating agencies and other involved entities. The US-75 Corridor is a major north-south radial Corridor connecting downtown Dallas with many of the suburbs and cities north of Dallas. The primary Corridor consists of a freeway, continuous frontage roads, light-rail line, transit bus service, park-and-ride lots, major regional arterial streets, toll roads, bike trails, and intelligent transportation systems. A concurrent-flow, high-occupancy vehicle lane in the Corridor, opened in December 2007, added significant expansion of the intelligent transportation systems for the freeway and arterials street systems are programmed.

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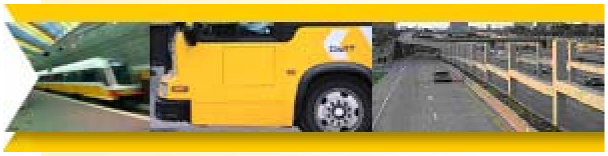

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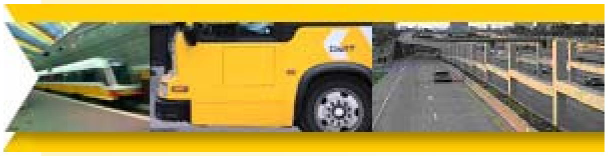


1. Scope and Summary

1.1. INTRODUCTION

This Concept of Operations (Con Ops) for the US-75 Integrated Corridor Management (ICM) Program has been developed as part of the Federal Highway Administration, the Federal Transit Administration, and RITA (FHWA/FTA/RITA) Integrated Corridor Management Initiative. The basic premise behind the ICM initiative is that independent, individual network-based transportation management systems, and their cross-network linkages, can be operated in a more coordinated and integrated manner, thereby increasing overall corridor throughput and enhancing the mobility of the corridor users.

This document is intended as a high-level Con Ops for the US-75 Corridor in Dallas(Figure 1.2-1) consisting of freeway, arterial, bus and rail networks, and serving a central business district. The purpose of this Con Ops is to answer the questions of who, what, when, where, why and how for the application of an Integrated Corridor Management System (ICM) within this corridor. Given that an ICM is a “system of systems,” involving multiple agencies and stakeholders, this Con Ops also defines the roles and responsibilities of the participating agencies and other involved entities.

The purpose of a Con Ops is to define the current and future operational mission of the ITS Project and the operational requirements of the systems that will support and enable the Project to achieve these missions. In essences, the Con Ops will define:

- Goals, objectives, and capabilities of each existing and planned system in the project corridor
- Roles and responsibilities of the participating agencies and stakeholders associated with the project

Secondly, the Con Ops is the first step in the structured systems engineering process recommended by the Federal Highway Administration (FHWA) for ITS projects. The primary functions of the Con Ops S are listed below.

Purpose of the Con Ops:

- To ensure that stakeholder needs and expectations are captured early
- To ensure that the implementation is linked to agency mission, goals, and objectives
- To identify existing operational environment and operations
- To identify where the system could enhance existing operations
- To illustrate the future environment with the system
- To establish a list of operational requirements
- To begin the traceability of the Systems Engineering Process. (The operational requirements will set benchmarks for system testing)

For this project, the Con Ops will provide a “snapshot” of the existing operations and a preview of what future systems could do to enhance this corridor’s operations. When a system or operation is changed, the Con Ops will be revisited or developed.

1.2. ICM CORRIDOR BOUNDARIES AND TRAVEL CHARACTERISTICS

The Corridor for the Dallas Pioneer Project is the US-75 Corridor (aka the North Central Expressway Corridor). This Corridor is a major north-south radial Corridor connecting downtown Dallas with many of the suburbs and cities north of Dallas. The primary Corridor consists of a freeway, continuous frontage roads, light-rail line, transit bus service, park-and-ride lots, major regional arterial streets, toll roads, bike trails, and intelligent transportation systems. A concurrent-flow, high-occupancy vehicle lane in the Corridor, opened in December 2007, added significant expansion of the intelligent transportation systems for the freeway and arterials street systems are programmed.

The US-75 Corridor has been defined at two levels. The immediate Corridor consists of the primary freeway Corridor and light-rail line Corridor and all arterial streets within approximately two miles of the freeway, as described above. The primary Corridor is highlighted in Figure 1.2-1. In addition, a full “travelshed” influence area has been defined that includes additional alternate modes and routes that may be affected by a major incident or event. The travelshed area is generally bound by the downtown to the south, the Dallas North Tollway to the west, SH 121 to the north, and a combination of arterials streets and the DART Blue Line to the east. This travelshed influence area is also shown in Figure 1.2-1.

This US-75 Corridor contains Dallas’ first major freeway completed around 1950. This section of freeway was totally reconstructed with cantilevered frontage roads over the depressed freeway section and re-opened in 1999 with a minimum of eight general-purpose lanes. The freeway mainlanes carry over 250,000 vehicles a day, with another 20,000-30,000 on the frontage roads.

The Corridor also contains the first light-rail line constructed in Dallas, part of the 20-mile DART starter system, opened in 1996. The Red Line now expands into cities of Richardson and Plano and passes next to the cities of Highland Park and University Park. This facility operates partially at-grade and partially grade separated through deep-bored tunnels under US 75. There is also another rail line, the Blue Line, which operates in the US-75 Corridor near downtown Dallas and extends along the eastern edge of the Corridor boundary. In the downtown, there is also a connection from these lines to the regional commuter rail line that extends to downtown Fort Worth.

The Corridor serves commuting trips into downtown Dallas via the freeway, bus routes, light-rail line, and arterial streets. There are also a significant number of reverse commuters traveling to commercial and retail developments in the northern cities and neighborhoods. The Corridor also serves significant regional traffic during off-peak periods. The freeway is a continuation of Interstate 45; and thus, it also serves interstate traffic into Oklahoma. The Corridor is also a major evacuation route and experienced significant volumes during the Hurricane Rita evacuation in 2005.

There are three major freeway interchanges in the Corridor. US-75 has an interchange with the downtown freeway network connecting to Interstate 45 and Interstate 35E. At the midpoint in the Corridor, there is a newly constructed interchange with Interstate 635. In the northern section, there is an interchange with the President George Bush Turnpike (PGBT).

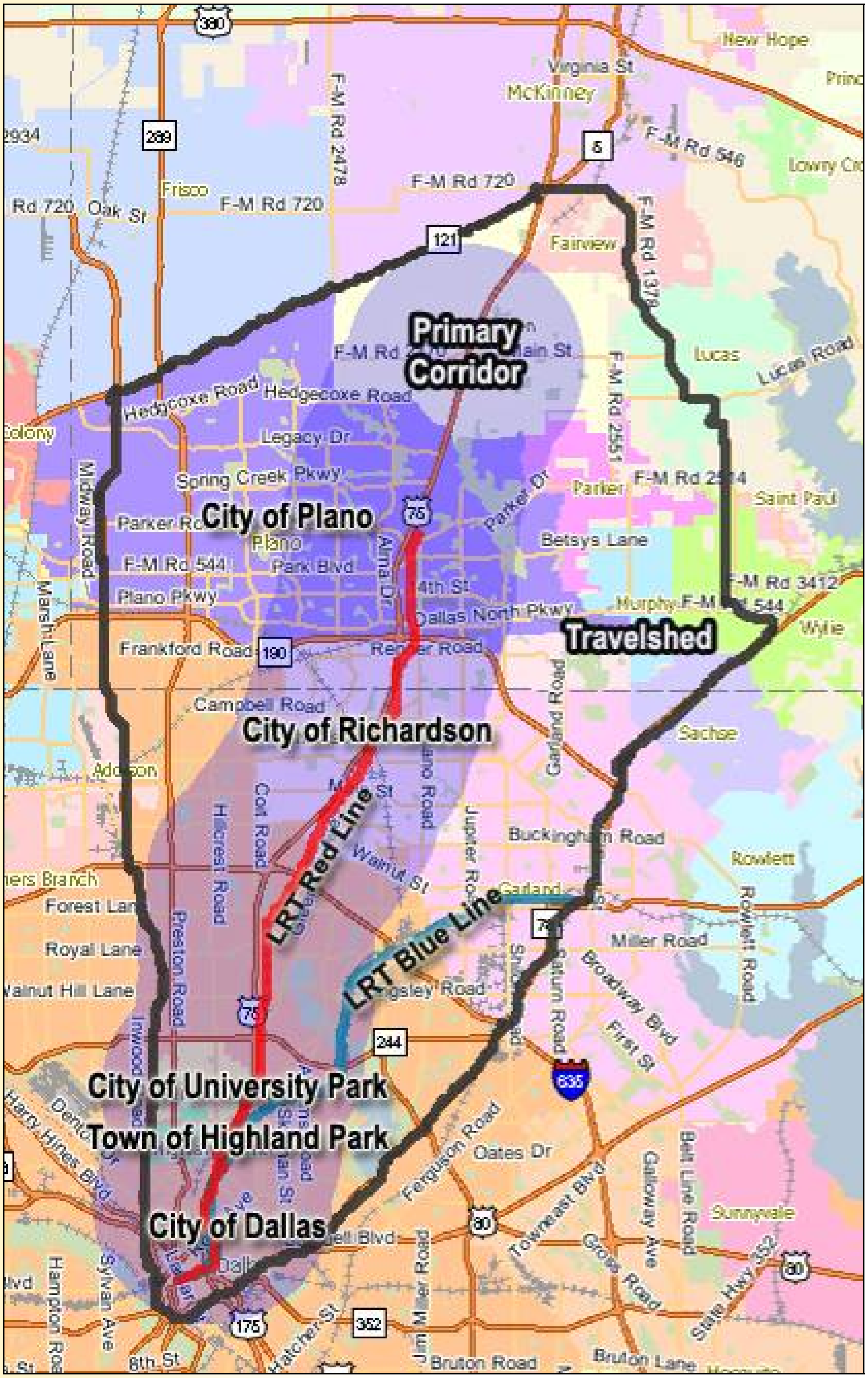


Figure 1.2-1 US-75 Corridor Boundaries (Source: NCTCOG website dfwmaps.com)

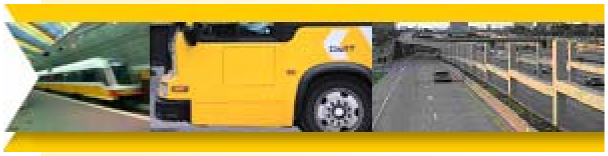
1.3. CORRIDOR STAKEHOLDERS AND USERS

The operating agencies located in the US-75 Corridor are all shown below, all of which were involved to some extent in the development of this Concept of Operations. Each agency has a designated lead staff member along with the technical staff in key areas of responsibility. A strong pool of universities supports the team and provides the needed expertise.

Table 1.3-1 below shows the current responsibilities and infrastructure that each agency within the US-75 Corridor currently provides to the region.

Table 1.3-1 Traffic Related Responsibilities of US-75 ICM Agencies

Traffic Related Roles	Texas DOT	City of Dallas	City of Richardson	City of Plano	DART	NTTA	NCTCOG	City of University Park	Town of Highland Park	University team
Police		●	●	●	●			●	●	
Fire		●	●	●				●	●	
Emergency Services		●	●	●	●			●	●	
Courtesy Patrol	●				●	●				
Traffic Signal System		●	●	●				●	●	
Surveillance / detectors	●	●	●	●	●	●				
DMS	●	●			●	●				
Public Works		●	●	●				●	●	
CCTV – sharing and control	●	●	●	●	●	●				
Electronic toll / fare / parking equipment					●	●				
Transit – Bus/ LRT/ Train					●					
Parking management		●	●	●	●					
Maintenance/ construction	●	●	●	●	●	●		●	●	
HOV	●				●					
Data Warehouse (○ = provide data)	○	○	○	○	○	○	●	○	○	
Modeling							●			●
Internet Traveler Information	●	●	●	●	●	●	●	●	●	



1.4. NEED FOR INTEGRATED CORRIDOR MANAGEMENT (ICM)

Simply put, the Integrated Corridor Management concept seems to be the only solution for increasing capacity in the Dallas US-75 Corridor. The needs and goals, as detailed in Section 3.8 related transportation operations within the Corridor, are most likely to be met only with operations within each of the separate transportation networks to be coordinated.

The US-75 Corridor consists of multiple independent networks:

- Freeway
- Managed High Occupancy Vehicle (HOV) Lanes
- Tollway
- Arterials
- Bus
- Light Rail

Each of these corridor networks are experiencing congestion to some extent during peak hours. "Integrated Corridor Management" focuses on the operational, institutional, and technical coordination of multiple transportation networks and cross-network connections comprising a corridor. Moreover, ICM can encompass several activities which address the problems and needs identified in the previous section (e.g., integrated policy among stakeholders, communications among network operators and stakeholders, improving the efficiency of cross-network junctions and interfaces, real-time traffic and transit monitoring, real-time information distribution, congestion management, incident management, public awareness programs, and transportation pricing and payment).

The US-75 Steering Committee has identified multiple areas and strategies that would assist in operating the corridor in a more efficient and safe manner and has a positive impact to the overall economy of the region. The first major area deals with information sharing both with the public and among agencies. Currently the region has an ITS Standards based Center-to-Center program with a couple of the agencies integrated. This sharing of information could be used for better informing the public of the operations of the corridor and the availability and impact of different modes. The corridor could provide comparative travel time across modes, so that travelers can make informed decisions about trips they are about to make, this would include the ability to collect and distribute arterial travel time data via various media including through 3rd party ISPs, websites, and subscription services for phones and PDAs.

One of the areas multiple agencies identified that is needed is coordinated response plans and a decision support tool to assist with the on-going operations of the corridor. This decision support tool would be integrated with the various agencies, and provide multi-agency responses to scenarios that have been modeled, agreed to, or meet certain criteria. The agencies will identify hot spots where re-occurring incidents and special events occur, and develop responses that are coordinated and agreed upon by the agencies.

One of the deficiencies that needs to be addressed – and a specific attribute of the Regional ITS Architecture – involves the exchange and sharing of real-time data. With real-time data and video among the networks, each network could monitor the conditions of adjacent networks to anticipate when travelers may shift to their network and take appropriate actions. Moreover, real-time condition information would provide the foundation for corridor-wide traveler information. The corridor has solutions for both of these deficiencies – the current center-to-center project is used by some of the agencies within the corridor, but further expansion to all of the corridor agencies is needed. A Regional Data and Video Communication System is currently being designed that would serve as the central distribution point for sharing video among corridor agencies. Currently several cities, DART, and TxDOT share some of their video images.

Another element of ICM that is needed is outreach and marketing to the public and major employers within the corridor. Currently, many travelers utilize the regional website and 3rd Party ISPs (including Media) to find out about current conditions. One of the strategies identified by the stakeholders is outreach to major employers to provide customized traveler information to them; this could then be used as a potential way to allow diversion of travelers to use their overflow parking.

Another potential element of ICM involves enhanced mobility opportunities, including shifts to alternate routes and modes. Currently, any shifts that do occur are based on traveler knowledge and past experience. Using integrated real-time information, the various networks working as a corridor could influence traveler network shifts; especially promoting, when appropriate, shifts to the rail network with its unused capacity. The one problem with influencing a shift to rail is the parking shortage. Parking notification could be used to direct travelers to available parking; or in some situations temporary parking may be instituted to handle the new demand.

Current and new DMS deployed among the networks could be operationally integrated and messages could be used to provide travelers condition information on all corridor networks so that each traveler can take appropriate action if one or more of the corridor's network's performance is compromised. More can be done with corridor trip travel times to influence traveler shifts, or staggering of the start of travel. For special events, the DMS could be used to direct event attendees to specific event corridor transportation services.

Clearly, there is great potential to enhance current and near-term operations by implementing selected ICM and cross-network strategies. All of these enhancements would not be possible from an independent network operational perspective. The potential strategies identified above indicate that further investigation and design concerning integrated corridor management is warranted.

1.5. ICM VISION, GOALS AND OBJECTIVES

The US-75 ICM Project is a collaborative effort between Dallas Area Rapid Transit (DART), City of Dallas, Town of Highland Park, North Central Texas Council of Governments (NCTCOG), North Texas Tollway Authority (NTTA), City of Plano, City of Richardson, Texas Department of Transportation (TxDOT), the City of University Park and many local emergency service providers. The Team defined the Vision for the Corridor as:

"Operate the US-75 Corridor in a true multimodal, integrated, efficient, and safe fashion where the focus is on the transportation customer."

Using the Vision Statement as a starting point, the US-75 Steering Committee developed four primary Goals for the ICM, and discussed the Objectives and Strategies for each of the Goals. These Goals and Objectives are interrelated such that activities and strategies oriented towards attaining one of the Goals will likely impact the attainment of other Goals and Objectives.

Table 1.5-1 Goals and Objectives Relationship

Goals	Objectives
Increase corridor throughput – The agencies within the corridor have done much to increase the throughput of their individual networks both from a supply and operations point of view, and will continue to do so. The integrated corridor perspective builds on these network initiatives, managing delays on a corridor basis, utilizing any spare capacity within the corridor, and coordinating the junctions and interfaces between networks, in order to optimize the overall throughput of the corridor.	• Increase transit ridership, with minimal increase in transit operating costs. • Maximize the efficient use of any spare corridor capacity, such that delays on other saturated networks may be reduced. • Facilitate intermodal transfers and route and mode shifts • Improve pre-planning (e.g., developing response plans) for incidents, events, and emergencies that have corridor and regional implications.
Improve travel time reliability - The transportation agencies within the corridor have done much to increase the mobility and reliability of their individual networks, and will continue to do so. The integrated corridor perspective builds on these network initiatives, managing delays on a corridor basis, utilizing any spare capacity within the corridor, and coordinating the junctions and interfaces between networks, thereby providing a multi-modal transportation system that adequately meets customer expectations for travel time predictability.	• Reduce overall trip and person travel time through the corridor. • Improve travel predictability. • Maximize the efficient use of any spare corridor capacity, such that delays on other saturated networks may be reduced. • Improve commercial vehicle operations through and around the corridor.

Table 1.5.1 Goals and Objectives Relationship (Continued)

Goals	Objectives
Improved incident management - Provide a corridor-wide and integrated approach to the management of incidents, events, and emergencies that occur within the corridor or that otherwise impact the operation of the corridor, including planning, detection and verification, response and information sharing, such that the corridor returns back to "normal."	• Provide/expand means for communicating consistent and accurate information regarding incidents and events between corridor networks and public safety agencies. • Provide an integrated and coordinated response during major incidents and emergencies, including joint-use and sharing of response assets and resources among stakeholders, and development of a common policies and processes. • Continue comprehensive and on-going training program – involving all corridor networks and public safety entities – for corridor event and incident management.
Enable intermodal travel decisions - Travelers must be provided with a holistic view of the corridor and its operation through the delivery of timely, accurate and reliable multimodal information, which then allows travelers to make informed choices regarding departure time, mode and route of travel. In some instances, the information will recommend travelers to utilize a specific mode or network. Advertising and marketing to travelers over time will allow a greater understanding of the modes available to them.	• Facilitate intermodal transfers and route and mode shifts • Increase transit ridership • Expand existing ATIS systems to include mode shifts as part of pre-planning • Expand coverage and availability of ATIS devices • Obtain accurate real-time on the current status of the corridor network and cross-network connections

1.6. ICM OPERATIONAL APPROACHES AND STRATEGIES

In order to determine the Strategies to meet the Needs, Goals, and Objectives of the US 75 Corridor Stakeholders, several meetings and workshops were completed to ensure that all Stakeholder viewpoints were relayed and considered in the decision-making process by the project US-75 Steering Committee. The activities that were completed as part of developing this Con Ops included:

- Meeting with each Stakeholder agency individually to discuss the US 75 Corridor, the agency's needs and potential Strategies for meeting the Goals
- Multiple project US-75 Steering Committee meetings / workshops to review the findings of the agency meetings, and to the discuss Goals and Strategies for the US 75 Corridor ICM

These scenarios and the Goals, Objectives, and needs of the Corridor also guided the selection of the ICM Strategies for the US 75 Corridor, which are shown in Table 1.6-1 by Goal.

Table 1.6-1 ICM Approaches and Strategies

Goal	Proposed ICM Approach and Strategies

Increase corridor throughput	• HOV Lanes
	• Transit Usage Increase
	• Increase/ Maximize Supply
	  o Additional Transit
	  o Additional Parking
	  o Diversion of Vehicles
	• Integrated Approach to Management
	  o Trade-offs between agencies to improve overall corridor operations
	• Modeling of Corridor and Strategies

Improve travel time reliability	• ATIS • Incident Management o Response Time Improvements – consistent goal among agencies within Corridor

Improved incident management	• Inter-agency cooperation
	• Inter-agency information sharing
	  o CAD System integration
	  o Radio system
	  o Center to Center
	  o Video Sharing
	• Training of Agencies on common approach
	  o Current courses available
	• Integrated Policies for Incident Response (towing policies, response times)
	• Decision Support Model for historical, and near real-time scenario evaluation

Enable intermodal travel decisions	• Model of Multi-mode system
	• ATIS
	  o Availability of other modes
	  o Linked Websites/ Portal
	  o 3rd Party Integration
	• Marketing/ Advertising
	  o Public Outreach/ Education

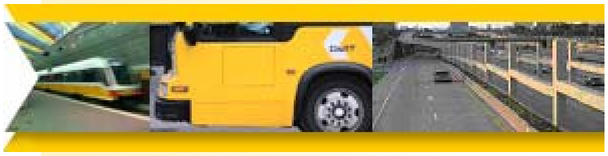


Table 1.6-2 Relationship between US 75 ICM Strategies and Corridor Goals

ICM Strategy **● = Directly Supports Goal** **○ = Indirectly Supports Goal**	**Increase corridor throughput**	**Improve travel time reliability**	**Improved incident management**	**Enable intermodal travel decisions**
Information Sharing/ Distribution				
Manual information Sharing	○	○	●	○
Automated information sharing (real time data)		○	●	○
Automated information sharing (real time video)		○	●	○
Information clearinghouse / Information Exchange Network (corridor networks / agencies)	●	●	○	●
Corridor-based ATIS database that provide information to users	●	●	○	●
Access to corridor ATIS database by 3rd party information providers		●	●	○
En-route traveler information devices (DMS, 511, transit PA systems) being used to describe current operational conditions on another network within the corridor			●	●
A common incident reporting system and asset management (GIS) system			●	
Decision Support Tools to model responses – pre-planned	●	●	●	●
Decision Support Tools to model and develop responses in near real-time		●	●	●
Improve Operational Efficiency				
Signal priority for transit (e.g., extended green times to buses that are operating behind schedule)	●	○		●
Transit Traveler Information	○			●
Multi-modal electronic payment.	●			●
Multi-agency/multi-network incident response teams and service patrols, along with training exercises for various types of incidents and events.	○		●	○
Coordinated operation between traffic signals and rail transit crossings in close proximity	●	○		
Accommodate / Promote Cross-Network Route & Modal Shifts				
Modeling of Mode Shift	●	●		●
Modify arterial signal timing to accommodate traffic shifting from freeway	●	○		

Table 1.6-2 Relationship between US 75 ICM Strategies and Corridor Goals (Continued)

ICM Strategy **● = Directly Supports Goal** **○ = Indirectly Supports Goal**	**Increase corridor throughput**	**Improve travel time reliability**	**Improved incident management**	**Enable intermodal travel decisions**
Mode Shift from roadways to transit (or vice versa) via en-route traveler information devices (e.g., DMS, HAR, “511”) Advise motorists of congestion ahead, direct them to light rail / rail transit, & provide real-time information on the number of parking spaces available in the park & ride facility.	○	○		●
Manage Capacity–Demand Relationship – Real-time” / Short-Term				
Add transit capacity by adjusting headways and number of vehicles	●	○		●
Add capacity at parking lots (temporary lots)	○			●
Coordinated scheduled maintenance and construction				
Increase roadway capacity by opening HOV lanes during major incidents to all traffic	○		●	
Modify HOV restriction	○		●	
Restrict / re-route commercial traffic	●	○		

1.7. ICMS CONCEPT OPERATIONAL DESCRIPTION

The ICMS is the system that will carry out the ICM strategies. In the future, the US-75 Corridor ICMS will provide, to the greatest extent possible, efficient and reliable travel throughout the US-75 Corridor and the constituent networks, resulting in improved and consistent trip travel times. Using cross-network strategies, the US-75 Corridor will capitalize on integrated network operations to manage the total capacity and demand of the system in relation to the changing corridor conditions.

The US 75 ICMS is a system that generates comparative corridor data in real-time on freeways, HOV lanes, arterials, and transit facilities. The system projects corridor operations one hour into the future, analyzes potential corridor operating strategies and their benefits, and communicates recommended response plans back to the corridor operating agencies. Each operating agency is responsible for implementing their part of a response plan; however, the actions and corridor impacts can be monitored from the regional traveler information web site.

The daily operation of the corridor will be an expansion of the existing relationships and operations of the agencies within the region with additional coordination, communication, and responses to congestion and incidents in the corridor; but will now be applied on a permanent basis for day-to-day operations.

All operations among corridor networks and agencies will be coordinated through a corridor Decision Support System interconnected with the Regional Center-to-Center communication network. The US-75 Corridor Steering Committee, as described in Section 1.9, will develop and update corridor response plans for various scenarios that can be expected to occur within the US-75 Corridor.

Communications, systems, and system networks will be integrated to support the corridor and decision support system. Voice, data, video, information, and control will be provided to all agencies based on the adopted protocols and standards for the sharing of information and the distribution of responsibilities.

Traveler information (on websites, DMS, and through the media and ISPs) will be corridor-based, providing information on corridor trip alternatives complete with current and predicted conditions. Travelers will access or be given real-time corridor information so they can plan or alter their trips in response to current or predicted corridor conditions.

Each traveler will be able to make route and modal shifts between networks easily due to integrated corridor information, integrated fare/parking payment system, and coordinated operations between networks. Using one network or another will be dependent on the preferences of the traveler, and not the nuances of each network.

Travelers will be able to educate themselves about the corridor so they can identify their optimal travel alternatives and obtain the necessary assets (e.g., smart card, available parking) to facilitate their use of corridor alternatives when conditions warrant.

1.8. REQUIRED ASSETS AND ICM IMPLEMENTATION ISSUES

The assets and processes that are needed for a more integrated corridor will be prioritized and accounted for when the high-level and detailed level requirements and designs are developed in the future as a part of the systems engineering process. A key component of this prioritization is the corridor models that are in development. These models will be utilized by the committee to review and analyze the proposed strategies, to determine which strategies have the best benefit/ cost ratio for the corridor and are technologically feasible with the existing systems.

Table 1.8-1 Asset Changes and Additions by Agency

Organizational Entity	Changes and Additions
Texas Department of Transportation (TxDOT)	• Deployment of Additional Devices • Ramp Meters
City of Dallas	• Additional 10 Arterial DMS and 130 Cameras • Arterial DMS Interface to Freeway Messages • Upgrade of ATMS planned for 2008-2009
City of Richardson	• Complete Upgrade of Traffic Signal Controllers • Communications Upgrade to Spread-spectrum Radio • Citywide Highway Advisory Radio system • Transit Signal Priority
City of Plano	• New Coordination Timing of the City's Traffic Signals • Transit Signal Priority
Dallas Area Rapid Transit (DART) - Bus Service	• Mobile Data Terminals in Supervisor/ DART Police Vehicles • Replacement of Radio System/ AVL by 2010 • Testing of Real-time Passenger Information Systems
Dallas Area Rapid Transit (DART) - Rail Service	• Vehicle Business System • Mobile Data Terminals • Link to Traffic Monitoring System
Dallas Area Rapid Transit (DART)	• DART communication network (intra-agency integration) • In-vehicle business system (DART Police) • Upgrade radio system network (DART Police)
North Central Texas Council of Governments	• Data Archive • City Plug-ins to the C2C database
North Texas Tollway Authority	• Additional CCTV cameras • Vision based toll collection

The ICM concept represents a paradigm shift for management and operations within the Generic Corridor – from the current partial coordinated operations between corridor networks and agencies, to a fully integrated and pro-active operational approach that focuses on a corridor perspective rather than a collection of individual (and relatively independent) networks. To make this happen, several implementation and integration issues must be resolved. Several of these implementation issues will involve choices that cannot be fully addressed and subsequently resolved until later stages of the systems engineering process (e.g., design, procurement, and implementation).

1.9. US-75 CORRIDOR ICM CONCEPT INSTITUTIONAL FRAMEWORK

In developing the institutional framework, the US-75 Steering Committee considered many configurations and institutional arrangements to continue and improve upon a de-centralized operational model with a centralized decision making body for cooperation and oversight. The concept presented herein represents the institutional framework endorsed by the US-75 Steering Committee. The approach for the US-75 Corridor is to utilize existing institutional cooperation agreements, and expand on them specifically for the corridor.

The management and operations of the corridor and the ICM will be a joint effort involving all the stakeholders. To effectively manage and operate the ICM concept as described in this Con Ops document, the US-75 Steering Committee recommends the creation of a central corridor decision-making body. This body – designated as the **US-75 ICM Subcommittee** – will consist of leadership level representatives from each of the stakeholders in the US-75 Corridor. Due to the number of agencies involved, the subcommittee is envisioned to be a subcommittee of the Regional ITS Steering Committee. The membership will consist of members from each of the corridor agencies; however, membership will be on a rotational basis so that the size doesn't become too large.

The elected officials for the region are members of the **Regional Transportation Council**, which provides direction and policy decisions for the members of the US-75 Corridor. A formal recognition of the US-75 ICM Subcommittee will be requested, and a committee charter created to outline its goals. It is envisioned that the US-75 ICM Subcommittee will be a subcommittee of the existing regional **ITS Steering Committee**.

The US-75 ICM Subcommittee will be the central decision-making body for the corridor, managing the distribution of responsibilities, the sharing of control, and related functions among the corridor agencies. The US-75 ICM Subcommittee will be responsible for establishing the necessary inter-agency and service agreements, budget development, project initiation and selection, corridor operations policies and procedures, and overall administration.

The US-75 Steering Committee discussed how the corridor would be managed from an institutional point of view, and in keeping with the current plans for the region. Since both TxDOT and DART will be operating from the DalTrans advanced transportation management center, and will continue to be connected to the City of Dallas and the City of Richardson, it will serve as the central point of coordination for the US-75 Corridor.

The proposed institutional framework for the US-75 Corridor as described above is shown in Figure 1.9-1, the green shaded boxes (TxDOT and DART) are co-located at the DalTrans Facility, and the blue shaded boxes (City of Dallas and City of Richardson) have direct connections to the DalTrans facility. The US-75 Corridor staffing is summarized in Table 4.9-1.

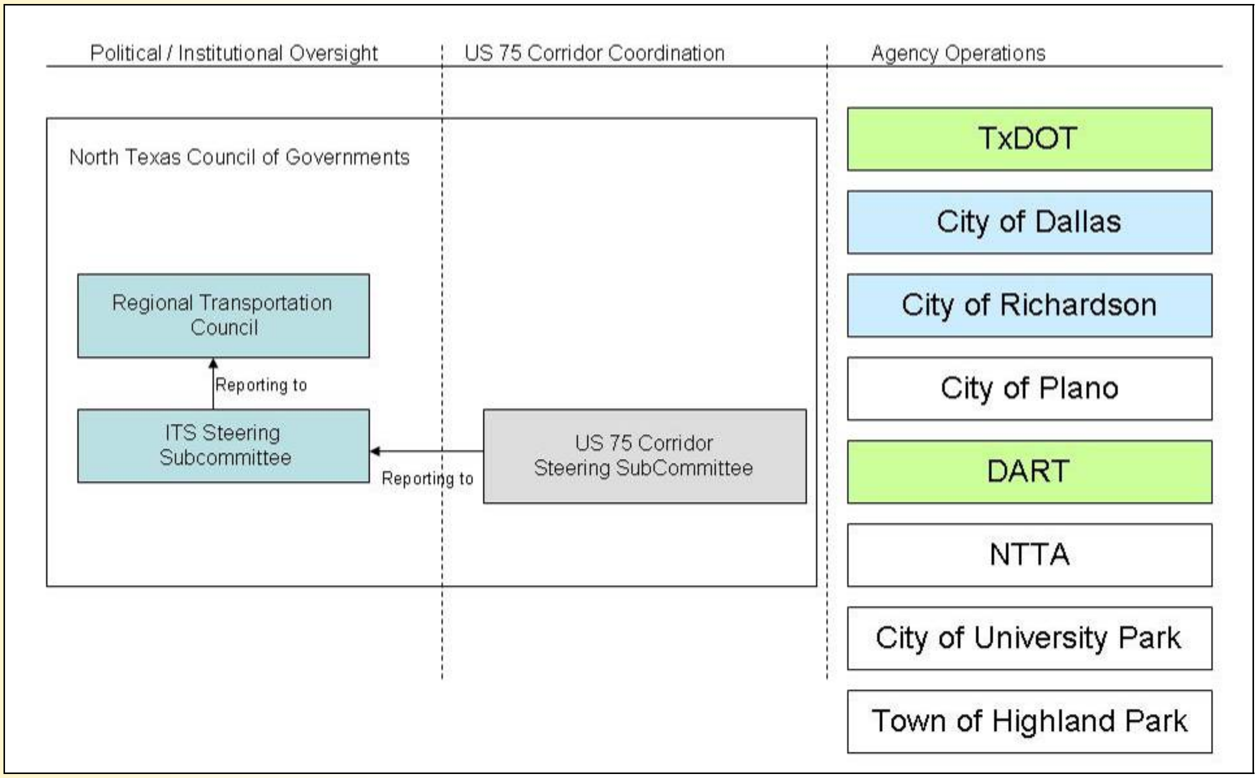


Figure 1.9-1 US-75 ICM Institutional Framework

1.10. SUMMARY

The US-75 Steering Committee is committed to the concepts of ICM and have agreed to continue the pursuit of working in a more coordinated and efficient manner for the US-75 Corridor. The key areas of commitment include focusing on the continued expansion and integration of information sharing between the agencies and the traveling public. The Dallas area understands the need and value for Integrated Corridor Management and is committed toward both short-term deployments and the longer term deployments. As shown in Section 3.5 (Proposed Near-Term Network Improvements) and Section 4.4 (Comparison of ICM Asset Requirements with Current/ Proposed Assets) the agencies in the corridor will be making improvements to the corridor infrastructure that will assist in improving the integration and infrastructure for the corridor.

The US-75 Steering Committee understands the benefits of ICM, and have agreed to continue to work cooperatively to improve the operations of the corridor, the spirit of ICM will continue in the corridor regardless of the funding available through the US DOT ICM Program.

2. References

Overview – This chapter serves as a guide to resources utilized in the development of the ICM Con Ops document, as well as a source for additional information regarding the various agencies and their network-specific systems to be integrated into the ICM, related guides and standards, and the ICM Initiative itself.

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- Draft I-30 (Tom Landry Freeway) Buffer-separated Concurrent-flow and Barrier-separated Reversible-flow Managed HOV Lanes: Standard Operating Procedures, TxDOT and DART, June 2007.
- I-635 (LBJ Freeway) Buffer-separated Concurrent-flow and Barrier-separated Reversible-flow HOV Lanes: Standard Operating Procedures, TxDOT and DART, July 2007.

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3. System Overview and Operational Description

3.1. CORRIDOR BOUNDARIES AND NETWORKS

The following descriptions of the US-75 ICM Corridor Boundaries were initially defined through the proposal process of the ICM project. Through stakeholder concurrence gained as part of developing this Con Ops, the Corridor Boundaries have been confirmed and remain unchanged from the proposal. This concurrence took into account current and forecasted travel patterns; the travel market or markets that are served by the Corridor; operational characteristics and typical scenarios/events (as part of Chapter 4) within the Corridor; availability of cross-network connections and spare capacity; as well as other conditions and deficiencies expressed by Stakeholders within the Corridor. In addition to a description of the Corridor Boundaries, travel Networks that compose the Corridor are also described in this Section. The Networks include: arterial streets, freeways, managed HOV lanes, tollways, bus and rail transit, vanpool, and pedestrian/bicycle facilities.

3.1.1. Corridor Description and Boundaries

This Concept of Operation is defined for the Dallas US-75 Corridor (aka the North Central Expressway Corridor). The US-75 Corridor is a major north-south radial corridor connecting downtown Dallas with many of the suburbs and cities north of Dallas. It contains a primary freeway, continuous frontage roads, a light-rail line, transit bus service, park-and-ride lots, major regional arterial streets, toll roads, bike trails, and significant intelligent transportation system (ITS) infrastructure. Within the next two years, a high-occupancy vehicle (HOV) lane will be added to the US-75 freeway, and associated expansion of ITS infrastructure for the freeway and arterials streets is programmed for deployment.

For the Con Ops, the US-75 Corridor boundaries have been defined at two levels. The immediate Primary Corridor Boundary encompasses the primary US-75 freeway corridor, the light-rail line corridor, and all arterial streets within approximately two miles of the freeway. The “Primary Corridor Boundary” (referred to as such herein) is portrayed in Figure 3.1-1 below. In addition, a full “travelshed” influence area boundary has been defined that includes additional alternate modes and routes that may be affected by a major incident or event. The travelshed area is generally bound by Downtown Dallas to the south, the Dallas North Tollway to the west, SH21 to the north, and a combination of arterials streets and the DART Blue Line to the east. This travelshed influence area (referred to herein as “Influence Area”) is also shown below in Figure 3.1-1.

The US-75 Corridor contains Dallas’ first major freeway – completed around 1950. This section of freeway was totally reconstructed with cantilevered frontage roads over the depressed freeway section and re-opened in 1999 with a minimum of eight general-purpose lanes. The freeway mainlanes carry over 250,000 vehicles-a-day, with another 20,000-30,000 on the frontage roads. Concurrent-flow, high-occupancy vehicle lanes are scheduled to open during 2007 in the northern portion of US-75.

The Corridor also contains the first light-rail line constructed in Dallas, part of the 20-mile DART starter system, opened in 1996. The Red Line light rail service now expands into cities of Richardson and Plano and passes adjacent to the cities of Highland Park and University Park. This facility operates partially at-grade and partially grade-separated through deep-bored tunnels under US-75. The Blue Line light rail service operates in the US-75 Corridor near downtown Dallas and extends along the eastern edge of the Corridor Influence Area boundary. There is also a downtown Dallas connection from the Red and Blue Lines to the regional commuter rail line that extends to downtown Fort Worth.

The Corridor serves commuting trips into downtown Dallas via the freeway, bus routes, light-rail line, and arterial streets. There is also a significant number of reverse commuters traveling to commercial and retail developments in cities and neighborhoods north of Dallas. The Corridor serves significant regional traffic during off-peak periods. The freeway is a continuation of Interstate 45; and thus, it also carries interregional Interstate freeway traffic into and out of Oklahoma. Additionally, the Corridor serves as a major evacuation route and experienced significant volume increases during the Hurricane Rita evacuation in 2005 There are significant employment destinations within the corridor (e.g., Texas Instruments), and major shopping centers (NorthPark Mall).

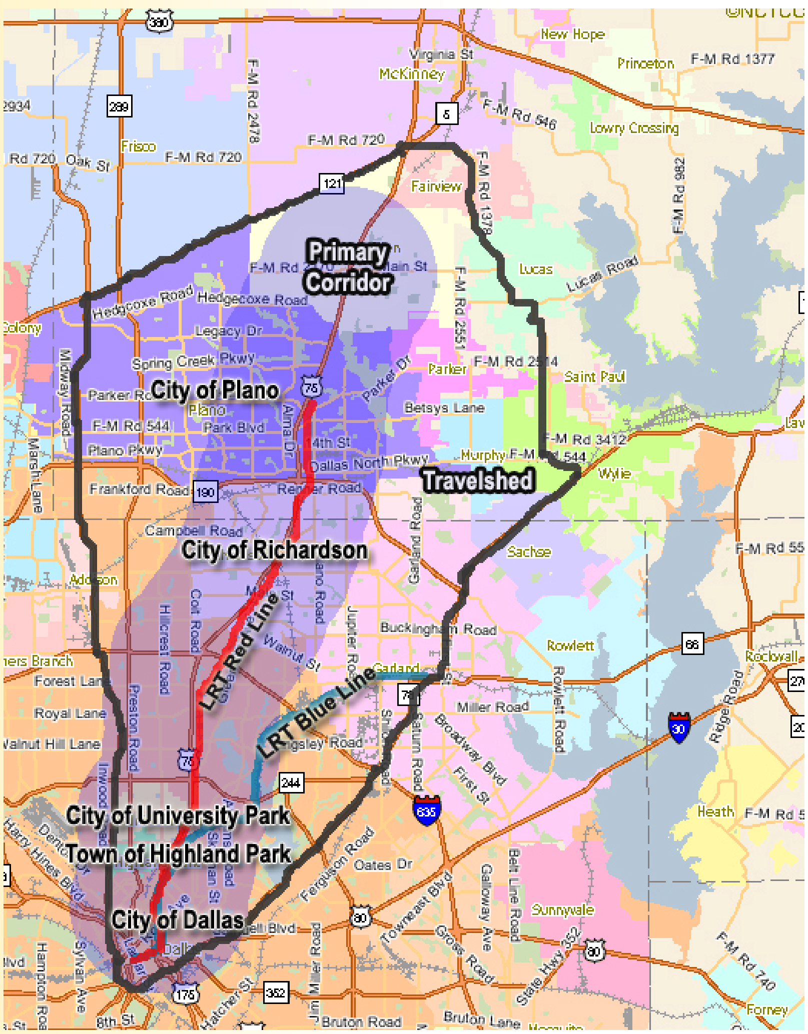


Figure 3.1-1 Primary Corridor for the US-75 ICM (Source: NCTCOG website dfwmaps.com)

There are three major freeway interchanges in the Corridor. To the south, US-75 has an interchange with the downtown freeway network, including connections with Interstate 45 and Interstate 35E. At the approximate midpoint of the Corridor, there is a newly constructed interchange with Interstate 635. In the northern section, there is an interchange with the President George Bush Turnpike (PGBT), and US-75 and SH 121 will become a major interchange.

3.1.2. Corridor Networks

This section describes the Networks contained within the US-75 ICM Corridor. A Network is defined for the purposes of this Con Ops as a system of transportation infrastructure that is independent of agency or jurisdictional boundary. A description of each Network is provided in more detail below. Table 3.1-1 below provides an overall summary of the transportation infrastructure assets in the seven Networks within the US-75 ICM Corridor.

Table 3.1-1 Existing Asset Statistics for Network Facilities in US-75 Corridor

Transportation Facility (with Corresponding Agency[ies])	Summary Total
Access Controlled Freeways with Frontage Roads (TxDOT)	272 lane-miles
Freeway Management Center (TxDOT)	1 center
High Occupancy Vehicle Facilities (DART/TxDOT)	31 lane-miles
Light Rail Transit System (DART)	2 lines – 20 stations
Bus Transit System (DART)	30 bus routes
City Computer Controlled Traffic Signal Systems	3 systems
Dallas	500 signals
Plano	196 signals
Richardson	120 signals
Arterials Streets (Richardson, Dallas, Plano, University Park, Highland Park)	167 center-line miles
Park and Ride Lots (DART)	9
Tollways (NTTA)	105 lane-miles

3.1.3. Freeway Network - US-75 North Central Expressway & Dallas High-Five Interchange

The section of US-75 North Central Expressway contained within the Corridor Boundary is approximately 28 miles in length. The freeway is divided into 3 major sections. The southern section, generally an eight-lane freeway, spans 10 miles from downtown Dallas to I-635. This section was recently reconstructed and opened in 1999. The middle section, also an eight-lane freeway, spans from I-635 to the PGBT, a distance of seven miles. The northern section of the US-75 Corridor goes from north of PGBT to the end of the HOV lane, a distance of eight miles. In this section the freeway transitions to a six-lane freeway. There are continuous frontage roads that parallel the freeway.

In addition to the freeway general purpose lanes, a major new interchange was added at I-635. Locally referred to as the "High-Five", the interchange consists of five-levels: a level for US-75 mainlanes, a level for I-635 mainlanes, a level for one set of direct connect ramps, a level for another set of direct connect ramps, and a fifth level for a full at-grade interchange of the continuous frontage roads. The full interchange of the frontage road facilitates expanded traffic management capabilities - if an incident affects one of the direct connect ramps, the freeway-to-freeway traffic can be routed through the signalized frontage road interchange. There is significant capacity to reroute traffic because the frontage road intersections essentially operate as two phase signalized intersections of two one-way streets.

3.1.4. Freeway Network - US-75 HOV Lane

The US-75 HOV lane construction was completed in December 2007. The HOV lane is a single concurrent flow lane in each direction separated from the general purpose traffic by a painted buffer area with pylons to provide physical separation. The HOV lane is 15 miles in length (these are new miles being added to the existing 31-mile system) and extends from the northern end of the Corridor (Exchange Parkway and US-75) to the I-635 interchange.

There are three access points in each direction to the HOV lane within the Corridor. The northern end has a slip ramp from the inside lanes of the freeway. Near the I-635 interchange there are "wishbone" type ramps for traffic to enter and exit the facility.

3.1.5. Transit Network – Light Rail

The primary light-rail line within the US-75 Corridor is the Red Line which runs north-south, as shown in Figure 3.1-2 below. The portion of the Red Line within the Corridor Boundaries runs from the Downtown Dallas station (Convention Center Station) to the northern-most station (Parker Road Station) in the City of Plano. Between these two endpoints, there are a total of 17 rail stations.

In addition, the Blue Line runs in the US-75 Corridor Influence Area from Downtown Dallas to the Mockingbird Lane Station (approximately three miles). From the Mockingbird Lane Station, the Blue Line runs into the City of Garland. The Blue Line is the eastern-most boundary of the larger Corridor Influence Area and could serve as an alternate rail route into downtown if there were problems with the Red Line.

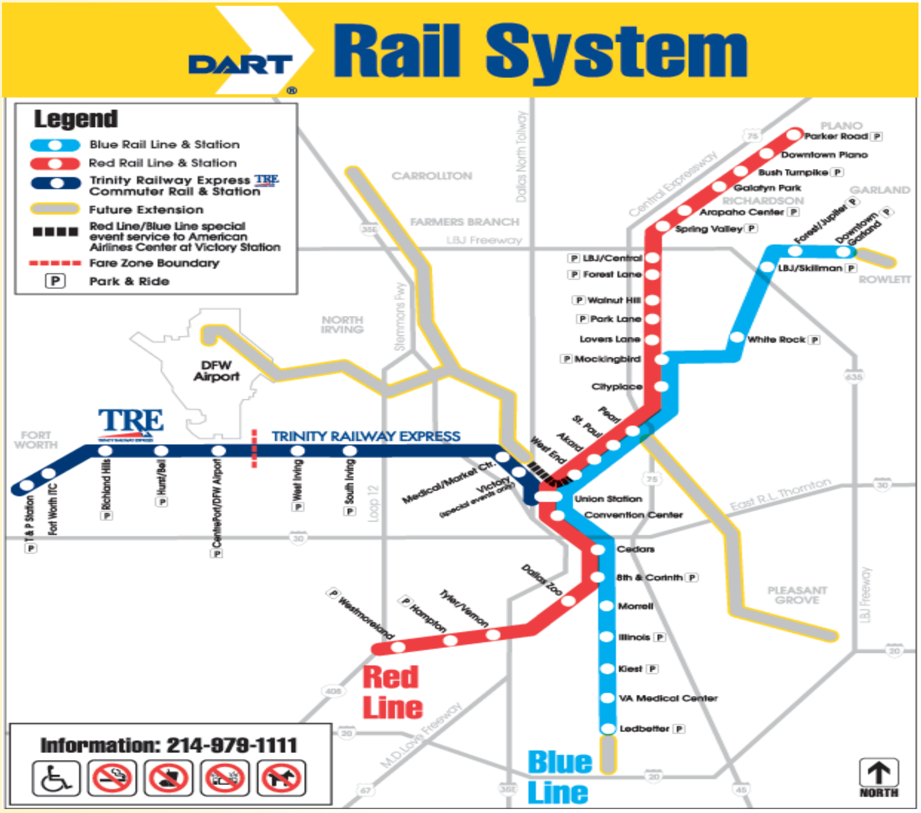


Figure 3.1-2 DART Light Rail Network (Source: DART)

3.1.6. Transit Network - Bus

The bus transit Network within the US-75 Corridor Boundary consists of various types of services. There is local bus service serving specific areas characterized by frequent stops. In addition, express routes and cross-town routes that serve longer distance trips. Express routes have less frequent stops and generally run on the primary arterials within the Corridor.

There is also a light-rail station feeder bus service. These bus lines transport passengers traveling between light-rail stations. In total, there are 30 express routes and an additional 12 special routes in the US-75 Corridor.

3.1.7. Arterial Network

The arterial street system consists of several major north-south arterial streets. These primary streets are typically spaced at one-mile intervals and serve as primary travel routes and potentially serve as alternate routes for traffic diverted from freeways and toll roads. The key north-south arterials in the US-75 Corridor are shown in the table below.

Table 3.1-2 Major North-South Arterials in US-75 Corridor

Arterials East of ICM	Arterials West of ICM
• Jupiter Road	• Custer Road

• Plano Road • Abrams Avenue / Gaston Road • Skillman Avenue / Live Oak Avenue • Alma Road	• Coit Road • Greenville Avenue • Hillcrest Road • Preston Road

There are also several key east-west arterials. While many of these carry significant traffic, these arterials are critical for moving traffic between the north-south routes, especially for diversion purposes. The key east-west arterials are:

- McDermott Road
- Spring Creek Parkway
- Park Boulevard
- Plano Parkway
- Campbell Road
- Arapaho Road
- Belt Line Road
- Spring Valley Road
- Forest Lane
- Royal Lane
- Walnut Hill Lane
- Northwest Highway
- Lovers Lane
- Mockingbird Avenue

In general, the arterials are on a grid pattern and US-75 is aligned in a north-northwest direction.

3.1.8. Toll Road Network

The NTTA operates both the President George Bush Turnpike (PGBT) and the Dallas North Tollway (DNT). The PGBT is an east-west toll road that intersects the Corridor in the northern section. The PGBT provides access to several of the north-south arterials to the west as well as the DNT. The DNT is the other major north-south controlled access facility. The north-south arterials and the DNT have the ability to serve as alternate routes to destinations in the US-75 Corridor.

The DNT has three mainline plazas with both high-speed electronic toll collection-only (ETC) lanes, and toll booth lanes that accept either electronic or cash payment. There are also ten ramp access locations that accept both electronic and cash payment.

3.1.9. Bicycle and Pedestrian Network

Bicycle and pedestrian paths, part of a regionally planned system, are also present in the Corridor. There are 62 miles of off-street, multi-use pedestrian and bicycle facilities and 82 miles of on-street bicycle routes. There are two primary bicycle / pedestrian facilities in the US-75 Corridor: the Katy Trail and the Hillcrest to White Rock Lake trail.

The Katy Trail runs from the West End and the American Airlines Center in the south, through the heart of urban Dallas past Knox Street, up to SMU and Mockingbird DART Station in the north. When complete, the Katy Trail will serve bikers, runners, walkers, and in-line skaters. It will feature a 3.5-mile, 12-foot wide concrete path for wheels and a 3.1-mile, 8-foot wide state-of-the-art, soft-surface track for runners and walkers.

The trail extending from Hillcrest to White Rock Lake is approximately 10 miles in length and crosses the Corridor close to the beginning of the Katy Trail facility.

3.2. CORRIDOR STAKEHOLDERS

There are portions of five municipalities, two counties, a tollway authority, a metropolitan planning organization, and a transit authority operating as public agency Stakeholders within the US-75 ICM Corridor A description of each stakeholder is included in more detail below. It is noted that the municipalities listed are in the service area of the transit authority and all are contained within the area of responsibility for the Dallas District of the Texas Department of Transportation.

3.2.1. City of Dallas

Dallas is the largest city in the urban area with a population of 1,210,390 – making it the 9th largest city in the United States, 3rd largest in Texas, covering 384 square miles. The City of Dallas municipal agency employs over 12,000 workers, with over 5,400 dedicated to public safety (police and fire). The Dallas Independent School District is comprised of 180 public elementary and middle schools and 37 public high schools. In addition, the metro area has 17 two-year and technical/trade colleges, 4 public four-year colleges and universities, and 17 private colleges and universities. Dallas is one of the top convention cities in the country, with 3,700,000 conference attendees per year. The City of Dallas also has two airports.

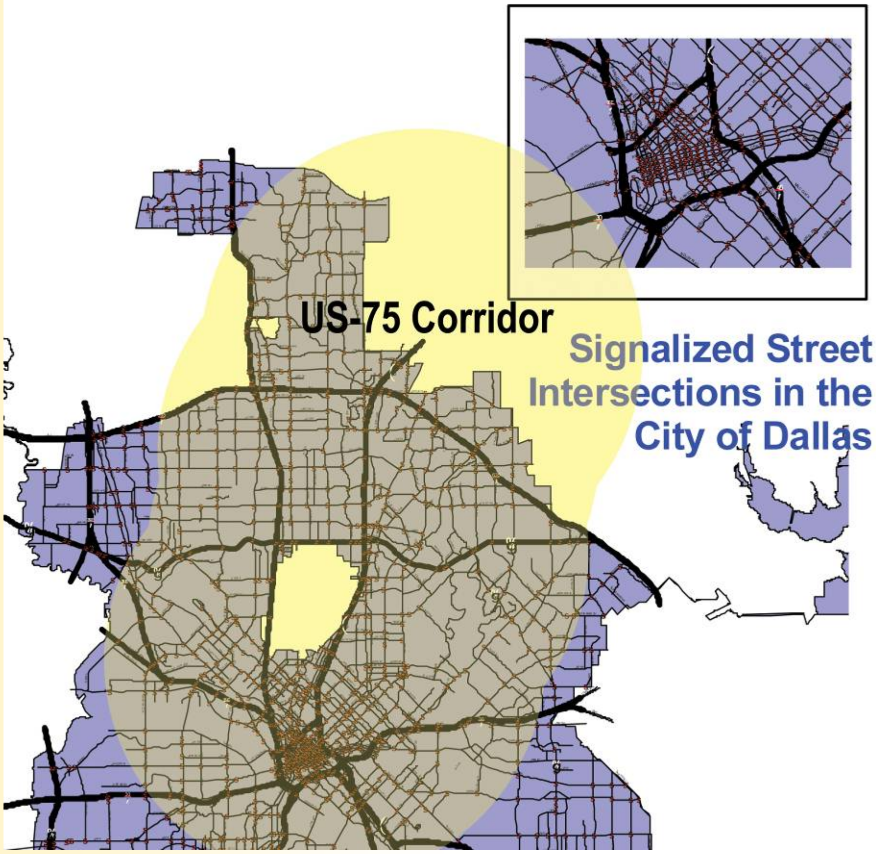


Figure 3.2-1 City of Dallas - Signals within the Corridor (Source: City of Dallas)

The City operates and maintains 1,300 traffic signals, shown in Figure 3.2-1, (most of which are in coordinated arterial signal systems); and 37 arterial Dynamic Message Signs (DMS), and 3 roadside cameras. There are 62 miles of bike & jogging trails and 500 miles of street bicycle routes. The Dallas Police Department provides incident management on all facilities within the City of Dallas except the HOV lanes and tollways.

3.2.2. Town of Highland Park

The Town of Highland Park has a population of 8,800 with 13 isolated traffic signals. Although freeway or tollway facilities do not pass through the town, both types of facilities abut the town limits.

3.2.3. City of Plano

Plano is the second largest city in the urban area with a population of 249,000. The Plano Police Department provides incident management on all facilities within its city limits except the tollways. The city operates a remote-access automated traffic signal system with over 196 intersections under control.

3.2.4. City of Richardson

Richardson has a population of 97,800. The Richardson Police Department provides incident management on all facilities within its city limits except the tollways. The city operates a remote-access automated traffic signal system with over 120 intersections under control, and a count station network of 105 locations.

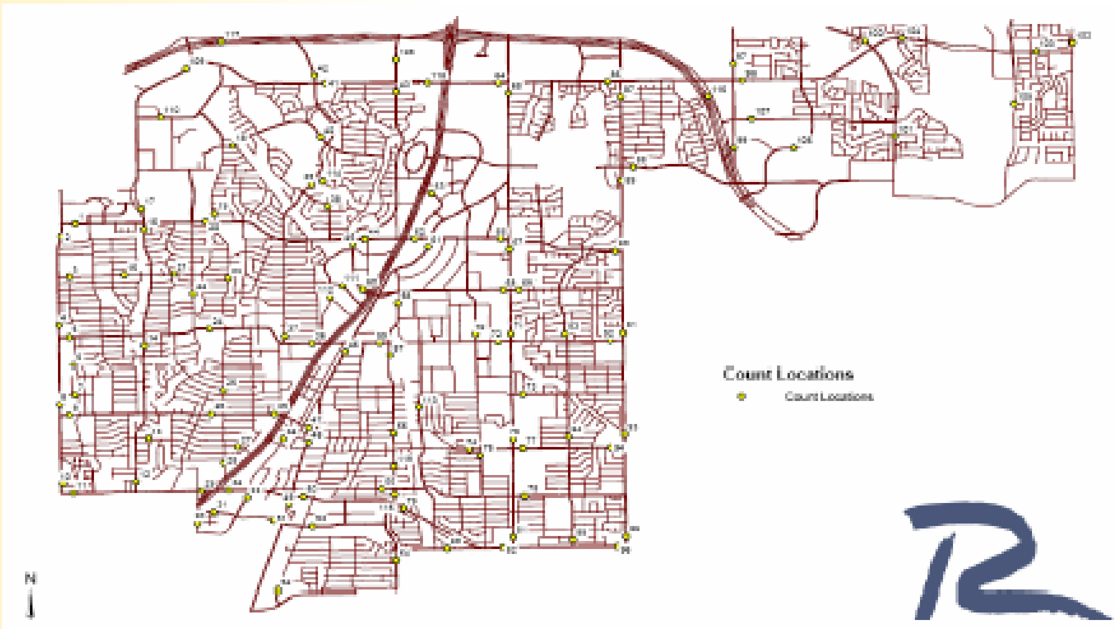


Figure 3.2-2 City of Richardson - Locations of Count Stations (Source: City of Richardson)

3.2.5. City of University Park

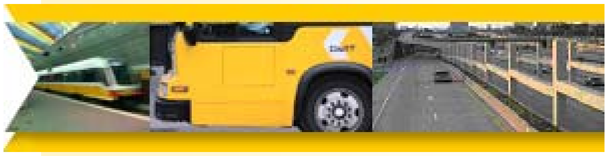
The City of University Park has a population of 23,300 with 33 traffic signals under coordination by three field masters. US-75 runs on the east side of University Park with a majority of the city to the west and a few city blocks to the east. The Dallas North Tollway runs along the western edge of the city.

3.2.6. Collin County

The northern portion of the Corridor is located in Collin County, which has a population of 492,700. The County does not have freeway management, signal management, or other operational responsibilities in the Corridor.

3.2.7. Dallas County

The southern portion of the Corridor is located in Dallas County, which has a population of 2.2 million. The Dallas County Sheriff operates courtesy patrols on the freeways and tollways in the region including coverage within the US-75 Corridor. The County does not operate freeway management systems, traffic signal systems, or transit systems. The



Dallas County Sheriff-based courtesy patrol staff coordinates activities with the regional transportation infrastructure agencies.

3.2.8. Dallas Area Rapid Transit Authority (DART)

Dallas Area Rapid Transit (DART) – a regional transit agency authorized pursuant to Chapter 452 of the Texas Transportation Code – was created by voters and funded with a one-cent local sales tax in 1983. The service area consists of 13 member cities: Addison, Carrollton, Cockrell Hill, Dallas, Farmers Branch, Garland, Glenn Heights, Highland Park, Irving, Plano, Richardson, Rowlett and University Park. DART is governed by a 15-member board appointed by member-city councils based on population. Eight members are appointed by the City of Dallas and seven are appointed by the remaining cities. Board members serve two-year terms with no limits. Board officers are elected from the board membership and serve one-year terms.

Dallas Area Rapid Transit (DART) provides bus and light rail transit service throughout the Corridor. Currently, DART serves Dallas and 12 surrounding cities with approximately 130 bus routes, 45 miles of light rail transit (DART Rail), 31 freeway miles of high occupancy vehicle (HOV) lanes, and paratransit service for the mobility impaired. DART and the Fort Worth Transportation Authority ("the T") jointly operate 35 miles of commuter rail transit (the Trinity Railway Express or TRE), linking downtown Dallas and Fort Worth with stops in the mid-cities and DFW International Airport. Through 2014, the DART Rail System is slated to more than double in size to 93 miles. Extensions now in development include the 17.5-mile Northwest Corridor serving downtown Dallas, American Airlines Center, the Dallas Medical/Market Center, Love Field Airport, and the cities of Farmers Branch and Carrollton.

The 45-mile DART Rail System provides fast, convenient service to work, shopping and entertainment destinations in Dallas, Plano and Richardson. Free parking is available at most rail stations, and all are served by bus routes timed to make transfers easy. Popular shopping, dining, and entertainment destinations near DART Rail stations within the US-75 Corridor include NorthPark Center and the Upper Greenville Avenue area (Park Lane Station), West Village (subterranean Cityplace Station), Mockingbird Station (Mockingbird Station), the Dallas Museum of Art (St. Paul Station), the historic West End District (West End Station), American Airlines Center (Victory Station), the Dallas Convention Center (Convention Center Station), the Renaissance Hotel and Eisemann Center for the Performing Arts (Galatyn Park Station in Richardson); Downtown Plano, the ArtCentre of Plano, and the Courtyard Theater (Downtown Plano Station).

DART operates all HOV facilities within the Dallas Region, including a Motorist Assistance Patrol on HOV facilities. Buses, motorcycles, vanpools and carpools with two or more occupants are eligible to use DART's 31-mile network off HOV lanes. DART operates HOV lanes on East R. L. Thornton Freeway (I-30) between Downtown Dallas and Jim Miller Road; Stemmons Freeway (I-35E) between LBJ Freeway (I-635) and Round Grove Road; LBJ Freeway between North Central Expressway and Stemmons Freeway; and I-35E/US 67 south of Downtown Dallas. Dynamic Message Signs, lane control signals, changeable message signs, and cameras associated with the HOV lane facilities are operated from the ITS Satellite Control Center at a DART/TxDOT facility. DART's Transit System Plan calls for 116 miles of managed HOV lanes. HOV lanes are jointly planned and designed by DART and the Texas Department of Transportation. DART is responsible for facility management, operation, and enforcement.

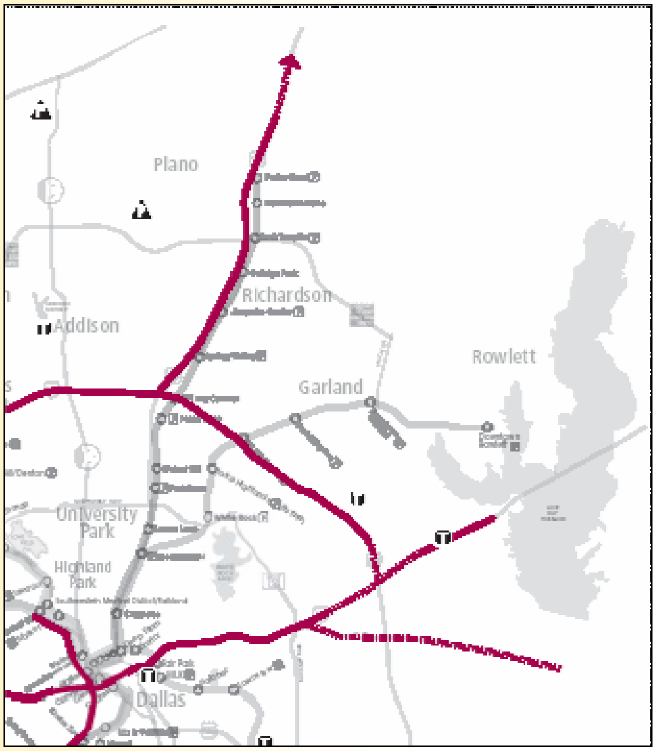


Figure 3.2-3 DART HOV Network in the US-75 Corridor (Source: DART)

3.2.9. North Central Texas Council of Governments (NCTCOG)

Regional transportation planning in North Central Texas is conducted by this federally designated Metropolitan Planning Organization (MPO), comprised of the NCTCOG Transportation Department, NCTCOG Executive Board, Regional Transportation Council (RTC), and several technical committees. The MPO works with state and local governments, the private sector, and the region's citizens to plan coordinated transportation systems designed to move goods and people affordably, efficiently, and safely. Areas served include the Dallas-Fort Worth-Arlington, Denton-Lewisville, and McKinney urbanized areas and surroundings. Major products produced by the MPO include a long-range Metropolitan Transportation Plan (MTP), a shorter-term Transportation Improvement Program (TIP), a Congestion Management Process (CMP), and a Unified Planning Work Program (UPWP).

In addition to the major products outlined above, NCTCOG will be operating the Intelligent Transportation System (ITS) data archive for the North Texas region.

3.2.10. North Texas Tollway Authority (NTTA)

North Texas Tollway Authority (NTTA) operates two toll roads within the Corridor: the Dallas North Tollway (running north and south) and the President George Bush Turnpike (running east and west). Incident management along these tollways is provided by Texas Department of Public Safety Troopers along with a courtesy patrol provided by the Dallas County Sheriff.

The North Texas Tollway Authority (NTTA), a political subdivision of the State of Texas under Chapter 366 of the Transportation Code, is empowered to acquire, construct, maintain, repair, and operate turnpike projects in the North Texas region; to raise capital for construction projects through the issuance of Turnpike Revenue Bonds; and to collect tolls to operate, maintain and pay debt service on those projects. The NTTA is governed by a seven-member board of directors representing each of the four counties: Collin, Dallas, Denton and Tarrant.

The NTTA's origins were with the Texas Turnpike Authority (TTA), which was established as a state agency in 1953. TTA's first project was the Dallas-Fort Worth Turnpike, started in 1955 and completed in 1957. In 1977, when all outstanding bonds were retired, the road was transferred to the Texas Department of Transportation (TxDOT) as a toll-free highway, 17 years ahead of schedule. TxDOT designated the former DFW Turnpike Interstate 30. TTA began its second project, the Dallas North Tollway, in 1966 and opened the first segment to motorists in 1968. In 1977, TTA initiated construction on the Mountain Creek Lake Bridge in Grand Prairie. The two-mile bridge was opened to traffic in 1979. Throughout the years, TTA also initiated projects in other areas of Texas.

NTTA was created in 1997 with 213 employees, to finance, construct and oversee turnpike projects in North Texas. At that time, TTA's assets and liabilities in North Texas were transferred to NTTA. Today, the NTTA operates almost 51 miles of toll roads in North Texas and has over 700 employees.

3.2.11. Texas Department of Transportation (TxDOT) Dallas District

The Dallas District of the Texas Department of Transportation (TxDOT) is responsible for the Design, Construction, Maintenance, and Operations of the US and State Highway System in seven counties in north Texas: Dallas, Denton Collin, Rockwall, Kaufman, Ellis and Navarro. The population within the Dallas District is estimated, as of Jan. 1, 2006, at 4,003,350.

The District has 1,090 employees within the District Offices in Dallas County, and Area Offices in each County plus five in Dallas County. The Area Offices are responsible for the highways within its jurisdiction, while the District Offices support the Area Office efforts. The District has 3,637 centerline miles of highway, including 10,427 lane miles. There are over 3.1 million registered vehicles in the District and it is estimated there are over 64 million vehicles miles traveled on TxDOT-operated roads daily.

The District Offices have five primary sections. These sections are Administration, Transportation Planning and Development, Construction, and Maintenance and Transportation Operations. Two of the offices under the Transportation Operations section are the Freeway Management office and the Traffic Engineering office. The Freeway Management Office is responsible for managing incidents in the District and operating the DalTrans system, which is the District's intelligent transportation system providing freeway surveillance and motorist information systems. The management center is located in the center of the Corridor. The Traffic Engineering Office is responsible for traffic engineering studies, signing and speed zones, and investigates and responds to transportation-related complaints or concerns from the public, other transportation agencies, municipalities, and elected officials.

The US-75 Corridor from downtown Dallas passes through two counties (Dallas and Collin Counties) and four TxDOT Area Offices (of which three are located in Dallas County). Those offices being the Central Dallas Area Office, the Northwest Dallas Area Office, the Northeast/Rockwall Area Office, and the Collin County Area Office. These four offices have 318 employees.

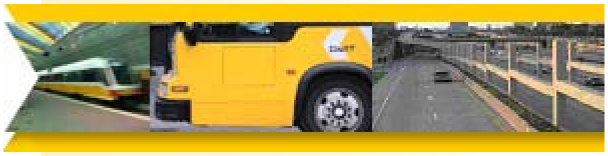
3.2.12. Transportation Management Associations

Transportation Management Associations (TMAs), also know as Transportation Management Organizations or TMO's, are private and public-private organizations that implement congestion mitigation strategies and work together on local transportation issues. Many are incorporated, non-profit organizations; they tend to be membership organizations, made up of employers, developers, building owners, and local government representatives. Most TMA's are located in the areas of dense employment and focus on Travel Demand Management (TDM) programs for public and private employers.

In recent years, TMA's have played increased roles in new areas, including CMP development, ITS initiatives, and in development of residential and tourism travel markets. Usually, the principle role of a TMA is to involve the business community in transportation planning and to provide a forum for the private sector to impact strategy development and implementation. The following non-exhaustive list demonstrates the variety of transportation activities in which TMA's have been involved:

- Advocacy on transit, roadway, bicycle, pedestrian, land use, and air quality issues;
- Transit pass subsidy or voucher programs;
- Shuttles or vanpools for employees, customers, or both;
- Ridematching services and support for carpools and vanpools;
- Parking management programs;
- Guaranteed or emergency ride home programs;
- Telecommuting/teleconferencing center (s) operation;
- Employer transportation coordinator training;
- Promotional programs and incentives for alternative travel modes; and
- Educational programs.

One example of an active TMA is the Downtown Dallas association. They have been active with traffic management, parking, and wayfinding. Within the US-75 Corridor, a TMA in the Richardson / North Central Expressway has been identified and funded in the Transportation Improvement Program.



3.3. OPERATIONAL CONDITIONS OF THE CORRIDOR AND INCLUDED NETWORKS

This section focuses on the operational characteristics of the US-75 ICM Corridor and the associated Networks. Corridor attributes highlighted include major traffic generators, corridor demand and usage, and the types and frequency of events that impact network and corridor operations. The volume to capacity ratios shown in the tables below come from the North Central Texas Council of Government's Mobility 2025 report. The V/C ratio is the travel demand from the regional model divided by the capacity of the corresponding link in the model. The NCTCOG's travel demand model will allow demand to exceed capacity in the traffic assignment. Thus, a V/C above 1.0 is not uncommon.

For the roadways listed in the tables below, the regional travel demand model divides these roadways into several links. The V/C ratio for each of these links was calculated. The tables below provide the "high" v/c ratio, the "low" v/c ratio, and the "median" v/c ratio. Since some of the roadway lengths can exceed 10 miles, the "high", "low", and "median" were provided to give the reader a sense of the range and prevailing volume to capacity ratio for the roadway.

3.3.1. Network Conditions

Arterial Street Network
There are 14 east-west arterials and 10 north-south primary arterials in the Corridor, comprising approximately 67 and 91 lane-miles, respectively. There are approximately 800 signalized intersections with virtually all of them being traffic responsive and coordinated in individual cities. The MPO (North Central Council of Governments) has recently evaluated the Level of Service (LOS) in the area and determined that most intersections, and therefore arterial segments, are oversaturated and operate at LOS E during peak periods in the peak direction, and often in the off-peak direction. During off-peak hours, intersections are generally in the LOS C range. Year 2007 projected volume-capacity ratios based on the NCTCOG 2025 Mobility Plan are shown in Table 3.3-1 and Table 3.3-2 below.

Table 3.3-1 Volume-Capacity Ratios for Major East-West Arterials

MAJOR ARTERIALS EAST/WEST				
		Volume/Capacity Ratio		
	Dist.	Low	High	Median
McDermott Rd.	5.5	0.82	2.91	1.15
Spring Creek Pkwy.	4.3	0.71	2.26	1.37
Park Blvd.	5.3	0.37	1.28	0.78
Plano Pkwy.	5.1	0.73	1.72	1.14
Campbell Rd.	4.3	0.24	1.26	1.23
Arapaho Rd.	5.1	0.73	2.18	1.39
Belt Line Rd.	6.0	1.45	2.45	1.56

Spring Valley Rd.	5.2	0.49	1.91	0.75
Forest Lane	6.0	1.21	2.56	1.73
Royal Lane	4.8	0.63	2.17	1.14
Walnut Hill Ln.	4.5	0.74	1.97	1.56
Northwest Hwy.	3.5	0.94	2.72	2.00
Lovers Ln.	3.5	0.23	2.67	1.90
Mockingbird Ave.	3.6	1.66	3.22	2.11
TOTAL	66.6	Miles		

Table 3.3-2 Volume-Capacity Ratios for Major North-South Arterials

MAJOR ARTERIALS NORTH/SOUTH				
		Volume/Capacity Ratio		
	Dist.	Low	High	Median
Jupiter Rd.	6.6	0.92	2.63	1.34
Plano Rd.	10.8	1.08	1.95	1.67
Abrams/Gaston	9.7	0.50	1.69	0.91
Live Oak Ave./Skillman	10.3	0.26	1.97	0.62
Ross Ave./Greenville	14.8	0.32	2.54	1.19
Alma Rd.	9.7	0.26	2.12	1.18
Custer Pkwy.	7.0	0.68	1.55	1.33
Coit Rd.	4.8	1.69	3.10	2.18
Greenville Ave.	8.1	1.13	1.77	1.19
Preston	8.9	0.81	2.25	1.69
TOTAL	90.6	Miles		

Source: Calculations Based on NCTCOG 2007 traffic assignments in 2025 Mobility Plan.
Corridor Roadway mileages scaled from maps and are approximate.

For current operational V/C ratio, the following data was compiled for some select roadways:

Table 3.3-3 Volume-to-Capacity Ratios for Selected Links

Facility	Direction	Location (nearest cross street)	Data Collection Date	Time of Day	Number of Lanes per Direction	Vehicle Volume[1]	Assumed Lane Capacity (vphpl)	V/C Ratio[2]
US 75	Southbound	Collins	July 11, 2007	7-8 am	4	7,086	2,200	0.81
US 75	Northbound	Collins	July 11, 2007	5-6 pm	4	7,173	2,200	0.82
US 75	Southbound	Park Lane	July 11, 2007	7-8 am	4	7,164	2,200	0.81
US 75	Northbound	Park Lane	July 11, 2007	5-6 pm	4	5,556	2,200	0.63
US 75	Southbound	Knox Ave	July 11, 2007	7-8 am	4	4,023	2,200	0.46
US 75	Southbound	Knox Ave	July 11, 2007	5-6 pm	4	7242	2,200	0.82
Plano Rd	Southbound	Campbell Rd	Dec 1, 2004	8-9 am	3	1,488	800	0.62
Plano Rd	Northbound	Campbell Rd	Dec 1, 2004	5-6 pm	3	1,822	800	0.76
Coit Rd	Northbound	Campbell Rd	Nov 9, 2004	5-6 pm	3	2,140	800	0.89
Coit Rd	Southbound	Campbell Rd	Nov 9, 2004	7-8 am	3	2,236	800	0.93

Notes:

1. US 75 Volumes collected by ITS System on US 75 and archived in DalTrans archive; arterial volumes from City of Richardson manual traffic count program
2. v/c ratio = volume / (lane capacity * number of lanes)

Freeway Network

There are approximately 272 lane-miles of access-managed freeways in the US-75 ICM Corridor. For non-incident operational conditions (i.e., recurrent congestion), peak direction LOS varies from section-to-section but is generally in the D to E range. Off-peak direction LOS generally is in the range of C to D. For major incident conditions (i.e., non-recurrent congestion), LOS in both peak and off-peak conditions rapidly deteriorate to LOS F. Year 2007 projected volume-to-capacity ratios based on the NCTCOG 2025 Mobility Plan are shown in Table 3.3-4.

Table 3.3-4 Volume-Capacity Ratio for Freeways

FREEWAYS				
		Volume/Capacity Ratio		
	Dist.	Low	High	Median
US-75 SB	28.5	0.93	2.07	1.16
US-75 NB	28.5	0.76	1.27	1.06
US-75 SB FRTG	28.5	0.21	1.96	0.67
US-75 NB FRTG	28.5	0.26	1.54	0.56
LBJ Frwy. EB	5.5	1.02	1.35	1.14

LBJ Frwy. WB	5.5	1.04	1.37	1.14
LBJ Frwy. EB FRTG	5.5	0.24	1.84	0.93
LBJ Frwy. WB FRTG	5.5	0.29	1.48	1.10
TOTAL	136.0	Miles		

HOV Network
High-occupancy vehicles are defined by the Regional Transportation Council of the NCTCOG as two-or-more occupants in a vehicle (2+ HOV). Completed in December 2007, the US-75 HOV lane connects the existing HOV lane on I-635. Both the US-75 and I-635 HOV lanes are concurrent-flow lanes built in the median of the freeway. The two facilities are connected by a reversible HOV direct connect ramp built into the High-Five Interchange. The travel flow directionality of the HOV connection matches the congestion and commuting pattern in the Corridor. The US-75 HOV lane opened to traffic operating at near capacity conditions.

Tollway Network
There are approximately 106 lane-miles of tollways in the US-75 ICM Corridor. For non-incident operational conditions (i.e., recurrent congestion), peak direction LOS varies from section-to-section but is generally in the C to E range. Off-peak direction LOS is generally in the range of C to D. For major incident conditions (i.e., non-recurring congestion), LOS in both peak and off-peak conditions rapidly deteriorates to LOS F. Tollway Network Volume-Capacity Rations are provided in Table 3.3-5.

Table 3.3-5 Volume-Capacity Ratios for Tollways

TOLLWAYS				
		Volume/Capacity Ratio		
	Dist.	Low	High	Median
DNT NB	9.0	0.72	1.00	0.88
DNT SB	9.0	0.70	1.00	0.87
PGBT WB	4.2	0.53	0.97	0.74
PGBT EB	4.2	0.52	0.95	0.67
PGBT WB FRTG	4.2	0.52	0.95	0.75
PGBT EB FRTG	4.2	0.35	1.04	0.55
TOTAL	34.6	Miles		

Bus Transit Network
The DART bus network consists of 30 regular routes in the Corridor with approximately 21,000 of 46,300 available seats occupied per day (45% use of capacity). Transfer points within the bus transit network are approximately 63-percent occupied.

Rail Transit Network
There are two light rail lines (Red Line and Blue Line) operating in the Corridor. The Red Line is the primary rail Corridor near US-75. The Blue Line light rail service branches off to the northwest within the Corridor Influence Area. There are approximately 19 center-line miles of light-rail track (two-way) within the Primary Corridor Boundary.

Light-rail lines within the Downtown Dallas area operate at-grade. There are a total of 15 at-grade surface street intersection crossings. Implementation of transit priority in the City of Dallas downtown signal system, within the Corridor Boundary, is planned. From downtown to the Mockingbird Station, the rail lines operate in tunnels under the US-75 mainlanes and frontage roads. North of the Mockingbird Station, the rail line operates mostly at-grade with positive grade crossing control at each of the arterial crossings.

The rail lines operate on approximately five-minute headways in the peak periods. There are 23,500 of 47,300 available seats occupied per day (50% occupied).

Vanpool Service
Thirty-one (31) vanpools operate in the Corridor carrying 682 trips per day. Expansion of vanpool service within the Corridor is currently under consideration, possibly providing an additional 12 vans carrying 264 trips per day.

Park-and-Ride Lots
DART operates a total of eight park-and-ride lots in the US-75 Corridor that serve the transit bus and light-rail facilities.

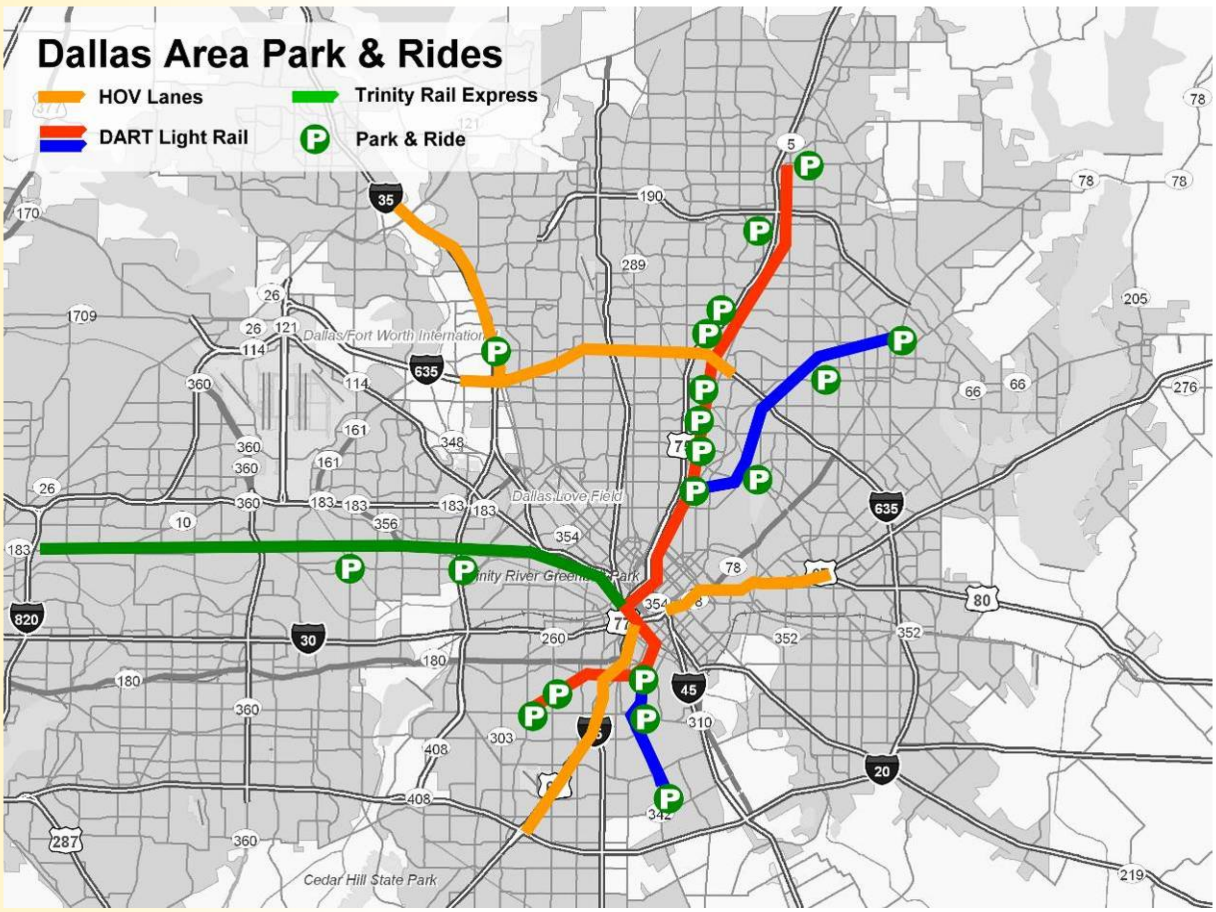
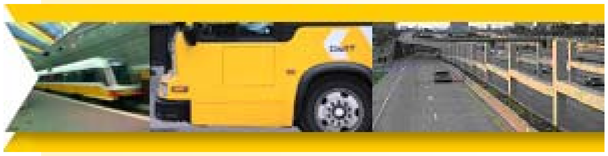


Figure 3.3-1 DART Park and Ride Lots (Source: DART)

Pedestrian/Bicycle Network
An extensive pedestrian and bike route system is in the regional planning document. At present there are approximately 62 miles of off-street bike, pedestrian, or combined pathways and 82 miles of on-street bicycle routes.



3.3.2. Traffic Generators and Events

The following is a partial list of events that generally occur annually and impact the US-75 Corridor. These events typically have custom traffic control and special transit service.

- The Texas State Fair (October with 3.5 million attendees)
- The Texas/OU Football Game (October)
- The Cotton Bowl (January)
- The City of Plano Balloon Festival (September)
- The City of Richardson Wildflower Festival (May)
- Various Fourth of July Festivals (July)

The following is a list of venues that hold frequent events that impact the US-75 Corridor. While typically smaller in size, these events occur more frequently and can still have significant traffic impacts to the Corridor.

- Fair Park Special Events Center (277 acres with nine museums and six performance facilities; 7 million visitors annually)
- American Airlines Center (Dallas Maverick Basketball, Dallas Stars Hockey, Concerts)
- Dallas Convention Center
- Morton H. Meyerson Symphony Center
- Dallas Arts District
- Ford Stadium (SMU Football)
- Moody Coliseum on (SMU Basketball and graduation)
- The Eisemann Center for the Performing Arts in Richardson
- City of Plano Amphitheater

A representative list of these is as follows:

- Dallas Central Business District
- Texas Instruments Headquarters and Manufacturing Facilities
- Countrywide Mortgage
- Richardson Telecom Corridor
- Three major shopping malls (NorthPark Shopping Center, Valley View Center, Collin Creek Mall)
- Several major regional hospitals

In addition, there have been two significant events in the past few years that also opened the possibility of significant strain in operational conditions of this Corridor. The first was the evacuation for Hurricane Rita that hit the eastern coast of Texas. Interstate 45 was one of the hurricane evacuation routes that feed into the US-75 Corridor. This event brought thousands of additional trips to the US-75 Corridor. The second event was the Immigration March held in Downtown Dallas. On Sunday April 9, 2006 close to 500,000 protestors assembled in Downtown Dallas. Special traffic control was needed along the southern end of the US-75 Corridor and DART recorded its highest day of ridership during the event.

Another event that will affect the US-75 Corridor during the timeframe from 2007 to 2012 is the reconstruction of I-635 (LBJ Freeway) between US-75 and I-35E. This freeway is currently an eight-lane freeway with a concurrent-flow HOV lane on the inside of the freeway in each direction. The final configuration will be eight general purpose lanes and six managed lanes. The geometric design approved in the Environmental Impact Statement (EIS) is for the managed lanes to be tunneled under the general purpose lanes. At the peak of reconstruction, the cross-section may need to be reduced to only three lanes in each direction (the configuration of those three lanes as general purpose or HOV are still under analysis). The result will require significant diversion from the I-635 Corridor. While east-west routes will need to carry a bulk of the diverted traffic, recent regional modeling also shows significant increases in traffic on major north-south routes (such as US-75 and the parallel arterials in the Corridor). Having operational systems in place to assist the operating agencies in measuring impacts and implementing alternate operating strategies will be critical to mobility in the region.

3.4. EXISTING NETWORK-BASED TRANSPORTATION MANAGEMENT/ ITS ASSETS

This section provides a general inventory of existing Network and Corridor management and operation, along with ITS-based assets. Included is a description of each Network asset along with various travel management tactics in place within each Network, as well as travel management for the Corridor as a whole. Also included is a description of ITS assets within the Corridor.

3.4.1. Network Assets and Management Tactics

The following are descriptions of assets and travel management tactics within each separate Network within the Corridor.

Arterial Street Network
The Cities of Dallas, Richardson, and Plano operate centrally-managed computerized signal control systems.

- All systems are capable of traffic responsive plan selection.
- All systems are capable of manual override in response to special events and circumstances (weather, major crashes, or spillages, etc.).
- City of Dallas Arterial DMS Signs

Freeway Management Network
TxDOT monitors most freeways within the Corridor via CCTV, private ISP providers, field units (enforcement and courtesy patrols), and other available sources along all but 14 highway miles in the Corridor. The remaining 14-mile section (US-75 from I-635 to the northern Corridor limit) will be instrumented within the next two years.

- TxDOT responds to incidents with appropriate messages on DMS signs.
- TxDOT dispatches courtesy patrol vehicles to detected or reported incidents.

HOV Management Network
DART operates concurrent flow HOV lanes on I-635 in both directions. Two or more occupants are required for HOV use. DART maintains HOV management staff in the TxDOT Freeway Management Center with access to the CCTV system.

- As the HOV lanes are adjacent to freeway lanes, TxDOT responds to incidents with appropriate messages on DMS signs.
- DART dispatches courtesy patrol vehicles to detected or reported incidents.

Tollway Management Network
NTTA operates two tollways within the Corridor, including eight CCTV cameras and two DMS. An additional eight cameras and one DMS are planned. Toll plazas are equipped with electronic toll sensors (Tolltag®) and over 80 percent of all transactions are from toll tags.

- NTTA responds to incidents with appropriate messages on DMS signs.
- NTTA dispatches courtesy patrol vehicles to detected or reported incidents.

Transit Network
DART operates three light rail and 30 local bus transit routes in the Corridor. As noted above, DART also operates the HOV lanes.

- DART has the ability to respond to special events or other special requirements with an additional 12 bus routes within the Corridor.
- DART plans to fully implement GPS-based technology on all rail vehicles within the next two years. The technology will include automated stop announcements, passenger counters, AVL and transmission of estimated arrival times to information sign boards at rail stations. DART's bus fleet currently has in place AVL technology, which is currently being updated with new GPS antennas on all buses. A capital project is underway to replace the radio existing radio and AVL system within the next three years.

3.4.2. Corridor Management Tactics

The following are descriptions of travel management tactics within the US-75 Corridor as a whole – applying operational management across two or more Networks.

Coordinated DMS Operation
The City of Dallas Transportation Department operates five DMS on arterial streets in the Corridor. Five more are planned in the next two years. Operation is coordinated with DMS operated by TxDOT on freeways by providing city street drivers with freeway condition information to assist them in route selection.

Sharing of CCTV Images among Public Agencies
The Cities of Richardson and Dallas have real-time access to images from TxDOT freeway cameras. This assists the cities in managing the arterial signal system by viewing freeway field operations in real-time. Additionally, TxDOT is able to monitor city cameras, some of which are located along freeways where TxDOT does not have camera coverage.

Regional Center-to-Center (C2C) Functionality
Representatives from regional agencies (cities, DART, TxDOT, NTTA, and others) have met periodically over the past few years to develop needs and policies for defining data types and information sharing among agencies. TxDOT has contracted with Southwest Research Institute to develop C2C software for automated sharing of data and information among the operating agencies. The software is essentially complete and the plug-ins for individual agencies will be complete within the next two years.

Cross-Jurisdictional Traffic Signal Coordination
For a number of years, the cities in the Corridor have cooperated in coordination of traffic signals along corridors that cross city boundaries. In the mid 1980s, the practice was formalized when a county program funded development of signal timing plans in subsystems, which, in many cases, crossed city limits. Cities implemented these plans and evaluations showed significant operational improvement. Although conditions have changed over the years and signal timing plans have been updated, the cities still attempt to coordinate with each other wherever possible.

Dallas / Fort Worth Real-Time Traffic Map
In 2006, the Texas Transportation Institute (TTI) worked with the TxDOT Dallas District to develop a new real-time web site for the Dallas/Fort Worth region. **The software driving the DFW Traffic web site collects data from contributing control centers through a center-to-center interface.**

Information provided on the website includes: incident information and location, lane closures, DMS messages, camera images, and speeds. This information is provided via icons overlaid on a dynamic map. The base map, which is provided by Google Incorporated, can be panned and zoomed, and can be viewed with satellite imagery (http://daltrans.org/). The new web traffic map not only provides information to the traveling public, but also serves as a multi-agency/network management tool as individual agencies can access the site for real-time traffic conditions on the freeway system.

DalTrans Transportation Management Center
The existing Transportation Management Center (TMC) responsible for freeway and HOV lane system operations is currently located along the US-75 Corridor, just south of the High-Five Interchange. The DalTrans TMC, opened in December 2007, is currently occupied by both TxDOT and DART for freeway and HOV lane operation, respectively. This new TMC is a 50,000 square foot facility. The TMC has expanded its operational responsibilities to include transportation management across additional travel networks. The additional building space allows the TxDOT Dallas District to house its entire traffic engineering and transportation management staff under one roof. Along with TxDOT, staff from DART, Dallas County Sheriff, and the Texas Transportation Institute occupy the building.

City Transportation Management Centers
The cities of Dallas, Richardson, and Plano all have Transportation Management Centers (TMCs) that operate the transportation network in their jurisdictional areas. The centers focus on arterial street management and emergency response. The city TMCs work with other city services such as maintenance, police, and emergency response. The City of Richardson provides video to a wrecker contractor that can self dispatch to incidents in the area.

3.4.3. ITS Assets

The following is a description of ITS Assets being used for travel management within the Corridor. In addition to the multiple computer aided dispatching (CAD) systems used by the main local emergency service providers, there are six primary transportation management systems in the US-75 ICM Corridor. They are operated by TxDOT, DART, NTTA, City of Dallas, City of Plano, and City of Richardson. All systems are used on a day-to-day basis and are considered to be very reliable.

TxDOT Freeway Management System

The TxDOT freeway management center (DalTrans) is located in the southern section of the US-75 Corridor (just south of I-635). In addition to the US-75 Corridor, the TMC manages other freeways in the Dallas urban area. All equipment is monitored and controlled from the TMC via the DalTrans central software. Within the Corridor, DalTrans ITS infrastructure includes:

- 49 CCTV Cameras (27 more planned within the next two years)
- 9 Dynamic message signs (5 more planned within the next two years)
- 25 miles of freeway courtesy patrol coverage (Courtesy patrol operates from 5 a.m. to 9:30 p.m. M-F, and 11:00 a.m. to 8:00 pm on the weekends)
- 6 miles of freeway with speed detector coverage (Additional 25 miles is planned within the next two years)

The TMC is staffed 16 hours-per-weekday. Basic maintenance (filter change, DMS bulb change, lubrication, lenses cleaning) is performed on a scheduled basis. Other system maintenance is primarily part or component change out as needed. More severe problems are handled by on-call contractors.

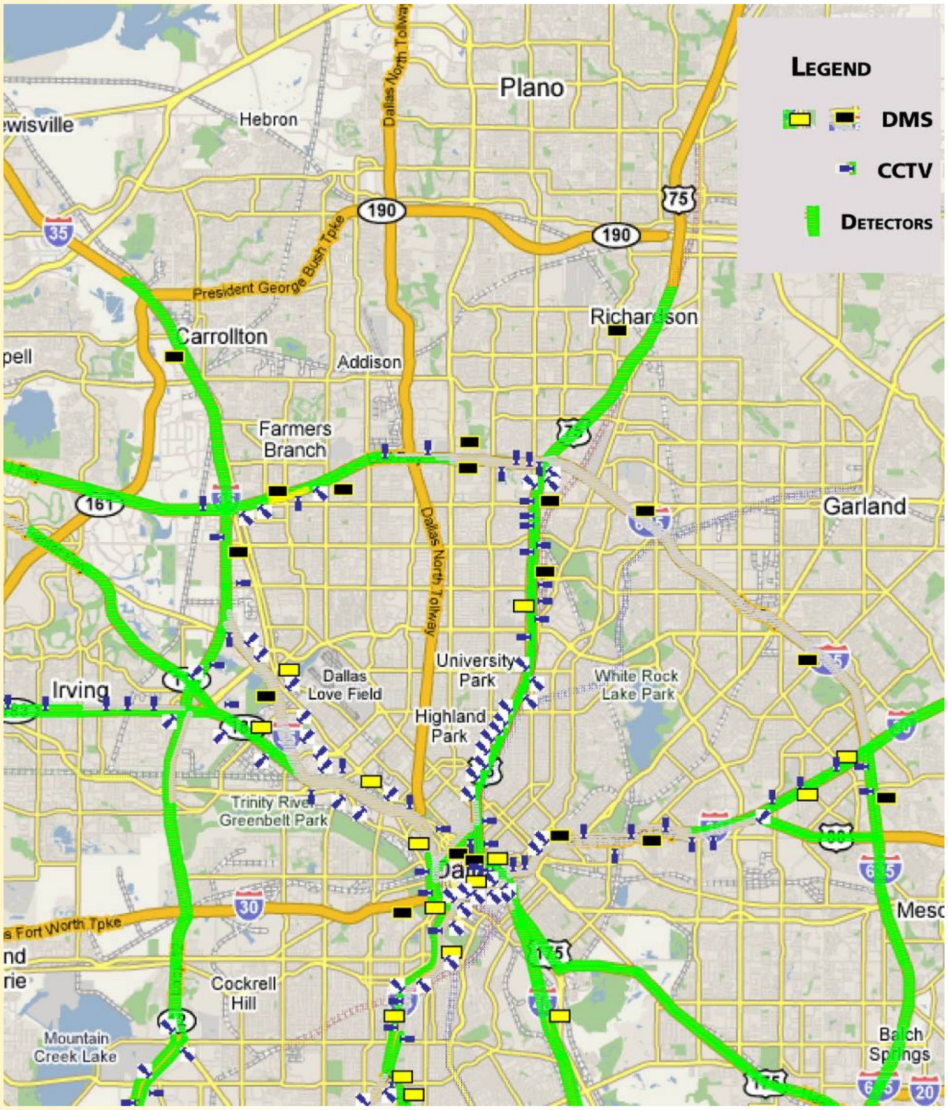


Figure 3.4-1 TxDOT ITS Asset Locations (Source: Google Maps)

3.4.4. DART ITS Assets

DART operates a bus, HOV, and light-rail transit operations center at the DART Service & Inspection Facility located in the southern part of the Corridor. DART ITS assets within the US-75 ICM Corridor include:

- HOV management center collocated with TxDOT's DalTrans center
- 9 Dynamic Message Signs (DMS) for HOV lanes
- 8 Lane Control Signals (LCS)
- 16 HOV flashing signs to open and close the HOV Lanes
- Courtesy patrol for HOV lanes (Courtesy patrol operates from 5 a.m. to 9:30 p.m. M-F, and 11:00 a.m. to 8:00 pm on the weekends)
- 14 Rail Stations with Public Address/Visual Message Boards
- 31 Courtesy Patrol officers operate in two shifts on each our existing facilities.
- 742 Buses equipped with automatic vehicle location (AVL) devices

- 742 Buses equipped with automated fare collection

In the next year, the DART center-to-center (C2C) communication network will be completed. This network will aid DART in exchanging information among all existing centers within the region. Anticipated information exchange includes data on: collisions, special events, weather, bus delay, train arrival, and detours for a route as a result of the delays.

DART operates and manages the HOV lanes within the corridor, this includes both US-75, shown in the figure below, and I-635 East. At the southern edge of the corridor travelshed is the I-30 HOV Lane and the I-35E HOV going south out of downtown.

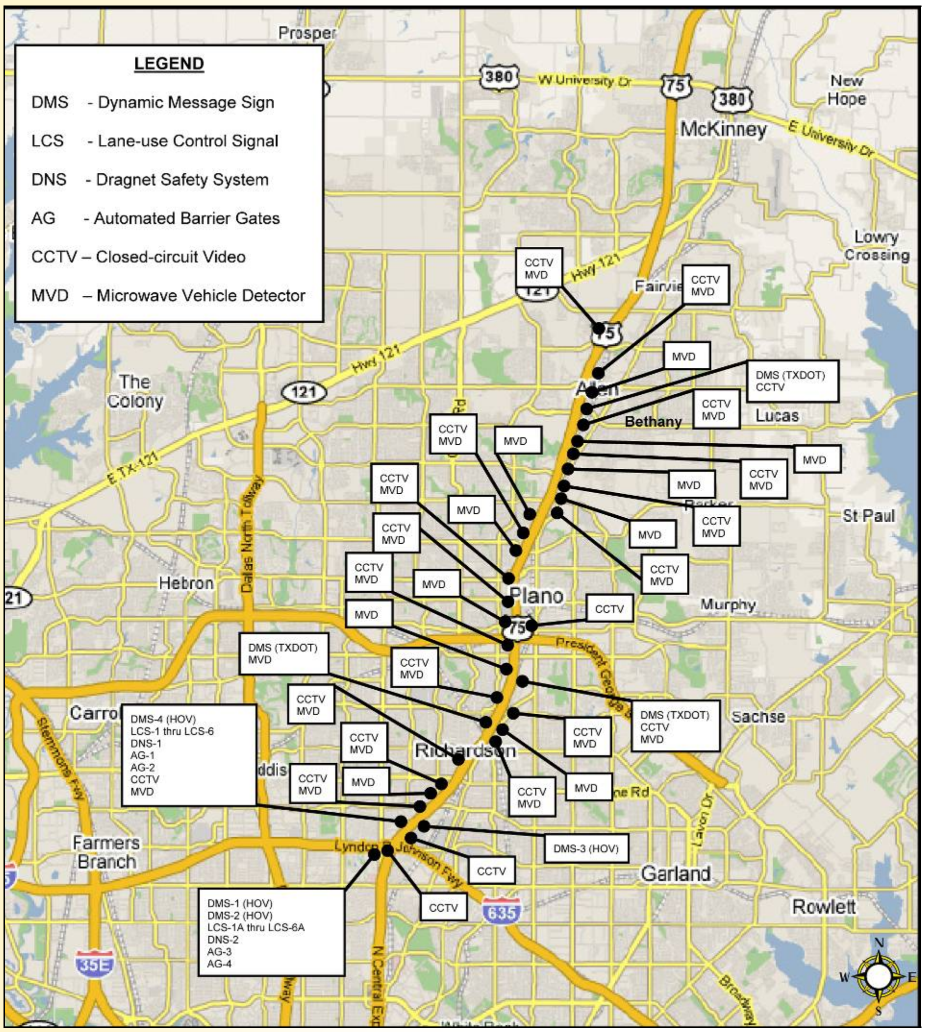
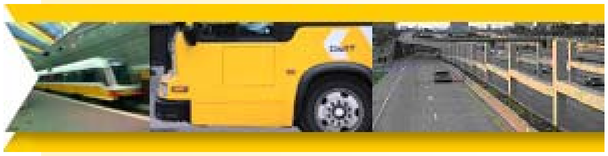


Figure 3.4-2 US-75 HOV - ITS Assets (Source: Google Maps)

DART employs 26 Automatic Passenger Counter (APC) equipped vehicles, which are not utilized along any specific routes. APC data is offloaded at the vehicle garages via 802.11 wireless connections. The ridership data is processed by a central server, and then loaded into the Trapeze PLAN software module for end-user access to the information. Additionally, DART is currently running a maintenance program to connect all bus fareboxes to the existing GPS receivers onboard. Vehicle location information would then



be available in the farebox data set, which is currently offloaded at the garages via manual probes. This system configuration will then allow passenger boarding data throughout the network to be tracked. The APC system is approximately 94% accurate. Component failure, incorrect anticipated stop sequences, and inherent sensor exceptions account for the bulk of the missed or bad information.

Systems are monitored daily by the operators, who fill out maintenance tickets if the system(s) malfunctions. DART plans to replace its existing radio system within the next three years, including replacement of GPS/AVL system components. DART is also currently working to implement mobile data terminals in the vehicles utilized by all Field Supervisory Staff and the DART Police force. The mobile data terminals will have the capability of monitoring vehicle location information for the bus fleet initially, and will be able to monitor rail vehicles with the completion of the GPS based system on rail vehicles in the next two years.

DART plans to expand the communications network within the DART system to interconnect all DART centers creating a single virtual center where information can be shared between DART centers. This effort is planned to use National, Regional, and DART ITS standards and architectures, where applicable, as a guide.

The DART interconnect effort will support the implementation and connectivity of ITS field devices at key locations for a variety of modes. This will also support the dissemination of traveler information pre-trip, on-site, and en-route. Specific applications recommended as part of this project include:

- Create communication network between DART centers to share incident and event information.
- Build the foundation for connecting the DART system to the Regional ITS Network.
- Install Automatic Vehicle Location (AVL), and electronic message signs (Next Train Information) at all DART TRE rail stations to compliment the Fort Worth system.
- Install Train detector and alert system at major specific stations for efficient transfer between rail and fixed route buses.
- Improve real-time status information for customer service representatives.

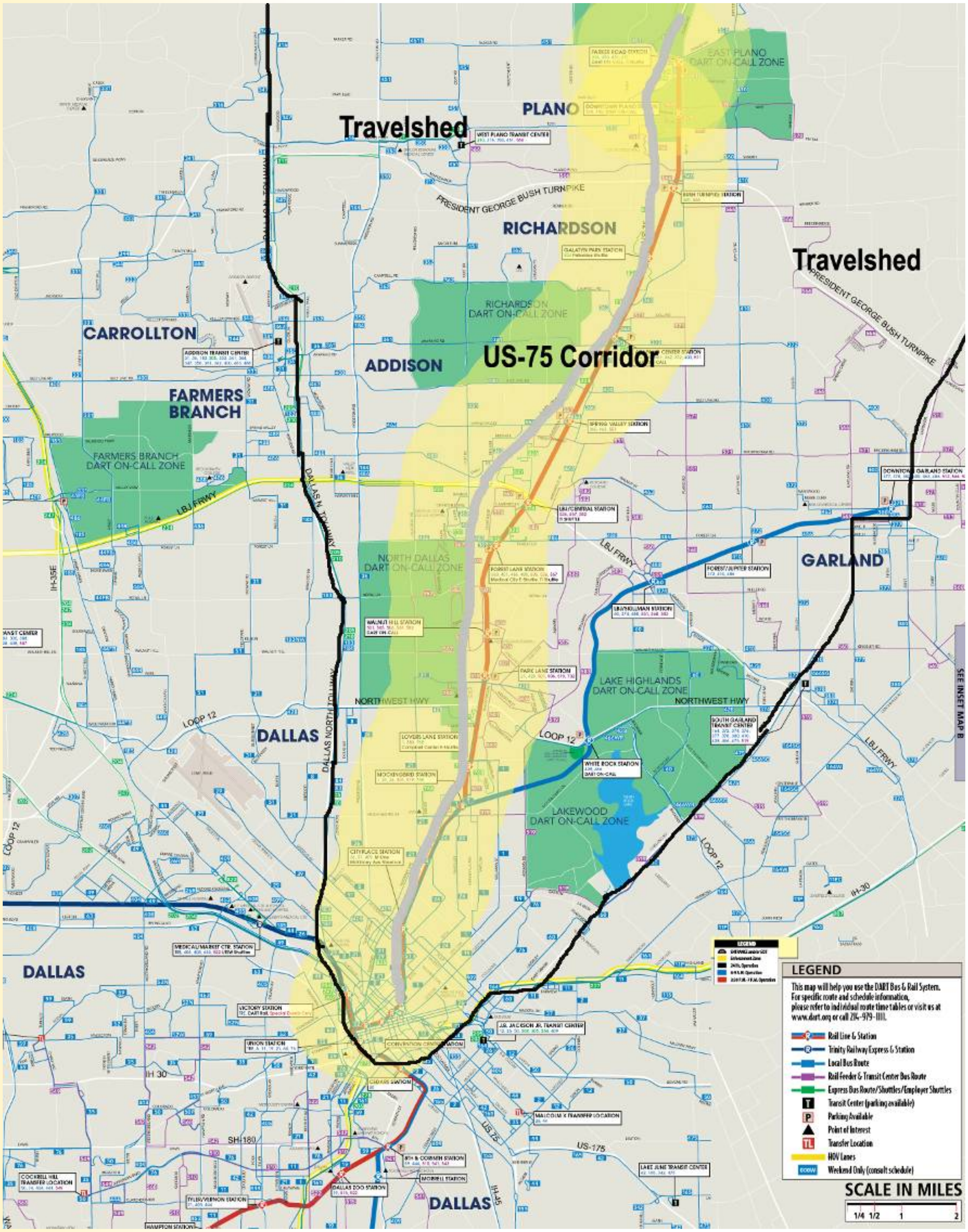


Figure 3.4-3 DART System Map (Source: DART)

A Transit Signal Priority (TSP) project allows traffic signal systems to grant (or deny) priority to light rail vehicles within Dallas Central Business District (CBD), as shown in the figure below. In addition, TSP is also installed at the intersection of US-75 and University, and TI Boulevard and Restlan. The system's goal is to aid a transit vehicle to get back on schedule from preceding delays by reducing and eliminating wait times at signalized intersections. This effort will give DART the opportunity to expand its existing LRT system without adding a second LRT mall. The TSP project will include:

- Upgrade to the GPS system to make the system more robust.
- Upgrade to the APC system.
- Include Cameras on buses along selected routes.
- Compliment the TRE system with traveler information for next train arrival and enhance safety and security along both the LRT and TRE systems.
- Integrate the HOV devices with the regional network through incorporating DART HOV to DalTrans system. DalTrans will house TxDOT, DART HOV and DART police, and the Dallas County Police Department.

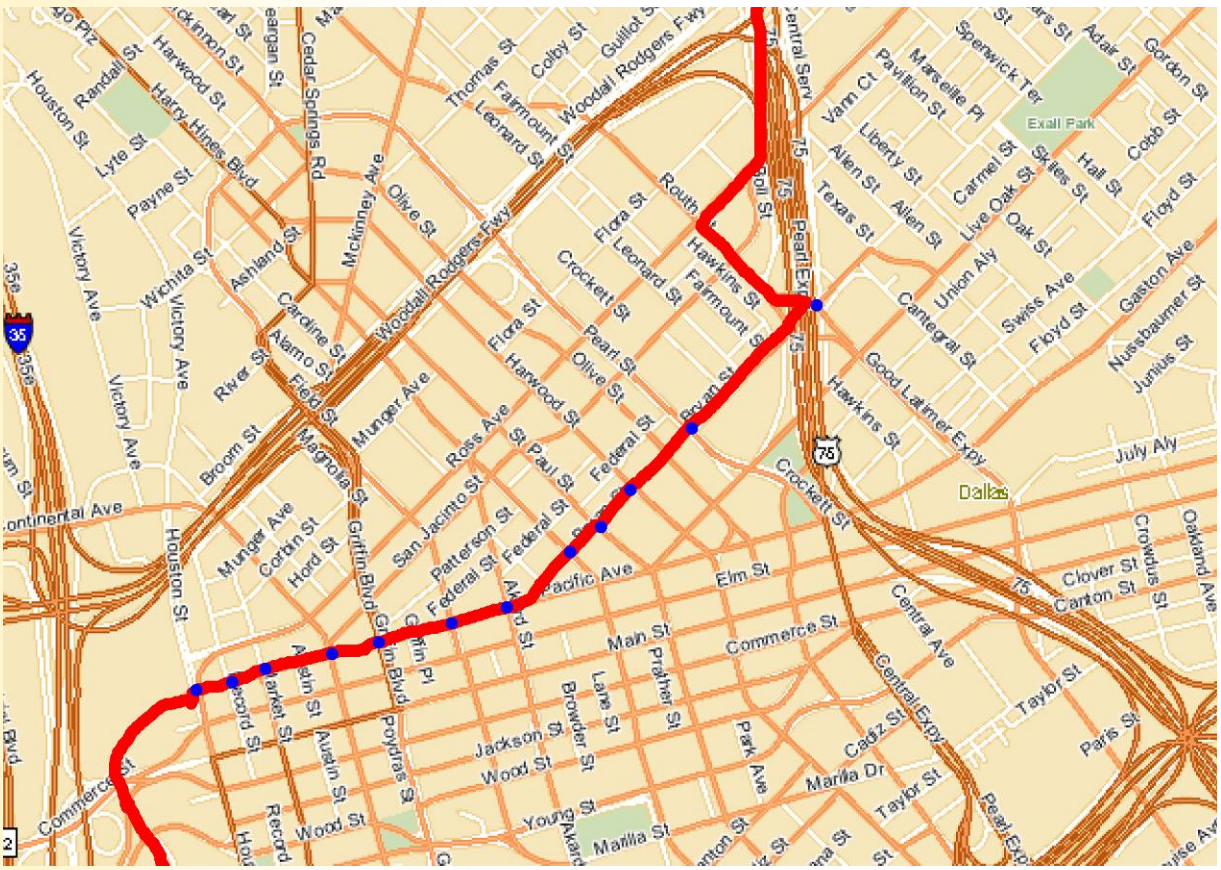


Figure 3.4-4 Transit Signal Priority in Downtown Dallas (Red Line Indicates LRT – Both the Red and Blue Lines) (Source: NCTCOG website dfwmaps.com)

3.4.5. North Texas Tollway Authority (NTTA) ITS Assets

NTTA operates a total of approximately 50 miles of toll roads in the four-county region consisting of Dallas, Tarrant, Denton, and Colin counties. Of that system, approximately seven miles of north-south tollway and four miles of east-west tollway are in the US-75 Corridor. The NTTA also has a traffic operations center located near the intersection of the PGBT and Coit Road. The NTTA traffic operations center monitors both traffic and tolling systems. Approximately 82 percent of all transactions are by electronic toll collection within the Corridor.

NTTA ITS operations within the Corridor include:

- CCTV cameras that will be deployed system-wide by 2007. Currently there are eight CCTV cameras in the US-75 Corridor. An additional seven cameras are planned for the Corridor in the next two years.
- Two dynamic message signs are deployed in the Corridor, with one additional DMS planned in the next two years.
- Three mainlane plazas (MLP) and ten ramp plazas, all equipped with Electronic Toll Collection (ETC) equipment currently exist in the Corridor.
- Tollway courtesy patrol vehicles are operated on all tollways.
- Fiber optic cable line, including additional strands for regional use, exists along most of the NTTA toll roads.

No significant additions in the Corridor are planned for the next two years.

Figure 3.4-5 NTTA ITS Asset Location (Source: NTTA)

3.4.6. City of Dallas ITS Assets

The City of Dallas operates centrally managed traffic control system with 90% of the signals in coordinated systems. System adjustments and monitoring for failures are accomplished from the TMC located in City Hall at the southern end of the Corridor. Dallas technical capabilities within the Corridor include:

- 500 centrally managed, coordinated traffic signals
- Five arterial street DMS
- Arterial street CCTV cameras

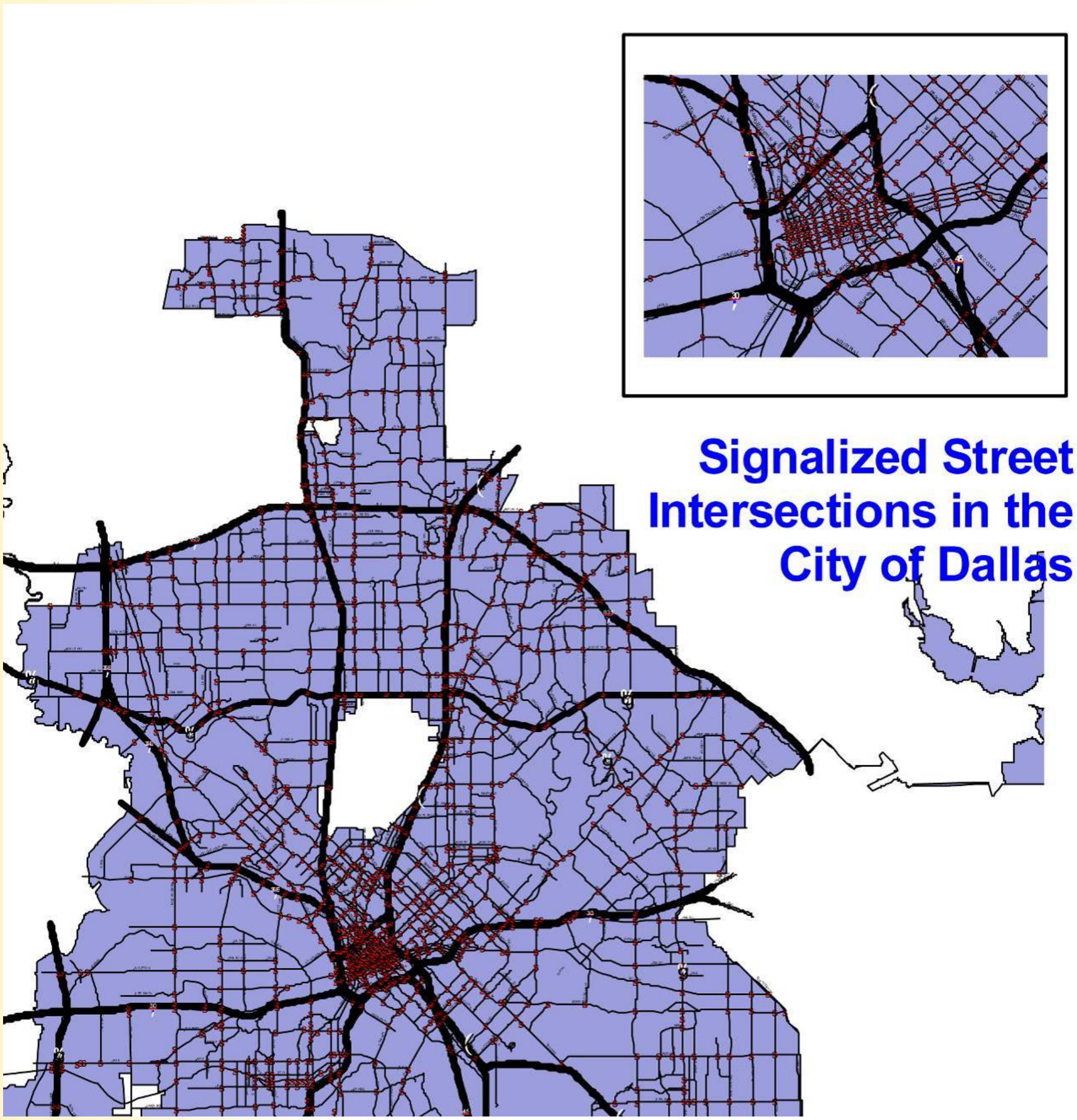


Figure 3.4-6 City of Dallas - Traffic Signal Locations (Source: City of Dallas)

Approximately 37 new DMS signs and 50 CCTV cameras are planned to be added to the City of Dallas arterial network over the next two years, as shown in the figure below. The City will continue to be an information sharing partner through the area C2C as it is implemented.

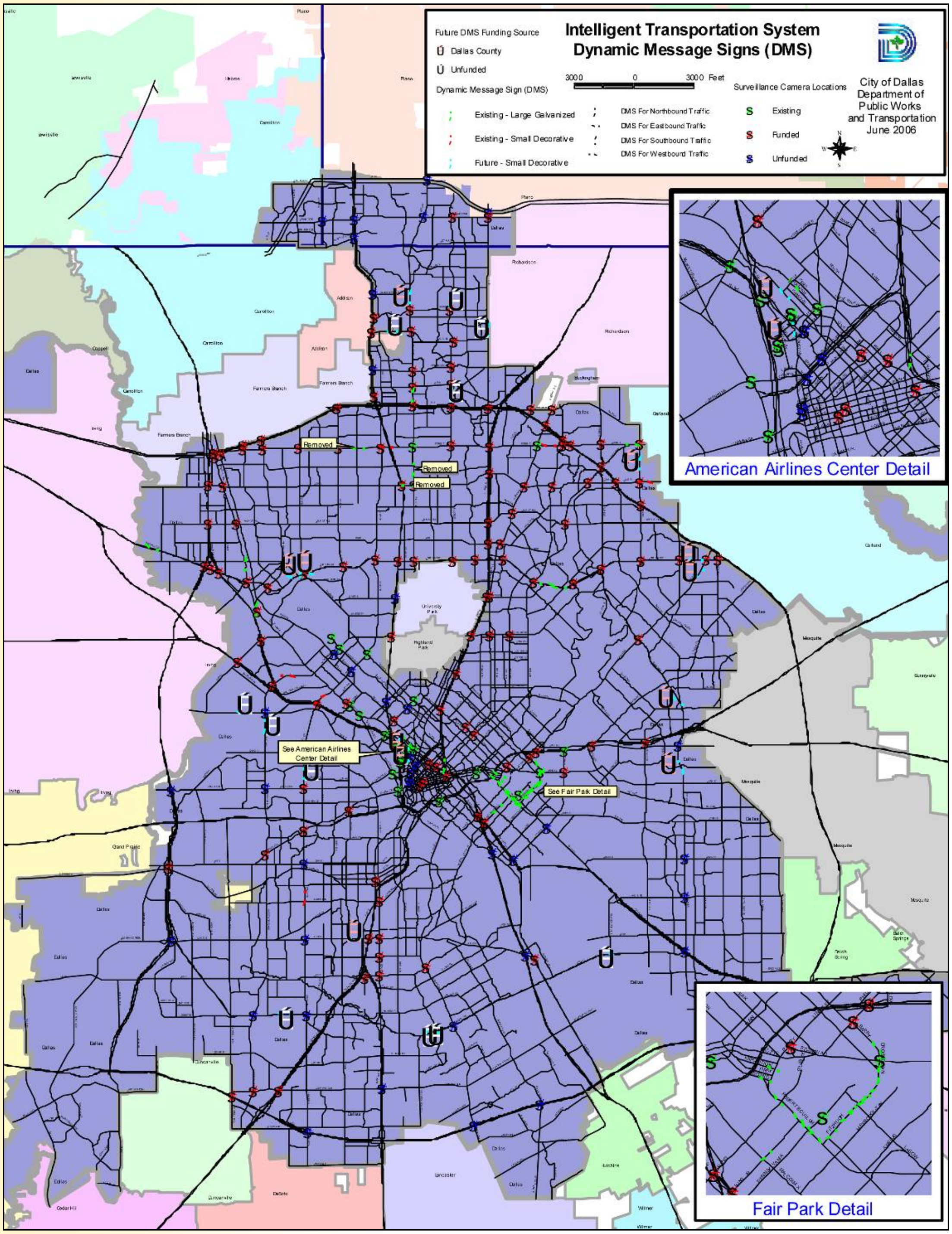


Figure 3.4-7 City of Dallas DMS and CCTV Locations (Source: City of Dallas)

3.4.7. City of Plano ITS Assets

The City of Plano operates a centrally managed traffic control system of 196 signals with all of the signals in coordinated systems. System adjustments and monitoring for failures are accomplished from the TMC located in City Hall at the northern end of the Corridor. Corridor Plano technical capabilities within the Corridor include:

- 196 centrally managed, coordinated traffic signals
- 10 CCTV cameras at intersections; additional cameras are planned
- Signals are coordinated by wireless telecommunication system

Preventative maintenance is performed twice a year or as needed.

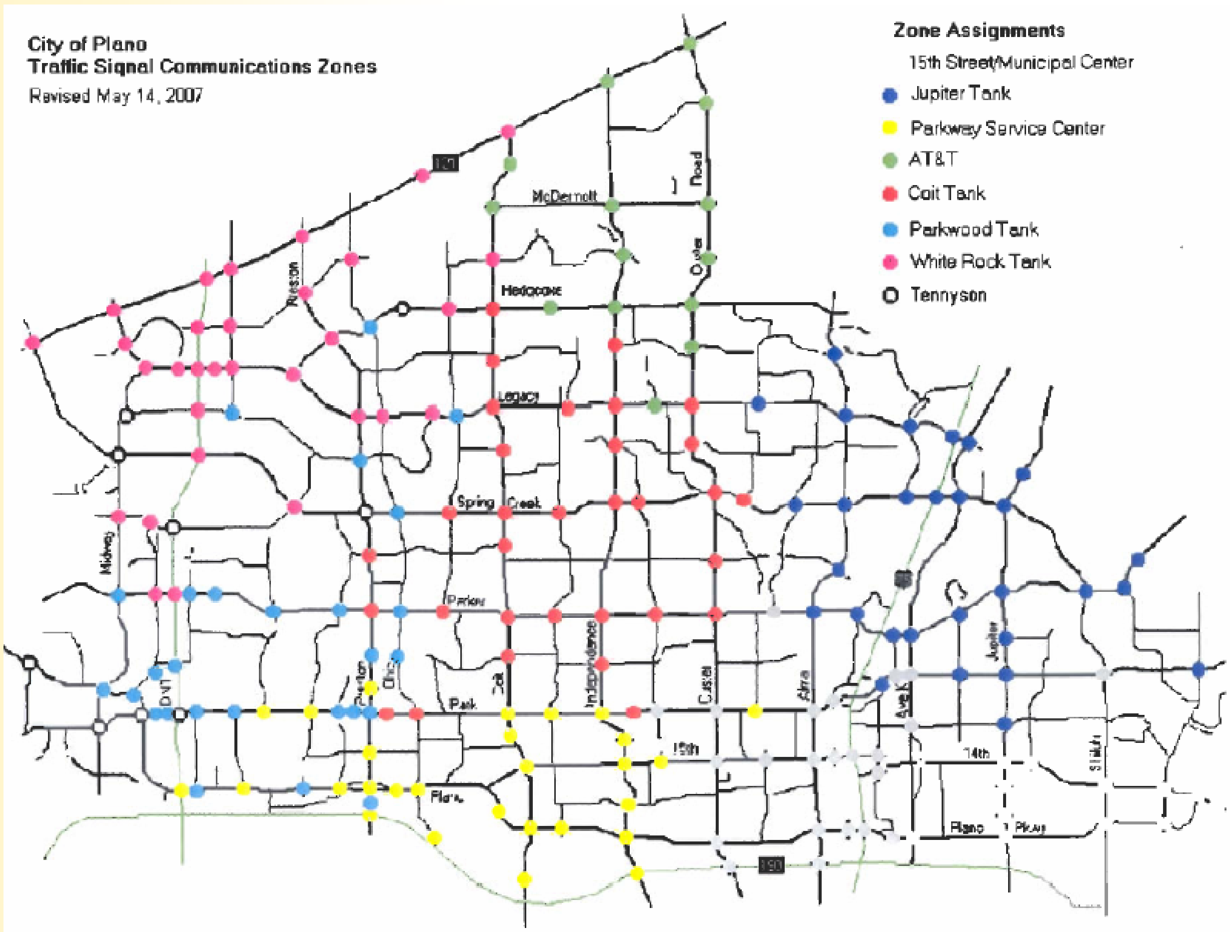


Figure 3.4-8 City of Plano Traffic Signal Locations (Source: City of Plano)

3.4.8. City of Richardson ITS Assets

The City of Richardson operates a centrally managed traffic control system with 92% of the signals in coordinated systems. System adjustments and monitoring for failures are accomplished from the TMC located in City Hall in the middle of the Corridor. Richardson's technical capabilities within the Corridor include:

- 120 centrally managed, coordinated traffic signals

- 22 arterial street CCTV cameras
- Building located freeway CCTV cameras
- ISDN data connection to regional data network
- Regional control software for cameras
- Citywide wireless data network, up to 10 additional cameras, high-speed fiber connection to the regional data network

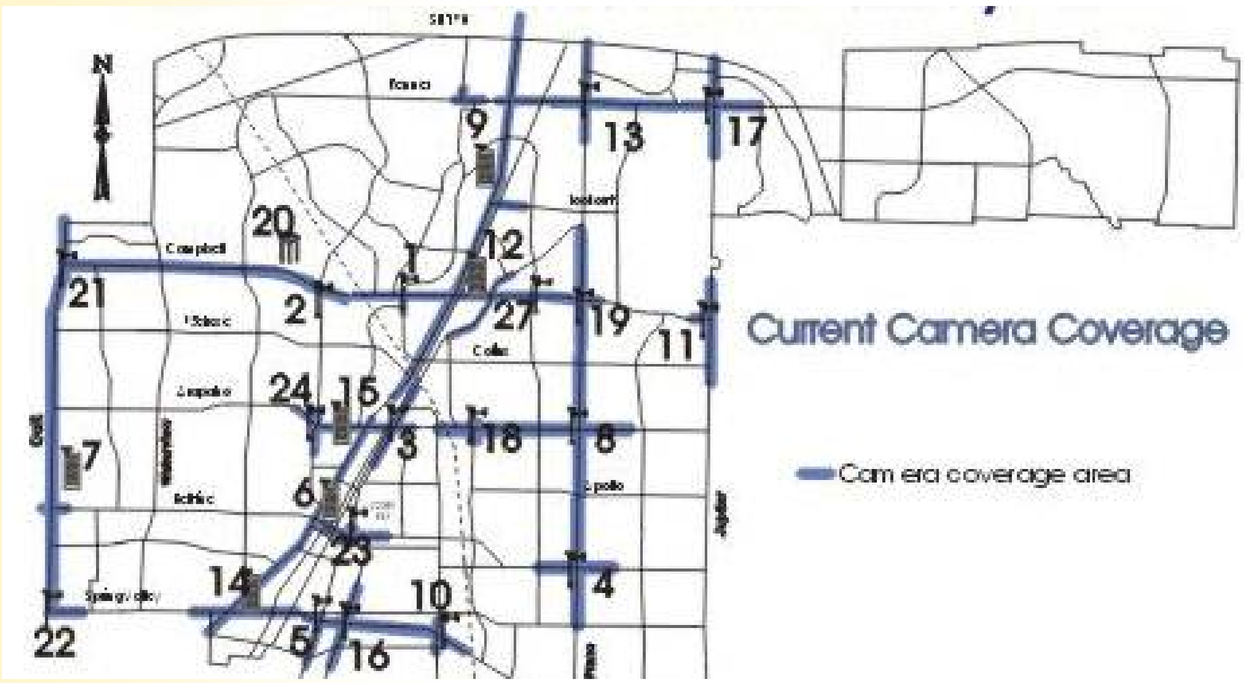


Figure 3.4-9 City of Richardson CCTV Locations (Source: City of Richardson)

3.5. PROPOSED NEAR-TERM NETWORK IMPROVEMENTS

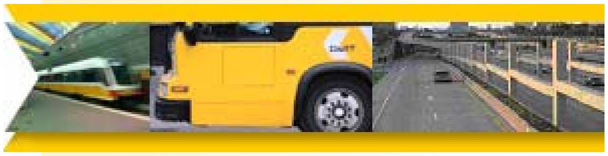
As part of the North Central Council of Governments ITS Partnership Program, several improvement projects have been funded that will have direct impact on the US-75 ICM. Categories for these projects include:

1. Projects that fill in gaps within existing Intelligent Transportation System (ITS) deployments by completing critical systems
2. Projects that enhance interagency cooperation
3. Projects that increase the reliability of the existing transportation system
4. Projects that promote multimodal usage

These categories also fit within the goals and objectives of the US-75 ICM project. Table 3.5-1 below lists near-term projects within the region that are anticipated to have impact on the US-75 ICM. We have agreed to continue to work cooperatively to improve the operations of the corridor, the spirit of ICM will continue in the corridor regardless of the funding available through the US DOT ICM Program.

Table 3.5-1 Proposed/Programmed Near-Term Projects Impacting the US-75 ICM

Project Name - Agency	Initial Scope	Year Complete



Project Name - Agency	Initial Scope	Year Complete
Regional Center-to-Center Software - Regional Partners	ITS software plug-in will assist in sharing automatic traffic information data through Center-to-Center protocol using the regional communication network. It will mainly have two components: data-pulling component, and data-pushing component.	2008
Transit Station Public Announcement and Visual Message Boards	Public Announcement and Visual Message Boards will be added to the four Central Business District stations that are located along the Transitway Mall, in the southern section of the Corridor.	2009
Arterial DMS Interface to Freeway Messages - City of Dallas	Develop interface software to receive data from TxDOT and NTTA TMCs and automatically generate message downloads to arterial DMS. Sign messages currently activated by manual input of TMC operators. The automated system will allow traveler information 24/7. Dallas TMC is not staffed week nights or weekends. -- Automated Display of Incident Messages -- Default Display of Freeway Travel Times	2008
Regional Data & Video Sharing - Regional Partners	This project will develop a regional data and video communication system to aid in the flow of regional ITS information to partners in the DFW region. This project will include a detailed design of data and video communication system, including individual agency connections and hardware needs for the regional network. The project cost estimate below will also include some funds to begin network deployment.	2008
DART ITS System Integration - DART	DART System Interconnection, known as DART Network, is the integration of systems between LRT - TRE - HOV - Paratransit-Bus.	2008

3.6. CURRENT NETWORK – BASED INSTITUTIONAL CHARACTERISTICS

The institutional fabric within the Dallas US-75 ICM Corridor is multi-agency, multi-functional, and multi-modal. Moreover, the authority for transportation-related decision-making is dispersed among several different agencies, including TxDOT, NTTA, DART, NCTCOG, Counties, Cities, and Transportation Management Authorities (TMAs). Additionally, agencies of the US Government (e.g., FHWA, FTA, and DHS) and their rules and regulation also impact the operations within the Corridor. The management and operations of the various Networks (and the supporting ITS-based systems) have tended to be "stovepiped," leaving the need for better optimizing communications between the transportation networks and their operators, with the exception of coordination during major events and incidents.

3.6.1. Institutional Cooperation

- The Corridor Stakeholders have agreed that hosting of Integrated Corridor Management System central control/server deployments should be at the new DalTrans center. This was confirmed by TxDOT representatives, who will manage the future center.
- The Corridor Stakeholder decision-makers have expressed commitment to improving institutional cohesiveness for further implementation of corridor operational technologies and management strategies.
- History of regional ITS and operational cooperation that has followed the systems engineering process for the last decade.
  - o Completed Dallas Area-Wide ITS Plan in 1996. See http://nortex-its.org/General_References/1996_Dallas_ITS_Plan/Dallas_ITS_Plan.htm.
  - o Developed Fort Worth Regional ITS Plan in 1999. See http://nortex-its.org/General_References/1999_Fort_Worth_Regional_ITS_Plan/Ft._Worth_Regional_ITSPlanRevised.pdf.
  - o Entered into regional MOU for implementation of ITS in 2001.
  - o Developed a concept of operations for the software and operation of a system to support high priority market packages in 2001. See http://nortex-its.org/Team_Meetings/2002/C2CConceptOfOperations1_0.pdf.
  - o Developed a high level software requirements recommendation that supports the 2001 Concept of Operations. See http://nortex-its.org/General_References/Center-to-Center_docs/C2C SRS - ver 3.0.pdf.
  - o Agencies are building on these documents for their specific deployments. The 2002 TxDOT DalTrans Operational Concept Document is an example. See http://nortex-its.org/Team_Meetings/2002/DalTrans-OCD-1.15_1.pdf.
- Current projects
  - o MPO is implementing regional data archiving under direction of multiple agency Review Committee that will use center-to-center standards.
  - o Texas DOT Dallas District and DART Transit Agency are building a new TMC where they will co-locate activities along with City of Dallas, City of Richardson, and possibly the City of Plano traffic and emergency operations.

3.6.2. Institutional Agreements

The foundation agreement that started regional ITS cooperation in the Dallas/Fort Worth area is the Regional Comprehensive Intelligent Transportation Systems Agreement. A copy of the signed agreement is included in Figure 3.6-1 below. In addition to this agreement, there are institutional agreements related to freeway management software sharing, shared facility use for collocated central command, communication sharing, C2C software sharing, and media relations. Each of these agreements are highlighted below and detailed as to their purpose, term, and effectiveness.

MEMORANDUM OF UNDERSTANDING

REGIONAL COMPREHENSIVE INTELLIGENT TRANSPORTATION SYSTEMS (ITS)

PROGRAM FOR THE DALLAS/FORT WORTH REGION

Intelligent Transportation Systems (ITS) continue to be an important part of the operation of surface transportation systems and service to the traveling public. In the Dallas/Fort Worth region, several elements of ITS have been implemented with several other projects under design and construction. ITS systems are being planned or implemented by various transportation agencies including the Dallas and Fort Worth Districts of the Texas Department of Transportation (TxDOT), Dallas Area Rapid Transit (DART), the Fort Worth Transportation Authority (The T), North Texas Tollway Authority (NTTA), Dallas/Fort Worth International Airport (DFW Airport) and local municipalities. The North Central Texas Council of Governments (NCTCOG) Regional Transportation Council (RTC) has planning, programming, funding and regulatory interests including air quality conformity in a regional ITS program. Other organizations such as the Dallas Regional Mobility Coalition (DRMC) has a keen interest in transportation and advocating mobility in the Dallas area.

Several ITS planning initiatives have been developed or are underway in the Dallas/Fort Worth Region. ITS Programs must be mutually complementary among agencies if they are to be effective from both a cost and service aspect. Therefore, the undersigned agencies hereby agree to the concept of a REGIONAL COMPREHENSIVE INTELLIGENT TRANSPORTATION SYSTEMS (ITS) PROGRAM FOR THE DALLAS/FORT WORTH REGION, and pledge to work together and with local municipalities in the region to coordinate and cooperate in planning, implementation and operation of ITS systems.

DALLAS AREA RAPID TRANSIT	NCTCOG REGIONAL TRANSPORTATION COUNCIL
DALLAS/FORT WORTH INTERNATIONAL AIRPORT	NORTH TEXAS TOLLWAY AUTHORITY
DALLAS REGIONAL MOBILITY COALITION	TEXAS DEPARTMENT OF TRANSPORTATION (DALLAS DISTRICT)
FORT WORTH TRANSPORTATION AUTHORITY	TEXAS DEPARTMENT OF TRANSPORTATION (FORT WORTH DISTRICT)

Figure 3.6-1 Dallas/Fort Worth Regional Comprehensive Intelligent Transportation Systems Agreement

Memorandum of Understanding: Regional Comprehensive Intelligent Transportation Systems

Purpose of the agreement

The purpose of the Memorandum of Understanding (MOU) is to ensure that ITS programs among the agencies are mutually complimentary so as to be effective in cost and service provided. The MOU also pledges to work cooperatively with local municipalities to coordinate and cooperate in planning, implementation, and operation of ITS systems. The MOU was executed in 2001 and signers were:

- Dallas Area Rapid Transit (DART)
- Dallas Regional Mobility Coalition (DRMC)
- Fort Worth Transportation Authority
- North Texas Council of Governments
- (NCTCOG) Regional Transportation Council
- North Texas Tollway Authority (NTTA)
- Texas Department of Transportation (Dallas District)
- Texas Department of Transportation (Fort Worth District)

The current DFW Regional ITS Executive Committee is currently made up of the following individuals:

- District Engineer, Texas Department of Transportation - Dallas District
- District Engineer, Texas Department of Transportation - Fort Worth District
- President / Executive Director, Fort Worth Transportation Authority
- President / Executive Director, Dallas Area Rapid Transit
- Executive Director, Dallas Regional Mobility Coalition
- Executive Director, North Texas Tollway Authority
- Chief Executive Officer, Dallas/Fort Worth International Airport
- Director of Transportation, North Central Texas Council of Governments

Although individual cities did not sign the MOU, the NCTCOG Regional Transportation Council, made up of elected officials, represents these area cities.

Agreement term

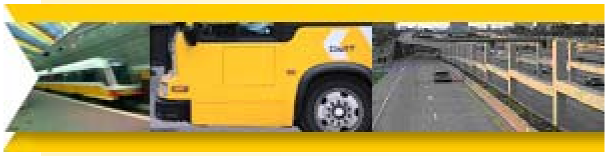
This agreement was executed in the year 2001 and continues to be in effect.

Examples of how the agreement has facilitated operations between or among partner agencies

This agreement facilitated the development of the regional ITS architecture. In addition, the agreement led to the regional development of Center-to-Center (C2C) software, regional data archiving, and the regional cooperative ITS development program.

Applicant analysis of missing institutional integration

Formal written procedures for sharing of traffic, video, and other operational data among agencies are needed to effectively coordinate operations. Four of the participating agencies (TxDOT, Dallas, Richardson and Plano) currently have the communication hardware and network to coordinate operations. Other participating agencies (NTTA, DART) will be connected soon.



Licensing of TxDOT Freeway Management Software to Local Agencies

Purpose of the agreement
The purpose of the Software Licensing Agreements is to allow cities and other agencies to utilize transportation management software developed by TxDOT to access and utilize CCTV, traffic data, and Dynamic Message Signs in the TxDOT system. At present, agreements have been signed between TxDOT and the Cities of Dallas, Plano, and Richardson, as well as Dallas County. Agreements with TxDOT and DART and NTTA are pending.

Agreement term
Open subject to 30 notice of termination by either party.

Examples of how the agreement has facilitated operations between or among Partner Agencies
Agencies are able to readily access information and control functions of CCTV cameras and have the ability to control DMS subject to certain criteria.

Applicant analysis of missing institutional integration
Formal operating procedures are needed.

Joint Use Agreement for Transportation Management Building (TxDOT with DART and Dallas County Sheriff)

Purpose of the agreement(s)
TxDOT has completed construction on its an expanded TMC (DalTrans), which also provides space for DART's HOV management and Dallas County Sheriff's operation of the motorist assistance patrols on a portion of area freeways.

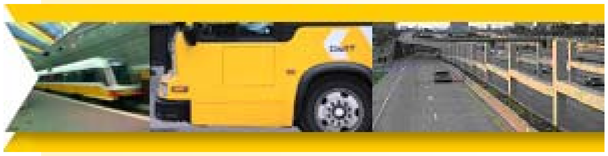
Agreement term
Open subject to notification by either party to terminate the relationship.

Examples of how the agreement has facilitated operations between or among partner agencies
Coordinated management efforts will be enhanced by collocation.

Applicant analysis of missing institutional integration
At the present time, other local agencies will not have staff located in DalTrans but high speed communication links between TxDOT and those agencies will enhance coordinated efforts.

Adoption of Regional ITS Communication Approach

Purpose of the agreement
As area agencies implemented various ITS systems, it was apparent that not only was coordination of efforts vital but that there were opportunities for shared infrastructure as well, e.g. fiber links.



Agreement term
No set term.

Examples of how the agreement has facilitated operations between or among partner agencies
The final report, as agreed to by the participating agencies, provides the following guidelines:

- The region will collectively seek to build on the center-to-center (C2C) communication software investment provided through TxDOT's Inter-District Communications Project by extending it to additional agencies.
- Agencies will work together to share video images for the purposes of incident management and traffic control.
- Agencies that acquire central system software will ensure that it includes standards compliant with center-to-center capability.
- Agencies with fiber optic communication infrastructure will allow the use of two fibers in every fiber link for the exchange of regional transportation information among agencies.
- Representatives of agencies owning communication links will meet to determine where and how they could provide alternate path communication redundancies, i.e., so that Agency A's communications continue using Agency B's cable links if Agency A's cable is out.
- Agencies with communication links will make reasonable expenditure commitments to facilitate, operate, and maintain the connection of their communications systems with those of other agencies.

Applicant analysis of missing institutional integration
Interoperable software and operating procedures established between agencies to more clearly define/guide needed communications links and protocol.

Commitment to Regional Center-to-Center Software

Purpose of the agreement
The purpose of this agreement is to ensure, to the extent possible, that local operating agencies have a mechanism for coordination and information sharing with regard to ITS systems.

Agreement term
No set term.

Examples of how the agreement has facilitated operations between or among partner agencies
DART underwrote the expense of convening and processing results of a series of meetings among local agencies for the purpose of documenting information needs and willingness to share ITS traffic data. Numerous meetings were held along with workshops to assist operating agencies in defining their needs. As a result of that regional effort, TxDOT entered into a contract with a system integration contractor to develop regional C2C software. The regional partners have been briefed and had the opportunity to provide input to the developer.

Applicant analysis of missing institutional integration
Regional partners are committed to the use of center-to-center software. Local agencies will need "plug-ins" for their particular system. TxDOT has programmed funds for this activity and is currently in process of development and deployment to local agencies.

License Agreement between TxDOT and Local Television Stations for Use of Freeway Images

Purpose of the agreement
The purpose of this agreement is to define requirements and rules for use of TxDOT camera images by broadcast media.

Agreement term
The terms vary.

Examples of how the agreement has facilitated operations between or among partner agencies
Does not directly affect other partner agencies.

Applicant analysis of missing institutional integration
The agreement does not affect other partner agencies.

3.6.3. Stakeholder Institutional Challenges

Other specific institutional-related obstacles that will effect operation of the Dallas US-75 ICM include:

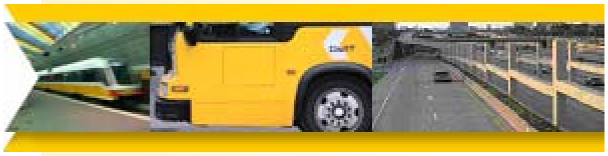
- Current jurisdictional policies don't allow recommendation of specific route to be communicated to travelers (for various reasons, including liability due to injury/death caused by diversion)
- Current institutional standard operating procedures discourage diversion off freeways onto arterials (for various reason, including heavy arterial congestion within local municipalities)

3.7. REGIONAL ITS ARCHITECTURE REVIEW

The Regional Architecture and ITS Plan for the Dallas-Fort Worth was defined in 1999. The Regional Architecture was updated in 2004 and 2005 and posted to the regional ITS web site (http://nortex-its.org/Architecture/ArchHome.htm). The Dallas Area ITS Plan is currently being updated. The goals and strategies for the Regional ITS Architecture are very similar to the strategies and integration needed for the US-75 Integrated Corridor Management System.

The 1999 ITS Plan Regional Goals were defined as:

1. Enhance mobility of people and goods by reducing recurrent traffic congestion
2. Enhance mobility of people and goods by reducing traffic congestion caused by incidents
3. Enhance access and operation of high-occupancy modes of travel



4. Reduce drive-alone and peak period travel
5. Provide a safe transportation system
6. Provide increased opportunities for air quality and other environmental improvements

Similarly, the Goals for the US-75 ICM, as discussed in Section 4 below, are similar:

1. Increase corridor throughput
2. Improve travel time reliability
3. Improved incident management
4. Enable intermodal travel decisions

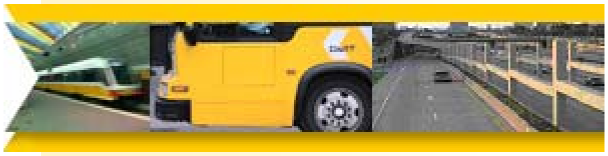
Market Packages

In addition, many of the strategies that the US-75 Steering Committee discussed are captured in many of the Market Packages described in the Dallas-Fort Worth Regional ITS Architecture. A sequence of projects is one of the required components of the regional ITS architecture. In order to meet this requirement, the Dallas-Fort Worth region has developed a sequence of market packages. Each market package priority was determined based on the regional ITS initiatives outlined in existing ITS documents and through consensus building of the Regional ITS Steering Committee. These initiatives include reducing the impacts of recurring and non-recurring congestions; improvements to the overall safety of the transportation system; enhance access and operation of high occupancy modes of travel; and the dependency of one market package on the deployment of another market package. Table 3.7-1 below summarizes the market package prioritization in the Dallas-Fort Worth region adopted in February 2005.

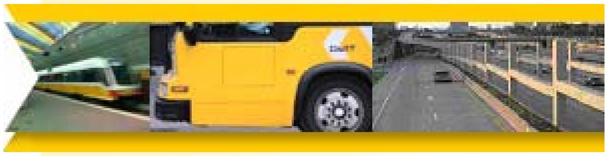
Table 3.7-1 Summary of Market Package Priorities for the DFW Regional ITS Architecture

Area	Market Package	Priority 1	Priority 2	Priority 3
Traffic Management Systems	Network Surveillance	x		
	Probe Surveillance	x		
	Surface Street Control		x	
	Freeway Control	x		
	HOV Lane Management	x		
	Traffic Information Dissemination	x		
	Regional Traffic Control		x	
	Traffic Incident Management System	x		
	Electronic Toll Collection	x		
	Emissions Monitoring and Management			x
	Standard Railroad Grade Crossing	x		
	Railroad Operations Coordination		x	
	Parking Facility Management		x	
	Regional Parking Management			x
	Reversible Lane Management		x	
	Speed Monitoring	x		
	Roadway Closure Management	x		

Table 3.7-1 Summary of Market Package Priorities for the DFW Regional ITS Architecture (Continued)



Area	Market Package	Priority 1	Priority 2	Priority 3
Emergency Management	Emergency Call-Taking and Dispatch		x	
	Emergency Routing			x
	Mayday Support		x	
	Roadway Service Patrols	x		
	Transportation Infrastructure Protection			x
	Wide-Area Alert		x	
	Early Warning System			x
	Disaster Response and Recovery			x
	Evacuation and Reentry Management			x
	Disaster Traveler Information			x
Maintenance and Construction	Road Weather Data Collection		x	
	Weather Information Processing and Distribution			x
	Winter Maintenance			x
	Roadway Maintenance and Construction	x		
	Work Zone Management	x		
	Work Zone Safety Monitoring			x
	Maintenance and Construction Activity Coordination	x		
Public Transportation	Transit Vehicle Tracking	x		
	Transit Fixed-Route Operations		x	
	Demand Response Transit Operations			x
	Transit Passenger and Fare Management		x	
	Transit Security			x
	Transit Maintenance			x
	Multi-modal Coordination		x	
	Transit Traveler Information			x
Commercial Vehicle Operations	HAZMAT Management		x	
Traveler Information	Broadcast Traveler Information	x		
	Interactive Traveler Information		x	
Archived Data	ITS Data Mart		x	
	ITS Data Warehouse			x



Other deployment considerations:

- Fill gaps in the existing ITS communications infrastructure by completing critical system linkages
- Leverage transportation resources by targeting investment, where possible, to facilities undergoing reconstruction
- Leverage transportation resources by creating or enhancing public/private partnerships which will provide communications infrastructure for regional ITS
- Provides transportation service or transportation data that is regional in scope.

3.8. INDIVIDUAL NETWORK AND CORRIDOR CHALLENGES AND NEEDS

This section summarizes the problems, issues and needs of the individual Networks and the Corridor as a whole. Using the inventory information and other gathered data, coupled with stakeholder discussions, this section addresses operational, technical, and, institutional deficiencies and constraints, As such, it provides insight into the types of problems being faced in the US-75 Corridor.

Within the US-75 Corridor, the challenges in efficient movement of people and goods can be classified in terms of 1) agency coordination, 2) available capacity, and 3) proactive operational and control strategies.

3.8.1. Network Challenges

Agency Coordination: First, the Corridor encompasses multiple modes of transportation and a variety of facilities as highlighted in Section 3.1.2 – Corridor Networks. It also encompasses multiple operating agencies with various responsibilities for providing transportation services. These operating agencies include five cities, two counties, a state department of transportation, a transit authority, a regional tolling authority, a metropolitan planning organization and a large number of local emergency service providers. While the various agencies generally operate in a cooperative manner, there are limited systems and tools for integrated coordinated operation.

One example where data is exchanged is between Texas Department of Transportation (TxDOT), the Dallas 911 system, and Metro Traffic (one of the local information service providers). The TxDOT Dallas District ITS central system receives traffic incidents from Dallas related to incidents, events, or other actions is accomplished by email or telephone. There is not, however, a Corridor-wide automated mechanism for improved sharing of data, control strategies, and response plans.

For example, a major incident may occur on a freeway and block travel lanes for an hour or more. Drivers may reroute based on information from Dynamic Message Signs (DMS) or from Information Service Providers (ISPs). There exists an opportunity for a modal shift to transit, a travel schedule shift, or a route shift if there is a mechanism in place for the affected agencies to act. Even with recurrent congestion, there exists an opportunity for modal, schedule, or route shifts with exchange of information among agencies along with communication to travelers. Such exchange of information and an action plan can better balance available capacity either in time or space. In either case - recurrent or non-recurrent congestion - agencies would be able to manage travel in a more coordinated manner with improved exchange of information and a coordinated action plan taking into account available capacity from all modes.

During 2005, the TxDOT freeway management system logged over 8,500 incidents on US-75 and over 5,000 incidents on I-635 within the Corridor boundaries. These incidents ranged in severity from debris in the roadway, to stalled vehicles, to major vehicle crashes with multiple lane closures.

Available Capacity: Second, the Corridor represents a highly-developed, urbanized area. As such, there is limited right-of-way remaining to expand the freeway and arterial streets. Therefore, the vehicle capacity is set, and the ability to handle future demand increases relies on moving more people on the given modes and effectively utilizing the existing capacity in real-time as both demand and capacity fluctuate.

Proactive Operational and Control Strategies: Third, maintaining mobility and safety in the Corridor will require proactive operational and control strategies implemented in an integrated manner among the agencies in the Corridor. Whether it is responding to the high travel demand each day or responding to special and planned events in the Corridor, there is a need to coordinate available capacity to match changes in demand. Furthermore, traveler information must be provided to inform users of travel alternatives to maximize their trips.

While the Corridor Stakeholders are in agreement that the principal mobility challenge in the Corridor is the daily traffic demand, there are a significant number of special events at venues in or near the Corridor that add additional challenges for mobility, safety, and wayfinding.

3.8.2. Network Needs

Many of the operational deficiencies within the US-75 Corridor have already been discussed in Section 3.3 – Operational Conditions of the Corridor and Included Networks, representing a major problem along most of the networks within the Corridor. Specific examples of additional needs relating to separate Network, as well as the Corridor as a whole are discussed below. These needs were established through a dedicated Corridor Stakeholder interviewing process, as well as by general input throughout the process of developing this Con Ops.

Arterial Network Needs

- Increased communications infrastructure between agency systems/centers, especially for video sharing
- Optimization / retiming of traffic signals – especially on established detour routes within Corridor
- Signal systems that better react to current travel conditions (rather than time-of-day) – i.e., deployment of traffic responsive signal systems along arterials throughout corridor.

- Collection and use of real-time traffic conditions along arterials – volume data is needed along with speed data
- Increase city traffic management office access to 911 / Emergency CAD data to better manage signal system based on incidents effecting traffic on arterials
- Improved incident management policies for incidents on arterials – different than freeways

Freeway Network Needs

- Increased freeway travel data to distribute accurate traveler information
- Increased mediums for distributing freeway traveler information, e.g., automated emailing of incidents based on personalized travel preferences
- Processing accurate freeway travel times
- Increased sharing of existing freeway travel speed data to other agency systems
- Relaying freeway travel times to travelers, specifically on DMS
- Making freeway travel times available to other agencies for operational use and distribution to travelers
- Steaming video to travelers
- Improve ability to delineate the events that will effect highway mobility from within integrated data from 911/Emergency CAD system
- Improve ability for appropriate TxDOT personnel to be alerted by 911/Emergency CAD events that effect transportation system

Transit Network Needs

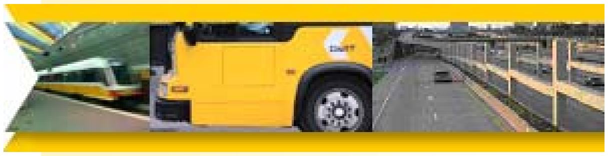
- Signal priority capability for light rail transit.
- Signal priority for bus transit vehicles (especially near transit centers)
- Increased coordination between DART and Cities for management and public information distribution relating to transit line closures
- Ability to accurately measure bus and rail ridership in real-time
- Need ability to alert (not just broadcast) customers about service disruptions, both pre-trip and en-route (probably via wireless medium, e.g., cell phones or PDAs)
- Need better parking management at park-n-ride facilities, e.g., traveler information about lots being full
- Need for automated payment collection at park-n-ride lots
- Increased information sharing within DART so that bus operators know about problems on rail, and vice-versa

Incident Management / Field Operation Needs

- Increased outreach/education for local police & fire in incident response procedures related to traffic management, i.e., keeping traffic moving where possible
- Increased coordination with incident responders to communicate operational decisions, including between TxDOT maintenance, local police, local fire, towing, and EMS personnel.
- Need for interoperable communication between incident responders of all agencies

Multi-Network Needs

- Getting freeway travel times and incidents to travelers along arterials prior to getting on freeway.



- Additional mediums for distributing travel conditions to travelers en-route, e.g., via cell-phones or PDAs.
- Ability to effectively communicate diversion routes to travelers who may be unaccustomed to alternate routes, e.g., use dynamic trailblazing signage.
- Proven systems for predicting operating conditions in order to make operational decisions.
- Ability to measure mode change when put into affect as traffic management tool
- Increased sharing of video
- Increased sharing of travel conditions along all networks, so that information about problems on one network can be relayed to travelers who seek to transfer from another network
- Access to real-time information about incidents, including what agencies and/or resources are at the incident scene
- Ability to effectively relay travel time and/or delay information for all modes to travelers en-route so that travel decisions can be made
- Need for real-time volume data on all modes, not just flow data
- Integration of existing bus location data (for flow information) to freeway systems
- Public outreach and education to traveling public who's unaccustomed to use of alternate modes of travel, e.g., education program to explain use of park-n-ride lots and transit fare payment options.

Institutional / Coordination Needs

- There is a need for formalized agreements to define data and video sharing protocol between partner agencies.
- There is a need for formalized standard operating procedures for multi-agency shared control of ITS devices through integrated systems
- There currently is no clearly defined and agreed-upon performance measures for determining the effectiveness of multi/cross-network operational management
- There needs to be increased coordination between agencies about what real-time data is being collected and how it can be made available
- Increased focus of Corridor Stakeholders for integration of existing system, rather than deployment of additional non-integrated systems
- Acquiring decision-maker/political support for ICM concepts, specifically the City Councils and RTC

3.9. POTENTIAL FOR ICM IN THE CORRIDOR

Simply put, the Integrated Corridor Management concept seems to be a strong fitting solution for the Dallas US-75 Corridor. The needs and goals, as detailed in Section 3.8 above, related transportation operations within the Corridor, are most likely to be met only with operations within each of the separate transportation networks to be coordinated.

The US-75 Corridor consists of multiple independent networks:

- Freeway
- Managed High-Occupancy Vehicle Lanes
- Tollway
- Arterials

- Bus
- Light Rail

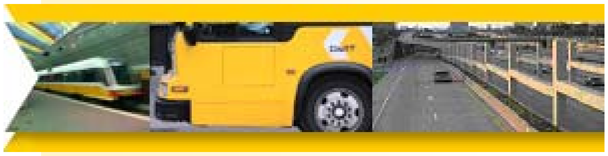
Each of these corridor networks are experiencing congestion to some extent during peak hours. "Integrated Corridor Management" focuses on the operational, institutional, and technical coordination of multiple transportation networks and cross-network connections comprising a corridor. Moreover, ICM can encompass several activities which address the problems and needs identified in the previous section (e.g., integrated policy among stakeholders, communications among network operators and stakeholders, improving the efficiency of cross-network junctions and interfaces, real-time traffic and transit monitoring, real-time information distribution, congestion management, incident management, public awareness programs, and transportation pricing and payment).

The US-75 Steering Committee has identified multiple areas and strategies that would assist in operating the corridor in a more efficient and safe manner and has a positive impact to the overall economy of the region. The first major area deals with information sharing both with the public and among agencies. Currently the region has a ITS Standards based Center-to-Center program with a couple of the agencies integrated. This sharing of information could be used for better informing the public of the operations of the corridor and the availability and impact of different modes. The corridor could provide comparative travel time across modes, so that travelers can make informed decisions about trips they are about to make, this would include the ability to collect and distribute arterial travel time data via various media including through 3rd party ISPs, websites, and subscription services for phones and PDAs.

One of the areas multiple agencies identified that is needed is pre-planned response plans and a decision support tool to assist with the on-going operations of the corridor. This decision support tool would be integrated with the various agencies, and provide response plan requests. The agencies will identify hot spots where recurring incidents and special events occur, and develop responses that are coordinated and agreed upon by the agencies.

One of the deficiencies that needs to be addressed – and a specific attribute of the Regional ITS Architecture – involves the exchange and sharing of real-time data. With real-time data and video among the networks, each network could monitor the conditions of adjacent networks to anticipate when travelers may shift to their network and take appropriate actions. Moreover, real-time condition information would provide the foundation for corridor-wide traveler information. The corridor has solutions for both of these deficiencies – the current center-to-center project is used by some of the agencies within the corridor, but further expansion to all of the corridor agencies is needed. A Regional Data and Video Communication System is currently being designed that would serve as the central distribution point for sharing video among corridor agencies. Currently several cities, DART, and TxDOT share some of their video images.

Another element of ICM that is needed is outreach and marketing to the public and major employers within the corridor. Currently, many travelers utilize the regional website and 3rd Party ISPs (including Media) to find out about current conditions. One of the strategies identified by the stakeholders is outreach to major employers to provide customized traveler information to them; this could then be used as a potential way to allow diversion of travelers to use their overflow parking.



Another potential element of ICM involves enhanced mobility opportunities, including shifts to alternate routes and modes. Currently, any shifts that do occur are based on traveler knowledge and past experience. Using integrated real-time information, the various networks working as a corridor could influence traveler network shifts; especially promoting, when appropriate, shifts to the rail network with its unused capacity. The one problem with influencing a shift to rail is the parking shortage. Parking notification could be used to direct travelers to available parking; or in some situations temporary parking may be instituted to handle the new demand.

Current and new DMS deployed among the networks could be operationally integrated and messages could be used to provide travelers condition information on all corridor networks so that each traveler can take appropriate action if one or more of the corridor's network's performance is compromised. More can be done with corridor trip travel times to influence traveler shifts, or staggering of the start of travel. For special events, the DMS could be used to direct event attendees to specific event corridor transportation services.

Clearly, there is great potential to enhance current and near-term operations by implementing selected ICM and cross-network strategies. All of these enhancements would not be possible from an independent network operational perspective. The potential strategies identified above indicate that further investigation and design concerning integrated corridor management is warranted.

3.10. CORRIDOR VISION

The US-75 ICM Project is a collaborative effort between Dallas Area Rapid Transit (DART), City of Dallas, Town of Highland Park, North Central Texas Council of Governments (NCTCOG), North Texas Tollway Authority (NTTA), City of Plano, City of Richardson, Texas Department of Transportation (TxDOT), the City of University Park and many local emergency service providers. The Team defined the Vision for the Corridor as:

"Operate the US-75 Corridor in a true multimodal, integrated, efficient, and safe fashion where the focus is on the transportation

4. ICM System Operational Concept

This chapter describes the Integrated Corridor Management System (ICM) operational concept for the US-75 Corridor in Dallas. The proposed ICM concept explains how things are expected to work once the ICM program and system are in operation, and identifies the responsibilities of the various stakeholders for making this happen. The chapter defines the ICM goals and objectives (Section 4.1); the operational approaches and strategies to be implemented in response to the Corridor problems and needs (Section 4.2); proposed changes to the current technical, operational, and institutional situation within the corridor (in essence, de facto "requirements") providing a sense of the overall scope for the ICM concept; alignment of the ICM with the Regional ITS Architecture (Section 4.6); and corridor performance measures and metrics (Section 4.9). The system concept also addresses the key system implementation issues including how they may be resolved (Section 4.7). An initial mapping (i.e., traceability) of each selected ICM strategy to the goal(s) and the corresponding need(s) it addresses is also included within the chapter. This chapter provides the traceability from vision, goals and objectives through to the assets and strategies that the US-75 Steering Committee discussed.

4.1. CORRIDOR GOALS AND OBJECTIVES

The Vision Statement for the Corridor, as stated in Section 3.10, is "Operate the US-75 Corridor in a true multimodal, integrated, efficient, and safe fashion where the focus is on the transportation customer." Using the Vision Statement as a starting point, the US-75 Steering Committee developed four primary Goals for the ICM, and discussed the Objectives and Strategies for each of the Goals. These Goals and Objectives, shown in Table 4.1-1 below, are interrelated such that activities and strategies oriented towards attaining one of the Goals will likely impact the attainment of other Goals and Objectives.

Table 4.1-1 Corridor Goals and Objectives

Goals	Objectives
Increase corridor throughput – The agencies within the corridor have done much to increase the throughput of their individual networks both from a supply and operations point of view, and will continue to do so. The integrated corridor perspective builds on these network initiatives, managing delays on a corridor basis, utilizing any spare capacity within the corridor, and coordinating the junctions and interfaces between networks, in order to optimize the overall throughput of the corridor.	• Increase the vehicle person throughput of the US 75 corridor. • Increase transit ridership, with minimal increase in transit operating costs. • Maximize the efficient use of any spare corridor capacity, such that delays on other saturated networks may be reduced. • Facilitate intermodal transfers and route and mode shifts • Improve pre-planning (e.g., developing response plans) for incidents, events, and emergencies that have corridor and regional implications.

Table 4.1-1 Corridor Goals and Objectives (Continued)

Goals	Objectives
Improve travel time reliability - The transportation agencies within the corridor have done much to increase the mobility and reliability of their individual networks, and will continue to do so. The integrated corridor perspective builds on these network initiatives, managing delays on a corridor basis, utilizing any spare capacity within the corridor, and coordinating the junctions and interfaces between networks, thereby providing a multi-modal transportation system that more adequately meets customer expectations for travel time predictability.	• Reduce overall trip and person travel time through the corridor. • Improve travel predictability. • Maximize the efficient use of any spare corridor capacity, such that delays on other saturated networks may be reduced. • Improve commercial vehicle operations through and around the corridor. • Increase travel time reliability (i.e., lower the 95% travel time)
Improved incident management - Provide a corridor-wide and integrated approach to the management of incidents, events, and emergencies that occur within the corridor or that otherwise impact the operation of the corridor. The approach includes planning, detection and verification, response and information sharing, so that the corridor returns back to “normal” more quickly.	• Provide/expand means for communicating consistent and accurate information regarding incidents and events between corridor networks and public safety agencies. • Provide an integrated and coordinated response during major incidents and emergencies, including joint-use and sharing of response assets and resources among stakeholders, and development of a common policies and processes. • Continue comprehensive and on-going training program – involving all corridor networks and public safety entities – for corridor event and incident management. • Reduce secondary crashes
Enable intermodal travel decisions - Travelers must be provided with a holistic view of the corridor and its operation through the delivery of timely, accurate and reliable multimodal information, which then allows travelers to make informed choices regarding departure time, mode and route of travel. In some instances, the information will recommend travelers to utilize a specific mode or network. Advertising and marketing to travelers over time will allow a greater understanding of the modes available to them.	• Facilitate intermodal transfers and route and mode shifts • Increase transit ridership • Expand existing ATIS systems to include mode shifts as part of pre-planning • Expand coverage and availability of ATIS devices • Obtain accurate real-time on the current status of the corridor network and cross-network connections

These corridor-wide Goals and Objectives have a general premise in the travelers' (i.e., "customers'") perspective of only one surface transportation system; and that the public generally is not concerned with which jurisdiction or agency is responsible for the road or transit network on which they are currently traveling. As taxpayers and fare/toll payers, they want and deserve a safe and reliable trip – one that provides a consistent level-of service with minimal congestion, and is predictable in terms of travel time. Travelers also need accurate and timely information so that they can make informed decisions before and during trips. Table 4.1-2 maps these goals against the various corridor needs (as discussed in Chapter 3).

Table 4.1-2 Mapping of Goals against Corridor Needs

	Goals			
Problems and Needs	**Increase corridor throughput**	**Improve travel time reliability**	**Improved incident management**	**Enable intermodal travel decisions**
Corridor based approach among agencies and modes.	●	●	●	
Improved coordination, cooperation and integration among stakeholders	●		●	
Improved interagency information sharing			●	●
Improve demand balance among facilities		●		●
Reduce non-recurring incidents	●	●		
Improve incident management process			●	
Data warehousing	●		●	●
More standardization and system interoperability within and between all stakeholders		●	●	
Accurate real-time information on the operations of all network including travel time		●		●
Improved operational coordination of networks in the corridor, particularly at junctions (including multi-modes)	●	●	●	
Accurate models to simulate corridor operation under various scenarios.	●	●		●
Joint use of resources and infrastructure (e.g., service patrols, DMS)	●	●	●	
Improved in-reach and public outreach	●	●	●	●
Funding sources for corridor initiatives including the O&M				
Increased transit usage	●			●
Improved corridor wide incident management			●	●
Performance measures for screening, monitoring and evaluating corridor-based strategies and operations				●
Information Sharing both Inter-agency and with the Public	●		●	●
Provide tools for Real-time operation of the system	●		●	●

4.2. USER NEEDS

User needs identify the high-level ICM system needs; these user needs are developed to focus on the operational aspects of the ICM, and defining the functional requirements of the proposed ICM system. These needs are based upon the system goals and objectives provided above, and the future operational conditions and scenarios defined in Section 5. The user needs will be utilized during the requirements development of the next phase of the systems engineering process to develop the high-level system requirements document.

4.2.1. Use Cases

Use cases are a technique for capturing the functional requirements of a system. Use cases work by describing the typical interactions between the users of a system and the system itself, by providing a narrative of how a system is used.

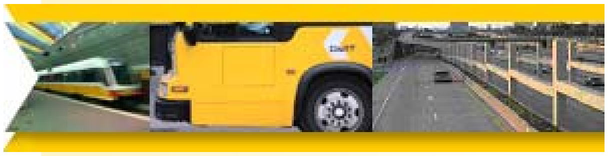
Utilizing the scenarios developed during the concept of operations phase of the ICM project, use cases were developed to tie the scenarios together by a common user goal. The goal of the typical user (traveler) is to make a trip from one location to another. This trip requires the user to plan, understand the current conditions of the transportation network, and make changes during the trip if the conditions of the network change. In use case terminology, the users are referred to as actors. An actor is a role that a user plays with respect to the system. Actors might include travelers, agency operators, or the ICM steering committee. Actors carry out use cases. A single actor may perform many use cases; conversely a use case may have several actors performing it.

There are three key things we need to know to describe a use case:

- The actor or actors involved. An actor is a type of user (for example, traveler) that interacts with the system.
- The system being used.
- The functional goal that the actor achieves using the system the reason for using the system.

There's a little more to it than that, for example if we were developing a use case for an Automated Teller Machine:

- The actor describes a role that users play in relation to the system. Maybe the cardholder is an advertising executive, but that doesn't interest us. We only care about his relationship to the system.
- The actor is external to the system itself.
- Actors don't have to be people. They can be other systems. For example, the ATM may need to connect to the cardholder's bank. External systems that interact in a use case are also actors.
- The goal must be of value to the actor. We wouldn't have a use case called Cardholder enters PIN because that, by itself, has no value to the cardholder. We don't build ATM's just so people can enter their PINs!



When we are analyzing functional requirements for a system, the key questions we need to ask are; who will be using the system, and what will they be using it to do?

In order to develop the user needs and functional requirements of the ICM system, a Use Case diagram was developed to show the ICM system and all of its actors and use cases (at a high level.) The actual use case descriptions and content will be provided in the requirements document during the next phase.

During the high-level requirements development, each Use Case will be expanded upon to discuss the dependencies, interfaces, and conditions.

4.2.2. User Needs Development

These needs were established through a dedicated Corridor Stakeholder interviewing process, as well as by general input throughout the process of developing this Con Ops. Utilizing the Use Cases from the section above, User Needs were developed. The following needs represent the identified needs of the ICM system.

Table 4.2-1 User Needs for US-75 Integrated Corridor Management System

Need #	Need Title and Description
1	**Need for improved communication among agencies** – to ensure that actions taken by one corridor agency do not have unintended consequences on the corridor, or other agencies within the corridor, the agencies need to communicate interactively with each other in order to plan and execute actions that are not normal operation procedures. The communication does not have to be continuous, but does need to occur in a timely manner when actions are about to begin.
2	**Need to monitor the status of the physical transportation infrastructure** – The agency operators need to monitor the status of all devices within the corridor on a real-time or near real-time basis. Knowing which devices are operational will enable them to determine which devices can be used to affect change within the corridor.
3	**Need to process information on status of the infrastructure in near-real time** – The ICM system needs to be able to process all of the relevant data and information it receives from the various agencies within the corridor, in order to provide information to operators and travelers which can be used to make informed decisions on actions to be made.
4	**Need to update conditions of the infrastructure to the public and other agencies in near-real time** - in order to optimize the corridor operations, the travelers and the agencies need to have up to date information on the current conditions and status of the corridor infrastructure.

Table 4.2-1 User Needs for US-75 Integrated Corridor Management System (Continued)

Need #	Need Title and Description
5	**Need for interactive trip planning** – to ensure that travelers within the corridor can make informed decisions, the corridor agencies need to provide a way to allow travelers to develop plans for a trip. This could include various media, and multi-modes of travel.
6	**Need for near-real time information for travelers** – in order to optimize the trips that a traveler makes, they need to have current information provided to them during trips in order to make informed decisions on the their current route and mode.
7	**Need to have physical infrastructure coverage** – The components for the physical infrastructure (DMS, CCTV, communications network, etc.) within the corridor need to be reliable, available, maintained, extensible, and interoperable. The operators of the corridor need to know the location of all devices and other facilities within the corridor's network, and their purpose and capabilities. If a device is not operating correctly, the operator needs to know whom to contact to fix the device.
8	**Need to collect and store data/ information** – The data/ information collected during daily operations of the corridor needs to be stored for analyzing the effectiveness of the corridor strategies and responses, and for modeling.
9	**Need to provide pre-agreed incident response plans** – The agencies in the corridor need to have some pre-arranged response plans for incidents within the corridors, these will provide the contacts, roles and responsibilities, and responses for each network within the corridor.
10	**Need to coordinate incident responses among agencies** – The agencies within the corridor need to coordinate responses to incidents such that two agencies are not responding to the same incident, and not inadvertently impacted one another.
11	**Need to provide multi-modal alternatives for travelers** – In order to reduce congestion, and improve efficiency of the entire corridor, multiple modes and routes need to be available to the traveler. These modes choices need to include alternatives for various levels of income and mobility for the traveler.
12	**Need to measure effectiveness of responses** – During the response to an event in the corridor, the operators need to be able to determine if the pre-planned response is effective and if the response if having the intended effect. This includes verifying what conditions exist after implementation of a response. If the operators of the systems determine that their response is not effective, they should be able to change components of their response plans and communicate these changes to the other agencies within the corridor, such that they are not inadvertently impacting the other agencies.

Table 4.2-1 User Needs for US-75 Integrated Corridor Management System (Continued)

Need #	Need Title and Description
13	**Need to modify responses during event as conditions change** - As an event progresses, the conditions (such as lanes closed, severity, etc.) will change. The operators should be able to modify the current conditions, and communicate with the others within the corridor of the change. The system needs to also request changes to the current responses as the conditions warrant.
14	**Need to request use of infrastructure from third party** - During some major incidents and special events, the current and planned capacity of the infrastructure owned and operated by the agencies may not be sufficient. This requires an interface to multiple third parties (large companies, private parking, van services, etc.) to request service from them or use of their infrastructure during special circumstances.

4.3. APPLICATION OF ICM APPROACHES AND STRATEGIES

In order to determine the Strategies to meet the needs, goals, and objectives of the US-75 Corridor Stakeholders, several meetings and workshops were completed to ensure that all Stakeholder viewpoints were relayed and considered in the decision-making process by the project US-75 Steering Committee. The activities that were completed as part of developing this Con Ops included:

- Meeting with each Stakeholder agency individually to discuss the US-75 Corridor, the agency's needs and potential Strategies for meeting the goals
- Multiple project US-75 Steering Committee meetings / workshops to review the findings of the agency meetings, and to the discuss goals and strategies for the US-75 Corridor ICM

Overall, the Strategies for meeting the goals agreed to by the US-75 Steering Committee fit very well with many of the activities already underway in the Dallas Region. From the ICM Strategies discussed, the US-75 Steering Committee discussed multiple scenarios to decide upon the institutional framework for the corridor, and to ensure that all goals and Strategies were documented. The US-75 Steering Committee participated in multiple workshops and discussed and evaluated each of the scenarios and Strategies for the corridor with respect to their potential for achieving the goals, objectives, and needs of the corridor and stakeholders. As this analysis evolved, the following scenarios were addressed:

- Daily Operations (including minor incidents)
- Major Incidents
  - Freeway
  - Arterial
- Transit Incident
- Weather Event

These scenarios and the goals, objectives, and needs of the corridor also guided the selection of the ICM Strategies for the US-75 Corridor, which are shown in Table 4.3-1 by Goal.

Table 4.3-1 ICM Approaches and Strategies

Goal	Proposed ICM Approach and Strategies

Increase corridor throughput	• Managed HOV Lanes
	• Transit Usage Increase
	• Increase/ Maximize Supply
	  o Additional Transit
	  o Additional Parking
	  o Diversion of Vehicles
	• Integrated Approach to Management
	  o Trade-offs between agencies to improve overall corridor operations
	• Modeling of Corridor and Strategies
	• Decision Support Model for near real-time scenario evaluation.
	• Pricing

Improve travel time reliability	• ATIS • Incident Management o Response Time Improvements – consistent goal among agencies within Corridor

Improved incident management	• Inter-agency cooperation
	• Inter-agency information sharing
	  o CAD System integration
	  o Radio system
	  o Center to Center
	  o Video Sharing
	• Training of Agencies on common approach
	  o Current courses available
	• Integrated Policies for Incident Response (towing policies, response times)
	• Decision Support Model for historical, and near real-time scenario evaluation

Enable intermodal travel decisions	• Model of Multi-mode system
	• ATIS
	  o Availability of other modes
	  o Linked Websites/ Portal
	  o 3rd Party Integration
	• Marketing/ Advertising
	  o Public Outreach/ Education

As previously noted, the ICM Strategies selected by the US-75 Steering Committee and Stakeholders were developed based on how each goal could be met through Integrated Corridor Management System deployments and initiatives. Since there were many commonalities among the Strategies identified, an analysis was executed to ensure that Strategies for one goal did not compete or contradict with other Strategies for the corridor. The resultant Corridor ICM strategy (or approaches) grouping is shown in Table 4.3-2. The bulleted text are the high-level strategies developed by USDOT and provided in their documentation, the dashed bullets are sub-strategies that the US-75 Steering Committee provided as strategies and actions they need to make the ICM successful. The sub-bullets identify areas of consideration the stakeholders considered important for the corridor.

Table 4.3-2 Proposed ICM Approaches and Strategies

Proposed ICM Approach and Strategies

Information Sharing/ Distribution

- Manual information sharing (e.g., voice telecommunications, emailing)
- Automated information sharing (real-time data)
    - Toll tag readers, cell phone probes
    - Define what real-time information is available from all agencies
    - Measure response time and incident clearance time
    - Data mining of CAD systems
    - Speed and travel time on arterials
    - System detection for signal system
- Automated information sharing (real-time video)
    - Regional video sharing
    - Need for streaming video (or near streaming) sharing and distribution
- Information clearinghouse / Information Exchange Network (corridor networks / agencies)
    - Center-to-Center (C2C) Network
    - Share information between TxDOT, DART, Emergency 911, Cities along the corridor and NTTA on the "highway" travel times
    - Integrated approach to management
    - A common incident reporting and asset management
    - Shared control of passive ITS devices such as CCTV
        - Trade-offs between agencies to improve overall corridor operations
- Corridor-based ATIS integrated database and distribution
    - Automated emailing on incidents
    - Traveler information to PDAs
    - Subscription based traveler information to PDAs and text capable devices
    - Web-based trip planner
    - Traveler information at major sources of employment
    - Availability of other modes
    - Linked Websites/ Portal
- Access to corridor ATIS database by 3rd party information providers

Table 4.3-2 Proposed ICM Approaches and Strategies (Continued)

Proposed ICM Approach and Strategies

- En-route traveler information devices (e.g., DMS, HAR, 511, transit PA systems) being used to describe current operational conditions on another network within the corridor
  - Passenger Information System – Public Address System, DMS at rail & bus stations
  - Information to motorists on highway with information to the drivers on parking availability/ transit
  - Expand real-time travel times on DMS
  - Expand traveler information distribution infrastructure on arterials
  - Customers subscription to real-time data on schedule data, amount of delay, etc. – cell phone, PDA – time of day, and location based
  - Dynamic “trail blazing” signage
  - Arterial DMS
    - Automated downloads
    - Display of freeway travel times based on real-time information
- A common incident reporting system and asset management (GIS) system
  - Integrate/ share data from multiple CAD Systems
    - Measure response time and incident clearance time
    - Data mining of the CAD Systems
  - Common Radio system (frequency/ channels) for emergency services
  - Pre-defined, acceptable detours are needed for certain incident location
- Decision support tools to model responses – pre-planned
- Decision support tools to model responses – real-time
- Decision support tools to model responses – predictive

Improve Operational Efficiency

- Signal priority for transit (e.g., extended green times to buses that are operating behind schedule)
  - Transit signal priority
    - Light rail transit
    - Bus operations
- Transit pre-emption (City of Richardson and maybe Plano)/ “best route” for emergency vehicles
- Transit traveler information
  - Real-time train arrival information
  - Pre-trip planning
- Multi-modal electronic payment
  - Bus/ light rail/ toll payment card (parking at airports)
- Transit hub connection protection

Table 4.3-2 Proposed ICM Approaches and Strategies (Continued)

Proposed ICM Approach and Strategies

- Multi-agency / multi - network incident response teams / service patrols and training exercises
    - Need for interoperable communications
        - Radio/ CAD systems
    - Expand real-time tracking of courtesy patrols
    - Need for better coordination between responders
    - Need for staging of resources
    - Need for pre-planning of incident scenarios
    - Training of agencies on common approach
        - Outreach to relay availability of existing courses
    - Coordinated / consistent policies for incident response (e.g., towing policies, response times)
- Coordinated traffic signals with rail transit crossings in close proximity
    - Transit signal priority
- Use of dynamic lanes assignment to increase the frontage road available capacity in case of accidents on the freeway and increase amount of green in the direction of the accident.

Accommodate / Promote Cross-Network Route & Modal Shifts

- Modeling of mode shift
    - Determine benefits and impact
- Modify arterial transit signal priority timing to accommodate traffic shifting from freeway
    - Retiming of traffic signals
    - Modify arterial signal timing to accommodate traffic shifting from freeway
- Facilitating mode shift from roadways to transit (or vice-versa) via en-route traveler information devices (e.g., DMS, HAR, 511) to advise motorists of, e.g.: congestion ahead, directions to light rail / rail transit stations, and real-time information on the number of parking spaces available in the park & ride facility.
    - Agree to how mode change is measured
    - Evaluate if travelers saved time by mode change
    - Traveler information to PDAs
    - Dynamic trail blazing signage

Manage Capacity–Demand Relationship – Real-time / Short-Term

- Add transit capacity by adjusting headways and number of vehicles
    - Deploy model to evaluate when this is worth the expense
- Add capacity at parking lots (temporary lots)
    - Work with local businesses in Corridor to make parking capacity available
    - Shuttles from temporary parking lots to/ from transit locations*
    - Change parking fees
- Coordinate scheduled maintenance and construction activities
- Increase roadway capacity by opening HOV lanes during major incidents to all traffic

Table 4.3-2 Proposed ICM Approaches and Strategies (Continued)

Proposed ICM Approach and Strategies

- Modify HOV restrictions
  - Remove HOV restrictions during major incidents and special events
  - Potential for HOT lanes in the future. Current study shows that the HOV will be at capacity when it opens. Potential for 3+ in the future, with HOT lane. (future)
  - Variable speed limit
- Restrict / re-route commercial traffic
  - Coordinate with major CVO hubs in the area
  - Convert regular lanes to truck-only.
  - Variable truck restrictions (lane, speed, network, time of day)

Manage Capacity – Demand Relationship - Long-Term

Capacity Oriented

- Low-cost infrastructure improvements to cross-network linkages and junctions
- Add Managed HOV lanes
- Increase/ maximize supply
  - Additional transit - Automatic Passenger Counters
  - Additional parking
  - Diversion of vehicles
  - Re-routing rail transit to alternative rail network

Demand-Oriented

- Ride-sharing programs
- Marketing/ advertising
  - Public outreach/ education
    - Guidelines for flexible work hours, mode shifts, ride sharing
  - Information at Trucking distribution centers (Garland/Shiloh/Northwest Hwy, Harry Hines, I-20)

The Strategies decided upon by the US-75 Steering Committee were selected based upon achieving the goals of the Corridor, and of the individual Stakeholders within the Corridor. A high-level outline of Strategy relationship to the corridor goals is provided in Table 4.3-3, presented below.

In order to be consistent with US DOT terminology, the US-75 Corridor Strategies identified in Table 4.3-2 were mapped to the high-level strategies provided by the US DOT in the Generic ICM Con Ops document. These Strategies were grouped into five categories. The first grouping, Information Sharing/ Distribution, provides the information foundation for the corridor. Many of the Strategies are already in existence within the corridor, but need to be expanded throughout the Corridor agencies and communized. The existing Center-to-Center communication infrastructure provides the basis for interagency and intra-agency communication. The regional ATIS system hosted by the NCTCOG website provides a baseline for a corridor web-based ATIS system. As with most major cities, this information is also provided to 3rd party information service providers and combined with their value-added information to provide additional recommendations and traveler information. One of the important parts of this strategy is the use of modeling to provide decision support tools and for monitoring the ongoing performance measures of the corridor for the agencies. The decision support tools will model the individual networks, and model the potential and historical mode shifts within the corridor.

The second grouping, "Improve Operational Efficiency" approach will provide some needed expansions in the corridor to improve operations. These strategies will improve the travel reliability and corridor throughput, both of which are goals of the US-75 Corridor.

The third grouping, "Accommodate / Promote Cross-Network Route & Modal Shifts" will assist in optimizing the overall corridor throughput and will assist the agencies within the Corridor to better manage congestion and improve the overall reliability of the network. A major component of this strategy is to ensure that the public is aware of all modes and travel choices within the Corridor, such that they can plan their trips using current information within the network.

The fourth grouping, "Manage Capacity – Demand Relationship" approach provides the strategies necessary to make the public aware of their choices in modes, thus improving corridor capacity and potentially reducing or moving the demand. These strategies include public outreach to employers to assist with spreading out the daily demand on the network, and reducing demand during special events and emergencies.

The last grouping, "Manage Capacity – Demand Relationship – Long Term" are strategies that will be done over a longer period of time, and include "re-training" the public to think about the alternate modes.

Table 4.3-3 Relationship between US-75 ICM Strategies and Corridor Goals

ICM Strategy **● = Directly Supports Goal** **○ = Indirectly Supports Goal**	**Increase corridor throughput**	**Improve travel time reliability**	**Improved incident management**	**Enable intermodal travel decisions**
Information Sharing/ Distribution				
• Manual information Sharing	○	○	●	○
• Automated information sharing (real time data)	●	●	●	●
• Automated information sharing (real time video)		○	●	●
• Information clearinghouse / Information Exchange Network (corridor networks / agencies)	●	●	○	●
• Corridor-based ATIS database that provide information to users	●	●	○	●
• Access to corridor ATIS database by 3rd party information providers	●	●	●	●

Table 4.3-3 Relationship between US-75 ICM Strategies and Corridor Goals (Continued)

ICM Strategy ● = Directly Supports Goal ○ = Indirectly Supports Goal	Increase corridor throughput	Improve travel time reliability	Improved incident management	Enable intermodal travel decisions
• En-route traveler information devices (DMS, 511, transit PA systems) being used to describe current operational conditions on another network within the corridor			●	●
• A common incident reporting system and asset management (GIS) system			●	
• Decision Support Tools to model responses – pre-planned	●	●	●	●
• Decision Support Tools to model and develop responses in near real-time		●	●	●
Improve Operational Efficiency				
• Signal priority for transit (e.g., extended green times to buses that are operating behind schedule)	●	●		○
• Transit Traveler Information	●			●
• Multi-modal electronic payment.	●	●		●
• Multi-agency/multi-network incident response teams and service patrols, along with training exercises for various types of incidents and events.	●		●	○
• Coordinated operation between traffic signals and rail transit crossings in close proximity	●	●		
• Transit pre-emption (City of Richardson and maybe Plano)/ "best route" for emergency vehicles				
• Transit hub connection protection	●			
• Use of dynamic lanes assignment to increase the frontage road available capacity in case of accidents on the freeway and increase amount of green in the direction of the accident.	●	●		
Accommodate / Promote Cross-Network Route & Modal Shifts				
• Modeling of Mode Shift	●	●		●
• Modify arterial signal timing to accommodate traffic shifting from freeway	●	○		

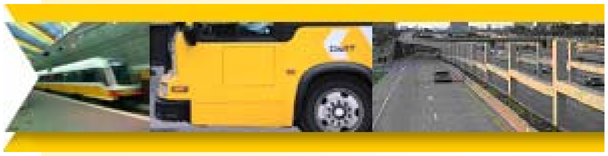


Table 4.3-3 Relationship between US-75 ICM Strategies and Corridor Goals (Continued)

ICM Strategy **● = Directly Supports Goal** **○ = Indirectly Supports Goal**	**Increase corridor throughput**	**Improve travel time reliability**	**Improved incident management**	**Enable intermodal travel decisions**
• Mode Shift from roadways to transit (or vice versa) via en-route traveler information devices (e.g., DMS, HAR, "511") Advise motorists of congestion ahead, direct them to light rail / rail transit, & provide real-time information on the number of parking spaces available in the park & ride facility.	●	●		●
Manage Capacity–Demand Relationship – Real-time" / Short-Term				
• Add transit capacity by adjusting headways and number of vehicles	●	●		●
• Add capacity at parking lots (temporary lots)	●			●
• Coordinated scheduled maintenance and construction		●		
• Increase roadway capacity by opening HOV lanes during major incidents to all traffic	●	●	●	
• Modify HOV restriction	●	●	●	
• Restrict / re-route commercial traffic	●	●	○	

4.4. ICM CONCEPT ASSET REQUIREMENTS AND NEEDS

In order to better understand the asset requirements and needs, the US-75 Steering Committee organized the Strategies based upon the segment of transportation that was impacted, this included 5 categories: arterial, freeway, tollway, transit, and overall corridor. Table 4.4-1, below, shows these Strategy groupings organized by network utilizing the Strategy categories provided in the Generic Concept of Operations, which are used to look at the asset needs of the individual Networks. This section identifies the assets required to implement and support the various strategies, as defined in the National ITS Architecture and the Generic Concept of Operations. The list of assets shown in Table 4.4-2 below does not consider whether these assets currently exist.

Table 4.4-1 ICM Strategies by Network

Arterial Network Strategies

Information Sharing / Distribution

- Speed and volume measurement - toll tag and readers, cell phone probes, real time volume information
- Expand traveler information distribution infrastructure on arterials
- Arterial dynamic message signs
    - Automated downloads
    - Real-time freeway travel times

Improve Operational Efficiency

- Multi-agency / multi - network incident response teams / service patrols and training exercises
- Pre-defined, acceptable detours are needed for certain incident location

Accommodate / Promote Cross-Network Route & Modal Shifts

- Modify arterial signal timing to accommodate traffic shifting from freeway
    - Retiming of traffic signals
    - Dynamic trail blazer signing

Manage Capacity–Demand Relationship – Real-time / Short-Term

- Add capacity at parking lots (temporary lots)
    - Work with local businesses in Corridor with available parking capacity
    - Shuttles from temporary parking lots to/ from transit locations (transit access)*
- Coordinated scheduled maintenance and construction
- Restrict / re-route commercial traffic
    - Work with major CVO hubs in the area

Manage Capacity – Demand Relationship - Long-Term

- Low cost infrastructure improvements to cross-network linkages and junctions
- Increase/ Maximize Supply
    - Additional Parking

Freeway Network Strategies

Information Sharing / Distribution

- Existing Detectors (Volume, Speed Data real-time)
- Existing C2C
- Toll tag and readers, cell phone probes
- Share information and video between all public agencies, and ISPs on the "highway" travel times
- Expand real-time travel times on DMS

Improve Operational Efficiency

- Multi-agency / multi - network incident response teams / service patrols and training exercises
    - Expand real-time tracking of courtesy patrol
    - Need for better coordination between responders
    - Need for staging of resources
    - Need for pre-planning of incident scenarios
    - Training of Agencies on common approach
    - Integrated Policies for Incident Response (towing policies, response times)
- Pre-defined, acceptable detours are needed for certain incident location

Table 4.4-1 ICM Strategies by Network (Continued)

Accommodate / Promote Cross-Network Route & Modal Shifts

- Between roadways via en-route traveler information devices (e.g., DMS, HAR, "511") advising motorists of congestion ahead, directing them to adjacent freeways /arterials
- Inform users of current conditions – ISPs provide suggested routes. Certain Scenarios (Highway to Highway Detours for example) agencies would provide diversion recommendations.

Manage Capacity–Demand Relationship – Real-time" / Short-Term

- Add capacity at parking lots (temporary lots)
- Coordinated scheduled maintenance and construction
- Restrict / re-route commercial traffic

Manage Capacity – Demand Relationship - Long-Term

- Managed HOV Lanes
- Marketing/ Advertising

Tollway Network Strategies

Information Sharing / Distribution

- Existing Detectors (Volume, Speed Data real-time)
- Existing Toll tag and readers
- Provide real-time information to the public
- Share information and video between all public agencies, and ISPs through center to center project

Improve Operational Efficiency

- Utilize license plate readers for tolling to reduce need for manual toll booths

Accommodate / Promote Cross-Network Route & Modal Shifts

- Inform users of current conditions – ISPs provide suggested routes.

Manage Capacity–Demand Relationship – Real-time" / Short-Term

- Modify toll charges during major incidents to improve flow of corridor

Manage Capacity – Demand Relationship - Long-Term

- HOV / HOT Lanes

Transit Network Strategies

Information Sharing / Distribution

- Service Interruption Alerts to users (via wireless, web, at stations)
- Rail location/ speed AVL on Buses – Probes
  - Next Bus arrival at bus stop
  - Next Rail arrival at Rail
- Corridor-based ATIS database that provide information to users
  - Multi-agency at the regional level
  - Web based trip planner
    - Add real-time information on
  - Availability of other modes
    - Parallel bus routes, availability and capacity

Improve Operational Efficiency

- Signal priority for transit
  - Light Rail Transit
  - Bus Operations
  - (e.g., extended green times to buses that are operating behind schedule)

Table 4.4-1 ICM Strategies by Network (Continued)

- Parking Management
    - o Availability of Parking at Transit locations
    - o Shuttle Buses for temporary Parking Locations
- Multi-modal electronic payment
    - o Bus/ Light Rail/ Tolls Payment Card (parking at airports)
- Pre-defined, acceptable detours are needed for certain incident location

Accommodate / Promote Cross-Network Route & Modal Shifts

- Modeling of Mode Shift
    - o Determine Benefits and Impact
- Modify transit priority parameters to accommodate more timely bus / light rail service

Manage Capacity–Demand Relationship – Real-time" / Short-Term

- Add transit capacity by adjusting headways and number of vehicles
- Managed HOV Lanes
- Convert HOV Lanes to single use during incidents
    - o Need Model to evaluate when this is worth the expense

Manage Capacity – Demand Relationship - Long-Term

- Increase/ Maximize Supply
    - o Additional Transit
- Ride-sharing programs

Overall Corridor Strategies

Information Sharing / Distribution

- Center-to-Center Network
- Integrated Approach to Management
- Corridor-based ATIS database (Web Portal) that provide information to users – multi agency information

Improve Operational Efficiency

- Integrate/ Common CAD System
- Common Radio system (Frequency/ Channels) for Emergency Services
- Multi-agency/multi-network incident response teams and service patrols, along with training exercises for various types of incidents and events.

Accommodate / Promote Cross-Network Route & Modal Shifts

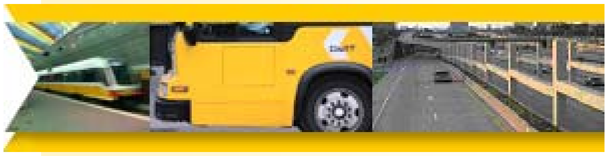
- Modeling of Mode Shift
    - o Determine Benefits and Impact
- Between roadways via en-route traveler information devices (e.g., DMS, HAR, "511") advising motorists of congestion ahead, directing them to adjacent freeways /arterials
    - o Web based trip planner
    - o Traveler information at major employers

Manage Capacity–Demand Relationship – Real-time" / Short-Term

- Coordinated scheduled maintenance and construction
- Restrict / re-route commercial traffic
    - o Work with major CVO hubs in the area

Manage Capacity – Demand Relationship - Long-Term

- Marketing/ Advertising
    - o Public Outreach/ Education



In Table 4.4-2, below, the categories and definitions provided in the US DOT Concept of Operations for a Generic Corridor were used to further define the US-75 Corridor ICM assets. These categories are defined as follows:

- **Network Systems** – These are the required network-based systems. They are identified by the National ITS Architecture nomenclature of "Market Package" for ease of reference to functionality.
- **Network Subsystems & Technologies** – This column provides additional information on these minimum network ITS-based requirements (e.g., specific field devices, hardware, and system functionality).
- **Information** – This column lists the data and other information to be gathered by the network systems, and subsequently shared among the stakeholders and corridor travelers.
- **Communication Subsystems** – These assets are communications – related, including the types of communications (e.g., center – to – center) as identified in the National ITS Architecture, interfaces to systems, and associated ITS standards.
- **Other/Performance** – This column is used for other ICM – required assets that don't "fit" into the other categories, such as the few regional/multi-system market packages, institutional assets (responsibilities and policies), and support tools.

Table 4.4-2 Asset Requirements for the ICM

Network Systems (Market Packages)	Network Subsystems & Technologies	Information	Communication Subsystems	Other (Operational) / Performance
Network / Probe Surveillance Surface Street control Freeway Control HOV Lane Management Traffic Information Dissemination Traffic incident Management Traffic Forecast & Demand Management Emissions Monitoring / Management Parking Facility Management	Traffic detectors / roadway surveillance / vehicle probes CCTV (video surveillance) Traffic signal control / monitoring (TOD schedule) Traffic signal control / monitoring (traffic adaptive) HOV by-pass DMS – freeway DMS - arterials Internet Traveler Information Automated Incident Detection Incident Detection (call – in, other)	Roadways (Freeway, Arterial, Managed Lanes) • Link congestion levels • Link volumes • Link occupancies • Link / spot speeds • Link travel times • Intersection approach volumes • Ramp queues • Average Vehicle Occupancy Transit • Transit schedules • Transit vehicle location • Schedule or headway status/deviation	Center-to-Center Center to field Roadside to vehicle Center to vehicle ITS standards for data formats and data transfer functions Video transport standards (digital, analog) Voice communications Subsystem Capacity for data distribution Subsystem Capacity for video distribution	Regional Traffic Control (MP) Regional Parking Management (MP) Multi-Modal Coordination (MP) Regional / Sub-regional ITS Architecture Information Exchange Network / Common displays for data entry/display Data aggregation / storage of processed data for subsequent analysis

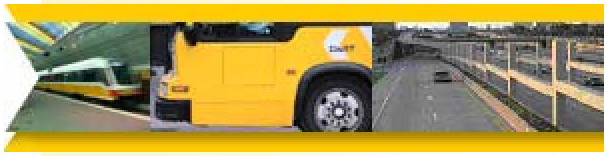


Table 4.4-2 Asset Requirements for the ICM (Continued)

Network Systems (Market Packages)	Network Subsystems & Technologies	Information	Communication Subsystems	Other (Operational) / Performance
Roadway Closure Management Transit Vehicle Tracking Transit Fixed Route Operations Transit Passenger and Fare Management Transit Traveler Information ISP Traveler Information (broadcast, interactive, route guidance) HAZMAT Management Emergency Call Taking and Dispatch Emergency Routing Roadway Service Patrols Transportation Infrastructure Protection Early Warning Wide Area Alert Disaster Response & Recovery	Incident Response Plans / Guidelines Teams Incident Reporting System (GIS, common display) Air quality sensors Road Weather Information Sensors Parking Surveillance/ occupancy Transit Vehicle Location / GPS Transit Schedule Performance Monitoring Passenger Counting Equipment Electronic Fare / Parking Payment Equipment DMS – transit Transit Public Address System Transit Trip Planning System Spare transit vehicles / operators Telephone – Based ATIS (511) Transit priority equipment (Intersection &Transit Vehicles) Public Safety CAD	• Transit vehicle headways • Link Travel Times • Priority requests • Next Vehicle Arrival • Average Waiting Time • Transit Fares • Average Vehicle Occupancy Equipment / Device Status • Locations • Surveillance / detectors • DMS • Other Traveler information Devices • Ramp meter • Traffic Signals • CCTV • Electronic toll / fare / parking equipment • Available transit vehicles / location Other • Video images / snapshots • Video control • Parking space availability • Incident location • Incident status / details • Maintenance/ construction events • Special events • Electronic payment account status	Subsystem capacity / frequencies for voice communications (including interoperability) Interfaces to network systems Interfaces to emergency service systems (CAD) Interfaces to proprietary / legacy systems Interfaces to ISP's (data and video export) Interfaces to financial transaction network Interfaces to Internet Security firewalls	Availability of spare network capacity Corridor Models (simulation) Accuracy of data/information Vehicle location accuracy Surveillance coverage Response plans On – line decision support (for selecting response plans) Definitions of responsibilities of agencies Common policies for incident reporting and response Special Event Plans Common fare collection technology Integrated back office systems Dynamic fare pricing capability Priority logic at intersections System back up / disaster recovery

Table 4.4-2 Asset Requirements for the ICM (Continued)

Network Systems (Market Packages)	Network Subsystems & Technologies	Information	Communication Subsystems	Other (Operational) / Performance
Evacuation & Re-entry Management Disaster Traveler Information ITS Data Mart / Warehouse Maintenance / Construction Vehicle & Equipment Tracking Road Weather Data Collection Weather Information Processing and Distribution Work Zone Management Maintenance & Construction Activity Coordination Other (e.g., Asset Management System)	Emergency vehicle priority / preemption (Intersection / Vehicles) Service Patrol Vehicles Real-time conditions data base / common displays Maintenance Vehicle Location AVL / GPS	• Emergency vehicle location • Maintenance vehicle location • Parking fees • Contact lists • Air quality • Road surface condition		

4.5. COMPARISON OF ICM ASSET REQUIREMENTS WITH CURRENT / PROPOSED ASSETS

Using the information from Chapter 3 on current and proposed corridor assets and information collected during stakeholder interviews, a comparison was performed with the list of assets needed to support the ICM concept. Table 4.4-2 was revised to highlight assets that are already operating within the corridor or are potential assets based on current improvement plans. The US-75 Steering Committee, as part of the scenario development, also identified data and infrastructure needs. The results are shown in Table 4.5-1 using the following:

- Bold Type and Gray Highlight – The asset is essentially deployed throughout the Corridor, except for the necessary integration among the corridor stakeholders.
- Underline – The asset is only partially deployed within the Corridor.
- None – Minimal, if any, deployment of the asset within the Corridor.

Table 4.5-1 Asset Availability for the ICM

Network Systems (Market Packages)	Network Subsystems & Technologies	Information	Communication Subsystems	Other (Operational) / Performance
Network / Probe Surveillance **Surface Street control** **Freeway Control** **HOV Lane Management** **Traffic Information Dissemination** **Traffic incident Management** Traffic Forecast & Demand Management **Emissions Monitoring / Management** **Parking Facility Management** **Roadway Closure Management** **Transit Vehicle Tracking** **Transit Fixed Route Operations** **Transit Passenger and Fare Management**	**Traffic detectors / roadway surveillance / vehicle probes** **CCTV (video surveillance)** **Traffic signal control / monitoring (TOD schedule)** Traffic signal control / monitoring (traffic adaptive) Ramp Meters (local control) Ramp Meters (central control) HOV by-pass **DMS – roadway** **Internet Traveler Information** Automated Incident Detection **Incident Detection (call – in, other)** Incident Response Plans / Guidelines Teams Incident Reporting System (GIS, common display) Air quality sensors Road Weather Information Sensors	**Roadways (Freeway, Arterial, Managed Lanes)** • Link congestion levels • **Link volumes** • Link occupancies • **Link / spot speeds** • Link travel times • **Intersection approach volumes** • Ramp queues • **Average Vehicle Occupancy** **Transit** • **Transit schedules** • **Transit vehicle location** • **Schedule or headway status/deviation** • **Transit vehicle headways** • **Link Travel Times** • Priority requests	Center-to-Center Center to field Roadside to vehicle Center to vehicle ITS standards for data formats and data transfer functions Video transport standards (digital, analog) **Voice communications** Subsystem Capacity for data distribution Subsystem Capacity for video distribution Subsystem capacity / frequencies for voice communications (including interoperability) Interfaces to network systems Interfaces to emergency service systems (CAD)	Regional Traffic Control (MP) Regional Parking Management (MP) Multi-Modal Coordination (MP) **Regional / Sub-regional ITS Architecture** Information Exchange Network / Common displays for data entry/display **Data aggregation / storage of processed data for subsequent analysis** **Availability of spare network capacity Corridor Models (simulation)** **Accuracy of data/information** Vehicle location accuracy Surveillance coverage

Table 4.5-1 Asset Availability for the ICM (Continued)

Network Systems (Market Packages)	Network Subsystems & Technologies	Information	Communication Subsystems	Other (Operational) / Performance
Transit Traveler Information **ISP Traveler Information (broadcast, interactive, route guidance)** **HAZMAT Management** **Emergency Call Taking and Dispatch** Emergency Routing **Roadway Service Patrols** Transportation Infrastructure Protection Early Warning Wide Area Alert Disaster Response & Recovery Evacuation & Re-entry Management Disaster Traveler Information **ITS Data Mart / Warehouse** Maintenance / Construction Vehicle & Equipment Tracking Road Weather Data Collection	**Parking Surveillance/occupancy** **Transit Vehicle Location / GPS** **Transit Schedule Performance Monitoring** Passenger Counting Equipment **Electronic Fare / Parking Payment Equipment** DMS – transit Transit Public Address System **Transit Trip Planning System** **Spare transit vehicles / operators** Telephone – Based ATIS (511) Transit priority equipment (Intersection &Transit Vehicles) **Public Safety CAD** Emergency vehicle priority / preemption (Intersection / Vehicles) **Service Patrol Vehicles** Real-time conditions data base / common displays Maintenance Vehicle Location AVL / GPS	• **Next Vehicle Arrival** • **Average Waiting Time** • **Transit Fares** • **Average Vehicle Occupancy** **Equipment / Device Status** • **Locations** • **Surveillance / detectors** • **DMS** • **Other Traveler information Devices** • Ramp meter • **Traffic Signals** • **CCTV** • **Electronic toll / fare / parking equipment** • Available transit vehicles / location Other • Video images / snapshots • Video control • Parking space availability • Incident location • Incident status / details • Maintenance/ construction events • **Special events** • Electronic payment account status	Interfaces to proprietary / legacy systems Interfaces to ISP's (data and video export) Interfaces to financial transaction network **Interfaces to Internet** Security firewalls	Response plans On – line decision support (for selecting response plans) Definitions of responsibilities of agencies Common policies for incident reporting and response **Special Event Plans** **Common fare collection technology** Integrated back office systems Dynamic fare pricing capability Priority logic at intersections System back up / disaster recovery

Table 4.5-1 Asset Availability for the ICM (Continued)

Network Systems (Market Packages)	Network Subsystems & Technologies	Information	Communication Subsystems	Other (Operational) / Performance
Weather Information Processing and Distribution **Work Zone Management** **Maintenance & Construction Activity Coordination** Other (e.g., Asset Management System)		• Emergency vehicle location • Maintenance vehicle location • **Parking fees** • **Contact lists** • **Air quality** • Road surface condition		

The US-75 Corridor is currently operated in a mostly agency specific way, instead of a coordinated corridor basis. The corridor agencies and the region have many of the assets needed to implement ICM, however further integration and coordinated response plans are needed. Some coordination does currently occur during special events and major incidents. Also, some integration is already in place. For instance, both the DART HOV operations and the TxDOT Freeway operations are co-located at a satellite TMC, and will be co-located in the new DalTrans facility once it is completed.

As can be seen by Table 4.5-1 above, numerous assets need to be implemented in order to carry out the US-75 Corridor ICM Strategies. The most significant asset needs for the stakeholders of the US-75 ICM are provided in Table 4.5-2, below. As discussed above, the current assets within the corridor provide for a significant foundation for the US-75 ICM. Integration of available data for Corridor Stakeholders is already begun and many of the assets required for ICM are already in place. However, as in most metropolitan areas with significant ITS deployment, expansion of existing systems is needed and additional data collection assets are required for the US-75 ICM to meet its full potential.

The assets and processes that are needed for a more integrated corridor will be prioritized and accounted for when the high-level and detailed level requirements and designs are developed in the future as a part of the systems engineering process. A key component of this prioritization is the corridor models that are in development. As described later in Section 4, the corridor plans to develop multiple microscopic, macroscopic and mesoscopic models for the corridor that will be utilized to model the various strategies and scenarios. These models will be utilized by the committee to review and analyze the proposed strategies, to determine which strategies have the best benefit/ cost ratio for the corridor and are technologically feasible with the existing systems.

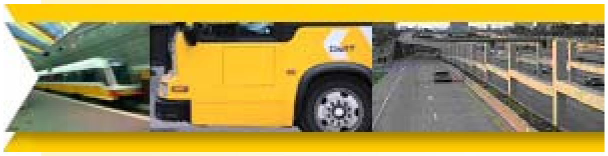
Table 4.5-2 Most Significant Asset Needs in the Corridor

Organizational Entity	Changes and Additions
Texas Department of Transportation (TxDOT)	• Deployment of Additional Devices
City of Dallas	• Additional 10 Arterial DMS and 130 Cameras • Arterial DMS Interface to Freeway Messages • Upgrade of ATMS planned for 2007-2009
City of Richardson	• Complete Upgrade of Traffic Signal Controllers • Communications Upgrade to Spread-spectrum Radio • Citywide Highway Advisory Radio system • Complete New Coordination Timing at 73% of the City's Traffic Signals • Transit Signal Priority
City of Plano	• New Coordination Timing of the City's Traffic Signals • Transit Signal Priority
Dallas Area Rapid Transit (DART) - Bus Service	• Mobile Data Terminals in Supervisor/ DART Police Vehicles • Replacement of Radio System/ AVL by 2010 • Testing of Real-time Passenger Information Systems
Dallas Area Rapid Transit (DART) - Rail Service	• Vehicle Business System • Mobile Data Terminals • Link to Traffic Monitoring System
Dallas Area Rapid Transit (DART)	• DART communication network (intra-agency integration) • In-vehicle business system (DART Police) • Upgrade radio system network (DART Police)
North Central Texas Council of Governments	• Data Archive • City Plug-ins to the C2C database • Regional Data and Video Communication System (RDVCS)
North Texas Tollway Authority	• Additional CCTV cameras • Vision based toll collection

The ICM concept represents a paradigm shift for management and operations within the Generic Corridor – from the current partial coordinated operations between corridor networks and agencies, to a fully integrated and pro-active operational approach that focuses on a corridor perspective rather than a collection of individual (and relatively independent) networks. To make this happen, several implementation and integration issues must be resolved. Several of these implementation issues will involve choices that cannot be fully addressed and subsequently resolved until later stages of the systems engineering process (e.g., design, procurement, and implementation).

4.6. CORRIDOR CONCEPT OPERATIONAL DESCRIPTION

Keeping in mind the vision of the ICM project, "Operate the US-75 Corridor in a true multimodal, integrated, efficient, and safe fashion where the focus is on the transportation customer", the management and operations of the corridor and the ICM will be a joint effort involving all the stakeholders. The management and operations of the corridor and



the ICM will be a joint effort involving all the stakeholders. To effectively manage and operate the ICM concept as described in this Con Ops document, the US-75 Steering Committee recommends the creation of a central corridor decision-making body. This body – designated as the **US 75 ICM Subcommittee** – will consist of leadership level representatives from each of the stakeholders in the US-75 Corridor. Due to the number of agencies involved in ITS and traffic operations in the Dallas – Fort Worth Region, the subcommittee is envisioned to be a subcommittee of the Regional ITS Steering Committee. The membership will consist of members from each of the corridor agencies; however, membership will be on a rotational basis so that the size doesn't become too large.

The daily operation of the corridor will be coordinated through the existing arrangements and information will be exchanged through the center-to-center project, along with a Decision Support system which will distribute response plan requests and utilize the center-to-center interface to communicate to the various agency systems. The central point of coordination for the corridor will be the DalTrans facility, with TxDOT, Dallas County, and DART co-located at the facility.

All operations among corridor networks and agencies (e.g., activation of specific ICM strategies) will be coordinated via the Decision Support system. The US 75 ICM Subcommittee will also investigate and prepare corridor response plans for various scenarios that can be expected to occur within the US-75 Corridor. The chairman of the committee will be responsible, with the other agency/service operations officers, for configuring the subcommittee with respect to its functions and staffing for all hours of operations. Staff will be assigned by the corridor stakeholders to support daily operations, develop response plans, analyze system deficiencies and needs, and general administration. Performance measurement and monitoring will be the responsibility of the US 75 ICM Subcommittee. The agency/service members, led by the chief chairman, will be accountable to the centralized decision-making body and make reports as the decision-making body designates.

Communications, systems, and system networks will be integrated to support the virtual corridor command center. Voice, data, video, information, and control will be provided to all agencies based on the adopted protocols and standards for the sharing of information and the distribution of responsibilities. The ICM will support the virtual nature of the corridor by connecting the member agency staff on a real-time basis via communications and other ITS technologies. While all the ICM operational strategies will be available for use, it is envisioned that only a subset of these strategies will be activated at any one time, depending on the operational conditions and events within the corridor.

The US 75 ICM Subcommittee, working with NCTCOG will conduct desktop scenario sessions to prepare, train and refine response plans for incidents, special events, weather, and evacuations. All the agency/service operations officers and staff will know their respective roles and responsibilities for any of the various situations the corridor may face and will be aided by the Decision Support system and the evaluation model results. Moreover, agency operations officers will be able and authorized to improvise as situations may dictate.

Traveler information via websites, DMS, and through the media and ISPs will be corridor-based, providing information on corridor trip alternatives complete with current and predicted conditions. Travelers will access or be given real-time corridor information so they can plan or alter their trips in response to current or predicted corridor conditions. Each traveler will be able to make route and modal shifts between networks easily due to integrated and real-time corridor information, integrated fare/parking payment system, and coordinated operations between networks. Using one network or another will be dependent on the preferences of the traveler, and not the nuances of each network. Travelers will be able to educate themselves about the corridor so they can identify their optimal travel alternatives and obtain the necessary tools to facilitate their use of corridor alternatives when conditions warrant.

The US-75 Corridor will be an integrated transportation system – managed and operated collectively – to maximize its efficiency to corridor travelers. All corridor assets will be attuned to obtain the goals and objectives of the corridor, as well as the goals of each individual traveler as their preferences prescribe. The corridor users will recognize the US-75 Corridor as a multimodal, integrated, efficient, and safe transportation system that provides them with multiple viable alternatives that they can select based on their specific travel circumstances and needs.

4.7. ALIGNMENT WITH REGIONAL ITS ARCHITECTURE

As discussed in 3.7 above, the North Central Texas Council of Governments maintains the Regional Architecture for the Dallas-Fort Worth Region, which the US-75 Corridor is a portion. The Regional Architecture and ITS Plan for the Dallas-Fort Worth was defined in 1999. The Regional ITS Plan is currently being updated, and should be completed soon. The goals and strategies for the Regional ITS Architecture are very similar to the strategies and integration needed for the US-75 Integrated Corridor Management System.

A review of the existing Regional Architecture and ITS Plan found that many of the goals were the same. The findings of this review are:

- Increase Corridor Throughput – this goal is in line with the goals of "Enhance mobility of people and goods by reducing recurrent traffic congestion", and
- Improve travel time reliability
- Improved incident management
- Enable intermodal travel decisions

The Major focus of the Corridor and the Region is increased and timely information sharing among agencies and the public. This has already been started through various projects and initiatives to include a Regional ITS website which provides Real-time Traveler Information, and through the Center-to-Center project which provides Standards based information sharing among agencies in the Dallas-Fort Worth Region, and among agencies in the US-75 Corridor.

Other deployment considerations:

- Fill gaps in the existing ITS communications infrastructure by completing critical system linkages
- Leverage transportation resources by targeting investment, where possible, to facilities undergoing reconstruction
- Leverage transportation resources by creating or enhancing public/private partnerships which will provide communications infrastructure for regional ITS
- Provides transportation service or transportation data that is regional in scope.

4.8. IMPLEMENTATION ISSUES

As part of the on-going discussions of strategies and scenarios, several implementation issues were identified. These implementation issues are both technical and political in nature. The technical issues deal with the limitations of technology, and traffic flow. The political issues deal with existing policies and budget issues. Table 4.8-1, below, identifies the main issues that were identified during the committee discussions.

Table 4.8-1 Implementation Issues

Issue / Limitation	Potential Impact
Transit Headway – maximum headway of light rail trains is 2 minutes	Limited increase in Light Rail capacity may be insufficient for major mode shift during major incidents and special events.
Light Rail – Train has maximum length of three cars due to the rail station length	Limited increase in Light Rail capacity may be insufficient for major mode shift during major incidents and special events.
Diversion Policies – several of the agencies have policies against diverting traffic from freeway to arterial streets	Full Corridor optimization may not be possible without some changes in current policies.
Detour Route Policies – several of the agencies have policies against specifying specific detour routes	Full Corridor optimization may not be possible without some changes in current policies.
Modeling requirements - Due to the complex nature of the ICM initiative, the committee has looked at the modeling effort as a prerequisite to prioritizing and finalizing the strategies for ICM.	Many strategies chosen initially may be found through modeling to have little to no positive effect on the corridor
Hours of Operations - Many of the City agencies have limited hours of operations due to funding issues.	Response to some corridor scenarios will be time limited in off-hours.
Coordination and delegation of authority – some agencies will not allow modification or control of their assets by others.	Responses to some scenarios will require more coordination and may increase time for response.
Resource Requirements – many of the operating agencies do not have the additional resources that may be needed for a corridor operation approach	Resources identified in the Design phase may not be available from some agencies.

4.9. CORRIDOR ICM CONCEPT INSTITUTIONAL FRAMEWORK

In developing the institutional framework, the US-75 Steering Committee considered many configurations and institutional arrangements to continue and improve upon a de-centralized operational model with a centralized decision making body for cooperation and oversight. The concept presented herein represents the institutional framework endorsed by the US-75 Steering Committee. The approach for the US-75 Corridor is to utilize existing institutional cooperation agreements, and expand on them specifically for the corridor.

The management and operations of the corridor and the ICM will be a joint effort involving all the stakeholders. To effectively manage and operate the ICM concept as described in this Con Ops document, the US-75 Steering Committee recommends the creation of a central corridor decision-making body. This body – designated as the **US 75 ICM Subcommittee** – will consist of leadership level representatives from each of the stakeholders in the US-75 Corridor. Due to the number of agencies involved, the subcommittee is envisioned to be a subcommittee of the Regional ITS Steering Committee. The membership will consist of members from each of the corridor agencies; however, membership will be on a rotational basis so that the size doesn't become too large.

The elected officials for the region are members of the **Regional Transportation Council**, which provides direction and policy decisions for the members of the US 75 Corridor. A formal recognition of the US 75 ICM Subcommittee will be requested, and a committee charter created to outline its goals. It is envisioned that the US 75 ICM Subcommittee will be a subcommittee of the existing regional **ITS Steering Committee**.

The US 75 ICM Subcommittee will be the central decision-making body for the corridor, managing the distribution of responsibilities, the sharing of control, and related functions among the corridor agencies. The US 75 ICM Subcommittee will be responsible for establishing the necessary inter-agency and service agreements, budget development, project initiation and selection, corridor operations policies and procedures, and overall administration. It is envisioned that the US 75 ICM Subcommittee will be the next generation of the US 75 ICM Committee established for this project.

The US-75 Steering Committee discussed how the corridor would be managed from an institutional point of view, and in keeping with the current plans for the region. Since both TxDOT and DART will be operating from the DalTrans advanced transportation management center, and will continue to be connected to the City of Dallas and the City of Richardson, it will serve as the central point of coordination for the US-75 Corridor.

The proposed institutional framework for the US-75 Corridor as described above is shown in Figure 4.9-1. The US-75 Corridor staffing is summarized in Table 4.9-1.

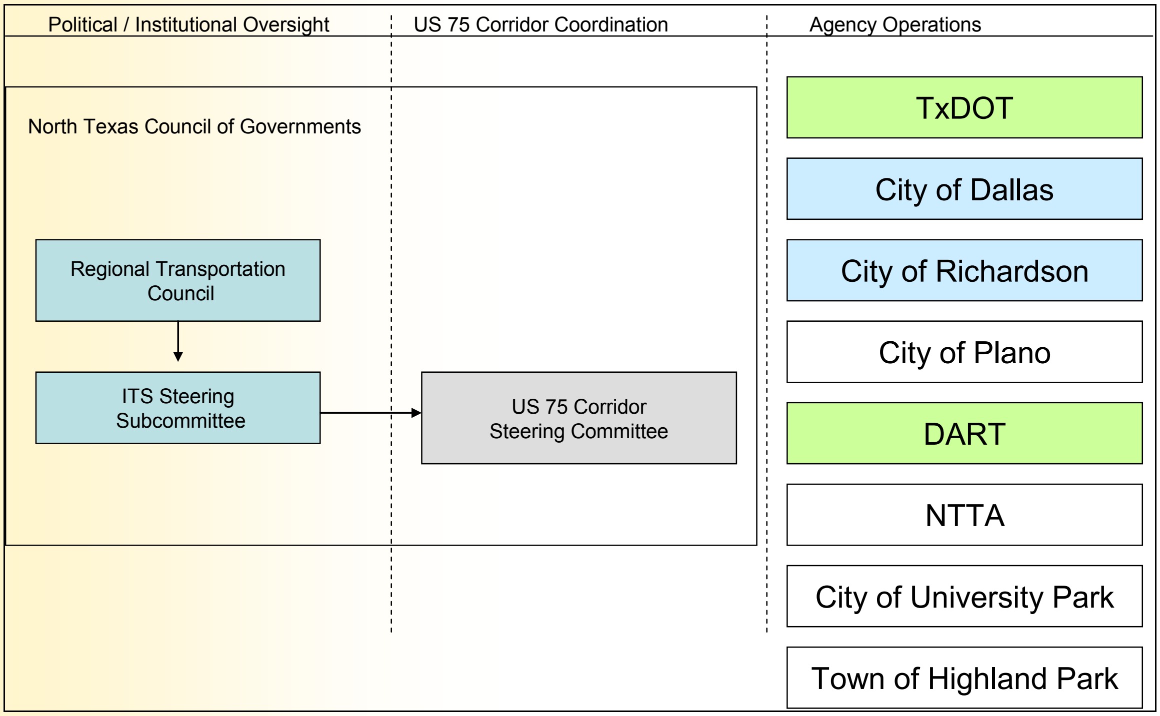


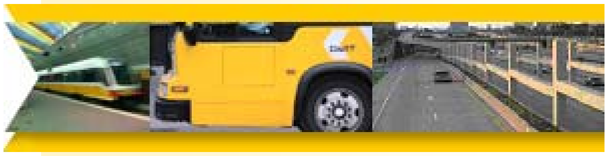
Figure 4.9-1 US 75 ICM Institutional Framework

Table 4.9-1 US-75 Corridor Staffing

Agency/Service	Responsibilities	Aligned Staff
US 75 Corridor Steering Committee	• Corridor coordinated operations • Corridor Administration • Corridor Performance monitoring • Corridor Technical Management and Development	• Staff support from other agencies/services to support coordinated ops and technical development
TxDOT	• Daily Operations • Monitoring freeway traffic flow • DMS • Freeway surveillance • Enact response plans • Maintenance	• Agency/Service Officer • Corridor Operations, Administration, and Technical support staff
City of Dallas	• Daily operations • Signal systems • DMS • Arterial surveillance • Enact response plans	• Agency/Service Officer • Corridor Operations, Administration, and Technical support staff

Table 4.9-1 US-75 Corridor Staffing (Continued)

Agency/Service	Responsibilities	Aligned Staff
City of Richardson	• Daily operations • Signal systems • DMS • Arterial surveillance • Enact response plans	• Agency/Service Officer • Corridor Operations, Administration, and Technical support staff
City of Plano	• Daily operations • Signal systems • DMS • Arterial surveillance • Enact response plans	• Agency/Service Officer • Corridor Operations, Administration, and Technical support staff
DART	• Daily operations • Monitor bus on-time levels • Enact response plans • Monitoring HOV traffic flow • DMS • HOV surveillance • Monitor train schedules • Monitor parking conditions	• Agency/Service Officer • Corridor Operations, Administration, and Technical support staff
NTTA	• Daily Operations • Monitoring tollway traffic flow • DMS • Tollway surveillance • Enact response plans • Maintenance	• Agency/Service Officer • Corridor Operations, Administration, and Technical support staff
Town of Highland Park	• Daily operations • Signal systems • DMS • Arterial surveillance • Enact response plans	• Agency/Service Officer • Corridor Operations, Administration, and Technical support staff
City of University Park	• Daily operations • Signal systems • DMS • Arterial surveillance • Enact response plans	• Agency/Service Officer • Corridor Operations, Administration, and Technical support staff
NCTCOG	• Coordination • On-going Training • Corridor Performance monitoring modeling	• Agency/Service Officer • Corridor Operations, Administration, and Technical support staff



The existing US-75 Steering Committee agreed that this is the best framework to facilitate the implementation and operations of this US-75 ICM Corridor. The US-75 Steering Committee has the endorsements of each stakeholder representative's agency/service leadership to pursue the creation of this institutional framework. As the project moves from concept to the design stage, formal inter-agency agreements will be developed and executed describing this institutional framework and structure in detail, including each agency's responsibilities.

4.10. PERFORMANCE MEASURES

As part of the workshops identifying goals and strategies, the US-75 Steering Committee discussed how the goals could be measured effectively and with the data available. These corridor performance measures are identified in Table 4.10-1. The US-75 Steering Committee also acknowledges that as the corridor system matures and operational experience is gained, these performance measures will likely change as new collection methods and processing techniques are implemented.

Table 4.10-1 Corridor Performance Measures

Goal	Potential Performance Measure

Increase corridor throughput	• Passenger/ Consumer Throughput (Freeway/Arterial)
	  o Person miles traveled/ vehicle miles of travel
	• Vehicle Throughput (Freeway/Arterial
	  o Person miles traveled/ vehicle miles of travel
	• Volume/Capacity Ratio
	• Average Travel Time/ Average Speed (Travel Time Index)
	• Ridership (Transit)

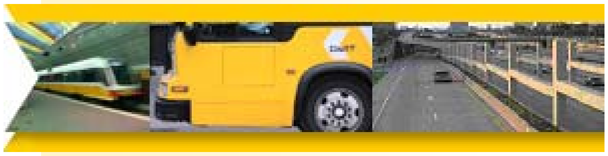
Improve travel time reliability	• Variance to Baseline Expectations (% Change) for time of day and for optimal conditions • Planning Index – 95% percentile travel time • Buffer Index – change between Mean and 95% • Transit Arrival Time (vs. schedule)
Improved incident management	• Clearance time for an Incident (based on Jurisdiction and Corridor) • Response time • Delay to the user • Impact to Capacity to Incident
Enable intermodal travel decisions	• Mode Shift – both Short-Term and Long-Term (especially Short-Term) • Park and Ride Trips • Park and Ride lot volumes • Revenue / Ticket sales for Transit

Each individual network will be responsible for collecting network-specific data related to each of the designated corridor performance measures and providing these network level data to the ICMS for processing and aggregation. The ICMS will in turn save data to the regional data warehouse for archiving.

Taking into account the vision, goals, and current conditions within the corridor, the US-75 Steering Committee discussed "success" targets for several of the performance measures, their main concern was if the target was realistic, could be measured, and if enough data would be available. These "Performance Measures Success Thresholds," listed in Table 4.10-2, provide an indication that the corridor goals have been achieved. The listed performance levels/thresholds are long-term targets that reflect the future vision of how the corridor will operate. Upon deployment of the ICM, any movement toward the thresholds will indicate that ICM is having the desired effect. As data is collected in the next phase, and models developed the targets will be validated and goals adjusted to ensure realistic and achievable targets are used.

Table 4.10-2 Corridor Performance Measure Targets

Performance Measure	Performance Measure Success Threshold
Travel Time Index	Reduce Index by 5% per year
Travel Time	Light Rail – reduce travel time by 20% in downtown corridor Bus - reduce travel time by 20% in downtown corridor
Corridor Throughput	Increase overall throughput – increase person/trips per hour by 5% Increase throughput during incident – increase person/trips per hour by 5%
Clearance time for an Incident (based on Jurisdiction and Corridor)	Emergency Responder Training - 75% of agencies trained on Incident Management response.
Response time	Response to Incidents - target is consistent response between jurisdictions
Revenue/ Cash machine Tickets for Transit	Increase in Ticket purchases during major incidents/ events – 10%
Parking Lot Volume at Transit locations	Parking Lot Capacity – 10% increase in utilization
Transit Ridership	Increase of ridership – 5% (year to year increase)
Queue wait time at intersections	Percentage of time stopped at intersections – reduce by 10% during peak period
Provide ATIS information to public on incident	Information to Regional ATIS – 10 minutes
Public Perception	Public Perception – Awareness of ICM and perceived benefits (survey based)
ICM Response Plan deployment	ICM Response Plan activated - 95% of plans were deployed correctly



The performance measures and targets discussed above focus on assessing the overall effectiveness of the ICM and corridor operations for purposes of needs identification and improvement selections. Such parameters, however, are not conducive to day-to-day assessments of alternatives by travelers and are not sensitive to quickly changing conditions within the corridor. As part of the modeling effort of the region and the corridor, many existing models are used to evaluate the performance of the corridor. The region has been utilizing models for many years in making transportation investment decisions. Currently, the NCTCOG has a large TRANSCAD macroscopic model for the DFW Regional Travel Demand Model. Additionally, a microscopic simulation model was developed using VISSIM for the downtown Dallas when Light Rail signal pre-emption was requested. From the performance measures selected by the committee, it was determined that most of the data required for the evaluation is currently available and that Regional Travel Model will meet the needs of the corridor.

Currently, there are several real-time data collection systems that will be utilized as part of the regional data warehouse to evaluate the performance of the corridor. These data include the real-time data being collected on freeways and toll roads for speeds and travel times, intersection volumes for signalized intersections, and passenger counters on some transit vehicles.

Another important resource for the corridor is utilizing the Urban Congestion Report, developed by TTI which will produce average corridor speed, average corridor volume, hours in congested travel, travel time index, and planning time index.

An education campaign will accompany the use of the operations measures so travelers and corridor agencies understand what the travel times represent and how to make assessments between network/mode combinations (i.e., what is and what is not accounted for in each of the measures). Our focus will be on congestion reduction, mode shift, and providing the public with a better understanding of the impact they make to our transportation network and the options they have to improve the regions congestion. This outreach will include individuals, large companies within the region, and commercial vehicle operators in the region.

4.10.1. Focus Groups

As part of our outreach effort, public focus groups will be developed to assist with marketing campaign review, public awareness, and better understanding the public's concerns with the strategies we are proposing.

4.10.2. Marketing Campaign

Our approach to marketing will be focused in multiple media formats, including print, radio, and television. We will develop a branding concept for the US-75 ICM, such that the public becomes familiar with the marketing schemes for this effort. We will concentrate our marketing on the development of press releases, media interviews, and public service announcements.

4.11. INTEGRATED CORRIDOR MANAGEMENT USER NEEDS AND FUNCTIONALITY

In order to get a more complete understanding of the user needs within the corridor, and identification of functions required, the input from the corridor stakeholders was utilized to develop a preliminary list of needs and functions. The following table provides a non-exhaustive listing of the needs and functions identified for an ICMS for US-75. The needs identified are items that are not existing, or need expansion to the existing system.

Table 4.11-1 Identified Needs and Functions

Agency/ Stakeholder	Identified Needs	Identified High-Level Functions Needed
US 75 Corridor Steering Committee	• Decision Support System • Institutional Framework for ICM	• Ability to receive incident and event information • Ability to provide pre-approved response plans to agencies based on input • Ability to update response plans
TxDOT	• Additional Infrastructure (DMS, CCTV, Detectors) • Ramp Meters • Improved Incident Response Coordination • Expanded ATIS Integration	• Ability to share network conditions (incidents, travel times, etc.) • Ability to manage traffic in a coordinated manner • Ability to implement response plan requests • Ability to inform public of network conditions
City of Dallas	• Center-to-Center plug-in • Arterial DMS • Arterial CCTV • Parking Management Systems • E911 Integration within Corridor	• Ability to share network conditions (incidents, travel times, etc.) • Ability to manage traffic in a coordinated manner • Ability to implement response plan requests • Ability to inform public of network conditions • Ability to adjust signal timing to respond to requests and network conditions • Ability to share information between agencies • Ability to coordinate responses between agencies

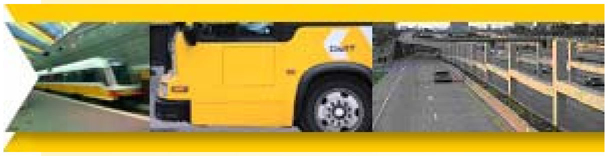


Table 4.11-1 Identified Needs and Functions (Continued)

Agency/ Stakeholder	Identified Needs	Identified High-Level Functions Needed
City of Richardson	• Center-to-Center plug-in • Arterial DMS • Arterial CCTV • Parking Management Systems • E911 Integration within Corridor • Communication Connection to US-75 agencies	• Ability to share network conditions (incidents, travel times, etc.) • Ability to manage traffic in a coordinated manner • Ability to implement response plan requests • Ability to inform public of network conditions • Ability to adjust signal timing to respond to requests and network conditions • Ability to share information between agencies • Ability to coordinate responses between agencies
City of Plano	• Center-to-Center plug-in • Arterial DMS • Arterial CCTV • Parking Management Systems • E911 Integration within Corridor • Communication Connection to US-75 agencies	• Ability to share network conditions (incidents, travel times, etc.) • Ability to manage traffic in a coordinated manner • Ability to implement response plan requests • Ability to inform public of network conditions • Ability to adjust signal timing to respond to requests and network conditions • Ability to share information between agencies • Ability to coordinate responses between agencies

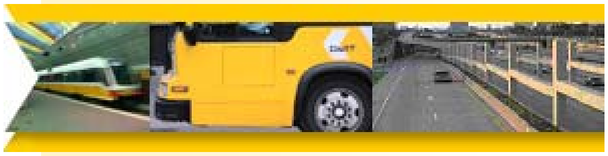
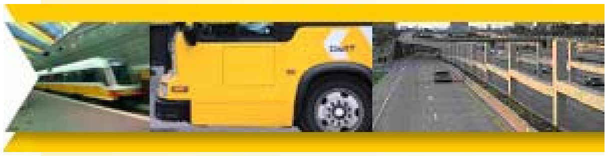


Table 4.11-1 Identified Needs and Functions (Continued)

Agency/ Stakeholder	Identified Needs	Identified High-Level Functions Needed
DART	• Transit Signal Priority • Additional LRT Vehicles • Passenger Counting Systems • Station Traveler Information Systems • In-vehicle ATIS (small DMS, kiosks, etc.) • Parking Management Systems • E911 Integration within Corridor	• Ability to share network conditions (incidents, travel times, etc.) • Ability to manage traffic in a coordinated manner • Ability to implement response plan requests • Ability to inform public of network conditions • Ability to modify transit pricing based on network conditions • Ability to modify parking pricing based on network conditions • Ability to determine available capacity of transit network • Ability to increase capacity of network (via additional vehicles, reduced headways)
NTTA	• Center-to-Center plug-in • Additional Detectors • Additional DMS • Additional CCTV • Dynamic Tolling • Communication Connection to US-75 agencies	• Ability to share network conditions (incidents, travel times, etc.) • Ability to manage traffic in a coordinated manner • Ability to implement response plan requests • Ability to inform public of network conditions • Ability to modify pricing based on network conditions

Table 4.11-1 Identified Needs and Functions (Continued)

Agency/ Stakeholder	Identified Needs	Identified High-Level Functions Needed
Town of Highland Park	• Center-to-Center plug-in • Arterial DMS • Arterial CCTV • Tolltag Readers • Communication Connection to US-75 agencies	• Ability to share network conditions (incidents, travel times, etc.) • Ability to manage traffic in a coordinated manner • Ability to implement response plan requests • Ability to inform public of network conditions • Ability to adjust signal timing to respond to requests and network conditions • Ability to share information between agencies • Ability to coordinate responses between agencies
City of University Park	• Center-to-Center plug-in • Arterial DMS • Arterial CCTV • Tolltag Readers • E911 Integration within Corridor • Communication Connection to US-75 agencies	• Ability to share network conditions (incidents, travel times, etc.) • Ability to manage traffic in a coordinated manner • Ability to implement response plan requests • Ability to inform public of network conditions • Ability to adjust signal timing to respond to requests and network conditions • Ability to share information between agencies • Ability to coordinate responses between agencies
NCTCOG	• ATIS Portal – US-75 ICM ATIS System • Expanded Data Warehouse • Improved Models for the ICM Corridor	• Ability to share network conditions (incidents, travel times, etc.) • Ability to inform public of network conditions • Ability to share information between agencies • Ability to coordinate responses between agencies • Ability to model conditions of the network and develop response scenarios



5. ICM Operational Scenarios

5.1. FUTURE ICM OPERATIONAL CONDITIONS

This section provides operational condition assumptions set forth by Dallas ICM Stakeholders for use during ICM scenario tabletop exercises carried out as part of developing this Con Ops. As such, these assumptions define a baseline operating environment that were needed for stakeholders to clearly identify operational roles and responsibilities, as well as needed data exchange and infrastructure improvements within the Dallas US-75 ICM Program. The baseline operational assumptions were developed using the needs and strategies identified in earlier stakeholder sessions, and as relayed in further detail in Section 4. Although a Con Ops is typically developed without use of detailed system requirements or design considerations, the Dallas US-75 ICM Stakeholders identified the need to clarify details related to how future ICM strategies and associated deployments/systems will operate in order to have significant discussions on operations as they may exist once the ICM program is initiated and running. The resulting definition of future ICM operational conditions for the US-75 Corridor is as follows:

- A future ICM System / suite of functionalities (herein referred to as “ICM System”) will be developed and deployed where all Stakeholders will have access to all information in the ICM System (assumed to be web-based), as well have the ability to enter/or provide a system interface with the ICM System to provide existing available information into the ICM System. The ICM System will:
- Build upon the existing Dallas Regional Center-to-Center System to provide a comprehensive and consolidated database for all incidents/events across all transportation Networks within the US-75 Corridor
- Incorporate NCTCOG GIS mapping data and systems to define incident / event locations
- Incorporate regional E-911 Center data on incident / event occurrences and locations
- Include a Decision Support subsystem that will include mutually developed and agreed upon categorization (e.g., Level 1-4) of incidents and events that are entered into the system by Stakeholders and/or Stakeholder systems. The incident/event categorization will be distinctly developed for each operational stakeholder based on algorithms that use:
    - All available real-time transportation data from stakeholder and modal network systems
    - Predefined operational strategies/actions that are available to the stakeholder related to the particular incident/event
    - Recommended operational strategies based on outputs from the Decision Support Subsystem models (which will be built upon current regionally-tailored DYNASMART applications and other real-time traffic estimation and prediction system models)
    - Real-time information on operational strategies/actions that are being deployed by all Stakeholders, specifically related to one/multiple incidents/events
- Collect and clearly relay operational strategies being implemented by all Stakeholder ICM System users

- Provide Stakeholder agencies the ability to access ICM System information within a ICM System GUI (web based), as well as an interface to for Stakeholder Agencies to integrate ICM System data into existing systems
- Manage “passive device” (to be clearly defined during requirements stage of ICM Project) control sharing between Stakeholders, including access request messaging and agency approval
- Include an alerting subsystem that alerts appropriate agency personnel to predefined conditions/parameters within the ICM System. The alerting subsystem will provide interface to email, cell phone/SMS, pagers, and integrated agency-operated system interface alerts.
- Shared / coordinated control plans for “passive devices” is mutually developed, adopted, and used by Stakeholders within the Corridor
- A future Dallas/Fort Worth Regional Advanced Traveler Information System (herein referred to as DFW ATIS) will be developed deployed where all Stakeholders will input data related to travel conditions and incident information (tailored for the traveling public) for respective Networks within the Corridor, as well have the ability to see and access data from other Networks and Stakeholders. The DFW ATIS will:
    - Build upon the existing DFW travel website (http://daltrans.org/) to provide a comprehensive and consolidated traveler information source for all Stakeholder transportation Networks
    - Interface with several methods for distributing traveler information, including: webpage, phone/511, media outlets, cell phone SMS, pagers, and in-vehicle systems.
    - Provide personalized traveler information service that allows travelers, places of business, and other regional points of interest to setup user accounts with specific travel routes, modes, and travel services where service disruption and other alerts are provided through: website login, email, phone/511 caller ID technology, cell phone SMS, pagers, and in-vehicle systems.
- Monitoring of incidents / events that have adverse affects on travel conditions within Corridor will be entered into a consolidated incident / event database within 10-minutes of the incident/event occurring.
- Minimum of 10-minute updates (voice or data) to Stakeholder center operations staff with latest incident response and field conditions from onsite responders
- Incident management response coordination procedures are mutually developed, adopted, and practiced by Stakeholders within the Corridor
- Traffic and transit diversion and detour plans are mutually developed, adopted and practiced by Stakeholders within the Corridor
- Systems related to effectively carrying out ICM Strategies, roles, and responsibilities will be available 95-percent of the time (related to system availability, redundancy, routine maintenance, and maintenance repairs/replacements).
- 75-percent real-time data coverage on traffic flow along major arterials within the Corridor.
- All “Significant (to be clearly defined during requirements stage of ICM Project) Arterial” signal systems will be coordinated across jurisdictional boundaries.
- All “Significant (to be clearly defined during requirements stage of ICM Project) Arterial” signal systems will be remotely monitored and managed by respective jurisdictional software signal control systems.

- All video within the Corridor will be accessible, in streamed format, to all ICM Stakeholders through the RDVCS project.
- Existing partnerships with local media outlets (radio and television) will continue for distribution of value-added traveler information.
- Programmed DART System for device control, video and information sharing, and traveler information between all DART divisions (HOV operations, bus, light rail, dispatch, and customer relations/traveler information) will be deployed.
- DART operations has access to park-n-ride lot status within the Corridor
- DART operations has access to real-time bus and rail occupancy data within the Corridor
- Transit signal priority systems will be deployed along "Significant Arterials" for all DART LRT trains and buses within the Corridor

5.2. SCENARIOS

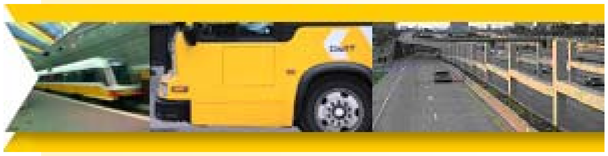
When deciding upon locations of events that drive operational scenarios for the US-75 ICM Con Ops, it was decided that varying locations would require varying response scenarios depending on both location and time-of-day. In order to capture the various ICM response strategies, the Corridor was divided into multiple sections and directions. Then based on time-of-day, the impact and necessary strategies could be determined. With the time available to the US-75 Steering Committee, a typical location and scenario was chosen for the majority of the scenarios.

The committee also tried to identify incidents that typically occur as frequently as possible, as well look at recurring areas of congestion for daily operations, and high frequency locations for incidents. The US-75 Steering Committee discussed how ICM in the future could be used to improve the efficiency and response of the coordinated response. The remaining scenarios were developed based on deviation from the baseline of "Daily Operations" – since many of the agencies deal with minor incidents on a routine basis, they decided that they are a part of daily operations.

5.3. DECISION SUPPORT SYSTEM

As discussed in Section 4.5, the operations and coordination of the corridor will utilize a Decision Support subsystem as part of the daily operation of the corridor, and will be coordinated through the existing arrangements between the agencies with information exchanged through the center-to-center project. The Decision Support system will distribute response plan requests and utilize the center-to-center interface to communicate to the various agency systems.

The Decision Support Subsystem will utilize existing Center-to-Center standards based communication infrastructure, using TMDD and MS/ETMCC standards. It will also be able to have direct connections to agencies not on the Center-to-Center network. The existing systems of each member agency would share ITS data with the corridor, and the Decision Support system would recommend responses to all affected agencies.



The Decision Support system would be initially populated by response plans developed by the US-75 Steering Committee utilizing the models developed for the corridor analysis and strategy selection.

The US-75 Steering Committee will meet on a monthly basis to do post-incident analysis and make any necessary modification to response plans to improve the efficiency of the corridor. The Decision Support hardware and software will be hosted and maintained at the DalTrans facility.

5.3.1. High-Level Functionality and Capability

The Decision Support system (DSS) will distribute response plan requests and utilize the center-to-center interface to communicate to the various agency systems. For instance, if TxDOT has an incident on the US-75 freeway, when the operator at the Daltrans facility inputs data in their ATMS incident management subsystem, the information from this subsystem would send basic information on the incident (such as location, number of lanes, severity) to the DSS via the regional Center-to-Center communication system. The DSS would then query its database based on this criteria, and model potential pre-approved response plans. The DSS would send then select and send response plan recommendations to all affected agencies, and a notification to the regional ATIS. The agencies in the corridor would accept or modify the recommended response, based on current conditions within their network. As the conditions of the incident change, and the agency systems are updated, the DSS would also be notified and send out updated pre-approved responses. In addition, the DSS will send out updated responses based on other criteria. For instance, if an incident was occurring during the peak hours, and extended beyond. One potential response during the peak could be to increase the number of Light Rail Trains in operation. If a certain time of day was reached before any updates were provided, the DSS may send DART an update that notifies them that additional LRT are not required. Over the next several phases of the ICM program, the DSS will be more defined, and requirements and design developed.

5.4. DAILY OPERATIONS

Daily operation is defined as:

- Operations that are not related to a particular incident/event that causes response or management strategies to be carried out, however minor incidents are routine and a part of daily operations.
- Recurring congestion and peak ridership conditions

Table 5.4-1 below, provides roles and responsibilities for Stakeholders who perform significant functions during Daily Operations within the US-75 ICM Corridor.

Table 5.4-1 Daily Operations Agency Roles and Responsibilities

Stakeholder	Roles and Responsibilities
Texas DOT	**Coverage** • Four-person operational coverage • 24 hours x 7-days/week x 365/year coverage • Freeways and interchanges/ramps with other networks within the "US-75 ICM Influence Area" **Monitoring** • TxDOT CCTV video • Regional CCTV video • Occurrence of incidents that effect travel through 911 and emergency centers • Traffic flow conditions • DalTrans system health and device status • Weather and emergency events • ICM System – incidents/events on other agency networks that may affect highways • Dallas County Sheriff Courtesy Patrol Radio **Coordination** • Coordinate construction and lane closures with TxDOT Districts and municipalities • Coordinate regional events (e.g., sporting events) • Coordinate recurring congestion traffic management with DART HOV, DART Transit, City signal control centers, and NTTA • Coordinate roadside assistance services with Dallas County Sheriff Courtesy Patrol • Coordinate control of "passive devices" with DART HOV, DART Transit, NTTA, and Cities **Information Distribution** • Distribute freeway travel conditions to DFW ATIS and other outlets, including media • Distribute travel messages and advisories using DMS **Maintenance** • Perform routine maintenance • Repair DalTrans system and communication failures • Repair / replace malfunctioning devices

Table 5.4-1 Daily Operations Agency Roles and Responsibilities (Continued)

Stakeholder	Roles and Responsibilities
City of Dallas	**Coverage** • Two-person operational coverage • 12-14 hours x 7-days/week x 365/year coverage • "Significant Arterial" streets in the City of Dallas and within the "US-75 ICM Influence Area" • Partial monitoring coverage responsibility along US-75 within the City of Dallas **Monitoring** • City CCTV video • Regional CCTV video • Occurrence of incidents that effect travel through 911 and emergency centers • Arterial traffic flow conditions • Signal system health and status • Weather and emergency events • ICM System – incidents/events on other agency networks that may affect city arterial travel conditions **Coordination** • Coordinate construction and lane closures with construction and maintenance offices • Coordinate regional events (e.g., sporting events) • Coordinate recurring congestion traffic management with TxDOT, DART HOV, DART Transit, and other city signal control centers – including timing plan changes • Coordinate transit signal priority with DART bus and rail centers/systems • Coordinate control of "passive devices" with TxDOT, DART HOV, DART Transit, and other Cities **Information Distribution** • Distribute arterial travel conditions to DFW ATIS and other outlets, including media • Distribute travel messages and advisories using arterial DMS **Maintenance** • Perform routine maintenance • Repair signal system and communication failures • Repair / replace malfunctioning signal intersection equipment

Table 5.4-1 Daily Operations Agency Roles and Responsibilities (Continued)

Stakeholder	Roles and Responsibilities
City of Richardson	**Coverage** • One/two-person operational coverage • 12-14 hours x 7-days/week x 365/year coverage • “Significant Arterial” streets in the City of Richardson and within the “US-75 ICM Influence Area” • Partial monitoring coverage responsibility along US-75 and the President George Bush Turnpike within the City of Richardson **Monitoring** • City CCTV video • Regional CCTV video • Occurrence of incidents that effect travel through 911 and emergency centers • Arterial traffic flow conditions • Signal system health and status • Weather and emergency events • ICM System – incidents/events on other agency networks that may affect city arterial travel conditions **Coordination** • Coordinate construction and lane closures with construction and maintenance offices • Coordinate event management • Coordinate recurring congestion traffic management with TxDOT, DART HOV, DART Transit, and other city signal control centers – including timing plan changes • Coordinate transit signal priority with DART bus and rail centers/systems • Coordinate control of “passive devices” with TxDOT, DART HOV, DART Transit, NTTA, and other Cities **Information Distribution** • Distribute arterial travel conditions to DFW ATIS and other outlets, including media • Distribute travel messages and advisories using arterial DMS **Maintenance** • Perform routine maintenance • Repair signal system and communication failures • Repair / replace malfunctioning signal intersection equipment

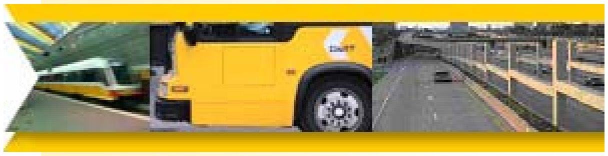


Table 5.4-1 Daily Operations Agency Roles and Responsibilities (Continued)

Stakeholder	Roles and Responsibilities
City of Plano	**Coverage** • One/two-person operational coverage • 12-14 hours x 7-days/week x 365/year coverage • “Significant Arterial” streets in the City of Plano and within the “US-75 ICM Influence Area” • Partial monitoring coverage responsibility along US-75 within the City of Plano **Monitoring** • City CCTV video • Regional CCTV video • Occurrence of incidents that effect travel through 911 and emergency centers • Arterial traffic flow conditions • Signal system health and status • Weather and emergency events • ICM System – incidents/events on other agency networks that may affect city arterial travel conditions **Coordination** • Coordinate construction and lane closures with construction and maintenance offices • Coordinate event management • Coordinate recurring congestion traffic management with TxDOT, DART HOV, DART Transit, and other city signal control centers – including timing plan changes • Coordinate transit signal priority with DART bus and rail centers/systems • Coordinate control of “passive devices” with TxDOT, DART HOV, DART Transit, and other Cities **Information Distribution** • Distribute arterial travel conditions to DFW ATIS and other outlets, including media • Distribute travel messages and advisories using arterial DMS **Maintenance** • Perform routine maintenance • Repair signal system and communication failures • Repair / replace malfunctioning signal intersection equipment

Table 5.4-1 Daily Operations Agency Roles and Responsibilities (Continued)

Stakeholder	Roles and Responsibilities
DART	**Coverage** <u>All</u> • One/two-person operational coverage at DalTrans Center • 14 hours x 7-days/week x 365/year coverage at DalTrans Center • 24 hours x 7-days/week x 365/ year coverage at customer service call centers <u>Rail</u> • All Red and Blue Line LRT light-rail routes and stations within the "US-75 ICM Influence Area" <u>HOV</u> • Managed HOV lanes • All HOV lanes along US-75 within the "US-75 ICM Influence Area" • Partial monitoring coverage responsibility along parallel freeway lanes within the "US-75 ICM Influence Area" <u>Bus</u> • All operational bus routes within the "US-75 ICM Influence Area" • Partial monitoring coverage responsibility on arterials and freeways that make up bus routes within the "US-75 ICM Influence Area" **Monitoring** <u>All</u> • DART CCTV video – stations, HOV, park-n-ride lots, and in-vehicle/train • Regional CCTV video • Occurrence of incidents that effect travel through 911 and emergency centers • Weather and emergency events • ICM System – incidents/events on other agency networks that may affect DART operations <u>Bus</u> • Bus schedule adherence / status • Real-time bus occupancy • Vehicle emergency status (voice communication with operator) <u>Rail</u> • Park-n-ride lot status • Rail schedule adherence / status • Real-time light rail occupancy • Train emergency status (voice communication with operator)

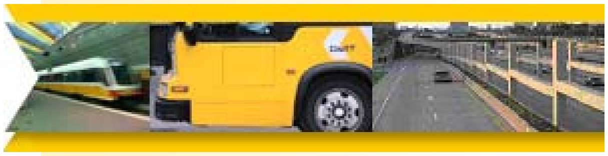


Table 5.4-1 Daily Operations Agency Roles and Responsibilities (Continued)

Stakeholder	Roles and Responsibilities
	<u>HOV</u> • HOV lane traffic flow • Partial monitoring coverage responsibility along TxDOT freeways within "US-75 ICM Influence Area" • DalTrans system health and device status • Dallas County Sheriff Courtesy Patrol Radio **Coordination** <u>All</u> • Coordinate construction, maintenance, and service disruptions with construction and maintenance offices • Coordinate event management • Coordinate recurring congestion traffic management with TxDOT, NTTA, and city signal control centers <u>Bus</u> • Coordinate transit signal priority with city signal control centers/systems • Coordinate transfer protection with DART Rail <u>Rail</u> • Coordinate transit signal priority with city signal control centers/systems • Coordinate transfer protection with DART Bus • Coordinate parking fare payment with NTTA <u>HOV</u> • Coordinate control of "passive devices" with TxDOT, NTTA, and Cities **Information Distribution** • Distribute transit travel conditions to DFW ATIS and other outlets, including media • Distribute travel messages and advisories using transit station, HOV, and parking lot station DMS and PA systems • Provide trip-planning services via website and call center **Maintenance** • Perform routine maintenance • Repair in-vehicle system and communication failures • Repair / replace malfunctioning signal intersection equipment

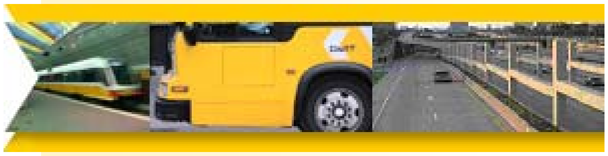


Table 5.4-1 Daily Operations Agency Roles and Responsibilities (Continued)

Stakeholder	Roles and Responsibilities
North Texas Tollway Authority	**Coverage** • Freeways and interchanges/ramps with other networks within the "US-75 ICM Influence Area" **Monitoring** • CCTV video • Regional CCTV video • Occurrence of incidents that effect travel through 911 and emergency centers • Traffic flow conditions • Weather and emergency events • ICM System – incidents/events on other agency networks that may affect highways **Coordination** • Coordinate construction and lane closures with TxDOT Districts and municipalities • Coordinate regional events (e.g., sporting events) • Coordinate recurring congestion traffic management with DART HOV, DART Transit, City signal control centers, and TxDOT • Coordinate control of "passive devices" with DART HOV, DART Transit, TxDOT, and Cities **Information Distribution** • Distribute freeway travel conditions to DFW ATIS and other outlets, including media • Distribute travel messages and advisories using DMS **Maintenance** • Perform routine maintenance • Repair operational system and communication failures • Repair / replace malfunctioning devices

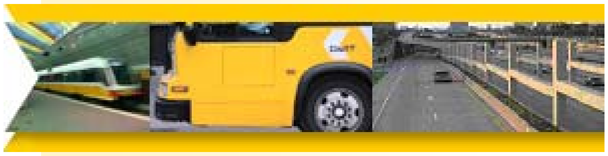


Table 5.4-1 Daily Operations Agency Roles and Responsibilities (Continued)

Stakeholder	Roles and Responsibilities
Town of Highland Park	**Coverage** • One/two-person operational coverage • 12-14 hours x 5-days/week x 365/year coverage **Monitoring** • City CCTV video • Regional CCTV video • Occurrence of incidents that effect travel through 911 and emergency centers • Arterial traffic flow conditions • Signal system health and status • Weather and emergency events • ICM System – incidents/events on other agency networks that may affect city arterial travel conditions **Coordination** • Coordinate construction and lane closures with construction and maintenance offices • Coordinate event management • Coordinate recurring congestion traffic management with TxDOT, DART HOV, DART Transit, and other city signal control centers – including timing plan changes • Coordinate control of “passive devices” with TxDOT, DART HOV, DART Transit, and other Cities **Information Distribution** • Distribute arterial travel conditions to DFW ATIS and other outlets, including media • Distribute travel messages and advisories using arterial DMS **Maintenance** • Perform routine maintenance • Repair signal system and communication failures • Repair / replace malfunctioning signal intersection equipment

Table 5.4-1 Daily Operations Agency Roles and Responsibilities (Continued)

Stakeholder	Roles and Responsibilities
City of University Park	**Coverage** • One/two-person operational coverage • 12-14 hours x 5-days/week x 365/year coverage **Monitoring** • City CCTV video • Regional CCTV video • Occurrence of incidents that effect travel through 911 and emergency centers • Arterial traffic flow conditions • Signal system health and status • Weather and emergency events • ICM System – incidents/events on other agency networks that may affect city arterial travel conditions **Coordination** • Coordinate construction and lane closures with construction and maintenance offices • Coordinate event management • Coordinate recurring congestion traffic management with TxDOT, DART HOV, DART Transit, and other city signal control centers – including timing plan changes • Coordinate control of “passive devices” with TxDOT, DART HOV, DART Transit, and other Cities **Information Distribution** • Distribute arterial travel conditions to DFW ATIS and other outlets, including media • Distribute travel messages and advisories using arterial DMS **Maintenance** • Perform routine maintenance • Repair signal system and communication failures • Repair / replace malfunctioning signal intersection equipment

ICM Strategies from Section 4 that will be deployed during Daily Operations Conditions include:

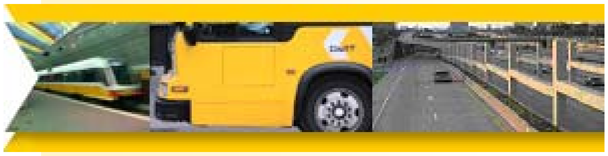


Table 5.4-2 Daily Operations Infrastructure Needs

Infrastructure Needs ● = Needed for Scenario, Currently Deployed ○= Needed for Scenario, Not Deployed	ICM Steering Committee	Texas DOT	City of Dallas	City of Richardson	City of Plano	DART	NTTA	NCTCOG	City of University Park	Town of Highland Park
Traffic detectors / roadway surveillance / vehicle probes		●	●	●	●		●			
CCTV (video surveillance)		●	●	●	●	●	●			
Traffic signal control / monitoring (TOD schedule)			●	●	●				●	●
Traffic signal control / monitoring (traffic adaptive)			○	○	○					
Ramp Meters (local control)		○					○			
Ramp Meters (central control)		○					○			
HOV by-pass						○	○			
HOV Managed Lanes						●	○			
DMS – freeway		●				●	●			
Internet Traveler Information		●	●	●	●	●	●	○	●	●
Automated Incident Detection		●	○	○	○	○	○	○	○	○
Incident Detection (call – in, other)		●	●	●	●	●	●		●	●
Incident Response Plans / Guidelines Teams		○	○	○	○	○	○	○	○	○
Incident Reporting System (GIS, common display)		○	○	○	○	○	○	○	○	○
Air quality sensors								●		
Road Weather Information Sensors		●					●			
Parking Surveillance/occupancy						●				
Transit Vehicle Location / GPS						●				
Transit Schedule Performance Monitoring						●				
Passenger Counting Equipment						●				
Electronic Fare / Parking Payment Equipment						●				
DMS – transit						●				
Transit Public Address System						●				
Transit Trip Planning System						●				
Spare transit vehicles / operators						●				
Telephone – Based ATIS (511)		○	○	○	○	○	○	○	○	○
Transit priority equipment (Intersection &Transit Vehicles)			○	○	○	○			○	○
Public Safety CAD			●	●	●	●			●	●
Emergency vehicle priority / preemption			○	○	○				○	○
Service Patrol Vehicles		●				●	●			

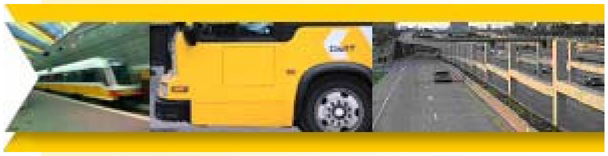


Table 5.4-2 Daily Operations Infrastructure Needs (Continued)

Infrastructure Needs ● = Needed for Scenario, Currently Deployed ○= Needed for Scenario, Not Deployed	ICM Steering Committee	Texas DOT	City of Dallas	City of Richardson	City of Plano	DART	NTTA	NCTCOG	City of University Park	Town of Highland Park
Real-time conditions data base / common displays (corridor)		○	○	○	○	○	○	○	○	○
Maintenance Vehicle Location AVL / GPS		●	○	○	○	○	○		○	○
Data Warehouse	○							○		
Decision Support System	○							○		

Table 5.4-3 Daily Operations Data Needs

Data Needs ● = Needed, Currently Deployed ○= Needed, Not Deployed	ICM Steering Committee	Texas DOT	City of Dallas	City of Richardson	City of Plan	DART	NTTA	NCTCOG	City of University Park	Town of Highland Park
Link congestion levels		○	○	○	○	○	○		○	○
Link volumes		●				●	●			
Link occupancies		●				●	●			
Link / spot speeds		●	●	●	●	●	●		●	●
Link travel times		○	○	○	○	○	○		○	○
Intersection approach volumes			●	●	●				●	●
Ramp queues		○								
Transit schedules						●				
Transit vehicle location						●				
Schedule or headway status/deviation						●				
Transit vehicle headways						●				
Priority requests						○				
Next Vehicle Arrival						○				
Average Waiting Time						●				
Transit Fares						●				
Average Vehicle Occupancy						●				
Equipment / Device Locations		●	●	●	●	●	●		●	●
Surveillance / detectors		●	●	●	●	●	●		●	●
DMS		●	●	○	○	●	●		○	○
Ramp meter		○								

Table 5.4-3 Daily Operations Data Needs (Continued)

Data Needs ● = Needed, Currently Deployed ○= Needed, Not Deployed	ICM Steering Committee	Texas DOT	City of Dallas	City of Richardson	City of Plan	DART	NTTA	NCTCOG	City of University Park	Town of Highland Park
Traffic Signals			●	●	●				●	●
CCTV		●	●	●	●	●	●		○	○
Electronic toll / fare / parking equipment						●	●			
Available transit vehicles / location						●				
Video images / snapshots		●	●	●	●	●	●		○	○
Video control		●	●	●	●	●	●		○	○
Parking space availability						●				
Maintenance/ construction events		●	●	●	●	●	●	●	●	●
Special events		●	●	●	●	●	●	●	●	●
Electronic payment account status						●	●			
Emergency vehicle location			●	●	●	●			●	●
Maintenance vehicle location		●	●	●	●	●	●		●	●
Parking fees						●				
Contact lists	●	●	●	●	●	●	●	●	●	●
Pre-planned response scenarios	○	○	○	○	○	○	○	○	○	○

The remaining scenarios were developed based on deviation from the baseline of "Daily Operations" – since many of the agencies deal with minor incidents as a routine, they decided that they are a part of daily operations.

5.5. TRAVELER INFORMATION

Since all scenarios have some component of traveler information, it was decided to include a discussion and description of the traveler information assets existing and needed for the US-75 ICM and for the region as a whole.

The traveler information capabilities for the US-75 ICM will involve multiple media, and varied capabilities. This includes existing systems for pre-trip planning, in-route traveler information, and general information regarding the transportation network. This element encompasses many different types of information that can be of use to the traveling public. Through the traveler information technologies that we propose to utilize and continue to deploy, information will be provided regarding incidents, congestion, travel times, road conditions, pricing, transit status and parking availability.

For example, when there are incidents, accident information will be provided to minimize adverse impacts and enable the public to make decisions on options for the use of work hubs or work from home alternatives. Transit information alternatives will be provided so that commuters can determine the status of the bus or light rail system and find out about the availability of parking in DART parking lots in the vicinity of LRT stations in order to avoid an incident or congestion.

The delivery methods to be employed in US-75 corridor will consist of:

- Dynamic message signs (DMS) placed at strategic locations
- Interactive traveler information websites that commuters can quickly check each morning or go to anytime for corridor information
- Traveler information service retailers who will take the data collected and provide value-based services for their customers
- A robust 511 phone system that will provide traffic conditions, road conditions, and transit information
- Media partnerships with television and radio formed to provide them with traveler information and camera feeds for rebroadcast
- A personalized traveler alert system that will enable travelers to create route specific alerts based on the parameters they enter

This component will also feature an in-reach and outreach program to garner support from public and private sector partners.

Table 5.5-1 Infrastructure Needs for US-75 ATIS

Infrastructure Needs ● = Needed for Scenario, Currently Deployed ○= Needed for Scenario, Not Deployed	Texas DOT	City of Dallas	City of Richardson	City of Plano	DART	NTTA	NCTCOG	City of University Park	Town of Highland Park
Traffic detectors / roadway surveillance / vehicle probes	●	●	●	●		●			
CCTV (video surveillance)	●	●	●	●	●	●			
DMS – freeway	●				●	●			
Internet Traveler Information	●	●	●	●	●	●	○	●	●
Incident Detection (call – in, other)	●	●	●	●	●	●		●	●
Air quality sensors							●		
Road Weather Information Sensors	●					●			
Parking Surveillance/occupancy					●				
Transit Vehicle Location / GPS					●				
Transit Schedule Performance Monitoring					●				
Passenger Counting Equipment					●				
Electronic Fare / Parking Payment Equipment					●				
DMS – transit					●				

Table 5.5-1 Infrastructure Needs for US-75 ATIS (Continued)

Infrastructure Needs ● = Needed for Scenario, Currently Deployed ○= Needed for Scenario, Not Deployed	Texas DOT	City of Dallas	City of Richardson	City of Plano	DART	NTTA	NCTCOG	City of University Park	Town of Highland Park
Transit Public Address System					●				
Transit Trip Planning System					●				
Spare transit vehicles / operators					●				
Telephone – Based ATIS (511)	○	○	○	○	○	○	○	○	○
Real-time conditions data base / common displays (corridor)	○	○	○	○	○	○	○	○	○
Data Warehouse							○		

Table 5.5-2 Data Needs for Travelers Using US-75 ICM

Data Needs ● =Provided, Currently ◘ = Provided, Partially ○ = Not Deployed	Travelers
Link congestion levels	◘
Link travel times	◘
Transit schedules	●
Transit vehicle location	○
Next Vehicle Arrival	◘
Average Waiting Time	○
Transit Fares	●
Equipment / Device Locations	●
Surveillance / detectors	◘
DMS Status/ Message	●
Video images / snapshots	◘
Parking space availability	◘
Maintenance/ construction events	●
Special events	●
Electronic payment account status	●
Parking fees	●
Contact lists	●
Pre-trip Itinerary Planning (Transit)	●
Pre-trip Route Planning	●
Park & Ride Location	●

5.6. INCIDENT SCENARIO

When discussing Incident scenarios, the US-75 Steering Committee discussed how multiple locations would require multiple response scenarios depending on location and time of day. Based on time of day and jurisdiction, the impact and necessary strategies would be determined.

5.6.1. Major Traffic Incident – Arterials

Since there are multiple Cities within the corridor, each with different infrastructure and integration – a sample major incident was chosen at a particular intersection where vehicle accidents occur regularly, and have major impact on overall mobility within the Corridor. Each of the five city US-75 ICM Stakeholders, has a primary arterial street that is used during peak hours for public and transit vehicles. Since many of the arterials are collectors or parallel routes to the freeway, many have very high volumes during peak times.

Incident Description:
During the evening peak, an incident occurs at the intersection of Greenville Avenue and Spring Valley Road that closes the intersection for the evening rush. Since it is a parallel route which feeds US-75, it does have some preliminary impact to US-75, as well as overall mobility within the Corridor.

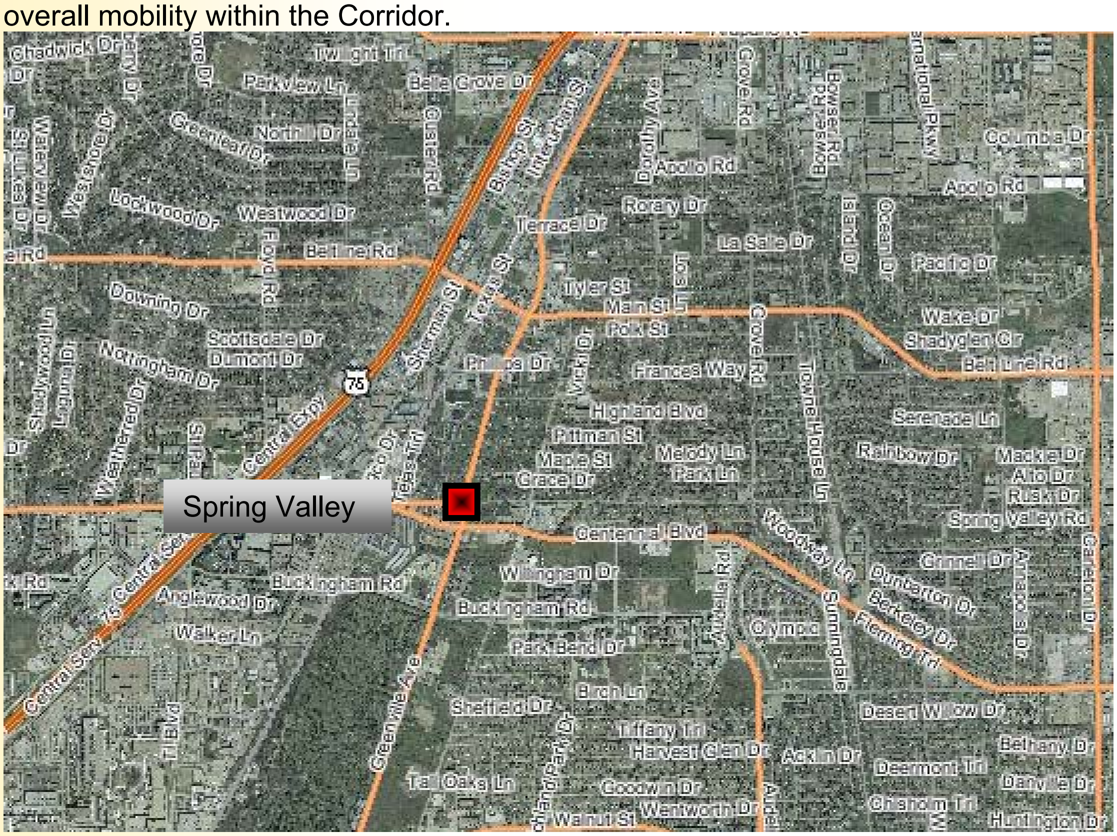


Figure 5.6-1 Incident Location at Intersection of Greenville Avenue and Spring Valley Road (Source: NCTCOG dfwmaps.com)

Assumptions:

- Major parallel route to the freeway, with impact to the corridor
- Multiple bus routes impacted
- Incident does not include any fatalities

Timeline:

4:00 p.m. Incident Occurs, drivers immediately contact E911 to report the incident. Due to integration with the various E911 CAD systems, the corridor agencies are immediately notified of the potential incident (through ICM System alerting subsystems) and approximate location (through ICM System mapping).

4:05 p.m. City of Richardson police arrive on scene and begin initial determination of severity and approximate time for resolution. DART Bus Dispatch is automatically notified by the ICM system of the location, and drivers on affected bus routes are notified.

4:20 p.m. City of Richardson updates ICM System to indicate major incident with a closure of more than 1 hour. The corridor agencies are alerted through ICM alerting subsystem, and a previously approved response plan is recommended by the corridor Decision Support subsystem. Incident data is transferred to the DFW ATIS, resulting in information on the incident being sent to local media, and 3^{rd} party ISPs, along with traveling public through various mediums. TxDOT, DART, and City of Richardson display preliminary information on DMS signs and HAR near the incident. DART displays intersection closure information on the vehicle and bus stop DMS along the affected routes.

4:30 p.m. City of Richardson implements timing plans for diversions around the intersection to parallel routes, and bus priority is implemented for pre-approved diversion routes for DART buses impacted by the intersection closure.

5:00 p.m. Initial clearance of the intersection, restoring traffic flow in all directions, City of Richardson updates ICM System. City of Richardson continues to monitor the traffic flow and change timing plans, if needed. DART and TxDOT remove DMS messages. DART is notified of opening, however, back-up still requires diversion

5:20 p.m. Normal operations, DART bus resumes routes through intersection.

Changes to Baseline Strategies:

The approach the US-75 Steering Committee has taken is to use the Daily Operations as the baseline for the strategies associated with the ICM, and then discuss what changes and additions are needed for the specific scenario. In the following tables, the stakeholders have identified some of the additional roles and responsibilities, and data and infrastructure required to have a corridor based response. In addition, the following changes to strategies were identified:

- Information sharing and distribution
- Operational efficiency at network junctions
- A common incident reporting system and asset management (GIS) system
- Modify transit priority parameters to accommodate more timely bus service and light rail service
- Emergency response signal priority
- En-route traveler information devices used to describe current operational conditions on another network(s) within the corridor

Table 5.6-1 Additional Roles and Responsibilities for Major Arterial Scenario

Stakeholder	Roles and Responsibilities
Texas DOT	**Monitoring** • On-going monitoring of response and flow on arterials and impact to freeway • Monitor freeway traffic flow around affected incident area • Strategies recommended by ICM Decision Support Tool • Strategies being carried out by ICM Stakeholders **Coordination** • Shared use and control of freeway CCTV able to see field conditions at incident scene, and/or traveling conditions around the incident scene • Coordinate traffic management of freeway conditions affected by arterial incident **Information Distribution** • Incident information on freeway DMS
City of Richardson	**Monitoring** • On-going monitoring of incident response and status through voice/data communications and city CCTV • On-going monitoring of flow on arterial network • Strategies recommended by ICM Decision Support Tool • Strategies being carried out by ICM Stakeholders **Coordination** • Coordinate incident response with local public safety, including emergency vehicle signal priority • Coordinate on-site traffic control with City emergency response agencies and traffic control crews • Update signal timings to follow pre-planned response • Enter and/or update incident information in ICM System

Table 5.6-1 Additional Roles and Responsibilities for Major Arterial Scenario (Continued)

Stakeholder	Roles and Responsibilities
	• Update Strategies being carried out on City arterial network in ICM System • Coordinate arterial management tactics with adjacent cities • Coordinate arterial incident affects on freeway operations with TxDOT, NTTA, and DART • Coordinate arterial management affects on transit operations with DART, including transit signal priority **Information Distribution** • Incident and alternate route information on arterial DMS and HAR • Provide interface to DFW ATIS to transfer incident and alternate route data • Distribute incident and alternate route information to media and local businesses
DART	**Monitoring** • On-going monitoring of response and flow on arterials and impact to HOV and transit networks • Monitor HOV traffic flow and transit vehicle schedule adherence near affected incident area • Strategies recommended by ICM Decision Support Tool • Strategies being carried out by ICM Stakeholders **Coordination** • Shared use and control of "passive devices" for incident response and travel management • Coordinate traffic management of HOV and transit conditions affected by arterial incident, including transit signal priority with cities **Information Distribution** • Incident information on DMS and trip planning services

Additional Data and Infrastructure Needs:

Table 5.6-2 below, identifies the data needs by agency and if the asset is currently deployed or available.

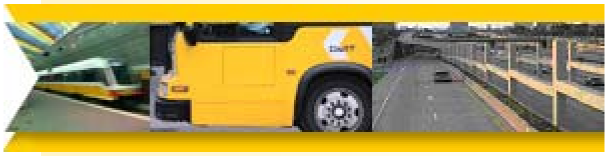


Table 5.6-2 Data and Infrastructure Needs for Major Arterial Scenario

Data and Infrastructure Needs ● = Needed, Currently Deployed ○= Needed, Not Deployed	Texas DOT	City of Richardson	DART
Traffic detectors / roadway surveillance / vehicle probes	●	●	
CCTV (video surveillance)	●	●	
Traffic signal control / monitoring (TOD schedule)		●	
Traffic signal control / monitoring (traffic adaptive)		○	
Ramp Meters (local control)	○		
Ramp Meters (central control)	○		
DMS – roadway	●	○	●
Internet Traveler Information	●	●	●
Automated Incident Detection		○	
Incident Detection (call – in, other)		●	
Incident Response Plans / Guidelines / Teams	○	○	○
Incident Reporting System (GIS, common display)	○	○	○
Transit Vehicle Location / GPS			●

5.6.2. Major Traffic Incident – Freeway

When deciding upon locations for scenarios multiple locations would require multiple response scenarios depending on location and time of day. In order to capture the various response strategies for a major incident, the corridor was divided into multiple sections and directions. Then based on time of day, the impact and necessary strategies could be determined. With the time available to the US-75 Steering Committee, a typical location and scenario was chosen.

Trying to use a real-world incident, the committee discussed a recent incident on US-75 at the LBJ Freeway. During the early morning hours (approximately 4 a.m.), a northbound commercial vehicle incident closed multiple exit ramps to include the interchange to LBJ. The commercial vehicle lost its load, and required clean-up and hazmat response due to over 50 gallons of diesel being spilled. The City of Plano emergency response arrived first at scene and closed three exit ramps to include the one to LBJ Freeway, a little later the City of Richardson arrived and took over responsibility. The City of Richardson opened a couple of the exit ramps. The TxDOT courtesy patrol assisted with traffic control, and began clean-up of incident. The incident went through multiple phases: initial reaction, clean-up, modifying traffic control, and resumption of normal operations. The US-75 Steering Committee discussed how ICM in the future could be used to improve the efficiency and response of the coordinated response.

Incident Description:
A commercial vehicle jackknifed on southbound US-75 north of the LBJ Freeway interchange at 6 a.m., spilling its load of boxes onto the freeway and closing the freeway in the southbound direction. The jurisdiction of the incident is the City of Richardson.

Figure 5.6-2 Incident Location on US-75 North of LBJ Freeway (Source: NCTCOG dfwmaps.com)

Assumptions:
The assumptions used for this scenario are:

- No fatalities
- Hazardous materials spill due to at least 50 gallons of diesel fuel spilled
- Long-term closure requiring mode shift, and arterial diversions
- Multiple coordinated responses needed to optimize the corridor

Timeline:

6:00 a.m. Incident Occurs, drivers immediately contact E911 to report the incident
Due to integration with the various E911 CAD systems, the corridor agencies are immediately notified of the potential incident (through ICM System alerting subsystems) and approximate location (through ICM System mapping).

6:10 a.m. City of Richardson police arrive on scene and begin initial determination of severity and approximate time for resolution. TxDOT courtesy patrol and DART Motorist Assistance arrive on scene to assist with traffic control. TxDOT uses video cameras to verify type of incident and number of lanes closed, and notifies ICM partners. TxDOT, DART, and City of Richardson and Plano display preliminary information on their DMS signs north of the incident.

6:20 a.m. City of Richardson updates ICM System to indicate major incident with a closure of more than 4 hours. The corridor agencies are alerted through ICM alerting subsystem, and a previously approved response plan is recommended by the corridor Decision Support system. Local wrecker service has been notified, and begins response to assist police with clearing incident.

6:30 a.m. As part of the pre-planned response contained in the corridor Decision Support system, DART begins preparation for additional light rail and bus bridging for temporary parking. City of Richardson contacts local business close to light rail station to implement pre-agreed temporary parking. City of Richardson and City of Plano implement timing plans for freeway diversions.

7:00 a.m. Temporary parking lots have been started; DMS signs and static trailblazer signs provide direction to motorists to these locations. DART has begun bus bridge between the temporary lots and light rail stations. City of Richardson and City of Plano have implemented bus signal priority.

9:00 a.m. HazMat response has begun to clean-up the fuel spill. The commercial vehicle has been up-righted, and clearance of boxes in roadway has begun.

9:30 a.m. Since majority of rush hour is completed, DART begins to reduce its light rail service back to normal levels.

10:30 a.m. Clearance of boxes has completed, and some capacity is restored to the freeway, interchange ramps have all re-opened.

12:00 p.m. Roadway is back to normal operation.

8:00 p.m. Bus Bridge ends for the temporary parking lots.

Changes to Baseline Strategies:
The approach the US-75 Steering Committee has taken is to use the Daily Operations as the baseline for the strategies associated with the ICM, and then discuss what changes and additions are needed for the specific scenario. In the following tables, the stakeholders have identified some of the additional roles and responsibilities, and data and infrastructure required to have a corridor based response. In addition, the following changes to strategies were identified:

- Information sharing and distribution
- Operational efficiency at network junctions
- A common incident reporting system and asset management (GIS) system
- Modify transit priority parameters to accommodate more timely bus service and light rail service
- Emergency response signal priority
- En-route traveler information devices used to describe current operational conditions on another network(s) within the corridor

Table 5.6-3 Additional Roles and Responsibilities for Major Freeway Scenario

Stakeholder	Roles and Responsibilities
Texas DOT	**Monitoring** • On-going monitoring of response and flow on freeway system **Coordination** • Communication with on-scene emergency response • Communicate any changes to pre-planned response through decision support tool **Information Distribution** • Provide updated information on the incident as time goes by to the corridor ATIS and through center-to-center
City of Richardson	**Monitoring** • On-going monitoring of response and flow on freeway system and impact to arterials • Monitor arterial traffic flow **Coordination** • Communication with on-scene emergency response • Communicate any changes to pre-planned response through decision support tool • Outreach to local business for temporary parking (pre-arranged) • Traffic control for re-directing traffic to overflow parking • Bus signal priority for overflow parking locations **Information Distribution** • Provide updated information on the incident as time goes by to the corridor ATIS and through center-to-center on arterial traffic flow
City of Plano	**Monitoring** • On-going monitoring of response and flow on freeway system and impact to arterials • Monitor arterial traffic flow **Coordination** • Outreach to local business for temporary parking (pre-arranged) • Traffic control for re-directing traffic to overflow parking • Bus signal priority for overflow parking locations **Information Distribution** • Provide updated information on the incident as time goes by to the corridor ATIS and through center-to-center on arterial traffic flow

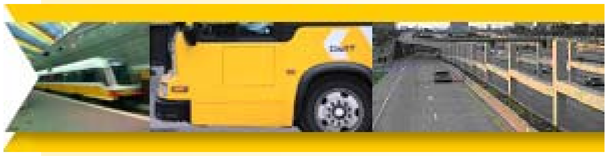


Table 5.6-3 Additional Roles and Responsibilities for Major Freeway Scenario (Continued)

Stakeholder	Roles and Responsibilities
DART	**Monitoring** • Monitor transit usage, provide additional vehicles (if needed) • Monitor parking availability • Provide shuttle bus service between rail stations and temporary parking lots • Provide connection protection • Monitor bus headways/schedules • Passenger counts **Coordination** • Inform cities when overflow parking is needed • Bus Bridge to overflow parking **Information Distribution** • Provide updated information on the incident as time goes by to the corridor ATIS and through center-to-center on transit capacity • Provide updated information on the incident as time goes by to the corridor ATIS and through center-to-center on parking availability

Additional Data and Infrastructure Needs:
Table 5.6-4 below, identifies the data needs by agency and if the asset is currently deployed or available.

Table 5.6-4 Additional Data and Infrastructure Needs for Major Freeway Scenario

Data and Infrastructure Needs ● = Needed, Currently Deployed ○= Needed, Not Deployed Data and Infrastructure Needs	Texas DOT	City of Dallas	City of Richardson	City of Plano	DART	NTTA	NCTCOG	City of University Park	Town of Highland Park
Highway Advisory Radio	○	○	○	○				○	○
Bus Bridge					●				
Light Rail Signal Priority		○	○	○				○	○
Bus Signal Priority		○	○	○				○	○
Emergency Vehicle Signal Pre-emption		○	●	●				○	○
Temporary Parking Lots – local business coordination		○	○	○			○	○	○
Incident Location	●	●	●	●	●	●		●	●
Incident Status	●	●	●	●	●	●		●	●
Incident Details	●	●	●	●	●	●		●	●

5.6.3. Major Transit Incident

The US-75 Steering Committee discussed various potential scenarios for disruption of the transit network, and tried to decide upon location, time-of-day, and incident parameters. In order to capture the various response strategies for a major transit incident, multiple transit modes and impacts could be shown. Based on time-of-day, the impact and necessary strategies could be determined. Some of the scenarios discussed included outage due to strikes, train breakdown, rail shutdown, major crime event, surface street intersection incident involving light rail, morning in-bound transit scenario, and evening out-bound transit scenario – each of these would require different strategies and responses. A LRT train hitting a pedestrian during evening peak volume period was decided upon due to: the need to shut both directions of travel down; the relatively high frequency of actual DART LRT pedestrian accidents; and due to the evening peak volume that LRT customers who are already in Dallas not having the option of working from home – as would be the case for a morning peak event.

Incident Description:
A pedestrian is hit by a DART Red Line LRT light-rail train at 4:30 p.m. After reporting the incident to DART dispatch personnel, the train operator is directed to hold the train at the Lovers Lanes station until emergency response arrives. The pedestrian accident leaves the LRT train in a position that is not blocking surface street arterial lanes.

Figure 5.6-3 Incident Location in DART Red Line (Source: NCTCOG dfwmaps.com)

Assumptions:

- Minor impact to arterial network travel conditions, outside of 2 block vicinity of incident
- Little/no impact to freeway travel conditions

Timeline:

4:30 p.m. Train operator radios pedestrian accident to DART dispatch, which then relays incident information and location to City of Dallas 911 dispatch.

4:35 p.m. Train ordered to remain in current location and exact location details are input into ICM System. DART and City of Dallas operators access TxDOT and City CCTV that are able to see incident scene and surrounding arterial network conditions.

4:37 p.m. Responders arrive on scene and begin relaying incident details, which are input into ICM system. DART enters incident information into DFW ATIS, and puts incident information out through vehicle and station DMS and PAs, as well as customer service and web trip planning services.

4:45 p.m. Incident responders relay that investigative operations will likely hold the train at current location and shutting down both directions of Red Line LRT for 2.5 hours. DART dispatch begins coordinating the transfer of Blue-Line LRT customers at the incident scene onto spare DART buses. Additionally, DART references ICM System Decision Support Tool for additional strategies based on modeling. Strategy of adding bus vehicles to adjacent lines, and beginning bus bridges to Red Line LRT are initiated.

5:00 p.m. City of Dallas sees DART bus lines have been increased and begins coordination for increased transit vehicle priority along City arterials.

7:30 p.m. DART verifies real-time ridership data and confirms ICM System Strategy to begin normal reduction in bus service due to time-of-day lower volumes. However, DART keeps the service higher than normal to accommodate for additional travelers using bus due to Red Line closure.

8:15 p.m. Incident investigative operations are finalized and Red Line LRT is reopened for travel. DART updates incident status in ICM System, as well as DFW ATIS.

Changes to Baseline Strategies:

The approach the US-75 Steering Committee has taken is to use the Daily Operations as the baseline for the strategies associated with the ICM, and then discuss what changes and additions are needed for the specific scenario. In the following tables, the stakeholders have identified some of the additional roles and responsibilities, and data and infrastructure required to have a corridor based response. In addition, the following changes to strategies were identified:

- Information sharing and distribution
- Operational efficiency at network junctions
- A common incident reporting system and asset management (GIS) system

- Modify transit priority parameters to accommodate more timely bus service and light rail service
- Emergency response signal priority
- En-route traveler information devices used to describe current operational conditions on another network(s) within the corridor
- Modify transit priority parameters to accommodate more timely bus service
- Modify HOV restrictions (increase minimum number from 2 to 4)
- Increase roadway capacity by using shoulders for traffic (peak periods)
- Add transit capacity (express bus service during peak periods) by adjusting headways and number of buses
- Add temporary new transit service (bus bridge)
- Peak spreading by outreach to media/commuters on ridesharing and telecommuting during closure of the section of rail

Table 5.6-5 Additional Roles and Responsibilities for Transit Scenario

Stakeholder	Roles and Responsibilities
Texas DOT	**Monitoring** • Strategies recommended by ICM Decision Support Tool • Strategies being carried out by ICM Stakeholders **Coordination** • Shared use and control of freeway CCTV able to see field conditions at incident scene, and/or traveling conditions around the incident scene **Information Distribution** • Incident information on freeway DMS
City of Dallas	**Monitoring** • On-going monitoring of incident response and status through voice/data communications and city CCTV • On-going monitoring of flow on arterial network • Strategies recommended by ICM Decision Support Tool • Strategies being carried out by ICM Stakeholders **Coordination** • Coordinate incident response with local public safety, including emergency vehicle signal priority • Coordinate on-site traffic control with City emergency response agencies and traffic control crews • Update signal timings to follow pre-planned response • Update Strategies being carried out on City arterial network in ICM System • Coordinate bus bridge and added bus service with DART **Information Distribution** • Incident information on City DMS

Table 5.6-5 Additional Roles and Responsibilities for Transit Scenario (Continued)

Stakeholder	Roles and Responsibilities
DART	**Monitoring** • Status and location of incident from vehicle and field/maintenance operators through DART System and voice communications • Strategies recommended by ICM Decision Support Tool • Strategies being carried out by ICM Stakeholders **Coordination** • Internal DART coordination between transit dispatch, field operations personnel, maintenance, and customer service offices through DART System • Enter and/or update incident information in ICM System • Coordination with City of Dallas (and other applicable cities) to increase transit signal priority requests • Coordination with City of Dallas public safety for traffic and incident management at incident scene **Information Distribution** • Incident location and status information to DFW ATIS for regional distribution • Coordination with local media and businesses for travel information distribution • Alert notifications and alternate route information through DART trip planning services (both phone and web) • Alert notifications at transit station DMS and PA systems

Additional Data and Infrastructure Needs:
Table 5.6-6 below, identifies the data needs by agency and if the asset is currently deployed or available.

Table 5.6-6 Additional Data and Infrastructure Needs for Major Transit Scenario

Infrastructure Needs ● = Needed for Scenario, Currently Deployed ○= Needed for Scenario, Not Deployed	Texas DOT	City of Dallas	DART
Transit schedules			●
Transit vehicle location			●
Available transit vehicles / location			●
Video images / snapshots	●	●	●
Incident location	●	●	●
Incident status / details	●	●	●
Emergency vehicle location		●	●
Contact lists	●	●	●
Incident Detection (call – in, other)		●	●
Incident Response Plans / Guidelines / Teams	○	○	○
Incident Reporting System (GIS, common display)	○	○	○
Transit Vehicle Location / GPS			●
Transit Public Address System			●
Public Safety CAD		●	●
Emergency vehicle priority / preemption (Intersection / Vehicles)		○	

5.7. WEATHER EVENT SCENARIO

The US-75 Steering Committee discussed various potential scenarios for weather events, how likely they could occur, and tried to decide upon specific events that currently occur. In order to capture the various response strategies for different types of weather, the committee discussed how each event impacts their current systems, and how often these events occur. It was also decided that depending on the weather event, location of impacts, and time of day – different responses would be needed. In order to discuss the various potential responses, the following events were discussed:

5.7.1. Rain

Rain does occur frequently, and have a general impact to the flow of traffic; this includes transit, freeway, and arterials, which usually decreases the average speed and decreases throughput of the corridor. Rain also does provide some impact to traffic signal systems in some areas, and reduces the speed of the light rail system. Several locations within the corridor lose power to the traffic signals during heavy rain events, which can cause various response strategies to be implemented (re-routing, police manually doing traffic control, etc.)

The strategies and responses to this scenario would be a subset of minor and major arterial scenarios, minor incidents on transit, and minor incidents on freeways.

5.7.2. Ice

Ice storms do occur a couple times per year on average in Dallas, and have tremendous regional impact. Since these events do not occur often, the agencies within the region do not have the resources (plows, salt trucks, etc.) that some northern locations that routinely have snow and ice would have. This causes various issues and incidents. Many of the businesses in the region will shutdown during ice storms, and in general discourage travel during these events.

Similar to rain, overall speeds decrease significantly and throughput increases. Also, incidents increase during this time on arterials and the freeway. One interesting side effect is also the impact on transit. The light rail system will sometimes be impacted due to ice that coats the power lines overhead of the vehicle and the contact between the vehicle and the power line is disrupted, causing shutdown of the vehicle. Overall, when discussing responses to this scenario, the committee focused more on the information needed and distributed to the public to try and reduce travelers during these events.

5.7.3. Ozone Alert / Action Day

Dallas is an air quality non-attainment area, and due to the heat during the summer months frequently has ozone alert and ozone action days. Part of the current response is to market heavily through the media, and ATIS systems. The committee also discussed the potential for using the ICM for additional mode shift to include increasing transit usage, and car pooling. Similar to a major freeway incident, temporary parking lots would be needed, to include bus bridges, and signal priority.

Table 5.7-1 Additional Roles and Responsibilities for Weather Event Scenarios

Stakeholder	Roles and Responsibilities
Texas DOT	**Monitoring** • On-going monitoring of response and flow on freeway system **Coordination** • Response requests for minor and major incidents during weather events **Information Distribution** • Update DMS with current information • Update Regional ATIS with current information
City of Dallas	**Monitoring** • On-going monitoring of response and flow on arterial system **Coordination** • Response requests for minor and major incidents during weather events **Information Distribution** • Update DMS with current information • Update Regional ATIS with current information

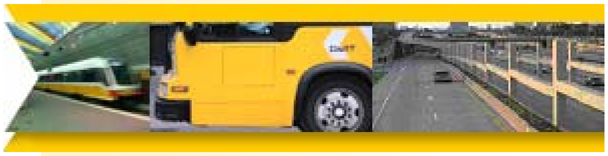


Table 5.7-1 Additional Roles and Responsibilities for Weather Event Scenarios (Continued)

Stakeholder	Roles and Responsibilities
City of Richardson	**Monitoring** • On-going monitoring of response and flow on arterial system **Coordination** • Response requests for minor and major incidents during weather events **Information Distribution** • Update DMS with current information • Update Regional ATIS with current information
City of Plano	**Monitoring** • On-going monitoring of response and flow on arterial system **Coordination** **Information Distribution** • Update DMS with current information • Update Regional ATIS with current information
DART	**Monitoring** • On-going monitoring of response and flow on transit system • On-going monitoring of response and flow on HOV system **Coordination** • Response requests for minor and major incidents during weather events **Information Distribution** • Update DMS with current information • Update Regional ATIS with current information
North Texas Tollway Authority	**Monitoring** • On-going monitoring of response and flow on tollway system **Coordination** • Response requests for minor and major incidents during weather events **Information Distribution** • Update DMS with current information • Update Regional ATIS with current information
Town of Highland Park	**Monitoring** • On-going monitoring of response and flow on arterial system **Coordination** • Response requests for minor and major incidents during weather events **Information Distribution** • Update DMS with current information • Update Regional ATIS with current information

Table 5.7-1 Additional Roles and Responsibilities for Weather Event Scenarios (Continued)

Stakeholder	Roles and Responsibilities
City of University Park	**Monitoring** • On-going monitoring of response and flow on arterial system **Coordination** • Response requests for minor and major incidents during weather events **Information Distribution** • Update DMS with current information • Update Regional ATIS with current information
North Central Council of Governments	**Monitoring** • Environmental Sensor Data **Coordination** • Regional Weather Data • Regional Air Quality Data **Information Distribution** • Air Quality Model results • Weather Service Information

The data and infrastructure needs listed in Table 5.7-2 below are only related to the specific weather information needs, for incidents occurring during these events on arterials, freeway, and transit the needs identified for those scenarios would be required.

Table 5.7-2 Additional Data and Infrastructure Needs for Weather Event Scenario

Data and Infrastructure Needs ● = Needed, Currently Deployed ○= Needed, Not Deployed	Texas DOT	City of Dallas	City of Richardson	City of Plano	DART	NTTA	NCTCOG	City of University Park	Town of Highland Park
Weather Information Data							●		
Air Quality Monitors							●		
RWIS – tied into regional ATIS	○	○	○	○	○	○	○	○	○
Weather Information – weather service	○	○	○	○	○	○	○	○	○
Marketing – public information (weather events)	●	●	●	●	●	●	●	●	●
Marketing – business outreach (weather events)	●	●	●	●	●	●	●	●	●
Light Rail – weather sensors/ monitoring					●				
Flood Detectors (critical field infrastructure locations in flood plain)	○	○	○	○	○	○		○	○