DuPage County
Transportation Coordination Initiative (TCI)

FINAL
IMPLEMENTATION PLAN

August 2007

Edwards and Kelcey

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DOCUMENT REVISION HISTORY

Integration Strategies and Technologies Issue No.	*Integration Strategies and Technologies Issue Date*	*Comment*
1.0	August 2007	Initial release

TABLE OF CONTENTS

TABLE OF ACRONYMS

AASHTO	American Association of State Highway and Transportation Officials
AVL	Automatic Vehicle Location
CAD	Computer-Aided Dispatch
CATS	Chicago Area Transportation Study
CCTV	Closed-Circuit Television
CMAP	Chicago Metropolitan Agency for Planning
CMAQ	Congestion Mitigation and Air Quality (Improvement Program)
CVO	Commercial Vehicle Operations
DMMC	DuPage Mayors and Managers Conference
DMS	Dynamic Message Signs
DOT	Division of Transportation
Du-COMM	DuPage Public Safety Communications
ESDA	Emergency Services and Disaster Agency
FHWA	Federal Highway Administration
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
GCM Corridor	Gary-Chicago-Milwaukee ITS Priority Corridor
GPS	Global Positioning System
HAR	Highway Advisory Radio
HOV	High Occupancy Vehicle (lane)
HRI	Highway Railroad Intersection
IDOT	Illinois Department of Transportation
IEMA	Illinois Emergency Management Agency
IEPA	Illinois Environmental Protection Agency
IFERN	Interagency Fire Emergency Radio Network
IREACH	Illinois Radio Emergency Assistance Channel
IRP	International Registration Plan
ISP	Illinois State Police
ISPERN	Illinois State Police Emergency Radio Network
ISTHA	Illinois State Toll Highway Authority
ITS	Intelligent Transportation Systems
ITSPO	Intelligent Transportation System Program Office
ITTF	Illinois Terrorism Task Force
IWIN	Illinois Wireless Information Network
LRTP	Long Range Transportation Plan
MABAS	Mutual Aid Box Alarm System
MDT	Mobile Data Terminal
MOE	Measures of Effectiveness
MPO	Metropolitan Planning Organization
NIMS	National Incident Management System
NTCIP	National Transportation Communications for ITS Protocol
PSAP	Public Safety Answering Point
RTA	Regional Transportation Authority
RTIP	Regional Transit ITS Plan

TABLE OF ACRONYMS

SAFETEA-LU	"Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users" – authorizing legislation for federal transportation programs (2005 – 2009)
SEDP	Strategic Early Deployment Plan
SEOC	State Emergency Operations Center
STIP	Statewide Transportation Improvement Plan
TEA-21	"Transportation Equity Act for the 21st Century" – authorizing legislation for federal transportation programs (1998 – 2004)
TCI	Transportation Coordination Initiative
TIMS	Traffic and Incident Management System (Illinois Tollway), Train Information Management System (Metra)
TIP	Transportation Improvement Plan
TMC	Traffic Management Center
TSC	Traffic Systems Center
USDOT	United States Department of Transportation

1. EXECUTIVE SUMMARY

1.1 Introduction

The DuPage County Transportation Coordination Initiative represents the efforts of numerous transportation stakeholders over a number of years to improve the operation and management of the transportation system in the county. As such, this initiative will provide recommendations for the deployment of ITS technologies and operational strategies that can maximize the capacity of the county network, reduce travel times, enhance incident management and coordination, and improve traveler information services throughout the county.

The DuPage County Transportation Coordination Initiative (TCI) Strategic Plan consists of the following documentation:

- Concept of Operations technical memorandum (which includes the stakeholder Needs Assessment technical memorandum)
- DuPage County Subregional ITS Architecture document
- Integration Strategies and Technologies technical memorandum
- ***Implementation Plan***

This Implementation Plan builds upon the findings in the TCI Integration Strategies and Technologies document, the TCI Concept of Operations, and the DuPage County Subregional ITS Architecture by identifying proposed projects to address the TCI needs identified in previous steps. The ITS Projects recommended in this document will provide the basis for planning, deployment, operation, and maintenance of these ITS in DuPage County for the next ten years.

Intelligent transportation systems can be defined as "the integrated application of sensor, computer, electronics, and communications **technologies and management strategies** to provide traveler information to increase the **safety and efficiency** of the surface transportation system." Or, simply put,

People using technology in transportation to save time, lives, and money

Before intelligent transportation systems can be effectively deployed, ITS stakeholders should come together to develop a common vision for ITS. This vision statement is a key component of the TCI Strategic Plan because it provides overall direction for the identification of stakeholder needs, operational concepts, potential ITS strategies and technologies, and ultimately the final recommendations. The TCI vision is:

"Build a resilient, sustainable, technologically advanced, multi-modal transportation system that provides practical, safe, accessible and coordinated movement of people and goods throughout DuPage County and the region"

As such, the Transportation Coordination Initiative is intended to provide recommendations for the deployment of ITS technologies and operational strategies in DuPage County that can maximize the capacity of the network. These deployments should:

- Improve traffic system performance and transit services
- Reduce travel times
- Enhance incident management and coordination
- Improve traveler information services throughout the County

1.2 Recommended Integration Strategies and Technologies

The Integration Strategies and Technologies document builds upon the findings in the Concept of Operations and DuPage County Subregional ITS Architecture by evaluating potential solutions to the TCI needs identified in previous steps. With the identified TCI needs as a starting point, 83 candidate operational strategies and transportation technologies, essentially potential ITS solutions, were identified which might be applied to address those needs.

While each of the potential ITS solutions would help to address the transportation needs of DuPage County, limits on available funding, staff, and other considerations require that they be compared to determine deployment priorities. A series of evaluation criteria were developed and applied to identify the following top-rated ITS solutions, listed below in Section 3.2.

1.3 ITS Projects

Based on a comprehensive evaluation that considered identified stakeholder needs, TCI Steering Committee input, and the results of a prioritization exercise by the Project Team, the following fifteen projects have been identified for deployment as part of the Transportation Coordination Initiative:

<u>System Design and Interagency Coordination Projects</u>

- *Traffic Incident Management (TIM) Work Group* - Traffic incident management stakeholders in DuPage County can form an informal work group for identifying needs and opportunities for improvements that relate to highway incident activities.
- *Quick Clearance Program Enhancement* – Building upon current quick clearance practices in the county, this project, to be addressed through the TIM Work Group, would evaluate current quick clearance practices and identify ways to improve, standardize, and promote these programs.
- *Multi-Jurisdictional Communications Channel Integration* - This project would build off existing efforts to provide a common frequency for responders to communicate directly with each other.
- *Countywide ITS System Design* - This project will consider how to deploy ITS in DuPage County by identifying requirements, roles and responsibilities, and deployment locations for the infrastructure projects described below, as well as a comprehensive transportation communications system.

<u>Infrastructure Projects</u>

- *Countywide Traffic Signal Optimization Plan* - This project would create updated and enhanced procedures and processes for the regular measurement, evaluation, and

optimization of traffic signals (and signal systems) across the county to improve traffic flow for both passenger cars and transit vehicles.

- *Advanced Traffic Management System* - Building on the signal optimization improvements described above, this project would implement system-wide traffic signal control improvements that will improve intra- and inter-jurisdictional signal coordination. In addition, providing the functionality associated with a countywide traffic management center (TMC) would greatly enhance the integration and interoperability of the numerous existing deployments, ongoing initiatives, and future deployments.
- *Integrated Expressway-Arterial Corridors* - This project would deploy ITS applications that support the coordinated management of traffic across jurisdictional boundaries and modes of transportation. This project would also provide enhanced traffic data collection capabilities through modifications to existing infrastructure and the application of established and emerging technologies to provide real-time data on county arterials.
- *Highway-Rail Information System* - This project will consist of systems to monitor the status of highway-rail crossings and provide real-time highway-rail blockage updates to emergency responders, traffic managers, and the traveling public.
- *Transit Signal Priority Coordination Plan* - This project centers on coordinating the deployment of TSP, which gives special treatment to transit vehicles at signalized intersections, in DuPage County.
- *Countywide Dynamic Message Sign (DMS) Deployment* - This project would include the procurement of Portable Dynamic Message Signs (PDMS), electronic signs that can be programmed to provide traveler information on a variety of topics such as incidents, construction and lane closures, special events and congestion.

Data Integration Projects

- *DuPage County Subregional Hub* - Building on recommendations from the "Feasibility Study for Multi-Jurisdictional Signal Timing and Monitoring in DuPage County, Illinois," this project would expand current DuPage County efforts to create a centralized data source that allows any participating agency to access traffic data across the county (e.g., tube counts, intersection turn movement counts, traffic signal timing plans, CCTV video).
- *DuPage County Gateway Integration* - With increased levels of arterial traffic data collection, storage, and processing through other proposed TCI projects, DuPage County will soon be able to add value to regional and countywide traveler information sources by linking to the Gateway.
- *DuPage County Construction Information System* - This project would be deployed to collect roadway construction and maintenance information from municipal transportation agencies across DuPage County, integrate this information into a single data source, and disseminate this information back to partner agencies and to the public.
- *DuPage County Traffic Accident Record System* - DuPage County is initiating this project to bring traffic accident data from local municipalities, the DuPage Sheriff's Office and the County Division of Transportation into one central traffic accident database.
- *Countywide Dynamic Alternate Route Plan* - This project would develop a GIS database that would provide multiple agencies with access to alternate route information as well as incident and emergency management information through a secure Internet website.

Each of these projects is described in detail in Section 4.

1.4 Implementation Strategy

While all of the proposed ITS projects in Section 4 are designed to meet the goals of the TCI, additional considerations must be addressed before they can be deployed to realize these goals, including operations and maintenance costs, anticipated benefits, project sequencing, available procurement methods, potential funding sources, legal issues, and any interagency agreements that may be necessary for successful project deployment and operation.

The conceptual work plans provided under each proposed TCI project description in Section 4 address the incremental phases or subtasks that are recommended to successfully implement the proposed TCI projects. The Implementation Strategy lists the estimated design and deployment costs (in 2007 dollars), as well as the ongoing operations and maintenance (O&M) costs associated with each of the proposed TCI projects. The O&M costs include equipment maintenance (e.g., equipment replacements, upgrades) and personnel wages. Recommended personnel skill sets and job descriptions for the proposed TCI projects are detailed in Section 5.

To parallel the costs outlined in this TCI Implementation Plan, anticipated project benefits are also documented in the project descriptions and summarized in the Integration Strategy. Benefits include improvements to safety, mobility, productivity, efficiency, energy & environment, information, and traveler satisfaction.

With each of these factors in mind, Table 1 provides an overall sequencing of the fifteen proposed TCI projects. This sequence is based on conceptual project costs (both design/deployment and operations/maintenance), anticipated benefits, identified "early winner" projects, interdependencies between projects (e.g., CCTV cameras must be deployed before CCTV video sharing can take place), and balancing overall costs between the short-, medium-, and long-term.

Table 1 – Proposed TCI Project Deployment Sequence

TCI Project	Estimated Deployment Costs*			
	Short-Term (1-2 years)	Mid-Term (3-5 years)	Long-Term (5-10 years)	Total
Traffic Incident Management (TIM) Work Group	$ -	$ -	$ -	$ -
Quick Clearance Program Enhancement	$ 25,000	$ -	$ -	$ 25,000
Multi-Jurisdictional Communications Channel Integration	$ -	$ 150,000	$ -	$ 150,000
DuPage County ITS System Design	$ 250,000	$ -	$ -	$ 250,000
Countywide Traffic Signal Optimization Plan	$ 150,000	$ 700,000	$ 250,000	$ 1,100,000
Advanced Traffic Management System	$ 550,000	$ 200,000	$ -	$ 750,000
Integrated Expressway-Arterial Corridors	$ -	$ 500,000	$ 900,000	$ 1,400,000
Highway-Rail Information System	$ -	$ -	$ 400,000	$ 400,000
Transit Signal Priority Coordination Plan	$ 25,000	$ -	$ -	$ 25,000
Countywide Dynamic Message Sign Deployment	$ 160,000	$ 160,000	$ 320,000	$ 640,000
DuPage County Subregional Hub	$ 50,000	$ 350,000	$ -	$ 400,000
DuPage County Gateway Integration	$ -	$ 50,000	$ -	$ 50,000
DuPage County Construction Information System	$ -	$ 150,000	$ -	$ 150,000
DuPage County Traffic Accident Record System	$ 180,000	$ -	$ -	$ 180,000
Countywide Dynamic Alternate Route System	$ -	$ -	$ 150,000	$ 150,000
Totals:	**$ 1,390,000**	**$ 2,260,000**	**$ 2,020,000**	**$ 5,670,000**

* 2007 dollars

Shaded projects are currently underway

2. INTRODUCTION

The DuPage County Transportation Coordination Initiative (TCI) Strategic Plan consists of the following documentation:

- Concept of Operations technical memorandum (which includes the stakeholder Needs Assessment technical memorandum)
- DuPage County Subregional ITS Architecture document
- Integration Strategies and Technologies technical memorandum
- ***Implementation Plan***

This TCI Implementation Plan is focused on identifying ITS projects that will involve a high degree of coordination among agencies in DuPage County, or projects that can be deployed primarily by DuPage County for the benefit of multiple stakeholders. This Plan builds upon the findings in the TCI Integration Strategies and Technologies document, the TCI Concept of Operations, and the DuPage County Subregional ITS Architecture by identifying proposed projects to address the TCI needs identified in previous steps. The ITS Projects recommended in this document will provide the basis for planning, deployment, operation, and maintenance of these ITS in DuPage County for the next ten years. This document represents the next step in the systems engineering process, depicted below in Figure 1.

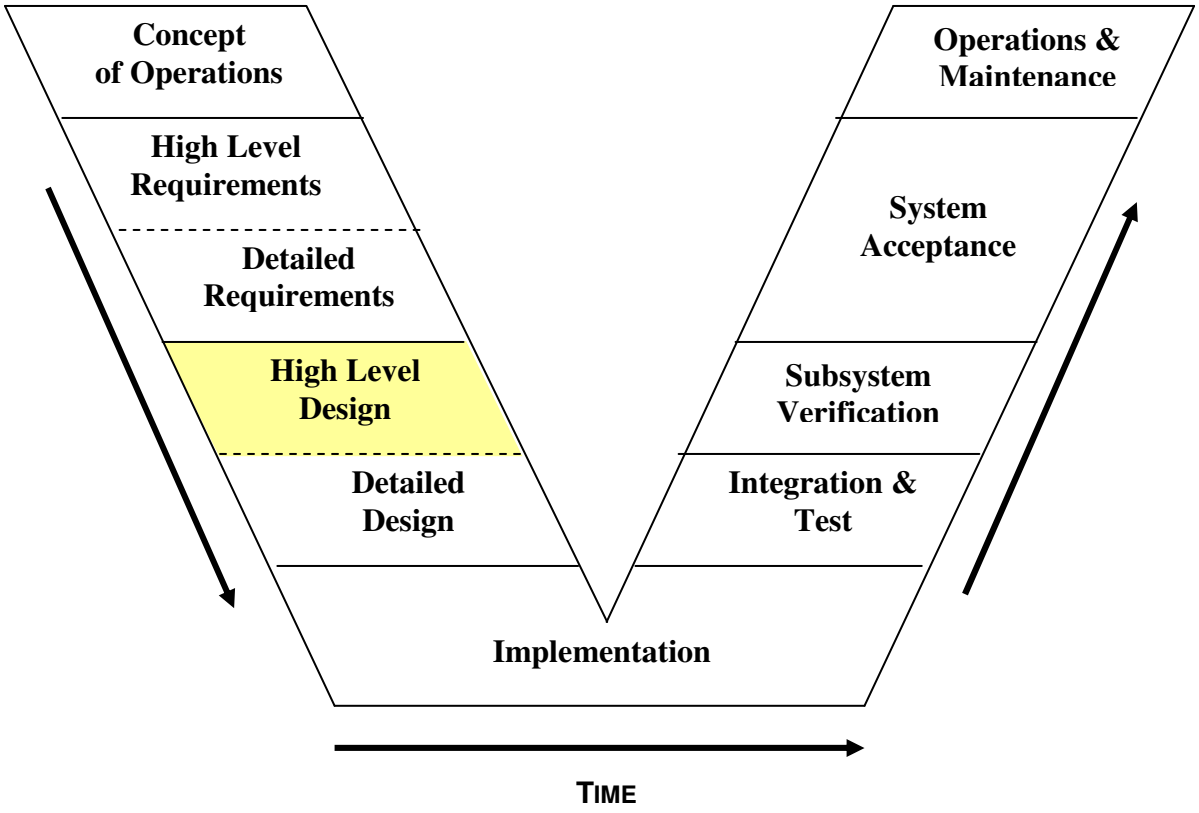


Figure 1 – "V" Diagram of Systems Engineering[1]

[1] Building Quality Intelligent Transportation Systems Through Systems Engineering, Mitretek, April, 2002.

2.1 The Transportation Coordination Initiative (TCI)

The DuPage County Transportation Coordination Initiative represents the efforts of numerous transportation stakeholders over a number of years to improve the operation and management of the transportation system in the County. The TCI builds upon work that began in the late 1990s with the development of the "Multi-Jurisdictional Signal Coordination and Monitoring Demonstration Project" and corresponding "Guidelines for the Implementation of Multi-Jurisdictional Signal Coordination and Monitoring."[2]

The TCI is led by a Steering Committee that consists of the following organizations/agencies:

- DuPage County Division of Transportation (DCDOT)
- DuPage Mayors and Managers Conference (DMMC)
- DuPage County Office of Homeland Security and Emergency Management (OEM)
- Illinois Department of Transportation (IDOT)
- Illinois State Toll Highway Authority (ISTHA)
- Regional Transportation Authority (RTA)
- Chicago Metropolitan Agency for Planning (CMAP)
- City of Naperville
- Village of Lombard
- Village of Oak Brook
- Village of Downers Grove

These agencies and many others have key roles in the development of the TCI Strategic Plan, including meeting participation, document review, and funding support.

The TCI is directed at four focus areas:

- **Arterial Operations** – improvements to local and regional traffic signal control and coordination, highway-rail intersection operations, and arterial-freeway link coordination
- **Transit Management** – improvements to transit efficiency and coordination with other transportation modes
- **Traffic Incident Management** – improvements to the detection, response, and resolution of planned and unplanned incidents on the transportation system
- **Traveler Information** – improvements to the collection, processing, and dissemination of timely, useful, and accurate traveler information

It is these four focus areas that serve as the basis for operational improvements as part of this document. Each focus area is discussed in greater detail in subsequent sections.

[2] Parsons Transportation Group, 2001.

2.2 Definition of Intelligent Transportation Systems (ITS)

Intelligent transportation systems can be defined as "the integrated application of sensor, computer, electronics, and communications **technologies and management strategies** to provide traveler information to increase the **safety and efficiency** of the surface transportation system." Or, simply put,

People using technology in transportation to save time, lives, and money

The most visible ITS components are the physical infrastructure that interfaces with the traveling public. This "intelligent infrastructure" includes the following components[3]:

- Arterial Management Systems
- Freeway Management Systems
- Transit Management Systems
- Incident Management Systems
- Emergency Management Systems
- Electronic Payment Systems
- Traveler Information
- Information Management
- Crash Prevention and Safety
- Roadway Operations and Maintenance
- Road Weather Management
- Commercial Vehicle Operations
- Intermodal Freight

In addition, emerging in-vehicle technologies are creating an "intelligent vehicle" initiative that includes the following components[4]:

- Collision Avoidance Systems
- Collision Notification Systems
- Driver Assistance Systems

In order for these intelligent transportation systems to be most effective, they must work together in an integrated manner. This less visible integration component requires various wireline and wireless communications systems to support the exchange of data between management centers, personnel, vehicles, field devices, and the traveling public.

Before this level of integration can be realized and ITS can be deployed, transportation managers must identify a framework upon which ITS should be built. This framework should:

- Identify ITS goals and objectives – a concept of how ITS will be operated;
- The various stakeholders and systems that are involved;

[3,4] USDOT ITS Joint Program Office website – Technology Overview

- The transportation services that partner agencies perform or plan to perform;
- Individual functional requirements for deployment of ITS;
- Functional links between partner agencies and the data exchanged over those links;
- Applicable standards that apply to the exchange of information; and
- Any applicable or necessary agreements between partner agencies.

Acknowledging the need for this framework before deploying ITS, in 2001 the Federal Highway Administration (FHWA) and Federal Transit Administration (FTA) developed a rule/policy that requires regions that plan to deploy ITS to develop a regional ITS architecture in order to receive Federal funding for such projects. As a result, various ITS architectures have been developed across the state and the region to provide a framework for the planning, deployment, and operation of ITS in Illinois.

There are several proven benefits to the implementation of ITS systems. These benefits are typically measured by an increase in system capacity/throughput, cost savings, increased customer satisfaction, reductions in delay/travel time, reduced energy usage/environmental impacts, and improved safety. ITS projects often provide a high return on investment, some with cost-to-benefit ratios of 20:1 or more, partly because they leverage existing infrastructure, instead of creating more infrastructure that must then be maintained.

2.3 TCI Vision

Before intelligent transportation systems can be effectively deployed, ITS stakeholders should come together to develop a common vision for ITS. This vision statement is a key component of the TCI Strategic Plan because it provides overall direction for the identification of stakeholder needs, operational concepts, potential ITS strategies and technologies, and ultimately the final recommendations.

During the project kickoff meeting held on March 23, 2006, key transportation and public safety representatives worked together to develop a vision for ITS in DuPage County. During the visioning exercise, a number of key words and phrases were considered for inclusion in the vision statement. These are:

- Coordination
- Communication
- Cooperation
- Promote true intermodal choices
- Resilient systems
- Efficient
- Safety
- Integrated
- Maintain a broader perspective
- Reliable
- Secured system
- Multi-jurisdictional integration
- Effective
- Dynamic
- Responsive
- Maintainable/sustainable
- User friendly
- Include public awareness
- National Incident Management System (NIMS)-compliant
- Simple/affordable in structure
- State of the art
- Keep it simple
- Building institutional and technological bridges

The resulting vision statement is:

> *"Build a resilient, sustainable, technologically advanced, multi-modal transportation system that provides practical, safe, accessible and coordinated movement of people and goods throughout DuPage County and the region"*

The vision statement is intended to serve as guidance for the planning and deployment of ITS in DuPage County for the next 10 years, and should be continually reevaluated to ensure that it accurately captures the needs and goals of travelers and transportation stakeholders in the region.

2.4 TCI Goals and Objectives

As traffic volumes and congestion grow, it has become evident that the physical infrastructure of the roadway system in DuPage County has a practical limit. As such, the Transportation Coordination Initiative is intended to provide recommendations for the deployment of ITS technologies and operational strategies in DuPage County that can maximize the capacity of the network. These deployments should:

- Improve traffic system performance and transit services – past studies in DuPage County have demonstrated that signal timing optimization and signal coordination can improve travel speeds and reduce delays.
- Reduce travel times – improvements to signal control systems in the last decade have kept average arterial travel times in DuPage County in check; these improvements will need to continue to keep pace with ever increasing traffic volumes.
- Enhance incident management and coordination – incidents account for at least half of non-recurring travel delay in urban areas[5]; improvements in traffic incident management (TIM) coordination between transportation agencies and emergency responders can result in reduced response times and thus reduced driver delay.
- Improve traveler information services throughout the County – through improved data collection, storage, processing, sharing, and dissemination, travelers in DuPage County can make better, more informed decisions.

Above all, recommendations resulting from the TCI should provide discrete objectives and actionable projects that will support these goals.

[5] Traffic Incident Management on Highways, Rutgers University

3. RECOMMENDED INTEGRATION STRATEGIES AND TECHNOLOGIES

The Integration Strategies and Technologies document builds upon the findings in the Concept of Operations and DuPage County ITS Architecture by evaluating potential solutions to the TCI needs identified in previous steps. The recommended ITS strategies and technologies address the four TCI focus areas:

- Arterial Operations
- Traffic Incident Management
- Transit Management
- Traveler Information and Data Management

3.1 Candidate Strategies and Technologies

With the identified TCI needs as a starting point, 83 candidate operational strategies and transportation technologies, essentially potential ITS solutions, were identified which might be applied to address those needs.

For the purposes of this analysis, TCI "strategies" and "technologies" can be defined as:

- **Strategy –** a plan or method for obtaining a specific goal or result. This may or may not be dependent upon a specific technology.
- **Technology –** electronic or digital products and systems considered as a group which can be employed for obtaining a goal or result.

3.2 Prioritization

While each of the potential ITS solutions would help to address the transportation needs of DuPage County, limits on available funding, staff, and other considerations require that they be compared to determine deployment priorities. A series of evaluation criteria were developed and applied to identify the following top-rated ITS solutions:

<u>Arterial Operations</u>

- Emergency Vehicle Preemption (EVP) Upgrades
- Traffic Signal Timing Optimization
- Regional Traffic Signal Coordination
- System Detection
- Traffic Management Center Functionality
- Traffic Signal Controller Upgrades
- Queue Detection Systems
- Vehicle Probes
- Traffic Signal Control System Improvements
- Traffic Forecast and Demand Management Algorithms
- Closed Circuit Television (CCTV) Surveillance
- Highway Rail Crossing Notification Systems

Traffic Incident Management

- Interagency Incident Responder Work Group
- Common Essential Information Dispatch Agreements
- Multi-agency Training and Exercises
- Promote Quick Clearance Practices
- Shared CCTV Surveillance Imaging
- Media Agreements for Video Sharing
- Integrated Communications Channels
- Co-located Emergency and Traffic Management Center

Transit Management

- Transit Trip Planning Coordination
- Transit Signal Priority
- Coordinated Multimodal Transportation Management Center
- Highway Shoulder Riding for Transit
- Transit Queue Jumping
- Active Transit Station Signs

Traveler Information and Data Management

- Compatible, Shared Base Mapping System
- Gateway Integration
- Shared Access to Atmospheric and Pavement Condition Sensors
- Existing Infrastructure Database
- Construction Information Database
- Shared Database/Map for Planned/Unplanned Events
- Alternate Route Plan Database
- Information Flow Mapping
- Corridor Action Teams
- Traffic Information Database
- Participation in 511 Services
- Traffic Accident Record System
- Dynamic Message Signs (DMS)

These are the potential ITS solutions that will be developed further in Section 4 of this TCI Implementation Plan.

4. PROPOSED TCI PROJECTS

The list of candidate ITS solutions in Section 3.2 was developed through input from the Project Team and TCI Steering Committee. This process considered the TCI goals, benefits to TCI stakeholders, existing systems, and estimated costs. As a third dimension of the evaluation process, each of these 39 solutions have also been compared to the key stakeholder needs identified in the TCI Concept of Operations document (see Table 2). Based on this comprehensive evaluation, the following fifteen projects have been identified for deployment as part of the Transportation Coordination Initiative (associated candidate ITS solutions addressed by each project are listed in parenthesis):

<u>System Design and Interagency Coordination Projects</u>

- *Traffic Incident Management (TIM) Work Group* (may include Common Essential Information Dispatch Agreements, and Multi-Agency Training Exercises)
- *Quick Clearance Program Enhancement*
- *Multi-Jurisdictional Communications Channel Integration*
- *Countywide ITS System Design*

<u>Infrastructure Projects</u>

- *Countywide Traffic Signal Optimization Plan* (includes Traffic Signal Controller Upgrades)
- *Advanced Traffic Management System* (includes Traffic Management Center Functionality, Traffic Signal Control Improvements, Coordinated Multimodal Transportation Management Center and Co-located Emergency and Traffic Management Center)
- *Integrated Expressway-Arterial Corridors* (includes System Detection, Queue Detection Systems, Vehicle Probes, CCTV Surveillance, Shared CCTV Surveillance Imaging, and Dynamic Message Signs)
- *Highway-Rail Information System*
- *Transit Signal Priority Coordination Plan*
- *Countywide Dynamic Message Sign (DMS) Deployment*

<u>Data Integration Projects</u>

- *DuPage County Subregional Hub* (includes Traffic Information Database)
- *DuPage County Gateway Integration* (includes Participation in 511 Services)
- *DuPage County Construction Information System*
- *DuPage County Traffic Accident Record System*
- *Countywide Dynamic Alternate Route System*

Each of these projects will be discussed in detail in the following subsections. This will include 1) the project title; 2) the applicable TCI focus area; 3) a project description; 4) the TCI stakeholder needs addressed; 5) ITS market packages addressed; 6) the project champion; 7) project partners; 8) any related or dependent projects; 9) a description of the conceptual project work plan; 10) potential benefits; 11) performance measures; 12) an estimated project timeframe; 13) a conceptual cost estimate; and 14) potential project funding sources.

Candidate ITS Solutions	Needs Category							
	Arterial Operational Efficiency	Communications Infrastructure	Data Management	Integration of Systems	Interagency Data Sharing	Operational Coordination	System Monitoring	Traveler Information Sources
Arterial Operations								
Emergency Vehicle Preemption (EVP) Upgrades	X		X					
Traffic Signal Timing Optimization	X							
Regional Traffic Signal Coordination	X			X		X		
System Detection	X		X				X	
Traffic Management Center Functionality	X	X		X		X		
Traffic Signal Controller Upgrades	X							
Queue Detection Systems	X					X	X	
Vehicle Probes	X						X	
Traffic Signal Control System Improvements	X					X		
Traffic Forecast and Demand Management Algorithms	X							
Closed Circuit Television (CCTV) Surveillance							X	
Highway Rail Crossing Notification Systems	X						X	X
Traffic Incident Management								
Interagency Incident Responder Work Group		X				X		
Common Essential Information Dispatch Agreements	X	X	X		X	X		
Multi-agency Training and Exercises	X	X	X			X		
Promote Quick Clearance Practices	X					X		
Shared CCTV Surveillance Imaging	X		X		X	X		
Media Agreements for Video Sharing					X			X
Integrated Communications Channels	X	X	X			X		
Co-located Emergency and Traffic Management Center	X	X	X	X		X		
Transit Management								
Transit Trip Planning Coordination	X							
Transit Signal Priority	X							
Coordinated Multimodal Transportation Management Center	X			X				
Highway Shoulder Riding for Transit	X							
Transit Queue Jumping	X							
Active Transit Station Signs								X
Traveler Information & Data Management								
Compatible, Shared Base Mapping System			X		X			
Gateway Integration			X		X			X
Shared Access to Atmospheric and Pavement Condition Sensors			X					
Existing Infrastructure Database			X					
Construction Information Database	X		X		X			
Shared Database/Map for Planned/Unplanned Events	X		X		X			
Alternate Route Plan Database	X		X		X			
Information Flow Mapping			X		X			
Corridor Action Teams								X
Traffic Information Database			X					
Participation in 511 Services								X
Traffic Accident Record System			X					
Dynamic Message Signs (DMS)								X

Top priority as identified by the TCI Steering Committee

Table 2 – Correlation of Candidate ITS Solutions to Identified TCI Stakeholder Needs

It is important to note that several transit projects in the candidate list are currently being considered, or have a pilot test deployment underway, by the RTA and/or Pace. These include Transit Trip Plan Coordination, Highway Shoulder Riding for Transit, Transit Queue Jumping, and Active Transit Station Signs. Since these projects will be led by RTA and/or Pace and their ultimate deployment within northeastern Illinois is contingent on decisions yet to be made, they are not pursued further in this TCI Implementation Plan. However, their inclusion in the TCI Implementation Plan is intended to demonstrate support by stakeholders in DuPage County for further investigation of these concepts.

4.1 System Design and Interagency Coordination Projects

Feasibility and coordination projects are focused on bringing together representatives from different agencies and functional areas to enhance system performance and traveler safety through improved management strategies and coordination. Through the projects listed in this section, transportation and emergency management agencies will have forums to collectively create and implement improvements to the transportation system in DuPage County.

4.1.1 TRAFFIC INCIDENT MANAGEMENT (TIM) WORK GROUP

Focus Area: Traffic Incident Management

Project description: Traffic incident management stakeholders in DuPage County can form an informal work group for identifying needs and opportunities for improvements that relate to highway incident activities. The group would coordinate with existing groups such as the Emergency Management Advisory Committee (EMAC) and the Crisis Management Team, supporting them by focusing on planning and management of TIM projects and initiatives. The members of this group would consist of frontline response personnel who deal with the unique problems associated with transportation related incidents on a daily basis. This places them in the best position to identify problems, needs, and potential solutions. Typically, groups of this can kind produce creative, low-cost solutions to recurring problems that impede their work. The group should meet regularly (e.g., quarterly) to oversee projects that address those needs and can also develop recommendations for improving policies, refining equipment issues, and recommending procedural changes.

During initial meetings of the DuPage County TIM Work Group, over forty projects have already been identified as ways to enhance TIM in DuPage County. These include initiatives that address improved incident awareness, response time, site management and motorist behavior during incidents. The list includes strategies for reducing the number and types of incidents, thereby reducing the need for response in the first place. The list also includes projects that deal with enhancing interagency communications, and cross training of personnel.

Needs Categories Addressed:

- Communications Infrastructure
- Operational Coordination

Market Packages Addressed:

- Traffic Incident Management Systems (ATMS08)

Project Champion: DuPage County Office of Homeland Security and Emergency Management and DuPage County Division of Transportation

Project Partners: DuPage County Sheriff, DuPage County Highway Maintenance Department, Illinois State Police, IDOT, ISTHA, DuPage County Chiefs of Police Association, DuPage Fire Chiefs Association, towing and recovery services, ambulance services, and municipal public works departments

Related/Dependent Projects: The work group's activities will tie into other proposed TIM projects in the county, including Quick Clearance Program Enhancement, Multi-Jurisdictional Communications Channel Integration, as well as other general enhancements in policies, procedures or equipment underway through other agencies. The group will also coordinate its activities with EMAC, the Crisis Management Team, and the Transportation Committee of the DuPage County Board.

Work Description: At a high level, TIM Work Group effort will include the following primary activities:

- Identify team members (and add members as appropriate)
- Hold regular meetings to determine and monitor short- and long-range tasks, (i.e., develop project concepts), debrief recent incidents, and conduct presentations on pertinent TIM topics
- Implement projects and track their success

Anticipated Benefits: Initially, the benefits of this project will be better awareness and coordination between participating agencies. As TIM projects are deployed, measurable benefits will be improved emergency response time and traveler safety, which will lead to reductions in secondary crashes, increased operational efficiencies, and reductions in travel times.

Performance Measures:

- Number of projects implemented
- Performance measures specific to the implemented projects, which may include:
  - Incident response time
  - Number of crashes (both primary and secondary)
  - Hours of training delivered

Timeframe: Short-term (1-2 years)

Conceptual Cost Estimate: This project can be implemented for approximately $5,000 per year for meeting materials, publications, and other administrative items, although this cost can be offset substantially by contributions of time and hosting of meetings by group members to support the group and to carry out administrative functions. TIM project costs would be dependant on the type of project and scale.

Funding Options: The cost estimate listed above only accounts for the development and coordination of TIM projects developed by the Work Group. This development and coordination

could be funded through a mix of Federal Congestion Mitigation and Air Quality (CMAQ) funds and contributions of administrative services from members of the work group.

The funds for each TIM project that the work group pursues would be identified in advance and could come from a variety of potential funding sources, including the Department of Homeland Security. Some projects, such as a recommendation for a change in policy or legislation, would require no outside costs.

4.1.2 QUICK CLEARANCE PROGRAM ENHANCEMENT

Focus Area: Traffic Incident Management

Project description: Incidents and stalled vehicles reduce the number of lanes available to traffic, causing significant traffic backups and the likelihood of secondary crashes. Quickly relocating these vehicles to areas of refuge can reduce congestion and increase traveler safety. Building upon current quick clearance practices in the county, this project, to be addressed through the TIM Work Group, would evaluate current quick clearance practices and identify ways to improve, standardize, and promote these programs. Through the collaborative nature of the TIM Work Group, members would develop and refine clearance procedures; identify potential resources, such as maintenance personnel and vehicles, to assist in response and clearance; and create interagency agreements to promote quicker incident response.

Needs Categories Addressed:

- Arterial Operations Efficiency
- Operational Coordination

Market Packages Addressed:

- Traffic Incident Management Systems (ATMS08)
- Roadway Service Patrols (EM05)

Project Champion: DuPage County Sheriff, Illinois State Police, DuPage County Chiefs of Police Association, DuPage Fire Chiefs Association, and towing and recovery services

Project Partners: DuPage County Division of Transportation, IDOT, ISTHA, and municipal public works departments

Related/Dependent Projects: As stated above, this project is related to the TIM Work Group which would serve as the multi-agency driving force for this project. Some municipalities within DuPage County have developed similar clearance procedures that would provide a starting point for this project. In addition, Lake County is already supporting changes in state law to allow local enforcement to move cars with minor damage. Under this program, DuPage County would determine whether it should support the language proposed by Lake County and, if it does, contact state legislators in the District and encourage them to support the legislation.

Work Description: At a high level, work on this project will include the following primary activities:

- Review quick clearance literature, including data available from existing DuPage quick clearance procedures and Lake County, to identify best practices
- Interview stakeholders to formulate outline of procedures
- Three meetings with stakeholders (could be combined with a TIM Work Group meeting)
- Create, review, and approve quick clearance policies and standards for DuPage County
- Provide training for quick clearance policies and standards
- Develop and implement public awareness campaign for quick clearance guidelines

Anticipated Benefits: An effective DuPage County Quick Clearance Program will reduce the duration of traffic incidents, which will increase road efficiency during incidents, reduce the possibility of secondary crashes, and improve overall traveler safety.

Performance Measures:
- Incident clearance times
- Number of secondary crashes
- Motorist delay (due to incidents)

Timeframe: Short-term (1-2 years)

Conceptual Cost Estimate: The initial cost of this project is estimated to be $15,000 to conduct a literature review, gather input from stakeholders, and develop standards. It would cost stakeholders another $5,000 to train the stakeholders and train operations staff in the quick clearance policy and standards. The public awareness campaign is estimated to cost an additional $5,000. Annual reviews and operations feedback could be conducted as part of a TIM Work Group meeting.

Funding Options: State or county funds could be applied to this project. Private towing and recovery industry groups might also be a source of funding, as these policies may benefit their operations.

4.1.3 MULTI-JURISDICTIONAL COMMUNICATIONS CHANNEL INTEGRATION

Focus Area: Traffic Incident Management

Project description: Integrating radio communications among agencies that respond to incidents is a priority to ensure timely coordination and an effective response. This project would build off existing efforts to provide a common frequency for responders to communicate directly with each other. This will also allow new agencies (e.g., highway maintainers, traffic managers, transit dispatchers and drivers) to become aware of incidents more quickly, as well as aid in incident reporting. Several common communications channels are or will be available in Illinois, including the satellite-based EMnet and DCERN for emergency communications between centers, IREACH for

interagency communications statewide, DIRS (interoperable radio frequencies used within DuPage County), and STARCOM21 (an 800 MHz trunk system for public safety communications statewide), and IFERN for fire personnel. This project will review the current practices in DuPage County, how the available systems fit with DuPage County stakeholder response practices, identify any technology needs for use of the frequencies, and procure and integrate the needed equipment. Through in-depth discussions with stakeholders and a review of both national and DuPage County practice, the County will determine the steps necessary to get responders talking on a common frequency.

Needs Categories Addressed:

- Arterial Operational Efficiency
- Communications Infrastructure
- Data Management
- Operational Coordination

Market Packages Addressed:

- Traffic Incident Management System (ATMS08)
- Disaster Response and Recovery (EM08)

Project Champion: DuPage County Office of Homeland Security and Emergency Management

Project Partners: Illinois State Police, Illinois Emergency Management Agency, Du-Comm, DuPage County Sheriff, municipal public safety and public works departments, ambulance services, DuPage County Division of Transportation , and Pace.

Related/Dependent Projects: This project builds off of communication projects and initiatives already being pursued in Illinois and DuPage County, namely the EMnet system, DCERN, STARCOM21, DIRS, and IREACH.

Work Description: At a high level, work on this project will include the following primary activities:

- Review national best practices for interagency incident communications
- Review local practices for interagency incident communications, including meetings with stakeholders
- Identify redundancies and gaps, identify recommendations for multi-jurisdictional communications channel integration, develop plan for implementation
- Identify funding sources and procure equipment
- Integrate and test equipment
- Provide training for system users

Anticipated Benefits: This project will decrease multi-jurisdictional emergency response time, which will reduce the number of secondary crashes. This project will also promote inter-jurisdictional coordination and increase ease of information sharing between agencies, especially between emergency and transportation agencies.

Performance Measures:

- Number of responders from different agencies able to communicate directly with each other
- Number of incidents for which the equipment is used
- Incident response time
- User satisfaction/surveys of usefulness

Timeframe: Mid-term (3-5 years)

Conceptual Cost Estimate: The initial identification of gaps and development of an implementation plan should cost approximately $20,000. This effort, best developed through the TIM Work Group, would encourage participation of transportation agencies in incident response. Procurement and integration of a new interoperable radio system could cost between $100,000 to $1 million, depending on the equipment required and the number of stakeholders requiring new equipment. Instead, existing systems should be used to involve new agencies in incident management. This would require the purchase of radios or user consoles for additional participating agencies. As an example, the procurement of one EMnet console and user license would cost approximately $6,000. For cost estimation purposes, 20 agencies are assumed to require such equipment. The on-going operations and maintenance of the system would be $1,000 per year per agency.

Funding Options: Federal funds through the CMAQ program are one potential funding source for this project. Funds from the Department of Homeland Security or IEMA could also be applied to this project because it would be utilized during security events.

4.1.4 COUNTYWIDE ITS SYSTEM DESIGN

Focus Area: Arterial Operations, Traveler Information and Data Management

*Project description: T*he Transportation Coordination Initiative has followed the systems engineering process depicted in Figure 1. To promote the coordinated deployment of infrastructure projects described in Section 4.2, a Countywide ITS System Design will be conducted to continue this process. This conceptual design will consider how to deploy ITS in DuPage County by addressing the following:

- An advanced traffic management system (ATMS) for traffic signal control and ITS field devices (see Section 4.2.2);
- A DuPage County Virtual Traffic Management Center (TMC) (see Section 4.2.2);
- ITS field devices, specifically arterial vehicle detection systems, dynamic message signs (DMS) and closed-circuit television (CCTV) cameras (see Section 4.2); and
- A comprehensive transportation communications system to collect data from field devices and share that data with partner agencies. In the 21st Century, broadband communications will dominate the telecommunications infrastructure. This will result from the total transition of information from the analog to the digital domain and the expanded use of Internet protocols, including commercial television programming. To satisfy this need to transport vast amounts of data and information, new opportunities and methods will be developed to provide communications for transportation needs and other County requirements. This conceptual design will examine those current and potential

requirements; look at methods being used in other regions of the country (such as private networking, leased services, and public/private partnerships) for development; and evaluate their potential for addressing the DuPage County requirements. The final result will be a communications plan for the County that will share the benefits of this communications evolution.

The Countywide ITS System Design will identify requirements associated with each of these items, define roles and responsibilities for champion and partner agencies in the use of these tools, and specify deployment locations for ITS field devices and communications elements.

Needs Categories Addressed:

- Communications Infrastructure
- Integration of Systems
- Interagency Data Sharing
- System Monitoring

Market Packages Addressed: None

Project Champion: DuPage County Division of Transportation

Project Partners: IDOT, Illinois Tollway, local municipalities, DuPage County Office of Homeland Security and Emergency Management, DuPage County Sheriff

Related/Dependent Projects: Advanced Traffic Management System, Integrated Expressway-Arterial Corridors, Countywide DMS Deployment

Work Description: This project will create a DuPage County System ITS Design, which will include the following elements, and tasks associated with each:

- Advanced Traffic Management System (ATMS) Assessment – identify ATMS requirements, evaluate alternatives for an ATMS, and develop a request for proposals (RFP) or related documents for ATMS selection, procurement and deployment
- DuPage County Virtual Traffic Management Center (TMC) Deployment Plan – build upon the TCI Concept of Operations to develop a multi-agency concept of operations for the Virtual TMC, build upon the applicable components of the DuPage Subregional ITS Architecture to identify requirements for TMC software and hardware and data flows for the Virtual TMC, and create a detailed deployment schedule for system components
- ITS Field Device Deployment Plan – identify deployment locations, develop requirements, create an operations plan, and develop device control/data sharing agreements for the use of vehicle detection systems, dynamic message signs (DMS), and closed-circuit television (CCTV) cameras across the county
- Communications Plan for Transportation Systems – conduct best practices review and identify integration opportunities, identify current and individual project communications requirements for transportation and emergency operations, identify limitations or issues associated with public/private partnering in DuPage County, and develop a strategic vision and migration plan from existing communications usage to future communications infrastructure and applications

Performance Measures: See performance measures for individual infrastructure projects in Section 4.2.

Timeframe: Short-term (1-2 years)

Conceptual Cost Estimate: This study, including all tasks listed above, could be completed for approximately $250,000.

Funding Options: This project could apply Federal funds from the CMAQ, or ITS Research Program, National Highway System (NHS), or Surface Transportation programs.

4.2 Infrastructure Projects

Infrastructure projects provide the tools for transportation and emergency managers to monitor the roadway network, implement traffic system performance and transit service improvements, and inform the public about current network conditions.

4.2.1 COUNTYWIDE TRAFFIC SIGNAL OPTIMIZATION PLAN

Focus Area: Arterial Operations

Project description: This project would create updated and enhanced procedures and processes for the measurement, evaluation, and optimization of traffic signals (and closed-loop signal systems) across the county to improve traffic flow for both passenger cars and transit vehicles. At present, many traffic agencies in DuPage County conduct traffic counts on an as-needed basis, while DCDOT conducts regular traffic count every two or three years. DCDOT uses all of the data to update its countywide Synchro® model, which is then used to identify potential signal timing improvements. Coordination and standardization of traffic data collection, storage, and reporting among agencies would reduce the duplication of efforts and improve the uniformity and reliability of the data.

In addition, through improved and increased vehicle detection methods described in Section 4.2.3, more real-time traffic data will become available (e.g., traffic volumes, travel times). By using existing tools like the countywide Synchro® model, this larger pool of data will allow traffic agencies in DuPage County to quickly identify where signal timing improvements can be made. Identification and implementation of these more frequent improvements may require additional traffic staff or outside support.

With the County's use of closed-loop signal systems, it should be aware of a new means of enhancing their operation. The FHWA, in partnership with Siemens, Purdue University and the University of Arizona, is currently developing an adaptive control software (ACS) intended for use in small and medium-sized communities called "ACS-Lite." According to the FHWA, ACS-Lite is designed for closed-loop systems and will be a low-cost, distributed system that operates

in real-time with new and existing signals, adjusting signal timing at the field controller to accommodate changing traffic patterns and ease traffic congestion. ACS-Lite will be rolled out over the next two years by FHWA and will be available from multiple vendors (including Econolite, the County's signal control vendor). DuPage County should consider ACS-Lite as an option in considering how best to improve traffic signal coordination throughout the county.

Needs Categories Addressed:

- Arterial Operational Efficiency

Market Packages Addressed:

- Surface Street Control (ATMS03)

Project Champion: DuPage County Division of Transportation

Project Partners: Municipalities, IDOT District 1 Bureau of Traffic

Related/Dependent Projects: Advanced Traffic Management System, Integrated Expressway-Arterial Corridors, Transit Signal Priority, DuPage County Traffic Accident Record System, DuPage County Subregional Hub

Work Description: Before moving into the first phase of this project, it would be beneficial to establish a multi-agency DuPage County Arterial Management (DCAM) Team that would meet on a regular basis to discuss traffic signal operations and address arterial ITS issues and priorities. This group would also help build momentum and multi-agency support for implementation of the Signal Optimization Plan. A first topic of discussion for the group should be how to improve the collection, storage, and reporting of traffic counts across the county. Once the count data format is standardized, the data can be more easily shared across jurisdictional boundaries. In addition, the data can be used with the countywide Synchro® model to identify multi-agency signal timing improvements.

The first phase of the project would review and update current performance data and revise the list of most heavily congested corridors and intersections. Later phases of the project would consider other congested corridors based on the current countywide Synchro® model. Priority should be placed on transit routes with the highest ridership volumes. Based on stakeholder input, the current Synchro® model analysis, and the results of the most recent countywide travel time analysis, the corridors and intersections for Phase 1 should include, but not be limited to:

<u>Highest Congestion Corridors</u>

- 75th Street (EB, WB) between Olympus Drive and Wherli Road, and between Lemont Road and Plainfield Road
- Army Trail Road (WB) between Glen Ellyn Road and County Farm Road
- IL 19 (Irving Park Road) (EB, WB) between IL 83 and Taft Avenue
- IL 38 West (Roosevelt Road) (EB) between Naperville Road and Summit Avenue
- IL 56 East (Butterfield Road) (EB) from Finley Road to Summit Avenue
- US 20 West (Lake Street) (WB) from County Farm Road to Green Brook Blvd (East, West) and from Mill Road to Villa Avenue

- US 34 (Ogden Avenue) (EB, WB) between Naper Boulevard and IL 59
- Roselle/Bloomingdale (SB) between N Brandon Drive and Army Trail Road
- Summit/Cass Avenue (NB, SB) between Plainfield Road and Ogden Avenue
- Finley/Belmont Road (NB) between 63rd St. and Roosevelt Road
- IL 59 (SB) between 75th Street and I-88
- Highland/Lemont Avenue (NB/SB) between 75th St. and Roosevelt Road
- Naperville/Naper Road (NB) between Ogden Avenue and Roosevelt Road

Highest Congestion Intersections

- Aurora Avenue and IL 59
- IL 64 (North Avenue) and Swift Road
- US 20 (Lake Street) and Addison Road
- I-88 WB Ramp and IL 59
- Army Trail Road and County Farm Road
- 75th Street and IL 53
- 55th Street and Cass Avenue
- IL 38 (Roosevelt Road) and Winfield Road
- Army Trail Road and Bloomingdale Road
- 22nd Street and IL 83

The current traffic model would then be used to evaluate signal timing and coordination alternatives for the highest priority corridors. This optimization process will consider interconnecting nearby intersections, multi-jurisdictional signal coordination, changes in signal phasing, and upgrading traffic signal equipment. Optimized timings (which may require hardware upgrades) would be implemented on a priority basis. Through this process, procedures would be developed for regular system evaluation and prioritization.

In later phases of the project, real-time data at each intersection and corridor would be used to update the countywide Synchro® model on a more frequent basis. Procedures developed in the first phase would be applied and improved.

Related to this project, many signals within the highest congestion corridors are not currently linked to nearby signal systems, which may be contributing to some of the current congestion issues. As future resurfacing or reconstruction projects are developed in the highest congestion corridors, the following traffic signals should be interconnected to nearby existing signal systems to permit coordinated signal operation:

- Mall Entrance near 320 W. Army Trail Road (Bloomingdale)
- Elm Street and Naperville Road, Farnham Lane and Naperville Road (Wheaton)
- Columbia Street and Ogden Avenue (Naperville)
- Greene Road and 75th Street, IL 53 and 75th Street, Woodridge Drive and 75th Street (Woodridge)
- Hobson Road/59th Street and Belmont Road, Maple Avenue and Belmont Road, Curtiss Street and Belmont Road, Warren Avenue and Belmont Road, Prairie Avenue and Belmont Road (Downers Grove)

- Opus Place and Finley Road, Business Entrance and Finley Road, Brook Drive and Finley Road, Eisenhower Lane and Finley Road, 22nd Street and Finley Road (Downers Grove)
- Maple Avenue and Main Street, Grant Street and Main Street, 39th Street and Main Street, Hospital Entrance and Main Street (Downers Grove)
- E. Traube Avenue and Cass Avenue, W. Traube Avenue and Cass Avenue, 55th Street and Cass Avenue (Westmont)

Anticipated Benefits: Benefits from this project should include reductions in traffic delays, a decrease in travel times, a decline in crash frequency, a reduced number of stops, and reduced emission levels.

Performance Measures:
- Intersection delay (seconds/vehicle)
- Travel times (minutes/corridor)
- Customer satisfaction
- Crash frequency
- Number of stops
- Emission levels

Timeframe: The DCAM Team should be established in the short-term (1-2 years), preferably within 6 months, and meet on an ongoing basis to enable deployment phases of the project. Phase one: short-term (1-2 years) and subsequent phases: medium- and long-term (3+ years).

Conceptual Cost Estimate: Administration of the DCAM Team would cost approximately $5,000 annually, exclusive of staff time, which would include the facilitation of regular meetings, production of publications, etc. (considered operations and maintenance costs).

Based on similar signal optimization projects deployed elsewhere, the cost to upgrade and optimize an isolated signal is approximately $10,000. This includes the cost to analyze and implement the optimized signal timings, along with any associated hardware upgrades. However, most of the signals in Phase 1 of this project are part of an existing signal system, meaning that optimization of these signals could be done in groups, as opposed to isolated intersections. As such, the estimated optimization cost for intersections within a system is $5,000 per signal.

The highest congestion corridors/intersections listed above include a total of 174 traffic signals. Of these, 152 are included in one of the 28 existing signal systems, and 22 are isolated signals. The resulting cost of optimizing these areas of highest congestion is estimated at $1,100,000. In the future, isolated signals within these corridors (e.g., Finley/Belmont Rd. [NB] between 63rd St. and Roosevelt Rd.) should be considered for interconnection to improve traffic progression. The ongoing costs of signal system optimization should be approximately $5,000 per intersection.

This project would also require additional internal or external staff to perform regular system timing optimization. Operations costs associated with this staff are discussed in Section 5.1.2.

Funding Options: Traffic signal timing improvements can reduce congestion and the degradation of air quality that vehicle emission cause. As such, Congestion Mitigation and Air Quality (CMAQ) or Surface Transportation Program (STP) funding can be applied to this project.

4.2.2 ADVANCED TRAFFIC MANAGEMENT SYSTEM

Focus Area: Arterial Operations, Traffic Incident Management

Project description: DuPage County is similar to most counties and municipalities in that traffic signal operations form the backbone of its transportation management responsibilities. This project builds upon the traffic signal optimization improvements described in Section 4.2.1 and implements an advanced traffic management system (ATMS) to provide real-time, system-wide traffic signal control and arterial traffic operations monitoring and management capabilities. Implementation of the ATMS would begin with high-priority DuPage County arterial routes identified in Section 4.2.1, and then expand over the longer term to encompass the entire network of County signals. In addition, the signal systems of other TCI stakeholders (i.e., IDOT and municipalities) should be incorporated into the ATMS as agreements are reached between DCDOT and its partner agencies.

This project is consistent with the "Guidelines for the Implementation of Multi-Jurisdictional Signal Coordination and Monitoring" document prepared six years ago on behalf of the DuPage Mayors and Managers Conference (DMMC.) This study stated that "As a county TMC is designed and implemented and more dynamic operation is desired, distributed/centralized control that can operate with or without on-street masters should come into play."[6] The ATMS would ultimately provide the improvements to intra- and inter-jurisdictional signal system coordination envisioned in the DMMC study.

Other field devices, such as CCTV surveillance and DMS are slowly but steadily being deployed on arterial roadways throughout northeastern Illinois and across the country, mostly in urbanized areas. As such, the selection process for the ATMS should also include requirements to control and operate other ITS field elements (e.g., dynamic message signs [DMS], CCTV cameras, queue detection systems) as they are deployed as a part of other proposed TCI projects. There are software package solutions with varying functionality available from multiple vendors that can operate and control traffic signals and these other ITS elements. These software packages continue to enhance their capabilities on an ongoing basis. The selection of the ATMS software that best serves the needs of DuPage County and its partner agencies should be undertaken as a part of the DuPage County ITS System Design project.

One of the recommended requirements for an ATMS is full remote access. That way, even though the ATMS would be based at DCDOT, access to the system would be possible from virtually any location, including partner agency facilities. This permits deployment of what could be termed a **DuPage County "Virtual Traffic Management Center."** With a Virtual TMC, a system operator with appropriate user permissions could access traffic management and monitoring applications on any workstation connected to the network. These applications could include traffic signal, DMS, and CCTV camera control; data management tools described in

[6] Parsons Transportation Group, 2001.

Section 4.3; and other existing data available to maintenance dispatchers (e.g., weather information).

Traditionally, a "bricks and mortar" TMC was required in order to provide the same functionality that the County and its partner agencies can now obtain with a Virtual TMC. The Virtual TMC concept provides a more cost-effective means to meet the identified needs that have been expressed through the outreach efforts, which are to maintain local control of ITS applications and cooperation with emergency services, while still permitting a high-level perspective on traffic operations within the county. A Virtual TMC also enhances the integration and interoperability of the numerous existing deployments, ongoing initiatives and future deployments.

The collection and distribution of transportation data and real-time traveler information to other agencies and the traveling public has also become an important component of ITS deployments. Overall, the Virtual TMC should include the following functionality, at a minimum:

- Control and operate traffic signals and ITS field devices
- Share data and traveler information with other agencies
- Support evacuation and major route detour traffic in coordination with emergency management agencies
- Coordinate operations between transportation operations agencies
- Provide traveler information
- Archive transportation data
- Collect road condition data

The virtual nature of the DuPage County TMC will facilitate a cost-effective means of including an ATMS workstation at a transit or emergency response management center (e.g., DuPage County Emergency Management Center, DuPage County Sheriff Communications Center) and other traffic management centers (e.g., Illinois Tollway). Access to the virtual network by these agencies would aid in effective operational coordination and information sharing. However, DCDOT and other transportation agencies should retain management of the arterial operations for their respective networks.

Over the long term, as more traffic signals and ITS devices are brought online as a part of the ATMS, a dedicated DuPage County TMC facility may become desirable. This option should be reevaluated if co-location with an emergency, or transit, management center is an option in the future. Co-location would provide additional space and make a "bricks and mortar" TMC more cost-effective.

Communications links are the lifeblood of an ATMS, providing the means by which data and information can be exchanged. As such, a critical factor in the successful deployment of the Virtual TMC will be the communications links required among field devices, DCDOT, and partner agencies. The DuPage County Subregional ITS Architecture provides a starting point for identifying data sharing needs between system elements. Overall communications requirements will be identified and defined in the DuPage County ITS System Design Project (Section 4.1.4).

Needs Categories Addressed:

- Arterial Operations Efficiency
- Communications Infrastructure
- Integration of Systems
- Interagency Data Sharing
- Operational Coordination

Market Packages Addressed:

- Surface Street Control (ATMS03)
- Traffic Information Dissemination (ATMS06)
- Regional Traffic Control (ATMS07)
- Virtual TMC and Smart Probe Data (ATMS12)
- Rail Operation Coordination (ATMS15)
- Emergency Routing (EM02)
- Disaster Traveler Information (EM10)

Project Champion: DuPage County Division of Transportation

Project Partners: Local municipalities, IDOT, ISTHA, DuPage County Sheriff, DuPage County Highway Maintenance Department, DuPage County Office of Homeland Security and Emergency Management, Illinois State Police, DuPage County Chiefs of Police Association, DuPage Fire Chiefs Association, towing and recovery services, ambulance services

Related/Dependent Projects: Countywide Traffic Signal Optimization Plan, Integrated Expressway-Arterial Corridors, Transit Signal Priority Coordination Plan, Countywide Dynamic Message Sign (DMS) Deployment, DuPage County Subregional Hub, DuPage County Gateway Integration, DuPage County Construction Information System, DuPage County Traffic Accident Record System, Countywide Dynamic Alternate Route Plan

Work Description: Deployment of the ATMS and Virtual TMC should be undertaken in phases. The first phase, to be addressed by the DuPage County ITS System Design, and will include:

- Development of an ITS field device implementation plan (see Section 4.2.3)
- Development of detailed ATMS software requirements (see below)
- Communications and Virtual Traffic Management Network requirements
- Development of detailed ATMS hardware requirements
- Development of detailed staffing and training requirements

The second phase of the work would involve:

- Procurement and installation the ATMS software, hardware, and related communications/network infrastructure
- Integration of the various systems and components
- Acceptance testing and verification/validation
- Revisions or updates, as required

It is critical that both internal and external stakeholders and partner agencies and organizations be included in the development of the ATMS and Virtual TMC, such as the DuPage County Sheriff and Office of Emergency Management, municipal public works departments, and county/regional transit agencies. Potential ATMS software solutions will be evaluated and selected by DCDOT and the multi-agency DCAM Team as part of the DuPage County ITS System Design. This process should begin with the identification of system requirements, followed by the issuance of a request for proposals (RFP), and concluded with vendor selection. Below is a listing of suggested ATMS requirement categories:

- Software
  - Traffic management – minimum number of traffic signals/signal systems, timing plan flexibility, links with traffic capacity analysis software (e.g., Synchro®)
  - Data collection – minimum number of data collection field devices, data polling rates, data storage, reporting, links with the DuPage County Traffic Accident Record System
  - Video management – minimum number of CCTV cameras, camera control, video viewing/sharing
  - Information dissemination – minimum number of DMS, DMS messaging, message library
  - Incident management – incident response plans, reports, links with the DuPage County Construction Information System or Countywide Dynamic Alternate Route Plan
  - System administration – minimum number of system users, system user access, graphical user interface, configuration management
- Hardware – server and workstation specifications, communications equipment requirements, warranty
- Support – availability of vendor technical support, response time limits
- Training – amount and content of training sessions, reference materials

A prioritization exercise will be conducted to determine the order in which traffic signal systems should be brought into the ATMS. At present, there are approximately 880 traffic signals in DuPage County (County, IDOT, and municipal), including approximately 490 signals under DuPage County jurisdiction. Roughly 80% of the County signals are included in one of 40 interconnected signal systems. These signals, and an additional 31 isolated County signals, are currently linked to DCDOT via dial-up telephone lines. Since upgrading the existing communications links will be less costly than deploying new links, these signals and signal systems will be the first to be incorporated into the ATMS. Cross-referencing the highest congestion signal systems discussed above in Section 4.2.1, the following systems should be integrated into the ATMS first:

- 75th Street (Fort Hill Drive to Ranch View Drive and Dunham Road to Fairview Avenue)
- Army Trail Road (County Farm Road to Merbach Drive, Gary Avenue to Schmale Road, Cardinal Drive to Whitman Drive, and Regency Drive to Brookdale Drive)
- IL 19 (Irving Park Road) (Spruce Avenue to York Road and Oleary Drive to Taft Avenue)
- IL 38 West (Roosevelt Road) (Warrenville Road to I-355 and Lloyd Avenue to Summit Avenue)
- IL 56 East (Butterfield Road) (Lloyd Avenue to Downers Drive)

- US 20 West (Lake Street) (Barrington Road to Rodenburg Road and JF Kennedy Drive to Walnut Street)
- US 34 (Ogden Avenue) (Trade Street to Beaumont Drive, Fort Hill Drive to Quincy Avenue, Aurora Road to Loomis Street, and Iroquois Boulevard to Naper Road)
- Roselle/Bloomingdale (Sidney Avenue to Brandon Drive)
- Summit/Cass Avenue (Plainfield Road to 75th Street, 67th Street to 59th Street, and Richmond Street to Chicago Avenue)
- Finley Road (IL 38 to Lacey Road)
- IL 59 (Beebe Drive to Meridian Parkway and Aurora Road to I-88 WB ramps)
- Highland/Lemont Avenue (75th Street to Pinewood Lane, 67th Street to 59th Street, Maple Avenue to Prairie Avenue, and 31st Street to 22nd Street)
- Naperville/Naper Road (Old Plank Road to Butterfield Road and Butterfield Road to Danada Road)

Existing dial-up communications links to these signal systems (30 total) will be upgraded over the long-term, incorporating more than 150 signals into the ATMS in the next ten years. In subsequent stages, additional existing and new signals would be brought into the ATMS as funding becomes available.

Anticipated Benefits: Implementation of this project should bring about a reduction in travel times, decrease in corridor delays and total number of stops, decline in fuel consumption, faster incident response times, reduction in incident rates, and increased availability of timely and accurate traveler information.

Performance Measures:
- Intersection delay (seconds/vehicle)
- Travel times (minutes/corridor)
- Incident response time
- Customer satisfaction
- Fuel consumption
- Number of stops

Timeframe: Begins in the short-term (1-2 years)

Conceptual Cost Estimate: The conceptual design of the ATMS and Virtual TMC will be carried out as part of the Countywide ITS System Design. The most suitable ATMS software option will be procured based on the findings of this process. Available options for the DuPage County ATMS range from $100,000 to several hundred thousand dollars, depending on the desired functionality. For estimating purposes, the ATMS procurement and implementation costs (for DCDOT) are estimated at $400,000, which includes the ATMS software, hardware (including warranty), software license, technical support, and system training necessary for a fully operational system. Assuming a two-year warranty is provided for upgrades, equipment repair, and labor, annual operations and maintenance costs, estimated to be $20,000 annually, would begin in the third year after ATMS deployment.

The cost to upgrade existing dial-up connections to the identified signal systems would require both initial hardware upgrades (e.g., modems) and an annual operations cost for the dedicated circuits. Implementation hardware costs are estimated to be $5,000 per signal system, and the estimated annual cost per connection for the leased communications line is $10,000. After all 30 signal systems are linked to the ATMS, the resulting costs are estimated at $150,000 for deployment, and $300,000 annually for communications. Communications costs associated with other ITS devices deployed as part of the Integrated Expressway-Arterial Corridors Project (Section 4.2.3) are included in that project.

As a part of the Countywide ITS System Design, system wide communications options should be studied in greater detail to determine the most cost-effective approach for communicating with traffic signal systems and ITS field devices from the Virtual TMC.

Lastly, cost considerations for linking partner agencies to the ATMS involve the computer hardware (e.g., servers, modems), software licenses, and integration costs associated with providing the core TMC functionality at these locations. Considering these factors, the conceptual cost to link a partner agency to the ATMS is approximately $100,000. For cost estimating purposes, two partner agencies are assumed to be linked for this project, for a total of $200,000. Annual operations and maintenance costs associated with these interagency linkages would cost approximately $5,000 per link per year.

Funding Options: As with the Countywide Traffic Signal Optimization Plan, CMAQ and STP funding can be applied to this project. The multi-jurisdictional nature of the Virtual TMC should also increase the number of available funding sources. The Virtual TMC would support efforts to reduce congestion and vehicle emissions, qualifying the project for federal CMAQ, STP, ITS Research, and National Highway System (NHS) funds. The project's role in assisting evacuations might also qualify it for grants from the Department of Homeland Security.

4.2.3 INTEGRATED EXPRESSWAY-ARTERIAL CORRIDORS

Focus Area: Arterial Operations, Traffic Incident Management

Project description: This project would deploy ITS devices that support the coordinated management of traffic across jurisdictional boundaries and modes of transportation. According to FHWA, Integrated Corridor Management (ICM) is defined as *the operational coordination of specific transportation networks and cross-network connections comprising a corridor, and the coordination of institutions responsible for corridor mobility. ICM will improve mobility, safety, and other transportation objectives for travelers and goods.*

This project entails integrating the operations of key expressways and arterial corridors in the county by increasing the roadway monitoring and control capabilities of traffic management agencies in these corridors. This would include the following:

- Queue detection systems at oversaturated ramps that would detect traffic queues before they back up onto the expressway mainline and implement modified ramp signal timings to "flush" the queues.
- Enhanced traffic data collection tools, including modifications to existing infrastructure and the application of established and emerging technologies to provide real-time data on county arterials. These data collection methods would include the use of existing traffic signal detection to provide real-time vehicle counts. Where traffic signals are widely spaced, mid-block vehicle detection technologies would be used to collect system data. To develop travel times along key arterial corridors, IPASS toll tag readers will be used at corridor entry points throughout the county.
- CCTV surveillance cameras at key interchanges to verify traffic incidents and provide incident response in a timely manner. Agreements between the arterial and expressway agencies for sharing of the CCTV surveillance imaging can be mutually beneficial and help reduce overall operating expenses.
- Permanent dynamic message signs (DMS) in order to provide timely and accurate traveler information to the roadway users.

As with other field technology projects contained in this TCI Implementation Plan, communications infrastructure will be an important consideration in deployment.

Needs Categories Addressed:

- Arterial Operational Efficiency
- Data Management
- Operational Coordination
- System Monitoring
- Traveler Information Sources
- Interagency Data Sharing

Market Packages Addressed:

- ITS Data Mart (AD1)
- Network Surveillance (ATMS01)
- Probe Surveillance (ATMS02)
- Surface Street Control (ATMS03)
- Traffic Information Dissemination (ATMS06)
- Regional Traffic Control (ATMS07)

Project Champion: DuPage County Division of Transportation/Illinois State Toll Highway Authority

Project Partners: IDOT District 1 Bureau of Traffic, local municipalities

Related/Dependent Projects: Countywide Traffic Signal Optimization Plan, Advanced Traffic Management System, Transit Signal Priority Coordination Plan, Countywide Dynamic Message Sign (DMS) Deployment, DuPage County Subregional Hub.

Work Description: The first phase of the project would be a pilot test deployment. By cross-referencing the highest congestion corridors listed above in Section 4.2.1 with expressway-arterial interchanges, the following candidate locations for this pilot are identified:

- Army Trail Road and I-355 Interchange (Meadow Road to IL 53/Rohlwing Road)
- IL 64 (North Avenue) and I-355 Interchange (Swift Road to IL 53)
- IL 56 (Butterfield Road) and I-355 Interchange (IL 53 to Downers Drive)
- IL 59 and I-88 Interchange (Aurora Road to Butterfield Road)
- Naperville Road and I-88 Interchange (Ogden Avenue to Warrenville Road)
- Highland Avenue and I-88 Interchange (31st Street to Roosevelt Road)
- IL 83 and I-88/22nd Street Interchange (31st Street to Roosevelt Road)

Based on the success of this pilot project, additional locations in the list would be selected for deployment of ICM applications. After the above listed corridors, the following expressway-arterial should be the next priority for additional deployments:

- Thorndale Avenue/Elgin O'Hare Expressway and I-290 Interchange (IL 53/Rohlwing Road to Prospect Avenue)
- US 20/Lake Street and I-355 Interchange (Swift Road to IL 53/Rohlwing Road)
- US 20/Lake Street and I-290 Interchange (Addison Road to Church Street)
- Roosevelt Road and I-355 Interchange (IL 53 to Finley Road)
- Ogden Road and I-355 Interchange (Main Street (Lisle) to Finley Road)
- Maple Avenue and I-355 Interchange (IL 53 to Belmont Road)
- 63rd Street and I-355 Interchange (IL 53 to Belmont Road)
- 75th Street and I-355 Interchange (IL 53 to Lemont Road)
- Boughton Road and I-355 Interchange (IL 53 to Lemont Road)
- IL 59 and I-88 Interchange (Aurora Road to IL 56 (Butterfield Road))
- Winfield Road and I-88 Interchange (Diehl Road to Warrenville Road)
- 31st Street and IL 83 Interchange (Midwest Road to Jorie Boulevard)
- Lemont Road and I-55 Interchange (87th Street to 97th Street)
- IL 83 and I-55 Interchange (75th Street to 87th Street)

Remaining locations for ICM applications include Eola Road and I-88, IL 53 and I-88, and Cass Avenue and I-55.

The pilot test project would entail engineering design and deployment of the four ICM applications listed above.

Queue detection systems on the expressway exit ramps would consist of vehicle detectors upstream on the ramps that would send an alert to the downstream traffic signal controllers when an occupancy threshold is met. These ramp detectors could also be used to collect traffic counts, speed data, and occupancy levels for traffic planning purposes.

To enhance corridor traffic data collection, vehicle detectors at actuated traffic signals would be modified to collect sampling data for operational and planning purposes. Dedicated mid-block detection devices could also be used to collect such data. Data from these mid-block locations would be transmitted to nearby intersections to utilize existing communications links back to the

center. To develop travel times in these corridors, IPASS toll tag readers will be implemented. Existing Tollway systems for calculating expressway travel times using IPASS transponders should be leveraged for arterial travel time measurements. Speed and congestion information gathered as part of this process would be shared with other key local traveler information services such as the Gateway and Shadow Networks. This integration would also be part of the design and implementation of the system.

CCTV cameras (both ISTHA and arterial cameras) would provide shared video data to the partner agencies. A wireless communications link between the DCDOT and Tollway would be established to facilitate sharing of CCTV surveillance imaging between agencies. Information sharing protocols between partner agencies would be developed through this pilot project that would enable efficient integration of various operations.

Dynamic message signs, both new arterial and existing Tollway DMS would be used at key locations around the interchange to provide timely traveler information to roadway users about the expressway and arterial travel conditions.

After deployment, the pilot test project would be evaluated and the findings from the test plan would be incorporated in the future deployments of this type of project. ITS tools and operational strategies would be rated based on how effectively they addressed the predefined performance measures. Thus, through an evolving deployment process, a region wide network of integrated corridors would be developed to improve the operational efficiency of the entire system.

Anticipated Benefits: This project will provide more data for determining real-time travel conditions, increasing traveler information and allowing travelers to make better-informed travel decisions. This should result in a decrease in vehicle-hours of delay, decrease in total number of stops, and higher levels of customer satisfaction.

Performance Measures:

- Intersection delay (seconds/vehicle)
- Travel time (minutes/corridor)
- Incident response time (minutes/incident)
- Customer satisfaction

Timeframe: Medium-term (3-5 years) for the pilot project. Subsequent phases would add other corridors to the centralized control, and would be deployed based on priority need.

Conceptual Cost Estimate: Engineering design of the pilot corridor (and subsequent corridors) would cost approximately $50,000. Deployment costs for ITS elements would depend on the number of devices installed at each corridor. The following estimated installation unit costs are assumed for each of the ICM devices:

- Queue detection system - $25,000 per ramp, including vehicle detectors, cabinet equipment, conduit, and wiring,

- Enhanced detection - $5,000 per site for conversion of existing intersection detection to provide sampling traffic data including cabinet equipment and wiring; $20,000 for mid-block detection including vehicle detectors, cabinets and cabinet equipment, conduit, and wiring; $20,000 per site for toll tag reader on existing traffic signal mast arm, and cabinet equipment.
- DMS - $100,000 per site for sign and support structure, conduit, wiring, and service/communications drops.
- CCTV cameras - $25,000 per site for camera, support, cabinet and cabinet equipment, conduit, wiring and service communications drops.

Applying these unit costs, a pilot location consisting of two queue detection systems, three detection stations (mid-block), two dynamic message signs, and four CCTV cameras would cost approximately $450,000. Subsequent similar deployments (two) in the long-term (5+ years) would cost approximately $450,000 each.

Once these systems are in place, operations (e.g., power, communications) and maintenance costs would accumulate on a regular basis. Estimated O & M costs for an integrated corridor would be $30,000 per year.

Funding Options: Federal CMAQ, STP, and NHS programs could be used to fund this project, as could possible future grants from FHWA's Integrated Corridor Management Program.

4.2.4 HIGHWAY-RAIL INFORMATION SYSTEM

Focus Area: Arterial Operations, Traffic Incident Management

Project description: This project will consist of systems to monitor the status of highway-rail crossings and provide real-time highway-rail blockage updates to emergency responders, traffic managers, and the traveling public. This system will include devices housed within traffic signal controller cabinets at highway-rail intersections that are already connected to the railroad equipment, communications links from this equipment to traffic management agencies and emergency dispatchers, and traveler information sources (e.g., dynamic highway-rail information signs, website).

Needs Categories Addressed:

- Arterial Operations Efficiency
- System Monitoring
- Traveler Information Sources

Market Packages Addressed:

- Traffic Information Dissemination (ATMS06)
- Advanced Railroad Grade Crossing (ATMS14)

Project Champion: DuPage County Division of Transportation

Project Partners: Rail operators in DuPage County (Metra, Union Pacific (UP) Railroad, BNSF Railway, Canadian National Railway (CN)); municipalities along rail lines in DuPage County (Milwaukee District West Line: Villages of Bensenville, Wood Dale, Itasca, Medinah, Roselle; UP West Line: Villages of Elmhurst, Villa Park, Lombard, Glen Ellyn, Wheaton, Winfield, West Chicago; BNSF Railway Line: Villages of Hinsdale, Clarendon Hills, Westmont, Downers Grove, Lisle, City of Naperville; CN: Bartlett, Carol Stream, Bloomingdale), IDOT District 1 Bureau of Traffic, DuPage County Office of Homeland Security and Emergency Management , DuPage County Sheriff, Du-Comm

Related/Dependent Projects: Advanced Traffic Management System

Work Description: This project will be deployed in stages, beginning with a pilot project. In order to identify top-priority highway-rail crossing locations for the Highway Rail Information System (HRIS) pilot project, four primary criteria were applied: average daily traffic (ADT), crash rate, crossing blockage delay, and proximity to an existing or planned grade-separated rail crossing. The following highway-rail intersections in DuPage County have ADT values of at least 15,000 vehicles/day, the highest crash rates in the county and/or the highest rail traffic blockage delay in the county,[7] and are within one mile of a grade-separated rail crossing:

- Medinah Road and the Milwaukee District West Line (Medinah)
- Roselle Road and the Milwaukee District West Line (Roselle)
- IL 59 and the CN (Bartlett)
- York Road and the UP West Line (Elmhurst)
- Grace Street and the UP West Line (Lombard)
- Winfield Road and the UP West Line (Winfield)
- IL 38 and the UP West Line (West Chicago)
- Garfield Avenue at the BNSF (Hinsdale)
- Cass Avenue at the BNSF (Westmont)
- Fairview Avenue at the BNSF (Downers Grove)
- Main Street at the BNSF (Downers Grove)
- River Road at the BNSF (Naperville)

Subsequent stages of the HRIS will implement crossing monitors and traveler warning signs at other high volume, high crash rate, high delay rail crossings, such as Main Street in Glen Ellyn, President Street and Main Street in Wheaton, and Villa Avenue in Villa Park.

Project deployment will continue to apply the systems engineering process for each stage:

1. Investigation of system deployment feasibility within the identified corridors (considerations: access to railroad equipment, communications options)
2. Conceptual system design (considerations: traveler information methods, partner agency coordination, conceptual communications design)

[7] DuPage County Highway Rail Crossing Internal Staff Report, 2003.

3. Detailed system design (considerations: traveler information source design, detailed communications design)
4. System deployment and testing
5. Operations, maintenance, and performance monitoring of system

Anticipated Benefits: Decrease in network delays, decrease in emergency response time due to HRI blockage, and increased traveler information.

Performance Measures:

- Number of system activations
- Driver delay (cumulative daily delay/AADT)
- Emergency response time
- Customer satisfaction

Timeframe: Long-term (5+ years)

Conceptual Cost Estimate: Based on similar deployments, estimated unit costs for the HRIS would be:

- Highway-rail crossing monitoring equipment - $5,000 per site (assumes cellular communications from the crossing to the HRIS central system computer and appropriate HRIS warning signs)
- Highway-rail crossing warning signs - $10,000 per site (assume two per crossing)
- HRIS central system - $20,000 for hardware, $80,000 for software (including HRIS website)

The HRIS pilot project, which consists of eleven crossing sites, fourteen warning signs, and the HRIS central system, is estimated to cost $400,000. Costs for subsequent stages would only include field equipment and modifications to the central system software that would be considered as part of the operations and maintenance costs.

Ongoing operations costs would focus primarily on communications costs between field devices and the central system and hardware, with staff time accounting for the central system/website administration. Maintenance of system components would also be recurring cost that would require an annual budget. Overall O & M costs are estimated to be $5,000 annually.

Funding Options: Federal funds from the Railway-Highway Crossing Program or the Highway Safety Improvement Program (HSIP) could be used for this project.

4.2.5 TRANSIT SIGNAL PRIORITY COORDINATION PLAN

Focus Area: Transit Management, Arterial Operations

Project description: This project centers on coordinating the deployment of Transit Signal Priority (TSP), which gives special treatment to transit vehicles at signalized intersections, in DuPage County. Through TSP, vehicles and signal controllers are equipped with technology that forces a traffic signal to be held green (or made green earlier than scheduled) so that a bus may

pass through an intersection. Transit Signal Priority (TSP) is the greatest opportunity for ITS coordination between local traffic agencies and Pace. Some issues related to TSP include signal system coordination across jurisdictions and current emergency vehicle signal preemption technology. This coordination project would be lead and funded by Pace but would require the coordination of all municipalities along the project corridors.

Pace Suburban Bus is experimenting with TSP by developing a Regional TSP Deployment Plan along with a demonstration and evaluation of how TSP can be used on Pace services along one corridor – Halsted Street. Based on the evaluation of the demonstration and the TSP deployment process identified in the plan, Pace will be able to prioritize deploying TSP along other corridors throughout the region. In DuPage County, there are five TSP Corridors that will be a part of the Regional TSP Deployment Plan. These are: Roosevelt Rd. (IL Hwy. 38), North Ave. (IL Hwy. 64), IL Hwy. 59, Robert Kingery Hwy. (IL Hwy. 83), and the J Line Bus Rapid Transit Corridor.

Through this TSP Coordination project, Pace will meet with the DuPage County Arterial Management (DCAM) Team to develop TSP design standards, determine TSP operational characteristics, and clarify TSP equipment procurement and maintenance responsibilities for the deployment of TSP in DuPage County.

Needs Categories Addressed:

- Arterial Operational Efficiency

Market Packages Addressed:

- Multi-modal Coordination (APTS7)
- Surface Street Control (ATMS03)

Project Champion: Pace Suburban Bus

Project Partners: IDOT, DuPage County Division of Transportation, and local municipalities

Related/Dependent Projects: Countywide Traffic Signal Optimization Plan and Advanced Traffic Management System. TSP is one component of Pace's bus/arterial rapid transit (BRT/ART) program. BRT/ART is part of Pace's vision for the future to create a 480-mile network of rapid transit routes on 23 corridors throughout northeastern Illinois. Service would be greatly improved along these arterial roads and highways with TSP, queue jump lanes, the usage of shoulder lanes and ramp metering.

Work Description: Pace is currently in the process of collecting and analyzing data along the Halsted corridor. Based on the results of this pilot project, specific sites and a recommended approach for TSP deployment will be determined. The Regional TSP Plan will prioritize transit corridors for TSP deployment in the near-term and long-term.

If Pace decides to move forward with TSP in DuPage County, signal controllers, intersections geometrics (e.g., far side bus stops), and signal priority devices would need to be installed at all affected intersections. As part of this TCI project, before TSP implementation takes place in DuPage County, it is recommended that Pace coordinate with all traffic managers in the county through the DCAM Team. This forum would provide Pace with an opportunity to present TSP to those agencies whose support would be required for implementation, and would provide an opportunity for those agencies influence its deployment. Through this improved coordination, the DCAM Team will identify tasks that it can complete to support TSP. These tasks could include conducting signal inventories including EVP equipment, traffic data collection, and outreach. Another key task is the definition of performance measures – for both transit operations and arterial traffic movement (see below).

Anticipated Benefits: Multi-agency coordination in the deployment of TSP would facilitate TSP implementation and optimize its performance. TSP itself has been seen to increase on-time arrival of transit buses, increase the number of bus passengers, decrease transit travel times, decrease delays at signals, and decrease overall fuel consumption

Performance Measures (for TSP deployment):

- Transit schedule adherence
- Traveler delay (sec/passenger or sec/vehicle)

Timeframe: Short-term (1-2 years) – after completion of the current Pace TSP pilot

Conceptual Cost Estimate: This TSP coordination effort would involve meetings between affected agencies and the development and publication of TSP standards and procedures. This work is estimated to cost $25,000. For informational purposes, TSP deployment project costs range from $10,000 - $15,000 per intersection.

Funding Options: Traditional funding sources to cover both the design and annual operating costs include federal, state and local funding. As stated above, SAFETEA-LU maintained the flexibility of mainstreaming funds from the Surface Transportation Fund (STP), National Highway System (NHS), and Congestion Mitigation and Air Quality Improvement Program (CMAQ). Local match requirement would be needed if federal funds were utilized. This match would be the same as the county's other projects. A final consideration for design funds would be applying for an earmark during the annual appropriations process.

The Cicero Ave. and Rand Road TSP Corridors received earmarked funding through the SAFETEA-LU transportation reauthorization in 2005 -- $836,000 and $668,800 respectively over the next four years. Other corridors utilize state appropriated funding. One of these corridors through DuPage County -- Roosevelt Road (IL Hwy. 38) – has proposed state appropriated funding for FY 2007.

4.2.6 COUNTYWIDE DYNAMIC MESSAGE SIGN (DMS) DEPLOYMENT

Focus Area: Arterial Operations, Traffic Incident Management

Project description: This project will support the Emergency Traffic Management System Project that is currently being planned for the region, and would include the procurement of portable dynamic message signs (DMS), electronic signs that can be programmed to provide traveler information on a variety of topics such as incidents, construction and lane closures, special events, and congestion. Deployment of portable DMS would be made possible by dependable wireless communications and will utilize vendor-provided software for operations (until another option such as an ATMS or virtual TMC software application is procured as part of a separate project).

This project would also include the creation of operations plans which would outline how the signs would be used, provide a library of messages for DMS use, and identify who would be responsible for maintenance of the equipment. Intergovernmental agreements would also be developed as part of this project so these assets could be utilized by a variety of stakeholders in the county to gain the maximum benefit. At present, IDOT, DuPage County DOT and a few municipalities like City of Naperville have deployed portable DMS on the arterial street network for providing traveler, incident and construction information to the drivers. IDOT is also deploying permanent arterial DMS in the region.

Needs Categories Addressed:

- Arterial Operational Efficiency
- Operational Coordination
- Traveler Information Sources.

Market Packages Addressed:

- Traffic Information Dissemination (ATMS6)

Project Champion: DuPage County Division of Transportation

Project Partners: Municipalities, IDOT, Illinois State Toll Highway Authority.

Related/Dependent Projects: Advanced Traffic Management System

Work Description: The work elements needed for this project would first include the identification of user requirements and functional requirements to make sure the signs meet the needs of the end users.

Next, specifications for the DMS should be developed based on the identified requirements. There are a variety of vendors that supply this hardware; understanding all of their features is an important step in the development of this specification. Many public agencies sponsor product "spotlights" which give vendors the opportunity to demonstrate their products outside of any procurement process. Understanding the devices capabilities is important so the specification does not require features which are not currently available in the marketplace and therefore increase risk into the process.

Once specifications are developed, the standard procurement process is followed to obtain the equipment. In conjunction with these efforts, the county will also need to develop a series of

Standard Operating Procedures (SOP) for use of the signs. These SOPs will outline the who (is responsible for posting messages), what (the content of the messages will be), when (equipment is activated or deployed), and where (the portable DMS will be located) of the operations. In conjunction with this effort, if any interagency agreements are needed to fulfill the objectives and missions of the DMS in the county, they should be identified, drafted and signed by all parties.

Anticipated Benefits: DMS can be used to provide location- and time-specific information directly to travelers, which will improve their decision-making process and help traffic managers, event managers, and emergency responders better direct traffic. This will lead to increases in emergency management efficiency and increases traveler safety.

Performance Measures:

- Number of portable DMS deployments
- Motorist delay (sec/vehicle)
- Customer satisfaction
- Incident response time

Timeframe: Short- to long-term (0-10 years)

Conceptual Cost Estimate: The identification of requirements, concepts of operations, and other considerations associated with the deployment of portable DMS would be bourn by the DuPage ITS System Design Project.

For planning purposes, the unit cost of a portable DMS unit is approximately $80,000, with another $5,000 per site for communications. Assuming eight signs, the total cost of this (phased) portion of the project would be $640,000 for deployment and another $40,000 for annual operating costs.

Funding Options: Through SAFETEA-LU, this project would be eligible for funds from the Surface Transportation Fund (STP), National Highway System (NHS), and Congestion Mitigation and Air Quality Improvement Program (CMAQ). Again, a local match requirement would be needed if federal funds were utilized.

4.3 Data Integration Projects

Data integration projects provide systems for the collection, storage, processing, sharing, and dissemination of traveler information throughout the county and the region. With the DuPage County Subregional Hub as its focal point, these projects will encourage transportation agencies to share critical data to help coordinate their operations and make better decisions.

4.3.1 DuPage County Subregional Hub

Focus Area: Traveler Information and Data Management

Project description: Building on recommendations from the "Feasibility Study for Multi-Jurisdictional Signal Timing and Monitoring in DuPage County, Illinois," this project would expand current DuPage County efforts to create a centralized data source that allows any

participating agency to access traffic data across the county (e.g., tube counts, intersection turn movement counts, traffic signal timing plans, CCTV video). This will be particularly important as more real-time data is collected as part of the Integrated Expressway-Arterial Corridors project (Section 4.2.3). A system of this type would provide geographic information on existing traffic related information across the county, including data collected by the other Data Integration Projects in this Implementation Plan. This data hub will enable the region's transportation community to access a much greater amount of traffic data for operations and planning purposes, and would serve as a data source for exchanging information with the Illinois Gateway (see Section 4.3.2).

In later phases, a module could be incorporated to include a database of existing infrastructure within the county, based upon current CMAP and RTA initiatives. A system of this type would provide geographic information on existing infrastructure. Currently, DCDOT digitally stores this information on a per-corridor basis for a limited number of corridors. This effort would consolidate the County data and combine it with existing municipal systems currently in place. For example some existing municipal GIS databases include centerline files with locations of fire hydrants, sanitary lines, jurisdictional boundaries, parcels, street signs, trees, street lights, water lines, traffic signals, and other various points of interest.

Needs Categories Addressed:

- Arterial Operational Efficiency
- System Monitoring.
- Data Management
- Integration of Systems
- Interagency Data Sharing

Market Packages Addressed:

- ITS Data Mart (AD1)
- ITS Data Warehouse (AD2)

Project Champion: TBD

Project Partners: DuPage County Division of Transportation, local municipalities, IDOT, CMAP, RTA

Related/Dependent Projects: Integrated Expressway-Arterial Corridors, Highway-Rail Information System, DuPage County Gateway Integration, DuPage County Construction Information System, DuPage County Traffic Accident Record System, Countywide Dynamic Alternate Route System

Work Description: Development of a DuPage County Subregional Hub would be software based. As such, it should pull extensively from other existing systems and be developed utilizing the systems engineering approach. As discussed often in the TCI documentation, the systems engineering approach is a structured process by which user needs and requirements are gathered in a systematic procedure that leads to a final product that addresses those specific user requirements.

It is recommended that, to develop the DuPage County Subregional Hub, the champion conduct the following task:

- User requirements definition
- Functional requirements definition
- System specification
- System design
- System testing and verification

It is also recommended that, as part of the design process, testing, operations, and maintenance plans be developed to ensure system compliance to design specifications as well as system longevity.

These tasks could be performed by champion agency staff or by outside consultant support. Either way, the system should be designed in accordance with applicable IT standards and conform to their enterprise system specifications in terms of data model definition, design, and maintenance.

Anticipated Benefits: The DuPage County Subregional Hub will provide the data source for countywide traveler information. Increased information should promote better driving decisions, which will reduce congestion, delay, and travel times. The hub will also provide historical data that will support effective transportation planning and analysis of travel demand patterns.

Performance Measures:

- Number of data sources participating in the DuPage County Subregional Hub
- Number of data transactions to/from the hub (transmissions/day)
- Number of hits to any associated Internet-based traveler information sources (hits/month)

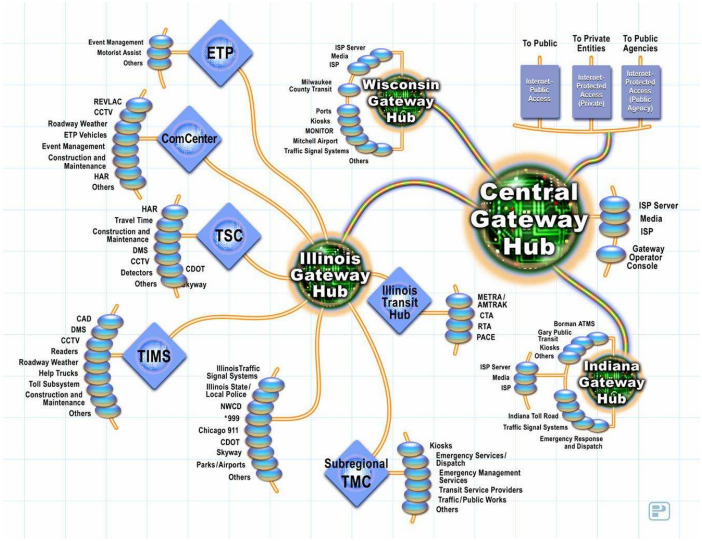
Timeframe: Medium-term (3-5 years)

Conceptual Cost Estimate: Conceptual system design and the identification of system requirements would cost approximately $50,000. The ultimate deployment cost of this project is highly depended on the resulting system design. However, the hub will consist of hardware (e.g., servers), software, and integration of the various information sources. The total estimated cost for these components is $350,000. Operation and maintenance of the system would require staff time, as well as equipment maintenance and interagency communications linkages. Estimated O&M costs would be $20,000 per year.

Funding Options: STP, NHS, and CMAQ funds can be applied towards ITS projects that would reduce congestion, as the Subregional Hub would. The federal ITS Research Program could also be a source of funding for this project. A final consideration for design funds would be applying for an earmark during the annual appropriations process.

4.3.2 DUPAGE COUNTY GATEWAY INTEGRATION

Focus Area: Traveler Information and Data Management



Project description: The Illinois Gateway is the traveler information collection and distribution hub for Northeastern Illinois. Currently, several regional transportation agencies are linked to the Gateway, providing traffic counts, congestion data, travel times, etc. that are used for transportation planning, operations, and traveler information. With increased levels of arterial traffic data collection, storage, and processing through other proposed TCI projects, DuPage County will soon be able to add value to regional and countywide traveler information sources by linking to the Gateway. This will require dedicated, high-bandwidth communications links with Gateway servers (which are scheduled to be relocated from the IDOT ITS Program Office to the IDOT Traffic Systems Center in June, 2007).

Needs Categories Addressed:

- Data Management
- Interagency Data Sharing
- Traveler Information Sources

Market Packages Addressed:

- Broadcast Traveler Information (ATIS1)
- ITS Data Mart (AD1)

Project Champion: DuPage County Division of Transportation

Project Partners: IDOT ITS Program Office, IDOT District 1 Bureau of Traffic

Related/Dependent Projects: Integrated Expressway-Arterial Corridors, Advanced Traffic Management System, DuPage County Subregional Hub

Work Description: Once traffic data collection enhancements have been made and a countywide traffic database (the DuPage County Subregional Hub) has been established, the primary remaining tasks to develop DuPage County Gateway Integration are the implementation of Gateway data protocols and the creation of a communications link between the DuPage County Subregional Hub and the Gateway. This will be done in coordination with the Illinois Department of Transportation, which administers the Gateway.

Anticipated Benefits: Gateway integration will increase the availability of arterial traffic data, addressing a current gap in regional traffic information. Linking the DuPage County Subregional Hub to the Gateway will also promote effective information sharing between partner agencies.

Performance Measures:

- Number of data transactions to/from the Gateway (transmissions/day)

Timeframe: Medium-term (3-5 years)

Conceptual Cost Estimate: Since the Gateway system is designed to collect transportation data from multiple regional sources, costs for modifying the Gateway would be minimal. The major costs for this project lie in creating dedicated, high-bandwidth communication links between a DuPage County Subregional Hub and the Gateway. This project is estimated to cost $50,000 for deployment, and $15,000 per year for operations and maintenance of the communication link.

Funding Options: As with the DuPage County Subregional Hub, integration with the Gateway could potentially draw on the Surface Transportation Fund (STP), National Highway System (NHS), Congestion Mitigation and Air Quality Improvement (CMAQ), and ITS Research programs for funding.

4.3.3 DUPAGE COUNTY CONSTRUCTION INFORMATION SYSTEM

Focus Area: Traveler Information and Data Management

Description: This project would be deployed to collect roadway construction and maintenance information from municipal transportation agencies across DuPage County, integrate this information into a single data source, and disseminate this information back to partner agencies and to the public. Building on existing systems such as the Village of Lombard's construction website, the DuPage County Construction Information System would be web-based, and would leverage the DuPage County Subregional Hub and the extensive geographic information systems (GIS) databases currently used and maintained by DuPage County and municipalities within the county to display construction information.

Needs categories Addressed:

- Arterial Operational Efficiency
- Data Management
- Interagency Data Sharing

Market Packages Addressed:

- Winter Maintenance (MC06)
- Roadway and Maintenance Construction (MC07)
- Maintenance and Construction Coordination (MC10)
- ITS Data Mart (AD1)

Project Champion: DuPage County Division of Transportation

Project Partners: DuPage County Highway Maintenance Department, IDOT District 1 Bureau of Construction, IDOT District 1 Bureau of Maintenance, Illinois State Toll Highway Authority, DuPage County municipalities

Related/Dependent Projects: Advanced Traffic Management System, DuPage County Subregional Hub

Work Description: Primary project tasks will include a conceptual design that defines the components of the system and addresses the collection and dissemination functions of the DuPage County Construction Information System.

A server with Gateway software and GIS map database of the DuPage County region would be used to collect the various construction and maintenance related project information from the various maintenance and construction operation agencies within the region. Data would be collected through a web-based graphical user interface (GUI) developed as part of this project. Input data would include project status, project schedule, project location, number of lanes closed, etc. The information would be provided to traffic management agencies, emergency response agencies, and the traveling public through a website which displays the information to aid them in making travel decisions. This display could be a color-coded map, tabular listing of current construction work, or a combination.

Specific design and deployment tasks include the following:

- GUI design for participating agencies
- Server procurement and installation
- Software and map database implementation
- Integration of communication links between the various nodes and the server
- Development of a publicly accessible website for providing the construction related information

Anticipated Benefits: By providing advance warning of lane closures, special events, and other incidents that reduce available capacity, this project will reduce congestion and travel times, speed emergency routing, and help to coordinating various maintenance and operations activities to avoid conflicting roadwork. These improvements should also result in an increase in user satisfaction.

Performance Measures:

- Number of participating agencies
- Number of construction data sets uploaded (transmissions/day)
- Number of "hits" to DuPage Construction Information website (hits/month)
- Travel times (minutes/corridor)
- Customer satisfaction

Timeframe: Short-term (1-2 years)

Conceptual Cost Estimate: It is estimated that this project would cost $100,000 for necessary hardware, software, map database installation, and communication infrastructure. The

conceptual design of the system would cost $50,000, and could be done simultaneously with the system design of other Data Integration projects. System operations and maintenance would cost approximately $10,000 per year.

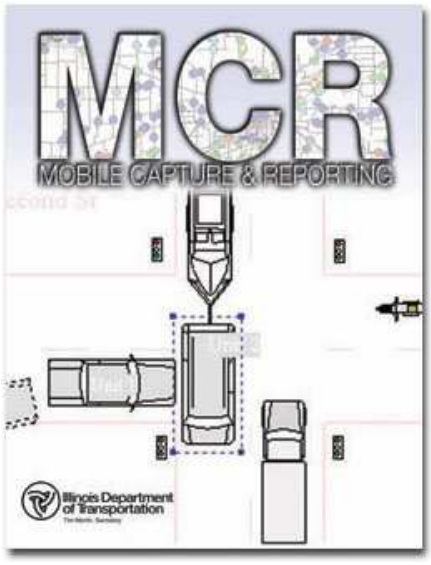
Funding Options: This project could apply Federal funds from the CMAQ, National Highway System (NHS), Surface Transportation, or ITS Research Program because of its potential to reduce congestion and vehicle emissions. Donated local agency labor and programming talent could be used to defray the cost of the project.

4.3.4 DUPAGE COUNTY TRAFFIC ACCIDENT RECORD SYSTEM

Focus Area: Traveler Information and Data Management

Project description: DuPage County is initiating this project to bring traffic accident data from local municipalities, the DuPage Sheriff's Office, and the County Division of Transportation into one central traffic accident database. This project will be developed to geographically locate accidents on road segments anywhere in the region. This system will provide a procedure for analyzing accident rates and their relation to physical roadway conditions. The results will be used to identify critical accident locations and conditions that cause accidents. Using this system, roadway segments, intersections, corridors, and geographical areas can be examined over any specified period of time for a complete accident history. Accidents can be identified by type, precise location, or any descriptive related with roadway characteristics, and jurisdiction. This system will provide a reliable means of data entry, data warehousing and analysis tool.

At present, IDOT Division of Traffic Safety has developed Mobile Capture and Reporting (MCR), a computer system for electronically capturing and submitting crash report data. The DuPage County Traffic Accident Record System can be modeled after this IDOT's initiative and directly linked to their central hub. This would provide a faster and more efficient interface for storing and accessing traffic accident related data in the Illinois region.



Needs Categories Addressed:

- Data Management
- Interagency Data Sharing

Market Packages Addressed:

- ITS Data Mart (AD1)

Project Champion: DuPage County Division of Transportation

Project Partners:

- DuPage County Sheriff's Department
- Municipal Police Department

Related/Dependent Projects: Traffic Incident Management Work Group, DuPage County Subregional Hub, as well as IDOT's MCR System

Work Description: This project will build upon the findings and recommendations from DuPage County's "Web-based Traffic Accident System Enhancement Project – Requirements Document." The two primary tasks associated with this project are 1) gaining the support and participation of the numerous public safety agencies that collect accident data and 2) developing and implementing a framework for accident data collection and dissemination. The conceptual design stage of the project should involve as many participating agencies as possible. As such, this Accident Record System should be considered as a topic for the TIM Work Group. Above all, this system should not add any tasks to the everyday workload of a traffic police officer.

Anticipated Benefits: This project will provide faster access to accident crash data which can be use to assess region-wide accident patterns. Automatic archiving and geo-location of incident data in historical databases could aid in the development of incident response plans as well as corrective and preventive measures for problem spots.

Performance Measures:

- Number of participating agencies
- Number of construction data sets uploaded (transmissions/day)
- Crash rate

Timeframe: Short-term (1-2 years)

Conceptual Cost Estimate: Building on current related activities, the conceptual system design, requirements definition, and research tasks associated with this project will cost approximately $30,000. Deployment of the project will cost $150,000. System operations and maintenance would cost approximately $10,000 per year.

Funding Options: The federal Highway Safety Improvement Program is a funding source for this project. CMAQ could also be used as a source, as a reduction in traffic accidents should reduce non-recurring congestion.

4.3.5 COUNTYWIDE DYNAMIC ALTERNATE ROUTE PLAN

Focus Area: Traveler Information and Data Management, Traffic Incident Management, Arterial Operations

Project description: This project would develop a GIS database that would provide multiple agencies with access to alternate route information, as well as incident and emergency management information, through a secure Internet website. This program can leverage current alternate and emergency route planning activities that are currently underway in DuPage County. In combination with the Construction Information System, these efforts will be used to develop information about viable routes in DuPage County for different conditions, such as construction, major incidents, or planned events. Incident and emergency management information would also be entered so that agencies can make the appropriate contacts as conditions change and decisions need to be made. Stakeholders can also determine whether they want to include information

about hospitals, school zones, restrictive turn radii at intersections, rail crossings, bridge size and weight restrictions, pavement load restrictions, and any other relevant information that can be used as criteria for selecting a link or restricting a link from being included in a detour route. This database needs to be dynamic and should allow multiple users to enter/view the data simultaneously, yet on a secure website to manage access. At a minimum, this database would enable agencies to preplan detours for critical roadway links. A more advanced version would take this one step further and enable the user to render one or more roadway links unavailable (due to construction or incidents) in the database and then have a macro calculate the best available detour under the current circumstances. This enhanced version would produce multiple detours for traffic in the immediate vicinity and for traffic that is approaching from a distance and still has other opportunities to bypass the incident site. This enhanced version would produce the best available detours even if multiple links are closed. It could operate on several criteria (such as shortest route, route with the best capacity, route with the fewest at-grade rail crossings, etc.).

Needs Categories Addressed:

- Arterial Operational Efficiency
- Data Management
- Operational Coordination

Market Packages Addressed:

- Traffic Incident Management System
- Emergency Routing
- Maintenance and Construction Activity Coordination

Project Champion: DuPage County Division of GIS

Project Partners: DuPage County DOT, IDOT, ISTHA, Illinois State Police, Illinois Emergency Management Agency, DuPage County Office of Homeland Security and Emergency Management, municipal public works departments

Related/Dependent Projects: Highway-Rail Information System, DuPage County Subregional Hub, DuPage County Construction Information System, as well as current alternate and evacuation route planning.

Work Description: Work will include the following activities:

- Hold stakeholder workshops to gather information
- Develop GIS database
- Populate database
- Review data in the database periodically
- Develop password protected website
- Develop procedures for timely notification of roadway link closures and re-openings
- Develop routine public information notification process to publicize long term detours

Anticipated Benefits: This project will speed emergency response, reduce congestion caused by incidents, take advantage of available capacity during incidents, and promote interagency operational coordination.

Performance Measures:

- Number of alternate routes included in the system
- Successful applications of alternate routes from database (based on user surveys)

Timeframe: Long-term (5+ years)

Conceptual Cost Estimate: The minimal system described above would involve local agency labor only because the work product would be developed interactively among the various partners. The enhanced version would require the purchase of existing route optimization software or the development of custom software. The cost of this enhanced version could vary considerably, and could potentially be developed as a pooled fund study with costs shared by multiple agencies around the country. A basic version of this project would cost approximately $100,000, with design costing approximately $50,000. System operations and maintenance would cost approximately $10,000 per year.

Funding Options: Homeland Security grant funding could be used for this project, either through IEMA or the Illinois Terrorism Task Force (ITTF). CMAQ and STP funds could also be used because of the project's potential to reduce congestion and vehicle emissions. Donated local agency labor and programming talent could be used to defray the cost as well.

5. IMPLEMENTATION STRATEGY

While all of the proposed ITS projects in Section 4 are designed to meet the goals of the TCI, additional considerations must be addressed before they can be deployed to realize these goals. The most critical issue that could impede deployment is cost, both capital costs and ongoing operations and maintenance costs, and the funding sources that will meet these costs. Project interdependencies must also be addressed so that one project does not languish until another "enabling" project gets underway. For any projects that interface with the traveling public, legal issues may arise. In addition, the high level of interagency coordination will require that agreements be developed, both to protect partner agency interest and to clearly define roles and responsibilities. The following subsections address each of these considerations in detail.

5.1 TCI Project Evaluation

In the final analysis, the ultimate success of the TCI projects proposed in Section 4 will be a question of the benefits provided for the cost expended. Subsections 5.1.1 through 5.1.4 provide a conceptual benefit-cost comparison, and a proposed TCI project sequence based on this comparison.

5.1.1 CONCEPTUAL TCI PROJECT DESIGN AND DEPLOYMENT COSTS

The conceptual work plans provided under each proposed TCI project description in Section 4 address the incremental phases or subtasks that are recommended to successfully implement the proposed TCI projects. Table 3 below provides a summary of the estimated design and deployment costs associated with these tasks, by project.

5.1.2 OPERATIONS AND MAINTENANCE

Operations and maintenance (O&M) planning is a critical component to any transportation system, especially in the case of ITS where new and complex technologies are being deployed. To promote the successful use of these technologies, consideration needs to be made for operations and maintenance aspects of ITS during the planning and implementation of projects.

O&M costs consist of equipment use (e.g., energy, communications) and maintenance (e.g., equipment replacements, upgrades), and personnel wages. A comprehensive O&M plan will address each of these recurring costs, which should then be incorporated into the overall project budget and/or the annual program budget.

Table 4 summaries the O&M costs and resource requirements for the high priority projects identified in previous sections. These O&M costs are in 2007 dollars and reflect the total cost to operate and maintain a particular project. Note that the O&M costs repeat every year after the initial deployment of the project and continue as long as the system or equipment is in operation.

EQUIPMENT USE AND MAINTENANCE

While some of the proposed TCI projects consist of committee activities and feasibility studies, most include the procurement of hardware and/or software. For these projects, over the long term, the ongoing cost of operating and maintaining the functionality of these systems can become more expensive than the implementation cost. Care should be given in the writing and enforcement of project materials specifications to ensure that reliable products are procured and

implemented. This is best accomplished by specifying product warranties and including product support in the cost of implementation. For example, two-year warranties are assumed for the advanced traffic management system associated with the Advanced Traffic Management System Project. As such, O&M costs for these projects begin in the third year after deployment.

For this TCI Implementation Plan, equipment operations and maintenance costs shown in Table 4 include a number of factors, including:

- Communications and power costs (ITS field devices)
- Equipment repair/replacement (estimated based on a percentage of the conceptual implementation cost)
- Outside maintenance labor (hours not incurred by partner agency staff)
- Software upgrades

PERSONNEL

An important part of O&M budgeting involves the estimation of new full-time employee (FTE) person-hours and the definition of required skill sets for those personnel.

The following list of skills sets would be required for different aspects of the fifteen projects described in Section 4:

- Traffic engineering: includes, but is not limited to, traffic signal optimization software operation and signal timing implementation
- Traffic management coordination: includes, but is not limited to, traffic and emergency management dispatching and coordination
- Traffic signals: includes, but is not limited to, traffic signal hardware and software operation, administration, and maintenance
- Electric power: includes, but is not limited to, electric power systems
- ITS standards: includes, but is not limited to, familiarity of current and developing ITS standards
- Data administration: includes, but is not limited to, administration of the various countywide traffic databases and associated user websites
- Computer administration: includes, but is not limited to, computer system administration, computer security setup and maintenance, hardware installation and configuration
- Local Area Network (LAN) administration: includes, but is not limited to, LAN systems administration, LAN security setup and maintenance, hardware installation and maintenance

From the list of defined skill sets, specific ITS O&M job positions can be defined. These positions, as listed in Table 4, include:

- Traffic Engineer (~1 FTE) – responsible for the monitoring, regular assessment, and optimization of signalized intersections in the county; responsible for operating the selected ATMS software application

- TMC Operator (1+ FTE) – responsible for functionality associated with the DuPage County Virtual TMC, including coordination with other transportation and emergency management agencies; responsible for system monitoring including integrated corridor locations
- Field Engineer (0.5 FTE) – responsible for the physical maintenance of ITS field devices, including traffic signal equipment
- Computer Systems Administrator (1.5 FTE) – responsible for maintenance of the databases associated with the DuPage County Subregional Hub, Construction Information System, Traffic Accident Record System, and Dynamic Alternate Route System; responsible for administering the communications and data link between the DuPage County Subregional Hub and the Gateway

5.1.3 ANTICIPATED TCI PROJECT BENEFITS

Anticipated benefits for the proposed TCI projects mirror the overall goals of the project: improved system performance, reduced travel times, faster and more efficient incident response, and increased traveler information. The individual project descriptions above have outlines some of these benefits and provided suggested performance measures to track how well the deployed projects attain these benefits.

In general, these benefits can be classified into overall categories, which are used to evaluate the effectiveness of these projects in addressing transportation issues. For this subjective evaluation, the following benefits categories are used:

- Safety – includes reductions in primary and secondary crashes, especially injury and fatality crashes
- Mobility – relates to traveler delay due to recurring and incident-based congestion, measured by travel times
- Productivity – relates to commercial and economic factors affected by congestion
- Efficiency – addresses the general throughput of the system
- Energy & Environment – residual effects of improvements in previous benefit categories, measured by fuel consumption and emissions
- Information – evaluation of the amount and usefulness of traveler information provided by the project
- Traveler Satisfaction – public perception of the project and its results

Table 3 – Estimated TCI Project Deployment Costs, by Project and Phase/Subtask

TCI Project ID	TCI Project	Conceptual Design and Deployment Costs*			
		Phase or Subtask	Phase/Subtask Cost	Overall Cost	Estimated DuPage County Portion
1	Traffic Incident Management (TIM) Work Group	Facilitate regular meetings, produce publications (considered operations and maintenance costs)	$ -	**$ -**	**50%**
2	Quick Clearance Program Enhancement	Conduct literature review, develop procedures, provide training, publicize the program	$ 25,000	**$ 25,000**	**10%**
3	Multi-Jurisdictional Communications Channel Integration	Identify gaps, develop implementation plan	$ 20,000	**$ 150,000**	**10%**
		Procurement of hardware (EMnet system)	$ 130,000		
4	DuPage County ITS System Design	Identify requirements, develop recommendations for the ATMS, Virtual TMC, ITS field devices, and countywide communications system	$ 250,000	**$ 250,000**	**80%**
5	Countywide Traffic Signal Optimization Plan	Corridor upgrades (28 intersections)	$ 150,000	**$ 1,100,000**	**80%**
		Corridor upgrades (36 intersections)	$ 200,000		
		Corridor upgrades (32 intersections)	$ 200,000		
		Corridor upgrades (37 intersections)	$ 300,000		
		Corridor upgrades (41 intersections)	$ 250,000		
6	Advanced Traffic Management System	Procure, implement ATMS hardware, software (signal control, traffic surveillance, traffic information dissemination, and incident response & coordination)	$ 400,000	**$ 750,000**	**80%**
		Upgrade existing dial-up communications links	$ 150,000		
		Provide ATMS linkages to two (2) partner agencies	$ 200,000		
7	Integrated Expressway-Arterial Corridors	Engineering design of pilot project	$ 50,000	**$ 1,400,000**	**80%**
		Deployment of pilot project (queue detection, enhanced detection, DMS, CCTV)	$ 450,000		
		Deployment of subsequent corridors (2)	$ 900,000		
8	Highway-Rail Information System	Center and field elements, including software (pilot project- eleven intersections)	$ 400,000	**$ 400,000**	**50%**
9	Transit Signal Priority Coordination Plan	Develop and document design standards	$ 25,000	**$ 25,000**	**10%**
10	Countywide Dynamic Message Sign Deployment	Procure and implement DMS (8 portable)	$ 640,000	**$ 640,000**	**60%**
11	DuPage County Subregional Hub	Conceptual system design, requirements identification	$ 50,000	**$ 400,000**	**80%**
		System design and implementation (ISP Hardware, System Integration, ISP Software, Map Database Software)	$ 350,000		
12	DuPage County Gateway Integration	Apply data transfer protocols, implement communications/data links	$ 50,000	**$ 50,000**	**80%**
13	DuPage County Construction Information System	Conceptual system design, requirements identification	$ 50,000	**$ 150,000**	**50%**
		Software development (database design, user interface, GIS component)	$ 100,000		
14	DuPage County Traffic Accident Record System	Conceptual system design, requirements identification	$ 30,000	**$ 180,000**	**50%**
		Software development (database design, user interface, reporting)	$ 150,000		
15	Countywide Dynamic Alternate Route System	Conceptual system design, requirements identification	$ 50,000	**$ 150,000**	**50%**
		Software development (database design, user interface, GIS component)	$ 100,000		

* 2007 dollars

$5,670,000

Table 4 – Estimated TCI Project Operations and Maintenance Costs

TCI Project ID	TCI Project	Estimated FTE	Position	Estimated O & M Costs*										
				Short-Term		Mid-Term			Long-Term					Total
				Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	
1	Traffic Incident Management (TIM) Work Group	0	-	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	**$50,000**
2	Quick Clearance Program Enhancement	0	-		-	-	-	-	-	-	-	-	-	**$0**
3	Multi-Jurisdictional Communications Channel Integration	0.25	TMC Operator					$20,000	$20,000	$20,000	$20,000	$20,000	$20,000	**$120,000**
4	DuPage County ITS System Design	0	-		-	-	-	-	-	-	-	-	-	**$0**
5	Countywide Traffic Signal Optimization Plan	0.5	Traffic Engineer, Field Engineer	$5,000	$5,000	$10,000	$15,000	$20,000	$25,000	$30,000	$30,000	$30,000	$30,000	**$200,000**
6	Advanced Traffic Management System	1.25	Traffic Engineer, TMC Operator			$0	$0	$25,000	$30,000	$30,000	$30,000	$30,000	$30,000	**$175,000**
7	Integrated Expressway-Arterial Corridors	0.5	TMC Operator, Traffic Engineer, Field Engineer						$30,000	$30,000	$60,000	$60,000	$90,000	**$270,000**
8	Highway-Rail Information System	0	-								$5,000	$5,000	$5,000	**$15,000**
9	Transit Signal Priority Coordination Plan	0	-		-	-	-	-	-	-	-	-	-	**$0**
10	Countywide Dynamic Message Sign Deployment	0	-					$10,000	$10,000	$20,000	$20,000	$30,000	$30,000	**$120,000**
11	DuPage County Subregional Hub	0.5	Computer Systems Administrator					$20,000	$20,000	$20,000	$20,000	$20,000	$20,000	**$120,000**
12	DuPage County Gateway Integration	0.25	Computer Systems Administrator				$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	**$105,000**
13	DuPage County Construction Information System	0.25	Computer Systems Administrator						$10,000	$10,000	$10,000	$10,000	$10,000	**$50,000**
14	DuPage County Traffic Accident Record System	0.25	Computer Systems Administrator			$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	**$80,000**
15	Countywide Dynamic Alternate Route System	0.25	Computer Systems Administrator									$10,000	$10,000	**$20,000**
	Totals:	**4**		**$5,000**	**$5,000**	**$20,000**	**$40,000**	**$100,000**	**$150,000**	**$165,000**	**$200,000**	**$220,000**	**$250,000**	

* 2007 dollars

Table 5 – Anticipated TCI Project Benefits, by Project

TCI Project ID	TCI Project	Safety	Mobility	Productivity	Efficiency	Energy & Environment	Information	Traveler Satisfaction	Benefits Score	Potential Scope of Benefits	Scope Score	Overall Score	Benefits Rank
1	Traffic Incident Management (TIM) Work Group	3	1	1	2	0	2	1	10	Regional	3	30	6
2	Quick Clearance Program Enhancement	3	2	2	2	1	0	1	11	Local/Corridor	1.5	16.5	15
3	Multi-Jurisdictional Communications Channel Integration	2	0	2	1	0	3	1	9	Regional	3	27	9
4	DuPage County ITS System Design	1	2	2	2	1	1	2	11	Regional	3	33	4
5	Countywide Traffic Signal Optimization Plan	0	2	3	2	3	0	2	12	Corridor	2	24	13
6	Advanced Traffic Management System	2	3	3	3	3	2	2	18	Countywide	3	54	1
7	Integrated Expressway-Arterial Corridors	1	3	2	3	2	2	2	15	Corridor	2.5	37.5	2
8	Highway-Rail Information System	2	3	2	2	1	2	2	14	Corridor/ Countywide	2.5	35	3
9	Transit Signal Priority Coordination Plan	0	3	3	2	2	0	1	11	Corridor	2	22	14
10	Countywide Dynamic Message Sign Deployment	2	1	1	2	1	3	2	12	Corridor/ Countywide	2.5	30	6
11	DuPage County Subregional Hub	0	1	1	2	1	3	1	9	Regional	3	27	9
12	DuPage County Gateway Integration	0	1	2	2	2	3	1	11	Regional	3	33	4
13	DuPage County Construction Information System	1	1	1	2	1	2	2	10	Corridor/ Countywide	2.5	25	12
14	DuPage County Traffic Accident Record System	3	0	1	0	2	2	1	9	Countywide	3	27	9
15	Countywide Dynamic Alternate Route System	2	1	2	2	1	2	2	12	Corridor/ Countywide	2.5	30	6

Benefit of Project Strength	0	Not relevant
	1	Generally relevant
	2	Relevant - sometimes direct
	3	Specifically relevant
Geographic Relevance of Project Scale	1	Local
	2	Corridor
	3	Countywide
	3	Regional

Table 6 – Proposed TCI Project Deployment Sequence

TCI Project ID	TCI Project	Estimated Deployment Costs*			
		Short-Term (1-2 years)	Mid-Term (3-5 years)	Long-Term (5-10 years)	Total
1	Traffic Incident Management (TIM) Work Group	$ -	$ -	$ -	$ -
2	Quick Clearance Program Enhancement	$ 25,000	$ -	$ -	$ 25,000
3	Multi-Jurisdictional Communications Channel Integration	$ -	$ 150,000	$ -	$ 150,000
4	DuPage County ITS System Design	$ 250,000	$ -	$ -	$ 250,000
5	Countywide Traffic Signal Optimization Plan	$ 150,000	$ 700,000	$ 250,000	$ 1,100,000
6	Advanced Traffic Management System	$ 550,000	$ 200,000	$ -	$ 750,000
7	Integrated Expressway-Arterial Corridors	$ -	$ 500,000	$ 900,000	$ 1,400,000
8	Highway-Rail Information System	$ -	$ -	$ 400,000	$ 400,000
9	Transit Signal Priority Coordination Plan	$ 25,000	$ -	$ -	$ 25,000
10	Countywide Dynamic Message Sign Deployment	$ 160,000	$ 160,000	$ 320,000	$ 640,000
11	DuPage County Subregional Hub	$ 50,000	$ 350,000	$ -	$ 400,000
12	DuPage County Gateway Integration	$ -	$ 50,000	$ -	$ 50,000
13	DuPage County Construction Information System	$ -	$ 150,000	$ -	$ 150,000
14	DuPage County Traffic Accident Record System	$ 180,000	$ -	$ -	$ 180,000
15	Countywide Dynamic Alternate Route System	$ -	$ -	$ 150,000	$ 150,000
	Totals:	**$ 1,390,000**	**$ 2,260,000**	**$ 2,020,000**	**$ 5,670,000**

* 2007 dollars

Shaded projects are currently underway

As described in Section 3**Error! Reference source not found.**, each of the proposed TCI projects was subjectively rated on a scale of 0 (not relevant) to 3 (directly relevant) against these benefit categories. Projects were also rated based on their projected scale of benefits resulting from the project (one point for local benefit level, two points for corridor level, and three points for countywide or regional level). Total benefit points were tallied and then multiplied by the geographic scale of the project to determine an overall benefits score. Those projects that ranked highest in this process were considered for earlier deployment.

5.1.4 PROPOSED TCI PROJECT SEQUENCE

This section describes a sequence of deployment for the ITS projects defined in Section 4. This sequence is based on conceptual project costs (both design/deployment and operations/maintenance), anticipated benefits, identified "early winner" projects, interdependencies between projects (e.g., CCTV cameras must be deployed before CCTV video sharing can take place), and balancing overall costs between the short-, medium-, and long-term. Table 6 provides an overall sequencing of the fifteen proposed TCI projects.

Short-term projects (Years 1 and 2) include "early winner" projects (TIM Work Group, Quick Clearance Program Enhancement), deployment studies that must be performed before certain projects can be deployed (DuPage County ITS System Design, Transit Signal Priority Coordination Plan, DuPage County Traffic Accident Record System), and phased infrastructure projects that can begin in the short-term (Countywide Traffic Signal Optimization Plan, Advanced Traffic Management System).

Medium-term projects (Years 3-5) include continuing phases of infrastructure projects that began in the short-term (Countywide Traffic Signal Optimization Plan), more costly infrastructure projects that require a longer deployment timeframe (Integrated Expressway-Arterial Corridors, Countywide DMS and CCTV Deployment, and data integration projects that will build off of these infrastructure deployments (DuPage County Subregional Hub, DuPage County Gateway Integration, DuPage County Construction Information System).

Long-term projects include continuing infrastructure projects and the deployment of additional infrastructure (Highway-Rail Information System) and data integration (Countywide Dynamic Alternate Route System) projects.

5.2 Procurement Methods

By their very nature, ITS projects involve a combination of technology and more typical transportation elements. As such, they are not always well-suited for low-bid contracts that transportation agencies traditionally apply for capital improvements. Studies have shown that, for ITS projects, the procurement method applied can have substantial influence on the ultimate success of the project.[8] Quite often, the procurement method for ITS projects is dictated not by the unique nature of the project, but rather by prevailing procedures of the champion agency. This can disrupt the systems engineering process that has been followed throughout this TCI project planning process (see Section 2).

[8] NCHRP Report 560, Transportation Research Board of the National Academies, 2006.

To assist transportation agencies as they seek to procure ITS products and services, the Transportation Research Board (TRB), through the National Cooperative Highway Research Program (NCHRP), produced its Report 560 titled "Guide to Contracting ITS Projects." This report provides a logical process for procurement of ITS products and services. The guide focuses on four dimensions: work distribution (e.g., low-bid contractor, systems integrator, design-build), method of award (e.g., low-bid, sole source, best value), and contract form (e.g., phased contracts, task orders), and contract type (e.g., fixed price, time and materials). It is recommended that NCHRP Report 560 be applied before procurement of each of the fifteen proposed TCI projects described herein by using the NCHRP Web-based Decision Model, which can be accessed at http://www.trb.org/nchrp/its/index.htm.

5.3 Funding Sources

Funding is a critical aspect of transportation programs. The purpose of this section is to provide the information necessary to consider funding alternatives that are available for ITS projects.

5.3.1 FEDERAL SOURCES

The 2005 Federal Transportation Reauthorization Act, known as the "Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users" (SAFETEA-LU), provides the largest amount of federal funding for highways, highway safety, and public transportation in the nation's history. It also promotes the use of such funding to improve safety, reduce congestion, and mitigate environmental impacts of congestion – all potential benefits of ITS.

While SAFETEA-LU does not provide a dedicated funding source for ITS projects, the following federal funding sources are available for ITS projects:

- National Highway System (NHS) funds
- Surface Transportation Program (STP) funds
- Congestion Mitigation and Air Quality (CMAQ) funds
- Federal Transit funds
- Interstate maintenance funds
- Interstate discretionary funds
- U.S. DOT safety initiatives (e.g., 511 and Mayday)
- U.S. DOT Research and Special Programs Administration (RSPA) University Transportation Centers program
- Federal Emergency Management Agency (FEMA) funds
- Highway Bridge Replacement and Rehabilitation Program funds
- Scenic Byways Program funds

In early 2001, as a further incentive for the development of regional ITS architectures, the Federal Highway Administration (FHWA) developed a Rule and the Federal Transit Authority (FTA) developed a parallel Policy to enact Section 5206(e) of the Transportation Equity Act for the 21st Century (TEA-21) in April of 2001. This Rule/Policy states that, in order to receive funding through the Highway Trust Fund, any region in the United States that has deployed or will soon deploy ITS projects must develop a regional ITS architecture. The DuPage County Subregional ITS Architecture has been developed to meet this requirement.

5.3.2 STATE SOURCES

Many of the federal funding sources listed above are often administered through the state. In addition, other various state funding programs might be applied toward ITS projects:

- Traditional Funding - NHS, STP, and Interstate Maintenance projects are selected by the State, in consultation with metropolitan planning organizations (MPOs) to be consistent with the local long range transportation plan (TIP).
- State Primary Highways (DS) - DS funds can be used for ITS projects on any state highway, bus system or rail system without any program restrictions on eligibility.

5.3.3 OTHER SOURCES

These include other sources of funding which lie outside of the traditional federal and state funding sources described earlier:

- ITS Deployment Program - under this program, eligible projects must demonstrate integration of multi-modal ITS components in metropolitan areas or rural areas to improve mobility, promote safety, increase traffic flow. In recent years, these funds have been heavily earmarked by members of Congress.
- Public/Private Partnerships - this is a progressive funding source in which the private entity provides ITS services and/or system elements, but instead of direct reimbursement from a public agency, part of private entity's cost is recuperated by selling ITS-based services to other private entities including end users. This offers a possible advantage of public cost reduction, and offers the public agency the opportunity to capitalize on the private sector's market orientation.
- State Infrastructure Banks (SIB) - the SIB is an investment fund that offers loans, credit enhancements etc. to surface transportation projects that meet federal standards and are eligible for assistance under Title 23 and capital projects defined by Title 49.

5.4 Legal Issues

Some legal issues might arise as DuPage County and other stakeholders deploy and integrate ITS projects. These issues are over and above the normal legal issues that are connected to deploying structures and equipment near or over a roadway.

One issue that is common for ITS projects is proprietary software. This is a term used to describe software which the user cannot study or edit the code, in contrast to free or open software. If a contractor is hired to develop software or if pre-developed software is used, the original developer often owns the rights to that code and only they are allowed to make changes to the code in order to modify the software. If an agency wants any modifications or enhancements, they must deal with that developer. This can leave the agency in a poor position to negotiate what it sees as a reasonable price for these changes. The best strategy is to address this in the initial agreement with a software developer, either allowing the agency to assume the rights to the software, including a warranty that covers future modification for a defined number of years, or by specifying a price or rate for the cost of future work on the software by the agency.

Other legal issues (beyond proprietary software) for the recommended projects include:

- *Integrated Expressway-Arterial Corridors* – There might be data privacy issues regarding transponders, but ISTHA has already used this application without raising any major legal issues.
- *Highway-Rail Information System* – This project will require a waiver from the Federal Railroad Administration (FRA), which will require documentation and data to justify the waiver. Workers who perform any work on the railroad right of way (such a in the railroad control box) will require authorization from the owning railroad company and insurance.
- *Quick Clearance Program Enhancement* – There are potential liability issues with agency representative moving vehicles, even if they are blocking a lane of traffic. Some strategies for effectively and safely moving vehicles can be addressed through proposed changes in statute that Lake County is supporting that allows peace officers to move a damaged vehicle blocking a roadway or authorize a third party to move it.

5.5 Agreements

Many of the projects recommended in this plan require coordination between multiple partners. This coordination can formally be clarified and responsibilities can be identified through agreements. Agreements that might be required or beneficial to the projects are listed below:

- *Advanced Traffic Management System* – This project will require an agreement between participating agencies regarding operations and maintenance of integrated system. This project will also require agreements between the county, municipalities, IDOT, and possibly ISTHA on operations and maintenance of the physical or virtual TMC. Agreements on information sharing might also be required between partners.
- *Integrated Expressway-Arterial Corridors* – This project will require agreements between participating agencies on control/operations and maintenance of the devices in the integrated corridor. It might also require data sharing agreements to clarify who is allowed to receive traffic sensor data or camera images. This project would also require an agreement between partner agencies and ISTHA to use their toll tags to collect travel times. It would also require maintenance agreements for toll tag readers placed on existing infrastructure.
- *Highway-Rail Information System* – This project would require a waiver from the Federal Transit Administration (FTA) and an agreement with the railroad company that owns the right of way for the intersections.
- *Traffic Incident Management (TIM) Work Group* - this project does not require any agreements to complete, but it might generate agreements in the future to advance traffic incident management practices, such as agreements about essential dispatch practices.
- *Quick Clearance Program Enhancement* – This project might require agreements between law enforcement agencies, DOT maintenance divisions, and private towing companies identifying who will move vehicles under what conditions, although any liability issues will have to be resolved prior to an agreement.
- *Multi-Jurisdictional Communications Channel Integration* – This project might require operational agreements between participating agencies. It may also require an agreement or license to access certain frequencies, such as the FCC and APCO Co-Primary Frequency Advisors for use of IREACH.

- *Transit Signal Priority* – This project will require an agreement regarding operations and maintenance of the signal receiver for each signalized intersection that is not operated by DuPage County. Pace will have an agreement template for this.
- *DuPage County Gateway Integration* – This project might require a data sharing agreement with IDOT, although this might be able to be performed without a formal agreement.
- *DuPage County Subregional Hub* – This project might require a data sharing between partners and a maintenance agreement identifying who will maintain the hub.
- *Countywide Dynamic Message Sign (DMS) & CCTV Deployment* – This project will require intergovernmental agreements allowing public partners to utilize the PDMS and CCTV cameras.