



Strafford Regional Planning Commission  
Rockingham Planning Commission

## STRAFFORD-ROCKINGHAM REGION ITS ARCHITECTURE

---

FINAL REPORT

MARCH 2008



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# 1. INTRODUCTION

This document is the Draft Final Report of the Strafford-Rockingham Region ITS Architecture and ITS Strategic Plan project. The purpose of this document is to summarize the detailed technical findings contained in two other project documents: the *Strafford-Rockingham Region ITS Architecture* document and the *Strafford-Rockingham Region ITS Strategic Plan* document.

## 1.1 Background

### 1.1.1 WHAT ARE INTELLIGENT TRANSPORTATION SYSTEMS (ITS)?

Intelligent Transportation Systems (ITS) are applications of advanced technology in the field of transportation, with the goals of increasing operational efficiency and capacity, improving safety, reducing environmental costs, and enhancing personal mobility. ITS projects can provide a variety of benefits, including: increased system capacity through more efficient use of existing infrastructure; improved system management, including incident management; better-informed travelers through the provision of real-time traveler and weather information; increased safety; and reduced environmental impacts. Intelligent Transportation Systems are a series of tools that can be applied, as needed, to address specific, identified regional transportation needs.

**Intelligent Transportation Systems (ITS) are tools designed to increase the safety and efficiency of the transportation network, enhance personal mobility, and improve interagency coordination.**

Examples of ITS projects include traffic signal interconnections, transit signal priority systems, traffic signal control software, variable message signs, closed-circuit television cameras, traveler information systems, electronic fare payment systems, and automatic vehicle location (AVL) systems.

ITS are designed to make better use of existing transportation infrastructure through improved system management and reliability at a fraction of the cost of conventional infrastructure expansion. Successful ITS deployment requires an approach to planning, implementation, and operations that emphasizes collaboration between relevant entities and compatibility of individual systems. Such an approach is designed to maximize user benefits and the cost efficiency of ITS investments.

### 1.1.2 WHAT ARE ITS PROJECTS?

An ITS project, as defined by the Federal Highway Administration (FHWA) and the Federal Transit Administration (FTA) is “any project that in whole or in part funds the acquisition of technologies or systems of technologies that provide or significantly contribute to the provision of one or more ITS user services as defined in the National ITS Architecture.”

Examples of user services include: Traffic Control, Incident Management, Public Transportation Management, Pre-trip Travel Information, Emergency Vehicle Management, and Maintenance and Construction Operations.

Essentially, an ITS project is any project that includes ITS technologies (i.e. advanced information processing, communications, sensing, or control technologies) and that has the potential to be integrated with other systems.

### 1.1.3 WHAT IS A REGIONAL ITS ARCHITECTURE?

There is sometimes confusion about what exactly is meant by an ITS “architecture.” In this case, architecture does not refer to a building, but rather a framework. These ITS architectures provide a framework for planning and implementing ITS across a region. They serve as a guide for how agencies can work together to improve interagency coordination, to increase efficiency while reducing costs, and to provide better services to the traveling public.

The architecture is a document that details the existing and planned linkages between transportation systems, projects, and institutions. A *regional ITS architecture* is based on the National ITS Architecture developed by the United States Department of Transportation (USDOT) and follows the guidance issued by the FHWA rule, “Intelligent Transportation System Architecture and Standards” and the FTA policy, “National ITS Architecture Policy on Transit Projects.” More information on the National ITS Architecture can be found at: [www.iteris.com/itsarch](http://www.iteris.com/itsarch).

To achieve their full potential, ITS systems cannot exist independently. Rather, they must be integrated with one another, and with conventional transportation investments, in order to maximize the return on investment of the individual systems. Successful ITS deployments require an approach to planning, implementation, and operations that emphasizes collaboration between relevant entities and compatibility of individual systems. At the core of this process is a systems architecture that guides the coordination and integration of individual ITS deployment projects.

The Strafford Regional Planning Commission (SRPC) and the Rockingham Planning Commission (RPC), working collaboratively with regional transportation stakeholders, have undertaken the development of a regional ITS architecture. The Strafford-Rockingham Region ITS Architecture serves as a framework for regional ITS coordination; defining the component systems, their interconnections, and providing a tool for facilitating institutional relationships within a region. As part of the architecture development process, an ITS Strategic Plan for the region was also developed. The ITS Strategic Plan recommends specific, project-based initiatives for implementing the Strafford-Rockingham Region ITS Architecture.

**Regional ITS Architectures are frameworks for regional ITS coordination; defining component systems, their interconnections, and providing a tool for facilitating institutional relationships in the region.**

### 1.1.4 DOES THE ITS ARCHITECTURE AFFECT ME?

Any public or private sector entity involved in the planning, engineering, and/or operations of passenger surface transportation (roadways or public transportation), whether at the municipal, regional, or state level, should have a basic awareness of the Strafford-Rockingham Region ITS Architecture. As ITS is increasingly 'mainstreamed' into transportation planning and projects, its use as a solution to regional transportation needs will impact and benefit a growing number of stakeholders.

In particular, entities that should have a working knowledge of the Strafford-Rockingham Region ITS Architecture include:

- Those involved in local or regional transportation planning, including the development of Transportation Improvement Programs (TIPs);
- Engineers, planners, and operators responsible for designing, maintaining, and operating regional transportation infrastructure or systems;

- Public and private sector providers of transit services interested in implementing advanced public transportation technologies;
- Entities involved in federally-funded transportation project planning, design, and/or implementation;
- Emergency responders with an interest in transportation system performance, including public safety (fire, police, and emergency medical services); incident management; disaster/emergency response; and/or Homeland Security;
- Private providers of transportation engineering, planning, or design services to public agencies or governments; and
- Anyone with an interest in the use of advanced technology to improve the efficiency, safety, and convenience of the region's transportation system, communication with the traveling public, and coordination among public agencies.

Some of these groups may require a more in-depth familiarity with the technical content of the architecture than others.

#### 1.1.5 HOW DOES THE REGIONAL ITS ARCHITECTURE AFFECT PROJECT FUNDING?

The development of a regional ITS architecture is part of the Federal requirements meant to encourage regional integration of transportation systems. The Transportation Equity Act for the 21st Century (TEA-21), enacted in 1998, promoted integration through a focus on interagency and multimodal coordination, and it included a requirement for ITS projects funded through the highway trust fund (including the mass transit fund) to conform to the National ITS Architecture and applicable standards.

**Federal funding for projects with ITS elements requires consistency with applicable Regional ITS Architectures.**

In January 2001, an FHWA Rule and FTA Policy were published that implement the ITS architecture requirement of TEA-21. The Rule/Policy defines conformance with the National ITS Architecture as adherence of ITS projects to a regional ITS architecture that is developed based on the National ITS Architecture. For reference, the FHWA rule and FTA policy are included in the appendices of the Strafford-Rockingham Region ITS Architecture document.

The Strafford-Rockingham Region ITS Architecture has been developed to ensure that ITS projects in the region adhere to the FHWA rule and the FTA policy. Furthermore, it is hoped that the development of the Strafford-Rockingham Region ITS Architecture will promote increased interagency coordination of transportation technology in the region. It should be noted that this regional ITS architecture is being developed in accordance with the guidelines, concepts, and terminology of the National ITS Architecture, Version 6.0 ([www.iteris.com/itsarch](http://www.iteris.com/itsarch)), as well as the requirements set forth in the 2001 Federal Highway Administration (FHWA) Rule and Federal Transit Administration (FTA) Policy that implement section 5206(e) of the U.S. Department of Transportation (USDOT) Transportation Equity Act for the 21st Century (TEA-21).

The Strafford-Rockingham Region ITS Architecture is designed to be consistent with the *New Hampshire Statewide ITS Architecture*, developed by NHDOT in February 2006. This regional ITS architecture is also intended to be consistent with adjacent regional ITS architectures, including the *ITS Architecture for the Nashua Region*, the *Regional Intelligent Transportation Systems (ITS) Architecture for the Southern New Hampshire Planning Commission (SNHPC) Region*, the *Maine Statewide ITS Architecture*, and the *Metropolitan Boston Regional ITS Architecture*.

The Strafford-Rockingham Region ITS Architecture provides the basis for satisfying federal requirements for ITS projects in the region funded with Highway Trust Funds (including the Mass Transit Fund). These regulations require that all projects that use federal funding be consistent with the appropriate regional ITS architecture(s). Federal regulations also require that all ITS projects be based on a systems engineering analysis. Therefore, it is vital that project proponents use Strafford-Rockingham Region ITS Architecture as a guideline during project development, just as FHWA and FTA will be using these architectures when reviewing the project. Failure to take consistency into account could result in the loss or delay of federal funding for a project.

#### 1.1.6 LIVING DOCUMENTS

It is important to understand that the *Strafford-Rockingham Region ITS Architecture* document and the *ITS Strategic Plan* document are “living documents,” and must be periodically re-evaluated and (if necessary) updated to ensure that it remains current with ITS deployment activities, evolving transportation needs in the region, and ITS developments at the agency, statewide, and national levels. A recommended process of using and maintaining the ITS Architecture and the ITS Strategic Plan is detailed in Chapter 5 of this report.

**The Strafford-Rockingham Region ITS Architecture and the ITS Strategic Plan are intended to evolve and adapt to reflect changes in the region.**

## 1.2 Organization of the Final Report

This final report summarizes the key findings of the *Strafford-Rockingham Region ITS Architecture* document and the *ITS Strategic Plan* document. This project summary is intended to aid those unfamiliar with ITS and ITS architectures. Individuals and organizations seeking a more detailed understanding of the *Strafford-Rockingham Region ITS Architecture* document and the *ITS Strategic Plan* document are recommended to refer to those documents separately. The final report is structured as follows:

- **Chapter 1 (Introduction):** This chapter provides introductory material; it describes the background of ITS architectures, outlines the objectives of this project, defines the region, and explains the Architecture process;
- **Chapter 2 (ITS Architecture Project Overview):** This chapter provides a high-level overview of the architecture mission statement and objectives, and the architecture development process;
- **Chapter 3 (Key Outputs of the ITS Architecture):** This chapter highlights key outputs of the *Strafford-Rockingham Region ITS Architecture* document, including: identification of regional transportation needs, an inventory of the region’s existing and planned ITS elements, identification of ITS market packages relevant to the region, a discussion of ITS standards, and a description of the operational concepts and functional requirements developed for market packages in the region;
- **Chapter 4 (ITS Strategic Plan Overview):** This chapter, summarizes the regional ITS projects identified in the *Strafford-Rockingham Region ITS Strategic Plan* document; and
- **Chapter 5 (Using and Maintaining the Regional ITS Architecture and ITS Strategic Plan):** This chapter concludes the report with recommendations for using and maintaining the *Strafford-Rockingham Region ITS Architecture* document and the *ITS Strategic Plan* document.

## 2. ITS ARCHITECTURE PROJECT OVERVIEW

### 2.1 Architecture Mission Statement and Goals

Working with regional stakeholders, the following mission statement was developed to define the mission of this regional ITS architecture:

“In order to enhance the region’s transportation safety, security, mobility, and performance; stakeholders in the Strafford-Rockingham region will apply advanced technologies and systems to improve interagency coordination and create opportunities for seamless integration of transportation services, both within the region and with adjacent regions.”

Consistent with the region’s transportation goals, the goals for this architecture are to:

- Improve safety.
- Improve security.
- Increase efficiency.
- Improve coordination.
- Improve mobility/ accessibility.
- Improve traveler information.
- Improve economic prosperity/livability.
- Reduce environmental impacts.
- Maximize investment value.

### 2.2 Architecture Objectives

The following are the strategic objectives for developing the Strafford-Rockingham Region ITS Architecture:

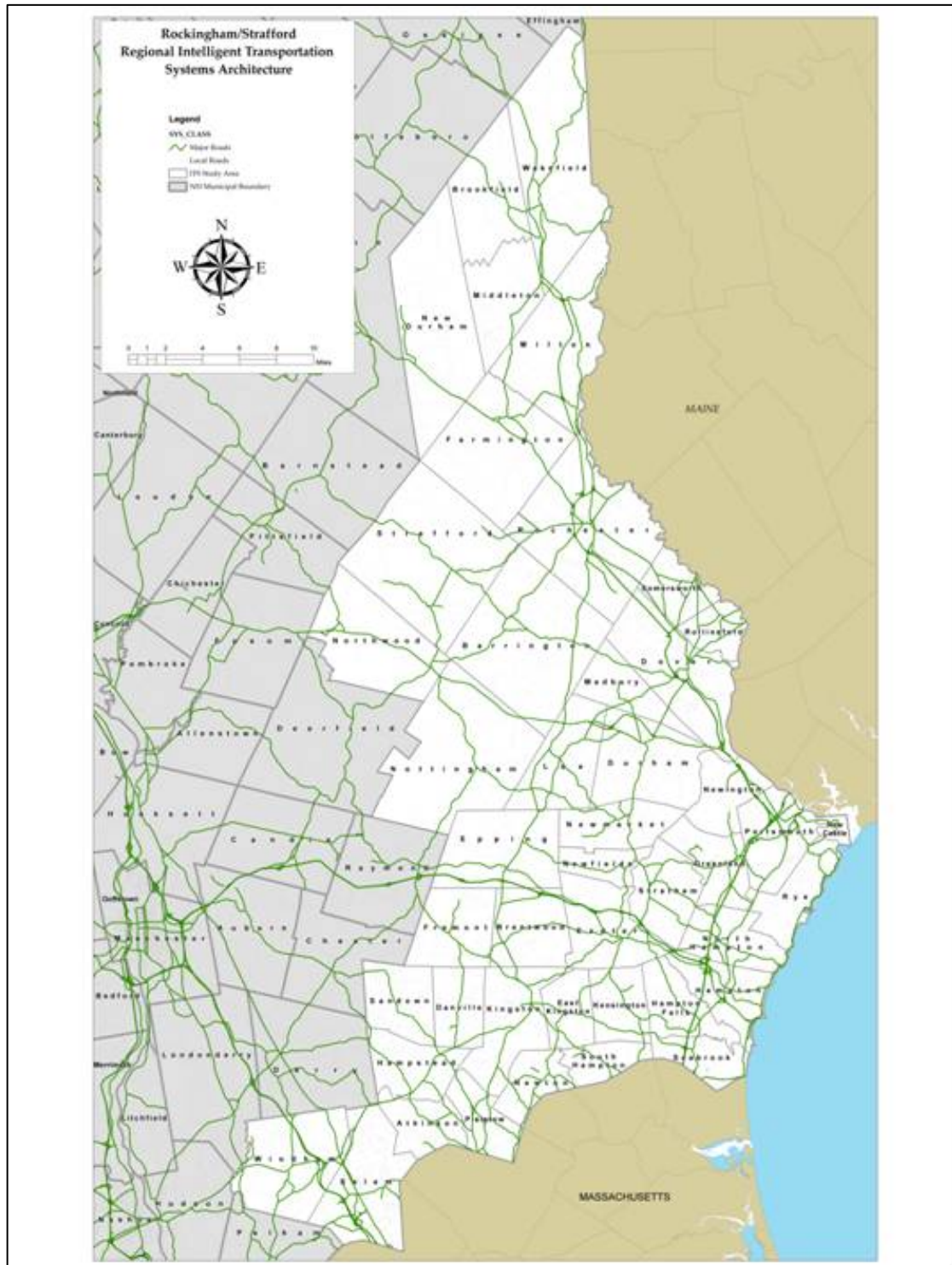
- **Providing a Framework for Regional ITS Implementation:** The ultimate goal in developing a regional ITS architecture is to establish a framework for integrated, systematic deployment of ITS systems across the region. This framework should not only provide a roadmap for implementing exclusive ITS projects, but also for considering the benefits of including ITS initiatives in all transportation investments.
- **Promoting a Regional ITS Dialogue and Improving Interagency Coordination:** A key objective is to improve interagency coordination, which is essential for integration of ITS and the transportation system as a whole. The architecture development process seeks to facilitate communication among the region’s agencies that will carry over to permanent working relationships. Thus, the architecture process defines interfaces between agencies, describes the roles and responsibilities of these interfacing agencies, and provides recommendations for agreements among them.

- **Consistency with, and Leveraging of, the National ITS Architecture and Standards:** Standards facilitate ITS coordination by assuring that ITS projects implemented over time, space, and jurisdictional boundaries are interoperable. Since there is an existing national architecture and standards being developed by USDOT, it makes sense to use them; adopting and enforcing these standards ensures that ITS projects built anytime, anywhere will be compatible with each other. The result is that each new project will both add value to the ever-expanding regional ITS program and benefit from it. These standards also help ensure that the regional ITS infrastructure will be compatible with state and national components, as the boundaries of each expand and overlap.
- **Fulfilling Federal ITS Requirements:** As previously mentioned, for ITS projects to receive federal funding, they must be consistent with a regional ITS architecture which is itself compliant with the FHWA Rule and FTA policy regarding the development of regional ITS architectures. This architecture's consistency with federal requirements is described in the following section.

### 2.3 Description of the Region

The region covered by this architecture consists of the geographic regions included in the Strafford Regional Planning Commission and the Rockingham Planning Commission boundaries. The region is shown in Exhibit 2-1.

**Exhibit 2-1: Definition of the Strafford-Rockingham Region**



## 2.4 Timeframe

The project team, in cooperation with numerous local, regional, and state transportation and emergency management stakeholders, is developing this architecture to provide a framework for coordinated ITS deployment in the region over the next ten (10) years, consisting of 2008 to 2018.

## 2.5 The Regional ITS Architecture Development Process

The process undertaken for building the Strafford-Rockingham Region ITS Architecture is illustrated in Exhibit 2-2. Each step of the process was founded on the comprehensive input and involvement of local ITS stakeholders, with the goal of creating a final regional ITS architecture rooted in local needs. The study approach was also fully mindful of Federal recommendations and requirements for the development and outcomes of the regional ITS architecture development process.

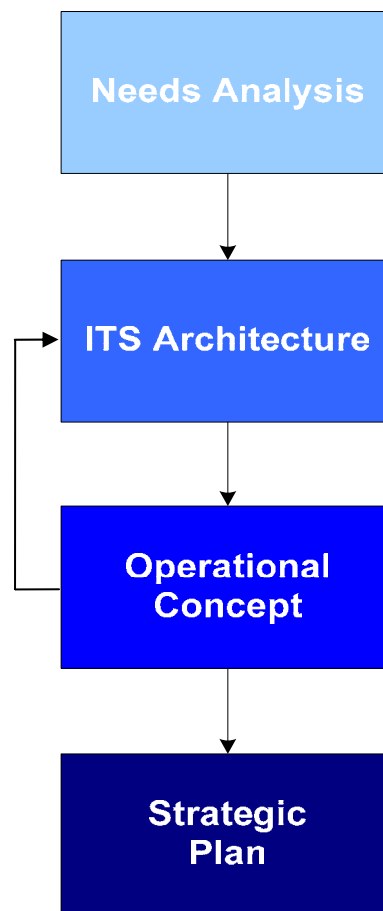
During the **Needs Analysis** process the regional transportation needs and ITS goals were determined. This was achieved by reviewing documentation from the region, engaging in one-on-one meetings with various stakeholders, and holding a stakeholder workshop on October 17, 2007 in Exeter, New Hampshire.

This analysis served as the basis for development of the component systems of the **ITS Architecture** and the interfaces between them during the architecture development process. Stakeholder involvement was also critical to this step of the process. Contact was made with several of the stakeholders to clarify their existing ITS systems and model their processes accurately. An initial draft of the architecture was developed, and then refinements were made based on stakeholder comments.

The **Operational Concept**, which defines the institutional roles and responsibilities of the stakeholders in operating component systems of the architecture, was developed next. In this phase, stakeholders provided information about existing interagency relationships and agreements. A stakeholder workshop, held on November 15, 2007, provided an opportunity for stakeholders to discuss existing and planned coordination efforts, including optional agreements that could be established or formalized. These agreements were documented as part of the architecture. Key outputs of the final architecture are described in Chapter 3. A maintenance plan and methodology for ensuring consistency between ITS projects and the architecture is included in Chapter 5.

The final architecture phase is the development of the **ITS Strategic Plan**, which provides a strategy and timeline for achieving the integrated transportation system envisioned by the architecture through a series of identified initiatives. Stakeholder input was again solicited in the development of the *ITS Strategic Plan* document through stakeholder interviews and a stakeholder

**Exhibit 2-2: The Regional ITS Architecture Process**



workshop held on January 18, 2008. The *Strafford-Rockingham Region ITS Strategic Plan* document is summarized in Chapter 4.

## 2.6 Stakeholder Outreach

A principal objective of the ITS Architecture development process is to bring together a variety of transportation and emergency management stakeholders to foster a regional dialogue about the future of Intelligent Transportation Systems in the Strafford-Rockingham Region. ITS architectures and systems are designed to address specific transportation needs. Thus the architecture development process requires that a wide range of agencies and organizations participate, ensuring that the regional ITS architecture accurately addresses the critical issues of the region. Any stakeholder involved in planning, funding, or operating transportation systems in the region has an inherent interest in the ITS architecture and future systems deployment.

The stakeholders who participated in the Strafford-Rockingham Region ITS Architecture development process represented a wide range of local, regional, and statewide entities, multiple modes of transportation, and both public and private interests. The stakeholders participated in workshops and meetings, reviewed project deliverables (draft documents), and provided input at each stage of the process, from the needs analysis to the strategic plan. A full listing of participating stakeholders is presented in Appendix D of the *Strafford-Rockingham Region ITS Architecture* document.

Regional stakeholders were also invited to three special workshops. These workshops offered an opportunity to learn more about ITS and ITS architectures, identify regional transportation needs, identify ITS services that might address specific regional transportation needs, review draft documentation of project deliverables, discuss operational concepts for specific ITS market packages in the region, and identify and prioritize potential ITS projects for the region.

The following workshops were held during the course of the study:

- **Workshop #1: Regional Transportation Needs (October 17, 2007):** This first workshop introduced ITS architecture concepts and facilitated a discussion among stakeholders about regional transportation needs. The needs identified in this meeting helped form the basis for the selection of ITS services described in the architecture.
- **Workshop #2: Operational Concept (November 15, 2007):** This workshop included a presentation of a preliminary ITS inventory and market packages based on information gathered through a review of relevant regional planning documents, through Workshop #1, and through one-on-one follow-up interviews. This workshop also explored the information flows and operational concepts among interfacing agencies. Preliminary “strawman” drafts of the regional ITS architecture were made available for stakeholder review and comment.
- **Workshop #3 – Project Development and Prioritization (January 18, 2008):** This workshop allowed regional stakeholders to meet together to develop the initial projects and priorities that are included in the region’s *ITS Strategic Plan* document. This workshop helped regional stakeholders translate desired ITS services into specific, feasible project concepts that can be further developed as part of the regional transportation planning process.

### 3. KEY OUTPUTS OF THE ITS ARCHITECTURE

This chapter summarizes some of the key outputs of the *Strafford-Rockingham Region ITS Architecture* document. For more detailed information, please refer to relevant portions of the document itself.

#### 3.1 Regional Needs

Stakeholders identified several inter-related issues as being the primary regional transportation needs, including:

- Transportation Funding - An overarching transportation issue in the region, transportation funding in the Strafford-Rockingham region is extremely limited. Transportation investments will likely need to rely primarily on local funding sources, such as transportation impact fees.
- Traffic Management - With the region experiencing significant growth in congestion, traffic management activities have taken on increasing regional importance. The region routinely must handle commuter congestion, seasonal and retail traffic peaks, roadway construction congestion and detours, toll collection congestion and detours, and congestion caused by incidents, inclement weather, and large-scale planned events. Traffic signals and monitoring equipment is seen as advantageous technologies.
- Incident and Emergency Management – In addition to improving incident detection and response, the region is at risk of flooding, hurricanes, severe storms, and emergency evacuation related to the FPL Energy Seabrook Station.
- Infrastructure Maintenance and Preservation – The region has an ongoing need for preservation and maintenance of transportation infrastructure, especially the region's bridges.
- Transit Management and Coordination – Population growth and the aging of the population contribute to an increased need for more public transit, improved transit operations, and improved coordination among transit agencies.
- Traveler Information Services – Improved traveler information is seen as a way to reduce traffic congestion, support public transit alternatives, improve public safety, and assist in other regional transportation goals.
- Data and Information Sharing – As more transportation data becomes available, there is increasing recognition of the benefits of exchanging this data with partners across multiple disciplines and jurisdictions.

#### 3.2 ITS Inventory

Based on the information gathered from regional stakeholders, an inventory of ITS elements was developed. This inventory includes existing elements, which are those that are already in place or that have been designed, as well as planned elements that address the needs identified in the needs analysis. A good working understanding of the region's existing and planned ITS elements allows for an informed collaboration of project stakeholders and ensures that project recommendations do not conflict with existing or planned ITS initiatives.

The ITS inventory for the region is presented in Exhibit 3-1, with the elements grouped by stakeholder. It should be noted that this inventory includes both specific ITS systems, where such systems presently exist in the region, as well as generic ITS elements intended to allow for future ITS deployments in the region. Only stakeholders that own or operate ITS elements in the region are captured in the following ITS inventory. This group of stakeholders is therefore a subset of the regional stakeholders that participated in the architecture development process. A listing of the ITS inventory organized by service functionality is included in Chapter 3 of the *Strafford-Rockingham Region ITS Architecture* document.

**Exhibit 3-1: ITS Inventory by Stakeholder**

<p><b>Alliance for Community Transportation (ACT)</b></p> <ul style="list-style-type: none"> <li>▪ ACT Broker/Manager</li> <li>▪ ACT Broker Telephone</li> </ul> <p><b>AMTRAK</b></p> <ul style="list-style-type: none"> <li>▪ Amtrak Operations</li> </ul> <p><b>Archive Data Users</b></p> <ul style="list-style-type: none"> <li>▪ Archived Data Users</li> </ul> <p><b>Bridge Authorities</b></p> <ul style="list-style-type: none"> <li>▪ Bridge Operations Centers</li> <li>▪ Bridge Operations Center Field Devices</li> </ul> <p><b>City of Portsmouth Department of Public Works</b></p> <ul style="list-style-type: none"> <li>▪ Dover Traffic Management System</li> <li>▪ Dover Traffic Signals</li> </ul> <p><b>City of Portsmouth Department of Public Works</b></p> <ul style="list-style-type: none"> <li>▪ Portsmouth Data Repository</li> <li>▪ Portsmouth Traffic Management System</li> <li>▪ Portsmouth Traffic Signals</li> <li>▪ Portsmouth DPW</li> </ul> <p><b>City of Portsmouth Public Safety Agencies</b></p> <ul style="list-style-type: none"> <li>▪ Portsmouth Dispatch Center</li> <li>▪ Portsmouth Public Safety Vehicles</li> </ul> <p><b>City of Somersworth Department of Public Works</b></p> <ul style="list-style-type: none"> <li>▪ Somersworth Data Repository</li> <li>▪ Somersworth Traffic Management System</li> <li>▪ Somersworth Traffic Signals</li> <li>▪ Somersworth DPW</li> </ul> <p><b>City of Somersworth Public Safety Agencies</b></p> <ul style="list-style-type: none"> <li>▪ Somersworth Dispatch Center</li> <li>▪ Somersworth Public Safety Vehicles</li> </ul>	<p><b>Cooperative Alliance for Regional Transportation (CART)</b></p> <ul style="list-style-type: none"> <li>▪ CART Bus Stops and Transfer Points</li> <li>▪ CART Data Repository</li> <li>▪ CART Demand Response Dispatch</li> <li>▪ CART Demand Response Transit Vehicles</li> <li>▪ CART Fixed Route Dispatch</li> <li>▪ CART Fixed Route Transit Vehicles</li> <li>▪ CART System Operator</li> <li>▪ CART Telephone</li> <li>▪ CART Transit Vehicle Operator</li> <li>▪ CART Website</li> </ul> <p><b>Cooperative Alliance for Seacoast Transportation (COAST)</b></p> <ul style="list-style-type: none"> <li>▪ COAST Bus Stops and Transfer Points</li> <li>▪ COAST Data Repository</li> <li>▪ COAST Demand Response Dispatch</li> <li>▪ COAST Demand Response Transit Vehicles</li> <li>▪ COAST Fixed Route Dispatch</li> <li>▪ COAST Fixed Route Transit Vehicles</li> <li>▪ COAST System Operator</li> <li>▪ COAST Transit Vehicle Operator</li> <li>▪ COAST Website</li> </ul> <p><b>Easter Seals NH</b></p> <ul style="list-style-type: none"> <li>▪ CART Broker/Manager</li> </ul> <p><b>Event Promoters</b></p> <ul style="list-style-type: none"> <li>▪ Regional Event Promoters</li> </ul>
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**Exhibit 3-1: ITS Inventory by Stakeholder (cont'd.)**

<p><b>FasTrans</b></p> <ul style="list-style-type: none"> <li>▪ FasTrans Bus Stops and Transfer Points</li> <li>▪ FasTrans Data Repository</li> <li>▪ FasTrans Dispatch</li> <li>▪ FasTrans System Operator</li> <li>▪ FasTrans Telephone</li> <li>▪ FasTrans Transit Vehicle Operator</li> <li>▪ FasTrans Transit Vehicles</li> <li>▪ FasTrans Website</li> </ul> <p><b>Federal Highway Administration</b></p> <ul style="list-style-type: none"> <li>▪ Government Reporting System</li> </ul> <p><b>Federal Public Safety Agencies</b></p> <ul style="list-style-type: none"> <li>▪ Alerting and Advisory Systems</li> </ul> <p><b>FEMA</b></p> <ul style="list-style-type: none"> <li>▪ FEMA</li> </ul> <p><b>Financial Institution</b></p> <ul style="list-style-type: none"> <li>▪ Financial Institution</li> </ul> <p><b>Homeland Security</b></p> <ul style="list-style-type: none"> <li>▪ Homeland Security</li> </ul> <p><b>Hospitals</b></p> <ul style="list-style-type: none"> <li>▪ Hospitals</li> </ul> <p><b>Local Media</b></p> <ul style="list-style-type: none"> <li>▪ Local Media</li> </ul> <p><b>Local Municipalities</b></p> <ul style="list-style-type: none"> <li>▪ Local Data Repositories</li> <li>▪ Local Field Devices</li> <li>▪ Local Infrastructure Monitoring Systems</li> <li>▪ Local Municipal Websites</li> <li>▪ Local Traffic Management Systems</li> <li>▪ Local Road Weather Stations</li> </ul> <p><b>Local Public Safety Agencies</b></p> <ul style="list-style-type: none"> <li>▪ Local EOC</li> <li>▪ Local Public Safety Centers</li> <li>▪ Local Public Safety Vehicles</li> </ul> <p><b>Local Public Works Agencies</b></p> <ul style="list-style-type: none"> <li>▪ Local DPW</li> <li>▪ Local Maintenance and Construction Vehicles</li> <li>▪ Local Parking Facility Security-Surveillance Systems</li> <li>▪ Local Parking Management System</li> </ul> <p><b>Maine Department of Transportation (MaineDOT)</b></p> <ul style="list-style-type: none"> <li>▪ MaineDOT Radio Room</li> </ul> <p><b>Maine Turnpike Authority</b></p> <ul style="list-style-type: none"> <li>▪ Maine Turnpike 24HR Communications Center</li> </ul> <p><b>Massachusetts Highway Department (MassHighway)</b></p> <ul style="list-style-type: none"> <li>▪ MassHighway Transportation Operations Center</li> </ul>	<p><b>Motor Carriers</b></p> <ul style="list-style-type: none"> <li>▪ Commercial Vehicles</li> <li>▪ Motor Carriers</li> </ul> <p><b>New Hampshire Commercial Vehicle Administration</b></p> <ul style="list-style-type: none"> <li>▪ New Hampshire Commercial Vehicle Administration</li> <li>▪ Roadside Safety Inspection Station</li> </ul> <p><b>New Hampshire Department of Health and Human Services</b></p> <ul style="list-style-type: none"> <li>▪ Health and Human Services</li> </ul> <p><b>New Hampshire Division of Ports and Harbors</b></p> <ul style="list-style-type: none"> <li>▪ Port Security System</li> </ul> <p><b>New Hampshire Department of Safety</b></p> <ul style="list-style-type: none"> <li>▪ E-911</li> <li>▪ Emergency Vehicle</li> <li>▪ New Hampshire Division of Emergency Services, Communication and Management</li> <li>▪ Portable Thermal Imaging Devices</li> <li>▪ Portable Weigh-In-Motion</li> <li>▪ State Police Dispatch</li> <li>▪ Statewide Emergency Operations Center</li> </ul> <p><b>NH Department of Safety – Division of Motor Vehicles</b></p> <ul style="list-style-type: none"> <li>▪ DMV Crash Archives Data</li> </ul> <p><b>New Hampshire Department of Transportation</b></p> <ul style="list-style-type: none"> <li>▪ 511</li> <li>▪ 511nh.com</li> <li>▪ Archived Data Management System (NHDOT)</li> <li>▪ Critical Transportation Infrastructure Security-Surveillance System</li> <li>▪ HAR</li> <li>▪ New Hampshire Road and Weather Conditions</li> <li>▪ NHDOT Field Devices</li> <li>▪ Rest Area and Service Plaza Security-Surveillance System</li> <li>▪ Road Weather Information System</li> <li>▪ Roadway Service Patrol Vehicle</li> <li>▪ State Maintenance and Construction Vehicle</li> <li>▪ Statewide Transportation Management Center</li> <li>▪ Surface Transportation Weather Service</li> <li>▪ Toll Administration Center</li> </ul> <p><b>NHDOT – Bureau of Turnpikes</b></p> <ul style="list-style-type: none"> <li>▪ Toll Plaza</li> </ul> <p><b>NHDOT – Maintenance District Three</b></p> <ul style="list-style-type: none"> <li>▪ NHDOT Maintenance District Three Headquarters</li> </ul> <p><b>NHDOT – Maintenance District Five</b></p> <ul style="list-style-type: none"> <li>▪ NHDOT Maintenance District Five Headquarters</li> </ul> <p><b>NHDOT – Maintenance District Six</b></p> <ul style="list-style-type: none"> <li>▪ NHDOT Maintenance District Six Headquarters</li> </ul>
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**Exhibit 3-1: ITS Inventory by Stakeholder (cont'd.)**

<p><b>Other Prepaid Stored Value Smart Card Distributors</b></p> <ul style="list-style-type: none"> <li>▪ Other Prepaid Stored Value Smart Cards</li> </ul> <p><b>Other State Police</b></p> <ul style="list-style-type: none"> <li>▪ Other State Police</li> </ul> <p><b>Other Transit Providers</b></p> <ul style="list-style-type: none"> <li>▪ Other Transit Provider Dispatch</li> <li>▪ Other Transit Provider Vehicles</li> </ul> <p><b>Parking Facility Operators (Non-Municipal)</b></p> <ul style="list-style-type: none"> <li>▪ Parking Facilities (Non-Municipal)</li> </ul> <p><b>Pedestrians</b></p> <ul style="list-style-type: none"> <li>▪ Pedestrians</li> </ul> <p><b>Private Ground Transportation Providers</b></p> <ul style="list-style-type: none"> <li>▪ Private Ground Transportation Providers</li> </ul> <p><b>Private Tow and Wrecker Company</b></p> <ul style="list-style-type: none"> <li>▪ Private Tow and Wrecker Vehicles</li> <li>▪ Private Tow and Wrecker Dispatch</li> </ul> <p><b>Private Traveler Information Systems</b></p> <ul style="list-style-type: none"> <li>▪ Private Traveler Information Systems</li> </ul> <p><b>Public and Private Utility Companies</b></p> <ul style="list-style-type: none"> <li>▪ Public and Private Utility Dispatch</li> </ul> <p><b>Rail/Airport/Port Operators</b></p> <ul style="list-style-type: none"> <li>▪ Rail/Airport/Port Non-Public Facilities Safety - Security Monitoring Devices</li> <li>▪ Rail/Airport/Port Operations</li> <li>▪ Rail/Airport/Port Public Facilities Safety - Security Monitoring Devices</li> <li>▪ Wayside Equipment</li> </ul> <p><b>Regional Fare Card Agencies</b></p> <ul style="list-style-type: none"> <li>▪ Regional Fare Card</li> </ul> <p><b>Rockingham Planning Commission (RPC)</b></p> <ul style="list-style-type: none"> <li>▪ RPC Data Warehouse</li> </ul> <p><b>FPL Energy Seabrook Station</b></p> <ul style="list-style-type: none"> <li>▪ Seabrook Station Alerting Systems</li> </ul>	<p><b>Service Agencies</b></p> <ul style="list-style-type: none"> <li>▪ Service Agency Cards</li> </ul> <p><b>Stafford Regional Planning Commission (SRPC)</b></p> <ul style="list-style-type: none"> <li>▪ SRPC Data Warehouse</li> </ul> <p><b>Town of Salem</b></p> <ul style="list-style-type: none"> <li>▪ Salem Data Repository</li> <li>▪ Salem Traffic Management System</li> </ul> <p><b>Town of Salem Department of Public Works</b></p> <ul style="list-style-type: none"> <li>▪ Salem Traffic Monitoring Devices</li> <li>▪ Salem Traffic Signals</li> <li>▪ Salem DPW</li> </ul> <p><b>Town of Salem Public Safety Departments</b></p> <ul style="list-style-type: none"> <li>▪ Salem Dispatch Center</li> <li>▪ Salem Public Safety Vehicles</li> </ul> <p><b>Traveler Card Update Device Owners</b></p> <ul style="list-style-type: none"> <li>▪ Traveler Card Update Devices</li> </ul> <p><b>Travelers</b></p> <ul style="list-style-type: none"> <li>▪ Traveler</li> <li>▪ Personal Devices</li> <li>▪ Vehicles</li> </ul> <p><b>TRIO</b></p> <ul style="list-style-type: none"> <li>▪ TRIO ISP</li> </ul> <p><b>U.S. Coast Guard</b></p> <ul style="list-style-type: none"> <li>▪ US Coast Guard</li> </ul> <p><b>Wildcat Transit - UNH</b></p> <ul style="list-style-type: none"> <li>▪ Wildcat Transit Bus Stops and Transfer Points</li> <li>▪ Wildcat Transit Data Repository</li> <li>▪ Wildcat Transit Fixed Route Dispatch</li> <li>▪ Wildcat Transit Fixed Route Transit Vehicles</li> <li>▪ Wildcat Transit System Operator</li> <li>▪ Wildcat Transit Transit Vehicle Operator</li> <li>▪ Wildcat Transit Website</li> </ul>
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### 3.3 Architecture Database

The regional transportation needs identified by stakeholders along with the identified existing and planned ITS elements provide the basis for developing the Physical Architecture, which describes specific ITS services in greater detail. The architecture is a framework that defines the desired ITS functions of a system, the physical entities in which the functions reside, and the information flows that connect the entities. It focuses on elements that are likely to be implemented over the next ten years to assure that the architecture is realistically applicable rather than an ITS “wish list.” The main underlying framework for the Strafford-Rockingham Region ITS Architecture came from the National ITS Architecture, as required by Federal guidelines, and the New Hampshire Statewide ITS Architecture. The local functional requirements were used to identify applicable portions of these frameworks, then insert local ITS inventory and additional future components as necessary to complete the systems. The result is a localized ITS architecture, unique to the region, but consistent with Federal and State examples.

The region's architecture was created using *TurboArchitecture™ Version 4.0*, a software program created by FHWA to facilitate development of regional ITS architectures. This tool was used to record and represent the architecture in an interactive, accessible form. *TurboArchitecture™* allows users to view the content of the architecture in varying levels of detail, and provides a streamlined way to update it as necessary. This *TurboArchitecture™* database, which contains the formal Physical Architecture, will be owned and maintained jointly by SRPC and RPC.

### 3.4 Description of the ITS Architecture

This section provides a brief summary of the Strafford-Rockingham Region ITS Architecture. For the sake of brevity, explanations of the federal framework are included only as necessary, but more information can be found at the National ITS Architecture website:

[http://www.ops.fhwa.dot.gov/its\\_arch\\_imp/index.htm](http://www.ops.fhwa.dot.gov/its_arch_imp/index.htm).

The building blocks of the architecture are Stakeholders, Equipment Packages, Elements, Entities, Interconnects, Information Flows, and Market Packages:

- *Stakeholders* own ITS *Elements*, which provide ITS functions through *Equipment Packages*;
- Elements can be combined and categorized as one of two types of *Entities*, either subsystems or terminators;
- Complete ITS services are provided when entities are *Interconnected* and exchange information through directional *Information Flows*; and
- All of these components combine to form *Market Packages*, which are realistic, deployment-oriented representations of the physical elements required to provide ITS services.

Elements are classified as “existing” if their design is complete at the time of the creation of the architecture, regardless of whether the actual element is deployed. Elements are classified as “planned” if their interfaces have not yet been designed at the time that this architecture was created.

#### 3.4.1 ARCHITECTURE STAKEHOLDERS

For purposes of the Physical Architecture, the *architecture stakeholders* are the owners and operators of ITS elements. Most of the stakeholders included in the architecture are defined as specific agencies or companies, but there are also several non-specific stakeholders to ensure that the architecture can accommodate other entities that are not called out specifically by name in the architecture (for instance, one of the smaller municipalities in the study region). Exhibit 3-2 lists all of the stakeholders with elements in the Strafford-Rockingham Region ITS Architecture.

**Exhibit 3-2: List of Stakeholders Defined in the Physical Architecture**

<p>Alliance for Community Transportation (ACT)                  AMTRAK                  Archived Data Users                  Bridge Authorities**                  City of Dover Department of Public Works                  City of Portsmouth Department of Public Works                  City of Portsmouth Public Safety Agencies                  City of Somersworth Department of Public Works                  City of Somersworth Public Safety Agencies                  Cooperative Alliance for Regional Transportation (CART)                  Cooperative Alliance for Seacoast Transportation (COAST)                  Easter Seals NH                  Event Promoters**                  FasTrans                  Federal Highway Administration                  Federal Public Safety Agencies                  FEMA                  Financial Institution**                  Homeland Security                  Hospitals**                  Local Media**                  Local Municipalities**                  Local Public Safety Agencies**                  Local Public Works Agencies**                  Maine Department of Transportation (MaineDOT)                  Maine Turnpike Authority                  Massachusetts Highway Department (MassHighway)                  Motor Carriers**                  New Hampshire Commercial Vehicle Administration                  New Hampshire Department of Health and Human Services</p>	<p>New Hampshire Department of Safety                  NH Department of Safety – Division of Motor Vehicles                  New Hampshire Department of Transportation                  NHDOT – Bureau of Turnpikes                  NHDOT Maintenance District Three                  NHDOT Maintenance District Five                  NHDOT Maintenance District Six                  New Hampshire Division of Ports and Harbors                  Other Prepaid Stored Value Smart Card Distributors**                  Other State Police**                  Other Transit Providers**                  Parking Facility Operators (Non-Municipal)**                  Pedestrians                  Private Commercial Carriers**                  Private Ground Transportation Providers**                  Private Tow and Wrecker Company**                  Private Traveler Information Systems**                  Public and Private Utility Companies**                  Rail/Airport/Port Operators**                  Regional Fare Card Agencies**                  Rockingham Planning Commission (RPC)                  FPL Energy Seabrook Station                  Service Agencies**                  Strafford Regional Planning Commission (SRPC)                  Town of Salem                  Town of Salem Department of Public Works                  Town of Salem Public Safety Departments                  Traveler Card Update Device Owners                  Travelers                  TRIO                  U.S. Coast Guard                  Wildcat Transit - UNH</p>
<p>** Non-specific entity representing other potential stakeholders not explicitly named</p>	

3.4.2 EQUIPMENT PACKAGES, ELEMENTS, AND ENTITIES

The stakeholders own elements, which are made up of equipment packages and combined to create entities. There are two types of entities: *subsystems* and *terminators*. *Subsystems* are combinations of elements that cooperatively perform specific functions. *Terminators* are the human (Driver, for example) and non-human (i.e. Media, Traveler Card) participants that are external to ITS but interface with it; they define the boundary of an architecture. The subsystems and terminators included in the Strafford-Rockingham Region ITS Architecture are listed in Exhibit 3-3.

**Exhibit 3-3: List of Entities**

<b>Subsystems</b>	<b>Terminators</b>
<ul style="list-style-type: none"> <li>• Archived Data Management Subsystem</li> <li>• Commercial Vehicle Administration</li> <li>• Commercial Vehicle Check</li> <li>• Commercial Vehicle Subsystem</li> <li>• Emergency Management</li> <li>• Emergency Vehicle Subsystem</li> <li>• Fleet and Freight Management</li> <li>• Information Service Provider (ISP)</li> <li>• Maintenance and Construction Management</li> <li>• Maintenance and Construction Vehicle</li> <li>• Parking Management</li> <li>• Personal Information Access</li> <li>• Remote Traveler Support</li> <li>• Roadway Subsystem</li> <li>• Security Monitoring Subsystem</li> <li>• Toll Administration</li> <li>• Toll Collection</li> <li>• Traffic Management</li> <li>• Transit Management</li> <li>• Transit Vehicle Subsystem</li> <li>• Vehicle</li> </ul>	<ul style="list-style-type: none"> <li>• Alerting and Advisory Systems</li> <li>• Archived Data User Systems</li> <li>• Basic Commercial Vehicle</li> <li>• Care Facility</li> <li>• Driver</li> <li>• Emergency Telecommunications System</li> <li>• Enforcement Agency</li> <li>• Event Promoters</li> <li>• Financial Institution</li> <li>• Government Reporting Systems</li> <li>• Intermodal Freight Depot</li> <li>• Media</li> <li>• Multimodal Transportation Service Provider</li> <li>• Other Emergency Management</li> <li>• Other Traffic Management</li> <li>• Pedestrians</li> <li>• Rail Operations</li> <li>• Surface Transportation Weather Service</li> <li>• Telecommunications System for Traveler Information</li> <li>• Transit Operations Personnel</li> <li>• Transit Vehicle Operator</li> <li>• Traveler</li> <li>• Traveler Card</li> <li>• Wayside Equipment</li> <li>• Yellow Pages Service Providers</li> </ul>

### 3.4.3 INFORMATION FLOWS

An interface between two entities is called an *Interconnect*. Directional movements of information between entities are called *Information Flows*. It is through these physical connections that data is exchanged to make ITS services possible. There are many different types of information flows throughout the architecture, specific to particular types of services being offered, so a comprehensive list is not included in this document. Instead, the information flows utilized in this architecture can be found in the Market Package Diagrams in Appendix F of the *Strafford-Rockingham Region ITS Architecture* document.

### 3.4.4 MARKET PACKAGES

Entities (subsystems and terminators) and information flows are combined to form *Market Packages*. Market packages are realistic, deployment-oriented representations of the physical elements required to implement ITS services. They combine existing and future elements to provide guidance for ITS coordination over a 10-year horizon.

Ninety-one (91) illustrative packages are defined in Version 6.0 of the National ITS Architecture, in eight categories:

- Advanced Transportation Management Systems (ATMS)
- Advanced Public Transportation Systems (APTS)
- Advanced Traveler Information Systems (ATIS)
- Archived Data Management (AD)
- Commercial Vehicle Operations (CVO)
- Emergency Management (EM)
- Maintenance and Construction Management (MC)
- Advanced Vehicle Safety Systems (AVSS)

Each Market Package is given a name and number that corresponds with the category of which it is a part. For example: "ATMS01 – Network Surveillance" is the first market package described in the Advanced Transportation Management Systems (ATMS) category. Also, there may be more than one version of the same Market Package, with different participants and elements. These multiple versions of a single Market Package are called *instances*.

The Strafford-Rockingham Region ITS Architecture was built using these illustrative packages, which were then localized based on unique regional ITS infrastructure and functional requirements. Examples of how the National ITS Architecture framework was adapted to reflect the unique characteristics of the region are included in Chapter 4 of the *Strafford-Rockingham Region ITS Architecture* document. The needs identified the region's transportation stakeholders were mapped to specific market packages as described in Exhibit 3-4 below:

**Exhibit 3-4: Mapping Needs to Market Packages**

Regional Need	Market Packages
Transportation Funding	While no ITS services or market packages address the issue of transportation funding, the implementation of all market packages and ITS services will face the challenge of securing funding in a fiscally-constrained environment.
Traffic Management	ATMS01, ATMS03, ATMS04, ATMS06, ATMS07, ATMS08, ATMS10, ATMS13, ATMS18, ATMS20, CVO03, CVO04, CVO06, CVO07, EM08, EM09, MC03, MC04, MC05, MC06, MC07, MC10
Emergency/ Incident Management	APTS07, ATMS01, ATMS03, ATMS04, ATMS06, ATMS07, ATMS08, EM01, EM02, EM03, EM04, EM05, EM06, EM07, EM08, EM09, EM10, MC03, MC04, MC08, MC10
Infrastructure Maintenance and Preservation	APTS05, ATMS01, EM05, MC01, MC03, MC04, MC05, MC06, MC07, MC08, MC10, MC12
Transit Management and Coordination	APTS01, APTS02, APTS03, APTS04, APTS05, APTS07, APTS08, APTS09, APTS10, EM08, EM09, MC04, MC06, MC07, MC10
Traveler Information Services	APTS08, ATIS01, ATIS02, ATMS06, EM06, EM10, MC10
Data and Information Sharing	AD1, AD2, APTS07, ATMS06, ATMS07, ATMS08, EM05, EM10, MC04, MC06, MC07, MC10

In all, forty-eight (48) of the ninety-one (91) possible market packages were included in the Strafford-Rockingham Region ITS Architecture. Exhibit 3-5, below, lists these market packages:

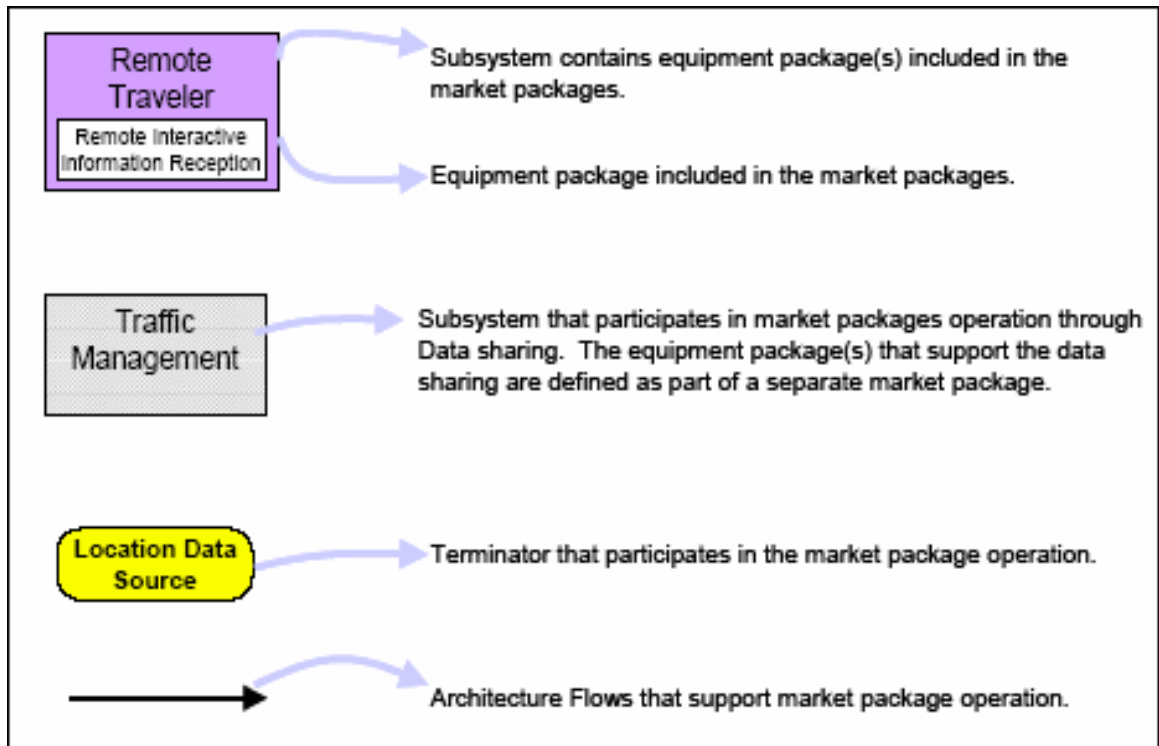
**Exhibit 3-5: Market Packages Included in Strafford-Rockingham Region ITS Architecture**

<b>Market Package</b>	<b>Title</b>	<b>Description</b>
AD1	ITS Data Mart	Provides an archive that houses data collected and owned by a single agency.
AD2	ITS Data Warehouse	Provides an archive that houses data collected from multiple agencies.
APTS01	Transit Vehicle Tracking	Monitors current transit vehicle location using an Automated Vehicle Location (AVL) system.
APTS02	Transit Fixed-Route Operations	Performs vehicle routing, optimized scheduling, and system monitoring for fixed-route transit services.
APTS03	Demand Response Transit Operations	Performs vehicle routing, optimized scheduling, system monitoring, and reservation services for demand responsive transit services.
APTS04	Transit Fare Collection Management	Manages passenger loading and fare payments on-board transit vehicles using electronic means. It allows transit users to pay with electronic fare cards.
APTS05	Transit Security	Provides for the physical security of transit passengers and transit vehicle operators. On-board equipment is deployed to perform surveillance and sensor monitoring in order to warn of potentially hazardous situations.
APTS07	Multi-modal Coordination	Establishes communications between multiple transportation agencies to improve service coordination.
APTS08	Transit Traveler Information	Provides transit users with transit information over the Internet, at stops, and on vehicles.
APTS09	Transit Signal Priority	This market package supports transit vehicle traffic signal priority.
APTS10	Transit Passenger Counting	Supports automatic counting of passengers entering and exiting a transit vehicle.
ATIS01	Broadcast Traveler Information*	Collects traffic/travel information and broadly disseminates it using a wide area digital broadcast (FM subcarrier, cellular data broadcast).
ATIS02	Interactive Traveler Information	Interactively provides tailored traveler information based on a traveler requests and submitted profiles.
ATIS07	Yellow Pages and Reservation*	Provides yellow pages and reservation services to the user.
ATMS01	Network Surveillance	Enables traffic management to monitor traffic and road conditions, identify and verify incidents, detect faults in indicators, and collect transportation data.
ATMS03	Surface Street Control	Provides the central control equipment, communication links, and signal control equipment that support local signal control and/or arterial traffic management.
ATMS04	Freeway Control*	Includes equipment to support ramp, lane, and interchange control for freeways.
ATMS06	Traffic Information Dissemination*	Provides driver information using roadway equipment such as dynamic message signs or highway advisory radio.
ATMS07	Regional Traffic Control	This market package provides for the sharing of traffic information and control among traffic management centers to support a regional control strategy.
ATMS08	Traffic Incident Management System	This market package manages both unexpected incidents and planned events so that the impact to the transportation network and traveler safety is minimized.
ATMS10	Electronic Toll Collection*	Provides technology to collect tolls electronically and detect violations.
ATMS13	Standard Railroad Grade Crossing*	Manages traffic at highway-rail intersections (HRIs) where speeds are less than 80 miles per hour.
ATMS16	Parking Facility Management	Provides enhanced monitoring and management of parking facilities.
ATMS18	Reversible Lane Management*	Provides for the management of reversible lane facilities and equipment.
ATMS20	Drawbridge Management*	Systems that manage drawbridges at rivers and canals.

Market Package	Title	Description
CVO03	Electronic Clearance*	Provides for automated clearance at roadside check facilities.
CVO04	CV Administrative Processes*	Provides for electronic handling of CVO credentials and tax filing.
CVO06	Weigh-In-Motion*	Provides for high speed weigh-in-motion.
CVO07	Roadside CVO Safety*	Provides for automated roadside safety monitoring, reporting, and safety inspections.
EM01	Emergency Call-Taking and Dispatch	Provides basic public safety call-taking services and facilitates the deployment of appropriate resources to an emergency.
EM02	Emergency Routing	Enhances emergency vehicle routing using automated vehicle location (AVL) technology and information about traffic, road conditions, and suggested routes. This market package also supports emergency vehicle traffic signal preemption.
EM03	Mayday Support*	Allows users to request emergency assistance and enables responders to locate the user.
EM04	Roadway Service Patrols*	Supports roadway service patrols that monitor roads and aid motorists.
EM05	Transportation Infrastructure Protection*	Monitors transportation infrastructure, prevents incidents using barriers, and controls access during incidents.
EM06	Wide-Area Alert*	Uses ITS driver and traveler information systems to alert the public in emergency situations that pose a threat to life and property.
EM07	Early Warning System*	Monitors and detects potential, looming, and actual disasters.
EM08	Disaster Response and Recovery*	Enhances the ability of the surface transportation system to respond to and recover from severe disasters.
EM09	Evacuation and Reentry Management*	Supports evacuation of the general public from a disaster area and manages subsequent reentry.
EM10	Disaster Traveler Information*	Provides disaster-related traveler information to the general public.
MC01	Maintenance and Construction Vehicle and Equipment Tracking	Tracks the location of maintenance and construction vehicles and other equipment to ascertain the progress of their activities.
MC03	Road Weather Data Collection*	Collects current road and weather condition data from sensors on the roadway or railway.
MC04	Weather Information Processing and Distribution*	Processes and distributes the environmental information collected from the Road Weather Data Collection market package.
MC05	Roadway Automated Treatment*	Automatically treats a roadway section based on environmental conditions.
MC06	Winter Maintenance	Supports winter road maintenance including snow plow operations and roadway treatments (such as de-icing).
MC07	Roadway Maintenance and Construction	Supports numerous services for scheduled and unscheduled maintenance and construction on a roadway system or right-of-way.
MC08	Work Zone Management*	Directs activity in work zones, controlling traffic through portable dynamic message signs (DMS) and coordinating activities with other impacted groups.
MC10	Maintenance and Construction Activity Coordination*	Supports the dissemination of maintenance and construction activity to centers that can utilize it as part of their operations or to the Information Service Providers who can provide the information to travelers.
MC12	Infrastructure Monitoring	Uses fixed and vehicle-based sensors to monitor vibration, stress, temperature, continuity, etc. of transportation infrastructure.
* Indicates market packages included solely by reference to the New Hampshire Statewide ITS Architecture.		

More detail on these market packages is included in Chapter 4 of the *Stafford-Rockingham Region ITS Architecture* document. Appendix F of the *Stafford-Rockingham Region ITS Architecture* document also contains market package diagrams for each of the market package instances specific to the Stafford-Rockingham region. Market package diagrams are visual representations of the market packages. These diagrams are designed to facilitate understanding of information flows among ITS element. These diagrams can be read using the key provided in Exhibit 3-6.

**Exhibit 3-6: Key to Reading Market Package Diagrams**



It should be noted that several market packages included in the Stafford-Rockingham Region ITS Architecture reference statewide ITS activities. In these instances, the relevant market packages are incorporated into the regional ITS architecture solely by reference to the New Hampshire Statewide ITS Architecture. For example, ATMS10 – Electronic Toll Collection is occurring within the region. However, since the electronic tolling is part of a statewide tolling effort and is already included in the New Hampshire Statewide ITS Architecture, therefore, this market package is incorporated solely by reference.

## 3.5 The Role of ITS Standards

ITS standards provide an additional level of *technical* coordination to achieve the Strafford-Rockingham Region ITS Architecture's goal of promoting compatibility among ITS deployments. This complements the *functional* coordination implicit in the market packages, and the *institutional* coordination facilitated by the operations concept.

- ITS standards provide a common structure for sharing of information and data among operating agencies, systems, and even individual ITS devices. ITS standards are also important because:
- The functionality of certain market packages requires interconnection of multiple ITS systems deployed in phases over time, and perhaps by different agencies. Achieving this functionality may be difficult, expensive, or even impossible if the systems are not built upon a common standards foundation.
- The effectiveness of a number of early ITS deployments has been limited by the inability to upgrade or interconnect those systems because the technology did not "speak the same language."
- Standards will facilitate integration of ITS systems being deployed at the statewide level, such as 511 traveler information systems, or across multiple local jurisdictions, such as traffic signal coordination.
- By using widely recognized ITS standards, operators of ITS systems will have greater latitude in developing, scaling, and upgrading ITS components. (For example, a Dynamic Message Sign (DMS) in the field can be replaced with another unit by a different manufacturer without having to re-code the interface between the sign and the central traffic management software).

Chapter 5 of the *Strafford-Rockingham Region ITS Architecture* document includes a discussion of national and statewide ITS standards development efforts, identifies important decision factors affecting the selection of regional ITS standards, and identifies several specific ITS standards that are relevant to the specific ITS interfaces within the region. The *Strafford-Rockingham Region ITS Architecture* document also provides recommended criteria for evaluating future ITS standards for regional adoption.

## 3.6 Operational Concepts and Interagency Agreements

While much discussion about ITS deployment focuses on technology, it is important to acknowledge that ITS coordination requires an important institutional component as well. ITS often offers an opportunity to introduce new methods of interagency communication and collaboration. These affect how organizations work on a day-to-day basis and deliver transportation services to the general public. Accordingly, the institutional and operational aspects of ITS planning deserve as much consideration as the technological aspects. Realizing an integrated ITS vision requires a diverse set of stakeholders to cooperatively plan, operate, and maintain the regional ITS inventory. Whereas the **Needs Analysis** and **ITS Architecture** development processes focused on the *logical* aspects of the Strafford-Rockingham Region ITS Architecture, the **Operational Concept** focuses on the *institutional* aspects. It describes how services will be implemented, the roles different agencies will have during operation, and the relationships required among organizations.

USDOT regional architecture guidance stipulates that that an operational concept should have two components:

1. A technical component, identifying *operational* roles and responsibilities through general descriptions of how the service will be provided; and
2. An institutional component, identifying *implementation* roles and responsibilities through a more detailed description of stakeholder responsibilities.

Interagency coordination will be necessary to implement any of the Market Package ‘instances’ (i.e., a specific regional variation of a Market Package) that involve the collaboration of more than one stakeholder. These market package ‘instances’ that require inter-agency coordination require an operational concept to describe the nature of this coordination and any necessary agreements. (Thus, market package instances in the architecture that involve only one agency are *not* featured in the operational concept.) In order to avoid duplication of effort, some instances with operational concepts are included solely by reference to the *New Hampshire Statewide ITS Architecture*.

Chapter 6 of the *Strafford-Rockingham Region ITS Architecture* document identifies operational concepts for the relevant market package instances in the region. That document also describes the nature and extent of interaction between agencies. Four types of interagency agreements were identified and described: “Share Information” (SI); “Request/Perform Action” (A); “Coordinate Activity” (C); and “Share Control” (SC). The *Strafford-Rockingham Region ITS Architecture* document provides guidance for documenting the formality of existing interagency agreements. The document also recommends typical content to consider when developing future interagency agreements. Specific operational concepts for market package instances requiring interagency coordination are included in Appendix H of the *Strafford-Rockingham Region ITS Architecture* document.

### 3.7 Functional Requirements

Based on the market packages selected and the operational concepts developed, high-level Functional Requirements were developed. These high-level Functional Requirements identify the functionality that ITS systems would need in order to fulfill the regional transportation needs identified by the stakeholders. These Functional Requirements are described in greater detail through the entities, data exchanges, and market packages that make up the Physical Architecture. Functional Requirements for specific ITS elements included in the Strafford-Rockingham Region ITS Architecture were also developed and included in Appendix J to the *Strafford-Rockingham Region ITS Architecture* document.

## 4. ITS STRATEGIC PLAN OVERVIEW

The ITS Strategic Plan is a strategy for implementing the systems defined in the Stafford-Rockingham Region ITS Architecture. This strategy was developed based on the regional transportation needs and priorities identified by regional stakeholders. It includes recommended ITS initiatives for the region and a prioritization and sequencing of those initiatives.

### 4.1 ITS Strategic Plan Objectives and Approach

The objective of the ITS Strategic Plan is to translate the recommendations of the completed logical architecture into specific short-, medium- and long-term projects that can be incorporated into the regional Transportation Improvement Program (TIP). The recommended projects must take into consideration the unique nature and attributes of the Stafford-Rockingham region and present an efficient, effective means of deploying ITS to achieve both early success and long-term integration with regional, state, and interstate advanced technology infrastructure.

The region's size and diverse project area and specific transportation needs requires a tailored approach to ITS deployment. Project stakeholders also applied ITS "lessons learned" and demonstrated benefits from other regions to the region. In addition, it is important that the deployment plan is realistic in terms of the scale and phasing of the deployment, ensuring free-standing operability of projects in the short-term.

Other key aspects of the approach include:

- **Consistency with the Regional ITS Architecture:** The Stafford-Rockingham Region ITS Architecture was developed to ensure that new ITS projects take interoperability and multidisciplinary needs into account; thereby maximizing the value for both existing and future ITS investments. Therefore all ITS projects suggested in the *ITS Strategic Plan* document are consistent with the recommendations of the regional ITS architecture.
- **Responsiveness to Regional Needs:** ITS solutions typical in other regions are not necessarily relevant to the Stafford-Rockingham region. The types of ITS projects proposed in the *ITS Strategic Plan* document directly relate to stakeholder-identified needs.
- **Multi-Functional ITS Technologies:** To maximize the value of ITS deployments in the region, the project concepts have been developed so that ITS equipment can serve more than one purpose whenever possible. Serving multiple purposes promotes the region's goals of improved interdisciplinary and interagency coordination. Multi-functionality also provides broader access to potential funding sources for regional ITS projects.
- **Inter-Regional and Interstate Coordination:** While the boundaries of this project were limited to the boundaries of the SRPC and RPC (the Stafford-Rockingham region), regional ITS projects will be impacted by statewide and inter-state initiatives.
- **Incremental Deployment Based Upon Early Success:** In developing the ITS Strategic Plan, identifying early success projects was deemed important. Early success projects, i.e., low-cost deployments which demonstrate real benefits within a short timeframe, help build momentum and confidence for the ITS program. These projects address short-term needs while providing a basis for eventual region-wide deployments.

## 4.2 Regional ITS Projects

The *ITS Strategic Plan* document includes high-level preliminary descriptions and cost estimates for the regional ITS projects identified by regional stakeholders. A summary of the regional ITS projects included in the *ITS Strategic Plan* document is included in Appendix A. More complete descriptions of each project are included in Appendix B of the actual *Strafford-Rockingham Region ITS Strategic Plan* document. Each description contains the following information:

- **Project Title and Description:** A general overview is given for each project, primarily focusing on the operational capabilities and functional scope of the project.
- **Project Location(s):** The approximate geographic extent of the project is described.
- **Planning Cost Estimate:** High-level, preliminary planning cost estimates have been provided for each of the projects identified in this ITS Strategic Plan to facilitate decision-making related to project programming, prioritization, and funding. It should be noted that costing for individual projects is dependent on a wide variety of factors that shall need to be investigated in the preliminary engineering phase of each project to produce refined engineering cost estimates.
- **Market Packages:** The relevant market packages from the *Strafford-Rockingham Region ITS Architecture* are identified. This illustrates the linkages between the project and the regional ITS architecture, which is necessary to apply federal funds toward the project.
- **Time Frame (Short-, Medium-, or Long-Term):** The relative deployment priority for each project was identified as Short-Term (0-3 years), Medium-Term (3-5 years), or Long-Term (5-10 years).
- **Lead Agency:** The public agency or agencies judged to be the most appropriate lead agency for each deployment are identified.
- **Project Participants:** Principal stakeholders and agencies whose cooperation and support is critical to the implementation and success of the project are also identified.
- **Expected Benefits:** Coordination activities or agreements between agencies that will be required to deploy and operate the ITS projects are identified.
- **Integration with Other Projects:** Other projects are identified that must be completed before or at the same time, to ensure the proper ordering and prioritization of projects to create a functional ITS system.

Through these regional ITS projects, summarized in Appendix A, the functional elements of the Strafford-Rockingham Region ITS Architecture have been translated into project-based deployments that can be prioritized, programmed into the regional TIP, funded, and implemented strategically over time.

## 5. USING AND MAINTAINING THE REGIONAL ITS ARCHITECTURE AND ITS STRATEGIC PLAN

As has been emphasized throughout this report, the *Stafford-Rockingham Region ITS Architecture* document and the *ITS Strategic Plan* document are “living documents” that outline a vision for strategic, coordinated ITS deployment in the study area. To serve its intended function, and to be consistent with Federal requirements, this regional ITS architecture and the ITS Strategic Plan should serve as an integral part of ITS project planning and design in the Stafford-Rockingham region.

Like any planning documents, the *Stafford-Rockingham Region ITS Architecture* document and the *ITS Strategic Plan* document should be revisited from time to time to ensure its ongoing consistency with actual conditions – transportation and emergency management needs, regional ITS deployment progress, ITS initiatives at the statewide level, evolutions in technology, updates to the National ITS Architecture, and other factors. This chapter presents recommendations related to the future use, maintenance, and upkeep of the Stafford-Rockingham Region ITS Architecture, the ITS Strategic Plan, and their respective documentation.

### 5.1 Using the ITS Architecture and the ITS Strategic Plan

More so than many such strategic planning tools, the Stafford-Rockingham Region ITS Architecture and the ITS Strategic Plan have direct relevance to project-level planning and engineering design as ITS migrates from vision to reality. The technical guidance outlined within the architecture provides a framework for individual project requirements as well as inter-project coordination. Furthermore, the interagency coordination aspects of project deployment, including formalization of agreements and operations-phase responsibility, are also contained within the architecture. The *ITS Strategic Plan* document identifies specific high-level projects that would help the region implement its ITS vision.

The Stafford-Rockingham Region ITS Architecture and the ITS Strategic Plan may be used as follows:

- To document regional ITS inventory, elements, initiatives, and interagency agreements. As ITS project needs, technology, and priorities evolve, the architecture will need to mirror that evolution. The regional ITS architecture should never act as a hindrance to ITS project development, but rather serve to guide project development to ensure that the value of the ITS investment is maximized.
- To guide project development. The architecture and the ITS Strategic Plan can be used to guide the development of worthwhile ITS initiatives within the region. Again, these initiatives will need to evolve to match changing needs and priorities.
- To facilitate “mainstreaming” of ITS planning and deployment into the regional transportation planning process. Intelligent Transportation Systems should be viewed as another tool in the transportation improvement toolkit, complementing and in some cases replacing more conventional infrastructure investments. The ITS architecture and ITS Strategic Plan can assist in mainstreaming ITS into the regional planning process.
- To demonstrate project consistency with the regional ITS architecture. The Stafford-Rockingham Region ITS Architecture includes a *TurboArchitecture*<sup>™</sup> database of ITS stakeholders, entities, market packages, interconnects, and other information. As ongoing ITS deployment in the region progresses, the *TurboArchitecture*<sup>™</sup> software tool can also be

used to develop project-specific architectures, facilitating consistency of those projects with the regional ITS architecture. Project consistency with this regional ITS architecture is an explicit requirement of the 2001 FHWA Rule and FTA Policy regarding ITS architecture conformity.

- To encourage agencies to collaborate on transportation technology investments and avoid duplication or conflict of effort at the earliest stage possible. As agencies collaborate and coordinate their technology procurements, project costs can be shared and benefits maximized. Consistency with the architecture encourages and facilitates this kind of interagency coordination.
- To promote systematic evaluation of ITS opportunities by regional stakeholders. One of recommendations of the architecture is to establish a Standing Regional ITS Coordination Committee which would have a mandate to review proposed transportation projects in order to evaluate what role, if any, ITS may play in such a project.

## 5.2 Custodial Agencies for the ITS Architecture and the ITS Strategic Plan

Due to their existing responsibilities in regional transportation, and its leadership in previous ITS planning initiatives, it is recommended that the Strafford Regional Planning Commission (SRPC) and the Rockingham Planning Commission (RPC) jointly assume the responsibilities of the Custodial Agency for the Strafford-Rockingham region. As Custodial Agencies, SRPC and RPC will not necessarily lead ITS project implementation, but rather will facilitate ITS coordination from a planning and policy perspective, as it relates to the regional ITS architecture. Each Custodial Agency would appoint an individual to serve as an ITS Coordinator. This person would act as the day-to-day contact and liaison for regional ITS coordination issues.

Responsibilities of the Custodial Agencies include:

- Serving as a repository for regional ITS architecture documentation, the *TurboArchitecture™* database, architecture amendments and addenda, the ITS Strategic Plan, and other information related to the architecture and regional ITS deployment. Thus, other stakeholders in the region will know that the designated Custodial Agencies are the source for the most complete, accurate, and up-to-date information concerning the Strafford-Rockingham Region ITS Architecture and the ITS Strategic Plan;
- Initiating periodic comprehensive reviews of the Strafford-Rockingham Region ITS Architecture and the ITS Strategic Plan (approximately every 4 years) to review the architecture against evolving transportation needs, regional ITS deployment progress, ITS standards development, National ITS Architecture updates, changing ITS project priorities, etc. (discussed below);
- Overseeing a revision or change management process to update the regional ITS architecture through interim modifications as specific deployment events necessitate (discussed below);
- Organizing and convening a Standing ITS Committee (discussed below) consisting of regional stakeholders to advise on ITS deployment matters (e.g., project review, development of regional standards, etc.); and

- Serving as a liaison with agency, statewide, and inter-regional ITS architecture and deployment initiatives, to ensure continuing coordination among ITS deployment efforts at various levels.

### 5.3 Standing Regional ITS Coordination Committee

It is recommended that Strafford-Rockingham region establish a Standing Regional ITS Coordination Committee, co-chaired by the ITS Coordinators of the Custodial Agencies, to meet from time to time to provide guidance on ITS architecture revisions and other issues. This committee should include representation from a wide variety of stakeholders, similar to the stakeholder groups convened to develop the Strafford-Rockingham Region ITS Architecture and the ITS Strategic Plan (specific issues could potentially be addressed by smaller working groups within the Committee).

The following entities, at a minimum, should be represented within the Standing Regional ITS Coordination Committee:

#### **Co-Chairs – Regional ITS Architecture Custodial Agency**

- Strafford Regional Planning Commission (SRPC) – ITS Coordinator
- Rockingham Planning Commission (RPC) – ITS Coordinator

#### **Committee Members:**

- New Hampshire Department of Transportation (NHDOT)
- New Hampshire Department of Safety – New Hampshire State Police
- Various Municipal DPW and Emergency Services Representatives
- Cooperative Alliance for Regional Transportation (CART)
- Cooperative Alliance for Seacoast Transportation (COAST)
- University of New Hampshire – Wildcat Transit
- Northern New England Passenger Rail Authority - Downeaster Passenger Rail
- Federal Highway Administration (FHWA)
- Federal Transit Administration (FTA)
- Various Institutional and Private Sector Representatives

This Committee, or a subset thereof reporting to the full Committee, should convene on an as-needed basis (not less than semi-annually) to perform the following functions:

- Interface with specific project proponents to address ITS Architecture consistency issues;
- During the project definition process, systematically review proposed transportation improvements to evaluate potential or proposed ITS components;
- Review and update the ITS Strategic Plan;
- Address regional ITS standards, operations, policy, and funding issues and make specific recommendations regarding the resolution of these issues;
- Oversee and approve of proposed interim architecture modifications; and
- Initiate and oversee periodic comprehensive reviews of the Strafford-Rockingham Region ITS Architecture.

## 5.4 Maintenance of the ITS Architecture

The Strafford-Rockingham Region ITS Architecture must be maintained in order to remain consistent with regional needs, goals, and priorities. Though not required by federal ruling, ITS architecture updates should also occur in response to federal consistency requirements, changing transportation needs, and actual ITS deployments. Updates to the Strafford-Rockingham Region ITS Architecture should take two forms:

- Interim Architecture Modifications: These modifications would be performed on a case-by-case basis as necessary to maintain consistency between regional and project architectures.
- Periodic Comprehensive Reviews: It is recommended that SRPC and RPC initiate a comprehensive ITS architecture update process approximately every four (4) years, to be coordinated with the Regional Planning Commissions' Long-Range Transportation Planning processes.

Additional information on these two types of ITS Architecture maintenance is included in Chapter 9 of the *Strafford-Rockingham Region ITS Architecture* document.

## 5.5 Maintenance of the ITS Strategic Plan

The *ITS Strategic Plan* presents an outlook and strategy for ITS deployment in the region. As needs change and as technology advances, the ITS Strategic Plan and the regional ITS projects will need to be modified and adapted as needed. In order to ensure responsiveness to regional needs, it is recommended that the ITS Strategic Plan be reassessed on a regular basis.

The Standing Regional ITS Coordination Committee is also well suited to address updates to the ITS Strategic Plan. Because the members of the Standing Regional ITS Coordination Committee make up the core interest group for the region, their continued involvement in the ITS planning and deployment process will expedite ITS development in the region and promote interagency dialogue and coordination on ITS issues.

It is recommended that when the Standing Regional ITS Coordination Committee evaluates the Strafford-Rockingham Region ITS Architecture for a periodic comprehensive review (typically once every four years following the development of a new Long-Range Transportation Plan), the Committee should also assess the ITS Strategic Plan and determine what, if any, modifications and updates should be included in the plan.

## 5.6 Summary of Use and Maintenance Recommendations

To derive the full benefits of regional ITS coordination, it is important that the Strafford-Rockingham Region ITS Architecture and ITS Strategic Plan remain relevant and up-to-date. The recommendations presented in this chapter are designed to facilitate the use and maintenance of the Strafford-Rockingham Region ITS Architecture and ITS Strategic Plan.

The following is a summary of recommendations to help to achieve the objectives of the ITS Architecture through the project deployment phase:

1. Revisit and revise the Strafford-Rockingham Region ITS Architecture and the ITS Strategic Plan periodically to ensure its ongoing consistency with actual conditions – regional transportation needs, regional ITS deployment progress, ITS initiatives at the statewide

level, evolutions in technology, ITS standards development, updates to the National ITS Architecture, and other factors.

2. Designate the Strafford Regional Planning Commission (SRPC) and the Rockingham Planning Commission (RPC) as the joint Custodial Agencies for the Strafford-Rockingham Region ITS Architecture and ITS Strategic Plan.
3. Appoint a staff-level ITS Coordinator within both SRPC and RPC to act as a day-to-day contact and liaison regarding regional ITS coordination issues.
4. Establish a Standing Regional ITS Coordination Committee, co-chaired by the ITS Coordinators of the Custodial Agencies, to meet periodically to provide guidance on ITS architecture revisions and other issues.
5. Promote systematic ITS review within the regional transportation planning process, potentially by giving the Standing Regional ITS Coordination Committee a specific mandate to review proposed transportation projects and to provide recommendations to MPOs.
6. Work with regional and statewide partners in the evaluation and endorsement of regional ITS standards, to ensure that the interoperability objectives of the architecture are carried through to the detailed technical design of project deployments.
7. Establish a mechanism for both Interim Architecture Modifications (as needed) and Periodic Comprehensive Reviews (approximately every four years) to ensure that both the Strafford-Rockingham Region ITS Architecture and ITS Strategic Plan remain up-to-date and relevant to stakeholder needs and ITS deployment conditions.

# APPENDIX A

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## LIST OF REGIONAL ITS PROJECTS



STRAFFORD-ROCKINGHAM REGION ITS ARCHITECTURE

Regional ITS Projects Identified in the Strafford-Rockingham Region ITS Strategic Plan

Ref. #	Project Title	Project Description	Project Location(s)	Planning Cost Estimate*	Market Packages	Timeframe	Lead Agency	Project Participants	Expected Benefits	Integration with Other Projects
AM-1	Salem Route 28 Corridor ITS Project – Phase 1	Signal coordination and control, traffic monitoring, and communications upgrades.	Town of Salem	\$500,000	AD1, ATMS01, ATMS03, ATMS08, EM02	Short-Term	Salem	NHDOT, FHWA	Improved traffic flow. Improved incident detection and response.	Coordinated with I-93 widening project to manage detours onto Route 28.
AM-2	Salem Route 28 Corridor ITS Project – Phase 2	Signal coordination and control, traffic monitoring, and communications upgrades.	Town of Salem	\$1 million	AD1, ATMS01, ATMS03, ATMS08, EM02	Medium-Term	Salem	NHDOT, FHWA	Improved traffic flow. Improved incident detection and response. Improved interagency coordination.	Coordinated with I-93 widening project to manage detours onto Route 28.
AM-3	Portsmouth Woodbury Avenue Signal Coordination	Signal coordination and control along congested corridor.	Woodbury Avenue in Portsmouth	\$639,000	AD1, ATMS01, ATMS03, ATMS08, EM02	Long-Term	Portsmouth	NHDOT	Improved traffic flow. Improved incident response.	Coordinated with Spaulding Turnpike widening
AM-4	Dover Central Avenue Signal Coordination	Signal coordination and control along congested corridor.	Central Avenue in Dover	\$739,000	AD1, ATMS01, ATMS03, ATMS08, EM02	Long-Term	Dover	NHDOT	Improved traffic flow. Improved incident response.	Coordinated with Spaulding Turnpike widening
AM-5	Route 1 Bypass Signal Coordination	Signal coordination and control along congested corridor.	Route 1 Bypass	\$639,000	ATMS01, ATMS03, ATMS08, EM02	Long-Term	NHDOT	Local Municipalities	Improved traffic flow. Improved incident response.	Coordinated with NHDOT efforts on I-95.
AM-6	Route 125 Signal Coordination - Plaistow	Signal coordination and control along congested corridor.	Plaistow	\$672,000	ATMS01, ATMS03, ATMS08, EM02	Long-Term	NHDOT	NHDOT, Local Municipalities, Plaistow	Improved traffic flow. Improved incident response.	Coordinated with AM-7 and IEC-3.
AM-7	Route 125 Signal Coordination - Epping	Signal coordination and control along congested corridor.	Epping	\$522,000	ATMS01, ATMS03, ATMS08, EM02	Long-Term	NHDOT	NHDOT, Local Municipalities, Epping	Improved traffic flow. Improved incident response.	Coordinated with AM-6 and IEC-3.
EM-1	Regional Portable VMS	Procure two portable VMS for the region to use to assist in construction traffic mitigation.	Strafford-Rockingham Region	\$70,000	ATMS06, MC06, MC07	Medium-Term	SRPC, RPC	NHDOT, Local Municipalities	Improved traveler information and traffic management.	Coordinated with local construction projects and maintenance activities.
EM-2	Route 1A Evacuation ITS Improvements	Deployment of Route 1A contra-flow signage, VMS, surveillance, and communications upgrades.	Route 1A	\$1.86 million	ATMS01, ATMS03, ATMS06, ATMS18, EM09	Long-Term	NHDOT	NHDOS, Local Municipalities, FPL Energy Seabrook Station, MassHighway	Improve ability to respond in an emergency evacuation scenario.	Coordinated with statewide EOC, Seabrook Station emergency planning efforts, and local traffic and parking management plans.
EM-3	Route 4 Incident Reporting	Deployment of static signage and marketing to promote reporting of incidents to coincide with state 511 improvements.	Route 4	\$100,000	ATIS01, ATMS06, ATMS08	Medium-Term	NHDOT	NHDOS, Local Municipalities	Improve incident detection and verification.	Coordinated with statewide 511 efforts.

STRAFFORD-ROCKINGHAM REGION ITS ARCHITECTURE

Ref. #	Project Title	Project Description	Project Location(s)	Planning Cost Estimate*	Market Packages	Timeframe	Lead Agency	Project Participants	Expected Benefits	Integration with Other Projects
FM-1	Rebuilding I-93 - ITS Deployments	Deployment of CMS, HAR, CCTV cameras, detection equipment, and communications equipment as part of I-93 widening efforts.	I-93 (Salem to Manchester)	\$7 million	ATIS01, ATMS01, ATMS04, ATMS06, ATMS07, ATMS08, MC08	Short-Term	NHDOT	NHDOS, Local Municipalities, MassHighway	Improved traffic flow. Improved incident detection and response. Improved traveler information.	Coordinated with Salem ITS Project and other local municipality projects.
FM-2	I-95 ITS Deployments	Deployment of CMS, HAR, CCTV cameras, detection equipment, and communications equipment as part of I-93 widening efforts.	I-95 (Hampton to Portsmouth)	\$3 million	ATIS01, ATMS01, ATMS04, ATMS06, ATMS07, ATMS08, MC08	Short-Term	NHDOT	NHDOS, Local Municipalities, MassHighway, MaineDOT, Maine Turnpike	Improved traffic flow. Improved incident detection and response. Improved traveler information.	Coordinated with local municipality projects.
FM-3	Spaulding Turnpike Widening - Phase 1	Deployment of VMS, HAR, CCTV cameras, detection equipment, and communications equipment as part of the Spaulding Turnpike widening efforts.	Rochester Tolls to Exit 15	\$1.5 million	ATIS01, ATMS01, ATMS04, ATMS06, ATMS07, ATMS08, MC08	Short-Term	NHDOT	NHDOS, Local Municipalities	Improved traffic flow. Improved incident detection and response. Improved traveler information.	Coordinated with local municipality projects.
FM-4	Spaulding Turnpike Widening - Phase 2	Deployment of VMS, HAR, CCTV cameras, detection equipment, and communications equipment as part of the Spaulding Turnpike widening efforts.	Newington to Dover Point	\$1.5 million	ATIS01, ATMS01, ATMS04, ATMS06, ATMS07, ATMS08, MC08	Short-Term	NHDOT	NHDOS, Local Municipalities	Improved traffic flow. Improved incident detection and response. Improved traveler information.	Coordinated with local municipality projects.
FM-5	Open Road Tolling Study	Technology evaluation and feasibility assessment of open road tolling.	Dover, Hampton, and Rochester Toll Plazas	\$100,000	ATMS10	Medium-Term	NHDOT	Local Municipalities, RPC, SRPC	Relieve traffic congestion at toll locations and reduce traffic divergence onto local arterials.	Coordinated with NHDOT efforts on I-95 and the Spaulding Turnpike.
IEC-1	SRPC Data Warehouse Study	Establish data format for the region's ITS data and procure system hardware.	SRPC Office (Dover, NH)	\$30,000	AD2	Medium-Term	SRPC	Dover, Somersworth, COAST, Wildcat Transit, FasTrans, NHDOT, Local Municipalities	Increased ease of ITS data exchange among agencies for planning/ research activities	Coordinated with regional ITS data collection efforts.
IEC-2	RPC Data Warehouse Study	Establish data format for the region's ITS data and procure system hardware.	RPC Office (Exeter, NH)	\$30,000	AD2	Medium-Term	RPC	Salem, Portsmouth, CART, COAST, NHDOT, Local Municipalities	Increased ease of ITS data exchange among agencies for planning/ research activities	Coordinated with regional ITS data collection efforts.
IEC-3	Route 125 and Interstate 495 Interchange Cross-Border ITS	Deployment of ATIS and Communications upgrades to coordinate traffic flow information across the MA-NH border.	Route 125	\$500,000	ATMS06, ATMS08, ATIS01	Long-Term	NHDOT	MHD, Local Municipalities	Improve traveler information on cross-border traffic conditions. Improve cross-border interagency coordination of traffic information.	Coordinated with ITS deployments along Route 125 (AM-6 and AM-7).

STRAFFORD-ROCKINGHAM REGION ITS ARCHITECTURE

Ref. #	Project Title	Project Description	Project Location(s)	Planning Cost Estimate*	Market Packages	Timeframe	Lead Agency	Project Participants	Expected Benefits	Integration with Other Projects
IEC-4	Bridge Security Surveillance and Interagency Video Exchange	Establish a video distribution system to allow authorized municipal and transit organizations to view bridge conditions in real-time.	Regional bridges	\$1.6 million	ATMS01, ATMS06	Short-Term	NHDOT	Local Municipalities, Transit agencies, MassHighway, Maine Turnpike, MaineDOT	Improve bridge security/surveillance. Allow transit and local transportation agencies to be aware of travel conditions (construction, congestion, incidents) at bridge locations.	Coordinated with ITS deployments along roads with bridges.
IEC-5	Region-to-TMC Communications Backbone	Implement a robust communications backbone between the State's TMC in Concord and the seacoast region	Strafford-Rockingham Region	\$3 million	ATMS06	Short-Term	NHDOT	Local Municipalities	Improve communications throughout the region back to central location, facilitating increased interagency coordination and supporting future ITS deployments.	Coordinated with ITS deployments region-wide.
IEC-6	Interstate TMC Coordination	Establish interstate communication protocols with adjoining states.	Strafford-Rockingham Region	\$50,000	ATMS06	Short-Term, Long-Term	NHDOT	Local Municipalities, MassHighway, Maine Turnpike, MaineDOT	Improve interstate coordination of transportation and incident management efforts.	
PT-1	ITS Support Plan for Regional Human Health Services Transportation Brokerage	Planning and procurement support of ITS in support of HHS transportation. Includes assessments of CAD/AVL, APC, and AFC potential.	Strafford-Rockingham Region	\$100,000	APTS01, APTS02, APTS03, APTS04, APTS07, APTS10	Medium-Term	ACT	CART, COAST, FasTrans, Wildcat Transit, Easter Seals NH, SRPC, RPC	Improve operating efficiency and reduce reporting costs of transit operations.	Coordinated with individual transit agency vehicle procurements and ITS investments.
PT-2	Park-and-Ride ITS Improvements	Deploy surveillance, parking sensors, and signage at Park-and-Ride facilities.	Park-and-Ride Lots (Dover, Portsmouth, and Salem)	\$675,000	APTS05, APTS08, ATMS01, ATMS16, ATIS01	Medium-Term	NHDOT	CART, COAST, FasTrans, Wildcat Transit, Easter Seals NH, ACT, SRPC, RPC, Local Municipalities	Improve security and surveillance at parking facilities. Improve traveler awareness of parking availability.	
PT-3	Regional Transit ITS Procurement Coordination	Establish process to enable regional coordination of transit ITS procurements.	Strafford-Rockingham Region	\$50,000	APTS01, APTS02, APTS03, APTS04, APTS05, APTS07, APTS08, APTS09, APTS10	Medium-Term	SRPC and RPC	CART, COAST, FasTrans, Wildcat Transit, Easter Seals NH, ACT, C&J Trailways, Amtrak, MVRTA	Improve interagency coordination and interoperability of ITS systems. Take advantage of economies of scale.	Coordinated with individual transit agency vehicle procurements and ITS investments.