KNOXVILLE REGIONAL ITS ARCHITECTURE and DEPLOYMENT PLAN

Ready for Use Approval by FHWA
November 3, 2021

The Knoxville Regional ITS Architecture provides a coordinated opportunity for stakeholders to develop a plan and framework for implementing ITS projects across a region to improve safety and mobility.

Chapter 1. Introduction

1.1 PROJECT OVERVIEW

A regional intelligent transportation system (ITS) architecture allows for local stakeholders to collectively plan for the future of their transportation system and then breaks the mid- to long-term vision into smaller components that can be implemented piece by piece as funding becomes available. The purpose of the Knoxville Regional ITS Architecture is to define the framework for planning, implementing, and operating ITS systems within the greater Knoxville area. This document presents the Knoxville Regional ITS Architecture, which promotes interagency collaboration, resource sharing, and interoperability within the Knoxville region.

In order to comply with the ITS conformity requirement established in the Transportation Equity Act for the 21st Century (TEA-21), a regional ITS architecture is typically required by the Federal Highway Administration (FHWA) and Federal Transit Administration (FTA) to receive federal funding on ITS-related projects within greater, metropolitan areas, such as Knoxville. Per Section 5206(e) of this bill, FHWA and FTA issued policy requiring regions implementing ITS systems to have an ITS architecture in place by April 2005. From that point on, only ITS projects included in the regional ITS architecture are eligible to receive federal funding, making it critically important to maintain and update a region's ITS architecture so that desired projects in the region can be implemented.

The Knoxville Regional ITS Architecture is a living document that was first developed in 2000 and has since been updated in both 2003 and 2012. Since the last update, a number of local ITS projects including numerous Traffic Operations Centers (TOCs) and Advanced Traffic Management Systems (ATMS) deployments are underway throughout many cities and counties in the Knoxville region. With that in mind, it is critical to keep regional ITS architectures up to date so that they accurately reflect current ITS conditions in the region and account for changes in the region's needs and visions. In March of 2020, the Knoxville Regional Transportation Planning Organization (TPO) and the Tennessee Department of Transportation (TDOT) began the update of the Knoxville Regional ITS Architecture to be completed in 2020. This effort took place over the course of 8 months in tandem with the Mobility Plan 2045 effort.

1.2 DOCUMENT OVERVIEW

The following sections comprise the Knoxville Regional ITS Architecture:

Section 1 – Introduction

This section provides an overview of the requirements for regional ITS architectures and identifies the geographic area and key stakeholders.

Section 2 – Regional ITS Architecture Development Process and RAD-IT Software

This section provides a summary of the process used to develop the update to the regional ITS architecture including the use of the RAD-IT software.

Section 3 – Regional ITS Needs

This section summarizes the ITS needs of the Knoxville region as identified by key stakeholders.

Section 4 – Regional ITS Inventory

This section summarizes the existing and planned ITS architecture components in the Knoxville region.

Section 5 – Regional ITS Architecture

This section presents the ITS service packages and illustrates how the National ITS Architecture links back to the needs and visions of the Knoxville region stakeholders.

Section 6 – Regional ITS Deployment Plan

This section documents ITS projects, both planned and potential, that may be implemented within the Knoxville region in order to provide ITS services as identified by stakeholders as a regional priority.

Section 7 – Use and Maintenance Plan

This section describes how agencies can use the regional ITS architecture for planning and designing projects in the region using Systems Engineering Analysis as well as how to maintain the architecture in the future.

Appendix

Appendix A – List of Stakeholders

Appendix B – ITS Service Packages

Appendix C – ITS Element Functions

Appendix D – Existing Agreement Documents

Appendix E - Architecture Maintenance Documentation Form

Appendix F - FHWA Ready for Use Approval Letter

1.3 KNOXVILLE REGION

Study Area

The Knoxville Regional ITS Architecture study area includes all of Anderson, Blount, Knox, Loudon, and Sevier Counties and extends beyond the Knoxville Regional TPO planning area as shown in Figure 1. Of note is that although Roane County is shown on the map, but it is only included in the ITS Architecture to the extent that it is included in the TPO planning area. As shown in Figure 1, the Knoxville region is served by multiple interstates, most notably I-40 and I-75 that run east-west and north-south, respectively, in addition to an expansive system of US and state routes, all of which are evaluated in the ITS Architecture. A comprehensive Statewide ITS Architecture that pertains to interstates and arterials throughout the state of Tennessee is maintained by TDOT and was last updated in 2019.

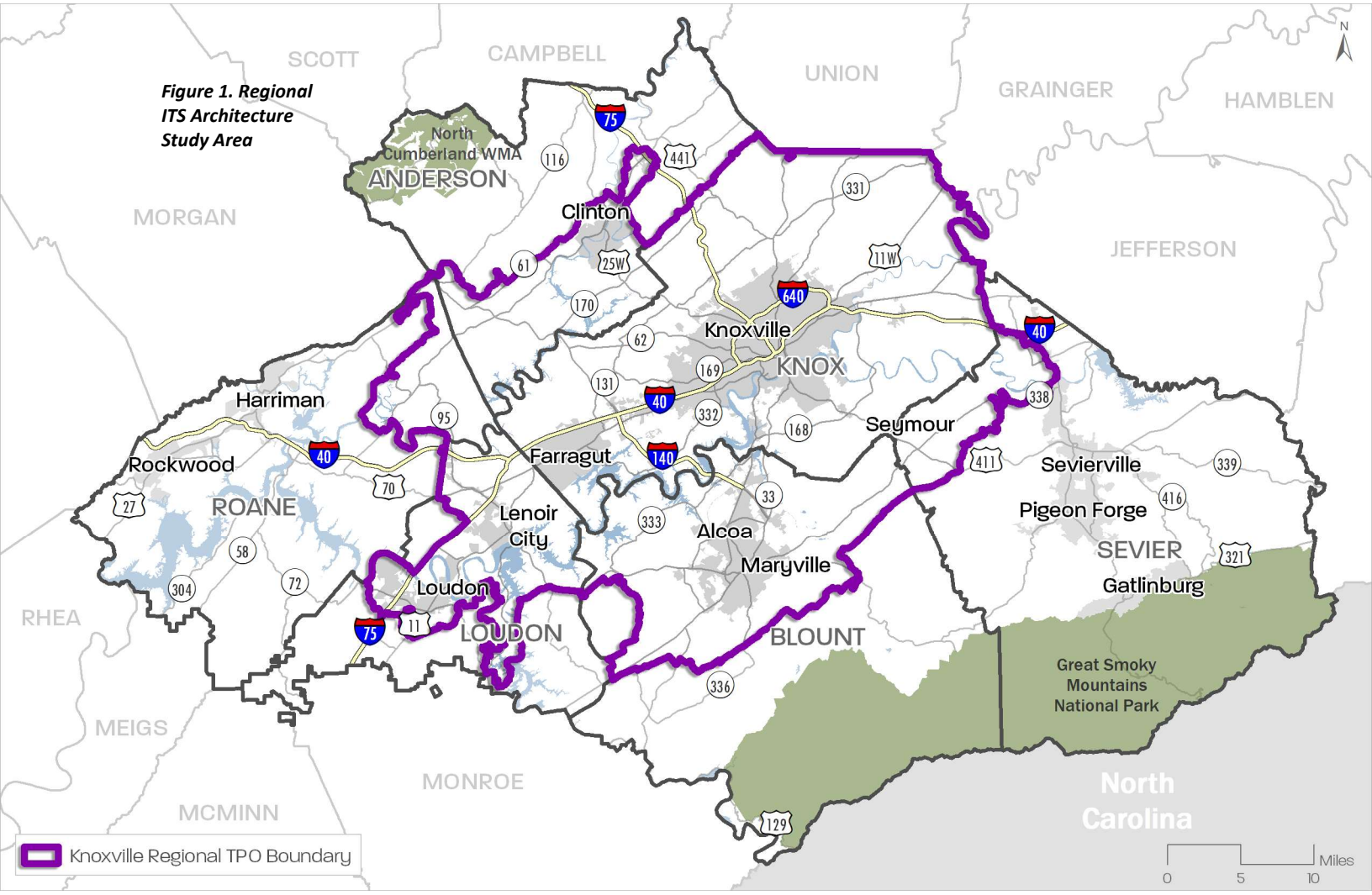


Figure 1. Regional ITS Architecture Study Area

Regional Stakeholders

The key to developing a useful regional ITS architecture is intertwining the needs and visions of a diverse group of agencies including local, regional, state, and federal stakeholders. Input from a wide range of stakeholders is needed to ensure the success of future coordination efforts and implementation of ITS deployments. The stakeholders for the Knoxville Regional ITS Architecture included representatives from transportation agencies and cities, transit agencies, public safety and emergency services, the University of Tennessee, and Oak Ridge National Laboratories, among others.

The complete list of stakeholders engaged throughout the development of the Knoxville Regional ITS Architecture is listed in the Appendix. These stakeholders were invited to participate at various points in the process to provide input on their needs and concerns involving ITS in the region. Due to challenges presented by the COVID-19 pandemic, all stakeholder involvement was conducted in virtual forums.

Chapter 2. Regional ITS Architecture Development Process and RAD-IT Software

2.1 REGIONAL ITS ARCHITECTURE UPDATE PROCESS

As ITS systems evolve and are implemented, regional priorities and strategies evolve as well. As the scope of ITS expands to incorporate new ideas and technologies, the Knoxville Regional ITS Architecture needs to be updated to incorporate these developments. Stakeholder input is critical to ensure these new developments in ITS are explored and implemented as appropriate to meet the needs of the region. The process used to develop the Knoxville Regional ITS Architecture, as shown in Figure 2, ensures that stakeholder input is a critical component. A description of each step in the process is provided below.

Figure 2. Regional ITS Architecture Development Process

Stakeholder Kick-Off Workshops: Regional stakeholders were invited to a virtual kick-off workshop to initiate the update the Knoxville Regional ITS Architecture. Two kick-off workshop opportunities were offered virtually due to restrictions on in-person meetings associated with the COVID-19 pandemic. The primary purposes of the workshops included the review of goals for ITS in the region, the identification of existing and planned ITS systems for each stakeholder agency, and the assessment of future ITS needs that would ultimately drive a collaborative vision for the future of ITS in the Knoxville region.

Stakeholder Outreach and System Inventory: In addition to the stakeholder kick-off workshops, individual small group interviews were conducted virtually to gain additional input needed to develop the regional architecture. These interviews grouped stakeholders by agency and geographic jurisdiction and

included a facilitated discussion used to inventory local ITS systems and catalog how ITS services are currently being operated, managed, and coordinated regionally. Additionally, more in-depth discussions were used to identify the need for future services and specific ITS projects in the region. These interviews were also used to develop the TPO's Congestion Management Process (CMP) as incorporated into Mobility Plan 2045. This coordination provided an integral linkage between the processes and allowed stakeholders to identify sources of congestion on the region's roadway system and explore how ITS and other technological and operational improvements could play a role in mitigating the impacts of roadway congestion. As needed, additional follow up correspondence with stakeholder agencies was undertaken to ensure all regional needs and potential projects were captured.

Develop the Knoxville Regional ITS Architecture: Utilizing the information gathered from stakeholders, a draft report was prepared that documents the roles and responsibilities of participating agencies in the operation and implementation of the ITS system. Further, the report identifies projects for deployment and updates the use and maintenance plan. All documents related to the architecture, including draft reports, meeting minutes, and the RAD-IT database, are uploaded to a website dedicated to the project.

https://knoxtpo.org/plans-studies/its-architecture/

Stakeholder Review: Upon completing the draft Knoxville Regional ITS Architecture, regional stakeholders were re-engaged to review the document and share questions, comments, or concerns with the project team. The document was then revised to reflect their input.

Final Report: The final Knoxville Regional ITS Architecture includes an executive summary, project report, RAD-IT database, and an interactive project website that consists of all components of the Regional ITS Architecture.

2.2 RAD-IT SOFTWARE

The Knoxville Regional ITS Architecture was developed using the Regional Architecture Development for Intelligent Transportation (RAD-IT) Version 9.0, which was released in September of 2021. RAD-IT is a software specifically developed for creating and maintaining regional ITS architectures by the United States Department of Transportation (USDOT). RAD-IT replaces the Turbo Architecture software that was used to develop previous versions of the Knoxville Regional ITS Architecture.

The RAD-IT database for the Knoxville Regional Architecture consists of various ITS service packages, presented in Table 1, that reflect the existing or planned services in the region. Elements, such as traffic signals or field sensors, and data that is shared between the elements are shown graphically within each service package.

Table 1. RAD-IT Reports and Diagrams

NAME	FUNCTION
Stakeholder Report	Consists of all stakeholders and related elements in the Regional ITS Architecture.
Inventory Report	Consists of each element in the Regional ITS Architecture.
Service Package Report	Consists of all service packages and related elements identified for the Region.
Interconnect Report	Consists of the interconnected elements related to each individual element and the status of the connections.
Standards Activities Report	Consists of the standards related to each data flow utilized in the Regional ITS Architecture.
Subsystem Diagram	Consists of all subsystems from the National ITS Architecture that are identified in the Regional ITS Architecture.
Interconnect Diagrams	Consists of the interconnected elements related to each individual element and the status of the connections. The diagrams can be customized to present individual or multiple elements within the Regional ITS Architecture.
Context Diagrams	Consists of all data flows coming to/from a center, physical object, functional object, or terminator.
Flow Diagrams	Consists of information provided by Interconnect Diagrams, as well as the actual data flows that are included in each connection between elements.
Service Package Diagrams	Consists of all elements and data flows included in each service package identified for the Regional ITS Architecture.
Website	Consists of a reference database of the Regional ITS Architecture, including stakeholders, elements, etc.

Chapter 3. Regional ITS Needs

The region's ITS needs were identified by stakeholders during the kick-off workshops that occurred on July 8, 2020 and July 15, 2020 as well as in follow up interviews. Due to the circumstances surrounding COVID-19, these meetings were conducted virtually. The identification of ITS needs for the Knoxville region by stakeholders was centered around the following categories, which are consistent with the National ITS Architecture:

- Commercial Vehicle Operations
- Data Management
- Maintenance and Construction
- Parking Management
- Public Safety
- Public Transportation
- Support
- Sustainable Travel
- Traffic Management
- Traveler Information
- Vehicle Safety
- Weather

The key needs of the Knoxville region identified in this architecture are summarized in Table 2. To address these needs, the recommended ITS service packages are presented in Chapter 5. For this report, no prioritization was applied to the ITS needs specifically. It should be noted that it may be advisable to develop a prioritization of the ITS needs for future ITS Architecture updates.

Table 2. Knoxville Regional ITS Needs

NAME	DESCRIPTION	SERVICE PACKAGE
Archived Data	▶ Need to improve data collection and archiving of traffic information for performance measures.	▶ DM01: ITS Data Warehouse ▶ DM02: Performance Monitoring
Data Collection and Sharing – Knoxville and Other Regions	▶ Need to coordinate between the Knoxville region and other regions to stare information.	▶ TM07: Regional Traffic Management
Data Collection and Sharing – Municipalities and Emergency Management Centers	▶ Need to improve information sharing between municipal/county traffic and emergency management centers.	▶ PS10: Wide-Area Alert ▶ PS12: Disaster Response and Recovery ▶ PS11: Early Warning System ▶ PS13: Evacuation and Re-entry Management ▶ PS14: Disaster Traveler Information ▶ TM06: Traffic Information Dissemination ▶ TM08: Traffic Incident Management System
Data Collection and Sharing – TDOT and Emergency Management Centers	▶ Need to integrate and share information between the TDOT Region 1 SmartWay TMC and the emergency management and public safety dispatching agencies.	▶ TM06: Traffic Information Dissemination ▶ TM07: Regional Traffic Management ▶ TM08: Traffic Incident Management System
Emergency Vehicle Preemption	▶ Need to add emergency vehicle signal preemption.	▶ PS03: Emergency Vehicle Preemption
Emergency Vehicle Technology	▶ Need MDTs and AVL on fire vehicles.	▶ PS01: Emergency Call-Taking and Dispatch ▶ PS02: Emergency Response ▶ PS05: Vehicle Emergency Response
Expand Service Patrol Coverage	▶ Need to expand geographic coverage of the HELP Service Patrol Routes.	▶ PS08: Roadway Service Patrols
Expand Traffic Information Coverage	▶ Need to expand geographic coverage of the TDOT Regional SmartWay system. ▶ Need to expand/implement City of Knoxville Information Systems.	▶ TM01: Infrastructure-Based Traffic Surveillance ▶ TM05: Traffic Metering ▶ TM06: Traffic Information Dissemination ▶ TM08: Traffic Incident Management System
Rural Traffic Data Sharing	▶ Need to obtain traffic flow data from rural areas.	▶ TM01: Infrastructure-Based Traffic Surveillance ▶ TM07: Regional Traffic Management
Speed Monitoring	▶ Need to implement speed monitoring.	▶ TM17: Speed Warning and Enforcement
Traffic Detection and Surveillance	▶ Need to add detection systems and CCTV cameras.	▶ TM01: Infrastructure-Based Traffic Surveillance ▶ VS08: Queue Warning
Traffic Signal Systems and Coordination	▶ Need to upgrade arterial signal systems and improve traffic signal coordination.	▶ TM03: Traffic Signal Control ▶ TM04: Connected Vehicle Traffic Signal System ▶ TM07: Regional Traffic Management
Transit Information	▶ Need to provide real-time transit information to users.	▶ PT01: Transit Vehicle Tracking. ▶ PT08: Transit Traveler Information ▶ PT09: Transit Signal Priority
Transit Route Planning	▶ Need to continuously improve route planning system.	▶ PT08: Transit Traveler Information
Transit Vehicle Systems	▶ Need to expand ITS deployments on transit vehicles.	▶ PT01: Transit Vehicle Tracking. ▶ PT04: Transit Fare Collection Management ▶ PT05: Transit Security ▶ PT07: Transit Passenger Counting
Traveler Information	▶ Need to expand use of existing information dissemination methods for traffic related information, such as the use of social media.	▶ TI01: Broadcast Traveler Information ▶ TI02: Personalized Traveler Information ▶ TI06: Dynamic Ridesharing and Shared Use Transportation

Weather Information	▶ Need real-time weather information.	▶ WX01: Weather Data Collection

Chapter 4. Regional ITS Inventory

Many ITS systems are already implemented or planned throughout the Knoxville region. These ITS systems were documented during the stakeholder kick-off workshop and the follow-up stakeholder interviews. The existing systems and components are used to shape the National ITS Architecture into a customized regional ITS architecture for the Knoxville region.

In discussing individual traffic, maintenance, and emergency management elements with stakeholders, the progress and on-going development of ITS systems across the region was apparent as many agencies have new programs and expansions underway. Details regarding each agency as well as a current inventory of ITS programs is detailed below.

4.1 STAKEHOLDERS

Within the Knoxville Regional ITS Architecture, each ITS element is associated with at least one stakeholder agency. The list of stakeholders engaged in the development of the regional ITS architecture is documented in the Appendix. However, Table 3 below details only those stakeholders involved in the operation, management, or coordination of ITS systems in the region along with a description of each agency. Small agencies and municipalities have been grouped and are generally identified as “Municipal Agencies” rather than identifying them individually.

Table 3. Knoxville Regional Stakeholder Descriptions

STAKEHOLDER NAME	STAKEHOLDER DESCRIPTION
Anderson County	Anderson County Municipal Government. This stakeholder includes all county departments, including those departments responsible for traffic and public safety.
Blount County	Blount County Municipal Government. This stakeholder includes all county departments, including those departments responsible for traffic and public safety.
City of Alcoa	City of Alcoa Municipal Government. This stakeholder includes all city departments, including those departments responsible for traffic and public safety.
City of Clinton	City of Clinton Municipal Government. This stakeholder includes all city departments, including those departments responsible for traffic and public safety.
City of Gatlinburg	City of Gatlinburg Municipal Government. This stakeholder includes all city departments, including those departments responsible for traffic and public safety.
City of Knoxville	City of Knoxville Municipal Government. This stakeholder includes all city departments, including those departments responsible for traffic and public safety.
City of Lenoir City	City of Lenoir City Municipal Government. This stakeholder includes all city departments, including those departments responsible for traffic and public safety.
City of Loudon	City of Loudon Municipal Government. This stakeholder includes all city departments, including those departments responsible for traffic and public safety.
City of Maryville	City of Maryville Municipal Government. This stakeholder includes all city departments, including those departments responsible for traffic and public safety.
City of Maryville/Alcoa	This stakeholder includes the combined government of Maryville and Alcoa. The Cities of Maryville and Alcoa (currently/will be) operating a joint traffic operations center and coordinating traffic signal timings across their shared boundary.
City of Oak Ridge	City of Oak Ridge Municipal Government. This stakeholder includes all city departments, including those departments responsible for traffic and public safety.
City of Pigeon Forge	City of Pigeon Forge Municipal Government. This stakeholder includes all city departments, including those departments responsible for traffic and public safety.
City of Sevierville	City of Sevierville Municipal Government. This stakeholder includes all city departments, including those departments responsible for traffic and public safety.
Commercial Vehicle Operators	This stakeholder represents all operators of commercial vehicles in the area.
ETHRA	The East Tennessee Human Resource Agency. This stakeholder is responsible for demand response transit service in the area.
Financial Institution	This stakeholder is responsible for the exchange of money in transit fare collection.
KAT	Knoxville Area Transit. This stakeholder provides fixed-route transit and paratransit services in the Knoxville urban area.
Knox County	Knox County Municipal Government. This stakeholder includes all county departments, including those departments responsible for traffic and public safety.
Knox County CAC	Knox County Community Action Committee. This stakeholder is a public agency that provides assistance for citizens of Knox County, including food, shelter, transportation, education, advocacy, training, case management and volunteer opportunities.
Knoxville Regional TPO	Knoxville Regional Transportation Planning Organization. This stakeholder is responsible for overall regional transportation planning initiatives in the area.
Loudon County	Loudon County Municipal Government. This stakeholder includes all county departments, including those departments responsible for traffic and public safety.
Media	This stakeholder represents all local media outlets including radio and television stations, newspapers, and news websites.
Municipal/County Government	This stakeholder represents municipalities and counties within the Region that are not specifically identified as a primary stakeholder.
National Park Service	This stakeholder is a bureau of the U.S. Department of the Interior that oversees operations of the National Park System.
NOAA	The National Oceanic and Atmospheric Administration. This stakeholder is responsible for weather information and issuing severe weather warnings nationwide.
Other Agencies	This stakeholder represents a wide variety of agencies that do not have an associated primary stakeholder.
Pigeon Forge/Sevierville Trolley	This stakeholder provides transit service in Pigeon Forge and Sevierville.

STAKEHOLDER NAME	STAKEHOLDER DESCRIPTION
Private Information Provider	This stakeholder represents the private sector business that handles traveler information. The gathering and distribution of traveler information is normally provided through a subscription service.
Private Service Provider	This stakeholder represents private businesses that offer a service related to transportation.
Rail Operators	This stakeholder represents the private sector businesses responsible for railway operations, including the railroad maintenance and operations and dispatch/control of trains operating on the railroads.
Rural Metro	This stakeholder represents the contract provider of emergency medical and fire services for rural areas.
Sevier County	Sevier County Municipal Government. This stakeholder includes all county departments, including those departments responsible for traffic and public safety.
System Users	This stakeholder represents all transportation system users.
TDOT	Tennessee Department of Transportation. This stakeholder is responsible for construction, maintenance, traffic, public safety, and operation of state roadways.
TEMA	Tennessee Emergency Management Agency. This stakeholder is responsible for emergency management during a natural disaster or large-scale incident.
Tennessee Bureau of Investigation	This stakeholder is responsible for issuing AMBER alerts statewide.
Tennessee Department of Health and Human Services	This stakeholder is responsible for managing funds dedicated to medical transportation services statewide.
Tennessee Highway Patrol	This stakeholder is a statewide agency responsible for enforcing traffic safety laws and other commercial vehicle regulations.
Town of Farragut	Town of Farragut Municipal Government. This stakeholder includes all town departments, including those departments responsible for traffic and public safety.

4.2 ITS ELEMENTS

Each component in the ITS inventory is documented as a specific element in the regional architecture. Table 4 breaks down each element with the stakeholder, element description, and the current status of the element, characterized as either existing or planned. Elements identified as existing may be functioning adequately or may need to be enhanced or expanded in some way. Further, because the status is categorized as either existing or planning, if an element exists in any capacity or quantity, it is identified as existing. This does not imply the element is currently built out or complete. An element identified as planned does not yet exist in any capacity within the system.The naming convention of this document follows the same conventions as the statewide ITS architecture. The consistent naming convention provides continuity between documents, but the binary nature of the convention is limiting. In some cases where an element is identified as existing, there may also be a plan for geographic expansion of said element. Where available, this has been conveyed in the element description.

Table 4. Knoxville Regional Inventory of Existing and Planned ITS Elements

STAKEHOLDER	ELEMENT NAME	ELEMENT DESCRIPTION	ELEMENT STATUS
Blount County	Blount County E911 Dispatch	911 Public Safety Answering Point (PSAP) responsible for answering all 911 calls made within the county and dispatching emergency responders.	Existing
	Blount County EMA	Emergency management agency for Blount County. Responsible for disaster planning for the County and operating the emergency operations center (EOC).	Existing
	Blount County EMA Website	Website for the Blount County EMA.	Existing
	Blount County Emergency Callout System	Automated system that can call phone numbers in a particular area with a recorded message.	Existing
	Blount County Emergency Communication System	Responsible for the dissemination of emergency information using the internet and other available dissemination methods.	Existing
	Blount County Fire Vehicles	Fire department vehicles for Blount County.	Existing
	Blount County Rescue Squad Vehicles	Vehicles for the Rescue Squad.	Existing
	Blount County Sheriff Vehicles	Vehicles for the Sheriff's Office.	Existing
	Blount County Traffic Signals	Traffic signals operated and maintained by Blount County.	Existing
City of Alcoa	City of Alcoa CCTV Cameras	Closed circuit television cameras for traffic surveillance and incident management.	*Planned*
	City of Alcoa Emergency Dispatch	Emergency services dispatch for the City of Alcoa.	Existing
	City of Alcoa Field Sensors	Roadway equipment used to detect vehicle volumes and/or speeds. Includes equipment such as video image vehicle detection systems (VIVDS), remote traffic microwave sensors (RTMS), or traditional loops.	Existing
	City of Alcoa Fire Vehicles	Fire Department Vehicles for the City of Alcoa.	Existing
	City of Alcoa Police Vehicles	Police Department Vehicles for the City of Alcoa.	Existing
	City of Alcoa Traffic Signals	Traffic signal system operated and maintained by the City of Alcoa. The City currently has 28 signals operating on a closed loop and no signals with central control. Additional deployment is desired.	Existing
City of Knoxville	City of Knoxville CCTV Cameras	Closed circuit television cameras for traffic surveillance and incident management.	*Planned*
	City of Knoxville Connected Vehicle Roadside Equipment	Field devices that are able to send information to and receive information from adjacent vehicles that are equipped with digital short-range communications (DSRC) or other wireless communications technology.	*Planned*

STAKEHOLDER	ELEMENT NAME	ELEMENT DESCRIPTION	ELEMENT STATUS
City of Knoxville (cont.)	City of Knoxville Engineers Office	City Engineer's office is responsible for administration of maintenance and construction projects within the region as well as communicating work zone information to the public through the Public Information Office.	Existing
	City of Knoxville Field Sensors	Roadway equipment used to detect vehicle volumes and/or speeds. Includes equipment such as video image vehicle detection systems (VIVDS), remote traffic microwave sensors (RTMS), traditional loops, or thermal cameras.	Existing
	City of Knoxville Fire Vehicles	Vehicles used by the Knoxville Fire Department.	Existing
	City of Knoxville Infrastructure Monitoring Equipment	Equipment that monitors the condition of pavement, bridges, tunnels, associated hardware, and other transportation-related infrastructure using both fixed and vehicle-based sensors and cameras. Sensors collect information such as vibration, stress, temperature, and continuity.	*Planned*
	City of Knoxville Maintenance Vehicles	The City of Knoxville vehicles used in maintenance operations.	Existing
	City of Knoxville Oversize Vehicle Detection	Measures the size and weight of passing vehicles and displays warnings to vehicles if the size exceeds the current infrastructure restrictions.	*Planned*
	City of Knoxville Parking Enforcement	Agency responsible for the enforcement of parking regulations in the City of Knoxville.	Existing
	City of Knoxville Parking Lot Operator	Operator of City of Knoxville parking facility. Responsible for the collection of data related to lot usage and input of that data into the Parking Management System.	Existing
	City of Knoxville Parking Management System	System for the monitoring and management of parking facilities in the City of Knoxville. A primary goal of the system is to support electronic collection of parking fees in addition to monitoring parking lot usage and providing information about real-time parking availability at both municipally owned and private parking facilities, as well as on-street parking.	Existing
	City of Knoxville Police Department	Police department for the City of Knoxville. The emergency dispatch functions for the Police Department are included in the Knox County E911Dispatch. Non-emergency functions include the collection of crash data and enforcement of speed limits and commercial vehicle regulations.	Existing
	City of Knoxville Police Vehicles	Vehicles used by the Knoxville Police Department.	Existing
	City of Knoxville Public Works Department	Department that oversees the maintenance of streets, sidewalks, and roadway right-of-way.	Existing
	City of Knoxville Public Works Department Vehicles	City of Knoxville vehicles used in maintenance operations.	Existing
	City of Knoxville Roadway Warning Equipment	Equipment associated with City of Knoxville dynamic roadway warning system.	*Planned*
	City of Knoxville Social Media Accounts	Social media sites such as Waze that can support distribution of real-time traveler information.	Existing
	City of Knoxville Speed Monitoring Equipment	Field equipment used for monitoring roadway speeds.	Existing
	City of Knoxville Streetlights	Streetlights that control lighting for transportation facilities and infrastructure.	Existing

STAKEHOLDER	ELEMENT NAME	ELEMENT DESCRIPTION	ELEMENT STATUS
City of Knoxville (cont.)	City of Knoxville TOC	Traffic operations center for the City of Knoxville. Responsible for the operation of the traffic signal system and possible future operation of closed-circuit television (CCTV) cameras, dynamic message signs (DMS), and any other ITS infrastructure deployed by the City. TOC will likely have single workstation with remote access from multiple devices.	*Planned*
	City of Knoxville Traffic Signals	Traffic signal system operated and maintained by the City of Knoxville. The City has completed the design and is preparing for the construction of 26 miles of fiber optics communications and overall modernization of over 150 signals city wide. This will include the installation of video detection (and traffic monitoring), data probing, centralized ATMS.	Existing
	City of Knoxville Wrong Way Detection and Warning Equipment	Electronic warning signs, field sensors, or other devices used in the operation of wrong way vehicle detection and warning.	*Planned*
	City of Knoxville Queue Detection System	Vehicle detection system that monitors queues and can either warn drivers approaching the queue through warning beacons or the system can interact with the traffic signal system to clear the queue.	*Planned*
	Parking Payment System	System for the payment of parking fees.	Existing
City of Lenoir City	City of Lenoir City CCTV Cameras	Closed circuit television cameras for traffic surveillance and incident management.	*Planned*
	City of Lenoir City Field Sensors	Roadway equipment used to detect vehicle volumes and/or speeds. Includes equipment such as radar detection, video image vehicle detection systems (VIVDS), remote traffic microwave sensors (RTMS), or traditional loops.	Existing
	City of Lenoir City TOC	Traffic operations center for the City of Lenoir City. Responsible for the operation of the traffic signal system, closed circuit television (CCTV) cameras, and any other ITS infrastructure deployed by the City.	*Planned*
	City of Lenoir City Traffic Signals	Traffic signal system operated and maintained by the City of Lenoir City. The City currently has 22 signals, 4 of which operate on a wireless closed loop system. No signals operate with central control.	Existing
City of Maryville	City of Maryville Traffic Signals	Traffic signal system operated and maintained by the City of Maryville. The City currently has 49 traffic signals including 41 on a closed loop system. There are no signals with central control.	Existing
	City of Maryville CCTV Cameras	Gridsmart cameras that can be utilized as closed-circuit television cameras for traffic surveillance and incident management.	Existing
	City of Maryville Emergency Dispatch	Emergency services dispatch for the City of Maryville.	Existing
	City of Maryville Field Sensors	Roadway equipment used to detect vehicle volumes and/or speeds. Includes equipment such as video image vehicle detection systems (VIVDS), remote traffic microwave sensors (RTMS), or traditional loops.	Existing
	City of Maryville Fire Vehicles	Fire Department Vehicles for the City of Maryville.	Existing
	City of Maryville Police Vehicles	Police Department Vehicles for the City of Maryville.	Existing
City of Maryville/Alcoa	Maryville-Alcoa Central Traffic Operations	Joint traffic operations center for the cities of Maryville and Alcoa. Responsible for the operation of the traffic signal system, closed circuit television (CCTV) cameras, dynamic message signs (DMS), and any other ITS infrastructure deployed by the cities.	*Planned*
City of Oak Ridge	City of Oak Ridge Field Equipment	Equipment used for the collection of vehicle probe data.	*Planned*

STAKEHOLDER	ELEMENT NAME	ELEMENT DESCRIPTION	ELEMENT STATUS
City of Oak Ridge (cont.)	City of Oak Ridge Field Sensors	Roadway equipment used to detect vehicle volumes and/or speeds. Includes equipment such as video image vehicle detection systems (VIVDS), remote traffic microwave sensors (RTMS), or traditional loops. The City is currently transitioning from traditional loops to Wavetronix. No future loops are planned.	Existing
	City of Oak Ridge Police Department	Police department for the City of Oak Ridge. The emergency dispatch functions for the Police Department are included in the Anderson County E911 Dispatch. Non-emergency functions include the collection of crash data and enforcement of speed limits and commercial vehicle regulations.	Existing
	City of Oak Ridge TOC	Traffic operations center for the City of Oak Ridge. Responsible for the operation of the traffic signal system and possible future operation of any ITS infrastructure deployed by the City. TOC is not planned to be expanded but will likely add more functionality.	Existing
	City of Oak Ridge Traffic Signals	Traffic signal system operated and maintained by the City of Oak Ridge.	Existing
City of Sevierville	City of Sevierville CCTV Cameras	Closed circuit television cameras for traffic surveillance and incident management.	Existing
	City of Sevierville Emergency Dispatch	Emergency services dispatch for the City of Sevierville.	Existing
	City of Sevierville Field Sensors	Roadway equipment used to detect vehicle volumes and/or speeds. Includes equipment such as video image vehicle detection systems (VIVDS), remote traffic microwave sensors (RTMS), or traditional loops. Field sensors for the City include Bluetooth technology and Gridsmart equipment.	Existing
	City of Sevierville Fire Vehicles	Fire Department vehicles for the City of Sevierville.	Existing
	City of Sevierville Police Vehicles	Police Department vehicles for the City of Sevierville.	Existing
	City of Sevierville Traffic Signals	Traffic signal system operated and maintained by the City of Sevierville. The City has 49 signals including 48 with communications.	Existing
	City of Sevierville/Pigeon Forge TOC	Separate, but integrated traffic operations centers for the Cities of Sevierville and Pigeon Forge. Responsible for the operation of the traffic signal system, closed circuit television (CCTV) cameras and any other ITS infrastructure deployed by the cities. TOC includes a single office in each city which communicate and share information with each other. The TOC also shares information with police department.	Existing
Commercial Vehicle Operators	Commercial Vehicles	Privately owned commercial vehicles traveling within the Region.	Existing
ETHRA	ETHRA Transportation Operations Facility CCTV Camera Surveillance	ETHRA closed circuit television camera surveillance at operations facilities.	Existing
	ETHRA Transportation Data Archive	Data repository used to store ETHRA ridership statistics used by the National Transit Database, FTA, and TDOT Office of Public Transportation.	Existing
	ETHRA Transportation Dispatch Center	Transit dispatch center responsible for the tracking, scheduling and dispatching of vehicles operated by ETHRA Transit.	Existing
	ETHRA Transportation IVR System	Telephone based communications system for communicating real-time traveler information to passengers.	*Planned*
	ETHRA Vehicles	Transit vehicles operated by ETHRA.	Existing

STAKEHOLDER	ELEMENT NAME	ELEMENT DESCRIPTION	ELEMENT STATUS
ETHRA (cont.)	ETHRA Website	Website for ETHRA. Includes information on transportation services and, in the future, it is envisioned that the website will have real-time information about regional transit services.	Existing
Financial Institution	Financial Service Provider	Service provider that handles exchange of money for electronic payment collection. This generic stakeholder could represent a variety of different institutions including banks, credit card companies, or private vendors.	Existing
KAT	KAT Electronic Fare Payment Card	Fare payment card for Knoxville Area Transit. The existing fare payment card cannot be reloaded. There are plans for existing system to be expanded.	Existing
	KAT Fixed Route Vehicles	Fixed route vehicles operated by Knoxville Area Transit.	Existing
	KAT Operations Facility CCTV Cameras Surveillance	KAT closed circuit television camera surveillance at operations facilities.	Existing
	KAT Social Media Accounts	Social media sites such as Facebook or Twitter that can support distribution of real-time traveler information.	Existing
	KAT Transit Center CCTV Camera Surveillance	KAT closed circuit television camera surveillance at transit transfer centers, KAT buses, The LIFT vehicles, or other transit facilities.	Existing
	KAT Transit Data Archive	Data repository used to store Knoxville Area Transit ridership statistics used by the National Transit Database, FTA, and TDOT Office of Public Transportation.	Existing
	KAT Transit Dispatch Center	Transit dispatch for fixed route KAT vehicles.	Existing
	KAT Transit Kiosks	Knoxville Area Transit kiosks for dissemination of transit traveler information. Kiosks can also be used for the purchase and recharging of electronic fare payment cards.	*Planned*
	KAT Website	Website for KAT. Includes information on KAT services and in the future, it is envisioned that the website will have real-time information about regional transit services.	Existing
	The LIFT Dispatch Center	Dispatch center for KAT paratransit vehicles.	Existing
	The LIFT IVR System	Telephone based communications system for communicating real-time traveler information to passengers.	Existing
	The LIFT Paratransit Vehicles	Paratransit vehicles operated by Knoxville Area Transit.	Existing
Knox County	Knox County CCTV Cameras	Closed circuit television cameras for traffic surveillance and incident management.	*Planned*
	Knox County E911 Dispatch	911 Public Safety Answering Point (PSAP) responsible for answering all 911 calls made within the county and dispatching emergency responders.	Existing
	Knox County EMA	Emergency management agency for Knox County. Responsible for disaster planning for the County and operating the emergency operations center (EOC).	Existing
	Knox County EMA Website	Website for the Knox County EMA.	Existing

STAKEHOLDER	ELEMENT NAME	ELEMENT DESCRIPTION	ELEMENT STATUS
Knox County (cont.)	Knox County Emergency Callout System	Automated system that can call phone numbers in a particular area with a recorded message.	Existing
	Knox County Emergency Communication System	Responsible for the dissemination of emergency information using the internet and other available dissemination methods.	Existing
	Knox County Field Sensors	Roadway equipment used to detect vehicle volumes and/or speeds. Includes equipment such as video image vehicle detection systems (VIVDS), remote traffic microwave sensors (RTMS), or traditional loops.	Existing
	Knox County Sheriff Vehicles	Vehicles used by the Knox County Sheriff's Office.	Existing
	Knox County Sheriff's Office	Law enforcement for Knox County. The emergency dispatch functions for the Sheriff's Office are included in the Knox County E911 Dispatch. Non-emergency functions include the collection of crash data and enforcement of speed limits and commercial vehicle regulations.	Existing
	Knox County TOC	Traffic operations center for Knox County. Responsible for the operation of the traffic signal system, closed circuit television (CCTV) cameras and any other ITS infrastructure deployed by the County. TOC will likely consist of laptop computer setup rather than full workstation.	*Planned*
	Knox County Traffic Signals	Traffic signal system operated and maintained by Knox County. The County currently operates 84 traffic signals.	Existing
Knox County CAC	Knox County CAC Electronic Fare Payment System	Web-based fare payment system for Knox County CAC Transit.	*Planned*
	Knox County CAC IVR System	Telephone based communications system for communicating real-time traveler information to motorists.	Existing
	Knox County CAC Transit Data Archive	Data repository used to store Knox County CAC Transit ridership statistics used by the National Transit Database, FTA, and TDOT Office of Public Transportation.	Existing
	Knox County CAC Transit Dispatch Center	Transit dispatch center responsible for the tracking, scheduling and dispatching of vehicles operated by Knox County CAC Transit.	Existing
	Knox County CAC Transit Operations Facility CCTV Camera Surveillance	Knox County CAC Transit closed circuit television camera surveillance at operations facilities.	Existing
	Knox County CAC Vehicles	Transit vehicles operated by Knox County CAC Transit.	Existing
	Knox County CAC Website	Website for Knox County CAC. Includes information on transit services and, in the future, it is envisioned that the website will have real time information about regional transit services.	Existing
Knoxville Regional TPO	Knoxville Regional TPO Data Archive	Archive of regional transportation data used in planning.	Existing
	Knoxville TPO SmartTrips	Carpool ride match service.	*Planned*
Loudon County	Loudon County E911 Dispatch	911 Public Safety Answering Point (PSAP) responsible for answering all911 calls made within the county and dispatching emergency responders.	Existing
	Loudon County EMA	Emergency management agency for Loudon County. Responsible for disaster planning for the County and operating the emergency operations center (EOC).	Existing

STAKEHOLDER	ELEMENT NAME	ELEMENT DESCRIPTION	ELEMENT STATUS
Loudon County (cont.)	Loudon County Fire and Rescue Vehicles	Fire and rescue vehicles for Loudon County.	Existing
	Loudon County Sheriff Vehicles	Sheriff vehicles for Loudon County.	Existing
	Loudon County Traffic Signals	Traffic signals operated and maintained by Loudon County.	Existing
Media	Local Print and Broadcast Media	Local media that provide traffic or incident information to the public.	Existing
Municipal/County Government	Municipal CCTV Cameras	Closed circuit television cameras for traffic surveillance and incident management.	*Planned*
	Municipal Field Sensors	Roadway equipment used to detect vehicle volumes and/or speeds. Includes equipment such as video image vehicle detection systems (VIVDS), remote traffic microwave sensors (RTMS), or traditional loops.	*Planned*
	Municipal Public Safety Dispatch	Municipal emergency services dispatch.	Existing
	Municipal Public Safety Vehicles	Vehicles used by public safety in those municipalities for which individual elements were not established, including the County Sheriff's Office.	Existing
	Municipal TOC	Traffic operations centers responsible for the operation of municipal signal systems and any other municipal ITS infrastructure.	*Planned*
	Municipal Traffic Signals	Traffic signal system operated and maintained by the Municipality.	Existing
	Municipal/County Engineers Office	Municipal/County Engineer's office is responsible for administration of maintenance and construction projects within the Region as well as communicating work zone information to the public through the Public Information Office.	*Planned*
	Municipal/County Maintenance	Department that oversees the maintenance of streets, sidewalks, and roadway right-of-way.	Existing
	Municipal/County Maintenance Vehicles	Municipal/County vehicles used in maintenance operations.	Existing
	Municipal/County RWIS	Municipal/County operated and maintained road weather information system equipment.	*Planned*
	Municipal/County Social Media Sites	Social media sites such as Facebook or Twitter that can support distribution of real-time traveler information.	Existing
	Municipal/County Website	Website containing information about maintenance and construction activities.	Existing
	Other County 911 Dispatch	911 Public Safety Answering Point (PSAP) responsible for answering all 911 calls made within the county and dispatching emergency responders.	Existing
	Volunteer Fire Vehicles	Vehicles operated by the Volunteer Fire Departments.	Existing

STAKEHOLDER	ELEMENT NAME	ELEMENT DESCRIPTION	ELEMENT STATUS
National Park Service	Great Smoky Mountains National Park	Represents central headquarters of Great Smoky Mountains National Park that coordinates with other agencies in the Region.	Existing
NOAA	National Weather Service	Provides official US weather, marine, fire, and aviation forecasts, warnings, meteorological products, climate forecasts, and information about meteorology.	Existing
Other Agencies	Broadcast Media	Broadcast media outlets aiding in the distribution of real-time traffic operations information.	Existing
	Other Maintenance and Construction Management	Additional maintenance and construction operations agencies with which information is shared for coordination in an emergency situation.	*Planned*
	Private Transportation Providers	Private providers of transportation services in the region such as taxis and intercity bus service.	*Planned*
	Surrounding County Transit Agencies	Other nearby transit agencies.	Existing
Pigeon Forge/Sevierville Trolley	Pigeon Forge/Sevierville Trolley CCTV Camera Surveillance	Pigeon Forge/Sevierville Trolley closed circuit television camera surveillance at transit vehicles.	*Planned*
	Pigeon Forge/Sevierville Trolley Dispatch	Transit dispatch center for the Pigeon Forge Fun Time Trolley.	Existing
	Pigeon Forge/Sevierville Trolley Electronic Fare Payment	Fare payment system for the Pigeon Forge Fun Time Trolley.	*Planned*
	Pigeon Forge/Sevierville Trolley Vehicles	Transit vehicles operated by the Pigeon Forge Fun Time Trolley.	Existing
	Pigeon Forge/Sevierville Trolley Website	Website for the Pigeon Forge Fun Time Trolley. Includes information on transit services and in the future, it is envisioned that the website will have real-time information about regional transit services.	Existing
Private Information Provider	Private Information Provider	Traveler information service operated by a private entity.	*Planned*
Private Service Provider	Private Parking Lot Operator	Operator of non-municipal parking lot within the City of Knoxville.	Existing
	Private Subscription Data Service Provider	Subscription based traffic data collection and distribution service.	Existing
Rail Operators	Rail Operator Wayside Equipment	Equipment located along the tracks including railroad crossing gates, bells, and lights as well as the interface to the traffic signal controller indicating the presence of a train.	*Planned*
Rural Metro	Rural Metro Dispatch	Dispatch for Rural Metro emergency medical and/or fire protection services.	Existing
	Rural Metro EMS Vehicles	Emergency medical services vehicles operated by Rural Metro.	Existing
	Rural Metro Fire Vehicles	Fire vehicles operated by Rural Metro.	Existing

STAKEHOLDER	ELEMENT NAME	ELEMENT DESCRIPTION	ELEMENT STATUS
Sevier County	Sevier County E911 Dispatch	911 Public Safety Answering Point (PSAP) responsible for answering all 911 calls made within the county and dispatching emergency responders. For incidents in Pigeon Forge, Sevierville, and Gatlinburg the E911 center relays the emergency call to the appropriate City for local police and fire dispatch.	Existing
	Sevier County EMA	Emergency management agency for Sevier County. Responsible for disaster planning for the County and operating the emergency operations center (EOC).	Existing
	Sevier County EMS Vehicles	Emergency Medical Services Vehicles for Sevier County.	Existing
System Users	Archive Data User	Users that request information from the data archive systems.	Existing
	Personal Computing Devices	Computing devices that travelers use to access public information.	Existing
	Private Traveler Vehicle	Private vehicles used by travelers.	Existing
	Traveler	Member of the traveling public.	Existing
	Vehicle Operator	Operators of commercial vehicles.	Existing
TDOT	Other TDOT Region Construction Offices	Regional construction offices for other TDOT regions besides Region 1.	Existing
	Other TDOT Region Maintenance	Regional maintenance for other TDOT regions besides Region 1.	Existing
	TDOT CCTV Cameras	Closed circuit television cameras for traffic surveillance and incident management. CCTV cameras are implemented as part of SmartWay on I-40, I-75, I-640, I-140, I-275, and the Alcoa Highway. Additional CCTV cameras will be deployed as part of future SmartWay expansion projects.	Existing
	TDOT Community Relations Division	Office responsible for integrating concerns of the public into TDOT processes.	Existing
	TDOT Connected Vehicle Roadside Equipment	Field devices that are able to send information to and receive information from adjacent vehicles that are equipped with digital short-range communications (DSRC) or other wireless communications technology.	*Planned*
	TDOT District Maintenance	Office that handles most of the routine roadway maintenance and responds to incidents when services are requested by local emergency management.	Existing
	TDOT DMS	Dynamic message signs for traffic information dissemination. DMS are implemented as part of SmartWay on I-40, I-75, I-640, I-140, I-275, and the Alcoa Highway. Additional DMS will be deployed as part of future SmartWay expansion projects.	Existing
	TDOT Emergency Services Coordinator	Coordinator responsible for managing the Tennessee Department of Transportation response in a large-scale incident or disaster in which the Tennessee Emergency Management Agency (TEMA) activates the state emergency operations center (EOC).	Existing
	TDOT Field Sensors	Roadway equipment used to detect vehicle volumes and/or speeds. Includes equipment such as remote traffic microwave sensors (RTMS). Additional field sensors will be deployed as part of future SmartWay expansion projects.	Existing
	TDOT HAR	Highway advisory radio for traffic information dissemination.	Existing

STAKEHOLDER	ELEMENT NAME	ELEMENT DESCRIPTION	ELEMENT STATUS
TDOT (cont.)	TDOT HELP Vehicles	Roadway service patrol vehicles operated by TDOT. HELP vehicle patrols are operated on all routes where SmartWay technologies are implemented.	Existing
	TDOT Maintenance Headquarters	The Tennessee Department of Transportation maintenance headquarters.	Existing
	TDOT Maintenance Vehicles	The Tennessee Department of Transportation vehicles used in maintenance operations.	Existing
	TDOT Overheight Vehicle Detectors	Roadway equipment to detect vehicle height approaching structures along the roadway.	Existing
	TDOT Data Archive	Data archive for TDOT.	Existing
	TDOT Public Information Office	Office responsible for the dissemination of traffic information to the media and the public.	Existing
	TDOT Ramp Metering Equipment	Roadway equipment used in the operation of a ramp metering system. Includes the signals and any other ITS equipment.	*Planned*
	TDOT Ramp Queue Detection System	Vehicle detection system that monitors queues at exit ramps and can either warn drivers approaching the queue through DMS or warning beacons or the system can interact with the traffic signal system to clear the queue.	*Planned*
	TDOT Region 1 Construction Office	Office responsible for oversight of construction projects in Region 1.	Existing
	TDOT Region 1 Engineer's Office	Region 1 Engineer's office is responsible for administration of maintenance and construction projects within the Region as well as communicating work zone information to the public through the Public Information Office.	Existing
	TDOT Region 1 HELP Dispatch	Roadway service patrol dispatch. Currently service is limited to the Knoxville area except in the case of a large-scale incident.	Existing
	TDOT Region 1 Maintenance	Region 1 maintenance headquarters. Responsible for maintenance operations in the Region; however, most routine maintenance is handled by the District Maintenance Offices. There are several District Maintenance Offices within the Region.	Existing
	TDOT Region 1 TMC - Knoxville	Transportation management center for Region 1, located in Knoxville. Responsible for the operation of the ITS equipment located in Region 1 that includes the freeway management system in Knoxville as well as rural ITS deployments. The TMC is operated 24 hours per day, 7 days per week.	Existing
	TDOT Region 2 TMC - Chattanooga	Transportation management center for Region 2, located in Chattanooga. Responsible for the operation of the ITS equipment located in Region 2 that includes the freeway management system in Chattanooga as well as rural ITS deployments.	Existing
	TDOT Region 3 TMC - Nashville	Transportation management center for Region 3, located in Nashville. Responsible for the operation of the ITS equipment located in Region 3 that includes the freeway management system in Nashville as well as rural ITS deployments.	Existing
	TDOT Region 4 TMC - Memphis	Transportation management center for Region 4, located in Memphis. Responsible for the operation of the ITS equipment located in Region 4 that includes the freeway management system in Memphis as well as rural ITS deployments.	Existing
	TDOT Roadway Warning Equipment	Equipment associated with TDOT dynamic roadway warning system.	*Planned*
	TDOT RWIS Sensors	Road weather information system sensors to monitor weather condition sat the roadway.	Existing

STAKEHOLDER	ELEMENT NAME	ELEMENT DESCRIPTION	ELEMENT STATUS
TDOT (cont.)	TDOT Smart Work Zone Equipment	Portable ITS equipment that can be used in work zones to more efficiently manage traffic and provide traveler information. Includes portable closed-circuit television (CCTV) cameras, vehicle detection, and dynamic message signs (DMS).	Existing
	TDOT SmartWay Information System (TSIS)	TSIS is a statewide roadway conditions database. Currently information can be entered by District and Regional maintenance personnel as well as staff at any of the traffic management centers (TMCs) and the Tennessee Highway Patrol (THP). TSIS feeds the Statewide 511 system and SmartWay website.	Existing
	TDOT SmartWay Website	Website providing road network conditions including incident and construction information and camera views. Much of the data for the website comes from TSIS.	Existing
	TDOT Weigh-in-Motion	TDOT facilities with the capability to weigh commercial vehicles while they are traveling at highway speeds.	*Planned*
	TN Trips	Tennessee Transport Route Integrated Permitting System.	Existing
	TDOT Wrong Way Detection and Warning Equipment	Electronic warning signs, field sensors, or other devices used in the operation of wrong way vehicle detection and warning.	*Planned*
	Tennessee 511 IVR	Tennessee 511 Interactive Voice Response (IVR). TDOT contracts the IVR operation to a vendor. The IVR accepts callers' requests and provides responses to specific traveler information needs. This is the customer interface component of the 511-phone system.	Existing
	Tennessee 511 System	511 traveler information system central server.	Existing
TEMA	TEMA	Tennessee Emergency Management Agency. Responsible for managing emergency operations during a disaster or large-scale incident.	Existing
Tennessee Bureau of Investigation	Tennessee Bureau of Investigation	Responsible for issuing statewide America's Missing: Broadcast Emergency Response (AMBER) Alerts in Tennessee.	Existing
Tennessee Department of Health and Human Services	Health and Human Services	Agency responsible for providing health related services including the subsidization of transportation to obtain medical services.	Existing
Tennessee Highway Patrol	THP CVO Enforcement	Tennessee Highway Patrol commercial vehicle inspection and enforcement.	Existing
	THP Dispatch	Tennessee Highway Patrol dispatch center. There are several THP dispatch centers around the state of Tennessee.	Existing
	THP Truck Weigh and Inspection Station	Commercial vehicle inspection station with the capability to weigh commercial vehicles and evaluate their credentials.	Existing
	THP Vehicles	Tennessee Highway Patrol vehicles.	Existing
	THP Weigh-in-Motion	Tennessee Highway Patrol facilities with the capability to weigh commercial vehicles while they are traveling at highway speeds.	Existing
	TITAN Database	Tennessee Integrated Traffic Analysis Network (TITAN) database. The Tennessee Department of Safety crash record database maintained by THP for the collection of crash record information. TITAN interfaces with the TraCS (Traffic and Criminal Software) system.	Existing
Town of Farragut	Town of Farragut CCTV Cameras	Closed circuit television cameras for traffic surveillance and incident management.	*Planned*

STAKEHOLDER	ELEMENT NAME	ELEMENT DESCRIPTION	ELEMENT STATUS
Town of Farragut (cont.)	Town of Farragut Field Sensors	Roadway equipment used to detect vehicle volumes and/or speeds. Includes equipment such as video image vehicle detection systems (VIVDS), remote traffic microwave sensors (RTMS), or traditional loops.	Existing
	Town of Farragut TOC	Traffic operations center for the Town of Farragut. Responsible for the operation of the traffic signal system, closed circuit television (CCTV)cameras, dynamic message signs (DMS), and any other ITS infrastructure deployed by the Town.	*Planned*
	Town of Farragut Traffic Signals	Traffic signal system operated and maintained by the Town of Farragut.	Existing

Chapter 5. Regional ITS Architecture

Following the systems inventory, the Regional ITS Architecture was developed to identify the ITS services applicable to the Knoxville region. There are 12 groups of ITS service areas as identified in the National ITS Architecture; these are identified in Table 5 along with the current level of deployment within the region as identified by stakeholders. In Table 5, each service area's levels of deployment and interest are categorized as high, medium, or low. These are subjective descriptions based on coordination with the stakeholders at various points of the ITS Architecture process.

Table 5. Knoxville Regional ITS Service Areas

SERVICE AREA	ELEMENT NAME	LEVEL OF DEPLOYMENT	LEVEL OF INTEREST
Commercial Vehicle Operations	Includes service packages such as Smart Roadside and Virtual WIM and Fleet and Freight Security.	Low	Medium
Data Management	Includes service packages such as ITS Data Warehouse and Performance Monitoring.	Medium	High
Maintenance and Construction	Includes service packages such as Maintenance and Construction Vehicle and Equipment Tracking and Work Zone Management.	Low	Medium
Parking Management	Includes service packages such as Parking Space Management and Regional Parking Management.	Medium	Medium
Public Safety	Includes service packages such as Emergency Call-Taking and Dispatch and Disaster Response and Recovery.	Medium	High
Public Transportation	Includes service packages such as Transit Vehicle Tracking and Transit Fixed-Route Operations.	Medium	High
Sustainable Travel	Includes service packages such as Emissions Monitoring and Roadside Lighting.	Low	Low
Support	Includes service packages such as Data Distribution and Field Equipment Maintenance.	Low	Low
Traveler Information	Includes service packages such as Broadcast Traveler Information and Personalized Traveler Information.	Medium	Medium
Traffic Management	Includes service packages such as Traffic Signal Control and Regional Traffic Management.	High	High
Vehicle Safety	Includes service packages such as Restricted Lane Warnings and Pedestrian and Cyclist Safety.	Medium	High
Weather	Includes service packages such as Weather Data Collection and Weather Information Processing and Distribution.	Low	Medium

Source: **https://local.iteris.com/arc-it/html/servicepackages/servicepackages-areaspsort.html**

5.1 ITS SERVICE PACKAGES

The current National ITS Architecture Version 8.3 contains 137 ITS elements. These are referred to within the National ITS Architecture as service packages. These ITS service packages visually illustrate how ITS services are deployed and how information is shared between elements and agencies. Services packages may include multiple elements and stakeholders working together to provide services to the region. The service packages included in the National ITS Architecture are defined in the Appendix.

Service packages are comprised of elements and flows. The components identified in previous sections of this document are mapped to a subsystem or terminator in the National ITS Architecture. These subsystems and terminators represent various functional categories defining the role of an element in the Knoxville Regional ITS Architecture. Flows connect the elements to illustrate existing and planned movement of information.

Elements are listed in the inventory of the ITS architecture. The elements of the ITS architecture can be identified as existing or planned as documented in Chapter 4. They are used in the development of the service packages included in the ITS architecture.

Subsystems are the highest-level building blocks of the physical architecture. The National ITS Architecture categorizes the subsystems in five classes, including Centers, Fields, Personnel, Support, and Vehicles. The five classes are further categorized into various objects that specify the function of each subsystem. Elements can be assigned to one or more subsystems.

Terminators are the systems, facilities, or people outside of the ITS that interact with ITS subsystems. Terminators include motorists, information providers, media, etc.

Architecture Flows represent the types of information that flow between elements within the ITS architecture. Architecture flows can be existing or planned. Existing flows can also designate a partially established connection that has not been fully completed. Some architecture flows have related technical standards that identify the format of the shared data.

The National ITS Architecture service packages were reviewed with stakeholders and selected for inclusion in the Regional ITS Architecture based on relevance to the Knoxville region. After selection, service packages were prioritized. There were 38 ITS service packages identified, as shown in Table 6.

Table 6. Knoxville Regional ITS Service Package Prioritization by Functional Area

SERVICE AREA	SERVICE PACKAGE	HIGH PRIORITY	MEDIUM PRIORITY	LOW PRIORITY
Commercial Vehicle Operations	CVO05: Commercial Vehicle Parking		✓	
	CVO08: Smart Roadside and Virtual WIM		✓	
Data Management	DM01: ITS Data Warehouse		✓	
	DM02: Performance Monitoring		✓	
Maintenance and Construction	MC01: Maintenance and Construction Vehicle and Equipment Tracking		✓	
	MC06: Work Zone Management		✓	
	MC08: Maintenance and Construction Activity Coordination	✓		
	MC09: Infrastructure Monitoring		✓	
Parking Management	PM01: Parking Space Management		✓	
	PM03: Parking Electronic Payment			✓
	PM04: Regional Parking Management		✓	
	PM05: Parking Reservations			✓
	PM06: Loading Zone Management			✓
Public Safety	PS01: Emergency Call-Taking and Dispatch	✓		
	PS03: Emergency Vehicle Preemption	✓		
	PS08: Roadway Service Patrols	✓		
	PS10: Wide-Area Alert	✓		
	PS12: Disaster Response and Recovery	✓		
	PS13: Evacuation and Reentry Management	✓		
	PS14: Disaster Traveler Information	✓		

SERVICE AREA	SERVICE PACKAGE	HIGH PRIORITY	MEDIUM PRIORITY	LOW PRIORITY
Public Transportation	PT01: Transit Vehicle Tracking	✓		
	PT02: Transit Fixed-Route Operations	✓		
	PT03: Dynamic Transit Operations	✓		
	PT04: Transit Fare Collection Management	✓		
	PT05: Transit Security	✓		
	PT06: Transit Fleet Management	✓		
	PT07: Transit Passenger Counting	✓		
	PT08: Transit Traveler Information	✓		
	PT09: Transit Signal Priority	✓		
	PT11: Transit Pedestrian Indication	✓		
	PT12: Transit Vehicle at Station/Stop Warnings	✓		
	PT14: Multi-Modal Coordination	✓		
Sustainable Travel	ST04: Roadside Lighting		✓	
Support	SU01: Connected Vehicle System Monitoring and Management		✓	
Traveler Information	TI01: Broadcast Traveler Information	✓		
	TI02: Personalized Traveler Information	✓		
	TI06: Dynamic Ridesharing and Shared Use Transportation	✓		
Traffic Management	TM01: Infrastructure-Based Traffic Surveillance	✓		
	TM02: Vehicle-Based Traffic Surveillance	✓		
	TM03: Traffic Signal Control	✓		
	TM04: Connected Vehicle Traffic Signal System	✓		

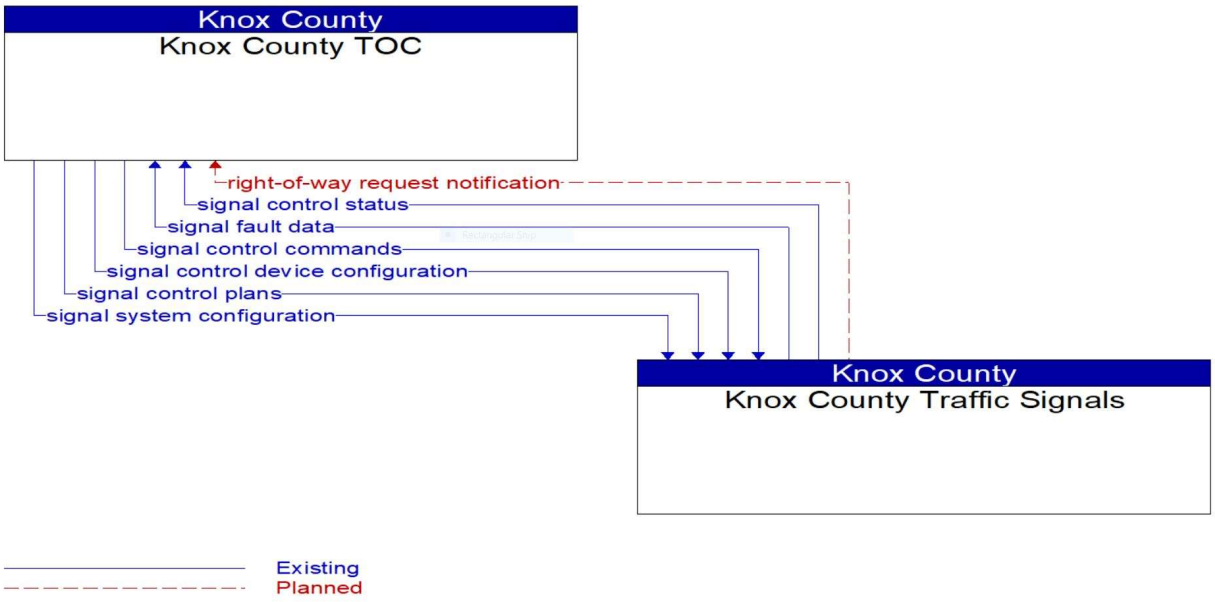
SERVICE AREA	SERVICE PACKAGE	HIGH PRIORITY	MEDIUM PRIORITY	LOW PRIORITY
Traffic Management (cont.)	TM05: Traffic Metering		✓	
	TM06: Traffic Information Dissemination	✓		
	TM07: Regional Traffic Management	✓		
	TM08: Traffic Incident Management System	✓		
	TM09: Integrated Decision Support and Demand Management			✓
	TM12: Dynamic Roadway Warning		✓	
	TM13: Standard Railroad Grade Crossing		✓	
	TM14: Advanced Railroad Grade Crossing		✓	
	TM17: Speed Warning and Enforcement		✓	
	TM19: Roadway Closure Management	✓		
	TM21: Speed Harmonization			✓
	TM25: Wrong Way Vehicle Detection and Warning		✓	
	TM26: Signal Enforcement		✓	
Support	SU01: Connected Vehicle System Monitoring and Management			
Vehicle Safety	VS01: Autonomous Vehicle Safety Systems		✓	
	VS02: V2V Basic Safety		✓	
	VS05: Curve Speed Warning		✓	
	VS08: Queue Detection		✓	
	VS09: Reduced Speed Zone Warning / Lane Closure		✓	
	VS11: Oversize Vehicle Warning		✓	
	VS12: Pedestrian and Cyclist Safety		✓	

SERVICE AREA	SERVICE PACKAGE	HIGH PRIORITY	MEDIUM PRIORITY	LOW PRIORITY
Vehicle Safety (cont.)	VS13: Intersection Safety Warning and Collision Avoidance		✓	
	VS16: Automated Vehicle Operations		✓	
Weather	WX01: Weather Data Collection	✓		
	WX02: Weather Information Processing and Distribution	✓		

The connectivity between the various transportation systems in the Knoxville region is a significant part of the ITS architecture as service packages represent potential deployments of integrated capabilities. The customization of service packages reflects stakeholder needs, systems, subsystems, and terminators within the region. Each service package contains information that is shared between the specified elements, referred to as data flows. Each data flow defines the information being shared and the direction in which the information is being sent.

Services packages are illustrated as figures with the service package name, identified local agencies, and data flows. Important to note is that the illustration of existing data flows does not mean deployment of a service is complete as there are often opportunities for service expansions even when a data flow is existing. Figure 3 shows an example customized service package in the Traffic Management service area. This diagram corresponds to the Traffic Signal Control (TM03) service package for Knox County. Specifically, the diagram depicts the traffic information that is being shared between elements, which in this case, are the Knox County TOC and Knox County's traffic signals.

Figure 3. Example Customized Service Package



As previously mentioned, stakeholders provided input that described the various needs of the region. The service packages that correspond to these identified needs were identified in Chapter 3 of this report. The remaining customized service packages are included in the online, interactive RAD-IT database.

5.2 FUNCTIONAL REQUIREMENTS

The various elements included in the ITS architecture include functional requirements that describe what each system must accomplish. The National ITS Architecture defines a wide range of functions with varying levels of detail. The USDOT recommends that regions define the level of detail that will be included in the elements for their associated functional requirements. In past ITS architectures, the Knoxville region has elected to develop the functional requirements, including the detailed "shall" statements for each system, at the project level. The "shall" statements describe all functions that a system is expected to accomplish when implemented.

The first portion of the functional requirements for the Knoxville Regional ITS Architecture includes the previously described customized ITS service packages. The service packages and data flows define what the Knoxville Regional ITS Architecture must accomplish and the information that must be shared between the various elements. Secondly, each element included in the ITS architecture has more detailed functional requirements that correspond specifically to the identified element. The functions of each element included in the Knoxville Regional ITS Architecture are presented in the Appendix.

5.3 STANDARDS

The Knoxville Regional ITS Architecture includes standards that enable an effective application of the described elements in perpetuity. The USDOT ITS Joint Program Office has provided Standards Development Organizations (SDO) with a comprehensive program to develop standards that allow for each region to install ITS architectures in an efficient way and maximize the success of the systems. The applicable standards to the Knoxville Regional ITS Architecture are presented in Table 7.

It should be noted that the standards included in Table 7 do not align with the specific flows of the ITS architecture. This information can be located on the National ITS Reference Architecture website. The website is updated more often than the RAD-IT software and provides links to information about the applicable standards. The National ITS Reference Architecture website can be found at the following link: **http://www.arc-it.net/**. The related standards are also included in the online, interactive RAD-IT database for the Knoxville region.

Table 7. Knoxville Region Applicable ITS Standards

SDO	DOCUMENT ID	STANDARD TITLE
American Public Transportation Association	APTA TCIP-S-001	Standard for Transit Communications Interface Profiles
Consortium of AASHTO, ITE, and NEMA	NTCIP 1201	Global Object Definitions
	NTCIP 1202	Object Definitions for Actuated Traffic Signal Controller (ASC) Units
	NTCIP 1203	Object Definitions for Dynamic Message Signs (DMS)
	NTCIP 1204	Object Definitions for Environmental Sensor Stations (ESS)
	NTCIP 1205	Object Definitions for Closed Circuit Television (CCTV) Camera Control
	NTCIP 1207	Object Definitions for Ramp Meter Control (RMC) Units
	NTCIP 1208	Object Definitions for Closed Circuit Television (CCTV) Switching
	NTCIP 1209	Data Element Definitions for Transportation Sensor Systems (TSS)
	NTCIP 1210	Field Management Stations (FMS) - Part 1: Object Definitions for Signal System Masters
	NTCIP 1211	Object Definitions for Signal Control and Prioritization (SCP)
General Transit Feed Specification Discussion Group	GTFS	General Transit Feed Specification (GTFS) Static
	GTFS-Realtime	General Transit Feed Specification (GTFS) Realtime
Institute of Electrical and Electronics Engineers	IEEE 1609.3	IEEE Standard for Wireless Access in Vehicular Environments (WAVE) - Networking Services
Internet Engineering Task Force	IETF RFC 4180	IEEE Standard for Wireless Access in Vehicular Environments (WAVE) - Networking Services
	IETF RFC 6353	Common Format and MIME Type for Comma-Separated Values (CSV) Files

SDO	DOCUMENT ID	STANDARD TITLE
Internet Engineering Task Force (cont.)	IETF RFC 7159	Transport Layer Security (TLS) Transport Model for the Simple Network Management Protocol (SNMP)
	IETF RFC 7230	The JavaScript Object Notation (JSON) Data Interchange Format
	IETF RFC 793	Hypertext Transfer Protocol (HTTP/1.1): Message Syntax and Routing
Institute of Transportation Engineers	ITE TMDD Vol. 2	Traffic Management Data Dictionary Standard for the Center-to-Center Communications: Volume 2: Design Content
Profile	ISO 21320-1	Information technology — Document Container File — Part 1: Core
	W3C WSDL 1.1	Web Services Description Language (WSDL) 1.1
	WZDx	Work Zone Data Exchange
Society of Automotive Engineers	SAE J2353	Data Dictionary for Advanced Traveler Information Systems (ATIS)
	SAE J2354	Message Set for Advanced Traveler Information System (ATIS)
	SAE J2735	Dedicated Short Range Communications (DSRC) Message Set Dictionary
	SAE J2945	Dedicated Short Range Communication (DSRC) Systems Engineering Process Guidance for J2945/x Documents and Common Design Concepts

5.4 OPERATIONAL CONCEPTS

Operational concepts define the roles and responsibilities of each stakeholder included in the Knoxville Regional ITS Architecture. These roles and responsibilities cover a range of different services, described generally below with specific Knoxville stakeholder roles presented in Table 8.

Commercial Vehicle Operations – The development of systems to facilitate the management of commercial vehicles.

Data Management – The development of systems to collect transportation data for use in non-operational purposes.

Emergency Management – The development of systems to provide emergency call taking, public safety dispatch, and emergency operations center activities.

Incident Management – The development of systems to provide rapid and effective response to incidents. Includes systems to detect and verify incidents along with coordinated agency responses to the incidents.

Maintenance and Construction – The development of systems to manage the maintenance of roadways in the region. Includes the managing of construction operations and coordinating construction activities.

Traffic Signal Management – The development of signal systems that react to changing traffic conditions and provide coordinated intersection timing over a corridor, an area, or multiple jurisdictions.

Transit Management – The development of systems to more efficiently manage fleets of transit vehicles or transit rail. Includes systems to provide transit traveler information both before and during the trip.

Traveler Information – The development of systems to provide static and real-time transportation information to travelers.

Weather– The development of systems to collect roadway weather data for use throughout the region.

Table 8. Knoxville Regional Stakeholder Roles and Responsibilities

SERVICE AREA	STAKEHOLDER	ROLES AND RESPONSIBILITIES
Commercial Vehicle Operations for Knoxville Region	Tennessee Highway Patrol	Operate weigh-in-motion commercial vehicle inspection station.
	Tennessee Highway Patrol	Enforce commercial vehicle regulations in the State of Tennessee.
Data Management for Knoxville Region	ETHRA	Collect and maintain transit archive data.
	KAT	Collect and maintain transit archive data.
	Knox County CAC	Collect and maintain transit archive data.
	Knoxville Regional TPO	Collect and maintain data from regional traffic, transit, and emergency management agencies.
	TDOT	Collect and maintain traffic archive data.
	Tennessee Highway Patrol	Collect and maintain crash record information from regional emergency management agencies.
Emergency Management for Knoxville Region	Blount County	Operates the EOC for Blount County in the event of a disaster or other large-scale emergency situation.
	Blount County	Responsible for tactical decision support, resource coordination, and communications integration among emergency management agencies in the County.
	Blount County	Lead regional efforts for emergency planning to support large-scale incidents and disasters.
	Blount County	Lead evacuation planning and coordination to manage evacuation and reentry in the vicinity of a disaster or other emergency situation.
	Blount County	Responsible for emergency call-taking for Blount County as the 911 PSAP. Relays dispatch to city run local dispatch for Alcoa, Maryville, and several other municipalities within the County.
	Blount County	Responsible for the dispatch of emergency vehicles to incidents and tracking of their location and status.
	Blount County	Responsible for the routing of emergency vehicles to facilitate the safest/quickest arrival at an incident.
	Blount County	Participate in regional emergency planning to support large scale incidents and disasters.
	Blount County	Participate in evacuation planning and coordination to manage evacuation and reentry in the vicinity of a disaster or other emergency situation.
	City of Alcoa	Responsible for the dispatch of emergency vehicles to incidents and tracking of their location and status.
	City of Alcoa	Responsible for the routing of emergency vehicles to facilitate the safest/quickest arrival at an incident.
	City of Alcoa	Participate in regional emergency planning to support large scale incidents and disasters.
	City of Alcoa	Participate in evacuation planning and coordination to manage evacuation and reentry in the vicinity of a disaster or other emergency situation.
	City of Maryville	Responsible for the dispatch of emergency vehicles to incidents and tracking of their location and status.
	City of Maryville	Responsible for the routing of emergency vehicles to facilitate the safest/quickest arrival at an incident.
	City of Maryville	Participate in regional emergency planning to support large scale incidents and disasters.
	City of Maryville	Participate in evacuation planning and coordination to manage evacuation and reentry in the vicinity of a disaster or other emergency situation.
	City of Sevierville	Responsible for the dispatch of emergency vehicles to incidents and tracking of their location and status.
	City of Sevierville	Responsible for the routing of emergency vehicles to facilitate the safest/quickest arrival at an incident.
	City of Sevierville	Participate in regional emergency planning to support large scale incidents and disasters.
	City of Sevierville	Participate in evacuation planning and coordination to manage evacuation and reentry in the vicinity of a disaster or other emergency situation.
	Knox County	Operates the EOC for Knox County in the event of a disaster or other large-scale emergency situation.
	Knox County	Responsible for tactical decision support, resource coordination, and communications integration among emergency management agencies in the County.
	Knox County	Lead regional efforts for emergency planning to support large-scale incidents and disasters.
	Knox County	Lead evacuation planning and coordination to manage evacuation and reentry in the vicinity of a disaster or other emergency situation.
	Knox County	Responsible for emergency call-taking for Knox County as the 911 PSAP.
	Knox County	Responsible for the dispatch of emergency vehicles to incidents and tracking of their location and status.
	Knox County	Responsible for the routing of emergency vehicles to facilitate the safest/quickest arrival at an incident.
	Knox County	Participate in regional emergency planning to support large scale incidents and disasters.
	Knox County	Participate in evacuation planning and coordination to manage evacuation and reentry in the vicinity of a disaster or other emergency situation.
	Loudon County	Operates the EOC for Loudon County in the event of a disaster or other large-scale emergency situation.
	Loudon County	Responsible for tactical decision support, resource coordination, and communications integration among emergency management agencies in the County.

SERVICE AREA	STAKEHOLDER	ROLES AND RESPONSIBILITIES
Emergency Management for Knoxville Region (cont.)	Loudon County	Lead regional efforts for emergency planning to support large-scale incidents and disasters.
	Loudon County	Lead evacuation planning and coordination to manage evacuation and reentry in the vicinity of a disaster or other emergency situation.
	Loudon County	Responsible for emergency call-taking for Loudon County as the 911 PSAP. Relays dispatch to local dispatch Rural Metroland several municipalities within the County.
	Loudon County	Responsible for the dispatch of emergency vehicles to incidents and tracking of their location and status.
	Loudon County	Responsible for the routing of emergency vehicles to facilitate the safest/quickest arrival at an incident.
	Loudon County	Participate in regional emergency planning to support large scale incidents and disasters.
	Loudon County	Participate in evacuation planning and coordination to manage evacuation and reentry in the vicinity of a disaster or other emergency situation.
	Municipal/County Government	Responsible for the dispatch of emergency vehicles to incidents and tracking of their location and status.
	Municipal/County Government	Responsible for the routing of emergency vehicles to facilitate the safest/quickest arrival at an incident.
	Municipal/County Government	Participate in regional emergency planning to support large scale incidents and disasters.
	Municipal/County Government	Participate in evacuation planning and coordination to manage evacuation and reentry in the vicinity of a disaster or other emergency situation.
	Rural Metro	Responsible for the dispatch of emergency vehicles to incidents and tracking of their location and status.
	Rural Metro	Responsible for the routing of emergency vehicles to facilitate the safest/quickest arrival at an incident.
	Rural Metro	Participate in regional emergency planning to support large scale incidents and disasters.
	Rural Metro	Participate in evacuation planning and coordination to manage evacuation and reentry in the vicinity of a disaster or other emergency situation.
	Sevier County	Operates the EOC for Sevier County in the event of a disaster or other large-scale emergency situation.
	Sevier County	Responsible for tactical decision support, resource coordination, and communications integration among emergency management agencies in the County.
	Sevier County	Lead regional efforts for emergency planning to support large-scale incidents and disasters.
	Sevier County	Lead evacuation planning and coordination to manage evacuation and reentry in the vicinity of a disaster or other emergency situation.
	Sevier County	Responsible for emergency call-taking for Sevier County as the 911 PSAP. Relays dispatch to city run local dispatch for Pigeon Forge, Sevierville, and Gatlinburg.
	Sevier County	Responsible for the dispatch of emergency vehicles to incidents and tracking of their location and status.
	Sevier County	Responsible for the routing of emergency vehicles to facilitate the safest/quickest arrival at an incident.
	Sevier County	Responsible for the dispatch of emergency vehicles to incidents and tracking of their location and status.
	Sevier County	Responsible for the routing of emergency vehicles to facilitate the safest/quickest arrival at an incident.
	Sevier County	Participate in regional emergency planning to support large scale incidents and disasters.
	Sevier County	Participate in evacuation planning and coordination to manage evacuation and reentry in the vicinity of a disaster or other emergency situation.
	TEMA	Operates the EOC for the State of Tennessee in the event of a disaster or other large-scale emergency situation.
	TEMA	Responsible for tactical decision support, resource coordination, and communications integration among emergency management agencies in the State.
	TEMA	Responsible for coordination with adjacent states, including the State of Georgia, as needed to support emergency management.
	TEMA	Lead statewide efforts for emergency planning to support large-scale incidents and disasters.
	TEMA	Lead evacuation planning and coordination to manage evacuation and reentry in the vicinity of a disaster or other emergency situation.
	Tennessee Bureau of Investigation	Responsible for the initiation of AMBER Alerts.
	Tennessee Highway Patrol	Responsible for the dispatch of emergency vehicles to incidents and tracking of their location and status.
	Tennessee Highway Patrol	Responsible for the routing of emergency vehicles to facilitate the safest/quickest arrival at an incident.
	Tennessee Highway Patrol	Participate in regional emergency planning to support large scale incidents and disasters.
	Tennessee Highway Patrol	Participate in evacuation planning and coordination to manage evacuation and reentry in the vicinity of a disaster or other emergency situation.
Incident Management for Knoxville Region	Blount County	Dispatch public safety vehicles to incidents.
	Blount County	Coordinate incident response with emergency dispatch agencies, the Maryville/Alcoa TOC, any other municipal TOCs, and the TDOT SmartWay Center in Knoxville for incidents on state facilities.
	City of Knoxville	Remotely control traffic and video sensors to support incident detection and verification.
	City of Knoxville	Responsible for the dissemination of traffic related data to other centers and the media.
	City of Knoxville	Responsible for coordination with other traffic operations centers and emergency management agencies for coordinated incident management.
	City of Knoxville	Coordinate maintenance resources for incident response.
	City of Maryville/Alcoa	Remotely control traffic and video sensors to support incident detection and verification.
	City of Maryville/Alcoa	Responsible for the dissemination of traffic related data to other centers and the media.

SERVICE AREA	STAKEHOLDER	ROLES AND RESPONSIBILITIES
Incident Management for Knoxville Region (cont.)	City of Maryville/Alcoa	Responsible for coordination with other traffic operations centers and emergency management agencies for coordinated incident management.
	City of Maryville/Alcoa	Coordinate maintenance resources for incident response.
	City of Maryville/Alcoa	Dispatch public safety vehicles to incidents.
	City of Maryville/Alcoa	Coordinate incident response with emergency dispatch agencies, the Maryville/Alcoa TOC, and the TDOT SmartWay Center in Knoxville for incidents on state facilities.
	City of Oak Ridge	Remotely control traffic and video sensors to support incident detection and verification.
	City of Oak Ridge	Responsible for the dissemination of traffic related data to other centers and the media.
	City of Oak Ridge	Responsible for coordination with other traffic operations centers and emergency management agencies for coordinated incident management.
	City of Oak Ridge	Coordinate maintenance resources for incident response.
	City of Sevierville	Remotely control traffic and video sensors to support incident detection and verification.
	City of Sevierville	Responsible for the dissemination of traffic related data to other centers and the media.
	City of Sevierville	Responsible for coordination with other traffic operations centers and emergency management agencies for coordinated incident management.
	City of Sevierville	Coordinate maintenance resources for incident response.
	Knox County	Remotely control traffic and video sensors to support incident detection and verification.
	Knox County	Responsible for the dissemination of traffic related data to other centers and the media.
	Knox County	Responsible for coordination with other traffic operations centers and emergency management agencies for coordinated incident management.
	Knox County	Coordinate maintenance resources for incident response.
	Knox County	Dispatch public safety vehicles to incidents.
	Knox County	Coordinate incident response with emergency dispatch agencies, the City of Knoxville TOC, Knox County TOC, other municipal TOCs, and the TDOT SmartWay Center in Knoxville for incidents on state facilities.
	Loudon County	Dispatch public safety vehicles to incidents.
	Loudon County	Coordinate incident response with emergency dispatch agencies, municipal TOCs, and the TDOT SmartWay Centering Knoxville for incidents on state facilities.
	Municipal/County Government	Remotely control traffic and video sensors to support incident detection and verification.
	Municipal/County Government	Responsible for the dissemination of traffic related data to other centers and the media.
	Municipal/County Government	Responsible for coordination with other traffic operations centers and emergency management agencies for coordinated incident management.
	Municipal/County Government	Coordinate maintenance resources for incident response.
	Municipal/County Government	Dispatch public safety vehicles to incidents.
	Municipal/County Government	Coordinate incident response with emergency dispatch agencies, municipal TOCs, and the TDOT SmartWay Centering Knoxville for incidents on state facilities.
	Other Agencies	Dispatch public safety vehicles to incidents.
	Other Agencies	Coordinate incident response with other public safety and traffic management agencies as well as the TDOT SmartWay Center in Knoxville for incidents on state facilities.
	Sevier County	Dispatch public safety vehicles to incidents.
	Sevier County	Coordinate incident response with emergency dispatch agencies, the City of Sevierville TOC, any other municipal TOCs, and the TDOT SmartWay Center in Knoxville for incidents on state facilities
	TDOT	Remotely control traffic and video sensors from the SmartWay TMC to support incident detection and verification.
	TDOT	Responsible for the dissemination of traffic related data to other centers and the media.
	TDOT	Operate DMS and HAR to distribute incident information to travelers on the roadway.
	TDOT	Responsible for coordination with other TOCs and emergency management agencies for coordinated incident management.
	TDOT	Responsible for the development, coordination, and execution of special traffic management strategies during an evacuation.
	Tennessee Highway Patrol	Dispatch public safety vehicles to incidents.
	Tennessee Highway Patrol	Coordinate incident response with other public safety and traffic management agencies as well as the TDOT SmartWay Center in Knoxville for incidents on state facilities.
Maintenance and Construction for Knoxville Region	City of Knoxville	Responsible for the tracking and dispatch of maintenance vehicles.
	City of Knoxville	Supports coordinated response to incidents.
	City of Knoxville	Supports work zone activities including the dissemination of work zone information through portable DMS and sharing of information with other groups.
	City of Knoxville	Disseminates work zone activity schedules and current asset restrictions to other agencies.
	Municipal/County Government	Responsible for the tracking and dispatch of maintenance vehicles.

SERVICE AREA	STAKEHOLDER	ROLES AND RESPONSIBILITIES
Maintenance and Construction for Knoxville Region (cont.)	Municipal/County Government	Supports coordinated response to incidents.
	Municipal/County Government	Supports work zone activities including the dissemination of work zone information through portable DMS and sharing of information with other groups.
	Municipal/County Government	Disseminates work zone activity schedules and current asset restrictions to other agencies.
	TDOT	Responsible for the tracking and dispatch of maintenance vehicles.
	TDOT	Supports coordinated response to incidents.
	TDOT	Supports work zone activities including the dissemination of work zone information through portable DMS, HAR, and sharing of information with other groups.
	TDOT	Responsible for entering and updating work zone information in TSIS.
	TDOT	Disseminates work activity schedules and current asset restrictions to other agencies.
	TDOT	Operates work zone traffic control equipment including portable surveillance equipment, DMS, and HAR transmitters.
Traffic Signal Management for Knoxville Region	City of Knoxville	Operate and maintain traffic signal systems within the City.
	City of Knoxville	Operate network surveillance equipment including CCTV cameras and vehicle detection on roadways within the City to facilitate traffic signal operations.
	City of Knoxville	Remotely operate traffic signal controllers to implement traffic management strategies at signalized intersections based on traffic conditions, incidents, and emergency vehicle preemptions.
	City of Knoxville	Provide traffic signal preemption for emergency vehicles.
	City of Knoxville	Provide traffic signal priority for transit vehicles.
	City of Lenoir City	Operate and maintain traffic signal systems within the City.
	City of Lenoir City	Operate network surveillance equipment including CCTV cameras and vehicle detection on roadways within the City to facilitate traffic signal operations.
	City of Lenoir City	Remotely operate traffic signal controllers to implement traffic management strategies at signalized intersections based on traffic conditions, incidents, and emergency vehicle preemption requests.
	City of Lenoir City	Provide traffic signal preemption for emergency vehicles.
	City of Maryville/Alcoa	Operate and maintain traffic signal systems within the City.
	City of Maryville/Alcoa	Operate network surveillance equipment including CCTV cameras and vehicle detection on roadways within the City to facilitate traffic signal operations.
	City of Maryville/Alcoa	Remotely operate traffic signal controllers to implement traffic management strategies at signalized intersections based on traffic conditions, incidents, and emergency vehicle preemption requests.
	City of Maryville/Alcoa	Provide traffic signal preemption for emergency vehicles.
	City of Oak Ridge	Operate and maintain traffic signal systems within the City.
	City of Oak Ridge	Operate network surveillance equipment including CCTV cameras and vehicle detection on roadways within the City to facilitate traffic signal operations.
	City of Oak Ridge	Remotely operate traffic signal controllers to implement traffic management strategies at signalized intersections based on traffic conditions, incidents, and emergency vehicle preemptions.
	City of Oak Ridge	Provide traffic signal preemption for emergency vehicles.
	City of Sevierville	Operate and maintain traffic signal systems within the City.
	City of Sevierville	Operate network surveillance equipment including CCTV cameras and vehicle detection on roadways within the City to facilitate traffic signal operations.
	City of Sevierville	Remotely operate traffic signal controllers to implement traffic management strategies at signalized intersections based on traffic conditions, incidents, and emergency vehicle preemption requests.
	City of Sevierville	Provide traffic signal preemption for emergency vehicles.
	Knox County	Operate and maintain traffic signal systems within the County.
	Knox County	Operate network surveillance equipment including CCTV cameras and vehicle detection on roadways within the County to facilitate traffic signal operations.
	Knox County	Remotely operate traffic signal controllers to implement traffic management strategies at signalized intersections based on traffic conditions, incidents, and emergency vehicle preemption requests.
	Knox County	Provide traffic signal preemption for emergency vehicles.
	Municipal/County Government	Operate and maintain traffic signal systems within the municipality.
	Municipal/County Government	Operate network surveillance equipment including CCTV cameras and vehicle detection on roadways within the municipality to facilitate traffic signal operations.
	Municipal/County Government	Remotely operate traffic signal controllers to implement traffic management strategies at signalized intersections based on traffic conditions, incidents, and emergency vehicle preemption requests.

SERVICE AREA	STAKEHOLDER	ROLES AND RESPONSIBILITIES
Traffic Signal Management for Knoxville Region (cont.)	Municipal/County Government	Provide traffic signal preemption for emergency vehicles.
	Town of Farragut	Operate and maintain traffic signal systems within the City.
	Town of Farragut	Operate network surveillance equipment including CCTV cameras and vehicle detection on roadways within the City to facilitate traffic signal operations.
	Town of Farragut	Remotely operate traffic signal controllers to implement traffic management strategies at signalized intersections based on traffic conditions, incidents, and emergency vehicle preemption requests.
	Town of Farragut	Provide traffic signal preemption for emergency vehicles.
Transit Management for Knoxville Region	ETHRA	Operates demand response transit services from a central dispatch facility responsible for tracking vehicle location and status.
	ETHRA	Provide transit passenger electronic fare payment.
	ETHRA	Provide transit security on transit vehicles and at transit terminals through silent alarms and surveillance systems.
	ETHRA	Provide transit traveler information to the agency website, local private sector traveler information services, and the Tennessee 511 Traveler Information System.
	ETHRA	Participate in evacuation planning and coordination to manage evacuation and reentry in the vicinity of a disaster or other emergency situation.
	KAT	Operates fixed route and paratransit services from central dispatch facilities responsible for tracking their location and status.
	KAT	Provide transit passenger electronic fare payment.
	KAT	Provide transit security on transit vehicles and at transit terminals through silent alarms and surveillance systems.
	KAT	Coordinate with the TOC on transit signal priority.
	KAT	Provide transit traveler information to the agency website, local private sector traveler information services, the Tennessee 511 system, the real-time app, texting feature, social media websites, and electronic signage.
	KAT	Operate real-time arrival information boards at transit stops and at transfer stations.
	KAT	Operate on-board systems to provide next stop annunciation.
	KAT	Participate in evacuation planning and coordination to manage evacuation and reentry in the vicinity of a disaster or other emergency situation.
	Knox County CAC	Operates demand response transit services from a central dispatch facility responsible for tracking vehicle location and status.
	Knox County CAC	Provide transit passenger electronic fare payment.
	Knox County CAC	Provide transit security on transit vehicles and at transit terminals through silent alarms and surveillance systems.
	Knox County CAC	Provide transit traveler information to the agency website, local private sector traveler information services, and the Tennessee 511 Traveler Information System.
	Knox County CAC	Participate in evacuation planning and coordination to manage evacuation and reentry in the vicinity of a disaster or other emergency situation.
	Pigeon Forge/Sevierville Trolley	Operates fixed route services from central dispatch facilities responsible for tracking their location and status.
	Pigeon Forge/Sevierville Trolley	Participate in evacuation planning and coordination to manage evacuation and reentry in the vicinity of a disaster or other emergency situation.
	Pigeon Forge/Sevierville Trolley	Provide transit passenger electronic fare payment.
	Pigeon Forge/Sevierville Trolley	Provide transit security on transit vehicles and at transit terminals through silent alarms and surveillance systems.
	Pigeon Forge/Sevierville Trolley	Provide transit traveler information to the agency website, local private sector traveler information services, and the Tennessee 511 Traveler Information System.
Traveler Information for Knoxville Region	City of Knoxville	Responsible for the collection and distribution of traveler information including incident information and maintenance and construction closure information.
	City of Knoxville	Responsible for the collection and distribution of emergency information to the traveling public, including evacuation information and wide-area alerts.
	City of Maryville/Alcoa	Responsible for the collection and distribution of traveler information including incident information and maintenance and construction closure information.
	City of Maryville/Alcoa	Responsible for the collection and distribution of emergency information to the traveling public, including evacuation information and wide-area alerts.
	City of Oak Ridge	Responsible for the collection and distribution of traveler information including incident information and maintenance and construction closure information.
	City of Oak Ridge	Responsible for the collection and distribution of emergency information to the traveling public, including evacuation information and wide-area alerts.
	City of Sevierville	Responsible for the collection and distribution of traveler information including incident information and maintenance and construction closure information.
	City of Sevierville	Responsible for the collection and distribution of emergency information to the traveling public, including evacuation information and wide-area alerts.
	TDOT	Collection, processing, storage, and broadcast dissemination of traffic, transit, maintenance and construction, event and weather information to travelers via the SmartWay Website and the Tennessee 511 system.
	TDOT	Provide transportation information to travelers via traveler information kiosks.
	TDOT	Provide transportation network condition data to private sector information service providers.
Weather for Knoxville Region	Municipal/County Government	Monitors environmental sensors and distributes information about road weather conditions.
	TDOT	Monitors environmental sensors and distributes information about road weather conditions.

5.5 AGREEMENTS

The many systems and services described in this ITS architecture require detailed cooperation and interaction between agencies. Information sharing between agencies necessitates agreements in order to safeguard the effective operations of the systems included in the ITS architecture. Agreements should provide a plan to identify the responsibilities each agency will have and the information that will be processed, rather than in-depth details about equipment and technology.

The completion of formal agreements between agencies may take several months to complete. For current agreements, review and updates should take place intermittently, and any adjustments should be made before undertaking new arrangements. There are a variety of agreement types, and the appropriate type should be considered for the necessary use. The typical agreement types are as follows:

Handshake Agreements are often used in preliminary project stages. This informal agreement depends on relationships between agencies and may not be appropriate for long-term operations.

Memorandums of Understanding (MOUs) establish general consensus but typically lack detail. The purpose of MOUs is to identify high-level goals and partnerships.

Interagency and Intergovernmental Agreements link public agencies and may include agreements on operations, maintenance, or funding projects and systems. Documentation may include the responsibility of each agency, functions they will provide, and liability.

Funding Agreements record arrangements for funding ITS projects. At a minimum, funding agreements include a detailed scope, services to be performed, and a detailed project budget, agency funding expectations or funding sources.

Master Agreements include standard contract language for an agency and serve as the main agreement between two entities which guides all business transactions. Use of a master agreement may allow agencies to do business without having to go through the potentially lengthy development of formal agreements with each deployment.

Potential and existing agreements related to the ITS architecture among Knoxville regional stakeholders are presented in Table 9. It is important to note that as ITS services and systems are implemented in the Region, part of the planning and review process for those projects should include a review of potential

agreements that would be needed for implementation or operations. The documents associated with the existing agreements are presented in the Appendix.

Table 9. Agreements in the Knoxville Region

AGREEMENTS	DESCRIPTION	EXISTING/PLANNED	EXISTING AGREEMENT DOCUMENTS
Data Sharing and Usage (Public/Private)	Agreement to allow private sector media and information service providers to access and broadcast public sector transportation agency CCTV camera video feeds, real-time traffic speed and volume data, and incident data. Agreements should specify the control priority to allow traffic agencies first priority to control cameras during incidents or other events. The ability of the traffic agency to deny access to video and data feeds if a situation warrants such action should also be part of the agreement.	**Existing** (TDOT with Media) - Agreement developed by TDOT for live CCTV video access and information sharing for private entity users.	**TDOT 1** - TDOT Access Agreement for Live Video - Private User
Data Sharing and Usage (Public/Public)	Agreement to define the parameters, guidelines, and policies for inter-agency ITS data sharing between public sector agencies including CCTV camera feeds. Similar to data sharing and usage agreements for public-private agencies, the agency that owns the equipment should have first priority of the equipment and the ability to discontinue data sharing if a situation warrants such action.	**Existing** (TDOT with Local Governments/Local Responder Entities) - Agreement developed by TDOT for live CCTV video access and information sharing for government/emergency responder entities.	**TDOT 2A** - TDOT Access Agreement for Live Video - Government User **TDOT 2B** - TDOT Access Agreement for Live Video - Responder User
Open Roads Policy (Public/Public)	Memorandum of Understanding among TDOT, THP (TDOSHS), and local governments that establishes guidelines to accelerate the removal of vehicles or debris on the State Highway System to restore the flow of traffic following an incident.	**Existing** (TDOT, THP and Local Governments) - MOU signed in 2019.	**TDOT 3** - Quick Clearance MOU

Traffic Signal Timing Data Sharing and Usage (Public/Public)	Agreement to define the parameters, guidelines, and policies for inter-agency traffic signal timing, including sharing of timing plans and joint operations of signals, between cities and counties.	**Existing** (City of Maryville and City of Alcoa) - Formal written Interlocal Agreement to establish centralized traffic operations between the two cities and designate and fund a Maryville-Alcoa Central Traffic Operations group known as "MACTO".	**COM 1A** - MACTO Interlocal Agreement
		Existing (Cities of Maryville & Alcoa (MACTO) with Blount County) - Formal written Interlocal Agreement to establish the role of each party in the management of traffic, signal timing and coordination of a specific new traffic signal location in Blount County that adjoins the MACTO coordinated system.	**COM 1B** - Maryville, Alcoa and Blount County Interlocal Agreement
		Existing (City of Knoxville with Knox County and City of Sevierville with City of Pigeon Forge) - Handshake types of agreement (verbal only) where these adjoining jurisdictions cooperatively develop signal timing and have the ability to control each other's traffic signals along overlapping roadway corridors. Formal, written agreements for this arrangement are **Planned**.	None

Communications Resource Sharing (Public/Public)	Agreement to allow sharing of fiber optic networks and allow use of surplus "dark fibers" between public agencies in order to improve network redundancy and reliability.	**Existing** (TDOT with City of Knoxville) - Fiber Optic communications network sharing agreement for fiber placed along specific roadway corridors in Knoxville.	**TDOT 4** - Communications Resource License Agreement between TDOT and City of Knoxville
Communications Resource Sharing (Public/Private)	Agreement to allow sharing of fiber optic networks and allow use of surplus "dark fibers" between public agencies and private companies in order to improve network redundancy and reliability.	**Existing** (TDOT with Knology and TDOT with Comcast) - Fiber Optic communication network sharing agreement for fiber placed along roadway corridors adjoining TDOT Smartway system in Knoxville.	**TDOT 5A & 5B -** Communications Resource License Agreement between TDOT and Knology (5A) and TDOT and Comcast (5B)
Utility Make-Ready for Fiber Installation (Public/Public)	Agreement to determine responsibilities for planning, design, funding, construction and maintenance of fiber optic network installation on public utility infrastructure.	**Existing** (City of Knoxville with Knoxville Utilities Board) - Utility make-ready agreement for installation of fiber attachments to utility poles along specific roadway corridors. **Planned** (City of Knoxville with Lenoir City Utility Board	**COK 1** - Fiber Optic Agreement between City of Knoxville and Knoxville Utilities Board (KUB)
Incident Data Sharing and Usage (Public/Public)	Agreement to define the parameters, guidelines, and policies for inter-agency sharing of incident data between transportation and emergency management agencies in the Region. Incident information could be sent directly to computer-aided dispatch systems and include information on lane closures, travel delays, and weather.	**Planned** (TDOT, THP and Emergency Management Agencies)	None

5.6 PHASES OF IMPLEMENTATION

The Knoxville Regional ITS Architecture includes several projects scheduled over a long-term timeframe. Fundamental ITS systems are still necessary in some portions of the region, while some jurisdictions have already deployed ITS services. A number of projects along with approximate timelines are outlined in Chapter 6, which details the deployment plan for these projects. The following is a list of specified service packages that will play vital roles in the future implementation of the Knoxville Regional ITS Architecture:

- TM01: Infrastructure-Based Traffic Surveillance
- TM03: Traffic Signal Control
- TM06: Traffic Information Dissemination
- TM07: Regional Traffic Management
- TM08: Traffic Incident Management System
- PS01: Emergency Call-Taking and Dispatch
- PT01: Transit Vehicle Tracking
- PT02: Transit Fixed-Route Operations
- PT03: Dynamic Transit Operations
- PT08: Transit Traveler Information
- PT14: Multi-Modal Coordination
- VS08: Queue Detection

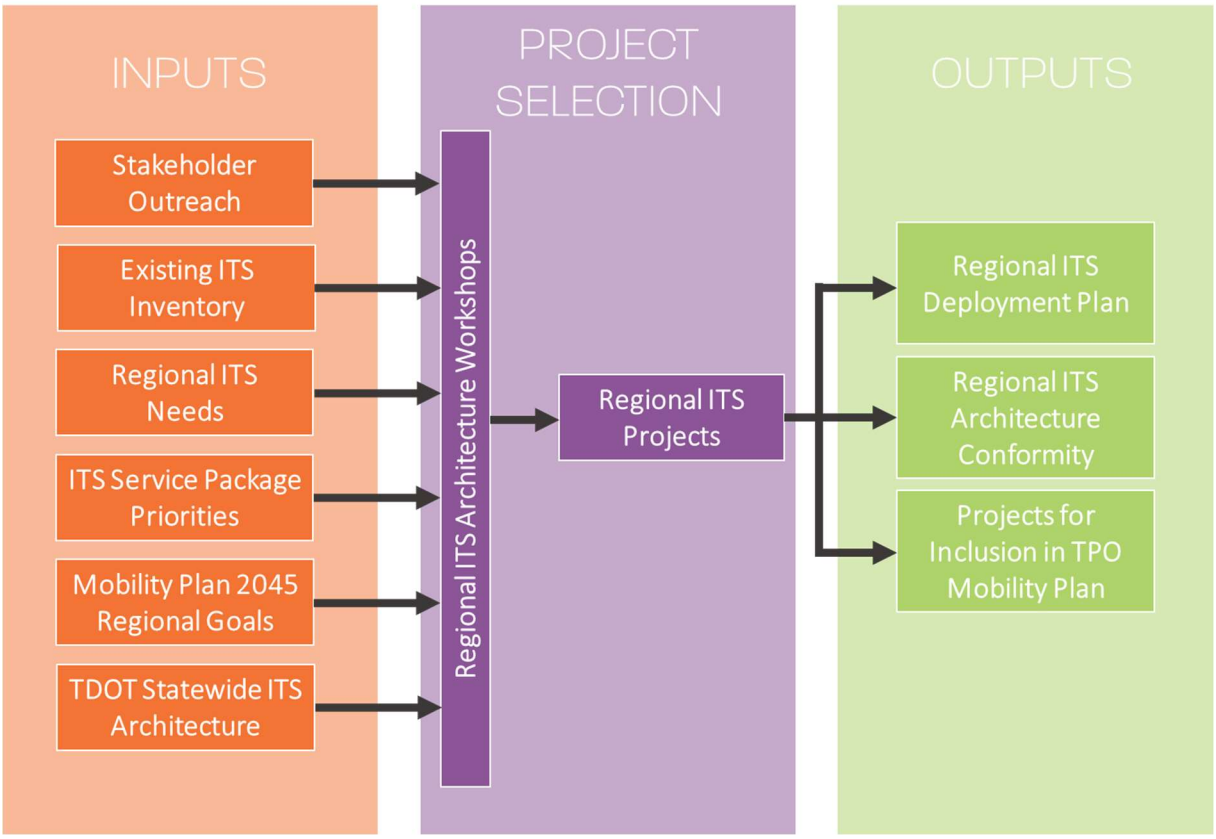
Chapter 6. REGIONAL ITS DEPLOYMENT PLAN

The Regional ITS Deployment Plan provides the region with a strategy to organize which projects should be implemented to achieve the maximum benefits of the ITS systems. The methodology presented in this chapter prioritizes the planned ITS-related projects and provides an approximate timeframe for implementing these projects. The plan also outlines which ITS service packages are associated with each project. It should be noted that this plan does not guarantee project funding as ITS projects are incorporated like other capital projects into the TPO's larger Mobility Plan updates.

6.1 PROJECT DEVELOPMENT PROCESS

The Regional ITS Architecture project development process is represented in Figure 4, which depicts the process of identifying objectives and prioritizing projects included in the Regional ITS Architecture. As shown, the input from stakeholders collected during workshops and interviews represents the first stage of the process as it informs the inventory of existing ITS systems and future needs in the region. Additionally, consideration of the goals and objectives of the TPO's Mobility Plan 2045 and the Statewide ITS Architecture helps ensure the linkage of the project list back to regional and state priorities. The selection of projects was based on these inputs and vetted through stakeholder review of the draft architecture. This process ultimately results in a deployment plan for implementing regional ITS projects that, when determined to be in conformity with the National ITS Architecture, can then be included in the TPO's Mobility Plan for funding.

Figure 4. Project Development and Selection Process



6.2 PROJECT RECOMMENDATIONS

The inventory of existing ITS systems in the Knoxville region is presented in Chapter 4 of this report. Specifically, Table 4 presents the existing ITS deployments in the Knoxville region along with the associated stakeholders. As shown there, several state, regional, and municipal agencies currently operate various ITS elements.

Before additional projects could be selected for prioritization, it was first necessary to determine the system on which ITS deployments would be appropriate or needed. Stakeholders were asked to identify corridors that had a potential need for ITS during the initial workshops and interviews. In addition, coordination with various regional entities also helped pinpoint where future ITS deployments could be effective. The process of identifying ITS projects and strategies was also tied in with the TPO's Congestion Management Process (CMP) for mitigation of congestion on the routes that were identified. The following routes in the Knoxville region were identified by stakeholders through the CMP process:

- Interstate 40
- Interstate 75
- Interstate 140
- Interstate 640
- Alcoa Highway (US 129)
- Cumberland Avenue
- Henley Street (US 441)
- Middlebrook Pike (SR 169)
- Kingston Pike (US 70/ SR 1)
- Chapman Highway (US 441 / SR 71)
- Maynardville Pike (SR 71)
- Cedar Bluff Road
- Lamar Alexander Pkwy (US 321 / SR 73)
- Lee Highway (US 11/ SR 2)
- Oak Ridge Turnpike (SR 95)
- Illinois Avenue (SR 62)
- Lafayette Drive
- Loudon Highway (SR 72)
- US 441 Parkway

Based on stakeholder input, a proposed list of ITS projects, known as a "Strategic Deployment Plan," was developed for the Knoxville region that expands the existing ITS systems in place. Table 10 lists the proposed ITS projects with project descriptions, the jurisdiction in which they would be implemented, estimated project costs, expected implementation timeframe, and the applicable ITS service packages.

Furthermore, the project list was coordinated and developed in conjunction with the TPO's Mobility Plan 2045 and the project ID number from that Plan is listed where applicable. Project with no Project ID have either already started and were not carried forward into the Mobility Plan or are still in the early development or concept stage where the timeframe is listed as "To Be Determined."

In addition to local priorities for ITS, Table 10 also includes projects in the Knoxville region that are sourced from the Tennessee Statewide ITS Architecture Update, which was completed in 2019 by TDOT. It should be noted that cost estimates and implementation schedules were not provided for these projects. However, some of the TDOT projects are included for long-term funding as part of the fiscally constrained Mobility Plan 2045.Furthermore, some TDOT projects listed were sourced from the *I-40/81 Multimodal Corridor Study* conducted by TDOT. These projects are not officially selected for funding at this time and would be implemented a long-term timeline compared to the other projects listed in Table 10.

Table 10. Strategic Deployment Plan for ITS Projects in the Knoxville Region

JURISDICTION	PROJECT NAME	DESCRIPTION AND CONSTRUCTION TIMEFRAME	PROJECT COST	SERVICE PACKAGES
City of Knoxville	Traffic Control Equipment Upgrade (#13-602)	Signal controllers, monitors, closed loop equipment and central software. Project covers two major roadway corridors - Broadway and Kingston Pike *(June 2021)*	$12,166,000	• TM01: Infrastructure-Based Traffic Surveillance • TM03: Traffic Signal Control • TM07: Regional Traffic Management • SU01: Connected Vehicle System Monitoring and Management
City of Knoxville	Chapman Highway ATMS (#13-1003)	ATMS upgrades for entire Chapman Highway corridor within city limits *(June 2021)*	$3,179,000	• TM01: Infrastructure-Based Traffic Surveillance • TM03: Traffic Signal Control • TM07: Regional Traffic Management • SU01: Connected Vehicle System Monitoring and Management
City of Knoxville	Middlebrook Pike ATMS (#18-603)	ATMS upgrades and DSRC for entire Middlebrook Pike corridor within city limits *(March 2022)*	$2,430,000	• TM01: Infrastructure-Based Traffic Surveillance • TM03: Traffic Signal Control • TM07: Regional Traffic Management • SU01: Connected Vehicle System Monitoring and Management

City of Knoxville	Traffic Signal Improvements for the U.T. area (#19-603)	Total of 39 signals adding ATMS data server, DSRC capable ATC controllers, detection and communication equipment *(To Be Determined)*	$2,967,000	• TM01: Infrastructure-Based Traffic Surveillance • TM03: Traffic Signal Control • TM07: Regional Traffic Management • SU01: Connected Vehicle System Monitoring and Management
City of Knoxville	Broadway Accelerated Bus Corridor (#17-106)	Implement transit signal priority, queue jumps, rider information dissemination, and other ITS transit elements, as well as construction of 14 enhanced bus stops and bus stop amenity upgrades. *(April 2023)*	$7,049,000	• PT02: Transit Fixed-Route Operations • PT08: Transit Traveler Information • PT09: Transit Signal Priority • PT11: Transit Pedestrian Indication • PT12: Transit Vehicle at Station/Stop Warnings • PT14: Multi-Modal Coordination
Town of Farragut	Town of Farragut ATMS - Phase 1 (#13-813)	Upgrade all 26 signals in Town and create centrally controlled system, also includes an added Phase 2 with DSRC and other elements *(October 2020)*	$7,020,000	• TM01: Infrastructure-Based Traffic Surveillance • TM03: Traffic Signal Control • TM07: Regional Traffic Management
Knox County	Knox County ATMS - Phase 1	Design and implement advanced traffic management system on two priority roads - Maynardville Pike and Cedar Bluff Road *(December 2020)*	$1,768,437	• TM01: Infrastructure-Based Traffic Surveillance • TM03: Traffic Signal Control • TM07: Regional Traffic Management

Knox County	Knox County ATMS - Phase 2 (#19-604)	Add DSRC and detection upgrades to Phase 1 and five new intersections *(To Be Determined)*	$1,547,000	• TM01: Infrastructure-Based Traffic Surveillance • TM03: Traffic Signal Control • TM07: Regional Traffic Management
City of Lenoir City	Lenoir City ITS Signal System Design	Design and implement ITS signal system for 20 coordinated signals along U.S. Route 321/State Route 73 and U.S. Route 11/State Route 2 *(December 2020)*	$1,856,095	• TM01: Infrastructure-Based Traffic Surveillance • TM03: Traffic Signal Control • TM07: Regional Traffic Management
City of Lenoir City	Lenoir City CMAQ ITS Phase II (#19-400)	ATMS equipment and DSRC to cover primary two corridors in Lenoir City of U.S. Route 11 and U.S. Route 321 *(To Be Determined)*	$2,310,000	• TM01: Infrastructure-Based Traffic Surveillance • TM03: Traffic Signal Control • TM07: Regional Traffic Management
City of Oak Ridge	Oak Ridge Signal Timing Optimization Ph. 2 (#13-802)	ATMS equipment and DSRC on Oak Ridge Turnpike *(July 2021)*	$2,855,400	• TM01: Infrastructure-Based Traffic Surveillance • TM03: Traffic Signal Control • TM07: Regional Traffic Management
City of Oak Ridge	Oak Ridge Signal Timing Optimization Ph. 3 (#19-100)	ATMS equipment and DSRC on Illinois Avenue and Lafayette Drive *(To Be Determined)*	$2,955,000	• TM01: Infrastructure-Based Traffic Surveillance • TM03: Traffic Signal Control • TM07: Regional Traffic Management

City of Loudon	Loudon Traffic Flow Improvement Project	Replace outdated infrastructure at seven signalized intersections, including updating vehicle detection, signal system communication and coordination. *(December 2020)*	$1,343,400	• TM01: Infrastructure-Based Traffic Surveillance • TM03: Traffic Signal Control • TM07: Regional Traffic Management
City of Maryville And Alcoa	Maryville Alcoa ATMS - Phase 2	Signal systems communication and equipment upgrades along four major corridors *(Currently Under Construction)*	$2,675,000	• TM01: Infrastructure-Based Traffic Surveillance • TM03: Traffic Signal Control • TM07: Regional Traffic Management
KAT	KAT – ITS Implementation	Implementation of ITS Capabilities including include bus automatic passenger counting, an automated pre-trip system for bus operators, closed-loop bus-to-dispatch FM communications system, traffic signal prioritization on the Broadway Avenue corridor, expanded fare collection to include smart card and mobile device fare technology, and real-time bus systems data feeds to the maintenance department. *(Currently Under Construction)*	$5,200,000	• PT02: Transit Fixed-Route Operations • PT08: Transit Traveler Information • PT09: Transit Signal Priority • PT11: Transit Pedestrian Indication • PT12: Transit Vehicle at Station/Stop Warnings • PT14: Multi-Modal Coordination
TDOT	ITS Expansion along Interstate 75 (#18-600)	From MM 109.6 to near MM 122 (SR 61) - includes the deployment of CCTV cameras at critical interchanges. Install communications infrastructure and at least two CCTV cameras at each interchange. *(2023)*	$4,000,000	• TM01: Infrastructure-Based Traffic Surveillance • TM07: Regional Traffic Management

TDOT	ITS Expansion along SR 115 (#18-200a, #18-200b)	From Cherokee Trails in Knox County to Rivertrace Boulevard in Blount County - includes the installation of fiber optic cable, CCTV cameras, DMS, and RDS. *(2023)*	$4,000,000	• TM01: Infrastructure-Based Traffic Surveillance • TM07: Regional Traffic Management
TDOT	Install ITS communication and instrumentation at SR 61/Andersonville Highway Interchange (MM 122) (#18-600)	Install communications infrastructure and at least two CCTV cameras at each interchange. *(2023)*	$5,000,000	• TM01: Infrastructure-Based Traffic Surveillance • TM07: Regional Traffic Management
TDOT	ITS Expansion along Interstate 140 (#18-201)	From Interstate 40 in Knox County to SR 115 in Blount County - includes the installation of fiber optic cable, CCTV cameras, DMS, and RDS. *(2022)*	$3,000,000	• TM01: Infrastructure-Based Traffic Surveillance • TM07: Regional Traffic Management
TDOT	ITS Expansion along Interstate 40	From Strawberry Plains Pike (MM 398) Interchange to SR 66 (MM 407) Interchange - includes the installation of fiber optic cable, seven CCTV cameras, three DMS and seven RDS. *(Currently Under Construction)*	$4,500,000	• TM01: Infrastructure-Based Traffic Surveillance • TM07: Regional Traffic Management
TDOT	Statewide Weigh-In-Motion Implementation (Interstate 40)	Implementation of weigh-in-motion systems with stations at Interstate 40 Eastbound MM 369.8 and Interstate 40 Westbound MM 372.3. Includes capabilities such as volume and class counts. *(February 2022)*	$4,000,000	• CVO08: Smart Roadside and Virtual WIM

TDOT	Interstate 40 "HELP Lite" Service Implementation **Project not officially selected for funding*	Implementation of "HELP Lite" service along Interstate 40 from Exit 398 to North Carolina State Line *(To be determined)*	$1,250,000	• TM08: Traffic Incident Management System
TDOT	Interstate 40 Ramp Metering Implementation **Project not officially selected for funding*	Implementation of Ramp Metering along Interstate 40 from Exit 374 to Downtown Knoxville near Broadway *(To be determined)*	$4,130,000	• TM05: Traffic Metering
TDOT	Interstate 40 Integrated Corridor Management Implementation **Project not officially selected for funding*	Implementation of Integrated Corridor Management along Interstate 40 from Exit 369 to Exit 407 *(To be determined)*	$10,720,000	• TM07: Regional Traffic Management
TDOT	Interstate 40 SmartWay Expansion **Project not officially selected for funding*	Expansion of TDOT SmartWay along Interstate 40 in Roane County between existing SmartWay deployments. *(To be determined)*	$7,980,000	• TM06: Traffic Information Dissemination • TM08: Traffic Incident Management System

Chapter 7. USE AND MAINTENANCE PLAN

The Knoxville Regional ITS Architecture includes a plan for how to implement ITS throughout the region with an effective and coordinated approach. However, there are a number of steps that must be taken at its completion and over time to ensure that it remains a useful resource for the region. For one, technological advances and changing regional needs mean that the Regional ITS Architecture will inevitably need to be updated over time. Additionally, federal regulations require both current and future Regional ITS Architectures to:

- Use a systems engineering analysis (SEA) approach in development;
- Consider ITS needs and projects in adjacent geographies and across the state; and
- Demonstrate conformity with the National ITS Architecture and standards.

The processes included in this chapter outline the procedures for maintaining the Regional ITS Architecture to ensure these standards are met. It should be noted that the Regional ITS Architecture should be updated comprehensively approximately every four years, but minor revisions can be implemented in between the comprehensive updates.

7.1 INCORPORATION INTO THE REGIONAL PLANNING PROCESS

To be most effective, the outcomes of the Regional ITS Architecture are incorporated into the regional planning processes conducted by the Knoxville Regional TPO as appropriate. This ensures that ITS investments are not only eligible for federal funding, but that they also help achieve regional goals for mobility and safety. The most straightforward integration is the inclusion of ITS projects in the TPO's Mobility Plan updates, which aligns available fiscal revenues with regional priorities for the transportation system. ITS projects consistent with the Regional ITS Architecture can be submitted for funding consideration in these plans. Through this process, ITS projects are scored, just like other capital projects, based on a number of performance metrics that ensure prioritized projects help the region progress towards meeting its goals and performance measure targets. As projects move through the development process and ultimately are slated for funding through the TPO's Transportation Improvement Program (TIP), TDOT conducts a formal evaluation of the projects to determine the appropriate level of systems engineering analysis required (described in Section 7.2) and their conformity with the National, Statewide, and Regional ITS Architectures (described in Section 7.3).

7.2 SYSTEMS ENGINEERING ANALYSIS (SEA)

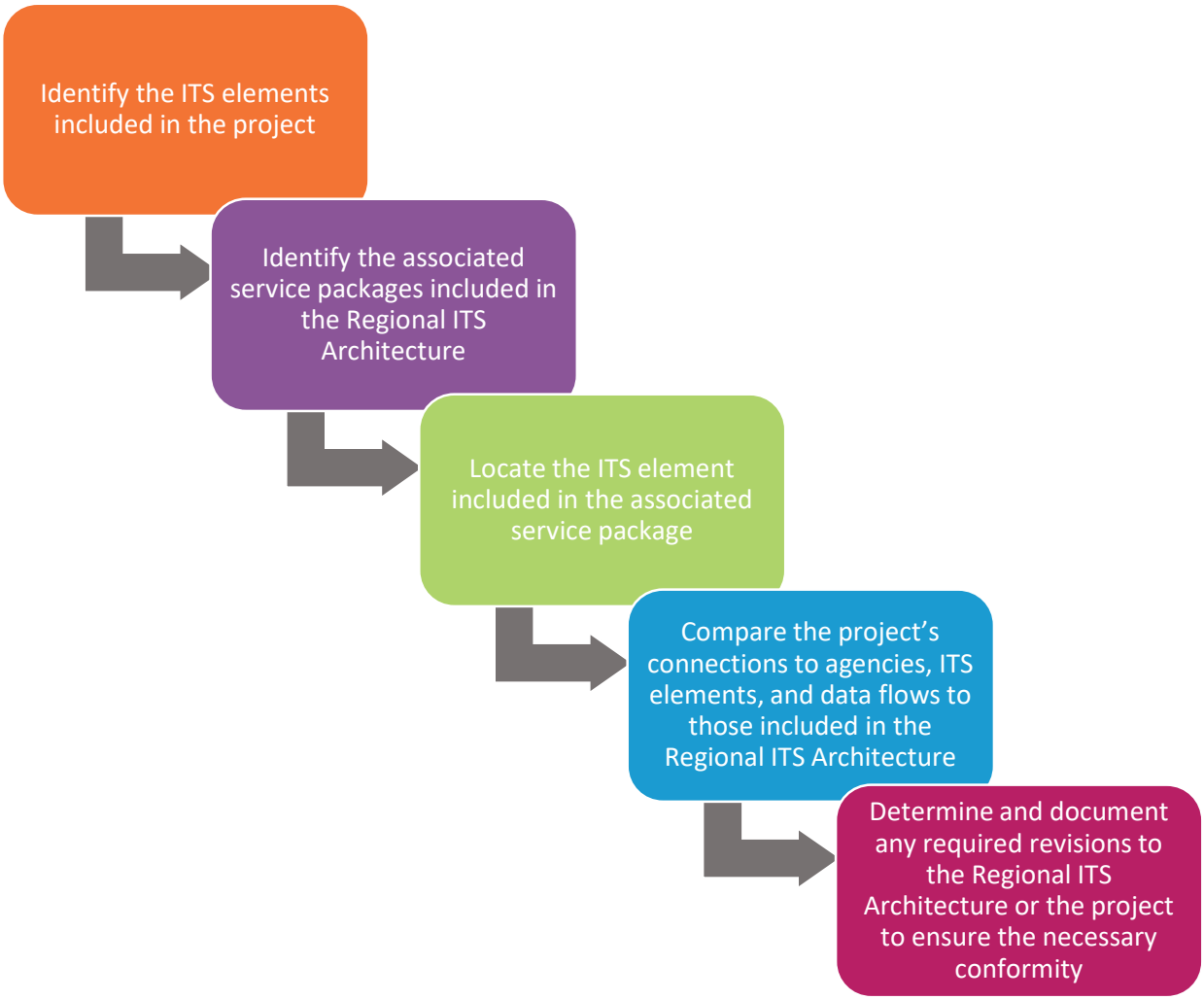
A Systems Engineering Analysis (SEA) is a process that is meant to ensure ITS projects be deployed with appropriate planning in regard to costs and scheduling. The TDOT Traffic Operations Division has developed its *ITS Project Development Guidelines*, which outline procedures to assist Tennessee jurisdictions in determining what level of analysis needs to be conducted and generally how to go through that process. These guidelines provide the details that need to be included in a Systems Engineering Analysis Report (SEAR). It should also be noted that a SEAR is a federal requirement for federally funded projects as stated in 23 CFR 940.11, which reads "all ITS projects funded with highway trust funds shall be based on a systems engineering analysis."

The level of analysis is primarily dependent on the type of project, which determines an inherent level of risk associated with potential cost and schedule overruns of a project. If, through this process, it is determined that an ITS project does not actually conform to the Regional ITS Architecture, the maintenance process described in Section 7.3 must be followed to ensure its full inclusion and conformity. Information included in the Knoxville Regional ITS Architecture can be used to satisfy the majority of requirements of the SEA, including the following:

- Specific components of the Regional ITS Architecture being implemented;
- Agencies involved and their associated roles and responsibilities;
- Defined system requirements in the RAD-IT database; and
- Applicable standards for the various ITS service packages.

7.3 PROCESS FOR DETERMINING ITS ARCHITECTURE CONFORMITY

As previously discussed, FHWA and FTA require ITS projects to conform to the Regional ITS Architecture in order to maintain eligibility for federal funding. The Knoxville Regional ITS Architecture contains customized service packages that provide the criteria by which each project must be evaluated. The previously outlined process of evaluation by the submitting agency and certification by the TPO must be conducted to ensure the consistency of the ITS elements included in a project. If the project does not conform properly, a request for revisions to the ITS architecture must be submitted. The TPO must then determine whether the requested revisions are appropriate. If the requests are deemed appropriate, TDOT will certify or reject the specified project. The stages of this process are as follows:



7.4 REGIONAL ITS ARCHITECTURE MAINTENANCE PROCESS

As mentioned previously, the certification process involving the Knoxville TPO and TDOT may require updates to the Regional ITS Architecture. The process by which the architecture is updated is referred to as the maintenance process, which is presented in Table 11.

Table 11. Regional ITS Architecture Maintenance Process

MAINTENANCE DETAILS	MINOR UPDATE	MAJOR UPDATE
Timeframe for Updates	As needed	Approximately every 4-7 years
Scope of Update	Update service packages to satisfy required conformity standards or to document revisions that impact the Regional ITS Architecture	Comprehensive update of Regional ITS Architecture
Lead Agency	Knoxville TPO	
Participants	Stakeholder impacted by the proposed modifications to service packages	All stakeholders
Results	Revisions to service packages or other components documented for next comprehensive update	Updated Regional ITS Architecture report, appendices, and RAD-IT Architecture database

7.5 PROCEDURE FOR SUBMITTING ITS ARCHITECTURE CHANGES BETWEEN MAJOR UPDATES

Minor revisions to the Regional ITS Architecture may be periodically necessary between comprehensive updates, which occur approximately every four years. With any minor revisions, changes should be documented and incorporated into the comprehensive update of the Regional ITS Architecture. To assist with this process, an Architecture Maintenance Documentation Form has been developed. This form should be submitted for any proposed minor update to the Regional ITS Architecture. The Architecture Maintenance Documentation Form is presented in the Appendix. The following describes the necessary criteria that should be included on the Architecture Maintenance Documentation Form:

Change Information – There are four types of changes that are described below:

- *Administrative Change* – Basic changes that do not impact the way the ITS service packages are assembled, such as changes to stakeholder or element names, statuses of elements or data flows, etc.
- *Functional Change (Single Agency)* – Changes to the way an ITS service package(s) is assembled that only affects a single agency, such as an additional ITS service package, data flow change, etc.
- *Functional Change (Multiple Agencies)* - Changes to the way an ITS service package(s) is assembled that could affect multiple agencies, such as such as an additional ITS service package, data flow change, etc.
- *Project Change* – Changes consisting of an addition, revision, or removal of a project listed in Deployment Plan chapter of the Regional ITS Architecture.

Description of the Requested Change – A summarized explanation of the requested change.

Impacted Service Packages – A list of each ITS service package that will be impacted by the requested change, as well as a sketch of the additional or modified service package that is being requested.

Impact of Proposed Change on Stakeholders – A list of all stakeholders that will be affected by the requested change, as well as documentation of coordination with the impacted stakeholders.

APPENDIX

APPENDIX A – LIST OF STAKEHOLDERS

APPENDIX B – ITS SERVICE PACKAGES

APPENDIX C – ITS ELEMENT FUNCTIONS

APPENDIX D – EXISTING AGREEMENT DOCUMENTS

APPENDIX E – ARCHITECTURE MAINTENANCE DOCUMENTATION FORM

APPENDIX F – FHWA READY FOR USE APPROVAL LETTER

APPENDIX A – LIST OF STAKEHOLDERS

List of Stakeholders

REGION	ORGANIZATION	REPRESENTATIVE
ANDERSON COUNTY	TPO Technical Committee	Kathryn Baldwin
	Highway Administration	Gary Long
	Sheriff's Office	Russell Barker
	Emergency Management	Steve Payne
CITY OF CLINTON	Representative	Larry Gann
	City Manager	Roger Houck
	Public Works	Lynn Murphy
	Police Department	Vaughn Becker
	Fire Department	Archie Brummitt
CITY OF OAK RIDGE	Community Development	Wayne Blasius
	Public Works	Roger Flynn
	Electric Department	John van Eek
	Police Department	Robin Smith
BLOUNT COUNTY	Highway Department	Chico Messer
	Highway Department	Jeff Headrick
	Sheriff's Office	James Berrong
	Emergency Management	Lance Coleman
	E-911	James Long
	Highway/Development	Don Walker
CITY OF ALCOA	Engineering	Megan Brooks
	Public Works	Shane Snoderly
	Police Chief	David Carswell
	Fire Chief	Roger Robinson
CITY OF MARYVILLE	Public Works	Brian Boone
	Traffic Engineering	Kevin Stoltenberg
	Public Safety	Tony Crisp
	Central Traffic Operations	Jason Chai
KNOXVILLE-KNOX COUNTY	EPW	Jim Snowden
	EPW Traffic Engineering	John Sexton

	ADA	Cindy Pionke
	Sheriff's Office	Scott DeArmond
	E-911	Brad Anders
	EMA	Colin Ickes
	EMA	Judy Wasik
	Rural Metro	Jerry Harnish
	CAC	Karen Estes
	Representative	Mandi Benedict
TOWN OF FARRAGUT	Engineering	Darryl Smith
	Engineering	Brannon Tupper
CITY OF KNOXVILLE	Engineering	Harold Cannon
	Traffic Engineering	Jeff Branham
	Traffic Engineering	Ernie Pierce
	Traffic Engineering	Zach Roberts
	Police Department	Brian Bumpus
	Fire Department	Stan Sharp
	Knoxville Area Transit (KAT)	Melissa Roberson
	Knoxville Area Transit (KAT)	Jacob Wright
	Knoxville Area Transit (KAT)	Si McMurray
LOUDON COUNTY	Representative	Jack Qualls
	Highway Maintenance	Eddie Simpson
	Highway Maintenance	Billy Pickel
	Sheriff's Office	Tim Guider
	EMA	Kelli Branam
CITY OF LENOIR CITY	City Manager	Amber Scott
	Police Department	Don White
	Fire Department	Richard Martin
CITY OF LOUDON	City Manager	Ty Ross
SEVIER COUNTY	Representative	Jeff Ownby
	Highway Maintenance	Jonas Smelcer
	Sheriff's Office	Ronald Seals

	EMA	Joe Ayers
CITY OF SEVIERVILLE	Public Works	Bryon Fortner
	Traffic Engineering	Joseph Dodgen
	Police Department	Joseph Manning
	Development and Technology	Dustin Smith
TDOT	Region 1	Amanda Snowden
	Region 1 Community Relations	Mark Nagi
	Region 1 Traffic	Andy Padgett
	Region 1 Traffic	Bryan Bartnik
	Region 1 Incident Management	Mark Dykes
	Region 1 TMC	Mark Best
	Region 1 OCT	Michelle Christian
	Region 1 OCT	Troy Ebbert
	HQ Traffic Operations	Lee Smith
	HQ Traffic Operations	Nathan Vatter
	HQ Traffic Operations	Veda Nguyen
	HQ Long Range Planning	Jennifer Marshall
	Region 1 HELP Trucks	David Wortham
	Representative	Eric Flora
	Representative	Taniya Sultana
	Representative	Greg Dyer
FHWA	TN Division	Sean Santalla
	TN Division	Pamela Heimsness
	TN Division	Melissa Furlong
OTHER LOCAL, STATE, AND FEDERAL AGENCIES	Tennessee Highway Patrol	Eric Miller
	East TN Resource Agency (ETHRA)	Mike Patterson
	Knoxville Commuter Pool	Deanna Flinchum
	UT Parking & Transit	Mark Hairr
	East TN South RPO	Don Brown
	Metro Knoxville Airport Authority	Blake Sartin

	Oak Ridge National Lab NOAA UT CTR	Rich Davies Anthony Cavalucci Airton Kohls

APPENDIX B – ITS SERVICE PACKAGES

ITS Service Packages

Service Package	Service Package Name	Service Package Description
CVO01	Carrier Operations and Fleet Management	This service package manages a fleet of commercial vehicles. The Fleet and Freight Management Center monitors the vehicle fleet and can provide routes using either an in-house capability or an external provider. Routes generated by either approach are constrained by hazardous materials and other restrictions (such as height or weight). A route is electronically sent to the Commercial Vehicle with any appropriate dispatch instructions. The location of the Commercial Vehicle can be monitored by the Fleet and Freight Management Center and routing changes can be made depending on current road network conditions. This service package also supports maintenance of fleet vehicles with on-board monitoring equipment. Records of vehicle mileage, preventative maintenance and repairs are maintained.
CVO02	Freight Administration	This service package tracks the movement of cargo and monitors the cargo condition. Interconnections are provided to intermodal freight shippers and intermodal freight depots for tracking of cargo from origin to destination. In addition to exceptions that are reported, on-going indications of the state of the various freight equipment are reported to the Fleet and Freight Management Center.
CVO03	Electronic Clearance	This service package provides for automated clearance at roadside check facilities. The roadside check facility communicates with the Commercial Vehicle Administration Center to retrieve infrastructure snapshots of critical carrier, vehicle, and driver data to be used to sort passing vehicles. This allows a good driver/vehicle/carrier to pass roadside facilities at highway speeds using vehicle to infrastructure (V2I) Communications. Results of roadside clearance activities will be passed on to the Commercial Vehicle Administration Center. The roadside check facility may be equipped with Automated Vehicle Identification (AVI), weighing sensors, communications equipment, and computer workstations. Communications may be implemented using a range of technologies from transponder data readers through connected vehicle short range communications.
CVO04	CV Administrative Processes	This service package supports program administration and enrollment and provides for electronic application, processing, fee collection, issuance, and distribution of CVO credential and tax

		filing. Through this process, carriers, drivers, and vehicles may be enrolled in a variety of programs including electronic clearance and wireless inspection programs which allow commercial vehicles to be screened at mainline speeds. Through this enrollment process, current profile databases are maintained in the Commercial Vehicle Administration Center and snapshots of this data are made available to the roadside check facilities. Current program status is maintained and made available to carriers, drivers, and other authorized users of the data. Enrolled carriers are provided the option to review and challenge the collected data.Commercial Vehicle Administration Centers can share current program status and credential information with other Centers, so that it is possible for any Commercial Vehicle Administration Center to have access to all credentials, credential fees, credentials status and safety status information. In addition, it is possible for one Commercial Vehicle Administration Center to collect HAZMAT route restrictions information from other Commercial Vehicle Administration Centers and then act as a clearinghouse for this route restrictions information.
CVO05	International Border Electronic Clearance	This service package provides for automated clearance at international border crossings. It augments the Electronic Clearance service package by allowing interface with border administration and border inspection related functions. This service package processes the entry documentation for vehicle, cargo, and driver, checks compliance with import/export and immigration regulations, handles duty fee processing, and reports the results of the crossing event to manage release of commercial vehicle, cargo, and driver across an international border. It interfaces with administrative systems used by customs and border protection, immigration, carriers, and service providers (e.g., brokers) and inspection systems at international border crossings to generate, process, and store entry documentation.
CVO06	Freight Signal Priority	The Freight Signal Priority service package (FSP) provides traffic signal priority for freight and commercial vehicles traveling in a signalized network. The goal of the freight signal priority service package is to reduce stops and delays to increase travel time reliability for freight traffic, and to enhance safety at intersections.
CVO07	Roadside CVO Safety	This service package provides for automated roadside safety monitoring and reporting. It automates commercial vehicle safety inspections at roadside check locations. The basic option, directly supported by this service package, facilitates safety inspection of vehicles that have been pulled off the highway, perhaps as a result

		of the automated screening process provided by the Electronic Clearance (CVO03) service package. In this scenario, only basic identification data and status information is read from the electronic tag on the commercial vehicle. The identification data from the tag enables access to additional safety data maintained in the infrastructure which is used to support the safety inspection, and may also inform the pull-in decision if system timing requirements can be met. More advanced implementations collect additional data from commercial vehicles. This service package focuses on manned inspection locations. See CVO08 for remote monitoring options using smart roadside infrastructure at unmanned, virtual inspection stations.
CVO08	Smart Roadside and Virtual WIM	This service package includes the delivery of capabilities related to wireless roadside inspections and electronic screening/virtual weigh stations. Wireless roadside inspection is defined by a safety screening capability that employs communications technologies to obtain information from a commercial vehicle that will allow safety screening of the vehicle and its driver. This capability provides for the interrogation at mainline speeds of a commercial vehicle when it has entered a control segment or geofenced area. Vehicle identification and driver information are provided to the roadside unit. The information communicated can be used to verify compliance with safety requirements, allowing a decision to be made regarding whether the vehicle should pull in to a roadside check station. A more advanced version of this service package would download safety information measured on the vehicle including driver related information such as the driver log allowing real time evaluation that the vehicle and driver are meeting safety requirements. The electronic screening/virtual weigh stations capability employs communications technologies to obtain information from a commercial vehicle that will allow verification of permits or credentials for the vehicle. The information communicated is used to verify compliance with safety requirements, allowing a decision to be made regarding whether the vehicle should pull in to a roadside check station. This service package can also be used to verify that the commercial vehicle meets vehicle weight (via weigh in motion capability) or dimension requirements.
CVO09	Freight-Specific Dynamic Travel Planning	This service package provides both pre-trip and en route travel planning, routing, and commercial vehicle related traveler information, which includes information such as truck parking locations and current status. The information will be based on data collected from the commercial fleet as well as general traffic

		data collection capabilities. The information, both real time and static can be provided directly to fleet managers, to mobile devices used by commercial vehicle operators, or directly to in vehicle systems as commercial vehicles approach roadway exits with key facilities such as parking. The service package can also provide oversize/ overweight permit information to commercial managers.
CVO10	Road Weather Information for Freight Carriers	The service package is a special case of the Road Weather Advisories and Warnings for Motorists service package that focuses on Freight Carrier users. It provides the capability to collect road weather data from connected vehicles and using that data to develop short term warnings or advisories that can be provided to individual commercial vehicles or to commercial vehicle dispatchers. The information may come from either vehicles operated by the general public and commercial entities (including passenger cars and trucks) or specialty vehicles and public fleet vehicles (such as snowplows, maintenance trucks, and other agency pool vehicles). The raw data will be processed in a controlling center to generate road segment-based data outputs. The processing will also include a road weather commercial vehicle alerts algorithm to generate short time horizon alerts that will be pushed to user systems and available to commercial vehicle dispatchers. In addition the information collected can be combined with observations and forecasts from other sources to provide medium (next 2-12 hours) or long term (more than 12 hours) advisories through a variety of interfaces including web based and connected vehicle based interfaces.
CVO11	Freight Drayage Optimization	This service package covers the information exchanges between all intermodal parties to provide current drayage truck load matching and container availability and appointment scheduling at railroad and steamship line terminals. It includes a link from drivers and freight management systems dispatchers to an intermodal terminal reservation system and integrates an appointment function with Terminal Queue Status and Load Matching. The service package provides information to the dispatcher and driver concerning the availability status for pickup of a container at an intermodal terminal. It also provides drivers and dispatchers with both intermodal terminal queue length, and estimated time from the back of the queue to the gate.
CVO12	HAZMAT Management	This service package integrates incident management capabilities with commercial vehicle tracking to assure effective treatment of HAZMAT material transport, including response to incidents.

		HAZMAT tracking is performed by the Fleet and Freight Management Center. The Emergency Management Center is notified by the Commercial Vehicle and the Fleet and Freight Management Center of the HAZMAT vehicle location and information about the HAZMAT load. If an incident occurs, the Emergency Management Center can use the information to coordinate the response. The response is tailored based on information that is provided as part of the original incident notification or derived from supplemental information provided by the Fleet and Freight Management Center. The latter information can be provided prior to the beginning of the trip, during the trip, or gathered following the incident depending on the selected policy and implementation.
CVO13	Roadside HAZMAT Security Detection and Mitigation	This service package provides the capability to detect and classify security sensitive HAZMAT on commercial vehicles using roadside sensing and imaging technology. Credentials information can be accessed to verify if the commercial driver, vehicle and carrier are permitted to transport the identified HAZMAT. If the credentials analysis and sensed HAZMAT information do not agree, the vehicle can be signaled to pull off the highway, and if required, an alarm can be sent to Emergency Management to request they monitor, traffic stop or disable the vehicle.
CVO14	CV Driver Security Authentication	This service package provides the ability for Fleet and Freight Management to detect when an unauthorized commercial vehicle driver attempts to drive their vehicle based on stored driver identity information. If an unauthorized driver has been detected, Fleet and Freight Management can activate commands to safely disable the commercial vehicle. Alarms can also be sent to emergency management to inform them of a potential commercial vehicle hijacking or theft and potential hazardous situation. In addition, Emergency Management can request Fleet and Freight Management to disable a specific vehicle in their fleet.
CVO15	Fleet and Freight Security	This service package provides enhanced security for commercial vehicle fleets and freight. Internal and external alerts and advisories are monitored to identify potential threats to the safety and security of the fleet and freight. It provides for the planning and tracking of three aspects of commercial vehicle shipments. For each shipment, the commercial vehicle, the freight equipment, and the commercial vehicle driver are monitored for consistency with the planned assignment. Any unauthorized changes are determined by the Fleet and Freight Management Center and then the appropriate people and Centers are notified. As the

		freight is shipped and tracked, security and public safety agencies may also interrogate the freight container to determine if it has been breached and to identify container contents. Once a route has been assigned, changes must be coordinated. Commercial Vehicle Drivers are alerted to any changes in route from the planned route and given an opportunity to justify a rerouting. Any unauthorized or unexpected route changes by the Commercial Vehicle will register a route deviation alert with the Fleet and Freight Management Center, which can notify local public safety agencies of the route deviation when appropriate (e.g., if there is safety sensitive HAZMAT being carried). Freight managers may decide to take further action on the alerts and/or provide responses that explain that the alerts are false alarms. If no explanation is received, the Fleet and Freight Management Center may notify the Emergency Management Center.
DM01	ITS Data Warehouse	This service package provides access to transportation data to support transportation planning, condition and performance monitoring, safety analysis, and research. Configurations range from focused repositories that house data collected and owned by a single agency, district, private sector provider, or research institution to broad repositories that contain multimodal, multidimensional data from varied data sources covering a broader region. Both central repositories and physical distributed ITS data repositories are supported. Requests for data that are satisfied by access to a single repository in the ITS Data Warehouse service package may be parsed by the local repository and dynamically translated to requests to other repositories that relay the data necessary to satisfy the request. The repositories could include a data registry capability that allows registration of data identifiers or data definitions for interoperable use throughout a region.
DM02	Performance Monitoring	The Performance Monitoring service package uses information collected from detectors and sensors, connected vehicles, and operational data feeds from centers to support performance monitoring and other uses of historical data including transportation planning, condition monitoring, safety analyses, and research. The information may be probe data information obtained from vehicles in the network to determine network performance measures such as speed and travel times, or it may be information collected from the vehicles and processed by the infrastructure, e.g. environmental data and infrastructure conditions monitoring data. Additional data are collected including accident data, road condition data, road closures and

		other operational decisions to provide context for measured transportation performance and additional safety and mobility-related measures. More complex performance measures may be derived from the collected data.
MC01	Maintenance and Construction Vehicle and Equipment Tracking	This service package tracks the location of maintenance and construction vehicles and other equipment to ascertain the progress of their activities. Checks can include ensuring the correct roads are being plowed and work activity is being performed at the correct locations.
MC02	Maintenance and Construction Vehicle Maintenance	This service package performs vehicle maintenance scheduling and manages both routine and corrective maintenance activities on vehicles and other maintenance and construction equipment. It includes on-board sensors capable of automatically performing diagnostics for maintenance and construction vehicles, and the systems that collect this diagnostic information and use it to schedule and manage vehicle and equipment maintenance.
MC03	Roadway Automated Treatment	This service package automatically treats a roadway section based on environmental or atmospheric conditions. Treatments include fog dispersion, anti-icing chemicals, etc. The service package includes the environmental sensors that detect adverse conditions, the automated treatment system itself, and driver information systems (e.g., dynamic message signs) that warn drivers when the treatment system is activated.
MC04	Winter Maintenance	This service package supports winter road maintenance including snow plow operations, roadway treatments (e.g., salt spraying and other anti-icing material applications), and other snow and ice control activities. This package monitors environmental conditions and weather forecasts and uses the information to schedule winter maintenance activities, determine the appropriate snow and ice control response, and track and manage response operations.
MC05	Roadway Maintenance and Construction	This service package supports numerous services for scheduled and unscheduled maintenance and construction on a roadway system or right-of-way. Maintenance services include landscape maintenance, hazard removal (roadway debris, dead animals), routine maintenance activities (roadway cleaning, grass cutting), and repair and maintenance of both ITS and non-ITS equipment on the roadway (e.g., signs, traffic controllers, traffic detectors, dynamic message signs, traffic signals, CCTV, etc.). Environmental conditions information is also received from various weather

		sources to aid in scheduling maintenance and construction activities.
MC06	Work Zone Management	This service package manages work zones, controlling traffic in areas of the roadway where maintenance, construction, and utility work activities are underway. Traffic conditions are monitored using CCTV cameras and controlled using dynamic message signs (DMS), Highway Advisory Radio (HAR), gates and barriers. Work zone information is coordinated with other groups (e.g., TIC, traffic management, other maintenance and construction centers). Work zone speeds and delays are provided to the motorist prior to the work zones. This service package provides control of field equipment in all maintenance and construction areas, including fixed, portable, and truck-mounted devices supporting both stationary and mobile work zones.
MC07	Work Zone Safety Monitoring	This service package provides warnings to maintenance personnel within a work zone about potential hazards within the work zone. It enables vehicles or the infrastructure to provide warnings to workers in a work zone when a vehicle is moving in a manner that appears to create an unsafe condition (e.g., moving at high speed or entering the work zone).
MC08	Maintenance and Construction Activity Coordination	This service package supports the dissemination of maintenance and construction activity to centers that can utilize it as part of their operations, or to Transportation Information Centers who can provide the information to travelers. Center to center coordination of work plans supports adjustments to reduce disruption to regional transportation operations.
MC09	Infrastructure Monitoring	This service package monitors the condition of pavement, bridges, tunnels, associated hardware, and other transportation-related infrastructure (e.g., culverts) using both fixed and vehicle-based infrastructure monitoring sensors. Fixed sensors monitor vibration, stress, temperature, continuity, and other parameters and mobile sensors and data logging devices collect information on current infrastructure condition. This service package also monitors vehicle probes for vertical acceleration data and other probe data that may be used to determine current pavement condition.
PM01	Parking Space Management	This service package monitors and manages parking spaces in lots, garages, and other parking areas and facilities. It assists in the management of parking operations by monitoring parking lot ingress and egress, parking space occupancy and availability.

		Infrastructure-based detectors and/or connected vehicles may be used to monitor parking occupancy. The service package shares collected parking information with local drivers and information providers for broader distribution.
PM02	Smart Park and Ride System	This service package provides real-time information on Park and Ride capacity and supports traveler's decision-making on where best to park and make use of transit alternatives. Transit operators are provided arrival information to support efficient pickup and drop offs and drivers switching to transit are offered current transit information.
PM03	Parking Electronic Payment	This service package supports electronic collection of parking fees. It collects parking fees from in-vehicle equipment, contact or proximity cards, or any smart payment device. User accounts may be established to enhance services offered to frequent customers.
PM04	Regional Parking Management	This service package supports communication and coordination between equipped parking facilities and also supports regional coordination between parking facilities and traffic and transit management systems. This service package also shares information with transit management centers and transportation information centers to support multimodal travel planning. Information including current parking availability, system status, and operating strategies are shared to enable local parking facility management that supports regional transportation strategies.
PM05	Parking Reservations	This service package manages parking reservations, allowing a traveler to reserve parking as part of the trip planning process. Parking reservations may be part of a trip plan provided by a Transportation Information Center (TIC) based on parking information provided by one or more parking facilities. This parking plan is provided to the traveler/driver, which includes the option to make a reservation if available. If the parking reservation is selected by the traveler/driver, then the TIC will negotiate the parking reservation with the parking facility and provide a confirmation to the traveler/driver.
PM06	Loading Zone Management	This service package manages the occupancy of spaces in a loading/ unloading zone. It monitors the current status of each loading/unloading zone space under its control and makes this information available to arriving vehicles. The service package also operates a reservation system for loading zones, providing the capability for loading zone users, including commercial vehicle drivers or fleet operators, to reserve and pay for future use of a

		loading/unloading space. Interfaces to the general Vehicle OBE are included since loading zones may be used by any vehicle, though commercial vehicles are the most frequent users.
PS01	Emergency Call-Taking and Dispatch	This service package provides basic public safety call-taking and dispatch services. It includes emergency vehicle equipment, equipment used to receive and route emergency calls, and wireless communications that enable safe and rapid deployment of appropriate resources to an emergency. Coordination between Emergency Management Centers supports emergency notification between agencies. Wide area wireless communications between the Emergency Management Center and an Emergency Vehicle supports dispatch and provision of information to responding personnel. This service package also provides information to support dynamic routing of emergency vehicles. Traffic information, road conditions, and weather advisories are provided to enhance emergency vehicle routing. The Emergency Management Center provides routing information based on real-time conditions and has the option to request an ingress/egress route from the Traffic Management Center.
PS02	Emergency Response	This service package supports emergency/ incident response by personnel in the field. It includes emergency vehicle equipment used to provide response status as well as video or images from either the vehicle or from emergency personnel in the field. Wide area wireless communications between the Emergency Management Center, Emergency Personnel and Emergency Vehicles supports a sharing of emergency response information. The service package also includes tactical decision support, resource coordination, and communications integration for Incident Commands that are established by first responders at or near the incident scene to support local management of an incident, including the functions and interfaces commonly supported by a mobile command center.
PS03	Emergency Vehicle Preemption	This service package provides signal preemption for public safety first responder vehicles. Both traditional signal preemption systems and new systems based on connected vehicle technology are covered. In more advanced systems, movement of public safety vehicles through the intersection can be facilitated by clearing queues and holding conflicting phases. In addition, this SP also covers the transition back to normal traffic signal operations after providing emergency vehicle preemption.

PS04	Mayday Notification	This service package provides the capability for a vehicle to automatically transmit an emergency message when the vehicle has been involved in a crash or other distress situation. An automatic crash notification feature transmits key data on the crash recorded by sensors mounted in the vehicle (e.g. deployment of airbags) without the need for involvement of the driver. The emergency message is sent to emergency response services, which determines and carries out the appropriate response. This service package allows passing vehicles to receive and forward mayday requests in areas where no communications infrastructure exists. Emergency notifications from personal devices are also supported.
PS05	Vehicle Emergency Response	The Vehicle Emergency Response service package provides arriving public safety vehicles with information from connected vehicles involved in a crash. Emergency responders need information about the vehicles involved in a crash to respond safely and effectively to the vehicle crash. Information such as HAZMAT data can assist the responders. Information about air bag activations and other measures indicating the severity of the crash can provide useful input to ambulance staff. In addition information about the power system of the vehicle (e.g. hybrid, electric, or internal combustion engine) can affect the response.
PS06	Incident Scene Pre-Arrival Staging Guidance for Emergency Responders	This service package will provide situational awareness to and coordination among emergency responders - upon dispatch, while en route to establish incident scene work zones, upon initial arrival and staging of assets, and afterward if circumstances require additional dispatch and staging. It collects a variety of data from emergency, traffic, and maintenance centers. It includes a vehicle and equipment staging function that supplies the en route responders with additional information about the scene of an incident that they can use to determine where to stage personnel and equipment prior to their arrival on-scene. The service package also includes a dynamic routing function which provides emergency responders with real-time navigation instructions to travel from their base to the incident scene, accounting for traffic conditions, road closures, and snowplow reports if needed. In addition it includes an emergency responder status reporting function which continuously monitors the location of the en route responder vehicles as well as the vehicles already on-scene. The function develops and maintains the current position of the responder's vehicles and provides updates for estimated time of arrival (ETA).

PS07	Incident Scene Safety Monitoring	This service package employs communications technologies to provide warnings and alerts relating to incident zone operations. One aspect of the service is an in-vehicle messaging system that provides drivers with merging and speed guidance around an incident. Another aspect is providing in-vehicle incident scene alerts to drivers, both for the protection of the drivers as well as incident zone personnel. A third aspect is a warning system for on-scene workers when a vehicle approaching or in the incident zone is being operated outside of safe parameters for the conditions.
PS08	Roadway Service Patrols	This service package supports roadway service patrol vehicles that monitor roads and aid motorists, offering rapid response to minor incidents (flat tire, accidents, out of gas) to minimize disruption to the traffic stream. If problems are detected, the roadway service patrol vehicles will provide assistance to the motorist (e.g., push a vehicle to the shoulder or median). The service package monitors service patrol vehicle locations and supports vehicle dispatch to identified incident locations. Incident information collected by the service patrol is shared with traffic, maintenance and construction, and traveler information systems.
PS09	Transportation Infrastructure Protection	This service package includes the monitoring of transportation infrastructure (e.g., bridges, tunnels and management centers) for potential threats using sensors and surveillance equipment and barrier and safeguard systems to control access, preclude an incident, and mitigate the impact of an incident if it occurs. Threats can result from acts of nature (e.g., hurricanes, earthquakes), terrorist attacks or other incidents causing damage to the infrastructure (e.g., stray barge hitting a bridge support). Infrastructure may be monitored with acoustic, environmental threat (such as nuclear, biological, chemical, and explosives), infrastructure condition and integrity, motion and object sensors and video and audio surveillance equipment. Data from such sensors and surveillance equipment may be processed in the field or sent to a center for processing. The data enables operators at the center to detect and verify threats. When a threat is detected, agencies are notified. Detected threats or advisories received from other agencies result in an increased level of system preparedness. In response to threats, barrier and safeguard systems may be activated to deter an incident, control access to an area or mitigate the impact of an incident. Barrier systems include gates, barriers and other automated and remotely controlled systems that manage entry to transportation infrastructure. Safeguard systems include blast shields, exhaust

		systems and other automated and remotely controlled systems that mitigate impact of an incident.
PS10	Wide-Area Alert	This service package uses ITS driver and traveler information systems to alert the public in emergency situations such as child abductions, severe weather events, civil emergencies, and other situations that pose a threat to life and property. The alert includes information and instructions for transportation system operators and the traveling public, improving public safety and enlisting the public's help in some scenarios. The ITS technologies will supplement and support other emergency and homeland security alert systems such as the Emergency Alert System (EAS). When an emergency situation is reported and verified and the terms and conditions for system activation are satisfied, a designated agency broadcasts emergency information to traffic agencies, transit agencies, information service providers, toll operators, and others that operate ITS systems. The ITS systems, in turn, provide the alert information to transportation system operators and the traveling public using ITS technologies such as dynamic message signs, highway advisory radios, in-vehicle displays, transit displays, 511 traveler information systems, and traveler information websites.
PS11	Early Warning System	This service package monitors and detects potential, looming, and actual disasters including natural disasters (hurricanes, earthquakes, floods, winter storms, tsunamis, etc.) and technological and man-made disasters (hazardous materials incidents, nuclear power plant accidents, and acts of terrorism including nuclear, chemical, biological, and radiological weapons attacks). The service package monitors alerting and advisory systems, ITS sensors and surveillance systems, field reports, and emergency call-taking systems to identify emergencies and notifies all responding agencies of detected emergencies.
PS12	Disaster Response and Recovery	This service package 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. All types of disasters are addressed including natural disasters (hurricanes, earthquakes, floods, winter storms, tsunamis, etc.) and technological and man-made disasters (hazardous materials incidents, nuclear power plant accidents, and national security emergencies such as nuclear, chemical, biological, and radiological weapons attacks).The service package supports coordination of emergency response plans, including general plans developed

		before a disaster as well as specific tactical plans with short time horizon that are developed as part of a disaster response. The service package provides enhanced access to the scene for response personnel and resources, provides better information about the transportation system in the vicinity of the disaster, and maintains situation awareness regarding the disaster itself. In addition, this service package tracks and coordinates the transportation resources - the transportation professionals, equipment, and materials - that constitute a portion of the disaster response.The service package identifies the key points of integration between transportation systems and the public safety, emergency management, public health, and other allied organizations that form the overall disaster response. In this service package, the Emergency Management Center represents the federal, regional, state, and local Emergency Operations Centers and the Incident Commands that are established to respond to the disaster. The interface between the Emergency Management Center and the other centers provides situation awareness and resource coordination among transportation and other allied response agencies. In its role, traffic management implements special traffic control strategies and detours and restrictions to effectively manage traffic in and around the disaster. Maintenance and construction provides damage assessment of road network facilities and manages service restoration. Transit management provides a similar assessment of status for transit facilities and modifies transit operations to meet the special demands of the disaster. As immediate public safety concerns are addressed and disaster response transitions into recovery, this service package supports transition back to normal transportation system operation, recovering resources, managing on-going transportation facility repair, supporting data collection and revised plan coordination, and other recovery activities. This service package builds on the basic traffic incident response service that is provided by TM08, the Traffic Incident Management service package. This service package addresses the additional complexities and coordination requirements that are associated with the most severe incidents that warrant an extraordinary response from outside the local jurisdictions and require special measures such as the activation of one or more emergency operations centers. Many users of ARC-IT will want to consider both TM08 and this service package since every region is concerned with both day-to-day management of traffic-related incidents and occasional management of disasters that require extraordinary response.Disaster Response and Recovery is also

		supported by PS14, the "Disaster Traveler Information" service package that keeps the public informed during a disaster response. See that service package for more information.
PS13	Evacuation and Reentry Management	This service package supports evacuation of the general public from a disaster area and manages subsequent reentry to the disaster area. The service package addresses evacuations for all types of disasters, including disasters like hurricanes that are anticipated and occur slowly, allowing a well-planned orderly evacuation, as well as disasters like terrorist acts that occur rapidly, without warning, and allow little or no time for preparation or public warning.This service package supports coordination of evacuation plans among the federal, state, and local transportation, emergency, and law enforcement agencies that may be involved in a large-scale evacuation. All affected jurisdictions (e.g., states and counties) at the evacuation origin, evacuation destination, and along the evacuation route are informed of the plan. Information is shared with traffic management agencies to implement special traffic control strategies and to control evacuation traffic, including traffic on local streets and arterials as well as the major evacuation routes. Reversible lanes, shoulder use, closures, special signal control strategies, and other special strategies may be implemented to maximize capacity along the evacuation routes. Transit resources play an important role in an evacuation, removing many people from an evacuated area while making efficient use of limited capacity. Additional shared transit resources may be added and managed in evacuation scenarios. Resource requirements are forecast based on the evacuation plans, and the necessary resources are located, shared between agencies if necessary, and deployed at the right locations at the appropriate times.Evacuations are also supported by PS14, the "Disaster Traveler Information" service package, which keeps the public informed during evacuations. See that service package for more information.
PS14	Disaster Traveler Information	This service package 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. This service package collects information from multiple sources including traffic, transit, public safety, emergency management, shelter provider, and travel service provider organizations. The collected information is processed and the public is provided with real-time disaster and evacuation information using ITS traveler

		information systems.A disaster will stress the surface transportation system since it may damage transportation facilities at the same time that it places unique demands on these facilities to support public evacuation and provide access for emergency responders. Similarly, a disaster may interrupt or degrade the operation of many traveler information systems at the same time that safety-critical information must be provided to the traveling public. This service package keeps the public informed in these scenarios, using all available means to provide information about the disaster area including damage to the transportation system, detours and closures in effect, special traffic restrictions and allowances, special transit schedules, and real-time information on traffic conditions and transit system performance in and around the disaster.This service package also provides emergency information to assist the public with evacuations when necessary. Information on mandatory and voluntary evacuation zones, evacuation times, and instructions are provided. Available evacuation routes and destinations and current and anticipated travel conditions along those routes are provided so evacuees are prepared and know their destination and preferred evacuation route. Information on available transit services and traveler services (shelters, medical services, hotels, restaurants, gas stations, etc.) is also provided. In addition to general evacuation information, this service package provides specific evacuation trip planning information that is tailored for the evacuee based on origin, selected destination, and evacuee-specified evacuation requirements and route parameters.This service package augments the Traveler Information (TI) service packages that provide traveler information on a day-to-day basis for the surface transportation system. This service package provides focus on the special requirements for traveler information dissemination in disaster situations.
PT01	Transit Vehicle Tracking	This service package monitors current transit vehicle location using an Automated Vehicle Location System. The location data may be used to determine real time schedule adherence and update the transit system's schedule in real-time.
PT02	Transit Fixed-Route Operations	This service package performs automated dispatch and system monitoring for fixed-route and flexible-route transit services. This service performs scheduling activities including the creation of schedules, blocks and runs, as well as operator assignment. This service monitors the transit vehicle trip performance against the schedule and provides information displays at the Transit

		Management Center.
PT03	Dynamic Transit Operations	The Dynamic Transit Operations service package allows travelers to request trips and obtain itineraries using a personal device such as a smart phone, tablet, or personal computer. The trips and itineraries cover multiple transportation services (public transportation modes, private transportation services, shared-ride, walking and biking). This service package builds on existing technology systems such as computer-aided dispatch/ automated vehicle location (CAD/AVL) systems and automated scheduling software, providing a coordination function within and between transit providers that would dynamically schedule and dispatch or modify the route of an in-service vehicle by matching compatible trips together. TI06 covers other shared use transportation options.
PT04	Transit Fare Collection Management	This service package manages transit fare collection on-board transit vehicles and at transit stops using electronic means. It allows transit users to use a traveler card or other electronic payment device such as a smart phone. Readers located either in the infrastructure or on-board the transit vehicles enable electronic fare payment. Data is processed, stored, and displayed on the transit vehicle and communicated as needed to the Transit Management Center.
PT05	Transit Security	This service package provides for the physical security of transit passengers and transit vehicle operators. On-board equipment performs surveillance and sensor monitoring in order to identify potentially hazardous situations. The surveillance equipment includes video (e.g., CCTV cameras), audio systems and/or event recorder systems. The sensor equipment includes threat sensors (e.g., chemical agent, toxic industrial chemical, biological, explosives, and radiological sensors) and object detection sensors (e.g., metal detectors). Transit user or transit vehicle operator activated alarms are provided on-board. Public areas (e.g., transit stops, park and ride lots, stations) are also monitored with similar surveillance and sensor equipment and provided with transit user activated alarms. In addition this service package provides surveillance and sensor monitoring of non-public areas of transit facilities (e.g., transit yards) and transit infrastructure such as bridges, tunnels, and transit railways or bus rapid transit (BRT) guideways. The surveillance equipment includes video and/or audio systems. The sensor equipment includes threat sensors and object detection sensors as described above as well as, intrusion or motion detection sensors and infrastructure integrity

		monitoring (e.g., rail track continuity checking or bridge structural integrity monitoring).Most of the surveillance and sensor data that is collected by this service package may be monitored by either the Emergency Management Center or the Transit Management Center, providing two possible approaches to implementing this service package. This service package also supports remote transit vehicle disabling and transit vehicle operator authentication by the Transit Management Center.
PT06	Transit Fleet Management	This service package supports automatic transit maintenance scheduling and monitoring. On-board condition sensors monitor system status and transmit critical status information to the Transit Management Center. The Transit Management Center processes this data and schedules preventative and corrective maintenance. The service package also supports the day to day management of the transit fleet inventory, including the assignment of specific transit vehicles to blocks and the assignment of transit vehicle operators to runs.
PT07	Transit Passenger Counting	This service package 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. The collected data can be used to calculate reliable ridership figures and measure passenger load information at particular stops.
PT08	Transit Traveler Information	This service package provides transit users at transit stops and on-board transit vehicles with ready access to transit information. The information services include transit stop annunciation, imminent arrival signs, and real-time transit schedule displays that are of general interest to transit users. Systems that provide custom transit trip itineraries and other tailored transit information services are also represented by this service package.
PT09	Transit Signal Priority	The Transit Signal Priority service package uses transit vehicle to infrastructure communications to allow a transit vehicle to request priority at one or a series of intersections. The service package provides feedback to the transit driver indicating whether the signal priority has been granted or not. This service package can contribute to improved operating performance of the transit vehicles by reducing the time spent stopped at a red light.
PT10	Intermittent Bus Lanes	This service package provides dedicated bus lanes during peak demand times to enhance transit operations mobility. An intermittent bus lane is a lane that can change its status from

		regular lane (accessible for all vehicles) to bus lane, for the time strictly necessary for a bus or set of buses to pass. The status of the IBL is communicated to drivers using roadside message signs and through in-vehicle signage. The creation and removal of dedicated bus lanes is managed through coordination between traffic and transit centers.
PT11	Transit Pedestrian Indication	The Transit Pedestrian Indication service package provides vehicle to device communications to inform pedestrians at a station or stop about the presence of a transit vehicle. In addition, this service package would inform the transit vehicle operator about the presence of pedestrians nearby and those waiting for the bus. It would help prevent collisions between transit vehicles and pedestrians.
PT12	Transit Vehicle at Station/Stop Warnings	The Transit Vehicle at Station/Stop Warnings service package inform nearby vehicles of the presence of a transit vehicle at a station or stop. The service package also indicates the intention of the transit vehicle in terms of pulling into or out of a station/stop.
PT13	Vehicle Turning Right in Front of a Transit Vehicle	The Vehicle Turning Right in Front of a Transit Vehicle (VTRFTV) service package determines the movement of vehicles near to a transit vehicle stopped at a transit stop and provides an indication to the transit vehicle operator that a nearby vehicle is pulling in front of the transit vehicle to make a right turn. This service package will help the transit vehicle determine if the area in front of it will not be occupied as it begins to pull away from a transit stop.
PT14	Multi-modal Coordination	This service package establishes two way communications between multiple transit and traffic agencies to improve service coordination. Multimodal coordination between transit agencies can increase traveler convenience at transit transfer points and clusters (a collection of stops, stations, or terminals where transfers can be made conveniently) and also improve operating efficiency.
PT15	Transit Stop Request	This service package allows a transit passenger to send a stop request to an approaching transit vehicle. The transit vehicle receives the request and notifies the vehicle operator of the stop request.
PT16	Route ID for the Visually Impaired	This service package assists visually impaired travelers to identify the appropriate bus and route to their intended destination. It provides information from bus stop infrastructure to visually

		impaired travelers portable devices that can be converted to audible information regarding the appropriate bus and route. It also allows the visually impaired traveler to query the portable device to identify route options.
PT17	Transit Connection Protection	This service package allows travelers to initiate a request for connection protection anytime during the trip using a personal device or on-board equipment and receive a confirmation indicating whether the request is accepted. Connection protection uses real time data to examine the arrival status of a transit vehicle and to transmit a hold message to a vehicle or other mode of transportation (e.g. rail) in order for the traveler to make a successful transfer from one vehicle to another. Connection protection can be performed within a single agency, across multiple agencies, and across multiple modes. In an intermodal, multimodal or interagency environment, a transfer request brokerage system, represented by the Transit Management System, can be used to determine the feasibility of a connection protection request and support schedule coordination between agencies.
PT18	Integrated Multi-Modal Electronic Payment	The Integrated Multi-Modal Electronic Payment service package provides electronic payment capability for transit fares, tolls, road use, parking, and other areas requiring electronic payments.
ST01	Emissions Monitoring	This service package monitors individual vehicle emissions and provides general air quality monitoring using distributed sensors to collect the data. The collected information is transmitted to the Emissions Management Center for processing. Both area wide air quality monitoring and point emissions monitoring are supported by this service package. For area wide monitoring, this service package measures air quality, identifies sectors that are non-compliant with air quality standards, and collects, stores and reports supporting statistical data. For point emissions monitoring, this service package collects data from on-board diagnostic systems and measures tail pipe emissions to identify vehicles that exceed emissions standards and/or clean vehicles that could be released from standard emissions tests, depending on policy and regulations. Summary emissions information or warnings can also be displayed to drivers. The gathered information can be used to implement environmentally sensitive travel demand management (TDM) programs, policies, and regulations.

ST02	Eco-Traffic Signal Timing	The Eco-Traffic Signal Timing service package is similar to current adaptive traffic signal control systems; however, the service package's objective is explicitly to optimize traffic signals for the environment rather than the current adaptive systems' objective, which is to enhance the intersection level of service or throughput, which might improve the intersection's environmental performance. The Eco-Traffic Signal Timing service package processes real-time and historical connected vehicle data at signalized intersections to reduce fuel consumption and overall emissions at the intersection, along a corridor, or for a region. It evaluates traffic and environmental parameters at each intersection in real time and adapts so that the traffic network is optimized using available green time to serve the actual traffic demands while minimizing the environmental impact.
ST03	Eco-Traffic Metering	The Eco-Traffic Metering service package determines the most environmentally efficient operation of traffic signals at freeway on-ramps to manage the rate of entering automobiles. This service package collects traffic and environmental data from roadside sensors and connected vehicles to allow on-ramp merge operations that minimize overall emissions, including traffic and environmental conditions on the ramp and on the freeway upstream and downstream of the ramp. Using this information, the service package determines a timing plan for the ramp meter based on current and predicted traffic and environmental conditions.
ST04	Roadside Lighting	The Roadside Lighting service package is a connected vehicle version of the automated roadside lighting systems that uses the presence of vehicles based on V2I communications as an input to control of roadside lighting systems. The service package can use the presence of vehicles to alter roadside lighting levels, and can use environmental data obtained from the vehicles as an input to support adjustment of the lighting based on adverse weather conditions such as fog, rain, or snow.
ST05	Electric Charging Stations Management	The Electric Charging Station Management service package provides an exchange of information between the electric vehicle and charging station to manage the charging operation. The agency or company operating the charging station can use vehicle information such as the capability of the vehicle (e.g. operational status of the electrical system, how many amps can the vehicle handle, and % charge complete) to determine that the charge is being properly applied and determine an estimated time to

		complete charging.
ST06	HOV/HOT Lane Management	This service package manages high-occupancy vehicle (HOV) and high-occupancy toll (HOT) lanes by coordinating freeway ramp meters and connector signals with HOV lane usage signals. Preferential treatment is given to HOV lanes using special bypasses, reserved lanes, and exclusive rights-of-way that may vary by time of day. Vehicle occupancy can be detected to verify HOV compliance and to notify enforcement agencies of violations. For HOT lane configurations, tolls are collected for vehicles that do not meet the high-occupancy criteria for the lane.
ST07	Eco-Lanes Management	The Eco-Lanes Management service package supports the operations of eco-lanes – dedicated lanes similar to high-occupancy vehicle (HOV) or high-occupancy toll (HOT) lanes, but optimized for the environment. The service package employs communication technology to gather traffic and environmental information from multiple sources including infrastructure, vehicles, and other systems. The service package then processes these data and determines whether an eco-lane should be created or decommissioned along a roadway. These decisions would be in response to real-time traffic and environmental conditions. While the eco-lanes would have the capability to be flexible and more dynamic, it is envisioned that these parameters would change only as needed to ensure that travelers do not become confused by a system that is too dynamic in nature. Travelers would need to assume some level of consistency with their trip and should not be surprised by constant changing of the eco-lane's parameters. The Eco-Lanes Management service package establishes parameters and defines or geo-fences the eco-lanes boundaries. Eco-lanes parameters may include the types of vehicles allowed in the eco-lanes, emissions parameters for entering the eco-lanes, the number of lanes, and the start and end of the eco-lanes. The service package also conveys this information about eco-lanes to traveler information centers so those centers can provide the information to travelers.
ST08	Eco-Approach and Departure at Signalized Intersections	The Eco-Approach and Departure at Signalized Intersections service package uses wireless data communications sent from a connected vehicle roadside equipment (RSE) unit to connected vehicles to encourage "green" approaches to and departures from signalized intersections. The vehicle collects intersection geometry information and signal phase movement information using V2I communications and data from nearby vehicles using V2V communications. Upon receiving this information, the service

		package performs calculations to provide speed advice to the driver, allowing the driver to adapt the vehicle's speed to pass the next traffic signal on green or to decelerate to a stop in the most eco-friendly manner. The service package also considers a vehicle's acceleration as it departs from a signalized intersection. Finally, the service package may perform engine adjustments that provide increased fuel efficiency.
ST09	Connected Eco-Driving	The Connected Eco-Driving service package provides customized real-time driving advice to drivers so that they can adjust their driving behavior to save fuel and reduce emissions. Eco-driving advice includes recommended driving speeds, optimal acceleration, and optimal deceleration profiles based on prevailing traffic conditions, interactions with nearby vehicles, and upcoming road grades. The service package also provides feedback to drivers on their driving behavior to encourage drivers to drive in a more environmentally efficient manner. Finally, the service package may include vehicle-assisted strategies where the vehicle automatically implements the eco-driving strategy (e.g., changes gears, switches power sources, or reduces its speed in an eco-friendly manner).
ST10	Low Emissions Zone Management	The Low Emissions Zone Management service package supports the operation of a low emissions zone that is responsive to real-time traffic and environmental conditions. Low emissions zones are geographic areas that seek to restrict or deter access by specific categories of high-polluting vehicles into the area to improve the air quality within the geographic area. The service package uses data collected from vehicles using connected vehicle technologies and from roadside equipment as input to the system. The Low Emissions Zone Management service package supports the geo-fencing of a cordon that may be scalable and moveable (e.g., created for a day, removable, flexible in its boundaries) and would be less dependent on conventional ITS infrastructure. The service package would establish parameters including the types of vehicles permitted to enter the zone, exemptions for transit vehicles, emissions criteria for entering the zone, fees or incentives for vehicles based on emissions data collected from the vehicle, and geographic boundaries for the low emissions zone. The service package would also include electronic toll collection functions that support payments of fees or collection of incentives for registered vehicles using connected vehicle technologies. Finally, this service package provides information about the low emissions zone to traveler information centers, including information about criteria for entering the zone, expected fees and incentives, current and predicted traffic conditions, and

		geographic boundaries of the zone.
SU01	Connected Vehicle System Monitoring and Management	This service package provides monitoring, management and control services necessary to other applications and/or devices operating within the Connected Vehicle Environment. This service package maintains and monitors the performance and configuration of the connected vehicle system. This includes tracking and management of the infrastructure configuration as well as detection, isolation, and correction of infrastructure service problems. It also includes monitoring of performance of the infrastructure and mobile equipment, which includes RSEs, OBEs, the back office applications, as well as the communication links that connect the system.
SU02	Core Authorization	This service package manages the authorization mechanisms to define roles, responsibilities and permissions for connected vehicle applications . This allows system administrators to establish operational environments where different connected vehicle system users may have different capabilities. For instance, some Mobile elements may be authorized to request signal priority, or some Centers may be permitted to use the geographic broadcast service, while those without those permissions would not.
SU03	Data Distribution	This service package manages the distribution of data from data providers to data consumers and protects those data from unauthorized access. It informs data providers of how to provide data, manages data subscriptions, and provides data forwarding capabilities. The service package also maintains a directory of System Users that want data and supports multiple distribution mechanisms including publish-subscribe and directly from data provider to data consumer. It allows data consumers to specify (and change the specification of) data they wish to receive.
SU04	Map Management	This service package defines interfaces that can be used download or update all types of map data used to support intelligent transportation systems. This map data will be accessed by centers, field, and vehicle physical objects. The service package can also be used to harness the Connected Vehicle Environment to provide rich source data that can be used to verify, refine, and enhance geographic map data.
SU05	Location and Time	This service package identifies the external systems and interfaces that provide accurate location and time to intelligent transportation system devices and systems.

SU06	Object Registration and Discovery	This service package provides registration and lookup services necessary to allow objects to locate other objects operating within the Connected Vehicle Environment.An object registry is like a phone book for all the connected centers, systems, and equipment in the transportation system (the “objects”). In this service package, each object registers itself with the ORDS and tells the registry where it lives in the communication network (e.g., host, port, node name) and information about the services it provides - information that other objects can use to determine the type of service, the geographic scope of the service, and other information that helps users of the registry to make informed decisions about which object(s) support a needed service or information stream. This is the “Discovery” part of the service. Connected objects can use the registry to find (discover) objects that can be used to get needed information or services.
SU07	ITS Communications	This service package provides secure, reliable communications between ITS devices. It provides the layered protocols and communications services and includes the physical network plant and network hardware that supports ITS communications. It also encompasses security services that protect communications and preserve privacy, and the management services that support network management.
SU08	Security and Credentials Management	This service package is used to ensure trusted communications between mobile devices and other mobile devices or roadside devices and protect data they handle from unauthorized access. The service package grants trust credentials to qualified mobile devices and infrastructure devices in the Connected Vehicle Environment so that those devices may be considered trusted by other devices that receive trust credentials from the SCM service package. The service package allows credentials to be requested and revoked and secures the exchange of trust credentials between parties, so that no other party can intercept and use those credentials illegitimately. The service package provides security to the transmissions between connected devices, ensuring authenticity and integrity of the transmissions. Additional security features include privacy protection, authorization and privilege class definition, as well as non-repudiation of origin.
SU09	Device Certification and Enrollment	This service package is used to illustrate the certification of devices, typically but not exclusively those intended for the connected vehicle environment. This assumes some independent certification body that can verify the performance and behavior of

		devices and applications, and provide that information to credentials-granting entities.
SU10	Center Maintenance	This service package supports maintenance of the computers, networks, video walls, and other information technology assets that are installed in a center to support center operations. Like other support service packages, this SP is drawn at a high level of abstraction so the basic interfaces and functionality associated with maintaining center IT assets can be applied to any center.
SU11	Field Equipment Maintenance	This service package supports maintenance of ITS devices that are installed in the field. Like other support service packages, this SP is drawn at a high level of abstraction so the basic interfaces and functionality associated with maintaining field ITS assets can be applied to any field equipment. In particular, this service package supports maintenance of field subsystems like ITS Payment Equipment, Parking Management Systems, Traveler Support Equipment, and Commercial Vehicle Check Equipment where maintenance is not covered by a more specific Service Package. Two Field subsystems have more specific service packages associated with their maintenance: See MC05 for maintenance of ITS Roadway Equipment and SU01 for more specific interfaces associated with maintaining Connected Vehicle Roadside Equipment.
SU12	Vehicle Maintenance	This service package identifies the interfaces and functionality that support vehicle maintenance, including maintenance of ITS equipment on board the vehicle. An interface with a Vehicle Service Center supports vehicle monitoring to support timely, effective maintenance. It also supports software configuration management and updates as part of maintenance of the software-based on-board systems. While this service package covers only maintenance of the Vehicle OBE, it is defined at the highest level of abstraction so that any center that is contemplating advanced maintenance concepts for its fleet vehicles can use this service package. Other service packages that provide maintenance support for fleet vehicles include CVO01, MC02, and PT06.
SU13	Personal Device Maintenance	This service package supports maintenance of ITS personal devices. Like other device maintenance service packages, this SP is drawn at a high level of abstraction to cover the basic interfaces and functionality associated with maintaining personal devices. The focus here is on devices that are used by transportation professionals. The maintenance of smart phones, tablets, laptops, and other general purpose devices that are used by travelers is

		coordinated between the travelers and the providers of the devices and communications services, which is beyond the scope of the architecture.
TI01	Broadcast Traveler Information	This service package provides a digital broadcast service that disseminates traveler information to all equipped travelers within range. It collects traffic conditions, advisories, general public transportation, toll and parking information, incident information, roadway maintenance and construction information, air quality and weather information, and broadcasts the information to travelers using technologies such as FM subcarrier, satellite radio, cellular data broadcasts, and Internet streaming technologies. This service package also provides location-specific or situation-relevant information to travelers in vehicles using Dedicated Short Range Communications (DSRC) infrastructure supporting mobility service packages for connected vehicles. DSRC is used to deliver real-time traveler information including travel times, incident information, road conditions, and emergency traveler information to vehicles as they pass connected vehicle roadside equipment along their route. This service package provides public information that is available to all equipped vehicles in the vicinity of the roadside equipment.
TI02	Personalized Traveler Information	This service package 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. Although the Internet is the predominate network used for traveler information dissemination, a range of two-way wide-area wireless and fixed-point to fixed-point communications systems may be used to support the required data communications with the traveler. A variety of interactive devices may be used by the traveler to access information prior to a trip or en route including phone via a 511-like portal and web pages via smart phone, tablet, personal computer, and a variety of in-vehicle devices.
TI03	Dynamic Route Guidance	This service package offers advanced route planning and guidance that is responsive to current conditions. The package augments a user's navigation system equipment with a digital receiver capable of receiving real-time traffic, transit, and road condition information, which is used by the user equipment to provide real-

		time route guidance that factors in current conditions.
TI04	Infrastructure-Provided Trip Planning and Route Guidance	This service package offers the user trip planning and en route guidance services. It generates a trip plan, including a multimodal route and associated service information (e.g., parking information), based on traveler preferences and constraints. Routes may be based on static information or reflect real time network conditions. Unlike TI03, where the user equipment determines the route, the route determination functions are performed by the center in this service package. The trip plan may be confirmed by the traveler and advanced payment and reservations for transit and alternate mode (e.g., airline, rail, and ferry) trip segments, and ancillary services are accepted and processed. The confirmed trip plan may include specific routing information that can be supplied to the traveler as general directions or as turn-by-turn route guidance depending on the level of user equipment.
TI05	Travel Services Information and Reservation	This service package provides travel service information and reservation services to the traveler pre-trip and while en route. This includes information for tourist attractions, lodging, dining, service stations, parking, emergency services, and other services and businesses of interest to the traveler.
TI06	Dynamic Ridesharing and Shared Use Transportation	This service package addresses dynamic ridesharing/ride matching services to travelers and other forms of shared use transportation. Dynamic ridesharing allows travelers to arrange carpool trips through a personal device with a wireless connection to a ride matching system (e.g., a web-based application). It uses inputs from both passengers and drivers pre-trip, during the trip, and post-trip . These inputs are then translated into “optimal” pairings between passengers and drivers to provide both with a convenient route between their two origin and destination locations. After the trip, information is provided back to the service package to improve the user’s experience for future trips.The shared use aspect of the service package addresses three types of shared use that may be arranged using an internet connected personal device. In the first type, a traveler arranges for the temporary use of a vehicle. In the second type of shared use, a traveler arranges for a vehicle to pick them up at a specific location and take them to another location. The second type of shared use may be implemented as a ride matching or ridesharing service, including those provided by Uber and Lyft. The third type of shared use is a bikeshare capability.

TI07	In-Vehicle Signage	This service package augments regulatory, warning, and informational signs and signals by providing information directly to drivers through in-vehicle devices. The information provided would include static sign information (e.g., stop, curve warning, guide signs, service signs, and directional signs) and dynamic information (e.g., current signal states including highway intersection and highway-rail intersection status and local conditions warnings identified by local environmental sensors). This service package also includes the capability for maintenance and construction, emergency, and transit vehicles to transmit sign information to vehicles in the vicinity so that in vehicle signing can be used without fixed infrastructure in areas such as work zones, around incidents, and at bus stops.
TM01	Infrastructure-Based Traffic Surveillance	This service package includes traffic detectors, other surveillance equipment, the supporting field equipment, and Center to Field communications to transmit the collected data back to the Traffic Management Center. The derived data can be used locally such as when traffic detectors are connected directly to a signal control system or remotely (e.g., when a CCTV system sends data back to the Traffic Management Center). The data generated by this service package enables traffic managers to monitor traffic and road conditions, identify and verify incidents, detect faults in indicator operations, and collect census data for traffic strategy development and long range planning. The collected data can also be analyzed and made available to users and the Traveler Information Center physical object.
TM02	Vehicle-Based Traffic Surveillance	This service package uses probe data information obtained from vehicles in the network to support traffic operations, including incident detection and the implementation of localized operational strategies. Since traffic data is collected from vehicles, travel times and other related traffic performance measures are available. This service package includes the capability to collect data from Connected Vehicles so that "probe" data can be collected from all equipped vehicles, providing access to a large vehicle population as penetration increases. Incident detection enables transportation agencies to determine the location of potential incidents so the agencies can respond more quickly to the incident and mitigate any negative impacts to the transportation network. Vehicle data that can be used to detect potential incidents include changes in vehicle speeds indicating the disruption of traffic flow, when a vehicle's safety systems have been activated or deployed, or sudden vehicle turns or

		deceleration at a specific location (indicating a potential obstacle in the roadway).
TM03	Traffic Signal Control	This service package provides the central control and monitoring equipment, communication links, and the signal control equipment that support traffic control at signalized intersections. A range of traffic signal control systems are represented by this service package ranging from fixed-schedule control systems to fully traffic responsive systems that dynamically adjust control plans and strategies based on current traffic conditions and priority requests. This service package is generally an intra-jurisdictional package. Systems that achieve coordination across jurisdictions by using a common time base or other strategies that do not require real time coordination would also be represented by this package. Coordination of traffic signal systems using real-time communications is covered in the TM07-Regional Traffic Management service package. This service package is consistent with typical traffic signal control systems.
TM04	Connected Vehicle Traffic Signal System	This service package uses both vehicle location and movement information from connected vehicles as well as infrastructure measurement of non-equipped vehicles to improve the operations of traffic signal control systems. The service package utilizes the vehicle information to adjust signal timing for an intersection or group of intersections in order to improve traffic flow, including allowing platoon flow through the intersection. Other service package provide related mobility services such as Transit Signal Priority, Freight Signal Priority, Emergency Vehicle Preemption, and Pedestrian Mobility to maximize overall arterial network performance.
TM05	Traffic Metering	This service package provides central monitoring and control, communications, and field equipment that support metering of traffic. It supports the complete range of metering strategies including ramp, interchange, and mainline metering. This package incorporates the instrumentation included in the TM01 service package (traffic sensors are used to measure traffic flow and queues) to support traffic monitoring so responsive and adaptive metering strategies can be implemented. Also included is configurable field equipment to provide information to drivers approaching a meter, such as advance warning of the meter, its operational status (whether it is currently on or not, how many cars per green are allowed, etc.), lane usage at the meter (including a bypass lane for HOVs) and existing queue at the

		meter.
TM06	Traffic Information Dissemination	This service package provides driver information using roadway equipment such as dynamic message signs or highway advisory radio. A wide range of information can be disseminated including traffic and road conditions, closure and detour information, travel restrictions, incident information, and emergency alerts and driver advisories. This package provides information to drivers at specific equipped locations on the road network. Careful placement of the roadway equipment provides the information at points in the network where the drivers have recourse and can tailor their routes to account for the new information. This package also covers the equipment and interfaces that provide traffic information from a traffic management center to the media (for instance via a direct tie-in between a traffic management center and radio or television station computer systems), Transit Management, Emergency Management, and Transportation Information Centers. A link to the Maintenance and Construction Management Center allows real time information on road/bridge closures and restrictions due to maintenance and construction activities to be disseminated.
TM07	Regional Traffic Management	This service package provides for the sharing of information and control among traffic management centers to support regional traffic management strategies. Regional traffic management strategies that are supported include inter-jurisdictional, real-time coordinated traffic signal control systems and coordination between freeway operations and traffic signal control within a corridor. This service package advances the TM03-Traffic Signal Control and TM05-Traffic Metering service packages by adding the communications links and integrated control strategies that enable integrated, interjurisdictional traffic management. The nature of optimization and extent of information and control sharing is determined through working arrangements between jurisdictions. This package relies principally on roadside instrumentation supported by the Traffic Signal Control and Traffic Metering service packages and adds hardware, software, and fixed-point communications capabilities to implement traffic management strategies that are coordinated between allied traffic management centers. Several levels of coordination are supported from sharing of information through sharing of device control between traffic management centers.
TM08	Traffic Incident	This service package manages both unexpected incidents and planned events so that the impact to the transportation network

	Management System	and traveler safety is minimized. The service package includes incident detection capabilities through roadside surveillance devices (e.g. CCTV) and through regional coordination with other traffic management, maintenance and construction management and emergency management centers as well as rail operations and event promoters. Information from these diverse sources is collected and correlated by this service package to detect and verify incidents and implement an appropriate response. This service package supports traffic operations personnel in developing an appropriate response in coordination with emergency management, maintenance and construction management, and other incident response personnel to confirmed incidents. The response may include traffic control strategy modifications or resource coordination between centers. Incident response also includes presentation of information to affected travelers using the Traffic Information Dissemination service package and dissemination of incident information to travelers through the Broadcast Traveler Information or Interactive Traveler Information service packages. The roadside equipment used to detect and verify incidents also allows the operator to monitor incident status as the response unfolds. The coordination with emergency management might be through a CAD system or through other communication with emergency personnel. The coordination can also extend to tow trucks and other allied response agencies and field service personnel. This service package is closely related with the Public Safety service packages, which focus on services that support first responders. In particular, local management of the incident using an incident command system is covered by PS02.
TM09	Integrated Decision Support and Demand Management	This service package recommends courses of action to transportation operators in a corridor, downtown area, or other heavily traveled area. Recommendations are based on an assessment of current and forecast transportation network performance and environmental conditions. Multi-modal transportation operational strategies are created that consider all modes and all roads in the travel area to correct network imbalances and effectively manage available capacity. As part of the operational strategies, this service package may also recommend lane restrictions, transit, parking, and toll strategies to influence traveler route and mode choices to support active demand management programs and policies managing both traffic and the environment. Operational strategies, including demand management recommendations, are coordinated to support

		operational decisions by each transportation operator that are consistent with the recommended strategy. All recommended operational strategies are based on historical evaluation, real-time assessment, and forecast of the roadway network performance based on predicted travel demand patterns. This service package also collects air quality, parking availability, transit usage, and vehicle occupancy data to support operational strategies that manage and balance capacity and demand.
TM10	Electronic Toll Collection	The Electronic Toll Collection service package provides toll operators with the ability to collect tolls electronically and detect and process violations. The fees that are collected may be adjusted to implement demand management strategies. Field-Vehicle Communication between the roadway equipment and the vehicle is required as well as Fixed Point-Fixed Point interfaces between the toll collection equipment and transportation authorities and the financial infrastructure that supports fee collection. Toll violations are identified and electronically posted to vehicle owners. Standards, inter-agency coordination, and financial clearinghouse capabilities enable broad interoperability for these services.
TM11	Road Use Charging	The Road Use Charging service package supports the capability to charge fees to roadway vehicle owners for using specific roadways with potentially differential payment rates based on time-of-day, which specific roadway is used, and class of vehicle or other vehicle-based criteria (a local policy decision by each roadway owner). These payment schemes could be forms of Vehicle Miles Traveled (VMT) or other schemes that are yet to be defined. Vehicle owners need only register with a single payment entity of their choice (a participating state, municipal, or regional DOT, an authority, or a private entity), and payments are reconciled by the entity receiving payment (and travel history) with all roadway owners that participate in the road use payment scheme, which may also include the Federal government. Vehicle owners would pay nothing for distances traveled where there are no payments required (e.g. in jurisdictions that have not implemented a distance-based payment or for roadway operators that collect payment using traditional tolls), although a Federal payment rate might cover some or all roadway operations (a Federal policy decision). Basic operation depends on the vehicle tracking its own location, and periodically reporting its travel history to the registered entity receiving payment using connected vehicle communications.

TM12	Dynamic Roadway Warning	This service package includes systems that dynamically warn drivers approaching hazards on a roadway. Such hazards include roadway weather conditions, road surface conditions, traffic conditions including queues, obstacles or animals in the roadway and any other transient event that can be sensed. These dynamic roadway warning systems can alert approaching drivers via warning signs, flashing lights, in-vehicle messages, etc. Such systems can increase the safety of a roadway by reducing the occurrence of incidents. The system can be centrally monitored and controlled by a traffic management center or it can be autonomous. Speed warnings that consider the limitations of a given vehicle for the geometry of the roadway (e.g., rollover risk for tall vehicles) are not included in this service package but are covered by the TM17 – Speed Warning and Enforcement service package. Roadway warning systems, especially queue warning systems are an Active Traffic Management (ATM) strategy and are typically used in conjunction with other ATM strategies (such as TM20-Variable Speed Limits and TM22-Dynamic Lane Management and Shoulder Use).
TM13	Standard Railroad Grade Crossing	This service package manages highway traffic at highway-rail intersections (HRIs) where operational requirements do not dictate more advanced features (e.g., where rail operational speeds are less than 80 miles per hour). Both passive (e.g., the crossbuck sign) and active warning systems (e.g., flashing lights and gates) are supported. (Note that passive systems exercise only the single interface between the ITS Roadway Equipment and the Driver in the physical view.) These traditional HRI warning systems may also be augmented with other standard traffic management devices. The warning systems are activated on notification of an approaching train by interfaced wayside equipment. The equipment at the HRI may also be interconnected with adjacent signalized intersections so that local control can be adapted to highway-rail intersection activities. Health monitoring of the HRI equipment and interfaces is performed; detected abnormalities are reported to both highway and railroad officials through wayside interfaces and interfaces to the Traffic Management Center.
TM14	Advanced Railroad Grade Crossing	This service package manages highway traffic at highway-rail intersections (HRIs) where operational requirements demand advanced features (e.g., where rail operational speeds are greater than 80 miles per hour). This service package includes all capabilities from the Standard Railroad Grade Crossing service

		package and augments these with additional safety features to mitigate the risks associated with higher rail speeds and leverage Connected Vehicle technologies. The active warning systems supported by this service package include positive barrier systems that preclude entrance into the intersection when the barriers are activated. Like the Standard package, the HRI equipment is activated on notification by wayside interface equipment which detects, or communicates with the approaching train. In this service package, the wayside equipment provides additional information about the arriving train so that the train's direction of travel, estimated time of arrival, and estimated duration of closure may be derived. This service package will alert and/or warn drivers who are approaching an at-grade railroad crossing if they are on a crash-imminent trajectory to collide with a crossing or approaching train. This enhanced information may be conveyed to the driver prior to, or in context with, warning system activation. This service package also includes additional detection capabilities that enable it to detect an entrapped or otherwise immobilized vehicle within the HRI and provide an immediate notification to highway and railroad officials.
TM15	Railroad Operations Coordination	This service package provides an additional level of strategic coordination between freight rail operations and other transportation centers. Rail operations provides train schedules, maintenance schedules, and any other forecast events that will result in highway-rail intersection (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.
TM16	Reversible Lane Management	This service package provides for the management of reversible lane facilities. In addition to standard surveillance capabilities, this service package includes sensory functions that detect wrong-way vehicles and other special surveillance capabilities that mitigate safety hazards associated with reversible lanes. The package includes the field equipment, physical lane access controls, and associated control electronics that manage and control these special lanes. This service package also includes the equipment used to electronically reconfigure intersections and manage right-of-way to address dynamic demand changes and special events.
TM17	Speed Warning and Enforcement	This service package monitors vehicle speeds and supports warning drivers when their speed is excessive. Also the service includes notifications to an enforcement agency to enforce the speed limit of the roadway. Speed monitoring can be made via

		spot speed or average speed measurements. Roadside equipment can display the speed of passing vehicles and/or suggest a safe driving speed. Environmental conditions and vehicle characteristics may be monitored and factored into the safe speed advisories that are provided to the motorist. For example, warnings can be generated recognizing the limitations of a given vehicle for the geometry of the roadway such as rollover risk for tall vehicles. This service focuses on monitoring of vehicle speeds and enforcement of the speed limit while the variable speed limits service (covered in TM20-Variable Speed Limits service package) focuses on varying the posted speed limits to create more uniform speeds along a roadway, to promote safer driving during adverse conditions (such as fog) and/or to reduce air pollution.
TM18	Drawbridge Management	This service package supports systems that manage drawbridges at rivers and canals and other multimodal crossings (other than railroad grade crossings which are specifically covered by other service packages). The equipment managed by this service package includes control devices (e.g., gates, warning lights, dynamic message signs) at the drawbridge as well as the information systems that are used to keep travelers apprised of current and forecasted drawbridge status.
TM19	Roadway Closure Management	This service package closes roadways to vehicular traffic when driving conditions are unsafe, maintenance must be performed, and other scenarios where access to the roadway must be prohibited. The service package includes automatic or remotely controlled gates or barriers that control access to roadway segments including ramps and traffic lanes. Remote control systems allow the gates to be controlled from a central location or from a vehicle at the gate/barrier location, improving system efficiency and reducing personnel exposure to unsafe conditions during severe weather and other situations where roads must be closed. Surveillance systems allow operating personnel to visually verify the safe activation of the closure system and driver information systems (e.g., DMS) provide closure information to motorists in the vicinity of the closure. The equipment managed by this service package includes the control and monitoring systems, the field devices (e.g., gates, warning lights, DMS, CCTV cameras) at the closure location(s), and the information systems that notify other systems of a closure. This service package covers general road closure applications; specific closure systems that are used at railroad grade crossings, drawbridges, reversible lanes, etc. are covered by other Traffic Management service packages.

TM20	Variable Speed Limits	This service package sets variable speed limits along a roadway to create more uniform speeds, to promote safer driving during adverse conditions (such as fog), and/or to reduce air pollution. Also known as speed harmonization, this service monitors traffic and environmental conditions along the roadway. Based on the measured data, the system calculates and sets suitable speed limits, usually by lane. Equipment over and along the roadway displays the speed limits and additional information such as basic safety rules and current traffic information. The system can be centrally monitored and controlled by a traffic management center or it can be autonomous. This service establishes variable speed limits and communicates the speed limits to drivers. Speed warnings and enforcement of speeds limits, including variable speed limits, is covered in the TM17-Speed Warning and Enforcement service package.Variable speed limits are an Active Traffic Management (ATM) strategy and are typically used in conjunction with other ATM strategies (such as TM22-Dynamic Lane Management and Shoulder Use and TM23-Dynamic Roadway Warning).
TM21	Speed Harmonization	This service package determines speed recommendations based on traffic conditions and weather information and uses connected vehicle technologies to assist in harmonizing speeds to these recommendations. The speed recommendations can be regulatory (e.g. variable speed limits) or advisory. The purpose of speed harmonization is to change traffic speed on links that approach areas of traffic congestion, bottlenecks, incidents, special events, and other conditions that affect flow. Speed harmonization assists in maintaining flow, reducing unnecessary stops and starts, and maintaining consistent speeds. The service package utilizes connected vehicle V2I communication to detect the precipitating roadway or congestion conditions that might necessitate speed harmonization, to generate the appropriate response plans and speed recommendation strategies for upstream traffic, and to broadcast such recommendations to the affected vehicles. The speed recommendations can be provided in-vehicle for connected vehicles, or through roadside signage for non-connected vehicles.
TM22	Dynamic Lane Management and Shoulder Use	This service package provides for active management of travel lanes along a roadway. The package includes the field equipment, physical overhead lane signs and associated control electronics that are used to manage and control specific lanes and/or the shoulders. This equipment can be used to change the lane

		configuration on the roadway according to traffic demand and lane destination along a typical roadway section or on approach to or access from a border crossing, multimodal crossing or intermodal freight depot. This package can be used to allow temporary or interim use of shoulders as travel lanes. The equipment can be used to electronically reconfigure intersections and interchanges and manage right-of-way dynamically including merges. Also, lanes can be designated for use by special vehicles only, such as buses, high occupancy vehicles (HOVs), vehicles attending a special event, etc. Prohibitions or restrictions of types of vehicles from using particular lanes can be implemented.The lane management system can be centrally monitored and controlled by a traffic management center or it can be autonomous. This service also can include automated enforcement equipment that notifies the enforcement agency of violators of the lane controls.Dynamic lane management and shoulder use is an Active Traffic Management (ATM) strategy and is typically used in conjunction with other ATM strategies (such as TM20-Variable Speed Limits and TM12-Dynamic Roadway Warning).
TM23	Border Management Systems	This service package provides international border crossing management for passenger vehicles and other non-commercial travelers crossing the border. This service package manages traffic at the border crossing, provides technology to support expedited processing of trusted travelers, and collects and disseminates border wait times.
VS01	Autonomous Vehicle Safety Systems	This service package improves vehicle safety using on-board sensors that monitor the driving environment surrounding the vehicle. All levels of driving automation are supported ranging from basic warning systems that warn the driver through full automation where the vehicle controls the steering and acceleration/deceleration in all scenarios and environments, without driver intervention. Unlike other Vehicle Safety service packages, this service package includes autonomous capabilities that rely only on on-board systems without communication with other vehicles or the infrastructure.
VS02	V2V Basic Safety	This service package exchanges basic safety messages with surrounding Connected Vehicles to support and augment the safety warning and control automation features identified in VS01. These exchanges support Connected Vehicle safety applications defined in SAE J2945/1: Emergency Electronic Brake Lights, Forward Crash Warning, Blind Spot Warning/Lane Change

		Warning, Intersection Movement Assist, Left Turn Assist, and Control Loss Warning. It also supports Do Not Pass Warning, Motorcycle Approaching indication, Tailgating Advisory, Stationary Vehicle, and Pre-Crash Actions applications from CVRIA.
VS03	Situational Awareness	This service package shares information about potentially hazardous road conditions or road hazards with other vehicles to support enhanced driver warnings and control automation. Vehicles broadcast relevant road condition information that is collected by the vehicle, such as fog or icy roads. This service package supports the capability for connected vehicles to share situational awareness information even in areas where no roadside communications infrastructure exists. It can be useful to vehicles that are not fully equipped with sensors, or vehicles entering an area with hazardous conditions. Roadside communications infrastructure, if available, can extend the situational awareness range to cover wrong way vehicles where closing rates can require notification beyond DSRC communications range.
VS04	V2V Special Vehicle Alert	This service package alerts the driver about the location of and the movement of public safety vehicles responding to an incident, slow moving vehicles, oversized vehicles, and other special vehicles that may require special attention from the driver. These public safety, commercial, and maintenance vehicles share their current status and location with surrounding vehicles so that other drivers in the vicinity can avoid interfering with their actions and avoid collisions.
VS05	Curve Speed Warning	This service package allows connected vehicles to receive information that it is approaching a curve along with the recommended speed for the curve. This capability allows the vehicle to provide a warning to the driver regarding the curve and its recommended speed. In addition, the vehicle can perform additional warning actions if the actual speed through the curve exceeds the recommended speed.
VS06	Stop Sign Gap Assist	This service package is intended to improve safety at non-signalized intersections where only the minor road has posted stop signs. It includes both onboard (for connected vehicles) and roadside signage warning systems (for non-equipped vehicles). The service package helps drivers on a minor road stopped at an intersection understand the state of activities associated with that intersection by providing a warning of unsafe gaps on the major road. The SSGA service package collects all available sensor

		information (major road, minor road, and median sensors) data and computes the dynamic state of the intersection in order to issue appropriate warnings and alerts.
VS07	Road Weather Motorist Alert and Warning	This service package collects road weather data from connected vehicles and uses that data to develop short term warnings or advisories that can be provided to individual motorists. The information may come from either vehicles operated by the general public and commercial entities (including passenger cars and trucks) or specialty vehicles and public fleet vehicles (such as snowplows, maintenance trucks, and other agency pool vehicles). The raw data will be processed in a controlling center to generate road segment-based data outputs. The processing will also include a road weather motorist alerts algorithm to generate short time horizon alerts that will be pushed to user systems and available to commercial service providers. In addition the information collected can be combined with observations and forecasts from other sources to provide medium (next 2-12 hours) or long term (more than 12 hours) advisories through a variety of interfaces including web based and connected vehicle based interfaces.
VS08	Queue Warning	This service package utilizes connected vehicle technologies, including vehicle-to-infrastructure (V2I) and vehicle-to-vehicle (V2V) communications, to enable vehicles within the queue event to automatically broadcast their queued status information (e.g., rapid deceleration, disabled status, lane location) to nearby upstream vehicles and to centers (such as the TMC). The infrastructure will broadcast queue warnings to vehicles in order to minimize or prevent rear-end or other secondary collisions. This service package is not intended to operate as a crash avoidance system. In contrast to such systems, this service package will engage well in advance of any potential crash situation, providing messages and information to the driver in order to minimize the likelihood of his needing to take crash avoidance or mitigation actions later. It performs two essential tasks: queue determination (detection and/or prediction) and queue information dissemination using vehicle-based, infrastructure-based, or hybrid solutions.
VS09	Reduced Speed Zone Warning / Lane Closure	This service package provides connected vehicles that are approaching a reduced speed zone with information on the zone's posted speed limit and/or if the configuration of the roadway is altered (e.g., lane closures, lane shifts). Reduced speed zones include (but are not be limited to) construction/work zones, school zones, pedestrian crossing areas, and incorporated zones

		(e.g., rural towns). The connected vehicle uses the revised speed limit along with any applicable changed roadside configuration information to determine whether to provide an alert or warning to the driver. Additionally, to provide warnings to non-equipped vehicles, infrastructure equipment measures the speed of the approaching vehicles and if greater than the reduced speed zone posted speed limit will provide warning signage. It will provide an alert to drivers in advance when aggressive braking is required to reduce to the posted speed limit.
VS10	Restricted Lane Warnings	This service package provides the connected vehicle with restriction information about the travel lanes, such as if the lane is restricted to high occupancy vehicles (HOV), transit, or public safety vehicles only or has defined eco-lane criteria. A connected vehicle can use this information to determine if the vehicle is in a lane that has lane restrictions.
VS11	Oversize Vehicle Warning	This service package uses external measurements taken by the roadside infrastructure, and transmitted to the vehicle, to support in-vehicle determination of whether an alert/warning is necessary. Specifically, the infrastructure data equipment detects and measures the approaching vehicle's height and width. The infrastructure component of the service package transmits the vehicle measurements, along with bridge, overpass, or tunnel geometry, to the oversize vehicle. The vehicle application utilizes this data to determine whether the vehicle can clear the bridge or tunnel. If deemed necessary, the driver is alerted to the impending low height and/or narrow horizontal clearance bridge or tunnel prior to a decision point, enabling the vehicle to reroute and avoid a collision. If the driver ignores the alert and continues along the route, the vehicle will generate a warning indicating an impending collision at a point near the bridge or tunnel approach. To support unequipped vehicles the infrastructure will display warning or reroute information when the measurements indicate that a vehicle does not have adequate height or width clearance. This service package can be expanded to consider weight as well as height and width.
VS12	Pedestrian and Cyclist Safety	This service package supports the sensing and warning systems used to interact with pedestrians, cyclists, and other non-motorized users that operate on the main vehicle roadways, or on pathways that intersect the main vehicle roadways. These systems allow automated warning or active protection for this class of users. It integrates traffic, pedestrian, and cyclist information from roadside or intersection detectors and new

		forms of data from wirelessly connected, non-motorized traveler-carried mobile devices to request right-of-way or to inform non-motorized travelers when to cross and how to remain aligned with the crosswalk or pathway based on real-time Signal Phase and Timing (SPaT) and MAP information. In some cases, priority will be given to non-motorized travelers, such as persons with disabilities who need additional crossing time, or in special conditions (e.g., weather) where non-motorized travelers may warrant priority or additional crossing time. This service package will enable a service call to be routed to the traffic controller from a mobile device of a registered person with disabilities after confirming the direction and orientation of the roadway that the individual is intending to cross. It also provides warnings to the non-motorized user of possible infringement of the crossing or pathway by approaching vehicles.
VS13	Intersection Safety Warning and Collision Avoidance	This service package enables a connected vehicle approaching an instrumented signalized intersection to receive information from the infrastructure regarding the signal timing and the geometry of the intersection. The vehicle uses its speed and acceleration profile, along with the signal timing and geometry information to determine if it appears likely that the vehicle will be able to pass safely through the intersection without violating the signal or colliding with other vehicles. If the vehicle determines that proceeding through the intersection is unsafe, a warning is provided to the driver and/or collision avoidance actions are taken, depending on the automation level of the vehicle.
VS14	Cooperative Adaptive Cruise Control	This service package adds vehicle to vehicle (V2V) communications to adaptive cruise control (ACC) systems, which provides enhanced information so that groups or 'strings' of CACC-equipped vehicles can follow a lead vehicle with better accuracy, quicker response, and shorter time gaps, enhancing traffic flow stability. In ACC systems, sensors (e.g., radar or lidar) and longitudinal control automation are used to measure and maintain a safe distance from the lead vehicle. V2V communications enables direct communication between the vehicles so that acceleration and deceleration can be more directly coordinated between vehicles in the string.
VS15	Infrastructure Enhanced Cooperative Adaptive Cruise Control	This service package adds Infrastructure to Vehicle (I2V) communications to Cooperative Adaptive Cruise Control systems so that strings of compatible CACC-equipped vehicles can be more efficiently formed and cooperating vehicles gain access to speed recommendations and traffic control status from the

		infrastructure, further enhancing traffic flow stability and improving highway capacity and throughput. Speed recommendations provided by the infrastructure can be used to stabilize traffic flow, reducing speed differentials and enhancing throughput along a route that includes a bottleneck. Access to traffic control information such as signal phase and timing enables synchronized starts by adjacent CACC-equipped strings of vehicles, increasing intersection throughput. The infrastructure can also assist with broader coordination between CACC-equipped vehicles, enabling strings of vehicles to be more efficiently formed that share performance parameters and destinations.
VS16	Automated Vehicle Operations	This service package provides full vehicle automation, controlling both the steering and acceleration/deceleration on areas of the highway system that support full automation. Communications between vehicles and between the vehicles and supporting infrastructure equipment supports cooperative check-in to the automated portion of the system and transition to automated mode, coordination of maneuvers between vehicles in automated mode, and checkout from the automated system. This service package is distinguished from the most advanced CACC systems in that full longitudinal and lateral control automation are supported, enabling closely spaced, tightly coupled platoons of vehicles to operate with short fixed gaps, providing greatly enhanced highway capacity and throughput with enhanced efficiency since aerodynamic drag is reduced.
VS17	Traffic Code Dissemination	This service package disseminates current local statutes, regulations, ordinances, and rules that have been adopted by local, state, and federal authorities that govern the safe, orderly operation of motor vehicles, bicycles, and pedestrians on public roads. The focus of this service package is electronic distribution to automated vehicles and their drivers so that automated vehicles can safely operate in compliance with the traffic or motor vehicle code for the current state and locality, though this information would also be useful to human drivers.
WX01	Weather Data Collection	This service package collects current road and weather conditions using data collected from environmental sensors deployed on and about the roadway. It also collects data from vehicles in the road network that can be used to directly measure or infer current environmental conditions. It leverages vehicle on-board systems that measure temperature, sense current weather conditions (rain and sun sensors) and also can monitor aspects of the vehicle operational status (e.g., use of headlights, wipers, and traction

		control system) to gather information about local environmental conditions. In addition, environmental sensor systems located on Maintenance and Construction Vehicles are also potential data sources. The collected environmental data is used by the Weather Information Processing and Distribution service package to process the information and make decisions on operations. The collected environmental data may be aggregated, combined with data attributes and sent to meteorological systems for data qualification and further data consolidation. The service package may also request and receive qualified data sets from meteorological systems.
WX02	Weather Information Processing and Distribution	This service package processes and distributes the environmental information collected from the Weather Data Collection service package. This service package uses the environmental data to detect environmental hazards such as icy road conditions, high winds, dense fog, etc. so operational centers and decision support systems can make decision on corrective actions to take. The continuing updates of road condition information and current temperatures can be used to more effectively deploy road maintenance resources, issue general traveler advisories, issue location specific warnings to drivers using the Traffic Information Dissemination service package, and aid operators in scheduling work activity.
WX03	Spot Weather Impact Warning	This service package will alert drivers to unsafe conditions or road closure at specific points on the downstream roadway as a result of weather-related impacts, which include, but are not limited to high winds, flood conditions, ice, or fog. The service packages is designed to use standalone weather systems to warn drivers about inclement weather conditions that may impact travel conditions. Real time weather information is collected from fixed environmental sensor stations and vehicle based sensors. The information is processed to determine the nature of the alert or warning to be delivered and then communicated to connected vehicles. If the warning includes road closure then diversion information can be provided. For non-equipped vehicles the alerts or warnings will be provided via roadway signage. In addition, the roadway equipment may calculate the appropriate speed for current weather conditions and provide this information to the connected vehicle or on roadway signage.

APPENDIX C – ITS ELEMENT FUNCTIONS

Functional Objects

Element Name	Functional Object
Blount County E911 Dispatch	Emergency Call-Taking
	Emergency Data Collection
	Emergency Dispatch
	Emergency Evacuation Support
	Emergency Incident Command
	Emergency Response Management
Blount County EMA	Emergency Evacuation Support
	Emergency Incident Command
	Emergency Response Management
Blount County EMA Website	TIC Data Collection
	TIC Emergency Traveler Information
Blount County Emergency Communication System	Emergency Evacuation Support
	Emergency Response Management
Blount County Fire Vehicles	EV On-Board En Route Support
Blount County Rescue Squad Vehicles	EV On-Board En Route Support
Blount County Sheriff Vehicles	EV On-Board En Route Support
Blount County Traffic Signals	Roadway Field Management Station Operation
	Roadway Signal Control
	Roadway Signal Preemption
City of Alcoa CCTV Cameras	Roadway Basic Surveillance
City of Alcoa Emergency Dispatch	Emergency Call-Taking
	Emergency Data Collection
	Emergency Dispatch
	Emergency Evacuation Support
	Emergency Incident Command
	Emergency Response Management

Element Name	Functional Object
City of Alcoa Emergency Dispatch (cont.)	Emergency Routing
City of Alcoa Field Sensors	Roadway Basic Surveillance
City of Alcoa Fire Vehicles	EV On-Board En Route Support
City of Alcoa Police Vehicles	EV On-Board En Route Support
City of Alcoa Traffic Signals	Roadway Field Management Station Operation
	Roadway Signal Control
	Roadway Signal Preemption
City of Knoxville CCTV Cameras	Roadway Basic Surveillance
City of Knoxville Connected Vehicle Roadside Equipment	ITS Management Support
	RSE Automated Vehicle Operations
	RSE Device Management
	RSE Environmental Monitoring
	RSE Infrastructure Monitoring
	RSE Infrastructure Restriction Warning
	RSE Intersection Management
	RSE Intersection Safety
	RSE Lighting System Support
	RSE Parking Management
	RSE Queue Warning
	RSE Road Closure Management
	RSE Situation Monitoring
	RSE Speed Warning
	RSE Traffic Monitoring
	RSE Traveler Information Communications
City of Knoxville Field Sensors	Roadway Basic Surveillance
City of Knoxville Fire Vehicles	EV On-Board En Route Support
City of Knoxville Infrastructure Monitoring Equipment	ITS Management Support

Element Name	Functional Object
City of Knoxville Infrastructure Monitoring Equipment (cont.)	Roadway Infrastructure Monitoring
City of Knoxville Maintenance Vehicles	MCV Infrastructure Monitoring
City of Knoxville Oversize Vehicle Detection	Roadway Restriction Monitoring and Warning
City of Knoxville Parking Management System	Parking Area Electronic Payment
	Parking Area Management
City of Knoxville Police Vehicles	EV On-Board En Route Support
City of Knoxville Public Works Department	MCM Environmental Information Processing
	MCM Incident Management
	MCM Roadway Maintenance
	MCM Vehicle Tracking
	MCM Work Activity Coordination
	MCM Work Zone Management
City of Knoxville Publice Works Department Vehicles	MCV Vehicle Location Tracking
City of Knoxville Queue Detection System	Roadway Basic Surveillance
	Roadway Environmental Monitoring
	Roadway Warning
City of Knoxville Roadway Warning Equipment	Roadway Basic Surveillance
	Roadway Warning
City of Knoxville Social Media Accounts	TIC Data Collection
	TIC Traveler Information Broadcast
City of Knoxville Speed Monitoring Equipment	Roadway Field Management Station Operation
	Roadway Speed Monitoring and Warning
City of Knoxville Streetlights	Roadway Basic Surveillance
	Roadway Lighting System Control
City of Knoxville TOC	TMC Barrier System Management
	TMC Basic Surveillance
	TMC Data Collection

Element Name	Functional Object
City of Knoxville TOC (cont.)	TMC Environmental Monitoring
	TMC Evacuation Support
	TMC Incident Detection
	TMC Incident Dispatch Coordination
	TMC Multi-Modal Coordination
	TMC Regional Traffic Management
	TMC Roadway Equipment Monitoring
	TMC Signal Control
	TMC Speed Warning
	TMC Standard Rail Crossing Management
	TMC Traffic Information Dissemination
	TMC Work Zone Traffic Management
City of Knoxville Traffic Signals	Roadway Field Management Station Operation
	Roadway Signal Control
	Roadway Signal Preemption
	Roadway Standard Rail Crossing
City of Knoxville Wrong Way Detection and Warning Equipment	Roadway Basic Surveillance
	Roadway Traffic Information Dissemination
	Roadway Wrong Way Vehicle Detection
City of Lenoir City CCTV Cameras	Roadway Basic Surveillance
City of Lenoir City Field Sensors	Roadway Basic Surveillance
City of Lenoir City TOC	TMC Basic Surveillance
	TMC Evacuation Support
	TMC Incident Dispatch Coordination
	TMC Regional Traffic Management
	TMC Roadway Equipment Monitoring
	TMC Signal Control

Element Name	Functional Object
City of Lenoir City Traffic Signals	Roadway Field Management Station Operation
	Roadway Signal Control
	Roadway Signal Preemption
City of Maryville CCTV Cameras	Roadway Basic Surveillance
City of Maryville Emergency Dispatch	Emergency Call-Taking
	Emergency Data Collection
	Emergency Dispatch
	Emergency Evacuation Support
	Emergency Incident Command
	Emergency Response Management
	Emergency Routing
City of Maryville Field Sensors	Roadway Basic Surveillance
City of Maryville Fire Vehicles	EV On-Board En Route Support
City of Maryville Police Vehicles	EV On-Board En Route Support
City of Maryville Traffic Signals	Roadway Field Management Station Operation
	Roadway Signal Control
	Roadway Signal Preemption
City of Maryville/Alcoa TOC	TMC Basic Surveillance
	TMC Data Collection
	TMC Evacuation Support
	TMC Incident Detection
	TMC Incident Dispatch Coordination
	TMC Regional Traffic Management
	TMC Roadway Equipment Monitoring
	TMC Signal Control
	TMC Traffic Information Dissemination
	TMC Work Zone Traffic Management

Element Name	Functional Object
City of Oak Ridge Field Equipment	RSE Situation Monitoring
City of Oak Ridge Field Sensors	Roadway Basic Surveillance
City of Oak Ridge TOC	TMC Basic Surveillance
	TMC Data Collection
	TMC Evacuation Support
	TMC Incident Detection
	TMC Incident Dispatch Coordination
	TMC Regional Traffic Management
	TMC Roadway Equipment Monitoring
	TMC Signal Control
	TMC Situation Data Management
	TMC Speed Warning
	TMC Work Zone Traffic Management
City of Oak Ridge Traffic Signals	Roadway Field Management Station Operation
	Roadway Signal Control
	Roadway Signal Preemption
City of Sevierville CCTV Cameras	Roadway Basic Surveillance
City of Sevierville Emergency Dispatch	Emergency Call-Taking
	Emergency Data Collection
	Emergency Dispatch
	Emergency Evacuation Support
	Emergency Incident Command
	Emergency Response Management
	Emergency Routing
City of Sevierville Field Sensors	Roadway Basic Surveillance
City of Sevierville Fire Vehicles	EV On-Board En Route Support
City of Sevierville Police Vehicles	EV On-Board En Route Support

Element Name	Functional Object
City of Sevierville Traffic Signals	Roadway Field Management Station Operation
	Roadway Signal Control
	Roadway Signal Preemption
City of Sevierville/Pigeon Forge TOC	TMC Basic Surveillance
	TMC Data Collection
	TMC Evacuation Support
	TMC Incident Detection
	TMC Incident Dispatch Coordination
	TMC Multi-Modal Coordination
	TMC Regional Traffic Management
	TMC Roadway Equipment Monitoring
	TMC Signal Control
	TMC Traffic Information Dissemination
	TMC Work Zone Traffic Management
Commercial Vehicles	CV On-Board Cargo Monitoring
ETHRA Tranportation Operations Facility CCTV Camera Surveillance	Field Secure Area Sensor Monitoring
	Field Secure Area Surveillance
ETHRA Transportation Data Archive	Archive Data Repository
	Archive Government Reporting
	Archive On-Line Analysis and Mining
	Archive Situation Data Archival
ETHRA Transportation Dispatch Center	Emergency Secure Area Alarm Support
	Emergency Secure Area Sensor Management
	Emergency Secure Area Surveillance
	Transit Center Fare Management
	Transit Center Paratransit Operations
	Transit Center Security

Element Name	Functional Object
ETHRA Transportation Dispatch Center (cont.)	Transit Center Vehicle Tracking
ETHRA Transportation IVR System	TIC Traveler Telephone Information
ETHRA Vehicles	Transit Vehicle On-Board Fare Management
	Transit Vehicle On-Board Maintenance
	Transit Vehicle On-Board Paratransit Operations
	Transit Vehicle On-Board Trip Monitoring
	Transit Vehicle Schedule Management
	Transit Vehicle Security
ETHRA Website	TIC Data Collection
	TIC Interactive Traveler Information
	TIC Trip Planning
Financial Service Provider	PAC Payment Administration
Great Smoky Mountains National Park	TMC Regional Traffic Management
KAT Fixed Route Vehicles	Transit Vehicle On-Board Fare Management
	Transit Vehicle On-Board Information Services
	Transit Vehicle On-Board Maintenance
	Transit Vehicle Passenger Counting
	Transit Vehicle Security
	Transit Vehicle Signal Priority
KAT Operations Facility CCTV Cameras Surveillance	Field Secure Area Sensor Monitoring
	Field Secure Area Surveillance
KAT Social Media Accounts	TIC Data Collection
	TIC Interactive Traveler Information
	TIC Trip Planning
KAT Transit Center CCTV Camera Surveillance	Field Secure Area Sensor Monitoring
	Field Secure Area Surveillance
KAT Transit Data Archive	Archive Data Repository

Element Name	Functional Object
KAT Transit Data Archive (cont.)	Archive Government Reporting
	Archive On-Line Analysis and Mining
	Archive Situation Data Archival
KAT Transit Dispatch Center	Emergency Secure Area Alarm Support
	Emergency Secure Area Sensor Management
	Emergency Secure Area Surveillance
	Transit Center Data Collection
	Transit Center Fare Management
	Transit Center Fixed-Route Operations
	Transit Center Information Services
	Transit Center Multi-Modal Coordination
	Transit Center Operator Assignment
	Transit Center Passenger Counting
	Transit Center Security
	Transit Center Vehicle Assignment
	Transit Center Vehicle Tracking
	Transit Evacuation Support
	Transit Garage Maintenance
KAT Transit Kiosks	TIC Interactive Traveler Information
	TIC Travel Services Information and Reservation
KAT Website	TIC Data Collection
	TIC Interactive Traveler Information
	TIC Trip Planning
Knox County CAC IVR System	TIC Travel Services Information and Reservation
Knox County CAC Transit Data Archive	Archive Data Repository
	Archive Government Reporting
	Archive On-Line Analysis and Mining

Element Name	Functional Object
Knox County CAC Transit Data Archive (cont.)	Archive Situation Data Archival
Knox County CAC Transit Dispatch Center	Emergency Secure Area Alarm Support
	Emergency Secure Area Sensor Management
	Emergency Secure Area Surveillance
	Transit Center Data Collection
	Transit Center Fare Management
	Transit Center Information Services
	Transit Center Multi-Modal Coordination
	Transit Center Operator Assignment
	Transit Center Paratransit Operations
	Transit Center Security
	Transit Center Vehicle Assignment
	Transit Center Vehicle Tracking
	Transit Evacuation Support
	Transit Garage Maintenance
Knox County CAC Transit Operations Facility CCTV Camera Surveillance	Field Secure Area Sensor Monitoring
	Field Secure Area Surveillance
Knox County CAC Vehicles	Transit Vehicle On-Board Fare Management
	Transit Vehicle On-Board Maintenance
	Transit Vehicle On-Board Paratransit Operations
	Transit Vehicle On-Board Trip Monitoring
	Transit Vehicle Schedule Management
	Transit Vehicle Security
	TIC Data Collection
	TIC Interactive Traveler Information
	TIC Trip Planning
Knox County CCTV Cameras	Roadway Basic Surveillance

Element Name	Functional Object
Knox County E911 Dispatch	Emergency Call-Taking
	Emergency Data Collection
	Emergency Dispatch
	Emergency Environmental Monitoring
	Emergency Evacuation Support
	Emergency Incident Command
	Emergency Response Management
	Emergency Routing
Knox County EMA	Emergency Evacuation Support
	Emergency Incident Command
	Emergency Response Management
Knox County EMA Website	TIC Data Collection
	TIC Emergency Traveler Information
Knox County Emergency Communication System	Emergency Evacuation Support
	Emergency Response Management
Knox County Field Sensors	Roadway Basic Surveillance
	Roadway Field Management Station Operation
Knox County Sheriff Vehicles	EV On-Board En Route Support
Knox County TOC	TMC Basic Surveillance
	TMC Data Collection
	TMC Regional Traffic Management
	TMC Roadway Equipment Monitoring
	TMC Signal Control
Knox County Traffic Signals	Roadway Field Management Station Operation
	Roadway Signal Control
	Roadway Signal Preemption

Element Name	Functional Object
Knoxville Regional TPO Data Archive	Archive Data Repository
	Archive Government Reporting
	Archive On-Line Analysis and Mining
	Archive Situation Data Archival
Knoxville TPO SmartTrips	TIC Data Collection
	TIC Dynamic Ridesharing
	TIC Shared Use
	TIC Trip Planning
Loudon County E911 Dispatch	Emergency Call-Taking
	Emergency Data Collection
	Emergency Dispatch
	Emergency Early Warning System
	Emergency Environmental Monitoring
	Emergency Evacuation Support
	Emergency Incident Command
	Emergency Response Management
Loudon County EMA	Emergency Evacuation Support
	Emergency Incident Command
	Emergency Response Management
Loudon County Fire and Rescue Vehicles	EV On-Board En Route Support
Loudon County Sheriff Vehicles	EV On-Board En Route Support
Loudon County Traffic Signals	Roadway Field Management Station Operation
	Roadway Signal Control
	Roadway Signal Preemption
Municipal CCTV Cameras	Roadway Basic Surveillance

Element Name	Functional Object
Municipal Field Sensors	Roadway Basic Surveillance
	Roadway Field Management Station Operation
Municipal Public Safety Dispatch	Emergency Call-Taking
	Emergency Data Collection
	Emergency Dispatch
	Emergency Evacuation Support
	Emergency Incident Command
	Emergency Response Management
	Emergency Routing
Municipal Public Safety Vehicles	EV On-Board En Route Support
Municipal TOC	TMC Basic Surveillance
	TMC Data Collection
	TMC Environmental Monitoring
	TMC Evacuation Support
	TMC Incident Detection
	TMC Incident Dispatch Coordination
	TMC Roadway Equipment Monitoring
	TMC Signal Control
	TMC Standard Rail Crossing Management
	TMC Traffic Information Dissemination
	TMC Work Zone Traffic Management
Municipal Traffic Signals	Roadway Field Management Station Operation
	Roadway Signal Control
	Roadway Signal Preemption

Element Name	Functional Object
Municipal/County Maintenance	MCM Environmental Information Collection
	MCM Environmental Information Processing
	MCM Incident Management
	MCM Roadway Maintenance
	MCM Vehicle Tracking
	MCM Work Activity Coordination
	MCM Work Zone Management
Municipal/County Maintenance Vehicles	MCV Vehicle Location Tracking
	MCV Work Zone Support
Municipal/County RWIS	Roadway Environmental Monitoring
Municipal/County Social Media Sites	TIC Data Collection
	TIC Traveler Information Broadcast
Municipal/County Website	TIC Data Collection
	TIC Traveler Information Broadcast
Other County 911 Dispatch	Emergency Call-Taking
	Emergency Dispatch
	Emergency Incident Command
	Emergency Response Management
Other Maintenance and Construction Management	MCM Work Activity Coordination
Other TDOT Region Construction Offices	MCM Work Activity Coordination
Other TDOT Region Maintenance	MCM Work Activity Coordination
Personal Computing Devices	Personal Traveler Information Reception
Pigeon Forge/Sevierville Trolley Dispatch	Emergency Secure Area Alarm Support
	Emergency Secure Area Sensor Management
	Emergency Secure Area Surveillance
	Transit Center Fare Management
	Transit Center Fixed-Route Operations

Element Name	Functional Object
Pigeon Forge/Sevierville Trolley Dispatch (cont.)	Transit Center Information Services
	Transit Center Multi-Modal Coordination
	Transit Center Operator Assignment
	Transit Center Passenger Counting
	Transit Center Security
	Transit Center Vehicle Assignment
	Transit Center Vehicle Tracking
	Transit Evacuation Support
Pigeon Forge/Sevierville Trolley Vehicles	Transit Vehicle On-Board Fare Management
	Transit Vehicle On-Board Information Services
	Transit Vehicle On-Board Trip Monitoring
	Transit Vehicle Passenger Counting
	Transit Vehicle Schedule Management
	Transit Vehicle Security
Pigeon Forge/Sevierville Trolley Website	TIC Data Collection
	TIC Interactive Traveler Information
	TIC Operations Data Collection
	Transit Stop Information Services
	Traveler Interactive Information
	Traveler Trip Planning
Private Information Provider	TIC Dynamic Ridesharing
	TIC Interactive Traveler Information
	TIC Operations Data Collection
	TIC Traveler Information Broadcast
	TIC Trip Planning
Private Subscription Data Service Provider	TIC Data Collection
	TIC Interactive Traveler Information

Element Name	Functional Object
Private Subscription Data Service Provider (cont.)	TIC Traveler Information Broadcast
Private Transportation Providers	Transit Center Multi-Modal Coordination
Private Traveler Vehicle	Vehicle Basic Toll/Parking Payment
	Vehicle Location Determination
	Vehicle Support Services
Rural Metro Dispatch	Emergency Call-Taking
	Emergency Dispatch
	Emergency Evacuation Support
	Emergency Incident Command
	Emergency Response Management
Rural Metro EMS Vehicles	EV On-Board En Route Support
Rural Metro Fire Vehicles	EV On-Board En Route Support
Sevier County E911 Dispatch	Emergency Call-Taking
	Emergency Data Collection
	Emergency Dispatch
	Emergency Environmental Monitoring
	Emergency Evacuation Support
	Emergency Incident Command
	Emergency Response Management
Sevier County EMA	Emergency Evacuation Support
	Emergency Incident Command
	Emergency Response Management
Sevier County EMS Vehicles	EV On-Board En Route Support
Surrounding County Transit Agencies	Transit Center Multi-Modal Coordination
TDOT CCTV Cameras	Roadway Basic Surveillance
TDOT Connected Vehicle Roadside Equipment	RSE Environmental Monitoring
	RSE Queue Warning

Element Name	Functional Object
TDOT Connected Vehicle Roadside Equipment (cont.)	RSE Traffic Monitoring
TDOT Data Archive	Archive Data Repository
	Archive Government Reporting
	Archive On-Line Analysis and Mining
	Archive Situation Data Archival
	TMC Data Collection
TDOT District Maintenance	MCM Incident Management
	MCM Vehicle Tracking
	MCM Work Activity Coordination
	MCM Work Zone Management
TDOT DMS	Roadway Traffic Information Dissemination
	Roadway Work Zone Traffic Control
TDOT Emergency Services Coordinator	MCM Incident Management
	MCM Roadway Maintenance
TDOT Field Sensors	Roadway Basic Surveillance
	Roadway Field Management Station Operation
TDOT HAR	Roadway Traffic Information Dissemination
	Roadway Work Zone Traffic Control
TDOT HELP Vehicles	EV On-Board En Route Support
	EV On-Board Incident Management Communication
TDOT Maintenance Headquarters	MCM Environmental Information Collection
	MCM Environmental Information Processing
TDOT Maintenance Vehicles	MCV Vehicle Location Tracking
	MCV Work Zone Support
TDOT Public Information Office	TIC Data Collection
	TIC Traveler Information Broadcast
TDOT Ramp Metering Equipment	Roadway Field Management Station Operation

Element Name	Functional Object
TDOT Ramp Metering Equipment (cont.)	Roadway Traffic Metering
TDOT Ramp Queue Detection System	Roadway Basic Surveillance
	Roadway Environmental Monitoring
	Roadway Warning
TDOT Region 1 Construction Office	MCM Work Activity Coordination
TDOT Region 1 HELP Dispatch	TMC Service Patrol Management
TDOT Region 1 Maintenance	MCM Environmental Information Collection
	MCM Incident Management
	MCM Roadway Maintenance
TDOT Region 1 TMC - Knoxville	TMC Basic Surveillance
	TMC Data Collection
	TMC Environmental Monitoring
	TMC Evacuation Support
	TMC Incident Detection
	TMC Incident Dispatch Coordination
	TMC Regional Traffic Management
	TMC Roadway Equipment Monitoring
	TMC Roadway Warning
	TMC Situation Data Management
	TMC Traffic Information Dissemination
	TMC Traffic Metering
	TMC Work Zone Traffic Management
TDOT Region 2 TMC - Chattanooga	TMC Regional Traffic Management
TDOT Region 3 TMC - Nashville	TMC Regional Traffic Management
TDOT Region 4 TMC - Memphis	TMC Regional Traffic Management
TDOT Roadway Warning Equipment	Roadway Basic Surveillance
	Roadway Field Management Station Operation

Element Name	Functional Object
TDOT Roadway Warning Equipment (cont.)	Roadway Warning
TDOT RWIS Sensors	Roadway Environmental Monitoring
TDOT Smart Work Zone Equipment	Roadway Work Zone Traffic Control
TDOT SmartWay Information System (TSIS)	MCM Environmental Information Processing
	MCM Incident Management
	MCM Work Activity Coordination
	MCM Work Zone Management
	TIC Data Collection
	TIC Emergency Traveler Information
	TIC Interactive Traveler Information
	TIC Traveler Information Broadcast
TDOT SmartWay Website	TIC Data Collection
	TIC Emergency Traveler Information
	TIC Interactive Traveler Information
	TIC Traveler Information Broadcast
TDOT Wrong Way Detection and Warning Equipment	Roadway Basic Surveillance
	Roadway Traffic Information Dissemination
	Roadway Wrong Way Vehicle Detection
TEMA	Emergency Evacuation Support
	Emergency Incident Command
	Emergency Response Management
Tennessee 511 IVR	TIC Traveler Telephone Information
Tennessee 511 System	TIC Data Collection
	TIC Emergency Traveler Information
	TIC Interactive Traveler Information
	TIC Traveler Telephone Information
Tennessee Bureau of Investigation	Emergency Early Warning System

Element Name	Functional Object
The LIFT Dispatch Center	Emergency Secure Area Alarm Support
	Emergency Secure Area Sensor Management
	Emergency Secure Area Surveillance
	Transit Center Data Collection
	Transit Center Fare Management
	Transit Center Information Services
	Transit Center Multi-Modal Coordination
	Transit Center Operator Assignment
	Transit Center Paratransit Operations
	Transit Center Security
	Transit Center Vehicle Assignment
	Transit Center Vehicle Tracking
	Transit Evacuation Support
	Transit Garage Maintenance
The LIFT IVR System	TIC Traveler Telephone Information
The LIFT Paratransit Vehicles	Transit Vehicle On-Board Fare Management
	Transit Vehicle On-Board Maintenance
	Transit Vehicle On-Board Paratransit Operations
	Transit Vehicle On-Board Trip Monitoring
	Transit Vehicle Schedule Management
	Transit Vehicle Security
THP Dispatch	Emergency Call-Taking
	Emergency Data Collection
	Emergency Dispatch
	Emergency Early Warning System
	Emergency Environmental Monitoring
	Emergency Evacuation Support

Element Name	Functional Object
THP Dispatch (cont.)	Emergency Incident Command
	Emergency Response Management
THP Vehicles	EV On-Board En Route Support
THP Weigh-in-Motion	CVCE Weigh-In-Motion
TITAN Database	Archive Data Repository
	Archive Government Reporting
	Archive On-Line Analysis and Mining
	Archive Situation Data Archival
Town of Farragut CCTV Cameras	Roadway Basic Surveillance
Town of Farragut Field Sensors	Roadway Basic Surveillance
	Roadway Field Management Station Operation
Town of Farragut TOC	TMC Basic Surveillance
	TMC Evacuation Support
	TMC Incident Dispatch Coordination
	TMC Regional Traffic Management
	TMC Roadway Equipment Monitoring
	TMC Signal Control
	TMC Traffic Metering
Town of Farragut Traffic Signals	Roadway Field Management Station Operation
	Roadway Signal Control
	Roadway Signal Preemption
Volunteer Fire Vehicles	EV On-Board En Route Support

APPENDIX D – EXISTING AGREEMENT DOCUMENTS

Appendix D – Agreements

1. TDOT 1 – TDOT Access Agreement for Live Video (Private User)
2. TDOT 2A - TDOT Access Agreement for Live Video (Government User)
3. TDOT 2B - TDOT Access Agreement for Live Video (Responder User)
4. TDOT 3 - Quick Clearance MOU
5. COM 1A - MACTO Interlocal Agreement
6. COM 1B - Maryville, Alcoa and Blount County Interlocal Agreement
7. TDOT 4 - Communications Resource License Agreement between TDOT and City of Knoxville
8. TDOT 5A - Communications Resource License Agreement between TDOT and Knology
9. TDOT 5B - Communications Resource License Agreement between TDOT and Comcast
10. COK 1 - Fiber Optic Agreement between City of Knoxville and Knoxville Utilities Board (KUB)

TDOT 1

TDOT Access Agreement for Live Video (Private User)

Tennessee Department of Transportation

TRAFFIC OPERATIONS PROGRAM POLICY

Effective Date:

Title: Access to Live Video feeds and Information Sharing

POLICY

The Tennessee Department of Transportation (TDOT) will make live video of traffic conditions from Closed Circuit Television (CCTV) available to the public. CCTV feeds from the Regional Transportation Management Centers (RTMC), located in Nashville, Knoxville, Chattanooga, and Memphis, will be supplied through TDOT's SmartView CCTV web site. The video feeds provided are those made available by the RTMC Operators from the images on the traffic surveillance monitors within the RTMC and that are consistent with the objectives of traffic management.

Live video feeds will generally be made available upon request to other government and public agencies to better coordinate traffic management strategies on incidents and crashes, and to private news media and other organizations for their use in providing traffic information to the public or their customers.

A non-exclusive access Agreement is required in order for governmental and private interests to receive access to live video. Costs associated with the access connection, if any, will be determined by TDOT and may become the responsibility of the USER.

BACKGROUND

In order to gather real-time traffic condition information, TDOT has constructed and operates four Regional Traffic management Centers located in Nashville, Knoxville, Chattanooga, and Memphis. The RTMC is the central collection point for roadway condition information. The RTMC support systems gather and disseminate traffic information using the latest technologies.

CCTV has proven to be a significant management and delay-reduction tool for the identification and verification of incidents and crashes, thereby enabling a proper and timely response. The sharing of video information enhances the communication of current traffic conditions, thereby aiding travelers in planning their trip times, routes, and travel mode using the latest available information. TDOT will operate and maintain the CCTV system for the purpose of enhancing traffic incident response on the Tennessee roadway system. TDOT wishes to share that traffic information with other transportation operating agencies, incident response agencies and the public.

Tennessee Department of Transportation
And
Private Entity USERs

ACCESS AGREEMENT FOR LIVE VIDEO AND INFORMATION SHARING

This Access Agreement for Live Video and Information Sharing is an Agreement between the Tennessee Department of Transportation (TDOT) and _____hereafter referred to as the "USER."

The effective date of this Agreement is _____.

The "Access to Live Video" is that video provided by a Closed Circuit Television (CCTV) system developed for traffic management and provided by the Tennessee Department of Transportation Regional Transportation Management Centers (RTMC) operated by TDOT. The CCTV feeds will show live traffic conditions including crashes, stalled vehicles, road hazards, weather conditions, traffic congestion, maintenance work, and repair work locations.

The purpose of providing the USER with Access to Live Video is to detect and disseminate real-time traffic information to motorists and improve incident response and recovery. The following provisions of this Agreement are intended to ensure that the CCTV system is accessed and its information is used for this purpose and this purpose alone.

Information Sharing, as defined in this agreement, is that information provided or discovered by the USER which has an adverse traffic impact on any Tennessee Interstate, State Route, and that which adversely affects travelers. Any information that falls within this definition will be shared with the TDOT RTMC within 10 minutes of receiving such information.

The USER hereby acknowledges and agrees that other matters not specifically addressed in this Agreement may arise and that TDOT shall have the right to make changes in this Agreement, by adding provisions, deleting provisions, and/or changing existing provisions when in TDOT's opinion circumstances require such changes. TDOT shall provide prior written notice of any such changes to this Agreement to the USER at which time the USER may or may not accept the revisions. Not accepting future revisions may result in the USER being denied access to the live video feeds.

USER shall also retain the right to terminate this Agreement as provided herein.

1. **GENERAL INFORMATION:**

A. TDOT will operate and maintain the CCTV system as a traffic management tool and, consistent with this purpose, TDOT agrees to provide the USER with Access to Live Video and Information Sharing. TDOT does not guarantee the continuity of this access, and TDOT does not warrant the quality of any video feeds or the accuracy of any image or information provided. Any reliance on such images or information is at the risk of the USER.

B. TDOT will offer two levels of service for Access to Live Video. Level one, known as SmartView, will be a web based interface offered free of charge to the USER (with the exception of those items mentioned in Section 2.A). Level two will be an enhanced version of the video provided through SmartView but will be accessed via direct feeds from IP addresses. Due to the increased bandwidth associated with this level of service there will be a monthly charge of $950.00 to help TDOT recover the costs.

C. TDOT will not record video feeds except for staff training purposes, and no recordings will be made available to the USER under this Agreement.

D. TDOT will maintain exclusive control of the information and images released from the CCTV system to the USER, including but not limited to determining whether and when to provide a CCTV system feed, from what location, and for what duration. No feed will deploy the cameras' zoom capabilities, and no image will focus on vehicle license plates, drivers, or other personal identification of individuals involved in any traffic-related incident. No image will focus on any property or person outside the TDOT right-of-way. Access via feed will not be provided for events that are not, in the opinion of TDOT personnel, traffic-related. The decision whether to activate, and upon activation to terminate the access, is exclusively at the discretion of TDOT personnel.

E. TDOT RTMC personnel will not accept requests that specific CCTV cameras are operated or repositioned.

F. TDOT will provide each USER the same video feed from the CCTV system as any other USER participating in this Agreement. This Agreement in no way limits or restricts TDOT from providing video information to any other potential USER.

G. TDOT reserves the right to terminate this video access program or to change the areas, times, or levels of access within the RTMC at any time.

H. TDOT will provide Training Opportunities to all entities named in this Agreement and encourage participation in said training.

2. **USER'S RESPONSIBILITIES:**

A. USER is exclusively responsible for any costs related to the purchase and installation of the equipment necessary to receive the live video feed. User will be required to remove previously installed equipment from the RTMC (if any). USER is exclusively responsible for any costs related to the removal of this equipment. USER must give RTMC personnel reasonable advance notice to schedule an appointment to remove equipment and RTMC personnel reserve the right to schedule such at a time and in such a manner so as to not interrupt or otherwise obstruct RTMC operations. USER staff at the RTMC shall be under the general direction of the RTMC Manager for routine conduct, privileges, and protocols within the RTMC.

B. USER shall maintain the security and integrity of the CCTV system by limiting use of the system to trained and authorized individuals within their organization, and by insuring the system is used for the specific purpose stated in this Agreement. No feed shall be purposely broadcast live or rebroadcast that is zoomed in on an incident where individuals or license numbers are recognizable.

C. USER accepts all risks inherent with the live video feeds, including, but not limited to, interruptions in the video feed, downtime for maintenance, or unannounced adjustments to the camera displays. TDOT is providing the video feeds as a convenience to the USER and agrees to provide a good faith effort to maintain the video feed from TDOT equipment. The USER agrees to hold TDOT harmless, including TDOT employees and TDOT designated agents, from any damages caused to USER by loss of a video signal due to equipment failure or any act or omission on their part.

D. USER agrees to provide TDOT with a technical contact person and with a list of all USER personnel trained to operate the TDOT SmartView system. USER shall limit technical calls to the RTMC for monitoring, diagnosing problems or otherwise performing any minor service on the SmartView system.

E. USER agrees to acknowledge that the video feeds are provided by the Tennessee Department of Transportation.

F. USER agrees to display the SMARTWAY logo in the upper left hand corner of any view provided outside of the agency.

G. USER agrees to provide timely, accurate information and assistance to TDOT or other agencies, responders and roadway users about roadway conditions, major and minor incidents and alternate routes through the use of any media and USER resources.

i. USER agrees to notify the RTMC of their surrounding TDOT Region of any unexpected incidents that are expected to have an adverse impact on traffic operations of Interstate or State Routes, within 10 minutes of first notification to the USER. This applies to any incident where TDOT or the Tennessee Highway Patrol is not already on-scene. Unexpected incidents may include, but are not limited to: traffic crashes, disabled vehicles, roadway debris, hazardous weather conditions, traffic queues, or traffic signal failures.

ii. USER agrees to collaborate with TDOT with respect to traffic management of planned events that are expected to have an adverse impact on traffic operations of Interstate or State Routes. Planned events include temporary traffic generating events (such as concerts or fairs) and roadway work zone activities (such as construction or maintenance activities). Collaboration and information sharing between USER and TDOT should occur as early as possible.

H. USER is invited to participate in quarterly Regional Traffic Incident Management meetings and may attend any traffic incident management training provided by participating agencies.

3. **LIABILITY AND INDEMNITY PROVISIONS:**

A. USER agrees to defend, indemnify, and hold TDOT harmless from and against any and all liability and expense, including defense costs and legal fees, caused by any negligent or wrongful act or omission of the USER, or its agents, officers, and employees, in the use, possession, or dissemination of information made available from the CCTV system to the extent that such expenses or liability may be incurred by TDOT, including but not limited to, personal injury, bodily injury, death, property damage, and/or injury to privacy or reputation.

B. The liability obligations assumed by the USER pursuant to this Agreement shall survive the termination of the Agreement, as to any and all claims including without limitation liability for any damages to TDOT property or for injury, death, property damage, or injury to personal reputation or privacy occurring as a proximate result of information made available from the CCTV system.

4. **TERMINATION:**

A. TDOT or USER may terminate this Agreement at any time for any reason by providing written notice of termination.

State of Tennessee
Department of Transportation

Approved as to Form:

By:_____ _____
John Schroer John Reinbold
Commissioner General Counsel

Date:_____

USER AGENCY_____

By_____

(Print Name)_____

(Title)_____

Date:_____

Approved by Legal Counsel for USER AGENCY

By_____

(Print Name)_____

(Title)_____

Date:_____

Technical Contact Person:

(Please Print)

Name: _____

Email: _____

Phone: _____

Other Contact Person (Optional**):**

Name: _____

Email: _____

Phone: _____

Other Contact Person (Optional**):**

Name: _____

Email: _____

Phone: _____

TDOT 2A

TDOT Access Agreement for Live Video (Government User)

Tennessee Department of Transportation

TRAFFIC OPERATIONS PROGRAM POLICY

Effective Date:

Title: Access to Live Video feeds and Information Sharing

POLICY

The Tennessee Department of Transportation (TDOT) will make live video of traffic conditions from Closed Circuit Television (CCTV) available to the public. CCTV feeds from the Regional Transportation Management Centers (RTMC), located in Nashville, Knoxville, Chattanooga, and Memphis, will be supplied through TDOT's SmartView CCTV web site. The video feeds provided are those made available by the RTMC Operators from the images on the traffic surveillance monitors within the RTMC and that are consistent with the objectives of traffic management.

Live video feeds will generally be made available upon request to other government and public agencies to better coordinate traffic management strategies on incidents and crashes, and to private news media and other organizations for their use in providing traffic information to the public or their customers.

A non-exclusive access Agreement is required in order for governmental and private interests to receive access to live video. Costs associated with the access connection, if any, will be determined by TDOT and may become the responsibility of the USER.

BACKGROUND

In order to gather real-time traffic condition information, TDOT has constructed and operates four Regional Traffic Management Centers located in Nashville, Knoxville, Chattanooga, and Memphis. The RTMC is the central collection point for roadway condition information. The RTMC support systems gather and disseminate traffic information using the latest technologies.

CCTV has proven to be a significant management and delay-reduction tool for the identification and verification of incidents and crashes, thereby enabling a proper and timely response. The sharing of video information enhances the communication of current traffic conditions, thereby aiding travelers in planning their trip times, routes, and travel mode using the latest available information. TDOT will operate and maintain the CCTV system for the purpose of enhancing traffic incident response on the Tennessee roadway system. TDOT wishes to share that traffic information with other transportation operating agencies, incident response agencies and the public.

Tennessee Department of Transportation
And
Government Entity USERs

ACCESS AGREEMENT FOR LIVE VIDEO AND INFORMATION SHARING

This Access Agreement for Live Video and Information Sharing is an Agreement between the Tennessee Department of Transportation (TDOT) and _____hereafter referred to as the "USER."

The effective date of this Agreement is _____.

The "Access to Live Video" is that video provided by a Closed Circuit Television (CCTV) system developed for traffic management and provided by the Tennessee Department of Transportation Regional Transportation Management Centers (RTMC) operated by TDOT. The CCTV feeds will show live traffic conditions including crashes, stalled vehicles, road hazards, weather conditions, traffic congestion, maintenance work, and repair work locations.

The purpose of providing the USER with Access to Live Video is to detect and disseminate real-time traffic information to motorists and improve incident response and recovery. The following provisions of this Agreement are intended to ensure that the CCTV system is accessed and its information is used for this purpose and this purpose alone.

Information Sharing, as defined in this agreement, is that information provided or discovered by the USER which has an adverse traffic impact on any Tennessee Interstate, State Route, and that which adversely affects travelers. Any information that falls within this definition will be shared with the TDOT RTMC within 10 minutes of receiving such information pursuant to section 2.I.

The USER hereby acknowledges and agrees that other matters not specifically addressed in this Agreement may arise and that TDOT shall have the right to make changes in this Agreement, by adding provisions, deleting provisions, and/or changing existing provisions when in TDOT's opinion circumstances require such changes. TDOT shall provide prior written notice of any such changes to this Agreement to the USER at which time the USER may or may not accept the revisions. Not accepting future revisions may result in the USER being denied access to the live video feeds.

USER shall also retain the right to terminate this Agreement as provided herein.

1. **GENERAL INFORMATION:**

A. TDOT will operate and maintain the CCTV system as a traffic management tool and, consistent with this purpose, TDOT agrees to provide the USER with Access to Live Video and Information Sharing. TDOT does not guarantee the continuity of this access, and TDOT does not warrant the quality of any video image or the accuracy of any image or information provided. Any reliance on such images or information is at the risk of the USER.

B. TDOT will not record video feeds except for staff training purposes, and no files will be made available to the USER under this Agreement.

C. TDOT will maintain exclusive control of the information and images released from the CCTV system to the USER, including but not limited to determining whether and when to provide a CCTV system feed, from what location, and for what duration. No feed will deploy the cameras' zoom capabilities, and no image will focus on vehicle license plates, drivers, or other personal identification of individuals involved in any traffic-related incident. No image will focus on any property or person outside the TDOT right-of-way. Access via feed will not be provided for events that are not, in the opinion of TDOT personnel, traffic-related. The decision whether to activate, and upon activation to terminate the access, is exclusively at the discretion of TDOT personnel.

D. TDOT RTMC personnel will not accept requests that specific CCTV cameras are operated or repositioned.

E. TDOT will provide each USER the same video feed from the CCTV system as any other USER participating in this Agreement. This Agreement in no way limits or restricts TDOT from providing video information to any other potential user.

F. TDOT reserves the right to terminate this video access program or to change the areas, times, or levels of access within the RTMC at any time.

G. TDOT will provide training opportunities to all entities named in this Agreement and encourage participation in said training.

2. **USER'S RESPONSIBILITIES:**

A. USER is exclusively responsible for any costs related to the purchase and installation of the equipment necessary to receive the live video feed. User will be required to remove previously installed equipment from the RTMC (if any). USER is exclusively responsible for any costs related to the removal of this equipment. USER must give RTMC personnel reasonable advance notice to schedule an appointment to remove equipment and RTMC personnel reserve the right to schedule such at a time and in such a manner so as to not interrupt or otherwise obstruct RTMC operations. USER staff at the RTMC shall be under the

general direction of the RTMC Manager for routine conduct, privileges, and protocols within the RTMC.

B. USER shall maintain the security and integrity of the CCTV system by limiting use of the system to trained and authorized individuals within their agency, and by insuring the system is used for the specific purpose stated in this Agreement. No feed shall be purposely broadcast live or rebroadcast that is zoomed in on an incident where individuals or license numbers are recognizable.

C. USER accepts all risks inherent with the live video feeds, including, but not limited to, interruptions in the video feeds, downtime for maintenance, or unannounced adjustments to the camera displays. TDOT is providing the video feeds as a convenience to the USER and agrees to provide a good faith effort to maintain the video feed from TDOT equipment. USER agrees that it shall not seek to hold TDOT, including TDOT employees and TDOT designated agents, liable for any damages caused to USER by loss of a video signal due to equipment failure or any act or omission on their part.

D. USER agrees to provide TDOT with a technical contact person and with a list of all USER personnel trained to operate the TDOT SmartView system. USER shall limit technical calls to the RTMC for monitoring, diagnosing problems or otherwise performing any minor service on the SmartView system.

E. USER agrees to acknowledge that the video feeds are provided by the Tennessee Department of Transportation.

F. USER agrees to display the SMARTWAY logo in the upper left hand corner of any view provided outside of the agency.

G. USER agrees to actively participate in the National Traffic Incident Management Responder Training Program. USER agrees that any employee of the agency reporting to the scene of an incident shall attend one 4-hour, in-person, National Traffic Incident Responder Training Program session within one year of the signing of this document. Training sessions will be provided for free and coordinated between the USER and TDOT.

H. USER agrees to support and abide by the concept of a safe and quick clearance approach to traffic incidents and events, as defined by the National Traffic Incident Responder Training Program.

I. USER agrees to provide timely, accurate information and assistance to TDOT or other agencies, responders and roadway users about roadway conditions, major and minor incidents and alternate routes through the use of any USER resources.

   i. USER agrees to notify the RTMC of their surrounding TDOT Region of any unexpected incidents that are expected to have an adverse impact on traffic operations of Interstate or State Routes, within 10 minutes of first notification to the USER. This applies to any incident where TDOT or the

Tennessee Highway Patrol is not already on-scene. Unexpected incidents may include, but are not limited to: traffic crashes, disabled vehicles, roadway debris, hazardous weather conditions, traffic queues, or traffic signal failures.

ii. USER agrees to collaborate with TDOT with respect to traffic management of planned events that are expected to have an adverse impact on traffic operations of Interstate or State Routes. Planned events include temporary traffic generating events (such as concerts or fairs) and roadway work zone activities (such as construction or maintenance activities). Collaboration and information sharing between USER and TDOT should occur as early as possible.

J. USER agrees to actively participate in quarterly Regional Traffic Incident Management meetings. USER agrees to provide the names of a primary and alternate individual with the authority to speak on behalf of the USER at these quarterly meetings.

3. **LIABILITY AND INDEMNITY PROVISIONS:**

A. To the extent permitted by applicable law, USER agrees that it shall be solely responsible for any and all liability and expense, including defense costs and legal fees, caused by any negligent or wrongful act or omission of the USER, or its agents, officers, and employees, in the use, possession, or dissemination of information made available from the CCTV system, including but not limited to, personal injury, bodily injury, death, property damage, and/or injury to privacy or reputation.

B. To the extent permitted by applicable law, the liability obligations assumed by the USER pursuant to this Agreement shall survive the termination of the Agreement, as to any and all claims arising under paragraph 3.A., including without limitation liability for any damages to TDOT property or for injury, death, property damage, or injury to personal reputation or privacy occurring as a proximate result of information made available from the CCTV system.

4. **TERMINATION:**

A. TDOT or USER may terminate this Agreement at any time for any reason by providing written notice of termination.

State of Tennessee
Department of Transportation

By:_____ _____
John Schroer Date
Commissioner

Approved as to Form:

By:_____ _____
John Reinbold Date
General Counsel

USER AGENCY_____

By_____

(Print Name)_____

(Title)_____

Date:_____

Approved by Legal Counsel for USER AGENCY

By_____

(Print Name)_____

(Title)_____

Date:_____

Technical Contact Person:

(Please Print)

Name: _____

Email: _____

Phone: _____

Other Contact Person (Optional**):**

Name: _____

Email: _____

Phone: _____

Other Contact Person (Optional**):**

Name: _____

Email: _____

Phone: _____

TDOT 2B

TDOT Access Agreement for Live Video (Responder User)

Tennessee Department of Transportation

TRAFFIC OPERATIONS PROGRAM POLICY

Effective Date:

Title: Access to Live Video feeds and Information Sharing

POLICY

The Tennessee Department of Transportation (TDOT) will make live video of traffic conditions from Closed Circuit Television (CCTV) available to the public. CCTV feeds from the Regional Transportation Management Centers (RTMC), located in Nashville, Knoxville, Chattanooga, and Memphis, will be supplied through TDOT's SmartView CCTV web site. The video feeds provided are those made available by the RTMC Operators from the images on the traffic surveillance monitors within the RTMC and that are consistent with the objectives of traffic management.

Live video feeds will generally be made available upon request to other government and public agencies to better coordinate traffic management strategies on incidents and crashes, and to private news media and other organizations for their use in providing traffic information to the public or their customers.

A non-exclusive access Agreement is required in order for governmental and private interests to receive access to live video. Costs associated with the access connection, if any, will be determined by TDOT and may become the responsibility of the USER.

BACKGROUND

In order to gather real-time traffic condition information, TDOT has constructed and operates four Regional Traffic Management Centers located in Nashville, Knoxville, Chattanooga, and Memphis. The RTMC is the central collection point for roadway condition information. The RTMC support systems gather and disseminate traffic information using the latest technologies.

CCTV has proven to be a significant management and delay-reduction tool for the identification and verification of incidents and crashes, thereby enabling a proper and timely response. The sharing of video information enhances the communication of current traffic conditions, thereby aiding travelers in planning their trip times, routes, and travel mode using the latest available information. TDOT will operate and maintain the CCTV system for the purpose of enhancing traffic incident response on the Tennessee roadway system. TDOT wishes to share that traffic information with other transportation operating agencies, incident response agencies and the public.

Tennessee Department of Transportation
And
Responder Entity USERs

ACCESS AGREEMENT FOR LIVE VIDEO AND INFORMATION SHARING

This Access Agreement for Live Video and Information Sharing is an Agreement between the Tennessee Department of Transportation (TDOT) and _____hereafter referred to as the "USER."

The effective date of this Agreement is _____.

The "Access to Live Video" is that video provided by a Closed Circuit Television (CCTV) system developed for traffic management and provided by the Tennessee Department of Transportation Regional Transportation Management Centers (RTMC) operated by TDOT. The CCTV feeds will show live traffic conditions including crashes, stalled vehicles, road hazards, weather conditions, traffic congestion, maintenance work, and repair work locations.

The purpose of providing the USER with Access to Live Video is to detect and disseminate real-time traffic information to motorists and improve incident response and recovery. The following provisions of this Agreement are intended to ensure that the CCTV system is accessed and its information is used for this purpose and this purpose alone.

Information Sharing, as defined in this agreement, is that information provided or discovered by the USER which has an adverse traffic impact on any Tennessee Interstate, State Route, and that which adversely affects travelers. Any information that falls within this definition will be shared with the TDOT RTMC within 10 minutes of receiving such information pursuant to section 2.I.

The USER hereby acknowledges and agrees that other matters not specifically addressed in this Agreement may arise and that TDOT shall have the right to make changes in this Agreement, by adding provisions, deleting provisions, and/or changing existing provisions when in TDOT's opinion circumstances require such changes. TDOT shall provide prior written notice of any such changes to this Agreement to the USER at which time the USER may or may not accept the revisions. Not accepting future revisions may result in the USER being denied access to the live video feeds.

USER shall also retain the right to terminate this Agreement as provided herein.

1. **GENERAL INFORMATION:**

A. TDOT will operate and maintain the CCTV system as a traffic management tool and, consistent with this purpose, TDOT agrees to provide the USER with Access to Live Video and Information Sharing. TDOT does not guarantee the continuity of this access, and TDOT does not warrant the quality of any video image or the accuracy of any image or information provided. Any reliance on such images or information is at the risk of the USER.

B. TDOT will not record video feeds except for staff training purposes, and no files will be made available to the USER under this Agreement.

C. TDOT will maintain exclusive control of the information and images released from the CCTV system to the USER, including but not limited to determining whether and when to provide a CCTV system feed, from what location, and for what duration. No feed will deploy the cameras' zoom capabilities, and no image will focus on vehicle license plates, drivers, or other personal identification of individuals involved in any traffic-related incident. No image will focus on any property or person outside the TDOT right-of-way. Access via feed will not be provided for events that are not, in the opinion of TDOT personnel, traffic-related. The decision whether to activate, and upon activation to terminate the access, is exclusively at the discretion of TDOT personnel.

D. TDOT RTMC personnel will not accept requests that specific CCTV cameras are operated or repositioned.

E. TDOT will provide each USER the same video feed from the CCTV system as any other USER participating in this Agreement. This Agreement in no way limits or restricts TDOT from providing video information to any other potential user.

F. TDOT reserves the right to terminate this video access program or to change the areas, times, or levels of access within the RTMC at any time.

G. TDOT will provide training opportunities to all entities named in this Agreement and encourage participation in said training.

2. **USER'S RESPONSIBILITIES:**

A. USER is exclusively responsible for any costs related to the purchase and installation of the equipment necessary to receive the live video feed. User will be required to remove previously installed equipment from the RTMC (if any). USER is exclusively responsible for any costs related to the removal of this equipment. USER must give RTMC personnel

reasonable advance notice to schedule an appointment to remove equipment and RTMC personnel reserve the right to schedule such at a time and in such a manner so as to not interrupt or otherwise obstruct RTMC operations. USER staff at the RTMC shall be under the general direction of the RTMC Manager for routine conduct, privileges, and protocols within the RTMC.

B. USER shall maintain the security and integrity of the CCTV system by limiting use of the system to trained and authorized individuals within their agency, and by insuring the system is used for the specific purpose stated in this Agreement. No feed shall be purposely broadcast live or rebroadcast that is zoomed in on an incident where individuals or license numbers are recognizable.

C. USER accepts all risks inherent with the live video feeds, including, but not limited to, interruptions in the video feeds, downtime for maintenance, or unannounced adjustments to the camera displays. TDOT is providing the video feeds as a convenience to the USER and agrees to provide a good faith effort to maintain the video feed from TDOT equipment. To the extent permitted by applicable law, USER agrees to hold TDOT harmless, including TDOT employees and TDOT designated agents, from any damages caused to USER by loss of a video signal due to equipment failure or any act or omission on their part.

D. USER agrees to provide TDOT with a technical contact person and with a list of all USER personnel trained to operate the TDOT SmartView system. USER shall limit technical calls to the RTMC for monitoring, diagnosing problems or otherwise performing any minor service on the SmartView system.

E. USER agrees to acknowledge that the video feeds are provided by the Tennessee Department of Transportation.

F. USER agrees to display the SMARTWAY logo in the upper right hand corner of any view provided outside of the agency.

G. USER agrees to actively participate in the National Traffic Incident Management Responder Training Program. USER agrees that any employee of the agency reporting to the scene of an incident shall attend one 4-hour, in-person, National Traffic Incident Responder Training Program session within one year of the signing of this document. Training sessions will be provided for free and coordinated between the USER and TDOT.

H. USER agrees to support and abide by the concept of a safe and quick clearance approach to traffic incidents and events, as defined by the National Traffic Incident Responder Training Program.

I. USER agrees to provide timely, accurate information and assistance to TDOT or other agencies, responders and roadway users about roadway conditions, major and minor incidents and alternate routes through the use of any USER resources.

i. USER agrees to notify the RTMC of their surrounding TDOT Region of any unexpected incidents that are expected to have an adverse impact on traffic operations of Interstate or State Routes, within 10 minutes of first notification to the USER. This applies to any incident where TDOT or the Tennessee Highway Patrol is not already on-scene. Unexpected incidents may include, but are not limited to: traffic crashes, disabled vehicles, roadway debris, hazardous weather conditions, traffic queues, or traffic signal failures.

ii. USER agrees to collaborate with TDOT with respect to traffic management of planned events that are expected to have an adverse impact on traffic operations of Interstate or State Routes. Planned events include temporary traffic generating events (such as concerts or fairs) and roadway work zone activities (such as construction or maintenance activities). Collaboration and information sharing between USER and TDOT should occur as early as possible.

J. USER agrees to actively participate in quarterly Regional Traffic Incident Management meetings. USER agrees to provide the names of a primary and alternate individual with the authority to speak on behalf of the USER at these quarterly meetings.

3. **LIABILITY AND INDEMNITY PROVISIONS:**

A. To the extent permitted by applicable law, USER agrees to defend, indemnify, and hold TDOT harmless from and against any and all liability and expense, including defense costs and legal fees, caused by any negligent or wrongful act or omission of the USER, or its agents, officers, and employees, in the use, possession, or dissemination of information made available from the CCTV system to the extent that such expenses or liability may be incurred by TDOT, including but not limited to, personal injury, bodily injury, death, property damage, and/or injury to privacy or reputation.

B. The liability obligations assumed by the USER pursuant to this Agreement shall survive the termination of the Agreement, as to any and all claims including without limitation liability for any damages to TDOT property or for injury, death, property damage, or injury to personal reputation or

privacy occurring as a proximate result of information made available from the CCTV system.

4. **TERMINATION:**

A. TDOT or USER may terminate this Agreement at any time for any reason by providing written notice of termination.

State of Tennessee
Department of Transportation

Approved as to Form:

By:_____
John Schroer
Commissioner

_____
John Reinbold
General Counsel

Date:_____

USER AGENCY_____

By_____

(Print Name)_____

(Title)_____

Date:_____

Approved by Legal Counsel for USER AGENCY

By_____

(Print Name)_____

(Title)_____

Date:_____

Technical Contact Person:

Name: _____

Email: _____

Phone: _____

Other Contact Person (Optional**):**

Name: _____

Email: _____

Phone: _____

Other Contact Person (Optional**):**

Name: _____

Email: _____

Phone: _____

TDOT 3

Quick Clearance MOU

OPEN ROADS POLICY

State of Tennessee

"OPEN ROADS POLICY"

Quick Clearance for Safety and Mobility Between the Tennessee Department of Transportation, Tennessee Department of Safety and Homeland Security, and Tennessee Counties and Cities

This Memorandum of Understanding (MOU) by and between the Tennessee Department of Transportation (TDOT), the Tennessee Department of Safety and Homeland Security (TDOSHS), County/City Law Enforcement and Fire and Rescue Agencies (City/County Agencies), establishes a policy for the Tennessee Highway Patrol (THP), TDOT, City/County Agencies to expedite the removal of vehicles, cargo, and debris from roadways on the State Highway System (roadways) to restore, in an URGENT MANNER the safe and orderly flow of traffic following a motor vehicle crash or incident on Tennessee's roadways. This MOU supersedes the 2012 Interagency Agreement on the Urgent Clearance of Highway Incidents signed on 2/16/12, and the previous Open Roads Policy agreement signed by TDOT and the TDOSHS on 10/12/2012. This MOU represents the consolidation and advancement of these previous agreements.

Whereas: Public safety is the highest priority and must be maintained especially when injuries or hazardous materials are involved. The quality of life in the State of Tennessee is heavily dependent upon the free movement of people, vehicles, and commerce. THP, TDOT, and City/County Agencies share the responsibility for achieving and maintaining the degree of order necessary to make this free movement possible. THP, TDOT, and City/County Agencies have the responsibility to do whatever is reasonable to reduce the risk to responders, secondary crashes, and delays associated with incidents, crashes, roadway maintenance, construction, and enforcement activities.

The following operating standards are based on the philosophy that the State Highway System will not be closed or restricted any longer than is absolutely necessary.

Be it resolved: Roadways will be cleared of damaged vehicles,spilled cargo, and debris as soon as it is safe to do so. It is understood that damage to vehicles or cargo may occur as a result of clearing the roadway on an urgent basis. While reasonable attempts to avoid such damage shall be taken, the highest priority is restoring traffic to normal conditions. Incident caused congestion has an enormous cost to society. This cost is significantly greater than the salvage value of an already damaged vehicle and its cargo.

Tennessee Highway Patrol Responsibilities

Members of the THP who respond to the scene of traffic incidents will make clearing the travel portion of the roadway a high priority. When an investigation is required, it will be conducted in as expedient a manner as possible considering the severity of the collision. Non-critical portions of the investigation may be delayed until lighter traffic conditions allow the completion of those tasks. The THP will only close those lanes absolutely necessary to conduct the investigation safely. Whenever practical, crashes on access controlled roadways will be removed to exit ramps, accident investigation sites or other safe areas for completion of investigations. In the enforcement of state laws and regulations, TDOSHS will try to minimize the impacts on traffic, especially during peak commuting periods, and will not block or restrict lanes except as necessary for safety or critical investigations. THP will coordinate with TDOT representatives to set up appropriate traffic control , establish alternate routes, expedite the safe movement of traffic trapped at the scene, and restore the roadway to normal as soon as possible.

Tow trucks will be requested as soon as it is evident that they will be needed to clear the roadway. The THP will assure that all authorized tow operators have met established competency levels and that the equipment is of appropriate size, capacity and design meeting the standards for the State of Tennessee to clear the travel portions of the roadway within 90 minutes, unless extenuating circumstances exist such as the presence of hazardous materials, serious bodily injury or a fatality.

The THP will not unnecessarily cause the delay in reopening all or part of a roadway to allow a company to dispatch their own equipment to off-load cargo or recover a vehicle or load that is impacting traffic during peak traffic hours or creating a hazard to the public. The THP and TDOT will cooperate in planning and implementing clearance operations in the most safe and expeditious manner.

The THP will encourage and assist other emergency responders in clearing incident scenes as soon as possible after their respective duties have been performed so as to reduce distractions for motorists and restore the roadway to normal operating conditions.

The THP will support the deployment of the National Traffic Incident Management Training Program in Tennessee, and include information about safe and efficient traffic incident management and urgent clearance of roadways in the training provided by the TDOSHS Training Academy.

Tennessee Department of Transportation Responsibilities

When requested by the THP or City/County Agencies, TDOT will respond and deploy resources to major traffic incidents 24 hours a day, 7 days per week. Each TDOT District will develop and implement response procedures to meet the goal of providing initial traffic control within 60 minutes of notification at all times within the district.

TDOT will dispatch HELP trucks to incident scenes within the areas served by the HELP program. Whenever possible, TDOT will also dispatch HELP trucks outside of the normal service areas when requested by TDOSHS. TDOT will also dispatch "Protect the Queue" (PTQ) vehicles when queue lengths from the primary incident are expected to exceed one quarter (¼) mile or at the request of TDOSHS or HELP Operators.

TDOT, in cooperation with the THP, will determine and deploy the necessary heavy equipment and manpower to reopen the roadway if clearance of the travel lanes are being delayed or is determined that the task is beyond the capabilities of the wrecker service on scene. If cargo or non-hazardous spilled loads are involved, TDOT will make every effort to assist in the relocation of the materials in the shortest possible time, using whatever equipment necessary. All such materials or any vehicles relocated by TDOT will be moved as short a distance as possible to eliminate the traffic hazard.

TDOT personnel will document all hours and equipment used for traffic control, roadway clearance, and debris clean up. TDOT will place traffic control devices at the scene should any damaged vehicles or cargo remain adjacent to the travel lanes on the shoulder for removal at a later time.

When requested, TDOT will assist in establishing temporary detours and associated traffic control. TDOT will work to provide a way for traffic caught in an extended closure to exit the controlled access highway safely to an alternate route.

TDOT will install and maintain reference markers, signs and other FHWA-approved markings as requested by TDOSHS to allow quicker location of incidents and to facilitate investigation and reporting of incidents. This includes enhanced (every 0.2 mile) mile markers on all Interstate Highways.

TDOT will strive to minimize the traffic impacts of highway construction and maintenance and will consult with TDOSHS about ways to accomplish that objective. TDOT will advise TDOSHS as far in advance as possible of all construction and maintenance activities that may have a significant impact on traffic flow and safety along state highways.

Local Law Enforcement, Fire and Rescue Department Responsibilities

Members of City/County Agencies who respond to the scene of traffic incidents will make clearing the travel portion of the roadway a high priority. When investigating an incident, the investigation will be conducted in as expedient a manner as possible considering the severity of the collision (serious injuries, fatality, or hazardous materials). City/County Agencies will close only those lanes absolutely necessary to safely conduct the fire/rescue operations. City/County Agencies will coordinate with TDOT representatives to set up appropriate traffic control, establish alternate routes, expedite the safe movement of traffic trapped at the scene, and restore the roadway to normal conditions as soon as possible. As soon as TDOT has set up appropriate traffic control for the safety of the responders and travelers, City/County Agencies will move any fire/rescue apparatus or vehicles initially used to shield responders to appropriate areas.

All Agencies Shared Responsibilities:

Agencies will work together at incident scenes to promote urgent clearance, safety for motorists and emergency responders, and thorough investigations as required by the circumstances. Initial Incident Command will be established by the first responder arriving on the scene of an incident in accordance with the protocols and procedures of the NIMS.

Agencies understand that additional damage to vehicles or cargo may occur as the result of clearing the roadway on an urgent basis. The priority is treatment and recovery of injured parties, public and responder safety, and restoring the roadway to normal conditions as soon as possible. Agencies will carry out the processes and procedures for removal of vehicles, spilled cargo, or other personal property as outlined in TCA § 54-16-113.

Agencies will position emergency equipment at incident scenes to minimize the impacts on traffic flow and to avoid blocking or restricting lanes unnecessarily. Further, the parties will coordinate the use of emergency lights at incident scenes, as practical and consistent with on-scene safety, to minimize distractions to motorists. The parties will also encourage other emergency responders to position their equipment accordingly and practice light discipline.

For incidents involving hazardous materials, agencies will work together with TEMA, fire services, and other responsible agencies. Once public safety has been assured, the priority will shift to opening one lane of travel and restoring the roadway to full capacity as soon as possible.

TDOT and TDOSHS will work together to ensure that safe and efficient traffic incident management and urgent clearance of roadways is part of the training provided for all law enforcement, fire and emergency medical services, rescue squads, towing and recovery operators, and other incident responders in Tennessee through supporting the National Traffic Incident Management Training Program.

TDOT, TDOSHS, local responders, and other agencies as needed, will conduct after action review (AAR) meetings as early as possible for incidents involving the long term closure of Tennessee highways as agreed upon by the relevant responding partners. The intent of these AAR meetings is not to assign blame for failures, but to seek to learn how process improvements can be made together to support the quick clearance of incidents.

Agencies will advise their personnel of this Agreement and promote implementation at every level of their organizations through established channels and protocol. TDOT will distribute advisory memorandums to personnel in Headquarters, Regions, Districts and County Offices.

Therefore, it is agreed as follows:

The THP, TDOT, and City/County Agencies, will evaluate and continually update and modify their operating policies, procedures, rules, and standards to assure they are consistent with this **"OPEN ROADS POLICY"** MOU.

The THP, TDOT, and City/County Agencies, will research, evaluate and conduct training in the most advanced technologies, equipment, and approved methods for the documentation and investigation of crash or incident scenes. THP and City/County Agencies will prioritize the investigative tasks and reopen travel lanes upon completion of tasks that must be conducted, without the impediment of traffic flowing.

Roadways will be cleared as soon as possible. It is the goal of THP, TDOT, and City/County Agencies that all incidents be cleared from the roadway within 90 minutes of the arrival of the first responding officer. This goal is being made with the understanding that a more complex

scenario may require additional time for complete clearance. Incidents that extend beyond the 90 minute goal will be assessed every 30 minutes to determine an expected clearance time and reported to the appropriate communications center.

The THP, TDOT, and City/County Agencies, will determine the well-being of motorists in the event of a lengthy traffic queue and /or roadway closure and provide assistance to motorists within the stopped traffic queue whenever possible.

Agencies will meet periodically to discuss experiences with incident management and to work toward improvements. In addition to the AAR meeting described above, periodic working sessions will be held in each of the TDOT Region Offices with TDOSHS, TDOT, and other state and local agencies to discuss overall incident management and related issues. The goal will be to have a Regional TIM Taskforce (Workgroup) meeting quarterly in each of TDOT's four regions.

It is further agreed that:

The THP, TDOT, and City/County Agencies, will actively solicit and enlist other state, county, and local agencies, political subdivisions, industry groups, and professional associations to endorse and become party to this **"OPEN ROADS POLICY"** for the State of Tennessee.

MOU Execution: ***Use of Counterpart Signature Pages***

This MOU, and any amendments hereto may be simultaneously executed in multiple counterparts, each of which so executed shall be deemed to be an original, and such counterparts together shall constitute one and the same instrument. Notwithstanding any other provision herein to the contrary, this MOU shall constitute an agreement amongst the parties that have executed a counterpart and parties listed but not executing shall not be deemed to be parties to the MOU.

In witness whereof, each party hereto has caused this document to be executed in its name and on its behalf by its duly authorized Chief Executive.

AGREED AND EXECUTED BY:

FOR TDOSHS: _____ 10/16/19

COMMISSIONER JEFF LONG — DATE:
TENNESSEE DEPARTMENT OF SAFETY
AND HOMELAND SECURITY

_____ 10-16-2019

COLONEL DERECK STEWART — DATE
TENNESSEE HIGHWAY PATROL

FOR TDOT _____ 10/16/2019

COMMISSIONER CLAY BRIGHT — DATE:
TENNESSEE DEPARTMENT OF TRANSPORTATION

_____ 10/16/19

CHIEF ENGINEER, PAUL DEGGES — DATE:
TENNESSEE DEPARTMENT OF TRANSPORTATION

Tennessee's

"OPEN ROADS POLICY"

Quick Clearance for Safety and Mobility

_____

Local Agency

By: _____

Print/Type Name: _____

Title: _____

Date: _____

ADDITIONAL SIGNATORIES

Name	Title	Date
Name	Title	Date
Name	Title	Date
Name	Title	Date

COM 1A

MACTO Interlocal Agreement

AN INTERLOCAL AGREEMENT TO ESTABLISH CENTRALIZED TRAFFIC OPERATIONS BETWEEN THE CITIES OF ALCOA AND MARYVILLE, TENNESSEE

This Agreement made and entered into on this the 5th day of June, 2012 by and between the City of Alcoa and City of Maryville, municipal corporations located in Blount County, Tennessee.

WITNESSETH:

THAT WHEREAS, the parties hereto are responsible for governing and managing services within their respective territorial jurisdictions; and

WHEREAS, there are instances where the most practical and cost-effective method to accomplish such responsibilities is through a joint and cooperative effort of the parties hereto; and

WHEREAS, the parties may enter into cooperative agreements pursuant to the Interlocal Government Cooperation Act found at Tennessee Code Annotated § 12-9-101, *et seq.*, as well as through other provisions of the Tennessee Code; and

WHEREAS, the parties have completed work on the traffic signal systems in both cities installing compatible equipment and coordinating timing in and between both jurisdictions; and

WHEREAS, joint traffic signal operation and maintenance is a means to manage systems in a collaborative way that should minimize duplications of effort, and the services provided by each jurisdiction will be greatly improved and streamlined.

NOW THEREFORE, for and in consideration of the premises and the mutual covenants and agreements hereinafter contained, it is agreed between the parties hereto as follows:

1. **NAME.** There is hereby established a Maryville-Alcoa Central Traffic Operations group (the "Group") also known as "MACTO."

2. **PURPOSE.** The purpose of the Group is to provide oversight, operations, design, timing and maintenance of the combined traffic signal systems of the cities of Maryville and Alcoa (the "Cities"). The Group's jurisdiction may be expanded to encompass other aspects of the Cities' traffic operations, including, but not limited to signing and striping.

3. **JURISDICTION.** The City of Alcoa Director of Public Works and Engineering and the City of Maryville Director of Engineering and Public Works (the "Directors") shall have exclusive jurisdiction to provide oversight and guidance and establish policies as set forth in section 2 above for the parties hereto. The Directors shall also act as the designated points of contact for the two Cities for all matters associated with this Agreement and the Group.

4. **POWERS.** The Directors of the two Cities shall have the following powers relative to the operation and organization of the Group:

    a. To establish rules and regulations for conduct of its business as they deem necessary;
    b. To provide for and establish policies for the appointment of a full-time Traffic Operations Manager and other personnel that may be hired within the Group; and
    c. To provide direction and approval regarding traffic signal operation within both Cities.

5. **FUNDING.** The Group shall be funded through joint funding of each participating government entity. At the time of this Agreement, funding will be based on the percentage of intersections controlled by traffic signals located within each city. At the time of this Agreement, funding shall be divided as follows:

City of Maryville	63%	(43 signalized intersections)
City of Alcoa	37%	(25 signalized intersections)

    Funding shall be reviewed annually and adjusted prospectively and proportionately according to each city's signalized street intersections. The funding allocation may be revised should the group's operations expand to include other traffic control functions.

6. **APPROPRIATION OF FUNDS.** The operating budget for the Group as proposed by the Directors and their respective City Managers is subject to annual appropriation of the governing bodies of both cities. In the event that funds are not appropriated for this Agreement, then this Agreement shall terminate as of June 30 of the last fiscal year for which funds were appropriated. A copy of the approved budget is available to the public by request directed to the City Recorder of the respective city.

7. **DURATION.** This Agreement will continue indefinitely; provided, however, either party may terminate this Agreement by giving the other party ninety (90) days written notice thereof.

8. **AMENDMENTS.** This Agreement may be altered or amended at any time by the unanimous agreement of all parties hereto, which amendment will not become effective until reduced to writing, approved by the governing bodies of the cities of Alcoa and Maryville, and executed by all of the parties hereto.

9. **EFFECTIVE DATE.** This Agreement will become effective upon its approval by the governing bodies of the cities of Alcoa and Maryville, to include the appropriate signatures.

IN WITNESS WHEREOF, the parties hereto have caused this Agreement to be duly executed on the day and the date above written.

City of Maryville

By: _____
Mayor

Attest:

_____
City Recorder

Approved as to Form:

_____
City Attorney

City of Alcoa

By: _____
Mayor

Attest:

_____
City Recorder

Approved as to Form:

_____
City Attorney

COM 1B

Maryville, Alcoa and Blount County Interlocal Agreement

INTERLOCAL AGREEMENT

THIS INTERLOCAL AGREEMENT is made and entered into as of the 2nd day of Jan., 2013, by and between THE CITY OF MARYVILLE, TENNESSEE ("Maryville"), a municipal corporation located in Blount County, Tennessee; THE CITY OF ALCOA, TENNESSEE ("Alcoa"), a municipal corporation located in Blount County, Tennessee; and BLOUNT COUNTY, TENNESSEE ("Blount County"), a political subdivision of the State of Tennessee, as follows:

WITNESSETH:

THAT WHEREAS, Alcoa and Maryville currently participate in providing services for joint traffic operations through a team known as "MACTO" (Maryville-Alcoa Central Traffic Operations), and

WHEREAS, the purpose of MACTO is to provide smooth, coordinated traffic flow between signalized intersections in both Maryville and Alcoa, and

WHEREAS, Blount County is installing a traffic signal that may benefit from MACTO's services and coordination through MACTO.

WHEREFORE, the parties hereto hereby agree as follows:

1. Purpose. The purpose of this Agreement is to establish the role of each participating party in the management of traffic, signal coordination, signal timing, and construction oversight of the intersection of State Route 33/Old Knoxville Highway at Defoe Circle in Blount County, Tennessee. Other intersections may subsequently be added to the coverage in this Agreement if agreed in writing by the parties hereto.

2. Term. The term of this Agreement shall be ten (10) years from the date of its execution. The Agreement will automatically renew for successive periods of ten (10) years unless terminated in writing by any party hereto. The Agreement further may be terminated at any time by any party hereto upon the provision of ninety (90) days advance written

notice to all other parties.

3. Responsibilities.

(a) Blount County through its Highway Department agrees to allow MACTO personnel access and control of traffic signal equipment at the intersection(s) at issue for the purpose of signal timing and coordination. Blount County through its Highway Department agrees that MACTO's standard equipment will be used for the new traffic signal installation at the intersection(s) at issue. Further, MACTO personnel will be allowed to perform regular inspections during the construction process to ensure that all applicable standards are met. Blount County will allow the signal(s) at issue to be timed as advised by MACTO during the term of this Agreement.

(b) Alcoa. Alcoa through MACTO agrees to provide traffic signal controller programming, initial set-up, and construction oversight for the purpose of establishing a coordinated traffic signal system between jurisdictions.

(c) Maryville. Maryville through MACTO agrees to provide traffic signal controller programming, initial set-up, and construction oversight for the purpose of establishing a coordinated traffic signal system between jurisdictions.

4. No maintenance or other services provided. This Agreement does not provide for routine maintenance or unscheduled maintenance or repair of the traffic signal(s) at issue. Blount County shall be solely responsible for repair, operations, and maintenance costs associated with the operation of the intersection(s) at issue including, but not limited to, utilities, bulb replacement, repairs due to accidents, etc.

5. Funding. Each party is responsible for the funding of its responsibilities as set forth in Paragraphs 3 and 4, above, of this Agreement. Neither party shall seek or request payment from any other party for services provided hereunder.

6. Amendments. This Agreement may be amended only in a writing signed by all parties hereto and authorized by the governing body of each party to this Agreement.

7. Relationships. The participants in work undertaken under this Agreement shall remain employees only of their own respective employers and neither the participants nor the parties shall be agents, representatives or joint ventures of any other party hereto.

IN WITNESS WHEREOF, we have set our hands and seals this the day and date first written above.

CITY OF MARYVILLE, TENNESSEE:

BY: Thomas W. Taylor

ITS: Mayor

ATTEST:

Deborah P. Coughlin

STATE OF TENNESSEE)
COUNTY OF BLOUNT)

Before me, a Notary Public in and for said County, personally appeared Thomas W. Taylor with whom I am personally acquainted, and who, upon oath, acknowledged himself to be the Mayor of the CITY OF MARYVILLE, TENNESSEE, the within named bargainor, and that he as such Mayor, being authorized so to do, executed the within instrument for the purposes therein contained by signing the name of the CITY OF MARYVILLE, TENNESSEE, by himself as Mayor.

WITNESS my hand and official seal at office this 2nd day of Jan., 2013

My Commission Expires:
4-30-16

Susie Stamm Cagle
Notary Public

CITY OF ALCOA, TENNESSEE:

BY: _____

ITS: Mayor

ATTEST:

_____

STATE OF TENNESSEE)
COUNTY OF BLOUNT)

Before me, a Notary Public in and for said County, personally appeared Donald R. Mull, with whom I am personally acquainted, and who, upon oath, acknowledged himself to be the Mayor of the CITY OF ALCOA, TENNESSEE, the within named bargainor, and that he as such Mayor, being authorized so to do, executed the within instrument for the purposes therein contained by signing the name of the CITY OF ALCOA, TENNESSEE, by himself as Mayor.

WITNESS my hand and official seal at office this 11th day of December, 2007.

My Commission Expires:
8/14/2013

_____
Notary Public

KIMBERLY J. WADE
STATE OF TENNESSEE NOTARY PUBLIC
COUNTY OF BLOUNT

BLOUNT COUNTY, TENNESSEE:

BY: _____

ITS: Mayor

ATTEST:

Tony Crawford, Jr.
By Margaret M. Dyer DC

STATE OF TENNESSEE)
COUNTY OF BLOUNT)

Before me, a Notary Public in and for said County, personally appeared Ed Mitchell, with whom I am personally acquainted, and who, upon oath, acknowledged himself to be the Mayor of BLOUNT COUNTY, TENNESSEE, the within named bargainor, and that he as such Mayor, being authorized so to do, executed the within instrument for the purposes therein contained by signing the name of BLOUNT COUNTY, TENNESSEE, by himself as Mayor.

WITNESS my hand and official seal at office this 21st day of December, 2007.

My Commission Expires:
Oct. 31, 2014

Patricia James
Notary Public

PATRICIA JAMES
STATE OF TENNESSEE
NOTARY PUBLIC
BLOUNT COUNTY

TDOT 4

Communications Resource License Agreement between TDOT and City of Knoxville

C-21-0059

COMMUNICATIONS RESOURCE LICENSE AGREEMENT

Between
STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION
and
CITY OF KNOXVILLE

THIS LICENSE AGREEMENT is entered into , 2019, by and between the STATE OF TENNESSEE, acting by and through its DEPARTMENT OF TRANSPORTATION ("TOOT"), and CITY OF KNOXVILLE ("COK").

RECITALS

1. The Commissioner of TOOT is empowered by Tennessee Code Annotated § 4-3-2303 to enter into this License Agreement.

2. The Mayor of COK is empowered to enter into this License Agreement and has authorized the undersigned to execute this License Agreement on behalf of COK.

3. Both TOOT and COK have participated in multiple Knoxville Regional ITS Architecture processes as defined by the Federal Highway Administration where sharing of data and investment infrastructure investments were identified.

4. Both TOOT and COK have identified the desire to participate in Integrated Corridor Management (ICM) initiatives for high priority parallel freeway and arterial corridors such as 1-40/75 and Kingston Pike in West Knoxville. ICM initiatives require a high level of integration of communication, data, and operation of area freeway management, arterial signal systems, and area transit operations.

5. TOOT has developed an Intelligent Transportation System (ITS) project that lies within the Metropolitan Area of the City of Knoxville, Tennessee, and contains a fiber optic communications backbone network of approximately 76 miles in length ("State Fiber Optic Network").

6. COK is developing an Advanced Traffic Management System project that lies within the Metropolitan Area of the City of Knoxville, Tennessee, and contains a fiber optic communications network of approximately 46 miles in length ("COK Fiber Optic Network"). The master plan of the project has been completed. The first phase of this project is presently under design and proceeding through the process required by the Local Programs Development Office within TOOT.

7. TOOT and COK both will control existing surplus dark fibers contained within their own respective fiber optic communication networks, and both parties desire access to additional fiber circuits along alternative paths from their existing facilities to improve each party's network reliability. A mutual licensing of access to and use of existing surplus facilities in lieu of independent facility construction is in the economic best interest of both parties. The TOOT fiber and COK fiber will connect at locations ("Demarcation locations").

8. TOOT wishes to gain access to and use existing surplus dark fibers within the COK Fiber Optic Network, and COK wishes to gain access to and use existing surplus dark fibers within the TOOT Fiber Optic Network. This fiber sharing between TOOT and COK will provide the mutual benefit of redundant backup network paths for their respective fiber optic communication networks, which will improve network reliability.

THEREFORE, in consideration of these premises and the mutual promises contained herein, the parties hereto agree as follows:

I. LICENSES

1. For the purpose of allowing TDOT to improve network reliability in the State Fiber Optic Network, COK hereby gives permission, revocable and terminable as provided herein, to TDOT to have access to and use approximately 411 surplus dark fiber optic strand-miles within the COK Fiber Optic Network, as further provided herein, along the following routes (the "Licensed COK Network Routes"):

   a. Along Kingston Pike between I-140 and Alcoa Highway. Twelve (12) dark fibers will be reserved along this corridor that is approximately 10.7 miles in length.

   b. Along Broadway between Hall of Fame Drive and I-640. Twelve (12) dark fibers will be reserved along this corridor that is approximately 2.2 miles in length.

   c. Along Chapman Highway between Henley Street and Governor John Sevier Highway. Twelve (12) dark fibers will be reserved along this corridor that is approximately 5.9 miles in length.

   d. Along Hall of Fame Drive between I-40 and Church Avenue. Twelve (12) dark fibers will be reserved along this corridor that is approximately 1.3 miles in length.

   e. Along Broadway between Western Avenue and Hall of Fame Drive. Twelve (12) dark fibers will be reserved along this corridor that is approximately 1.7 miles in length.

   f. Along Hall of Fame Drive between I-40 and Broadway. Twelve (12) dark fibers will be reserved along this corridor that is approximately 0.5 miles in length.

   g. Along Henley Street between Western Avenue and Blount Avenue. Twelve (12) dark fibers will be reserved along this corridor that is approximately 0.8 miles in length.

   h. Along Middlebrook Pike between Western Avenue and North Gallaher View Road. Twelve (12) dark fibers will be reserved along this corridor that is approximately 7.6 miles in length.

   i. Along Western Avenue between Broadway and I-640. Twelve (12) dark fibers will be reserved along this corridor that is approximately 3.6 miles in length.

2. For the purpose of allowing COK to improve network reliability in the COK Fiber Optic Network, TDOT hereby gives permission, revocable and terminable as provided herein, to COK to have access to and use approximately 334 surplus dark fiber optic strand-miles within the State Fiber Optic Network, as further provided herein, along the following routes (the "Licensed State Network Routes"):

   a. Along 1-140 between Kingston Pike and 1-40/75, along 1-40/75 between 1-140 and 1-640/75, and along 1-40 between 1-640/75 and Hall of Fame Drive. Six (6) dark fibers will be reserved along this corridor that is approximately 13.5 miles in length.

   b. Along 1-640/75 between 1-40/75 and 1-75, along 1-640 between 1-75 and 1-40, and along 1-40 between 1-640 and Rutledge Pike. Six (6) dark fibers will be reserved along this corridor that is approximately 11.4 miles in length.

   c. Along Alcoa Highway between Kingston Pike and 1-40. Six (6) dark fibers will be reserved along this corridor that is approximately 0.8 miles in length.

   d. Along Alcoa Highway between Kingston Pike and 1-140. Six (6) dark fibers will be reserved along this corridor that is approximately 8.6 miles in length.

   e. Along 1-140 between Kingston Pike and Alcoa Highway. Six (6) dark fibers will be reserved along this corridor that is approximately 10.6 miles in length.

   f. Along 1-40 between 1-640 and Strawberry Plains Pike. Six (6) dark fibers will be reserved along this corridor that is approximately 4.9 miles in length.

   g. Along 1-75 between 1-640 and Emory Road. Six (6) dark fibers will be reserved along this corridor that is approximately 4.5 miles in length.

   h. Along 1-40/75 between Lovell Road and 1-140. Six (6) dark fibers will be reserved along this corridor that is approximately 1.3 miles in length.

II. PARTY RESPONSIBILITIES

4. To achieve the purposes of this License Agreement, TOOT will:

   a. Construct demarcation cabinets at locations where the Licensed State Network Routes intersect with the COK Fiber Optic Network. These demarcation cabinets will provide COK with the point of entry to Licensed State Network Routes, and TOOT hereby permits authorized representatives of COK to have reasonable access to these demarcation cabinets for the purposes described in this License Agreement. COK will not have access to the State Fiber Optic Network facilities beyond these demarcation cabinets, apart from the licensed use of surplus dark fibers along the Licensed State Network Routes as provided herein, and the same restriction shall apply to TOOT regarding access to the COK Fiber Optic Network facilities.

   b. Provide COK with the use of approximately 334 dark fiber optic strand-miles along and within the Licensed State Network Routes in exchange for the use of comparable dark fiber optic strands along the Licensed COK Network Routes. The fiber optic strands provided under this License Agreement will accommodate a power loss budget of no greater than 1 decibel (db) per mile.

   c. Provide the necessary electronic means of lighting the all dark fiber optic strands provided to TOOT by COK under this License Agreement.

   d. Maintain the fiber optic strands made available for COK's use under this License Agreement. Upon notification from an authorized representative of COK regarding the loss of service, TOOT will use its best efforts to respond with maintenance personnel within four (4) hours of notification. The goal will be to restore service within four (4) hours of response. If special circumstances prevent service restoration within four (4) hours of notification, TOOT will notify COK of the reason and estimated time to restore.

5. To achieve the purposes of this License Agreement, COK will:

   a. Populate TOOT demarcation cabinets at locations where the Licensed COK Network Routes intersect with the State Fiber Optic Network. These demarcation cabinets will provide TOOT with the point of entry to Licensed COK Network Routes, and COK hereby permits authorized representatives of TOOT to have reasonable access to these demarcation cabinets for the purposes described in this License Agreement. TOOT will not have access to the COK Fiber Optic Network facilities beyond these demarcation cabinets, apart from the licensed use of surplus dark fibers along the Licensed COK Network Routes as provided herein, and the same restriction shall apply to COK regarding access to the State Fiber Optic Network facilities.

   b. Provide TOOT with the use of approximately 411 miles dark fiber optic strand-miles along and within the Licensed COK Network Routes in exchange for the use of comparable dark fiber optic strands along the Licensed State Network Routes. The fiber optic strands provided under this License Agreement will accommodate a power loss budget of no greater than 1 db per mile.

   c. Provide the necessary electronic means of lighting all dark fiber optic strand-miles provided to COK by TOOT under this License Agreement.

   d. Maintain the fiber optic strands made available for TOOT's use under this License Agreement. Upon notification from an authorized representative of TOOT regarding the loss of service, COK will use its best efforts to respond with maintenance personnel within four (4) hours of notification. The goal will be to restore service within four (4) hours of response. If special circumstances prevent service restoration within four (4) hours of response, COK will notify TOOT of the reason and estimated time to restore.

III. MISCELLANEOUS PROVISIONS

6. The parties recognize that it is in their mutual interest for their respective fiber optic networks to be operated as efficiently as possible in accordance with the requirements set forth in this License Agreement. To achieve this, the parties agree to cooperate with each other in accordance with the terms and provisions of this License Agreement. Should either party believe that the other is not acting timely or reasonably in responding to a request for action under this License Agreement, that party shall notify the appropriate person or agent.

7. Nothing herein shall be deemed to create a joint venture or principal-agent relationship between the parties; and neither party is authorized to, nor shall either party act toward third persons or the public, in any manner which would indicate any such relationship with the other.

8. This License Agreement, with the attachment hereto as incorporated herein, represents the entire understanding and agreement between the parties hereto with respect to the subject matter hereof, superseding all prior oral negotiations between the parties. This License Agreement may be amended, supplemented, modified, or changed only by a written amendment executed by the parties hereto.

9. All notices or demands upon any party to this License Agreement shall be in writing and shall be hand delivered or mailed to the following persons, or to such other persons as either party may hereafter identify in writing:

Tennessee Department of Transportation
505 Deaderick Street, Suite 1800
James K. Polk Building
Nashville, TN 37243
phillip.b.freeze@tn .gov

Attn: Mr. Brad Freeze
Traffic Operations Division, Director

City of Knoxville
3131 Morris Avenue
Knoxville, TN 37909
jbranham@knoxvilletn.gov

Attn: Mr. Jeff Branham
Chief Traffic Engineer

10. The licenses granted under this License Agreement shall not be transferred or assigned to any other party without the prior written approval of the parties hereto.

11. Each party agrees to hold the other party harmless from any and all damages resulting from intermittent loss of communication connectivity subject to the limitations of the Tennessee Governmental Tort Liability Act and the Tennessee Claims Commission Act.

12. Either party may terminate this License Agreement at will upon giving written notice thereof to the other party at least twelve (12) months in advance of the effective date of termination.

13. This License Agreement shall be subject to applicable Federal, State or local laws. If any section, subsection, sentence, clause, phrase, or portion of this agreement is, for any reason, held invalid or unconstitutional by any court of competent jurisdiction, such portion shall be deemed a separate, distinct, and independent provision and such holding shall not affect the validity of the remaining portions of the Agreement.

IN WITNESS WHEREOF, the parties have executed this Agreement the day and year first above written.

CITY OF KNOXVILLE

By_____
Indya Kincannon, Mayor

STATE OF TENNESSEE
Department of Transportation

By_____

Approved as to Form and Legality:

By_____
Charles W. Swanson, Law Director

Approved as to Form and Legality:

By_____

Funds Certified:

By

_____
Susan A. Gennoe, Finance Director

TDOT 5A

Communications Resource License Agreement between TDOT and Knology

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION
SUITE 1000, JAMES K. POLK BUILDING
DESIGN DIVISION
NASHVILLE, TENNESSEE 37243-0350
Phone: (615) 741-2806 Fax: (615) 741-6408

April 13, 2005

Mr. Thomas E. Larson
Knology
1241 O. G. Skinner Drive
West Point, GA 31833

Re: Fiber Optic Use Agreement, Knoxville, TN

Dear Mr. Skinner:

Enclosed is one (1) copy of an executed Fiber Optic Shared Use Agreement.

Please continue your coordination with Mr. John Benditz, Kimley Horn and Associates.

Thank you for your cooperation in this matter.

Sincerely,

Donald G. Dahlinger
Assistant Director
Design Division

Xc: John Benditz, Kimley Horn and Associates
Mr. Fred Corum
Mr. Mark Best/ w. attachment
File

Project: ITS Fiber Optic Backbone
Section: Various Locations Knoxville, TN

COMMUNICATIONS RESOURCE LICENSE AGREEMENT

Between
STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION
and
KNOLOGY OF KNOXVILLE, INC.

THIS LICENSE AGREEMENT is entered into _____, 2004, by and between the STATE OF TENNESSEE, acting by and through its DEPARTMENT OF TRANSPORTATION ("TDOT"), and KNOLOGY OF KNOXVILLE, INC. ("Knology").

RECITALS

1. The Commissioner of TDOT is empowered by Tennessee Code Annotated § 4-3-2303 to enter into this License Agreement.

2. Knology is empowered to enter into this License Agreement and has authorized the undersigned to execute this License Agreement on behalf of Knology.

3. TDOT has developed an Intelligent Transportation System project that lies within the Metropolitan Area of the City of Knoxville, Tennessee, and contains a fiber optic communications backbone network of approximately 47 miles in length ("State Fiber Optic Network"). The field survey of the project has been completed, and the design plans, estimates and specifications have been prepared and approved by TDOT and the Federal Highway Administration. The project is presently under construction and has a tentative completion date of December 29, 2004.

4. Knology has previously constructed a fiber optic communication backbone network that covers extensive portions of the Knoxville Metropolitan Area under authority granted by the City of Knoxville for the purpose of cable television and internet access service (the "Knology Fiber Optic Network").

5. TDOT and Knology both currently control existing surplus dark fibers contained within their own respective fiber optic communication networks, and both parties desire access to additional fiber circuits along alternative paths from their existing facilities to improve each party's network reliability. A mutual licensing of access to and use of existing surplus facilities in lieu of independent facility construction is in the economic best interest of both parties.

6. TDOT wishes to gain access to and use existing surplus dark fibers within the Knology Fiber Optic Network, and Knology wishes to gain access to and use existing surplus dark fibers within the State Fiber Optic Network, each for the purpose providing redundant backup paths for their respective fiber optic communication networks in order to improve network reliability.

THEREFORE, in consideration of these premises and the mutual promises contained herein, the parties hereto agree as follows:

I. LICENSES

1. For the purpose of allowing TDOT to improve network reliability in the State Fiber Optic Network, Knology hereby gives permission, revocable and terminable as provided herein, to TDOT to have access to and use two (2) surplus dark fiber optic strands within the Knology Fiber Optic Network, as further provided herein, along the following routes (the "Licensed Knology Network Routes"):
   a. Beginning at the Knology facility at 10115 Sherrill Boulevard to the Merchant Road Interchange

with I-75.

2. For the purpose of allowing Knology to improve network reliability in the Knology Fiber Optic Network, TDOT hereby gives permission, revocable and terminable as provided herein, to Knology to have access to and use two (2) surplus dark fiber optic strands within the State Fiber Optic Network, as further provided herein, along the following routes (the "Licensed State Network Routes"):

   a. Beginning at the Knology facility at 10115 Sherrill Boulevard to the Merchant Road Interchange with I-75.

3. The approximate location of the Licensed Knology Network Routes and the Licensed State Network Routes is depicted on the map attached hereto and incorporated herein as Attachment A.

II. PARTY RESPONSIBILITIES

4. To achieve the purposes of this License Agreement, TDOT will:

   a. Construct demarcation cabinets at locations where the Licensed State Network Routes intersect with the Knology Fiber Optic Network. These demarcation cabinets will provide Knology with the point of entry to Licensed State Network Routes, and TDOT hereby permits authorized representatives of Knology to have reasonable access to these demarcation cabinets for the purposes described in this License Agreement. Knology will not have access to the State Fiber Optic Network facilities beyond these demarcation cabinets, apart from the licensed use of surplus dark fibers along the Licensed State Network Routes as provided herein, and the same restriction shall apply to TDOT regarding access to the Knology Fiber Optic Network facilities.

   b. Provide Knology with the use of two (2) dark fiber optic strands along and within the Licensed State Network Routes in exchange for the use of comparable dark fiber optic strands along the Licensed Knology Network Routes. The fiber optic strands provided under this License Agreement will accommodate a power loss budget of no greater than 1 decibel (db) per mile.

   c. Provide the necessary electronic means of lighting the two (2) dark fiber optic strands provided to TDOT by Knology under this License Agreement.

   d. Maintain the fiber optic strands made available for Knology's use under this License Agreement. Upon notification from an authorized representative of Knology regarding the loss of service, TDOT will use its best efforts to respond with maintenance personnel within four (4) hours of notification. The goal will be to restore service within four (4) hours of response. If special circumstances prevent service restoration within eight (8) hours of notification, TDOT will notify Knology of the reason and estimated time to restore.

5. To achieve the purposes of this License Agreement, Knology will:

   a. Populate TDOT demarcation cabinets at locations where the Licensed Knology Network Routes intersect with the State Fiber Optic Network. These demarcation cabinets will provide TDOT with the point of entry to Licensed Knology Network Routes, and Knology hereby permits authorized representatives of TDOT to have reasonable access to these demarcation cabinets for the purposes described in this License Agreement. TDOT will not have access to the Knology Fiber Optic Network facilities beyond these demarcation cabinets, apart from the licensed use of surplus dark fibers along the Licensed Knology Network Routes as provided herein, and the same restriction shall apply to Knology regarding access to the State Fiber Optic Network facilities.

   b. Provide TDOT with the use of two (2) dark fiber optic strands along and within the Licensed

Knology Network Routes in exchange for the use of comparable dark fiber optic strands along the Licensed State Network Routes. The fiber optic strands provided under this License Agreement will accommodate a power loss budget of no greater than 1 db per mile.

c. Provide the necessary electronic means of lighting the two (2) dark fiber optic strands provided to Knology by TDOT under this License Agreement.

d. Maintain the fiber optic strands made available for TDOT's use under this License Agreement. Upon notification from an authorized representative of TDOT regarding the loss of service, Knology will use its best efforts to respond with maintenance personnel within four (4) hours of notification. The goal will be to restore service within four (4) hours of response. If special circumstances prevent service restoration within four (4) hours of response, Knology will notify TDOT of the reason and estimated time to restore.

III. MISCELLANEOUS PROVISIONS

6. The parties recognize that it is in their mutual interest for their respective fiber optic networks to be operated as efficiently as possible in accordance with the requirements set forth in this License Agreement. To achieve this, the parties agree to cooperate with each other in accordance with the terms and provisions of this License Agreement. Should either party believe that the other is not acting timely or reasonably in responding to a request for action under this License Agreement, that party shall notify the appropriate person or agent.

7. Nothing herein shall be deemed to create a joint venture or principal-agent relationship between the parties; and neither party is authorized to, nor shall either party act toward third persons or the public, in any manner which would indicate any such relationship with the other.

8. This License Agreement, with the attachment hereto as incorporated herein, represents the entire understanding and agreement between the parties hereto with respect to the subject matter hereof, superseding all prior oral negotiations between the parties. This License Agreement may be amended, supplemented, modified, or changed only by a written amendment executed by the parties hereto.

9. All notices or demands upon any party to this License Agreement shall be in writing and shall be hand delivered or mailed to the following persons, or to such other persons as either party may hereafter identify in writing:

Tennessee Department of Transportation
Design Division, Special Projects
505 Deaderick Street, Suite 1000
James K. Polk Building
Nashville, TN 37243
FAX (615) 741-6408

Attn: Mr. Don Dahlinger
TDOT SmartWay Director

Knology of Knoxville, Inc.
1241 O. G. Skinner Drive
West Point, GA 31833
FAX (706) 645-3985

Attn: Mr. Thomas Larson
Senior Manager Fiber Network Engineer

10. The licenses granted under this License Agreement shall not be transferred or assigned to any other party without the prior written approval of the parties hereto.

11. Each party agrees to hold the other party harmless from any and all damages resulting from intermittent loss of communication connectivity.

12. Either party may terminate this License Agreement at will upon giving written notice thereof to the other party at least 180 days in advance of the effective date of termination.

13. This License Agreement shall be subject to applicable Federal, State or local laws. If any section, subsection, sentence, clause, phrase, or portion of this agreement is, for any reason, held invalid or unconstitutional by any court of competent jurisdiction, such portion shall be deemed a separate, distinct, and independent provision and such holding shall not affect the validity of the remaining portions of the Agreement.

IN WITNESS WHEREOF, the parties have executed this Agreement the day and year first above written.

KNOLOGY OF KNOXVILLE

By _____
VP - Operations
3/18/05

STATE OF TENNESSEE
Department of Transportation

By _____

Approved as to Form and Legality:

By _____

TDOT 5B

Communications Resource License Agreement between TDOT and Comcast

COMMUNICATIONS RESOURCE LICENSE AGREEMENT

Between
STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION
and
COMCAST CABLE COMMUNICATION, INC.

THIS LICENSE AGREEMENT is entered into _____, 2004, by and between the STATE OF TENNESSEE, acting by and through its DEPARTMENT OF TRANSPORTATION ("TDOT"), and COMCAST CABLE COMMUNICATION, INC. ("Comcast").

RECITALS

1. The Commissioner of TDOT is empowered by Tennessee Code Annotated § 4-3-2303 to enter into this License Agreement.

2. Comcast is empowered to enter into this License Agreement and has authorized the undersigned to execute this License Agreement on behalf of Comcast.

3. TDOT has developed an Intelligent Transportation System project that lies within the Metropolitan Area of the City of Knoxville, Tennessee, and contains a fiber optic communications backbone network of approximately 47 miles in length ("State Fiber Optic Network"). The field survey of the project has been completed, and the design plans, estimates and specifications have been prepared and approved by TDOT and the Federal Highway Administration. The project is presently under construction and has a tentative completion date of December 29, 2004.

4. Comcast has previously constructed a fiber optic communication backbone network that covers extensive portions of the Knoxville Metropolitan Area under authority granted by the City of Knoxville for the purpose of cable television and internet access service (the "Comcast Fiber Optic Network").

5. TDOT and Comcast both currently control existing surplus dark fibers contained within their own respective fiber optic communication networks, and both parties desire access to additional fiber circuits along alternative paths from their existing facilities to improve each party's network reliability. A mutual licensing of access to and use of existing surplus facilities in lieu of independent facility construction is in the economic best interest of both parties.

6. TDOT wishes to gain access to and use existing surplus dark fibers within the Comcast Fiber Optic Network, and Comcast wishes to gain access to and use existing surplus dark fibers within the State Fiber Optic Network, each for the purpose providing redundant backup paths for their respective fiber optic communication networks in order to improve network reliability.

THEREFORE, in consideration of these premises and the mutual promises contained herein, the parties hereto agree as follows:

I. LICENSES

1. For the purpose of allowing TDOT to improve network reliability in the State Fiber Optic Network, Comcast hereby gives permission, revocable and terminable as provided herein, to TDOT to have access to and use four (4) surplus dark fiber optic strands within the Comcast Fiber Optic Network, as further provided herein, along the following routes (the "Licensed Comcast Network Routes"):

a. Beginning at the TDOT TMC facility at 7345 Region Lane to the Rutledge Pike Interchange with I-40; and

b. Beginning at the Cherry Street Interchange with I-40 to the Woodland Avenue Interchange with I-275.

2. For the purpose of allowing Comcast to improve network reliability in the Comcast Fiber Optic Network, TDOT hereby gives permission, revocable and terminable as provided herein, to Comcast to have access to and use four (4) surplus dark fiber optic strands within the State Fiber Optic Network, as further provided herein, along the following routes (the "Licensed State Network Routes"):

a. Beginning at the TDOT TMC facility at 7345 Region Lane to the Rutledge Pike Interchange with I-40; and

b. Beginning at the Cherry Street Interchange with I-40 to the Woodland Avenue Interchange with I-275.

3. The approximate location of the Licensed Comcast Network Routes and the Licensed State Network Routes is depicted on the map attached hereto and incorporated herein as Attachment A.

II. PARTY RESPONSIBILITIES

4. To achieve the purposes of this License Agreement, TDOT will:

a. Construct demarcation cabinets at locations where the Licensed State Network Routes intersect with the Comcast Fiber Optic Network. These demarcation cabinets will provide Comcast with the point of entry to Licensed State Network Routes, and TDOT hereby permits authorized representatives of Comcast to have reasonable access to these demarcation cabinets for the purposes described in this License Agreement. Comcast will not have access to the State Fiber Optic Network facilities beyond these demarcation cabinets, apart from the licensed use of surplus dark fibers along the Licensed State Network Routes as provided herein, and the same restriction shall apply to TDOT regarding access to the Comcast Fiber Optic Network facilities.

b. Provide Comcast with the use of four (4) dark fiber optic strands along and within the Licensed State Network Routes in exchange for the use of comparable dark fiber optic strands along the Licensed Comcast Network Routes. The fiber optic strands provided under this License Agreement will accommodate a power loss budget of no greater than 1 decibel (db) per mile.

c. Provide the necessary electronic means of lighting the four (4) dark fiber optic strands provided to TDOT by Comcast under this License Agreement.

d. Maintain the fiber optic strands made available for Comcast's use under this License Agreement. Upon notification from an authorized representative of Comcast regarding the loss of service, TDOT will use its best efforts to respond with maintenance personnel within four (4) hours of notification. The goal will be to restore service within four (4) hours of response. If special circumstances prevent service restoration within eight (8) hours of notification, TDOT will notify Comcast of the reason and estimated time to restore.

5. To achieve the purposes of this License Agreement, Comcast will:

a. Populate TDOT demarcation cabinets at locations where the Licensed Comcast Network Routes intersect with the State Fiber Optic Network. These demarcation cabinets will provide TDOT with the point of entry to Licensed Comcast Network Routes, and Comcast hereby permits authorized representatives of TDOT to have reasonable access to these demarcation cabinets for the purposes described in this License Agreement. TDOT will not have access to the Comcast Fiber Optic Network facilities beyond these demarcation cabinets, apart from the licensed use of surplus dark fibers along the Licensed Comcast Network Routes as provided herein, and the same restriction shall apply to Comcast regarding access to the State Fiber Optic Network facilities.

b. Provide TDOT with the use of four (4) dark fiber optic strands along and within the Licensed Comcast Network Routes in exchange for the use of comparable dark fiber optic strands along the Licensed State Network Routes. The fiber optic strands provided under this License Agreement will accommodate a power loss budget of no greater than 1 db per mile.

c. Provide the necessary electronic means of lighting the four (4) dark fiber optic strands provided to Comcast by TDOT under this License Agreement.

d. Maintain the fiber optic strands made available for TDOT's use under this License Agreement. Upon notification from an authorized representative of TDOT regarding the loss of service, Comcast will use its best efforts to respond with maintenance personnel within four (4) hours of notification. The goal will be to restore service within four (4) hours of response. If special circumstances prevent service restoration within four (4) hours of response, Comcast will notify TDOT of the reason and estimated time to restore.

III. MISCELLANEOUS PROVISIONS

6. The parties recognize that it is in their mutual interest for their respective fiber optic networks to be operated as efficiently as possible in accordance with the requirements set forth in this License Agreement. To achieve this, the parties agree to cooperate with each other in accordance with the terms and provisions of this License Agreement. Should either party believe that the other is not acting timely or reasonably in responding to a request for action under this License Agreement, that party shall notify the appropriate person or agent.

7. Nothing herein shall be deemed to create a joint venture or principal-agent relationship between the parties; and neither party is authorized to, nor shall either party act toward third persons or the public, in any manner which would indicate any such relationship with the other.

8. This License Agreement, with the attachment hereto as incorporated herein, represents the entire understanding and agreement between the parties hereto with respect to the subject matter hereof, superseding all prior oral negotiations between the parties. This License Agreement may be amended, supplemented, modified, or changed only by a written amendment executed by the parties hereto.

9. All notices or demands upon any party to this License Agreement shall be in writing and shall be hand delivered or mailed to the following persons, or to such other persons as either party may hereafter identify in writing:

Tennessee Department of Transportation
Design Division, Special Projects
505 Deaderick Street, Suite 1000
James K. Polk Building
Nashville, TN 37243

Attn: Mr. Don Dahlinger
TDOT SmartWay Director

FAX (615) 741-6408

Comcast Cable Communication, Inc.
5720 Ashville Highway
Knoxville, TN 37924
FAX (865) 862-5092

Attn: Mr. Hank Swindle
Engineering Manager

10. The licenses granted under this License Agreement shall not be transferred or assigned to any other party without the prior written approval of the parties hereto.

11. Each party agrees to hold the other party harmless from any and all damages resulting from intermittent loss of communication connectivity.

12. Either party may terminate this License Agreement at will upon giving written notice thereof to the other party at least 180 days in advance of the effective date of termination.

13. This License Agreement shall be subject to applicable Federal, State or local laws. If any section, subsection, sentence, clause, phrase, or portion of this agreement is, for any reason, held invalid or unconstitutional by any court of competent jurisdiction, such portion shall be deemed a separate, distinct, and independent provision and such holding shall not affect the validity of the remaining portions of the Agreement.

IN WITNESS WHEREOF, the parties have executed this Agreement the day and year first above written.

COMCAST CABLE COMMUNICATION, INC.

By_____

STATE OF TENNESSEE
Department of Transportation

By_____

Approved as to Form and Legality:

By_____

COK 1

Fiber Optic Agreement between City of Knoxville and Knoxville Utilities Board (KUB)

C-21-0314

FIBER OPTIC AGREEMENT BETWEEN CITY OF KNOXVILLE AND KNOXVILLE UTILITIES BOARD

This Fiber Optic Agreement is made and entered into this 12th day of May, 2021 by and between the Knoxville Utilities Board, hereinafter referred to as "KUB" and the City of Knoxville, hereinafter referred to as "City."

WHEREAS, the City owns, maintains and manages certain facilities within the public rights-of-way within the Knoxville city limits for the use and convenience of the public governing the flow of traffic; and

WHEREAS, the City intends to install an interconnected traffic signal system connecting approximately ninety (90) traffic signals along Kingston Pike, Broadway, and Chapman Highway (the "Project") incorporating the use of an ethernet-based fiber optic communications system ("City Fiber"); and

WHEREAS, in order to obtain appropriate funding levels for this project, the City has entered into a Locally Managed Project with the Tennessee Department of Transportation (TDOT) to use federal funds, specifically Surface Transportation Block Grant (STBG) and Congestion Mitigation and Air Quality Improvement (CMAQ) while following the TDOT Local Government Guidelines for the Management of Federal and State-Funded Transportation Projects; and

WHEREAS, as a requirement of its processes and procedures for Locally Managed Projects, TDOT requires Utility Make Ready (UMR) work to be performed by the local utility who has ownership of structures and/or agreements with other parties that have facilities installed on the structures; and

WHEREAS, KUB is a municipal utility established pursuant to the Charter of the City of Knoxville, which provides electric, natural gas, water, and wastewater services to more than 453,000 customers in Knoxville and parts of seven surrounding counties; and

WHEREAS, to provide electric service to its customers, KUB owns and maintains electric power poles ("poles") situated along the routes involved with this Project; and

WHEREAS, KUB acknowledges the types of infrastructure attachments utilized or proposed by City are not profit-oriented or competitive but are beneficial to the community; and

WHEREAS, KUB has a long-term plan for the construction of a fiber optic backbone within its service territory to serve its utility communication needs and the proposed routes by City are consistent with KUB's long-term fiber optic plan; and

WHEREAS, the rights and obligations of KUB under this Agreement will be to perform utility make ready ("UMR") and maintain the City Fiber but any electronics or other

technology necessary for the use of the City Fiber shall be the responsibility of the City or its contractors. The City will be responsible for the installation of City Fiber using contractors pre-qualified by KUB.

NOW, THEREFORE, the parties agree as follows:

1. PROJECT.

A. *Description of Project*. The scope of this Project will include UMR work and installation and maintenance of the fiber optic communications system described herein. This includes (all distances approximate) 12 miles of City Fiber along Kingston Pike, 5.5 miles of City Fiber along Broadway, 6 miles of City Fiber along Chapman Highway, and 0.5 miles of City Fiber along Liberty Street/Morris Avenue. Some of the City Fiber will be constructed underground; however, much of the City Fiber will be aerial connecting to poles owned by KUB and others. The number of affected poles within the KUB service territory is estimated at 620.

B. *Project Phases*. The Project will be completed in two phases, as follows:

1. Phase I: UMR Design and Construction. KUB will be responsible for the UMR portion of the Project on KUB-owned poles, but will not be responsible for the installation of the City Fiber. The outcome of the UMR efforts will be to create an attachment location approximately thirty inches (30") below the power supply space for the proposed fiber optic communications system as part of the right-of-way phase of the Project. All efforts toward UMR design and performance will be participatory pay items in the TDOT-City contract provided all efforts conform to procedures and requirements of TDOT and the City to be eligible for federal reimbursement.

a) *KUB will*:

1. Perform UMR design, which is anticipated to be done using outside professional services resources;

2. Review existing UMR plans prepared by the City;

3. Contact and coordinate proposed UMR with other affected attachers to obtain cost estimates and timelines for completion of required relocations;

4. Provide a statement of all costs, conditions, and timelines for both power and communication make ready work to the City for its contract with TDOT;

5. Perform the required power make ready using either in house crews or contract crews;

6. Manage make ready efforts by other attachers through use of the National Joint Utilities Notification system ("NJUNS") or other methods;

7. Inspect all completed UMR work to ensure proper spacing has been created; and

8. Complete the UMR construction activities with due and reasonable diligence.

b) *The City will*:

1. Review UMR design with KUB personnel;

2. Reimburse KUB pursuant to terms listed in this Agreement; and

3. Coordinate UMR with entities outside of KUB's service territory.

2. *Phase II Fiber Construction*. Installation of fiber shall be performed by a contractor engaged by the City under the following terms:

a) *KUB will*:

1. Provide the City the list of pre-qualified contractors;

2. Provide material for KUB's 432 strand fiber for installation, including documentation that fiber was procured through a competitive bidding process;

3. Attend project meetings and field review as reasonably requested; and

4. Pay for the provision and installation of the KUB 432 count fiber cable as a non-participatory pay item in the TDOT – City contract.

b) *The City will*:

1. Engage with a design consultant for the design of all fiber installation;

2. Engage a contractor to install all fiber required under this Agreement;

3. Require that its contractor install the fiber and messenger cable, including "drops" for Traffic Control equipment, for sole use by the City in a manner that will ensure the City's eligibility for grant participation;

4. Be responsible for all project management functions during the construction phase of the Project including ensuring fiber installation is at the planned location on each pole, and signal integrity is solid on the fibers; and

5. Be responsible for programming, testing, and start up requirements of new equipment.

6. Through its procurement and contracting process, and pursuant to specifications approved by KUB, provide material for the City's 72 strand fiber for installation.

2. **OWNERSHIP AND MAINTENANCE OF THE FIBER OPTIC CABLE**. KUB will maintain the City Fiber cable within the KUB electric service territory subject to the other terms and conditions of a separate agreement, in a manner that is consistent with the ordinary and usual operation of a fiber optic network. The City will fully own and be responsible for providing and installing all drops from the City Fiber network. Only KUB or its contractors will perform splices and connection of same drops to the cable after initial installation by the City Contractor.

3. **BILLING OF THE WORK**. KUB will submit invoices at such intervals to be determined by both parties for all work performed by KUB or its consultants and subcontractors toward completion of the Project. Such billing shall be in a format acceptable to both the City and TDOT for the reimbursement of funds to the City in furtherance of the Project.

4. **FUNDING BY THE CITY**. It is the agreement of the parties that the City will be solely responsible for the cost of the UMR part of the Project and no KUB funds will be used to pay for that work. As the Project proceeds, KUB will invoice the City in a manner consistent with the requirements set forth by TDOT for the Project. It is anticipated by the parties that such invoices will show each party's pro rata share of the work, when applicable. If another method of invoices and payments is required by TDOT, the parties will cooperate to conform with those requirements. The City will pay such invoices within thirty (30) days of receipt. Payment of an invoice does not waive a later objection.

5. **COMPLIANCE AND SAFETY**. The City and KUB agree to comply with all safety laws, regulations, ordinances, and statues pertaining to the work to be performed hereunder and the tools and equipment used to accomplish such work, and to be and remain solely

responsible for the compliance therewith by their employees, agents, servants and/or subcontractors.

6. **CODES, RULES AND STANDARDS**. The City's facilities, installed after the date of this Agreement, shall be erected and maintained in accordance with the requirements of specifications of the latest version of KUB's Attachment Guidelines. The parties, and their officers, employees and agents agree that the provisions contained in this Agreement shall comply with all applicable federal, state, and local laws, rules, and regulations, and as such may be amended from time to time. In the event any governmental entity or agency, except the parties hereto, requires modifications or changes to any provision in this Agreement so that such provision complies with controlling law or regulation, or such modification or change is a condition precedent to the receipt of a grant or other funds to either party, the other party shall not unreasonably withhold its agreement to such amendment, modification, revision, supplement, or deletion of any of the terms, conditions, or requirements contained in this Agreement that may be reasonably required.

7. **RELATIONSHIP OF THE PARTIES**. Agreement does not constitute a lease or conveyance of any real property interest to either party and does not waive any rights either party may have under controlling law or regulation.

8. **LIMITATIONS ON USE OF THE CITY FIBER NETWORK.** Without KUB's prior written consent, City shall not sub-license or lease to any third party, including but not limited to, allowing third parties to place attachments on KUB's infrastructure, including overlashing, riser, or service drops, or to place attachments for the benefit of such third parties on KUB infrastructure. The use of City's facilities by third parties (including but not limited to leases of dark fiber) that involve no additional attachment or overlashing is not subject to this limitation.

9. **EXPANSION AND GROWTH**. If the City determines it has need for additional fiber optic strands, KUB and the City shall enter into an amendment to this Agreement to add or install the additional or replacement fiber optic cable.

10. **SEVERABILITY**. If one or more clauses of this Agreement shall be held to be unlawful, invalid, or unenforceable, the parties agree the material rights of the parties shall not be affected except to the extent of such holding, and this Agreement shall be construed in all respects as if such invalid or unenforceable provision was omitted herefrom. In such case the parties agree to such amendment, modification, revisions, supplement, or deletion of any terms, conditions, or requirements contained in this Agreement to comport with such holding.

11. **LIMITATION OF SCOPE**. Notwithstanding any language or provision contained in this Agreement, this document does not constitute an acknowledgement or agreement by KUB regarding any current or future claims, costs, liability, or obligations that the City claims or may claim are due and/or owing to it or may hereafter claim are due and owing to it. In addition, this Agreement does not provide for any use of KUB Infrastructure that is not specifically provided for herein, including duration of such use

of infrastructure, and KUB reserves and does not waive any and all rights regarding such use of KUB Infrastructure.

12. **NOTICES**. All notices or communication related to this Agreement from and to the parties of this Agreement shall be sufficient if personally delivered to the officer designated below or sent to said officer, by United States mail or by overnight courier through a nationally recognized courier service addressed to the following:

    A. City of Knoxville:

    City of Knoxville Law Department
    400 Main Street, Room 699
    Knoxville, Tennessee 37902
    Attn: Law Director

    B. KUB:

    Knoxville Utilities Board
    PO Box 59017
    Knoxville, TN 37950-9017
    Attn: Procurement Manager

13. **APPLICABLE LAW**. This Agreement will be governed and construed in accordance with the laws of the State of Tennessee. Any action or dispute arising from this Agreement shall be instituted only in a court of appropriate jurisdiction in Knox County, Tennessee.

14. **ENTIRE AGREEMENT**. This Agreement forms the entire Agreement between the City and KUB. Any prior representations, promises, agreements, oral or otherwise, between the parties, which are not embodied in this writing, will be of no force or effect.

15. **WRITTEN AMENDMENTS**. This Agreement may be modified only by a written amendment or addendum that has been executed and approved by the appropriate officials shown on the signature page of this Agreement.

IN WITNESS WHEREOF, KUB and the City have executed this Agreement in two originals as of the above-written date.

{remainder of page intentionally left blank}

KNOXVILLE UTILITIES BOARD

BY: Gary Bales

ITS: President & CEO

APPROVED AS TO FORM:

CHARLES W. SWANSON
LAW DIRECTOR

CITY OF KNOXVILLE

BY:

INDYA KINCANNON
MAYOR

DATE: 5/10/2021

FUNDS CERTIFIED:

SUSAN A. GENNOE
FINANCE DIRECTOR

APPENDIX E – ARCHITECTURE MAINTENANCE DOCUMENTATION FORM

Knoxville Regional ITS Architecture

ITS Architecture Maintenance Documentation Form

Please complete the following form to document changes to the 2021 Knoxville Regional ITS Architecture. Forms should be submitted to the Knoxville Regional Transportation Planning Organization (TPO) for review and acceptance. All accepted changes will be kept on file by the TPO and shared with the TDOT Traffic Operations Division. Changes will be incorporated into the 2021 Knoxville Regional ITS Architecture during the next scheduled update.

Contact Information

Agency	
Agency Contact Person	
Street Address	
City	
State, Zip Code	
Telephone	
Fax	
E-Mail	

Change Information

Please indicate the type of change to the Regional ITS Architecture or Deployment Plan:

- ☐ Administrative Change: Basic changes that do not affect the structure of the ITS service packages in the Regional ITS Architecture.
  Examples include: Changes to stakeholder or element name, element status, or data flow status.

- ☐ Functional Change – Single Agency: Structural changes to the ITS service packages that impact only one agency in the Regional ITS Architecture.
  Examples include: Addition of a new ITS service package or changes to data flow connections of an existing ITS service package. The addition or changes would only impact a single agency.

- ☐ Functional Change – Multiple Agencies: Structural changes to the ITS service packages that have the potential to impact multiple agencies in the Regional ITS Architecture.
  Examples include: Addition of a new ITS service package or changes to data flow connections of an existing ITS service package. The addition or changes would impact multiple agencies and require coordination between the agencies.

- ☐ Project Change: Addition, modification, or removal of a project in the Regional ITS Deployment Plan.

- ☐ Other _____
  _____

Submittal

Please submit ITS Architecture Maintenance Documentation form to:

Knoxville Regional Transportation Planning Organization
400 Main Street, Suite 403
Knoxville, TN 37902
Phone: 865-215-2500

Form Submittal Date: _____

Knoxville Regional ITS Architecture

ITS Architecture Maintenance Documentation Form

Question 1 Describe the requested change to the Regional ITS Architecture or Deployment Plan.	
Question 2 Are any of the Regional ITS Architecture service packages impacted by the proposed change?	□ Yes: Please complete Questions 2A and 2B □ No: Please proceed to Question 3 □ Unknown: Please coordinate with the Knoxville TPO to determine impacts of the change to the Regional ITS Architecture
Question 2A List all of the ITS service packages impacted by the proposed change.	
Question 2B Include a copy of the ITS service packages impacted by the proposed change and mark any proposed modifications to the ITS service packages. Add any additional notes on proposed changes in this section.	
Question 3 Does the proposed change impact any stakeholder agencies other than the agency completing this form?	□ Yes: Please complete Questions 3A and 3B □ No: Form is complete □ Unknown: Please coordinate with the Memphis Urban Area MPO to determine impacts of change to other agencies in the Regional ITS Architecture
Question 3A Identify the stakeholder agencies impacted by the change and a contact person for each agency.	
Question 3B Describe the coordination that has occurred with the stakeholder agencies and the results of the coordination?	

APPENDIX F – FHWA READY FOR USE APPROVAL LETTER

U.S. Department of Transportation
Federal Highway Administration

Tennessee Division

404 BNA Drive, Suite 508
Nashville, Tennessee 37217
Phone (615) 781-5770

November 3, 2021

In Reply Refer To:
HTS-TN

Mr. Lee Smith
(Interim) Director of Operations
Tennessee Department of Transportation
James K. Polk Building, Suite 700
Nashville, TN 37243

Subject: Regional ITS Architecture (RITSA) Ready for Use
2021 Knoxville Urban Area RITSA and RAD-IT

Dear Mr. Smith:

In response to your request dated October 28, 2021, the Federal Highway Administration (FHWA) has reviewed the final RITSA documents for the subject project in accordance with 23 CFR 940. The RITSA documents are in compliance with the CFR requirements, therefore the request is approved, and the associated documents are considered "ready for use."

If you have questions regarding this approval, please contact me at (615) 781-5769.

Sincerely,

Melissa Furlong, P.E.
Operations Program Specialist