



Tennessee Department of Transportation  
Regional ITS Architectures and Deployment Plans

## Kingsport Region

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# Regional ITS Deployment Plan

*Prepared by:*



Kimley-Horn  
and Associates, Inc.

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069223002

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## LIST OF ACRONYMS

AD	Archived Data
APTS	Advanced Public Transportation System
ATIS	Advanced Traveler Information System
ATMS	Advanced Traffic Management System
AVL	Automated Vehicle Location
CAD	Computer Aided Dispatch
CCTV	Closed Circuit Television
DMS	Dynamic Message Sign
EM	Emergency Management
EMS	Emergency Medical Services
EOC	Emergency Operations Center
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
GIS	Geographic Information System
GPS	Global Positioning System
HAR	Highway Advisory Radio
HRI	Highway-Rail Intersection
ITS	Intelligent Transportation System
KATS	Kingsport Area Transit Service
MC	Maintenance and Construction
MEOC	Mountain Empire Older Citizens
MDT	Mobile Data Terminal
MPO	Metropolitan Planning Organization
TDOT	Tennessee Department of Transportation
TMC	Transportation Management Center
TOC	Traffic Operations Center
TSIS	Tennessee SmartWay Information System
VDOT	Virginia Department of Transportation

## 1. INTRODUCTION

### 1.1 Project Overview

The Kingsport Region has developed a Regional Intelligent Transportation System (ITS) Architecture under the direction of the Tennessee Department of Transportation (TDOT) with support from the Kingsport Metropolitan Planning Organization (MPO) and the Virginia Department of Transportation (VDOT). ITS architectures provide a framework for implementing ITS projects, encourage interoperability and resource sharing among agencies, identify applicable standards to apply to projects, and allow for cohesive long-range planning among regional stakeholders. The Kingsport Regional ITS Architecture focuses on the functionality that ITS provides in the Region as well as how those functions can operate for agencies in and around the Kingsport Region. The Regional ITS Architecture also satisfies an important requirement from the Federal Highway Administration (FHWA) and the Federal Transit Administration (FTA) regarding transportation funding. An FHWA Final Rule and an FTA Final Policy issued in 2001 require that regions develop an ITS architecture and show how ITS projects conform to that regional ITS architecture in order to receive federal funding.

The ITS Deployment Plan, while not required by FHWA and FTA, is a useful tool for regions to identify specific projects that are able to be deployed in order to implement their ITS Architecture. The ITS Deployment Plan builds on the ITS Architecture by outlining specific ITS project recommendations and strategies for the Region and identifying deployment timeframes so that the recommended projects and strategies can be implemented over time.

The ITS Deployment Plan also shows the correlation between each project and the ITS Architecture by identifying the market packages that correspond with each project. If projects are identified that do not correspond to a market package, the ITS Architecture can be revised while in draft format; therefore, the resulting ITS deployment projects from this effort should be clearly supported by the ITS Architecture.

The Kingsport Regional ITS Architecture and ITS Deployment Plan were both developed with significant input from local, state, and federal officials. A series of four workshops was held to solicit input from stakeholders and ensure that the plan reflected the unique needs of the Region. Copies of the draft reports were made available to all stakeholders. The Regional ITS Architecture and Deployment Plan developed reflects an accurate snapshot of existing ITS deployments and future ITS plans in the Region. Needs and priorities of the Region will change over time and, in order to remain effective, this plan should be periodically reviewed and updated.

### 1.2 Document Overview

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

#### **Section 1 – Introduction**

This section provides an overview of the Kingsport Regional ITS Deployment Plan and the key features and stakeholders in the Kingsport Region.

#### **Section 2 –Regional ITS Architecture Market Package Implementation**

A summary of the market packages selected and prioritized for the Region is provided in this section. Each market package is defined and is accompanied by a listing of projects that support implementation of the market package services.

### **Section 3 – Project Recommendations**

This section contains project recommendations to address stakeholder needs and goals for ITS implementation in the Region. Each project includes a description of the project, the responsible agency or agencies, an opinion of probable cost and whether or not funding was identified, deployment timeframe, and a listing of market packages associated with the project.

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

A brief description of the maintenance procedure for the Regional ITS Deployment Plan is provided in this section.

## **1.3 Kingsport Region**

### *1.3.1 Region Overview*

The Kingsport Region is defined by the boundaries of the Kingsport MPO and includes portions of Sullivan, Hawkins, and Washington Counties in Tennessee and Scott County in Virginia.

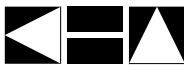
The Kingsport Region is adjacent to the Johnson City Region and the Bristol Region. The Johnson City Regional ITS Architecture was completed in 2006 and the Bristol Regional ITS Architecture was developed concurrently with the Kingsport Region. The close proximity to the Bristol Region and the fact that both Regions are located in TDOT Region 1 and Sullivan County, Tennessee created an overlap in many of the stakeholders. As detailed in the Kingsport Regional ITS Architecture, three of the four workshops held during the development process were conducted in coordination with workshops being held for the Bristol Region to facilitate coordination and consistency.

### *1.3.2 Stakeholders*

ITS often extends beyond traditional transportation infrastructure; therefore, the involvement of non-traditional stakeholders, such as police and fire, is important in the architecture development and visioning process. Input from these stakeholders, both public and private, is a crucial part of defining the interfaces, integration needs, and overall vision for ITS in a region.

The following stakeholder agencies have participated in the Kingsport Region project workshops or provided input to the study team:

- City of Kingsport Fire Department;
- City of Kingsport Police Department;
- City of Kingsport Public Works;
- Kingsport MPO;
- Kingsport Transit;
- Federal Highway Administration – Tennessee Division;
- Johnson City Metropolitan Transportation Planning Organization;
- Mountain Empire Older Citizens, Inc. (MEOC);
- Sullivan County Sheriff's Office;
- Tennessee Department of Transportation – Long-Range Planning Division;
- Tennessee Department of Transportation – Region 1;



- Tennessee Highway Patrol; and
- Virginia Department of Transportation – Bristol District.

A more detailed list of stakeholders, including the individuals representing each agency, is provided in the Regional ITS Architecture report.

## 2. REGIONAL ITS ARCHITECTURE MARKET PACKAGE IMPLEMENTATION

Of the 91 market packages available in Version 6.0 of the National ITS Architecture, 35 were selected by stakeholders and customized for deployment in the Kingsport Region as part of the Regional ITS Architecture development process. The market packages outline the functions that stakeholders envision ITS to perform in coming years. The Regional ITS Deployment Plan builds on those market packages through the development of project concepts to implement in the Region.

### 2.1 Market Package Prioritization

Stakeholders were asked to prioritize the market packages into high, medium, and low priorities based on regional needs, feasibility, likelihood of deployment, and overall contribution of the market package to the goals and vision for ITS functionality in the Region. A summary of these prioritized market packages is shown in **Table 1**. More detail on the market packages is provided in the Kingsport Regional ITS Architecture report.

**Table 1 – Kingsport Region Market Package Prioritization by Functional Area**

High Priority Market Packages		Medium Priority Market Packages		Low Priority Market Packages	
<b><i>Travel and Traffic Management</i></b>					
ATMS01	Network Surveillance	ATMS07	Regional Traffic Management	ATMS15	Railroad Operations Coordination
ATMS03	Surface Street Control	ATMS13	Standard Railroad Grade Crossing		
ATMS06	Traffic Information Dissemination	ATMS19	Speed Monitoring		
ATMS08	Traffic Incident Management System				
<b><i>Emergency Management</i></b>					
EM01	Emergency Call-Taking and Dispatch	EM04	Roadway Service Patrols		
EM02	Emergency Routing	EM08	Disaster Response and Recovery		
EM06	Wide-Area Alert	EM09	Evacuation and Reentry Management		
EM10	Disaster Traveler Information				
<b><i>Maintenance and Construction Management</i></b>					
MC03	Road Weather Data Collection	MC01	Maintenance and Construction Vehicle and Equipment Tracking	MC06	Winter Maintenance
MC04	Weather Information Processing and Distribution				
MC08	Work Zone Management				
MC10	Maintenance and Construction Activity Coordination				



**Table 1 – Kingsport Market Package Prioritization by Functional Area (continued)**

High Priority Market Packages	Medium Priority Market Packages	Low Priority Market Packages
<b>Public Transportation Management</b>		
APTS01 Transit Vehicle Tracking	APTS04 Transit Fare Collection Management	APTS06 Transit Fleet Management
APTS02 Transit Fixed-Route Operations	APTS08 Transit Traveler Information	APTS07 Multi-modal Coordination
APTS03 Demand Response Transit Operations	APTS10 Transit Passenger Counting	APTS09 Transit Signal Priority
APTS05 Transit Security		
<b>Traveler Information</b>		
ATIS01 Broadcast Traveler Information		
ATIS02 Interactive Traveler Information		
<b>Archived Data Management</b>		
	AD1 ITS Data Mart	AD2 ITS Data Warehouse

The market package prioritization was a primary factor in developing recommendations for ITS deployment and integration in the Kingsport Region. These priorities identified the key ITS services desired by stakeholders in the Kingsport Region, as well as the interfaces that need to be established to provide integrated functionality and establish communication between elements. The high, medium, and low prioritization does not necessarily correspond to any specific time frame (such as five-, ten-, or twenty-year deployment horizon). For example, a market package can be a high priority, but due to funding needs or prerequisite project requirements, deployment might not be feasible for several years. Maturity and availability of technology were also considered in prioritizing the market packages along with determining if the market package was more suitable for public or private sector deployment and operations.

## 2.2 Market Packages and Supporting Projects

In order to implement the ITS market package services in the Kingsport Region, each market package was reviewed to determine which projects should be deployed. Stakeholders provided a great deal of feedback on these projects at an ITS Deployment Plan Workshop. Although the timeframe of the Regional ITS Deployment Plan extended twenty years, stakeholders generally focused on identifying shorter term projects that were more likely to be funded.

Not every market package has an associated ITS project. Several market packages were identified as being important to the Region; however, at this time stakeholders decided there were no projects feasible enough to document in the ITS Deployment Plan. In the future, additional projects will likely be added to the ITS Deployment Plan to implement these market packages.

The market packages in the following subsections are organized by service areas in the order they appear in the National ITS Architecture. Each market package includes:

- A brief definition of the market package (which were modified from the National ITS Architecture definitions);
- Stakeholder priority for the market package;

- Recommended projects that will address some or all of the services that are contained in the market package; and
- Additional projects that support the services that are contained in the market package (if applicable).

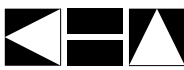
The projects listed in the Recommended Projects section of the market package tables are those that can be directly tied back to a particular market package and will help support the implementation of that market package. The projects listed in the Additional Supporting Projects section lists projects that will support the market package but are not a specific part of the actual implementation of the market package. For example, the City of Kingsport Closed Circuit Television (CCTV) Camera project will support operations of the City of Kingsport traffic signal system captured in the ATMS03 – Surface Street Control market package by allowing traffic operations personnel to visually monitor traffic signal operations at an intersection within range of a CCTV camera. However, the ATMS03 – Surface Street Control market package does not include any CCTV camera elements or data flows for traffic images and therefore the City of Kingsport CCTV Camera project supports its operations but does not contribute to its implementation.

### 2.2.1 Traffic Management Service Area

The following market packages and related projects implement the traffic management service area functions. These traffic management service areas represent some of the most commonly deployed projects, such as traffic signal systems, closed circuit television (CCTV) cameras, dynamic message signs (DMS), and traffic operations centers (TOCs). Many of the market packages in this service area are expected to be deployed prior to market packages in other service areas.

**Table 2 – Traffic Management Market Packages and Projects**

Network Surveillance (ATMS01)	High Priority
Includes traffic detectors, CCTV cameras, other surveillance equipment, supporting field equipment, and fixed-point to fixed-point communications to transmit the collected data back to a traffic management center.	
<p><b>Recommended Projects</b></p> <ul style="list-style-type: none"> <li>▪ City of Kingsport TN CCTV Cameras</li> <li>▪ City of Kingsport TN TOC</li> <li>▪ TDOT SmartWay Deployment at the I-26/I-81 Interchange – CCTV Cameras</li> <li>▪ TDOT SmartWay Deployment on I-26 – CCTV Cameras</li> <li>▪ TDOT SmartWay Deployment on I-26 – Vehicle Detection</li> <li>▪ VDOT CCTV Cameras</li> </ul>	
<p><b>Additional Supporting Projects</b></p> <ul style="list-style-type: none"> <li>▪ City of Kingsport TN Railroad Grade Crossing Improvements</li> <li>▪ City of Kingsport TN Speed Monitoring System</li> <li>▪ City of Kingsport TN TOC Coordination with TDOT Region 1 TMC – Knoxville</li> </ul>	
Surface Street Control (ATMS03)	High Priority
Provides the central control and monitoring equipment, communication links, and signal control equipment that support local street and/or arterial traffic management. This market package is consistent with typical urban traffic signal control systems.	
<p><b>Recommended Projects</b></p> <ul style="list-style-type: none"> <li>▪ City of Kingsport TN Centrally Controlled Signal System</li> <li>▪ City of Kingsport TN Emergency Vehicle Signal Preemption</li> <li>▪ City of Kingsport TN Ramp Queue Detection and Signal Preemption</li> <li>▪ City of Kingsport TN Signal System Communications</li> <li>▪ City of Kingsport TN TOC</li> </ul>	
<p><b>Additional Supporting Projects</b></p> <ul style="list-style-type: none"> <li>▪ City of Kingsport TN CCTV Cameras</li> <li>▪ City of Kingsport TN Signal System Communications</li> <li>▪ Kingsport Area Transit Service Signal Priority</li> </ul>	



**Table 2 – Traffic Management Market Packages and Projects (continued)**

<b>Traffic Information Dissemination (ATMS06)</b>	<b>High Priority</b>
<p>Provides information to drivers using roadway equipment such as DMS or highway advisory radio (HAR). Information can include traffic and road conditions, closure and detour information, incident information, emergency alerts and driver advisories.</p>	
<p><b>Recommended Projects</b></p> <ul style="list-style-type: none"> <li>▪ City of Kingsport TN DMS</li> <li>▪ City of Kingsport TN TOC</li> <li>▪ TDOT SmartWay Deployment on I-26 – DMS</li> <li>▪ VDOT DMS on US 23 and SR 224</li> <li>▪ VDOT Highway Advisory Radio</li> </ul>	
<b>Regional Traffic Management (ATMS07)</b>	<b>Medium Priority</b>
<p>Facilitates the sharing of traffic information and control among traffic management centers to support a regional control strategy. The nature of optimization and extent of information and control sharing is determined through working arrangements between jurisdictions.</p>	
<p><b>Recommended Projects</b></p> <ul style="list-style-type: none"> <li>▪ City of Kingsport TN TOC Coordination with TDOT Region 1 TMC – Knoxville</li> </ul>	

**Table 2 – Traffic Management Market Packages and Projects (continued)**

<b>Traffic Incident Management System (ATMS08)</b>	<b>High Priority</b>
<p>Manages both unexpected incidents and planned events so that the impact to the transportation network and traveler safety is minimized. This market package includes incident detection capabilities and coordination with other agencies. It supports traffic operations personnel in developing an appropriate response in coordination with emergency management, maintenance and construction management, and other incident response personnel.</p>	
<p><b>Recommended Projects</b></p> <ul style="list-style-type: none"> <li>▪ City of Kingsport TN TOC</li> <li>▪ City of Kingsport TN TOC Coordination with Kingsport TN 911</li> <li>▪ City of Kingsport TN TOC Coordination with TDOT Region 1 TMC – Knoxville</li> <li>▪ Sullivan County 911 Dispatch and EOC CCTV Camera Image Sharing</li> </ul>	
<p><b>Additional Supporting Projects</b></p> <ul style="list-style-type: none"> <li>▪ City of Kingsport TN CCTV Cameras</li> <li>▪ City of Kingsport TN DMS</li> <li>▪ TDOT HELP Vehicle Service Area Expansion</li> <li>▪ TDOT SmartWay Deployment at the I-26/I-81 Interchange – CCTV Cameras</li> <li>▪ TDOT SmartWay Deployment on I-26 – CCTV Cameras</li> <li>▪ TDOT SmartWay Deployment on I-26 – Vehicle Detection</li> <li>▪ VDOT CCTV Cameras</li> <li>▪ VDOT DMS on US 23 and SR 224</li> <li>▪ VDOT Highway Advisory Radio</li> </ul>	
<b>Standard Railroad Grade Crossing (ATMS13)</b>	<b>Medium Priority</b>
<p>Manages highway traffic at highway-rail intersections (HRIs) where rail operations speeds are less than 80 mph.</p>	
<p><b>Recommended Projects</b></p> <ul style="list-style-type: none"> <li>▪ City of Kingsport TN Railroad Grade Crossing Improvements</li> <li>▪ Municipal Railroad Grade Crossing Improvements</li> </ul>	
<p><b>Additional Supporting Projects</b></p> <ul style="list-style-type: none"> <li>▪ City of Kingsport TN TOC Coordination with Kingsport TN 911</li> </ul>	

**Table 2 – Traffic Management Market Packages and Projects (continued)**

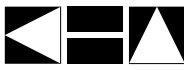
<b>Railroad Operations Coordination (ATMS15)</b>	<b>Low Priority</b>
<p>Provides an additional level of strategic coordination between freight rail operations and traffic management centers. Rail operations provide train schedules, maintenance schedules, and any other forecast events that will result in HRI closures. This information is used to develop forecast HRI closure times and durations that may be used in advanced traffic control strategies or to enhance the quality of traveler information.</p>	
<p><b>Recommended Projects</b></p> <p>No projects have been identified at this time. The Railroad Operations Coordination market package was customized and included in the ITS Architecture to reflect the desire for future coordination with railroad operations, however at this time significant institutional issues are obstacles to the development of any projects.</p>	
<b>Speed Monitoring (ATMS19)</b>	<b>Medium Priority</b>
<p>Monitors the speed of vehicles traveling through a roadway system.</p>	
<p><b>Recommended Projects</b></p> <ul style="list-style-type: none"> <li>▪ City of Kingsport TN Speed Monitoring System</li> <li>▪ City of Mt Carmel TN Speed Monitoring System</li> </ul>	

### 2.2.2 Emergency Management Service Area

The following market packages and related projects implement ITS functions that support emergency management activities. These market packages are important for incident response, coordination of the emergency management and transportation systems, traveler information during disasters, and protection of the transportation infrastructure.

**Table 3 – Emergency Management Market Packages and Projects**

<b>Emergency Call-Taking and Dispatch (EM01)</b>	<b>High Priority</b>
Provides basic public safety call-taking and dispatch services. Includes emergency vehicle equipment, equipment used to receive and route emergency calls, wireless communications, and coordination between emergency management agencies.	
<b>Recommended Projects</b>	
<ul style="list-style-type: none"> <li>▪ City of Kingsport TN Fire and EMS AVL and MDTs</li> </ul>	
<b>Additional Supporting Projects</b>	
<ul style="list-style-type: none"> <li>▪ City of Kingsport TN TOC Coordination with Kingsport TN 911</li> </ul>	
<b>Emergency Routing (EM02)</b>	<b>High Priority</b>
Supports automated vehicle location (AVL) and dynamic routing of emergency vehicles. Traffic information, road conditions and suggested routing information are provided to enhance emergency vehicle routing. Includes signal preemption and priority applications.	
<b>Recommended Projects</b>	
<ul style="list-style-type: none"> <li>▪ City of Kingsport TN TOC Coordination with Kingsport TN 911</li> <li>▪ City of Kingsport TN Fire and EMS AVL and MDTs</li> <li>▪ City of Kingsport TN Emergency Vehicle Signal Preemption</li> </ul>	
<b>Roadway Service Patrols (EM04)</b>	<b>Medium Priority</b>
Supports the roadway service patrol vehicles that aid motorists, offering rapid response to minor incidents (flat tire, accidents, out of gas) to minimize disruption to the traffic stream. This market package monitors service patrol vehicle locations and supports vehicle dispatch.	
<b>Recommended Projects</b>	
<ul style="list-style-type: none"> <li>▪ TDOT HELP Vehicle Service Area Expansion</li> </ul>	



**Table 3 – Emergency Management Market Packages and Projects (continued)**

<b>Wide-Area Alert (EM06)</b>	<b>High Priority</b>
<p>Uses ITS driver and traveler information systems to alert the public in emergency situations such as child abductions, severe weather, civil emergencies, or other situations that pose a threat to life and property.</p>	
<p><b>Recommended Projects</b></p> <p>No projects have been identified at this time specifically for wide area alerts. Disseminating this information is a high priority for the Region and is supported by several deployments that, although primarily implemented for traffic management purposes, could also be used for the dissemination of wide area alert information.</p>	
<p><b>Additional Supporting Projects</b></p> <ul style="list-style-type: none"> <li>▪ City of Kingsport TN DMS</li> <li>▪ TDOT SmartWay Deployment on I-26 – DMS</li> <li>▪ VDOT DMS on US 23 and SR 224</li> <li>▪ VDOT Highway Advisory Radio</li> </ul>	
<b>Disaster Response and Recovery (EM08)</b>	<b>Medium Priority</b>
<p>Enhances the ability of the surface transportation system to respond to and recover from disasters. It addresses the most severe incidents that require an extraordinary response from outside the local community.</p>	
<p><b>Recommended Projects</b></p> <ul style="list-style-type: none"> <li>▪ Sullivan County 911 Dispatch and EOC CCTV Cameras Image Sharing</li> </ul>	



**Table 3 – Emergency Management Market Packages and Projects (continued)**

<b>Evacuation and Reentry Management (EM09)</b>	<b>Medium Priority</b>
<p>Supports evacuation of the general public from a disaster area and manages subsequent reentry to the disaster area. This market package supports both anticipated, well-planned, and orderly evacuations such as for a hurricane, as well as sudden evacuations with little or no time for preparation or public warning such as a terrorist act. Employs a number of strategies to maximize capacity along an evacuation route including coordination with transit.</p>	
<p><b>Recommended Projects</b></p> <ul style="list-style-type: none"> <li>▪ Sullivan County 911 Dispatch and EOC CCTV Cameras Image Sharing</li> </ul>	
<p><b>Additional Supporting Projects</b></p> <ul style="list-style-type: none"> <li>▪ City of Kingsport TN CCTV Cameras</li> <li>▪ City of Kingsport TN DMS</li> <li>▪ City of Kingsport TOC Coordination with TDOT Region 1 TMC – Knoxville</li> <li>▪ TDOT HELP</li> <li>▪ TDOT SmartWay Deployment at the I-26/I-81 Interchange – CCTV Cameras</li> <li>▪ TDOT SmartWay Deployment on I-26 – CCTV Cameras</li> <li>▪ TDOT SmartWay Deployment on I-26 – DMS</li> <li>▪ TDOT SmartWay Deployment on I-26 – Vehicle Detection</li> <li>▪ VDOT CCTV Cameras</li> <li>▪ VDOT DMS on US 23 and SR 224</li> <li>▪ VDOT Highway Advisory Radio</li> </ul>	
<b>Disaster Traveler Information (EM10)</b>	<b>High Priority</b>
<p>Uses ITS to provide disaster-related traveler information to the general public, including evacuation and reentry information and other information concerning the operation of the transportation system during a disaster.</p>	
<p><b>Recommended Projects</b></p> <p>No projects have been identified at this time specifically for disaster traveler information. Traveler information during an emergency is a high priority for the Region and is supported by several deployments that, although primarily implemented for traffic management purposes, would also provide a disaster traveler information benefit during an emergency.</p>	
<p><b>Additional Supporting Projects</b></p> <ul style="list-style-type: none"> <li>▪ City of Kingsport TN DMS</li> <li>▪ TDOT SmartWay Deployment on I-26 – DMS</li> <li>▪ VDOT DMS on US 23 and SR 224</li> <li>▪ VDOT Highway Advisory Radio</li> </ul>	

### 2.2.3 Maintenance and Construction Management Service Area

The following market packages and related projects implement maintenance and construction management ITS functions. The priorities identified for the Region included road weather data collection using weather detection stations primarily for snow and ice, maintenance and construction activity coordination, and maintenance and construction vehicle tracking for public works vehicles.

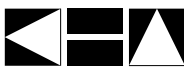
**Table 4 – Maintenance and Construction Management Market Packages and Projects**

<b>Maintenance and Construction Vehicle and Equipment Tracking (MC01)</b>	<b>Medium Priority</b>
Tracks the location of maintenance and construction vehicles and other equipment to ascertain the progress of their activities.	
<b>Recommended Projects</b>	
<ul style="list-style-type: none"> <li>▪ City of Kingsport TN Public Works Department Vehicle AVL</li> </ul>	

<b>Road Weather Data Collection (MC03)</b>	<b>High Priority</b>
Collects current road weather conditions using data collected from environmental sensors deployed on and about the roadway.	
<b>Recommended Projects</b>	
<ul style="list-style-type: none"> <li>▪ TDOT Weather Detection</li> </ul>	

<b>Weather Information Processing and Distribution (MC04)</b>	<b>High Priority</b>
Processes and distributes the environmental information collected from the Road Weather Data Collection market package. This market package uses the environmental data to detect environmental hazards such as icy road conditions, high winds, dense fog, etc. so system operators can make decisions on corrective actions to take.	
<b>Recommended Projects</b>	
No projects have been identified at this time for implementation in the Region.	
<b>Additional Supporting Projects</b>	
<ul style="list-style-type: none"> <li>▪ City of Kingsport TN TOC Coordination with TDOT Region 1 TMC – Knoxville</li> <li>▪ TDOT Weather Detection</li> </ul>	

<b>Winter Maintenance (MC06)</b>	<b>Low Priority</b>
Supports winter road maintenance. Monitors environmental conditions and weather forecasts and uses the information to schedule winter maintenance activities.	
<b>Recommended Projects</b>	
No projects have been identified at this time for implementation in the Region.	
<b>Additional Supporting Projects</b>	
<ul style="list-style-type: none"> <li>▪ TDOT Weather Detection</li> </ul>	



**Table 4 – Maintenance and Construction Management Market Packages and Projects (continued)**

<b>Work Zone Management (MC08)</b>	<b>High Priority</b>
<p>Directs activity in work zones, controlling traffic through portable DMS and informing other groups of activity for better coordination management. Also provides speed and delay information to motorists prior to the work zone.</p>	
<p><b>Recommended Projects</b></p> <p>No projects have been identified at this time although this market package is a high priority for the Region. Several projects have been listed below that will support traffic management in work zones, but ultimately most work zone traffic control is primarily managed by the contractor as part of each individual construction contract.</p>	
<p><b>Additional Supporting Projects</b></p> <ul style="list-style-type: none"> <li>▪ City of Kingsport TN DMS</li> <li>▪ TDOT SmartWay Deployment on I-26 – DMS</li> <li>▪ VDOT DMS on US 23 and SR 224</li> <li>▪ VDOT Highway Advisory Radio</li> </ul>	

<b>Maintenance and Construction Activity Coordination (MC10)</b>	<b>High Priority</b>
<p>Supports the dissemination of maintenance and construction activity information to centers that can utilize it as part of their operations. (i.e., traffic management, transit, emergency management).</p>	
<p><b>Recommended Projects</b></p> <ul style="list-style-type: none"> <li>▪ City of Kingsport TN TOC Coordination with Kingsport TN 911</li> </ul>	
<p><b>Additional Supporting Projects</b></p> <ul style="list-style-type: none"> <li>▪ City of Kingsport TN TOC Coordination with TDOT Region 1 TMC – Knoxville</li> </ul>	

### 2.2.4 Public Transportation Management Service Area

The following market packages and related projects implement public transportation management ITS functions. Public transportation projects for the Kingsport Area Transit Service were identified for a number of market packages. Many of these market packages are considered high priority and are currently being implemented including transit vehicle tracking and transit security using on-board video cameras.

**Table 5 – Public Transportation Management Market Packages and Projects**

<b>Transit Vehicle Tracking (APTS01)</b>	<b>High Priority</b>
Monitors current transit vehicle location using an AVL system. Location data may be used to determine real time schedule adherence and update the transit system's schedule in real time.	
<b>Recommended Projects</b>	
<ul style="list-style-type: none"> <li>▪ Kingsport Area Transit Service AVL</li> <li>▪ MEOC Transit AVL and MDTs</li> </ul>	
<b>Transit Fixed-Route Operations (APTS02)</b>	<b>High Priority</b>
Performs vehicle routing and scheduling, as well as operator assignment and system monitoring for fixed-route and flexible-route transit services.	
<b>Recommended Projects</b>	
<ul style="list-style-type: none"> <li>▪ Kingsport Area Transit Service AVL</li> </ul>	
<b>Demand Response Transit Operations (APTS03)</b>	<b>High Priority</b>
Performs vehicle routing and scheduling, as well as operator assignment and system monitoring for demand responsive transit services.	
<b>Recommended Projects</b>	
<ul style="list-style-type: none"> <li>▪ Kingsport Area Transit Service AVL</li> <li>▪ MEOC Transit AVL and MDTs</li> </ul>	
<b>Transit Fare Collection Management (APTS04)</b>	<b>Medium Priority</b>
Manages transit fare collection on-board transit vehicles and at transit stops using electronic means. Allows the use of a traveler card or other electronic payment device.	
<b>Recommended Projects</b>	
<ul style="list-style-type: none"> <li>▪ Kingsport Area Transit Service Electronic Fare Collection</li> </ul>	

**Table 5 – Public Transportation Management Market Packages and Projects  
(continued)**

<b>Transit Security (APTS05)</b>	<b>High Priority</b>
Provides for the physical security of transit passengers and transit vehicle operators. Includes on-board security cameras and panic buttons.	
<b>Recommended Projects</b>	
<ul style="list-style-type: none"> <li>▪ Kingsport Area Transit Service On-Board Security Monitoring</li> <li>▪ Kingsport Area Transit Service Security Monitoring</li> <li>▪ MEOC Transit On-Board Security Monitoring</li> </ul>	

<b>Transit Fleet Management (APTS06)</b>	<b>Low Priority</b>
Supports automatic transit maintenance scheduling and monitoring for both routine and corrective maintenance.	
<b>Recommended Projects</b>	
No projects have been identified at this time. Stakeholders expressed an interest in several of the technologies available but determined that this market package was not a high enough priority to develop specific project recommendations.	

<b>Multi-modal Coordination (APTS07)</b>	<b>Low Priority</b>
Establishes two way communications between multiple transit and traffic agencies to improve service coordination.	
<b>Recommended Projects</b>	
No projects have been identified at this time. Stakeholders expressed an interest in several of the technologies available but determined that this market package was not a high enough priority to develop specific project recommendations.	

<b>Transit Traveler Information (APTS08)</b>	<b>Medium Priority</b>
Provides transit users at transit stops and on board transit vehicles with ready access to transit information. Services include stop annunciation, imminent arrival signs, and real-time transit schedule displays. Systems that provide custom transit trip itineraries and other tailored transit information services are also represented by this market package.	
<b>Recommended Projects</b>	
<ul style="list-style-type: none"> <li>▪ Kingsport Area Transit Service Real-time Bus Arrival Information</li> </ul>	
<b>Additional Supporting Projects</b>	
<ul style="list-style-type: none"> <li>▪ Kingsport Area Transit Service AVL</li> </ul>	

<b>Transit Signal Priority (APTS09)</b>	<b>Low Priority</b>
Determines the need for transit priority on routes and at certain intersections and requests transit vehicle priority at these locations to improve on-time performance of the transit system.	
<b>Recommended Projects</b>	
<ul style="list-style-type: none"> <li>▪ Kingsport Area Transit Service Signal Priority</li> </ul>	



**Table 5 – Public Transportation Management Market Packages and Projects  
(continued)**

<b>Transit Passenger Counting (APTS10)</b>	<b>Medium Priority</b>
Counts the number of passengers entering and exiting a transit vehicle using sensors mounted on the vehicle and communicates the collected passenger data back to the management center.	
<p><b>Recommended Projects</b></p> <ul style="list-style-type: none"> <li>▪ Kingsport Area Transit Service Automatic Passenger Counters</li> </ul>	

### 2.2.5 Traveler Information Service Area

The following market packages and related projects implement traveler information ITS functions. Traveler information service area projects address market packages that make traveler information available to the public over a wide area such as the 511 traveler information phone number. Traveler information provided at a specific locations on the roadway, such as DMS, is addressed in the ATMS06 – Traffic Information Dissemination market package in Section 2.2.1.

**Table 6 – Traveler Information Market Packages and Projects**

<b>Broadcast Traveler Information (ATIS01)</b>	<b>High Priority</b>
Collects traffic conditions, advisories, general public transportation, toll and parking information, incident information, roadway maintenance and construction information, air quality and weather information, and broadly disseminates this information through existing infrastructures (radio, cell phones, etc.).	
<b>Recommended Projects</b>	
<ul style="list-style-type: none"> <li>▪ Regional Media Liaison and Coordination</li> </ul>	

<b>Interactive Traveler Information (ATIS02)</b>	<b>High Priority</b>
Provides tailored information in response to a traveler request. Both real-time interactive request/response systems and information systems that "push" a tailored stream of information to the traveler based on a submitted profile are supported. The traveler can obtain current information regarding traffic conditions, roadway maintenance and construction, transit services, ride share/ride match, parking management, detours, and pricing information.	
<b>Recommended Projects</b>	
No projects were specifically identified for local implementation. 511 traveler information phone and web-based services are being provided on a statewide level in both Tennessee and Virginia.	
<b>Additional Supporting Projects</b>	
<ul style="list-style-type: none"> <li>▪ City of Kingsport TN TOC Coordination with TDOT Region 1 TMC – Knoxville</li> </ul>	

### 2.2.6 Archived Data Management Service Area

The following market packages and related projects implement archived data management ITS functions. Data collected through ITS deployments can be housed in several different formats. The market packages selected by stakeholders will allow data from a specific agency to be housed by that agency, or data from throughout the Region can be sent to a site to be housed together. Data housed by an agency as part of an ITS data mart would likely be part of another project deployment and are not selected separately in this section. For example, DMS implementation might include software to archive all of the messages placed on the DMS over a period of time.

**Table 7 – Archived Data Management Market Packages and Projects**

<b>ITS Data Mart (AD1)</b>	<b>Medium Priority</b>
Provides a focused archive that houses data collected and owned by a single agency or other organization. Focused archive typically covers a single transportation mode and one jurisdiction.	
<b>Recommended Projects</b>	
No projects have been identified at this time, as ITS deployments come on line and the quantity of available data increases it is likely that stakeholder agencies might develop data mart projects.	
<b>ITS Data Warehouse (AD2)</b>	<b>Low Priority</b>
Includes all the data collection and management capabilities of the ITS Data Mart. Adds the functionality to allow collection of data from multiple agencies and data sources across modal and jurisdictional boundaries.	
<b>Recommended Projects</b>	
<ul style="list-style-type: none"> <li>▪ Kingsport MPO Archive Data Warehouse</li> </ul>	



### 3. PROJECT RECOMMENDATIONS

In order to achieve the ITS deployment levels outlined in their regional ITS architecture, a region must deploy carefully developed projects that provide the functionality and interoperability identified in their ITS architecture. A key step toward achieving the Kingsport Region's ITS goals is the development of an ITS Deployment Plan that identifies specific projects, timeframes, and responsible agencies.

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

To achieve input from stakeholders, a workshop was held in the Kingsport Region on February 7, 2008 to discuss potential projects. Each project recommended for the Regional ITS Deployment Plan was discussed, and consensus was reached by the stakeholders on the project description and the timeframe for deployment.

In the following sections all of the projects that were recommended for deployment by stakeholders are discussed. In Section 3.1 maps that identify locations of field elements for many of the priority projects in the Kingsport Region are presented. In Section 3.2 tables are provided with the ITS projects that have been identified for the stakeholder agencies in the Region.

#### 3.1 ITS Infrastructure Deployment Maps

Existing, planned and future ITS infrastructure in the Kingsport Region is shown on the ITS infrastructure deployment maps included in this section. **Figure 1** depicts field element deployments for state agencies and **Figure 2** covers local agency deployments. Some of the field element deployments on the maps are already fully implemented and are not shown in the project tables in Section 3.2.

The ITS infrastructure deployment maps do not represent a design of the system. Prior to the deployment of any of the ITS field elements, the location of each of the field elements should be reviewed. The maps were developed with significant stakeholder input to assist the Region in developing an initial concept of how ITS can be deployed throughout the Region.

ITS field elements are typically shown as existing or future. Existing elements have either been fully deployed or were in the process of being deployed at the time this report was developed. Future elements are those elements that are not part of a funded project but have been identified as important to the Region. Each of the future elements shown in **Figures 1 and 2** are part of the projects described in the project tables in Section 3.2.

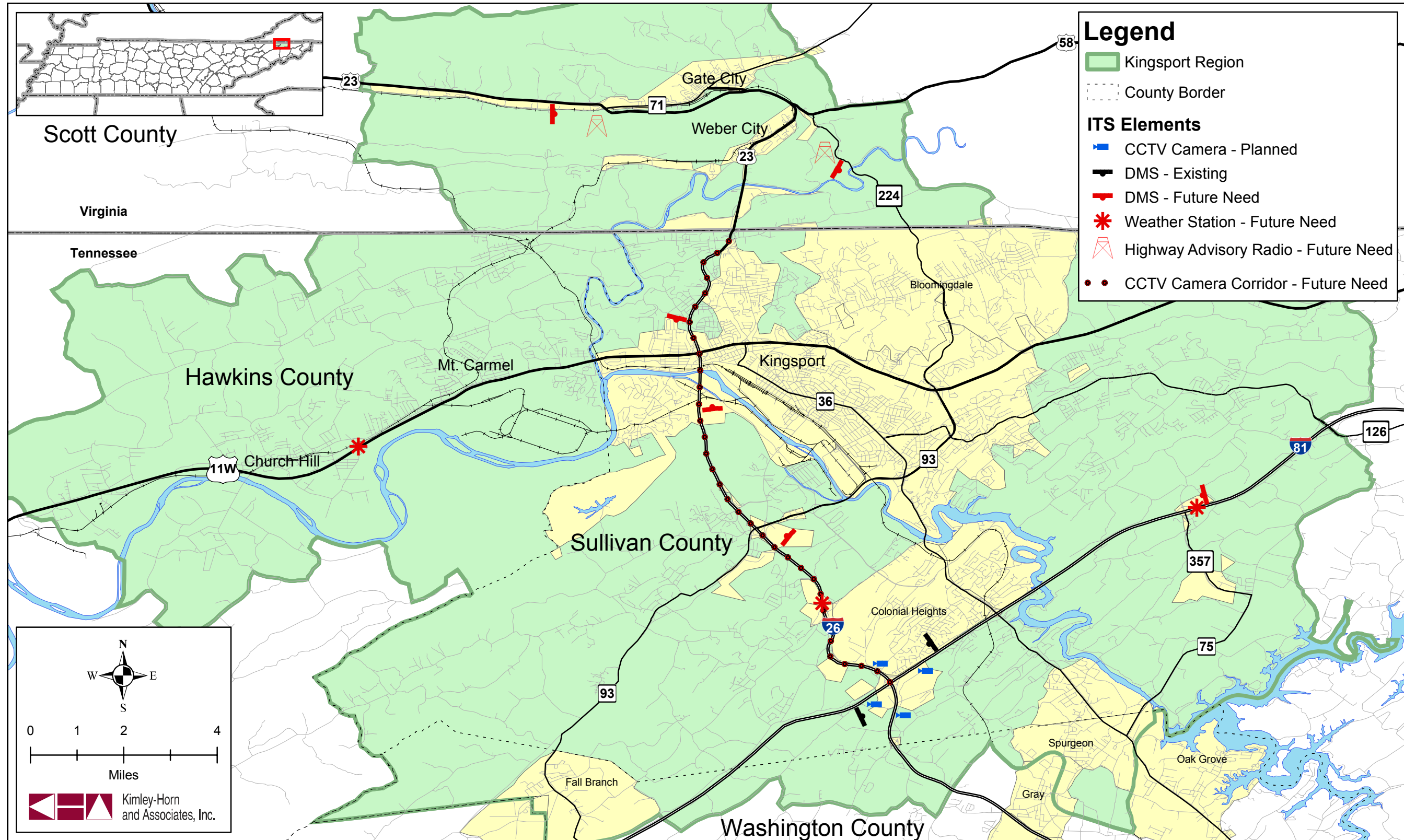


Figure 1 – State Agency ITS Field Element Deployments



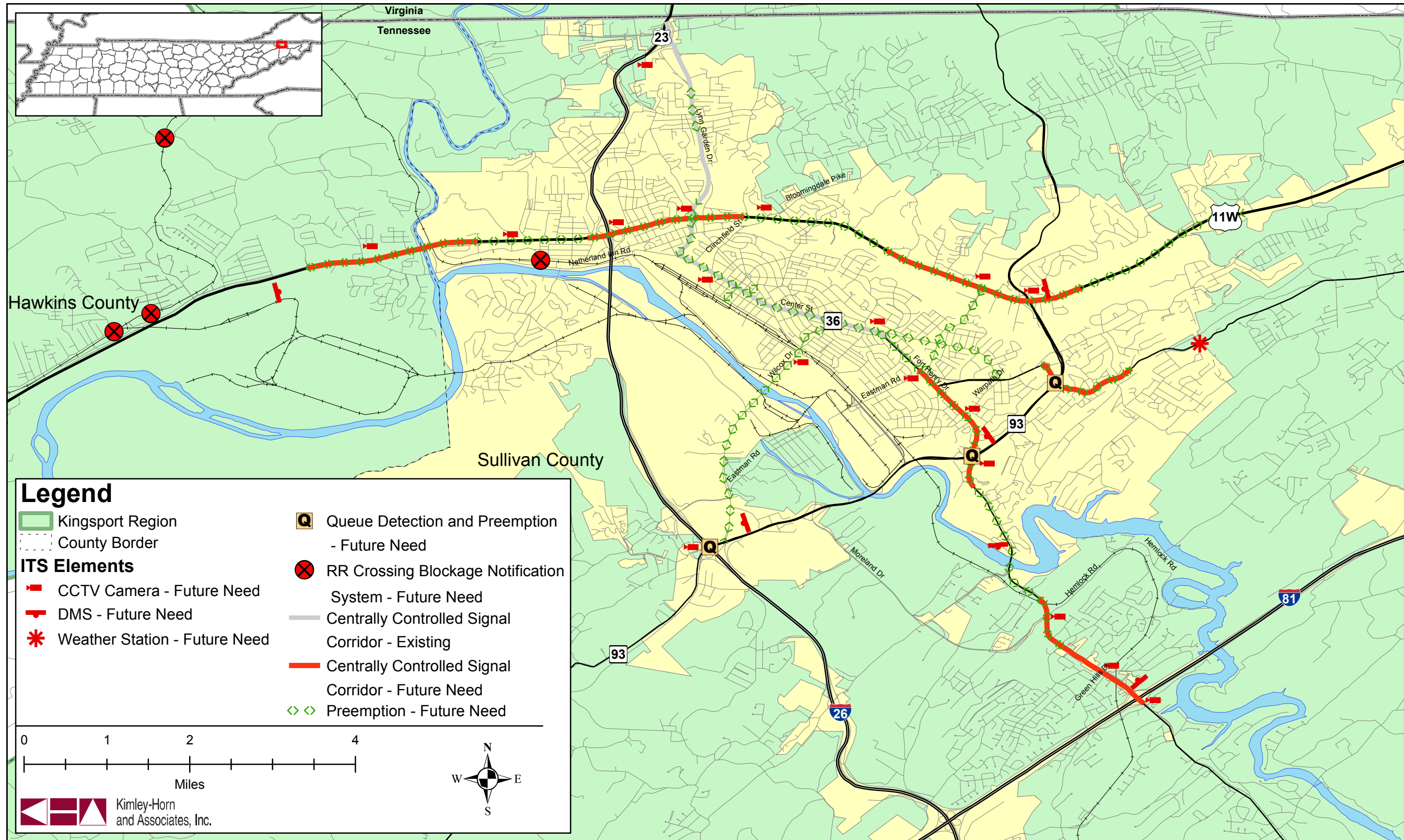


Figure 2 – Local Agency ITS Field Element Deployments

### 3.2 Regional Projects

Regional projects are identified in **Table 8** through **Table 16**. The tables are divided by primary responsible agency as follows:

- **Table 8** – City of Kingsport Tennessee;
- **Table 9** – Kingsport MPO;
- **Table 10** – Kingsport Area Transit Service;
- **Table 11** – Mountain Empire Older Citizens, Inc. Transit
- **Table 12** – Other Municipalities;
- **Table 13** – Sullivan County Tennessee;
- **Table 14** – Tennessee Department of Transportation;
- **Table 15** – Virginia Department of Transportation; and
- **Table 16** – Kingsport Region.

The projects identified in the tables represent priority projects for each agency that are needed in order to implement the ITS services that were identified as part of the Regional ITS Architecture development. A majority of the projects identified are not funded and identification of a funding source will likely be the most significant challenge in getting the projects implemented.

For each project, the following categories are discussed:

- **Project** – Identifies the project name including the agency responsible for implementation.
- **Description** – Provides a description of the project including notes on deployment locations and costs. The level of detail in the project descriptions varies depending on the implementing agency and how much detail they wanted to include regarding a project. In some cases projects had not been discussed beyond a very high conceptual level while in other cases an agency had begun detailed planning for a project implementation and more detail is provided in the description. **Figures 1 and 2** support the project descriptions by showing the location of many of the existing, planned, and future field components.
- **Opinion of Probable Cost and Funding Status** – Provides an opinion of probable cost of each project. Because design has not been undertaken for any projects, the opinion of probable cost should not be considered an estimate and should only be used for planning purposes. Costs are presented either as a total project cost when the project has been defined in more detail or as a unit cost per element when a project is at a higher conceptual level and has not been defined to the point where a total project cost opinion can be provided. For each project it is also noted whether funding has been identified or is still needed.
- **Deployment Timeframe** – Provides a recommended timeframe for deployment for each project. Timeframes have been identified as short-term (deployment recommended in 0-5 years), mid-term (deployment recommended in 5-10 years), and long-term (deployment recommended beyond 10 years). Recommendations for deployment timeframes were based on input from each agency and considered the project priority, possibility of funding, and dependency on other project deployments.
- **Applicable Market Packages** – Identifies the ITS market packages from the Regional ITS Architecture that each project will assist in implementing. Knowing which market packages each project identifies is an important part of an ITS architecture conformance review.

3.2.1 City of Kingsport Tennessee

**Table 8 – City of Kingsport Tennessee Project Recommendations**

Project	Description	Opinion of Probable Cost <sup>1</sup> and Funding Status	Deployment Timeframe <sup>2</sup>	Applicable Market Packages
City of Kingsport TN TOC	<p>Establish a Traffic Operations Center (TOC) for the City of Kingsport TN. The TOC will manage the closed loop traffic signal system, monitor and control closed circuit television (CCTV) cameras, vehicle detection, and dynamic message signs (DMS). The TOC should also be developed to support the coordination of traffic and incident information, including sharing of CCTV camera images between the City of Kingsport Traffic and other agencies including the City of Kingsport 911 Dispatch, City of Kingsport Emergency Operations Center (EOC), City of Kingsport Mobile EOC, Sullivan County EOC, and the TDOT Region 1 Transportation Management Center (TMC) in Knoxville.</p> <p>Cost of the TOC represents equipment costs and those costs associated with modifying space in an existing facility for use as a TOC.</p> <p>The City of Kingsport is interested in possibly co-locating the City's TOC and 911 Dispatch at some point in the future. Co-location will assist in the sharing of road closure and incident information between traffic personnel and 911 dispatchers and facilitate coordination during large incidents or evacuations. Depending on space requirements of the TOC and 911 Dispatch the cost for co-location could be significantly higher than the \$100,000 – \$200,000 provided in the opinion of probable cost.</p>	<p>\$100,000 – \$200,000 Funding Identified: No</p>	<p>Short-term</p>	<p>ATMS01 ATMS03 ATMS06 ATMS08</p>

**Table 8 – City of Kingsport Tennessee Project Recommendations (continued)**

Project	Description	Opinion of Probable Cost <sup>1</sup> and Funding Status	Deployment Timeframe <sup>2</sup>	Applicable Market Packages
City of Kingsport TN Centrally Controlled Signal System	<p>Migrate existing closed loop signal system to a centrally controlled signal system with Ethernet connections to each signal. System will use existing and future fiber optic network for communications to signals and allow for centrally controlled signal corridors to be implemented in the City. High priority corridors have been identified in Figure 2.</p> <p>The City of Kingsport has not made a final determination if this is the type of system they are going to pursue. The current system includes approximately 104 traffic signals with approximately 55 of those connected.</p> <p>The cost for this project, not including fiber communications, was estimated at approximately \$100,000 by the City of Kingsport.</p>	<p>\$100,000 Funding Identified: No</p>	<p>Short-term</p>	<p>ATMS03</p>
City of Kingsport TN Signal System Communications	<p>Deploy a fiber optic communications system to connect existing traffic signals to the City of Kingsport centrally controlled signal system. A plan should be developed to identify the full fiber communications system that is needed. When possible, fiber to complete the full communications system build out should be added into other road projects.</p> <p>The cost for this project will be on a per linear foot basis and could vary a great deal for each location. Factors affecting cost include aerial versus underground fiber installation, modification of an existing facility versus new construction when fiber is installed, and existing infrastructure in the area that will impact trenching for conduit.</p> <p>Although identified as a short-term need the communications system will probably not be fully implemented until the mid-term. In addition to traffic signals, there is the potential to use the high-bandwidth communications system to support other ITS applications.</p>	<p>To Be Determined Funding Identified: No</p>	<p>Short-term to Mid-term</p>	<p>ATMS03</p>

**Table 8 – City of Kingsport Tennessee Project Recommendations (continued)**

Project	Description	Opinion of Probable Cost <sup>1</sup> and Funding Status	Deployment Timeframe <sup>2</sup>	Applicable Market Packages
City of Kingsport TN Ramp Queue Detection and Signal Preemption	<p>Implement a queue detection system at off-ramps of controlled access freeways where traffic queues from a nearby traffic signal may block through lanes of the freeway. The system will include traffic signal preemption to prevent backups beyond a predetermined point.</p> <p>Priority locations that were identified included I-26 at SR 93 and John B Dennis (SR 93) at Ft Henry (SR 36).</p> <p>Cost for this project includes a vehicle detection system and a communications connection with the traffic signal cabinet.</p>	\$20,000/site	Short-term	ATMS03
City of Kingsport TN Speed Monitoring System	<p>Implement permanent speed monitoring systems at locations throughout the City. The speed monitoring systems can be deployed with a driver feedback sign if the purpose of the system is to reduce speeds or without a driver feedback sign if the purpose is to monitor actual speeds. The selection of locations for permanent signs should be coordinated between the City of Kingsport Public Works and Police Departments.</p>	\$5,000 – \$20,000/site Funding Identified: No	Short-term	ATMS19
City of Kingsport TN TOC Coordination with TDOT Region 1 TMC – Knoxville	<p>Establish a communications connection between the City of Kingsport TOC and the TDOT Region 1 TMC in Knoxville for the coordination of traffic information. This sharing will facilitate the inclusion of regional information into the Tennessee SmartWay Information System (TSIS) as well the sharing of weather information and video feeds. The inclusion of local information in TSIS will enable travelers to access consolidated travel information for local roadways as well as state facilities through the TDOT SmartWay website and 511 system.</p> <p>The City of Kingsport connection to TDOT will also facilitate coordination with VDOT through information sharing between the two states.</p> <p>Additional Responsible Agency: TDOT</p>	Cost To Be Determined Funding Identified: No	Short-term	ATMS07 ATMS08



**Table 8 – City of Kingsport Tennessee Project Recommendations (continued)**

Project	Description	Opinion of Probable Cost <sup>1</sup> and Funding Status	Deployment Timeframe <sup>2</sup>	Applicable Market Packages
City of Kingsport TN Fire and EMS AVL and MDTs	Implement automated vehicle location (AVL) and mobile data terminals (MDTs) for City of Kingsport Fire and EMS vehicles (this capability exists for the Police Department). In conjunction with the project to integrate the 911 Dispatch computer aided dispatch (CAD) system with the City of Kingsport TOC, this project will support real-time routing of emergency vehicles taking into account current traffic conditions. Cost represents in-vehicle equipment as well as supporting software.	\$3,000/vehicle Funding Identified: No	Short-term	EM01 EM02
City of Kingsport TN Emergency Vehicle Signal Preemption	Implement emergency vehicle signal preemption to traffic signals in the City of Kingsport to improve incident response times and emergency responder safety. Preemption will be for Fire and EMS vehicles.  Numerous corridors where emergency vehicle signal preemption is needed are shown in Figure 2. High priority locations include: <ul style="list-style-type: none"> <li>▪ SR 36 from US 23 to US 11</li> <li>▪ All approaches of US 11 at SR 36</li> <li>▪ Eastman between US 11 and Fort Henry (SR 36)</li> <li>▪ All approaches of US 11 at Eastman</li> </ul>	\$6,000/intersection \$1,500/vehicle Funding Identified: No	Short-term	ATMS03 EM02



**Table 8 – City of Kingsport Tennessee Project Recommendations (continued)**

Project	Description	Opinion of Probable Cost <sup>1</sup> and Funding Status	Deployment Timeframe <sup>2</sup>	Applicable Market Packages
City of Kingsport TN CCTV Cameras	<p>Implement additional CCTV cameras on key sections of roadway within the City of Kingsport. CCTV cameras can be used to monitor traffic conditions and to aid in incident management. Video feeds can be shared with emergency management agencies to facilitate emergency response. The CCTV camera locations should be coordinated with future TDOT CCTV camera location deployments on I-26 to share camera feeds and maximize deployment benefits.</p> <p>Approximately 14 high priority locations have been identified by the City of Kingsport and as many as 30 CCTV camera locations may ultimately be needed to complete the camera network in the City. The priority locations are shown in Figure 2 and include:</p> <ul style="list-style-type: none"> <li>▪ Stone at Eastman, Clinchfield, Lynn Garden, I-26, Deneen, and Neterland Inn</li> <li>▪ Center at Clinchfield</li> <li>▪ Ft Henry at Center, Eastman, Warpath, JB Dennis, Moreland, Green Hills, and I-81</li> <li>▪ Wilcox at Lincoln</li> <li>▪ I-26 at MM1 and John BD</li> </ul> <p>Cost shown includes the pole, camera, and controller cabinet. The cost will be lower if the camera is installed on a signal mast arm or other existing roadside structure.</p>	<p>\$30,000/site Funding Identified: No</p>	<p>Mid-term</p>	<p>ATMS01</p>
City of Kingsport TN DMS	<p>Deploy DMS in the City of Kingsport to provide traveler information, incident management, and special event management capabilities.</p> <p>Priority locations include deployments on US 11, SR 36, and SR 93 as identified in Figure 2.</p>	<p>\$100,000/site Funding Identified: No</p>	<p>Mid-term</p>	<p>ATMS06</p>
City of Kingsport TN Railroad Grade Crossing Improvements	<p>Implement advanced warning signs at railroad crossings to alert motorists of road blockages due to stopped trains. Notification that a crossing is blocked will also be sent to the City of Kingsport TN TOC and 911 dispatchers to aid in emergency vehicle dispatch and routing.</p>	<p>\$10,000 – \$20,000/site Funding Identified: No</p>	<p>Mid-term</p>	<p>ATMS13</p>

**Table 8 – City of Kingsport Tennessee Project Recommendations (continued)**

Project	Description	Opinion of Probable Cost <sup>1</sup> and Funding Status	Deployment Timeframe <sup>2</sup>	Applicable Market Packages
City of Kingsport TN TOC Coordination with Kingsport TN 911	<p>Establish a connection to allow sharing of CCTV camera images with 911 Dispatch to aid in incident management. Integration of the 911 Dispatch CAD system will allow the TOC to receive automated notification about incidents that might affect the roadway network and the use of real-time traffic information from the TOC in emergency vehicle dispatch.</p> <p>As noted in the City of Kingsport TN TOC project, the City is interested in possibly co-locating the TOC and 911 Dispatch. If co-location does occur the information sharing between the TOC and 911 Dispatch will be greatly enhanced.</p>	Cost To Be Determined Funding Identified: No	Mid-term	ATMS08 EM02 MC10
City of Kingsport TN Public Works Department Vehicle AVL	Implement AVL on City of Kingsport Public Works Department vehicles. Cost represents in-vehicle equipment as well as supporting software.	\$3,000/vehicle Funding Identified: No	Mid-term	MC01

<sup>1</sup>The design has not been undertaken and thus this is only an opinion of probable cost for implementation to be used for planning purposes.

<sup>2</sup>Deployment timeframes include short-term (0-5 years), mid-term (5-10 years), and long-term (10+ years).

### 3.2.2 Kingsport Metropolitan Planning Organization

**Table 9 – Kingsport Metropolitan Planning Organization Project Recommendations**

Project	Description	Opinion of Probable Cost <sup>1</sup> and Funding Status	Deployment Timeframe <sup>2</sup>	Applicable Market Packages
Kingsport MPO Archive Data Warehouse	Establish a data warehouse to archive data from cities and transit agencies in the metropolitan planning organization (MPO) service area for use in regional planning. Cost for this project represents an average range for developing a data warehouse system. Cost could vary widely depending on the level of detail and functionality of the system as well as the amount of development that is done in-house by the Kingsport MPO.	\$200,000 Funding Identified: No	Long-term	AD2

<sup>1</sup>The design has not been undertaken and thus this is only an opinion of probable cost for implementation to be used for planning purposes.

<sup>2</sup>Deployment timeframes include short-term (0-5 years), mid-term (5-10 years), and long-term (10+ years).

### 3.2.3 Kingsport Area Transit Service

**Table 10 – Kingsport Area Transit Service Project Recommendations**

Project	Description	Opinion of Probable Cost <sup>1</sup> and Funding Status	Deployment Timeframe <sup>2</sup>	Applicable Market Packages
Kingsport Area Transit Service AVL	Continue to implement AVL on buses for real-time vehicle location of the Kingsport Area Transit fleet. The system includes GPS and a communications link between vehicle and dispatcher. Vehicle locations are displayed in a GIS based tracking system.  AVL is included on new buses that are being purchased as existing buses in the fleet are replaced.	\$150,000 Funding Identified: No	Short-term	APTS01 APTS02 APTS03
Kingsport Area Transit Service Real-time Bus Arrival Information	Provide real-time bus arrival information and information about routes at the central station and bus shelters. Technologies could include kiosks and electronic display boards.  The Kingsport Area Transit Service is also considering adding real time bus arrival information on the web to improve the user friendliness of the transit system.	\$10,000 – \$25,000/site	Short-term	APTS08
Kingsport Area Transit Service Electronic Fare Collection	Implement electronic fare collection capabilities on Kingsport Area Transit Service vehicles. The system will also include kiosks for purchasing or recharging fare cards at transit transfer stations.	\$15,000/vehicle Funding Identified: No	Long-term	APTS04
Kingsport Area Transit Service Automatic Passenger Counters	Implement passenger counters on Kingsport Area Transit Service vehicles to record boardings and alightings.	\$5,000 – \$10,000/vehicle Funding Identified: No	Long-term	APTS10

**Table 10 – Kingsport Area Transit Service Project Recommendations (continued)**

Project	Description	Opinion of Probable Cost <sup>1</sup> and Funding Status	Deployment Timeframe <sup>2</sup>	Applicable Market Packages
Kingsport Area Transit Service On-Board Security Monitoring	Continue to implement video surveillance on Kingsport Urban Area Transit System vehicles to improve patron and driver safety. Cameras are for local recording only and do not provide video feeds back to transit dispatch. Video surveillance is included on new buses that are purchased.	\$3,000/vehicle Funding Identified: No	Short-term	APTS05
Kingsport Area Transit Service Security Monitoring	Implement video surveillance at the Kingsport Area Transit Service Central Station and select stops and transfer points to improve patron and driver safety.	\$10,000 – \$20,000/site Funding Identified: No	Mid-term	APTS05
Kingsport Area Transit Service Signal Priority	Provide transit priority capability for Kingsport Area Transit Service buses at the City of Kingsport traffic signals. Priority will be given along specified routes in coordination with the City of Kingsport Public Works.  Cost includes the cost per intersection to add priority capabilities as well as a cost per vehicle to purchase an emitter.	\$6,000/intersection \$1,500/vehicle Funding Identified: No	Long-term	APTS09

<sup>1</sup>The design has not been undertaken and thus this is only an opinion of probable cost for implementation to be used for planning purposes.

<sup>2</sup>Deployment timeframes include short-term (0-5 years), mid-term (5-10 years), and long-term (10+ years).

3.2.4 *Mountain Empire Older Citizens, Inc. Transit*

**Table 11 – MEOC Transit Project Recommendations**

Project	Description	Opinion of Probable Cost <sup>1</sup> and Funding Status	Deployment Timeframe <sup>2</sup>	Applicable Market Packages
MEOC Transit AVL and MDTs	Implement automated vehicle location (AVL) and mobile data terminals (MDTs) on buses. AVL will allow for real-time vehicle location of the MEOC Transit fleet and MDTs will allow MEOC Transit Dispatchers to provide information directly to drivers. Software cost is included in the cost per vehicle.	\$12,000/vehicle Funding Identified: No	Short-term	APTS01 APTS03
MEOC Transit On-Board Security Monitoring	Implement video surveillance on MEOC Transit vehicles to improve patron and driver safety. Cameras are for local recording only and do not provide video feeds back to transit dispatch.	\$3,000/vehicle Funding Identified: No	Short-term	APTS05

<sup>1</sup>The design has not been undertaken and thus this is only an opinion of probable cost for implementation to be used for planning purposes.

<sup>2</sup>Deployment timeframes include short-term (0-5 years), mid-term (5-10 years), and long-term (10+ years).

### 3.2.5 Other Municipalities

**Table 12 – Other Municipalities Project Recommendations**

<b>Project</b>	<b>Description</b>	<b>Opinion of Probable Cost<sup>1</sup> and Funding Status</b>	<b>Deployment Timeframe<sup>2</sup></b>	<b>Applicable Market Packages</b>
Municipal Railroad Grade Crossing Improvements	Implement advanced warning signs at railroad crossings to alert motorists of road blockages due to stopped trains.	\$10,000 – \$20,000/site Funding Identified: No	Mid-term	ATMS13
City of Mt Carmel TN Speed Monitoring System	Implement detection to monitor roadway speeds and determine locations for targeted enforcement. In select locations, such as school zones, the detection will also include driver feedback signs to inform the driver of their speed.	\$5,000 – \$20,000/site Funding Identified: No	Mid-term	ATMS19

<sup>1</sup>The design has not been undertaken and thus this is only an opinion of probable cost for implementation to be used for planning purposes.

<sup>2</sup>Deployment timeframes include short-term (0-5 years), mid-term (5-10 years), and long-term (10+ years).

3.2.6 Sullivan County Tennessee

**Table 13 – Sullivan County Tennessee Project Recommendations**

Project	Description	Opinion of Probable Cost <sup>1</sup> and Funding Status	Deployment Timeframe <sup>2</sup>	Applicable Market Packages
Sullivan County 911 Dispatch and EOC CCTV Camera Image Sharing	<p>Establish a connection to share TDOT and City of Kingsport closed circuit television (CCTV) camera images with the Sullivan County 911 Dispatch and Emergency Operations Center (EOC). Connecting to the City of Kingsport Traffic Operations Center (TOC) will allow the Sullivan County 911 Dispatch and EOC access to TDOT video once the City of Kingsport TOC is connected to TDOT.</p> <p>Additional Responsible Agencies: City of Kingsport, TDOT</p>	To Be Determined Funding Identified: No	Mid-term	<p>ATMS08 EM08 EM09</p>

<sup>1</sup>The design has not been undertaken and thus this is only an opinion of probable cost for implementation to be used for planning purposes.

<sup>2</sup>Deployment timeframes include short-term (0-5 years), mid-term (5-10 years), and long-term (10+ years).



3.2.7 Tennessee Department of Transportation

**Table 14 – TDOT Project Recommendations**

Project	Description	Opinion of Probable Cost <sup>1</sup> and Funding Status	Deployment Timeframe <sup>2</sup>	Applicable Market Packages
<p>TDOT SmartWay Deployment at the I-26/I-81 Interchange – CCTV Cameras</p>	<p>Implement four closed circuit television (CCTV) cameras at the I-81/I-26 interchange. CCTV cameras can be used to monitor traffic conditions and to aid in incident management. The cameras will be monitored by the TDOT Region 1 Transportation Management Center (TMC) in Knoxville. Video feeds can be shared with emergency management agencies to facilitate emergency response. Communications costs are not included and can vary widely depending on available options for communication and the quality of video that is required.</p> <p>Although not within the geographic boundaries of the Kingsport Regional ITS Architecture, this project has been included in the ITS Deployment Plan due to the impact it will have on traffic operations in the Kingsport Region. This project has also been included in the Bristol Regional ITS Deployment Plan.</p>	<p>\$30,000/camera Funding Identified: Yes</p>	<p>Short-term</p>	<p>ATMS01</p>
<p>TDOT HELP Vehicle Service Area Expansion</p>	<p>Expand the TDOT Region 1 HELP service area to include vehicles stationed in the Kingsport Region. HELP vehicles stationed in the area would facilitate incident management as well as special event management.</p>	<p>To Be Determined Funding Identified: No</p>	<p>Short-term</p>	<p>EM04</p>

**Table 14 – TDOT Project Recommendations (continued)**

Project	Description	Opinion of Probable Cost <sup>1</sup> and Funding Status	Deployment Timeframe <sup>2</sup>	Applicable Market Packages
TDOT SmartWay Deployment on I-26 – CCTV Cameras	<p>Implement CCTV cameras on I-26 in the Kingsport Region. CCTV cameras can be used to monitor traffic conditions and to aid in incident management. The cameras will be monitored by the TDOT Region 1 TMC in Knoxville and video feeds could be shared with local traffic and emergency management agencies.</p> <p>TDOT should coordinate with the City of Kingsport to select deployment locations on I-26 that are beneficial to TDOT and the City and also to share video feeds from CCTV cameras deployed by TDOT and the City of Kingsport along I-26.</p> <p>Cost shown includes the cost for a camera, pole, and controller cabinet. Communications costs are not included and can vary widely depending on available options for communication and the quality of video that is required.</p>	<p>\$30,000/site Funding Identified: No</p>	<p>Mid-term</p>	<p>ATMS01</p>
TDOT SmartWay Deployment on I-26 – DMS	<p>Implement DMS on I-26 in the Kingsport Region to disseminate incident, weather, construction, and general traffic information. Desired locations include southbound I-26 north of US 11 and northbound I-26 south of SR 93 as shown in Figure 1. Stakeholders also recommended that the inoperable message sign on northbound I-26 south of US 11 be replaced by a DMS.</p>	<p>\$175,000/site Funding Identified: No</p>	<p>Mid-term</p>	<p>ATMS06</p>
TDOT SmartWay Deployment on I-26 – Vehicle Detection	<p>Implement vehicle detection technologies on I-26 to monitor speeds and volumes. The cost and capabilities will depend on the technology chosen. Cost range represents a variety of technologies from in-pavement loop detectors to non-intrusive detectors that could be mounted on an existing or new pole. Spacing in rural areas will typically be greater than spacing in urban areas.</p>	<p>\$5,000 – \$20,000/site</p>	<p>Mid-term</p>	<p>ATMS01</p>

**Table 14 – TDOT Project Recommendations (continued)**

Project	Description	Opinion of Probable Cost <sup>1</sup> and Funding Status	Deployment Timeframe <sup>2</sup>	Applicable Market Packages
TDOT Weather Detection	Implement additional weather detection in the Kingsport Region for snow and ice detection. The bridges on I-26 and I-81 were identified as priority needs because these bridges are most likely to freeze during winter storms. Potential locations for weather detection have been identified in Figure 1.	\$10,000 – \$25,000/site	Mid-term	MC03

<sup>1</sup>The design has not been undertaken and thus this is only an opinion of probable cost for implementation to be used for planning purposes.

<sup>2</sup>Deployment timeframes include short-term (0-5 years), mid-term (5-10 years), and long-term (10+ years).

3.2.8 Virginia Department of Transportation

**Table 15 – Virginia Department of Transportation Project Recommendations**

Project	Description	Opinion of Probable Cost <sup>1</sup> and Funding Status	Deployment Timeframe <sup>2</sup>	Applicable Market Packages
VDOT DMS on US 23 and SR 224	Implement dynamic message signs (DMS) in the Kingsport Region to disseminate incident, weather, construction, and general traffic information. The priority locations that were identified included SR 71 and US 224 as shown in Figure 1.	\$100,000/site Funding Identified: No	Short-term	ATMS06
VDOT Highway Advisory Radio	Implement highway advisory radio (HAR) at two locations within the Kingsport Region. HAR allows for more detailed messages and information to be provided to motorist than can be given with a DMS. The priority locations that were identified include SR 71 and SR 224 as shown in Figure 1. Costs shown are for the transmitting tower only and do not include any software that may be needed to operate the HAR.	\$20,000 – \$30,000/site Funding Identified: No	Mid-term	ATMS06
VDOT CCTV Cameras	Implement closed circuit television (CCTV) cameras in the Kingsport Region for monitoring traffic conditions and to aid in incident management. The CCTV cameras are a low priority and will probably not be implemented until the next 10 to 15 years. Cost shown includes the cost for a camera, pole, and controller cabinet. Communications costs are not included and can vary widely depending on available options for communication and the quality of video that is required.	\$30,000/site Funding Identified: No	Long-term	ATMS01

<sup>1</sup>The design has not been undertaken and thus this is only an opinion of probable cost for implementation to be used for planning purposes.

<sup>2</sup>Deployment timeframes include short-term (0-5 years), mid-term (5-10 years), and long-term (10+ years).

3.2.9 *Kingsport Region*

**Table 16 – Regional Project Recommendations**

Project	Description	Opinion of Probable Cost <sup>1</sup> and Funding Status	Deployment Timeframe <sup>2</sup>	Applicable Market Packages
Regional Media Liaison and Coordination	<p>Develop agreements and enhanced coordination with local media to improve information sharing and dissemination. There is no cost associated with this project. If the media desires to gather data, such as closed circuit television (CCTV) camera video feeds, from the transportation agencies in the Region, then it is expected that the media will be responsible for any costs.</p> <p>Responsible Agencies: City of Kingsport, TDOT, VDOT</p>	<p>No Associated Cost Note: Funding not applicable</p>	Mid-term	ATIS01

<sup>1</sup>The design has not been undertaken and thus this is only an opinion of probable cost for implementation to be used for planning purposes.

<sup>2</sup>Deployment timeframes include short-term (0-5 years), mid-term (5-10 years), and long-term (10+ years).

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

Just as the ITS Architecture developed for the Kingsport Region documents the Region's goals for ITS implementation at the time it was developed, the ITS Deployment Plan addresses the projects that stakeholders agreed were necessary to implement at the time the plan was developed in order to reach their ITS deployment goals. As the Region grows, needs will change and as technology progresses new ITS opportunities will arise. Shifts in regional focus as well as changes in the National ITS Architecture will necessitate that the Kingsport Regional ITS Architecture be updated to remain a useful resource for the Region. These same changes will create new project opportunities and revisions to the projects in the ITS Deployment Plan.

Stakeholders agreed upon a procedure for updating the Regional ITS Architecture and Deployment Plan. The procedure, documented in detail in the Kingsport Regional ITS Architecture, outlines how to document ITS Architecture changes that may be needed for inclusion in the next plan update. While complete plan updates are scheduled to occur approximately every five years prior to the Long Range Transportation Plan update, stakeholders agreed that it would be beneficial to review the projects identified in the ITS Deployment Plan once a year. The Kingsport MPO will lead the annual project reviews. The purpose of the reviews will be to update project status, remove projects that are completed, add project detail when available, and add any new projects into the ITS Deployment Plan. Any corresponding changes to the Kingsport Regional ITS Architecture will be documented and retained by the Kingsport MPO for inclusion during the next complete update as outlined in the Kingsport Regional ITS Architecture document.