GTC

FINAL REPORT

Intelligent Transportation Systems (ITS) Strategic Plan for Greater Rochester

IBI GROUP

Submitted to Genesee Transportation Council (GTC)

by IBI Group

with Bergmann Associates | Howard/Stein-Hudson Associates

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IBI Group is a multi-disciplinary consulting organization offering services in four areas of practice:
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We provide services from offices located strategically across the United States, Canada, Europe, the Middle East and Asia.

77 Franklin Street, 7th Floor. Boston, MA 02110
Tel (617) 450-0701 Fax (617) 450-0702

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www.ibigroup.com

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Genesee Transportation Council

Intelligent Transportation Systems (ITS) Strategic Plan for Greater Rochester

EXECUTIVE SUMMARY

Overview

The Intelligent Transportation Systems (ITS) Strategic Plan for Greater Rochester is a strategy for coordinated deployment of technology in the Greater Rochester region over the next 10 years and beyond to enable improved management and operations of the transportation system.

The Genesee Transportation Council (GTC) has undertaken this project in cooperation with stakeholder agencies across the region involved in the planning, funding, deployment, operation, and maintenance of Intelligent Transportation Systems.

The ITS Strategic Plan for Greater Rochester updates a previous document known as the IMAGE Report, developed in 1996. The region has successfully achieved many of the key goals outlined in the IMAGE Report, most notably the development of a multi-agency Regional Traffic Operations Center (RTOC).

The ITS Strategic Plan for Greater Rochester sets forth a new vision and set of strategies to meet the challenges of the future. The Plan covers the entire 9-County, 4,700 square mile GTC planning area; however, most existing ITS investment and need is concentrated in the urbanized Transportation Management Area (TMA) of Monroe County and adjacent urbanized areas of Livingston, Ontario, and Wayne Counties.

Goal and Objectives

The Goal of the ITS Strategic Plan for Greater Rochester is to develop a multi-modal vision for Intelligent Transportation Systems investment over the next ten years that is responsive to the recognized transportation needs and priorities of the Greater Rochester region.

Specific objectives of the Plan include:

- Identify the rationale for ITS investment ("why?") based on an assessment of agency and regional needs;
- Identify roles and responsibilities ("who?") to achieve coordinated deployment and operation of ITS across the region;

Participating Agencies in the *ITS Strategic Plan for Greater Rochester*

New York State Department of Transportation (NYSDOT)

Monroe County Department of Transportation (MCDOT)

Monroe County Sheriff's Office

City of Rochester Department of Environmental Services (DES)

Rochester-Genesee Regional Transportation Authority (RGRTA)

New York State Police

New York State Thruway Authority

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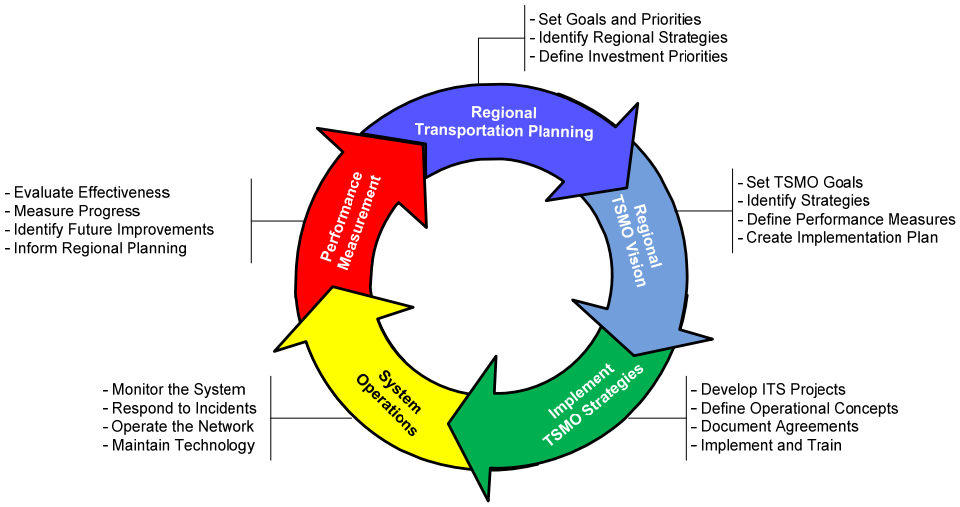
- Identify appropriate operational strategies that are appropriate to the region's needs ("what?");
- Determine which ITS investments are needed to implement those strategies ("how?"); and
- Prioritize and guide these regional ITS investments over a ten-year planning horizon ("when?").

Transportation System Management and Operations – An Vital Strategy for the Region

Intelligent Transportation Systems are the "enabling tools" that support the implementation of Transportation System Management and Operations (TSMO) strategies.

Transportation System Management and Operations (TSMO) strategies, such as incident management, traffic signal coordination, transit management, and winter maintenance activities are an increasingly important part of the region's overall approach to meeting its transportation needs.



The TSMO "Lifecycle" – Connecting Planning, Operations, and ITS

Four ingredients to successful TSMO implementation are:

- **Plans and Policies:** TSMO requires interagency coordination through plans, policies, interagency agreements, and regional concepts of operations to effectively use technology tools;
- **People:** Agency personnel dedicated to transportation operations, both in the field and in central control centers, implement TSMO strategies;
- **Resources:** TSMO strategies require a more sustained commitment to operational support than conventional transportation investment (e.g., capital projects), such as response vehicles, control centers, and other equipment; and

- **Technology:** ITS technologies enable agency personnel to proactively monitor, control, and inform.

TSMO strategies provide cost-effective tools to address congestion, mobility, economic development, and sustainability needs that can complement or replace conventional transportation infrastructure projects. Therefore, TSMO and ITS should be considered a vital part of the region's toolkit to meet its mobility, economic development, sustainability needs.

Opportunities to Coordinate ITS Deployment in Greater Rochester

The Greater Rochester region is a recognized national leader in regional coordination for ITS implementation. GTC facilitates a Transportation Management Committee (TMC) that provides a forum for regional cooperation on ITS and operations issues. On the strength of this and other initiatives, regional agencies have deployed hundreds of ITS field devices as well as central control and communications infrastructure impacting every mode of transportation in the region.

Nonetheless, participating agencies have identified numerous opportunities to further enhance the regional Transportation System Management and Operations program, including:

- **Expand the geographic coverage of ITS deployment** to corridors with congestion, high incident frequency, and other factors that would benefit from a proactive operations approach;
- **Integrate ITS systems and devices** to better support regional operations;
- **Increase data, video, and information sharing** among existing centers to improve regional coordination and effectiveness, including the NYSDOT/MCDOT Regional Traffic Operations Center; the NYS Thruway; regional emergency management centers; and RGRTA;
- **Increase participation of municipal law enforcement and emergency responders** in active operations and incident response best practices;
- **Share ITS infrastructure** to enhance functionality and reduce deployment costs, particularly in the deployment of communications infrastructure;
- **Formalize existing ad hoc relationships** among agencies to share infrastructure and coordinate ITS deployment;
- **Adopt performance measures**, such as the Travel Time Index, to better monitor the effectiveness of TSMO programs and their contribution to meeting regional transportation needs; and
- **"Mainstream" ITS and TSMO into regional transportation planning** and project development processes.

TSMO Initiatives for the Next Ten Years

Based on the assessment of needs and opportunities, the Plan identifies Transportation System Management and Operations Initiatives as the basis for guiding future ITS deployment needs. The identified TSMO Initiatives cover a range of planning, investment, and operations activities that enable regional agencies to address identified needs and opportunities.

The Initiatives are organized into nine theme areas as follows:

TSMO Initiatives Theme	Initiatives
Incident and Emergency Management (IE)	8
Public Transportation Management (PT)	18
Expressway Management (EM)	6
Arterial Management (AM)	7
Integrated Corridor Management (IC)	8
Parking Management (PM)	9
Winter Maintenance (WM)	3
Traveler Information (TI)	5
Communications Infrastructure (CI)	3

Transportation System Management and Operation (TSMO) Initiatives by Theme

Each of the TSMO Initiatives themes is outlined in terms of:

- Overall description
- Goal and Objectives of the Initiative
- Relevant Regional Needs
- Key Opportunities and Challenges
- A description of specific Initiatives

Details provided for specific initiatives within each category include: Timeframe (Near, Medium, Long); Lead and Participating Agencies; and Progress Milestones.

An overarching characteristic of the TSMO initiatives identified in the Plan is that most involve coordination among multiple agencies. This is a testament both to the cooperative spirit of the region as well as the need for a coordinated, collaborative approach in order to meet regional needs and to achieve the highest return on investment.

Ten-Year ITS Deployment Strategy

Because Intelligent Transportation Systems are the enabling technologies that make many TSMO initiatives possible, planning and prioritization for future ITS deployment across the region is an important consideration.

Additionally, for ITS investment to be coordinated with other regional transportation initiatives, it is important to identify the corridors that are operationally significant to the region in addressing its TSMO goals.

Two levels of priority are identified in the ITS Deployment Plan, Group 1 (Critical Operations Target Areas) and Group 2 (Corridors of Regional Operations Significance).

ITS Deployment Priority Group	Description
Group 1: Critical Operations Target Areas	• High priority targets for ITS deployment in critical Transportation corridors • Focus of discretionary ITS projects and infill investments to maximize system management capabilities • Includes currently Planned and Programmed ITS investments
Group 2: Corridors of Regional Operations Significance	• Corridors where enhanced operational capabilities and supporting ITS infrastructure are warranted • Implement ITS infrastructure as opportunities arise to achieve gradual build-out • Use "Complete Streets" approach to implement technology as part of capital projects in these corridors • Monitor and re-assess as transportation characteristics evolve, especially in rural areas

ITS Deployment Priority Groupings Identified in the Strategic Plan

The ITS Deployment Plan serves as a roadmap for ITS project development and implementation over the next ten years, culminating with the fulfillment of the regional ITS vision through incremental deployment.

The ITS Strategic Plan for Greater Rochester contains a map of the Group 1 and Group 2 corridors and geographic areas in the Greater Rochester area.

Integrating Operations into Regional Planning

Historically, ITS deployment and transportation operations planning and investment have occurred at arms' length from the formal regional transportation planning process facilitated by GTC as the region's Metropolitan Planning Organization.

While informal coordination in the region has been strong, including GTC's direct involvement facilitating the Transportation Management Committee, all agencies recognize the benefits of "mainstreaming" TSMO into the regional planning and project development processes.

The ITS Strategic Plan for Greater Rochester highlights specific opportunities in this regard:

- **Further incorporate ITS goals, objectives, and investment strategies into the region's Long Range Transportation Plan**, including those outlined in the ITS Strategic Plan and the NYSDOT Region 4 ITS Architecture;

ITS Deployment Plan for Greater Rochester: Highlights

Infill ITS devices in the urban core to fully instrument expressways and arterials identified as Critical Operations Target Areas.

Expand ITS systems coverage commensurate with traffic and congestion growth.

Coordinate with capital improvement projects to instrument ITS on Corridors of Regional Significance, achieving the build-out vision incrementally over time.

Integrate NYSDOT and MCDOT traffic signals into their respective central control systems.

More closely integrate RTOC, the NYS Thruway, RGRTA, and County Emergency Operations control centers.

Deploy Integrated Corridor Management to jointly manage operations on parallel facilities.

Continue deployment of RGRTA TIDE transit technology projects, including regional coordination for transit signal priority, traveler information, and video sharing.

Further integrate with NYSDOT statewide traveler information tools such as 511.

Address special events and parking management needs including downtown Rochester, the Port of Rochester, and other regional attractors such as the Darien Lakes area.

Address other operational hotspots outside of the Transportation Management Area as needed.

Establish a regional data archiving capability to support planning and performance measurement.

- **More fully integrate TSMO measures and ITS infrastructure as alternatives or complements to traditional transportation investments** as part of the strategy to meet the needs of a project, a corridor, or the region;
- **More closely integrate operations into the Congestion Management Process (CMP)**, both in identifying and mitigating congestion hotspots;
- **Increase emphasis of TSMO benefits and ITS infrastructure as part of the regional project development and evaluation process** for assembling the region's Transportation Improvement Program (TIP); and
- **Incorporate performance metrics that capture the benefits of TSMO initiatives**, such as the Travel Time Index for travel time reliability, as part of the region's Long Range Transportation Plan Performance Measures.

Regional Coordination Opportunities

The ITS Strategic Plan for Greater Rochester identifies several specific recommendations for building upon the region's excellent foundation for interagency coordination of ITS deployment and Transportation System Management and Operations:

- Building upon a legacy of cooperation and goodwill, **continue ongoing interagency coordination for operations through the Transportation Management Committee (TMC)**, facilitated by GTC;
- **Coordinate ITS project planning, design, funding, implementation, and operations** to maximize functionality and cost-effectiveness.
- Develop **Regional Concepts for Transportation Operations (RCTOs)** to formalize goals, roles, and agreed responsibilities in implementing TSMO strategies;
- **Formalize existing ad-hoc interagency agreements** through written memoranda of understanding (MOUs) for ITS planning, funding, operations, maintenance, and infrastructure sharing;
- **Implement a regional data management strategy** to collect, archive, and analyze transportation system performance data generated by ITS systems, in support of planning and performance measurement;
- **Manage and coordinate communications infrastructure implementation on a regional level**, facilitated by a regional communications plan and a formalized process of interagency agreements;
- **Promote resource sharing** (such as cross-trained personnel) and knowledge transfer among agencies (including local municipalities) to increase the region's knowledge base and operations capacity.
- **Support advocacy and awareness**, among policy makers, agencies, and the general public, of the benefits, opportunities, and effectiveness of ITS and TSMO in meeting the region's transportation needs.

Opportunities for Regional Coordination in ITS Planning and Deployment

Continued interagency coordination through the Transportation Management Committee (TMC)

Coordinate ITS project planning, design, funding, implementation, and operations

Regional Concepts for Transportation Operations (RCTOs) for critical operations functions

Formalize ad hoc interagency agreements

Regional data management and performance measurement

Regionally communications infrastructure sharing

Resource sharing and cross training of staff

Support advocacy and awareness of TSMO needs, opportunities, and benefits

Table of Contents

Funding assistance for the preparation of this report was provided by the Federal Highway Administration. The Genesee Transportation Council is solely responsible for its content and the views and opinions expressed herein do not necessarily reflect the official views or policy of the U.S. Department of Transportation.

List of Acronyms

AFC	Automated Fare Collection
ASA	Automatic Stop Annunciation
APC	Automatic Passenger Counters
ATMS	Advanced Traffic Management System
AVL	Automatic Vehicle Location
BRT	Bus Rapid Transit
BTI	Buffer Time Index
CAD	Computer-Aided Dispatch
CATS	County Area Transit System of Ontario County
CCTV	Closed-Circuit Television
CMP	Congestion Management Process
DMS	Dynamic Message Sign
EMS	Emergency Management Services
EOC	Emergency Operations Center
ETC	Electronic Toll Collection
GTC	Genesee Transportation Council
GPS	Global Positioning System
HAR	Highway Advisory Radio
HELP	Highway Emergency Local Patrol
HOV	High Occupancy Vehicle
IMAGE	Improved Mobility Areawide Guidance Evaluation
ISTEA	Intermodal Surface Transportation Efficiency Act
ICM	Integrated Corridor Management
ITS	Intelligent Transportation Systems
IVR	Interactive Voice Recognition
LATS	Livingston Area Transit System

LRTP	Long Range Transportation Plan
MCDES	Monroe County Department of Environmental Services
MCDOT	Monroe County Department of Transportation
MCECD	Monroe County Emergency Communications Department
MPO	Metropolitan Planning Organization
NITTEC	Niagara International Transportation Technology Coalition
NTCIP	National Transportation Communications for ITS Protocol
NYSDOT	New York State Department of Transportation
NYSP	New York State Police
NYSTA	New York State Thruway Authority
PSAP	9-1-1 Public Service Access Point
PPP	Public Private Partnership
PTI	Planning Time Index
RCTO	Regional Concept for Transportation Operations
RPD	Rochester Police Department
RGRTA	Rochester-Genesee Regional Transportation Authority
RTOC	Regional Traffic Operations Center
RTS	Regional Transit Service
RWIS	Roadway Weather Information System
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Act: A Legacy for Users
TEA-21	Transportation Efficiency Act for the 21st Century
TIDE	Technology Initiatives Driving Excellence
TIP	Transportation Improvement Program
TMA	Transportation Management Area
TMC	Transportation Management Committee
TSMO	Transportation System Management and Operations
TSP	Transit Signal Priority
TTI	Travel Time Index

USDOT	United States Department of Transportation
UTCS	Urban Traffic Control System
VII	Vehicle Infrastructure Initiative
VMS	Variable Message Sign
WATS	Wayne Area Transit System

Section 1: Introduction and Overview

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Introduction

This document is an Intelligent Transportation Systems (ITS) Strategic Plan for Greater Rochester. The purpose of the plan is to provide a strategy for coordinated deployment of ITS in the Greater Rochester Region over the next ten years that is responsive to regional transportation needs.

This plan has been developed in accordance with Transportation System Management and Operations (TSMO) principles. TSMO involves the integration of plans, policies, technology investment, and other resources to improve the real-time operation of the transportation system.

TSMO also promotes the integration of operations activities and ITS investment with "mainstream" regional planning, project development, and performance measurement activities, as part of a coordinated approach to meeting the transportation need of the Greater Rochester region.

The Genesee Transportation Council (GTC) has undertaken this project in collaboration with stakeholders throughout the Greater Rochester region.

The study assumes a ten-year planning horizon, which from a technology perspective may be thought of as a 'long range' plan given the pace of technology deployment and the evolution of transportation applications of that technology. The horizon allows the region to anticipate emerging and longer term considerations while also identifying priorities and actions in the near term.

Certain initiatives beyond the ten-year horizon have also been identified and are discussed throughout the Plan, because they help to shape the overall ITS vision and its relation to the region's overall transportation investment strategies 10 to 20 years into the future.

The ITS Strategic Plan for Greater Rochester presents a strategy for coordinated, prioritized deployment of transportation technologies that respond to regional needs.

What are Intelligent Transportation Systems (ITS)?

Intelligent Transportation Systems (ITS) are a set of technology tools that can be applied to improve management and operations of the regional transportation system. ITS Technologies 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 technologies can provide a variety of benefits, including:

- Increased system capacity through more efficient use of existing infrastructure and network capacity, particularly in response to non-recurring congestion;
- Providing cost-effective complements, or alternatives, to traditional forms of transportation investment such as capacity expansion;

- Improved real-time system management capabilities, including incident management, emergency management;
- Better-informed travelers through the provision of real-time traveler and weather information;
- Better informed and more responsive transportation agency with greater understanding needs and conditions at various times of day, under variable conditions, and across locations;
- Improved operational performance of multimodal transportation systems, including transit and freight reliability;
- Increased safety; and
- Reduced environmental impacts.

ITS provides a powerful toolkit of options and alternatives that can help to address regional transportation needs, in tandem or in lieu of other strategies such as capacity expansion or transportation demand management.

Non-recurring congestion caused by traffic accidents, weather, or other incidents is a key example of how ITS can address the transportation needs of the region. As evidenced by the GTC Long Range Transportation Plan and the regional Congestion Management Process, non-recurring congestion is an increasing component of delay and impediment to passenger and freight mobility. Because of the unpredictable nature and location of such incidents, conventional approaches such as capacity expansion are neither effective nor affordable. On the other hand, ITS tools such as video surveillance, incident detection, traffic management systems, and traveler information can have a direct impact on the duration and impacts of such events.

By coordinating ITS investments, agencies can better address the needs of the region's complex and inter-connected nature of the region's transportation system.

Purpose of the Regional ITS Strategic Plan

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.

An examination of ITS deployment experience in Greater Rochester to date shows the benefits of a coordinated approach (e.g., the nationally-recognized Transportation Management Committee and the interagency Regional Traffic Operations Center, or RTOC). However the same examination also shows the opportunities and need for further coordination and cooperation to address emerging needs such as Integrated Corridor Management or Transit Signal Priority.

The need for a collaborative planning approach has led to the development of this regional ITS strategic plan to coordinate the planning, funding, implementation, operations, and evaluation of ITS systems deployed by the multiple agencies with jurisdiction over parts of the region's multimodal transportation system.

Advantages of a coordinated approach to ITS planning and deployment include:

- More integrated ITS projects and systems that address the complex, multimodal transportation needs faced by the region and its "total transportation system."
- Increased functionality of ITS systems that provide value in response to multiple needs simultaneously.
- More cost-effective investment through sharing of infrastructure and systems by multiple agencies.
- Increased opportunities for cost sharing among participating agencies.
- Improved competitiveness for discretionary and emerging funding opportunities that require interagency or multimodal coordination.
- Improved coordination and integration of ITS investments into the comprehensive, multimodal regional transportation planning process.
- Integrated thinking throughout the ITS development lifecycle, including: policy coordination, strategic planning, investment decision-making, funding, project implementation, operations and maintenance, and performance measurement.
- Consistency with the New York Statewide ITS Architecture and the United States Department of Transportation (USDOT) National ITS Architecture, which envision connected, multimodal systems within the region and across the state.

To garner support and sustainable funding, it is critical to demonstrate how ITS investments address the region's transportation needs and priorities.

ITS Strategic Plan Goal and Objectives

ITS Strategic Plan Goal

The Goal of the ITS Strategic Plan for Greater Rochester is to develop a multi-modal vision for Intelligent Transportation Systems investment over the next ten years that is responsive to the recognized transportation needs and priorities of the Greater Rochester region.

As a strategic planning document, the ITS Strategic Plan recasts the regional transportation technology vision that was last formally articulated through the 1996 IMAGE Report (described below). The strategic directions set out by the IMAGE Report have largely been achieved or superseded by more recent technological developments.

ITS Strategic Plan Objectives

The Objectives of the ITS Strategic Plan are to:

- Identify a rationale for technology investment (*the "**why**" questions*) based on Transportation System Management and

Operations (TSMO) principles that address recognized regional needs;

- Identify roles and responsibilities (*the "**who**" questions*) for regional interagency coordination to implement system management strategies based on Regional Concept of Transportation Operations;
- Map operational strategies and concepts of operations to technology infrastructure investment needs in the region (*the "**what**" and "**how**" questions);* and
- Prioritize and guide regional ITS investment over a ten-year planning horizon (*the "**when**" questions).*

Other Anticipated Outcomes

Additional desired outcomes identified by project stakeholders include:

- Developing a collective sense of where future ITS goals and priorities in the region, building upon the successes of the past and the challenges of the future;
- Identifying regional collaboration opportunities to increase the effectiveness and cost-effectiveness of ITS investment;
- Responding to local needs and conditions by tailoring emerging best practices to the needs of the Greater Rochester region;
- Anticipating future evolutions in technology and the operating environment so that the region can respond proactively;
- Providing information and tools to facilitate implementation of the regional vision at the project level; and
- Providing evidence to help "make the case" for ITS capital investment and ongoing support of transportation operations.

The Greater Rochester region has accomplished many of the goals and milestones set out in the 1996 IMAGE Report.

This ITS Strategic Plan acknowledges past successes and resets goals for the next 10 years.

The IMAGE Report: Updating the Regional ITS Vision

In January 1996, NYSDOT completed the Improved Mobility Area wide Guidance Evaluation (IMAGE) Report, the region's current ITS strategic vision.

The IMAGE Report described goals for an Advanced Transportation Management System (ATMS) covering highways and arterials in Monroe County as follows:

> "*The goal of the Advanced Transportation Management System (ATMS) is to manage the transportation system, to reduce traffic congestion, and to improve the efficiency of the incident management process through the integrated management of the expressway and arterial roadway network, together with providing information to help efficiently manage the regional transit system."*

Contents of the IMAGE Report included:

- An Inventory of Activities, Roles, and Responsibilities
- Existing and Future Conditions/Institutional/User Needs
- Alternative Strategies Evaluation
- A Long-Term Vision Statement
- Regional Communication and Architecture
- Monroe County UTCS Upgrade Option
- Strategic Implementation/Deployment Plan
- Traffic Operations Center Evaluation
- Regional Operations Plan
- Public/Private Partnership Opportunities

While the plan assumed a 20-year horizon, the Greater Rochester region has caught up to many of the visionary goalposts established in the IMAGE Report. This ITS Strategic Plan updates those goalposts based on the successes and lessons learned in the more than a decade that has passed since the IMAGE Report was issued.

ITS Deployment Successes since the IMAGE Report

Since the time that the IMAGE Report was issued, there has been widespread deployment of ITS elements throughout the region, concentrated primarily within the boundaries of Monroe County. These investments have provide a substantial foundation for regional transportation system management and operations across all modes.

Examples of regional ITS deployment since the IMAGE Report include:

- Replacement of the Monroe County Urban Traffic Control System (UTCS) traffic signal system
- Expansion of MCDOT traffic signal system to include additional locations and initiation of a parallel NYSDOT traffic signal system (Streetwise)
- Upgrading the MCDOT coaxial cable traffic signal communications system to fiber optic cable
- Implementation of RGRTA Computer-Aided Dispatch/Automatic Vehicle Location (CAD/AVL) and other transit ITS deployments as part of its Technology Initiatives Driving Excellence (TIDE) program
- Regional deployment of NYSDOT Roadway Weather Information System (RWIS) program, in both urban and rural parts of the region
- Initiation of NYSDOT Highway Emergency Local Patrol (HELP) service and Incident Management trailers
- Use of “Surface Traffic Controller” concept to control and monitor lane closure activities on the expressway

- Implementation of NYSDOT "511" telephone traveler information system coverage in the Greater Rochester area
- E-ZPass Electronic Toll Collection (ETC) on New York State (NYS) Thruway in the Region
- Development of a Mobile Emergency Management Communications Trailer
- Deployment of milepost markers for incident verification and management
- Deployment of Closed Circuit Television (CCTV) cameras, Dynamic Message Signs (DMS), Highway Advisory Radio (HAR) around the region

The capstone accomplishment of the IMAGE Report vision was the establishment of the Regional Traffic Operations Center (RTOC), a multi-agency 24/7 transportation management center, opened in 2002. This visionary facility co-located NYSDOT Region 4 operations and Monroe County DOT in an integrated regional traffic control center with jurisdiction over both expressways and arterial streets. The control center is also co-located with a New York State Police station acknowledging their critical role in incident management. The facility is also used by the County Airport Authority to house its Airport Operations staff and equipment.

Taken in total, these deployments represent a significant advancement of the recommendations of the IMAGE Report and suggest the need for an updated regional ITS Strategic Plan with new goalposts. Additionally, these project provide much of the technology and infrastructure foundation for advanced Transportation System Management and Operations strategies.

The IMAGE Report: Lessons and Legacies

In several respects, the IMAGE Report was a visionary document and in many ways ahead of its time. The document cemented the working relationships among agencies in deploying ITS and operating the transportation network in a coordinated fashion. This ongoing legacy is one of the most enduring facets of the plan.

In spite of the accomplishments described above, many of the challenges described in the plan are as valid today as they were in 1996, and indeed have emerged nationally as universal challenges and themes. These include:

- The need for stable ITS funding for implementation, operations, and maintenance,
- A "unified, modern, and reliable communications network",
- Integration of ATMS projects into the regional project development and selection process, and
- Recognition of the benefits of video surveillance of roadways for traffic flow monitoring and incident detection/response.

On the other hand, some of the issues and topics addressed extensively in the IMAGE Report have diminished in importance over

the past 14 years. For example, many of the technical issues related to specific standards and concerns over cellular communications networks are archaic and dated by today's standards. In the development of this plan, stakeholders acknowledged as a lesson learned that the new ITS Strategic Plan should take care to focus on strategic themes that will endure the anticipated ten-year duration of the plan. Even assuming a 5-year update cycle for this vision, the pace of technological evolution in ITS necessitates that certain tactical technological issues be addressed in follow-up studies or within the project engineering process.

An issue that is treated with considerably less detail and rigor in the IMAGE Report than is common today is the area of transportation security, reflecting the post-9/11 world that has emerged in the intervening years. This includes both the use of ITS to ensure the physical security of the transportation network against attack (especially transit, bridges, terminals, and other critical infrastructure) as well as the role of ITS in supporting emergency management (disaster response, evacuation). For the RTOC building itself, locating the State Police within the building has helped to ensure the security of the facility.

A Transportation Systems Management and Operations (TSMO) Approach

"Transportation System Management and Operations" (TSMO) takes into account the complementary technologies, policies, institutions, and resources needed to manage the transportation system.

Intelligent Transportation Systems (ITS) are a set of enabling technology tools that support regional TSMO objectives.

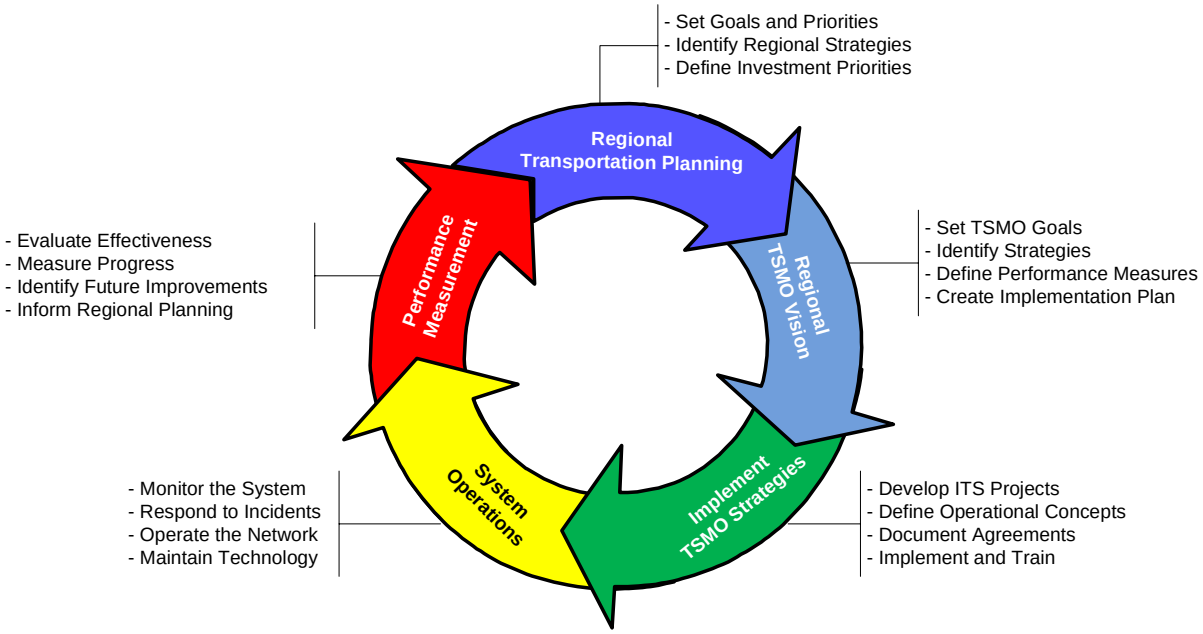
National and regional experience in the planning, deployment, and operations of ITS has yielded a critical lesson: the success of these technology strategies is as dependent upon institutional policies and relationships as it is on the technology systems themselves.

As ITS planning practices have evolved over the last five years, there has been greater emphasis on the operational, policy, and institutional context of ITS technology systems. Collectively this approach is known as Transportation System Management and Operations (TSMO).

Four ingredients to successful TSMO implementation are:

- **Plans and Policies:** TSMO requires interagency coordination through plans, policies, interagency agreements, and regional concepts of operations to effectively use technology tools;
- **People:** Agency personnel dedicated to transportation operations, both in the field and in central control centers, implement TSMO strategies;
- **Resources:** TSMO strategies require a sustained commitment to operational support than conventional transportation investment, such as response vehicles, control centers, and other equipment; and
- **Technology:** ITS technologies enable agency personnel to proactively monitor, control, and inform.

TSMO also connects Operations and Planning through a 'lifecycle" approach to development, implementation, evaluation, and refinement of operations strategies within the context of the regional transportation planning process, as shown in the diagram below.



The Transportation System Management and Operations (TSMO) Planning and Operations "Lifecycle"

Elements of a TSMO Approach

Basic tenets of a TSMO approach are as follows:

- Intelligent Transportation Systems are enabling tools that allow the implementation of TSMO system management and operational strategies.
- TSMO strategies such as expressway management, transit management, or parking management should be articulated and related to needs and objectives that have broad practical and policy resonance in the region (e.g. mobility, safety, travel time reliability, etc.).
- For each TSMO strategy, the region develops a Regional Concept for Transportation Operations (RCTO) articulating roles, responsibilities, and motivations for *why* ITS is being deployed.
- TSMO strategies should be an inherent part of the regional project development and planning conversation, reflected as one of the options available to address regional needs.
- Performance Measures should be used to measure the effectiveness of TSMO strategies and to prioritize future investments.

TSMO Approach to the ITS Strategic Plan

This ITS Strategic Plan for Greater Rochester has been developed using a TSMO philosophy and approach. Increasingly, effective system operations in the Greater Rochester region required collaboration on many levels among agencies that plan, own, operate, and maintain transportation and technology infrastructure.

In the development of this Plan, a discussion of System Management baseline conditions, needs, and future opportunities among stakeholders was used as a basis for the discussion with stakeholders of future ITS needs.

Once the specific System Management opportunities were discussed, the planning conversation shifted to the implications for functional and geographic needs for ITS technology tools in the region.

The ITS Strategic Plan is developed around TSMO objectives and strategies that will be resilient in the face of inevitable technological changes over the next 10 years.

Benefits of the TSMO Approach

By adopting this approach, the ITS Strategic Plan provides traceability between proposed ITS deployments and the underlying system management strategies that are enabled by investment in these tools.

Acknowledging the operational foundations of ITS investment, the TSMO approach also positions the region for successful deployment by identifying the overarching goals and institutional requirements to derive value from technology infrastructure that is being deployed.

Looking at the issue from the other side, the conversation about system management objectives was also used to identify gaps in existing ITS infrastructure based on *functional need*, not simply the existing absence of ITS infrastructure.

From a policy and planning perspective, the TSMO approach demonstrates the relationship between ITS and TMSO operational strategies and the widely-acknowledged transportation challenges of the region.

This is critical for engendering broad based understanding and policy support for investment in future ITS technologies and ongoing support of transportation operations programs. In many cases, ITS solutions may provide new and highly cost-effective options in addressing those needs.

ITS Strategic Planning in the Face of Evolving Technologies

As with the rapid evolution of technology that impacts many aspects of our society and economy, there are emerging issues that may impact how ITS and TSMO technologies are designed, managed, and delivered in the future.

A review of the 1996 IMAGE Report (summarized above) is instructive for demonstrating how technological conditions, priorities, and assumptions can evolve over time. For example, the Internet, which is now a mainstay of ITS service and traveler information delivery, was an emerging and uncertain influence in 1996.

This inherent uncertainty in the ITS field poses unique challenges for "long term" or "strategic" planning of rapidly evolving transportation technologies.

Moreover, because ITS and TSMO are young and evolving fields, agencies in the region and across the country are continuously learning new techniques to better operate, plan, coordinate, and measure to make most effective use of these tools.

All project participants recognize that an evolution of ITS technology, internet technology, communications, and many other factors could dramatically impact the ITS landscape within the ten-year planning horizon of this plan.

However, rather than viewing the inevitability of technological evolution as a reason for postponing or avoiding discussions of strategic objectives, the Plan takes the opposite approach. It is based on the premise that a clear understanding of regional operational objectives and transportation needs can serve as a relative constant that the region can use to benchmark future technology developments and investments to determine if they address the fundamental concerns of the region.

The Role of the Private Sector

One of the most uncertain yet potentially transformative issues in ITS is the growing role of the private sector in providing ITS services that are now delivered primarily by public sector.

Many industry observers anticipate a future when private Information Service Providers play a key role in areas such as traffic data collection or end-user traveler information services through mobile or in-vehicle devices or third-party services.

The I-95 Corridor Coalition's probe data pilot project using private-sector flow data is a poignant case study, particularly in light of that company's emerging business partnerships with Information Service Providers in the consumer technology market.

A valid question for public agencies in light of these circumstances is: How does the Greater Rochester Region leverage (rather than duplicate) this emerging private sector initiative to meet public agency objectives and regional transportation goals? The answers to this question can help to prioritize complementary public sector investment and foster the emergence of a seamless information infrastructure buttressed by both public and private-sector actors.

The private sector has already become an influence in Rochester. For example, Trafficland.com is used now to distribute live video images from the RTOC to the public and to the media. Looking farther ahead, some privately owned electronic billboards and message signs are being erected along highways, which could be used in the future to convey information to motorists about highway conditions.

The growing role of the private sector in providing ITS services and traveler information will be a leading factor over the next 10 years.

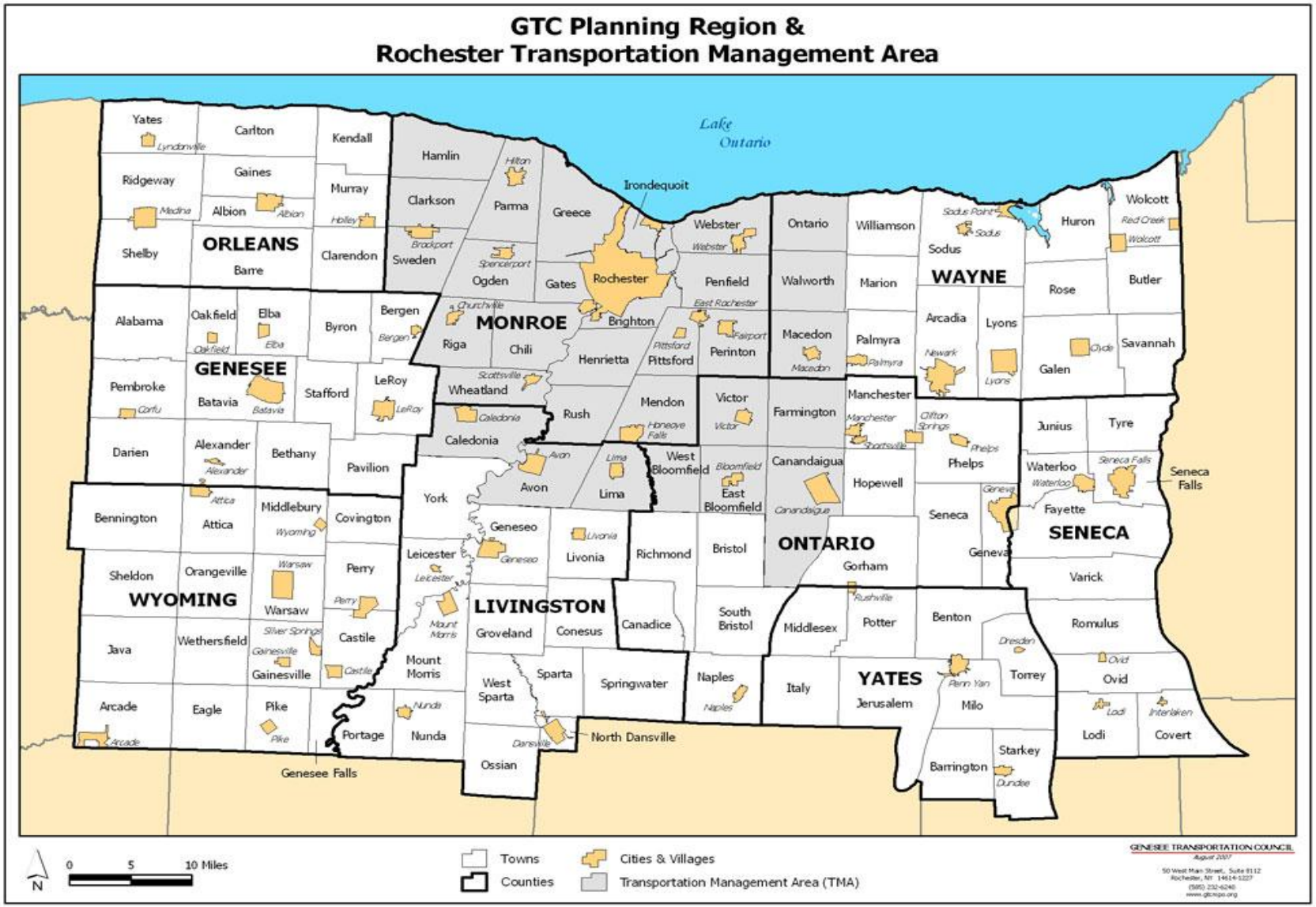
Study Area

This study covers the 9-county planning area of the Greater Rochester region comprising nearly 4,700 square miles of the Genesee-Finger Lakes region of New York. It encompasses the nine counties of Genesee, Livingston, Monroe, Ontario, Orleans, Seneca, Wayne Wyoming, and Yates.

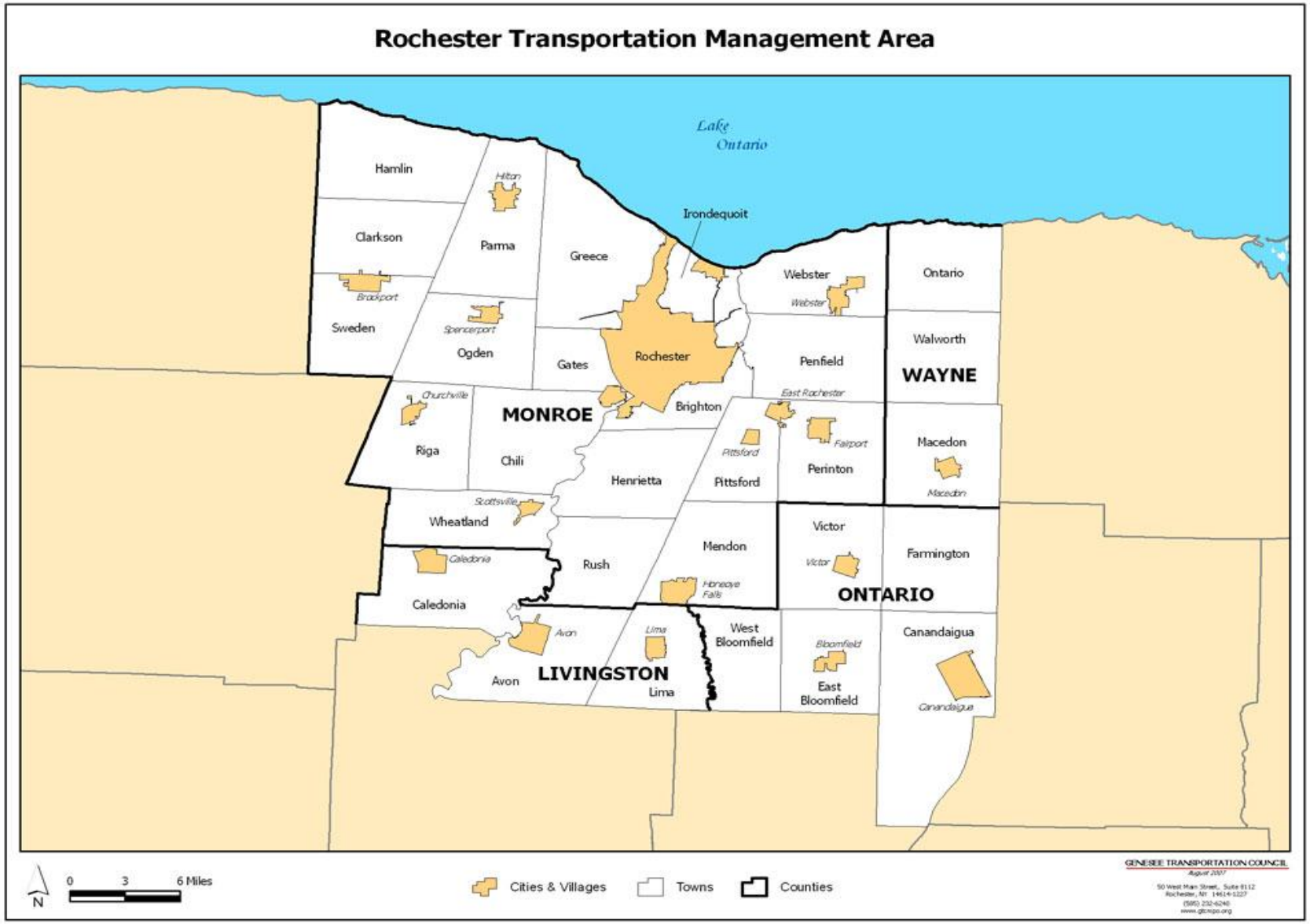
The region is home to approximately 1.2 million residents, 30,000 businesses and 500,000 employees. The economic hub of the region is the Rochester metropolitan area including the City of Rochester and adjacent urbanized communities.

Much of the region's existing transportation need lies within the urbanized Transportation Management Area (TMA) of Monroe County and adjacent urbanized areas of Livingston, Ontario, and Wayne Counties.

The Plan encompasses a diverse, 4,700 square mile, 9-county region including a major metropolitan region, major trade corridors, and rural communities.



Genesee Transportation Council 9-County Planning Area



The Transportation Management Area (TMA) of the Urbanized Greater Rochester Region

ITS technologies geared towards management of traffic congestion, incidents, transit, and operations along high-volume corridors tend to be concentrated in urbanized areas. Therefore, much of the ITS deployment in the region to date can be found in Monroe County and the Transportation Management Area encompassing the more urbanized corridors of region as well as the New York State Thruway corridor.

Some ITS applications, including roadway weather systems, traveler information systems, and safety systems, are effective in rural as well as urban areas. These needs and opportunities have been examined on a region-wide basis across the entire nine-county area.

Stakeholder Involvement

Key to the success of any regional planning effort is the identification and participation of a wide variety of stakeholders, and the Greater Rochester ITS Strategic Plan is no exception. By bringing together a variety of transportation and emergency management stakeholders, a valuable regional dialogue about the future of ITS in the Greater Rochester Region can be fostered.

The leadership and cooperation among regional agencies in ITS and operations is a tremendous asset to the region and a strong foundation for future initiatives.

The stakeholders who participated in the Greater Rochester ITS Strategic Plan Update development process represented a range of local, regional, and statewide entities and multiple modes of transportation. Many are actively involved in TSMO and/or the planning, implementation, operation and maintenance of the region's ITS and communications infrastructure.

Organization	Representative(s)
Monroe County Department of Transportation (MCDOT)	Terry Rice Jim Pond
Office of the Monroe County Sheriff	Major Steve Koster
New York State Department of Transportation (NYSDOT)	Dan McCusker Brad Walike
New York State Thruway Authority (NYSTA)	George White
New York State Police (NYSP)	Sergeant James Faber
City of Rochester Department of Environmental Services	Erik Frisch
Rochester Genesee Regional Transportation Authority (RGRTA)	Charles Walker Randy Weaver
Genesee Transportation Council (GTC)	Rich Perrin

Participating Agencies and Representatives

Stakeholders were invited to participate in meetings and interviews, to provide information on existing and planned ITS initiatives, and describe regional needs and priorities from the perspective of their organization.

Project stakeholders comprising the Steering Committee were invited to meet and provide input regarding the ITS inventory and needs assessment. A broad cross-section of the Steering Committee agencies listed above was represented at each meeting. Stakeholders were also able to provide their input through one-on-one discussions with the project team.

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Section 2: The State of ITS in Greater Rochester Today

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Overview

The purpose of this section is to review the existing conditions and status of ITS deployments initiated by agencies within the region. The agency snapshots are based on discussions with agencies participating in the ITS Strategic Plan Update development process, either through participation in Steering Committee meetings or through one-on-one stakeholder interviews.

The Transportation Management Committee (TMC)

The Transportation Management Committee is an informal, multimodal, regional coalition that provides a forum for collaboration on a range of ITS and TSMO issues.

Agencies in the Greater Rochester region coordinate through an *ad hoc* ITS and transportation operations coordination body known as the Transportation Management Committee (TMC). The Transportation Management Committee has been recognized by the USDOT Federal Highway Administration Office of Operations as an outstanding national example of regional ITS and transportation operations coordination.

The TMC is chaired by the Genesee Transportation Council (GTC), which facilitates the committee in the spirit of its similar role in other aspects of the transportation system. However, the TMC largely relies on the volunteer efforts, self-interest, and personal initiative of key figures in the regional ITS community.

Committee participation is open to all interested agencies but historically has been centered upon the coordination efforts of the Monroe County and New York State DOT staff of the Regional Traffic Operations Center, the New York State Thruway Authority, City of Rochester, New York State Police, Monroe County Sheriff's Department, Genesee Transportation Council, Rochester-Genesee Regional Transportation Authority (RGRTA), Monroe County Town Supervisor's Association, and other participants.

The roots of the TMC are in a preceding organization known as the Expressway Committee in the early 1990s to address expressway incident management operations and coordination.

The TMC maintains a flexible structure and agenda depending upon the needs and common interests of its participating agencies. Meetings are held on a bi-monthly basis and are conducted at the NYSDOT Region 4 offices at 1530 Jefferson Road.

TMC agenda topics had historically included topics such as:

- Review of planned and in-design ITS and communications projects
- Review/debrief of incidents
- Coordination for construction and special events
- Project development and funding coordination
- Training and professional capacity building activities

- Other special projects, studies, and initiatives

In 2002, the GTC studied the organizational and management structure of the TMC. The study recommended that the TMC maintain its ad-hoc organizational structure. This is in contrast to more formalized structures such as the Niagara International Transportation Technology Coalition (NITTEC) in the Buffalo-Niagara region. However, it recommended that the TMC expand its mandate in terms of regionally important ITS and operations coordination topics. The TMC has continued to be a vital part of the regional collaboration infrastructure on ITS and transportation operations issues.

Agency Profiles

The following are summaries of stakeholder outreach interviews, by agency. During stakeholder outreach, current agency goals, needs, and plans regarding ITS were discussed. The following subsections provide a snapshot of these agencies' ITS initiatives.

New York State Department of Transportation (NYSDOT)

The New York State Department of Transportation (NYSDOT), Region 4, is responsible for planning, construction, operation, and maintenance of state highways in the Greater Rochester region.

As a region and as a state agency, NYSDOT has implemented significant ITS and operational investments including advanced traffic management, signal coordination and control (implemented using the *Streetwise*® platform), traveler information (including statewide '511' telephone and web-based traveler information), roadway weather information systems, incident management, communications infrastructure, and other technologies that support a proactive stance towards regional transportation system operations and maintenance.

NYSDOT developed the Regional ITS Architecture and operates a network of arterial and expressway ITS from the RTOC.

NYSDOT maintains 24/7 operational capabilities from the Regional Traffic Operations Center (RTOC) located on the property of the Greater Rochester International Airport. In addition to operations, NYSDOT coordinates regional roadway maintenance, maintains a regional call center, and dispatches signal maintenance crews from the RTOC.

Being co-located at the RTOC with the MCDOT, the New York State Police, and the County Airport Authority, offers the region many benefits. In particular, NYSDOT is able to work very closely with these agencies with regard to incident management, construction and maintenance, and speed zones and safety control activities. During off hours, NYDOT dispatches Monroe County signal crews.

For example, NYSDOT has installed microwave detectors on I-390 which will enable NYSDOT to provide additional information about real-time road conditions along this route. Real-time traffic condition information from these detectors will also be made available to MCDOT. Some of these interagency relationships are less formal than others. Opportunities may exist for additional further integration and

coordination. For example, integration of ATMS systems to allow sharing of signal control is something that could be further explored. That type of functional integration would require a whole new level of cooperation and agreement and cost sharing.

NYSDOT key future priorities for ITS implementation include:

- Expanded traffic flow and incident detection across the network;
- Corridor management through improved signal coordination, including expanded central signal system control and coordination with the County;
- Improved incident and diversion route planning, including expanded partnerships, training, and tactical coordination with local law enforcement; and
- Integrated regional operations involving other transportation agencies such as Monroe County, the New York State Thruway Authority, RGRTA, and other local jurisdictions.

Other key considerations expressed by NYSDOT in developing the ITS Strategic Plan Update include:

- Emphasis on New Technologies – The region should be open and mindful of the advantages offered by newer technologies - particularly wireless communications alternatives to expensive fiber optic infrastructure. The needs and alternatives of a particular project or corridor should be considered during project development and implementation to ensure that technology selection decisions are being made in a forward-looking and cost-effective manner.
- Integration with Other Agencies - This plan would best serve the region by focusing on interagency coordination and cooperation. Possible institutional barriers should be identified and addressed. Interagency opportunities to collaborate and coordinate should be identified.
- Signal System Improvements – NYSDOT is interested in improving its signal system and increasing its remote signal control capabilities.

Monroe County Department of Transportation (MCDOT)

As with NYSDOT, the safe and efficient movement of traffic is the primary mission of the Monroe County Department of Transportation (MCDOT). With regards to ITS, they are interested in evaluating what has been successful in the past and building on that success. They view ITS as potential tools for operational improvement that can result in improved traffic conditions. ITS can also help facilitate interagency coordination, helping everyone to work together.

Monroe County DOT operates a large network of signals and ITS devices on the region's arterials from the RTOC.

Looking back, the IMAGE Report placed an emphasis on DMS. The IMAGE Report assumed that all DMS installations would be permanent. As a follow up, MCDOT tried to pick locations where permanent arterial DMS would be appropriate. MCDOT discovered that while these DMS were great for expressways with limited access points, they are less suitable for arterial locations. The high cost associated with permanent

installation and questions regarding their long-term reliability (raised by the State's experiences with their own DMS signs) persuaded MCDOT to hold off on arterial DMS installation until a future phase.

MCDOT purchased two portable DMS that could serve the same intended function as the proposed permanent arterial DMS, only these signs would not be tied to a specific location. Because these portable DMS could potentially be deployed anywhere, MCDOT chose relatively large trailer-mounted signs that could be used on higher speed roads. However, these larger signs proved difficult, and in some cases impossible, to fit into many locations. The logistics of moving and programming these large portable DMS also limited their use to traffic situations that were known ahead of time, such as construction-related detours or planned lane closures. The larger signs could also be used for unexpected longer term situations, such as flooding, where the information would remain relevant for many hours. These larger portable DMS have been valuable serving in this role, but they rarely come into play for the shorter term, real-time incident management role that they were originally envisioned for. MCDOT plans to purchase smaller portable DMS units. If funding allows, MCDOTwill purchase additional permanent locations, but currently these have been relegated to the long term.

If MCDOT pursues permanent DMS installations, MCDOT envisions providing additional information via these signs. For example, the New York State Department of Transportation (NYSDOT) has installed microwave detectors on I-390, and the MCDOT has system sensor detector loops in many locations. Tools such as these could enable the agencies to provide information about real-time road conditions along a given route.

MCDOT is also focusing on traffic control. MCDOT is in the process of developing preplanned incident management signal timings based on observed diversion routes as incidents are experienced over time. In developing these incident management signal timings, MCDOT will also use any data provided by others (NYSDOT, GTC, etc.).

MCDOT also expressed satisfaction in the cameras it has deployed. MCDOT has extensive camera coverage, useful for monitoring traffic conditions and incident response. The digital video format of these cameras allows for short term playback of video and facilitates interagency video sharing.

MCDOT's video system is directly linked with the County security system, enabling direct sharing of video with other agencies such as 911 and the Emergency Operations Center. This arrangement also allows MCDOT to use other cameras within the system that offer useful roadside views. A proposed change to the Countywide security software platform will need to be worked through to maintain this capability. Additionally, MCDOT has successfully implemented NTCIP as their communications protocol, thereby further facilitating communications interoperability.

The MCDOT owns and operates all of the current ITS deployments within the City. From an ITS perspective, this provides a single unified ITS network, simplifies interoperability issues, and provides efficiencies in terms of operation and maintenance. It should be noted however

that the City has plans to own and operate its own ITS devices as well (e.g. future electronic parking management systems).

Being co-located at the RTOC with the New York State Police and NYSDOT also works very well; establishing good interagency relationships and efficient communication. There currently exists a strong working relationship between MCDOT and the NYSDOT. There is potential for improved communication and coordination with the Sheriff's Department and the Thruway, and the co-location at RTOC opens many doors for enhanced cooperation and communication.

Moving forward, the MCDOT is expanding its fiber-optic coverage and moving away from coaxial cable. They are also planning to do some camera readjustment and place some additional cameras. They also are in favor of the RGRTA's bus signal priority plans. They are also interested in creating greater State interconnectivity, establishing communication paths to new locations, and continuing to formalize sharing agreements among agencies.

Monroe County Emergency Operations and Emergency Communications Department (9-1-1 Center)

The Monroe County's Emergency Operations Center is a specially designed facility where public organizations and private-sector agencies meet to decide and coordinate emergency response to community-wide disasters. The Emergency Operations Center is equipped with communication devices, state-of-the-art electronics, and other tools which facilitate the collaborative effort necessary for response to emergency events.

The County 9-1-1-Center is a key link between transportation and emergency management.

NYSDOT, MCDOT, RGRTA, and the City of Rochester are among the transportation agencies who participate in regional emergency operations functions alongside Law Enforcement, Fire Service, Health, Human Services, Communications agencies, and other key community partners.

Monroe County funds a regional 9-1-1 Emergency Communications System, and oversees the operation of the Emergency Communications Department (ECD). The ECD is the point of central reception and response to 9-1-1 dialed calls, dispatch of emergency equipment, and relay or transfer of service calls to the appropriate public service agencies. Over one million dispatches are made to police, fire and emergency services each year. The City of Rochester operates the ECD under contract with the County.

Incident notifications from the Monroe County Sheriff's Office and other law enforcement agencies most often reach the RTOC by way of the 9-1-1 Center.

Monroe County Sheriff's Office

Incident management is the primary concern and involvement of the County Sheriff's Office in regional transportation system management and operations.

The Monroe County Sheriff's office is a key participant in incident and traffic management.

The Sheriff's Office provides notification of incidents to the RTOC via mobile phone, generally only when traffic management support is needed (e.g. signal outages). The timing of this notification is left to the judgment of the Sheriff's Office, and the RTOC is sometimes not notified in the course of minor incidents. Multi-agency coordination is a component of the Sheriff Office's supervisor training course and a part of the initial police academy training.

From the perspective of the Sheriff's Office, ITS technology can assist in helping to identify the exact location of an incidents so that responders can obtain as much information on the conditions on scene before arrival, and also initiate the traffic management process (e.g. provide accident alerts) sooner. It was suggested that additional deployment of cameras accessible from law enforcement agency dispatch, along with DMS and HAR, would assist in these efforts.

Communication with law enforcement agencies to broaden awareness of the RTOC's capabilities and services has been identified as a key issue. This is particularly true for emergency responders at the municipal level, who have relatively little exposure and awareness of regional traffic management infrastructure, capabilities, and agency contacts.

Overall, the Sheriff's Office identified a very efficient and cooperative working relationship with the State Police at the RTOC. However, there can be an information lag – many first responders are unaware of what RTOC can do for them in the event of an incident. In the event of a significant incident, the ability to call RTOC and have them dispatch equipment to manage traffic (in terms of diversion and safety) so that the officers on the scene can focus on other responsibilities is at times underutilized.

Moving forward, communications interoperability is an important issue and the Sheriff's Office is in the process of getting new radios which will have new channels which will allow various first responders to communicate directly with other emergency management agencies.

City of Rochester

The City of Rochester is in a unique position in that it does not own or operate any of the current ITS deployments within the City. Rather, the City has an arrangement with Monroe County wherein the County is responsible for all traffic engineering and responsible for all traffic control devices within the City, including traffic signals, signs, and striping. As such, Monroe County owns, operates, and maintains all of the traffic signals and other ITS devices related to traffic flow on City streets. The County took possession of City traffic signals in the early 1970s.

From the City's perspective, this arrangement has worked well - the City has a good relationship with the County. The arrangement has not been tested or strained largely because of personalities and cooperative arrangements. It should be noted that the City does have plans to deploy some of its own ITS devices in the future.

The City views ITS as essential in keeping the City competitive and in providing congestion mitigation. One place in particular that the City would be interested in a deployment is around the O'Rorke Memorial Bridge. This lift bridge is the only crossing of the Genesee River for miles in either direction, and when it is open, there are significant backups and waits. Some openings are scheduled and some are not. DMS or other ITS deployments would be very useful for alerting or re-routing motorists.

The City is also interested in coordinating ITS from an economic development perspective. That is, using targeted ITS deployments in conjunction with economic development to make commercial and residential developments more appealing. This could be parking management, traffic routing, or other types of traveler information projects. Potential locations for these types of deployments could include the Port of Rochester; boater information for the public marina project; and special events management for concerts and watersport events held near the waterfront.

The City of Rochester partners with Monroe County to operate traffic signals and other related ITS devices within the City, and is planning on introducing ITS elements of its own.

Future plans for ITS in the City include installing AVL on the DES fleet, specifically on snow plows, and procuring weather sensors to track weather conditions around the City. The DES is also very supportive of RGRTA's transit ITS initiatives. Other potential ITS initiatives include using ITS for parking management. The City also supports continuing to have incident response as a policy priority and interagency information sharing.

The City is also trying to move in the direction of becoming a more bike and pedestrian friendly city. They were recently given an honorable mention by the League of American Bicyclists. They would be interested in having bicycle/pedestrian issues considered in the formulation of ITS policy.

The City of Rochester Police Department (RPD) has recently installed a series of security surveillance cameras throughout the city as a crime deterrent and investigation tool. Privately operated red light running cameras have also been installed through the city's Red Light Photographic Enforcement Program to improve safety at intersections. Up to fifty intersections are currently envisioned for red light running camera installation, building upon an initial deployment of three intersections. These red light cameras are installed through a contract with a private vendor who operates the equipment on the city's behalf. In addition to these law enforcement roles, RDP officers participate in special event traffic management, such as special events downtown and at the port.

Sharing police surveillance cameras with other law enforcement and traffic management agencies has not been fully explored, but is a promising opportunity to leverage the investments of individual agencies to cost-effectively meet broader functional traffic management and law enforcement needs. Regional video sharing would require

further exploration of technical and policy issues among the participating agencies.

Rochester Genesee Regional Transportation Authority (RGRTA)

RGRTA operates fixed-route and demand-responsive public transportation services in the Greater Rochester region. In recent years RGRTA has invested in a significant transit technology deployment program, the Technology Initiatives for Driving Excellence (TIDE).

The RGRTA has two primary goals with respect to its ITS initiatives:

- Customer satisfaction – Establishing a real-time connection to their customers; providing useful information and making transit ridership an attractive discretionary choice.
- Operating efficiencies – Using ITS to inform operational decision making processes and improve resource allocation and operational efficiency.

The RGRTA TIDE initiative will implement a comprehensive suite of transit applications, including: CAD/AVL for the RTS and LiftLine operating divisions; DMS; automated stop annunciation (ASA) automatic passenger counters (APC); automated fare collection (AFC); onboard and fixed security surveillance cameras; fleet maintenance sensors, and email and SMS notification system; and Google Transit trip-planning services.

Several of these systems are already operational, with others in various stages of design and implementation. They are also currently working with the City and the County on implementing transit signal priority (TSP). They are also working to provide schedule information to the NYSDOT *Trips1-2-3* website, and envision a future capability to provide traveler information through the statewide 511 traveler information telephone and internet system.

Looking to the future, the RGRTA is interested in working with other transit agencies to identify unified approaches to data collection, data management, and performance measures.

The RGRTA does not currently receive information from local agencies with regards to incidents, but would be interested in receiving this information, if available. This would allow the agency to perform real-time rerouting of their vehicles, particularly express routes that typically operate on expressways but could be diverted in the event of an incident. RGRTA also looks to continue its partnership with Monroe County to share fiber and communication resources.

The RGRTA Technology Initiatives Driving Excellence (TIDE) program is deploying integrated transit ITS to deliver more reliable and efficient service.

New York State Thruway Authority

The New York State Thruway Authority is interested in seeing greater operational integration of its facility with adjacent facilities in the Greater Rochester region. This is becoming increasingly important as urbanization in the Thruway corridor lends to greater interaction of the Thruway with NYSDOT feeder routes on a routine basis.

The Thruway is a vital trade link for the region's economy and a growing commuting corridor connecting the Genesee-Finger Lakes region.

The Thruway Authority feels that there needs to be more two-way communication between the Thruway and RTOC. This arrangement would ideally include additional sharing of expressway system information with NYSDOT, such as camera views, message sign information, incident information, etc. The Thruway Authority would also be interested in having more frequent meetings of the Transportation Management Committee to discuss operational strategy and other issues.

The Thruway Authority also pointed out that Rochester has many traffic cameras but I-490 and I-390 do not have cameras outside of Rochester proper. They would like for RTOC and the local players to understand where traffic is coming from/going to regionally, and allocate their efforts accordingly. They also indicated that there have been some communication issues in the past, with closure notifications not reaching the correct individuals but a dialog has opened to repair those connections.

Moving forward, they would place a high priority on ATMS compatibility with CAD capability. This compatibility will be key to establishing a statewide system. From their perspective, the highest priority should be placed on integration. Ideally, there will be a statewide system. As it is, the NYS Thruway Authority feeds all of their deployments into their ATMS. Increasingly, they are also feeding the deployments of other Regions into their ATMS. Integration and interoperability are key.

They are also interested in the continued deployment of base devices, establishing direct communication with RTOC, and identifying opportunities for regional ITS training. They are also interested in having the region participate in and coordinate with the Statewide ITS Strategic Plan.

From the New York State Thruway Authority perspective, the highest priority should be placed on integration with law enforcement agencies. In the absence of statewide emergency management Computer-Aided Dispatch (CAD) and a statewide traffic management systems, a high priority should be placed on integrating the regional CAD data with the RTOC's Advanced Traffic Management System (ATMS).

For the past few years the Thruway Authority has integrated a data feed of emergency management CAD events into its ATMS. Increasingly, the Thruway Authority is are also feeding the events of other NYSDOT Regions into its ATMS and in the future the pertinent Rochester events should be included in this integration. Ideally, the RTOC ATMS and the Authority's ATMS should be integrated and send events between the systems to support emergency and incident management coordination among all traffic and emergency management parties.

The New York State Police, co-located at the RTOC facility, are vital to the region's transportation safety, incident, and emergency management programs.

New York State Police (NYSP)

The focus of the State Police in Monroe County is primarily on the expressway network, both for incident response and law enforcement. The State Police devote significant time to DWI enforcement, seatbelt enforcement, speeding enforcement, and curbing aggressive driving.

Being collocated with NYSDOT and MCDOT at the RTOC facility has supported an integrated approach to incident management and relationship building among agencies. The team mentality and willingness to participate in interagency cooperation that this engenders is a valuable asset for the region.

The State Police also coordinate well with the other law enforcement agencies and first responders in the region. These agencies participate in routine multi-agency training drill, but these are not typically focused on traffic incident management and therefore do not generally involve NYSDOT or MCDOT representation.

The State Police view traffic surveillance cameras are an extremely valuable asset. As noted by the Monroe County Sheriff's Office, traffic surveillance cameras have been extremely useful in assessing the situation on-scene and gathering information about an incident, such as how far back-ups extend around an incident. The State Police support extending camera coverage across the regional transportation network.

The State Police would also be interested in receiving preferred routing information to support timely response to emergency calls in the face of traffic congestion or network disruptions.

Genesee Transportation Council (GTC)

As the Metropolitan Planning Organization for a 9-county area including Greater Rochester, the Genesee Transportation Council plays an important role in planning and funding of ITS deployments in the region.

While as a planning agency it does not own or operate infrastructure, GTC has historically served in a facilitation role, promoting regional coordination in ITS deployment and operation, including development of this regional ITS Strategic Plan. GTC also facilitates the interagency Transportation Management Committee (TMC) introduced earlier.

GTC is responsible for developing the regional Long-Range Transportation Plan (LRTP) as well as development and updating of the region's Transportation Improvement Plan (TIP). As such, GTC is a vital facilitator and 'gatekeeper' for funding of regional projects. From an ITS perspective, this includes both funding of ITS deployments that address identified regional needs as well as promoting transportation system management and operations strategies and technologies as one of the potential solutions to the region's transportation needs.

The Genesee Transportation Council provides a vital link between Planning and Operations, facilitating the Transportation Management Committee.

As with its peer agencies across the country, GTC is increasingly seeking tools and metrics for evaluating the performance of the regional transportation system as well as the effectiveness of the region's transportation investments. One example is its federally-mandated Congestion Management Process (CMP), which identifies and monitors congestion hotspots in the region. ITS field devices are one potential source of operational data to support CMP and LRTP monitoring, and could provide a more accurate and cost-effective alternative to existing sampling methods.

Analysis of field data also provides opportunities to monitor other regional transportation and system management performance metrics, particularly those requiring pervasive and continuous 24/7 monitoring

due to their unpredictable nature (e.g., incident frequency and the duration of resulting delays).

Section 3: Existing and Planned ITS Infrastructure

Overview

This section describes the physical deployment of ITS and communications infrastructure in the Greater Rochester Region.

It is acknowledged that the contents of this section are particularly sensitive to change as new and replacement infrastructure is deployed across the region. Rather than attempting to provide a comprehensive ITS inventory that is detailed but short-lived in its usefulness, this section strives to provide an overview to discuss systematic issues and noteworthy needs in terms of geographic coverage, functionality, integration, and management capabilities.

Existing and Planned ITS Infrastructure

As introduced in the preceding section, ITS elements have been deployed by several agencies within the region, including NYSDOT, MCDOT, the New York State Thruway Authority, the City of Rochester, and RGRTA. This section include a discussion of planned infrastructure for which funding has been identified at the time of writing.

Significant infrastructure, such as field devices and communication networks, has been installed and are operational within the metropolitan area. The majority of this infrastructure is concentrated in and around the Transportation Management Area.

System deployment has been achieved incrementally as funding and capital projects evolved. As a result, there are numerous manufacturers, equipment models, and legacy systems in place throughout the region. The agencies are continuing to update the infrastructure to current national protocols and standards.

The existing ITS equipment deployed within the region consists primarily of instrumentation placed at static locations. The focus of the equipment is to gather information about roadway operational conditions within the region. Field equipment includes CCTV, DMS, RWIS, System Sensors, HAR, and other industry specific devices.

At RTOC, MCDOT and NYSDOT both operate separate central traffic signal control systems. NYSDOT operates its signals using the Naztec Streetwise™ platform, while Monroe County uses a Transcore TransSuite® application.

The NYSDOT ATMS system (Telvent MIST®) primarily monitors the expressway system and the County system monitors traffic signals on major arterial roads. Additionally, NYSDOT operated a GPS application, RWIS weather systems, and an operations and dispatching application.

There is substantial coverage of ITS devices of devices within the region's central core as bounded by I-390, I-590 and NYS Route 104, known as the Outer Loop. Implementation is limited outside of this area, with the majority of devices located along the Expressway system.

Recent system elements have been deployed along the arterial roadways within and near the Outer Loop.

The *Existing Devices Inventory* map details existing ITS equipment locations.

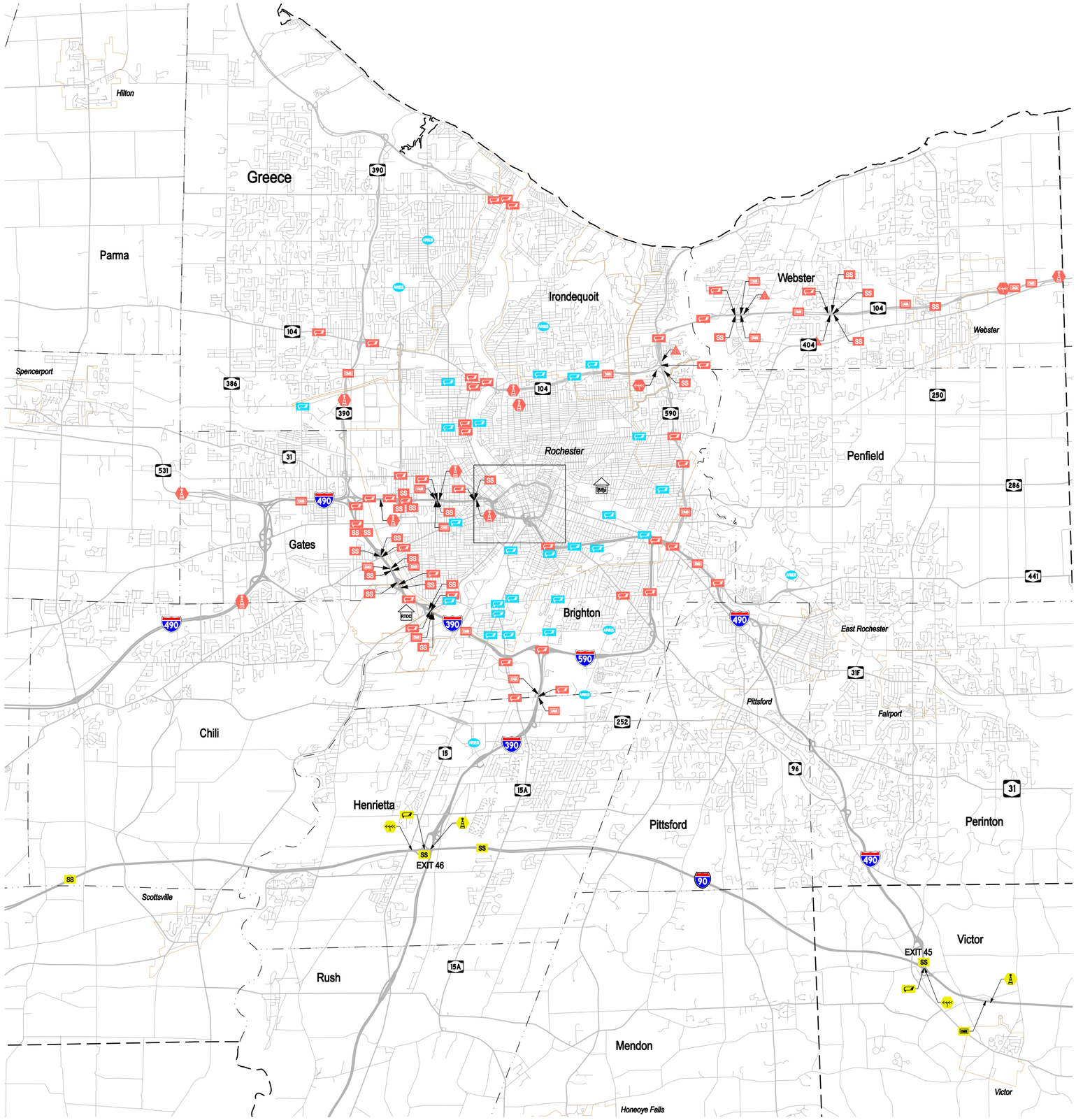
Several planned and funded projects in the near term are being pursued by MCDOT and NYSDOT. These projects will focus on expanding coverage onto Interstate 390 between Interstates 490 and 590, as well as along Long Pond Road in the Town of Greece. Additional enhancements include RWIS, CCTV and vehicle detection along Route 490 and 590.

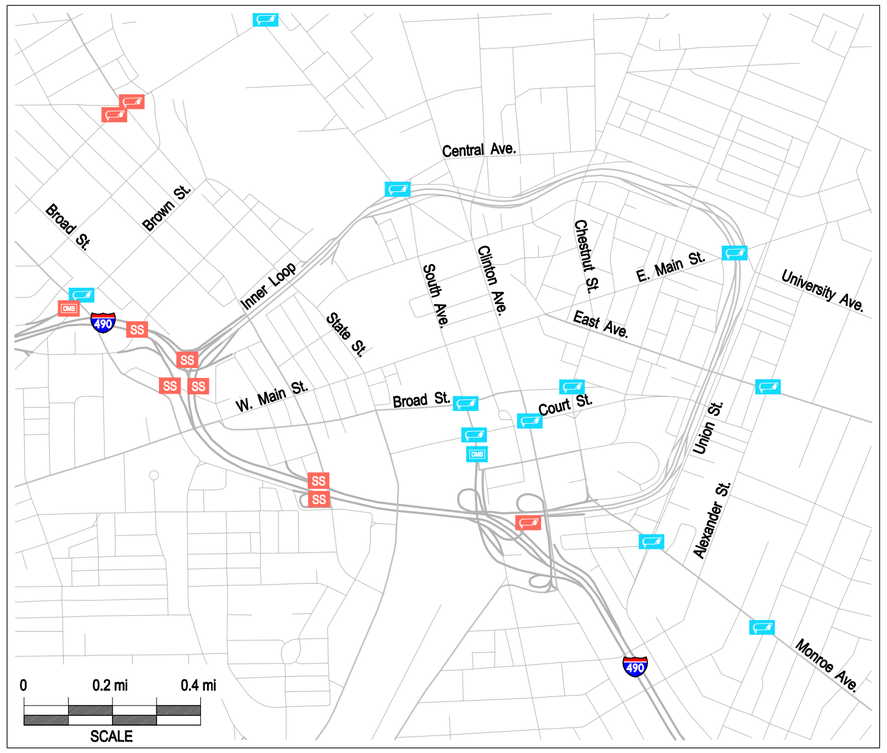
MCDOT is also planning supplementary installations of CCTV devices along arterial roadways within the Outer Loop and throughout the Rochester Central Business District.

The City of Rochester is embarking on a Port of Rochester ITS project which may include a variety of technology applications ranging from parking and event management to security and O'Rorke lift bridge notification systems. These systems are anticipated to enter design in 2011.

RGRTA has implemented a central Computer-Aided Dispatch (CAD) system and onboard Automatic Vehicle Location (AVL) as a backbone for its transit operations management system. A few of the buses within the fleet are equipped with onboard security surveillance cameras. As part of its TIDE program, RGRTA plans to implement additional ITS elements, including real-time bus arrival signs and transit signal priority (TSP).

The *Proposed Devices Inventory* map details planned ITS equipment locations in the region.





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Component	Existing	Proposed
Camera		
DMS		
Wireless Beacon		
Wireless Transmitter		
RWIS		
Aries		
System Sensor		
ATIS		
Satellite Transit Center		
HAR Beacon		
HAR Transmitter		
Building of Interest		

County Boundary | Municipal Boundary | City/Town Boundary

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Existing Devices Inventory

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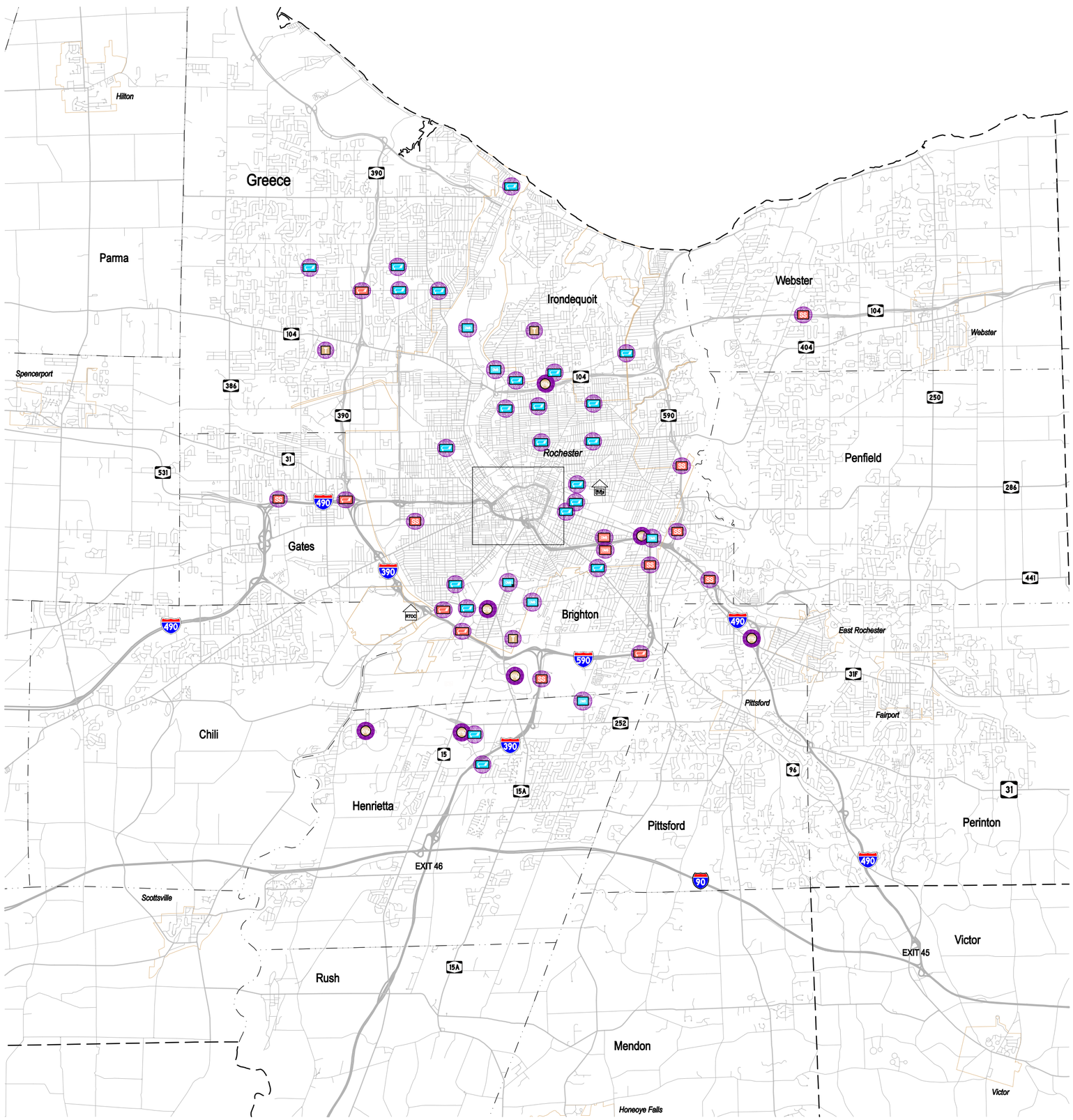

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Component	Existing	Proposed
Camera		
DMS		
Wireless Beacon		
Wireless Transmitter		
RWIS		
Aries		
System Sensor		
ATIS		
Satellite Transit Center		
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Building of Interest		

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Currently Planned Devices Inventory

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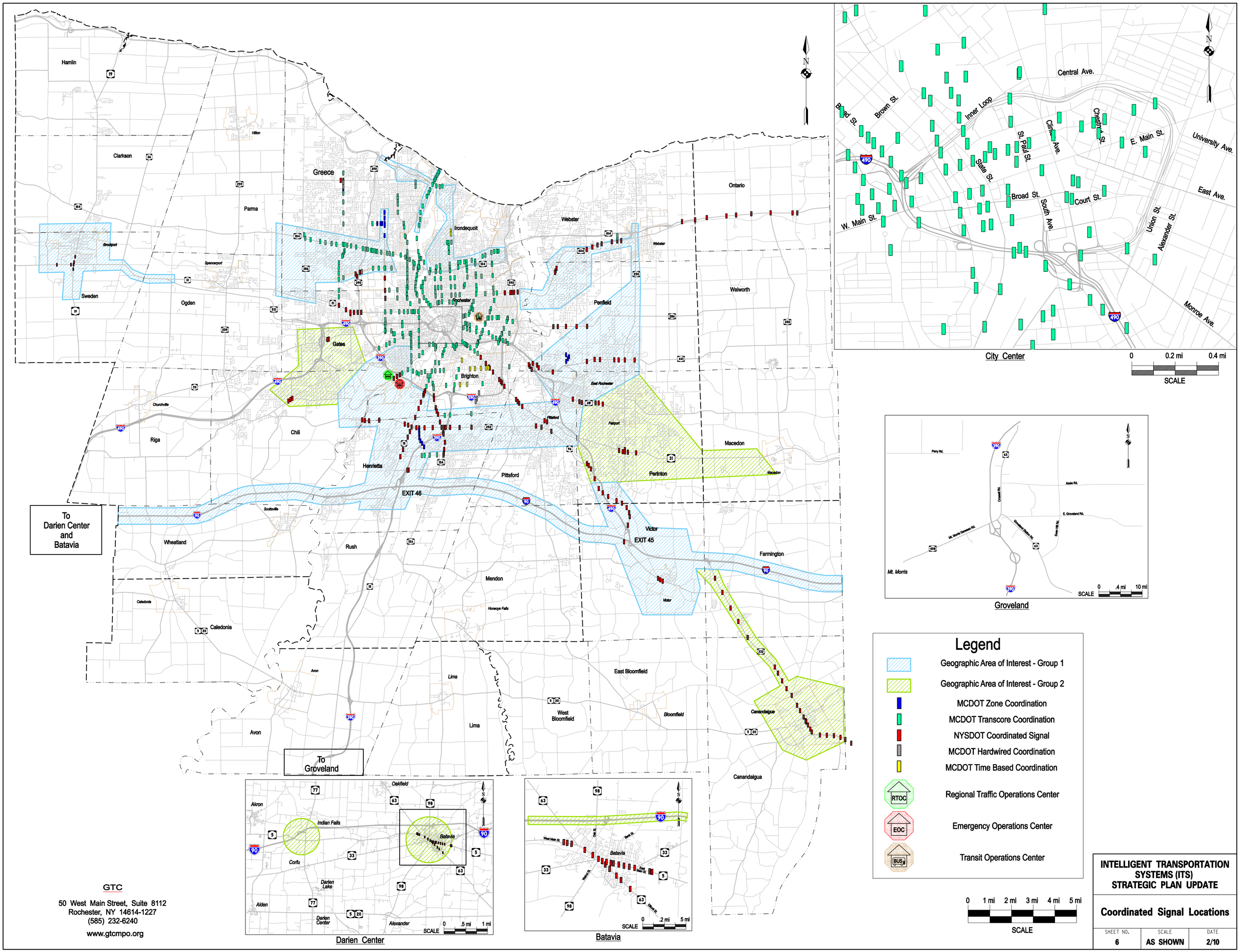

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Coordinated Signal Locations

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Existing and Planned Communications Infrastructure

There is an extensive communication network deployed within the region. The infrastructure consists of Coaxial Cable, Fiber Optic Cable, and wireless technologies. NYSDOT, NYSTA, MCDOT and MCDES all have communications plants deployed within the area. There is interagency sharing of communication capacity.

All above agencies are moving away from Coaxial Cable for communication purposes, as it is limited in communication bandwidth. There are extensive plans to augment the Fiber Optic Communications Plant for all agencies. These upgrades include replacement of legacy systems with new Fiber Optic installations and new routings to areas without current communications. Please refer to *Figure 3: Existing Communications Inventory* and *Figure 4: Proposed Communications Inventory* for maps detailing existing and planned communications infrastructure in the region.

Summary: Existing Conditions

The Greater Rochester region is fortunate to have a strong history of collaborative working relationships among partner agencies. In fact, elements of these regional efforts have been identified as national best practices by the Federal Highway Administration.

Transportation system management continues to be relevant to the region's long-range transportation needs, particularly since management of non-recurring congestion due to incidents and events is one of the key techniques for combating congestion in the region.

Commitment among personnel involved in ITS activities is high, though a need for broader awareness and understanding of these activities and their importance has been noted.

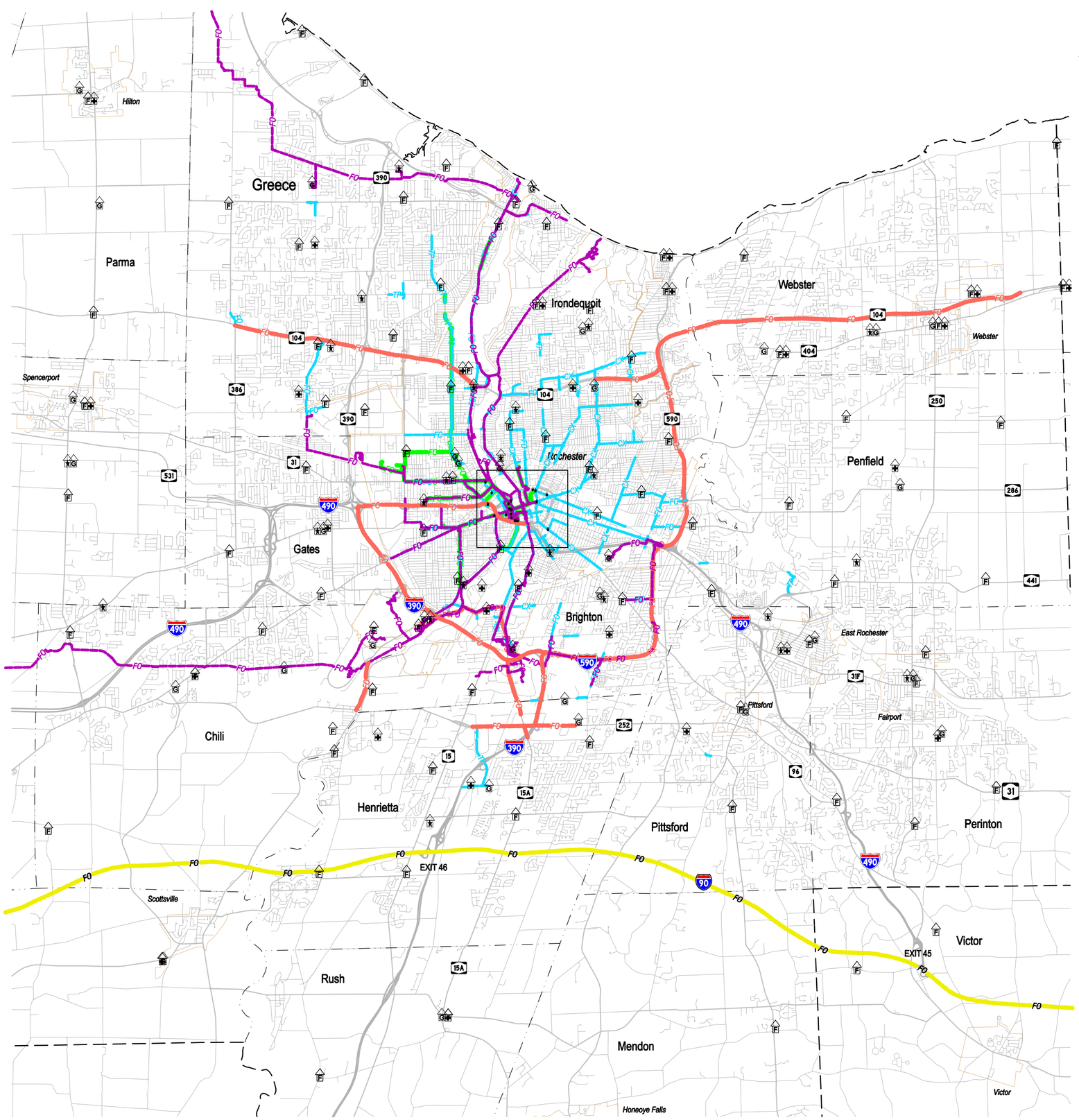
The region has largely achieved the objectives set out in the IMAGE Report of 1996. Having reached its initial goalposts, the region is ready to engage on an exercise of goal setting for a new horizon, also taking into consideration advances in ITS technologies and regional transportation system management and operations practices.

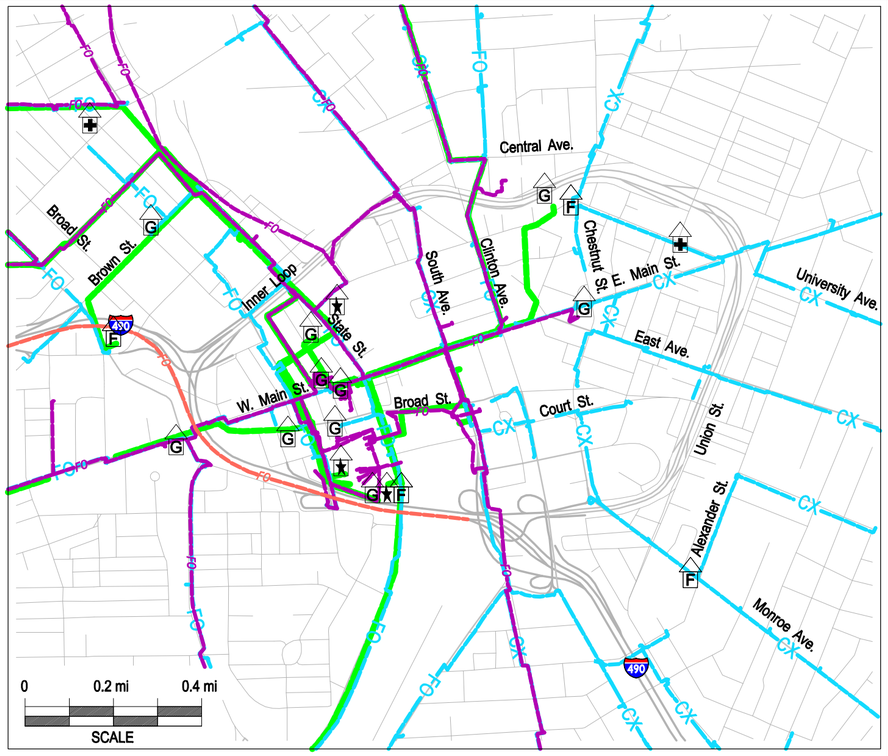
It is increasingly recognized that accomplishing joint system management objectives, as well as individual agency goals, requires an increasing amount of cooperation. Examples include implementation of integrated corridor management concepts, implementation of transit signal prioritization, incident response, and leveraging statewide investment in traveler information.

Other opportunities for regional collaboration include training, technical standards, and sharing of resources and specialized skills. The existing, ad hoc TMC serves as a basis for engaging participating agencies in this discussion.

Fostering an increased level of cooperation may require increased formalization of currently ad hoc processes, ranging from infrastructure management to operational response plans. This approach will enable regional partners to achieve the vision of an integrated, multimodal transportation system that is 'seamless' across jurisdictional boundaries. In certain areas, such as regional communications infrastructure management, it may also result in cost efficiencies to the participating agencies.

An overarching issue in the region and the country remains the scarcity of transportation funding. With the current downturn in the economy and the uncertain effects of proposed economic stimulus packages, transportation funding will need to continue to compete with other worthy public objectives for limited resources. A collaborative interagency approach will continue to be necessary to secure funding from diverse sources to implement and operate ITS systems that accomplish agency's future objectives. The existing working relationships are an asset to future efforts to identify common interests and secure ongoing funding for regional transportation system management.





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Component	Existing	Proposed
Coaxial	CX	CX
Fiber Optic	FO	FO
Twisted Pair	TP	TP
Interconnect Cable Hardwire		
Building of Interest		

Police Station — Hospital / ER / Ambulance

Fire house — government / town hall

County Boundary — Municipal Boundary — City/Town Boundary

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Existing Communications Inventory

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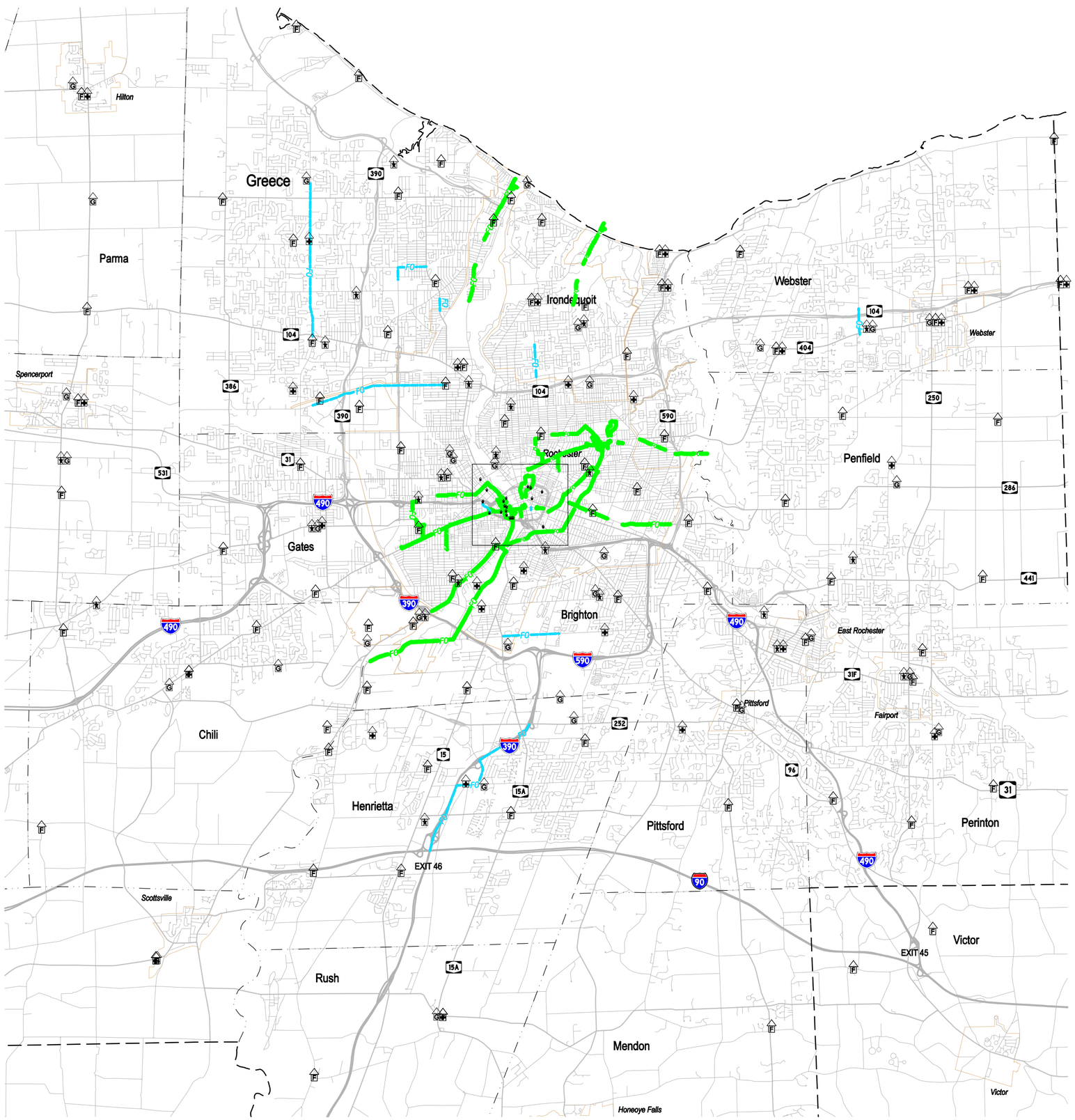

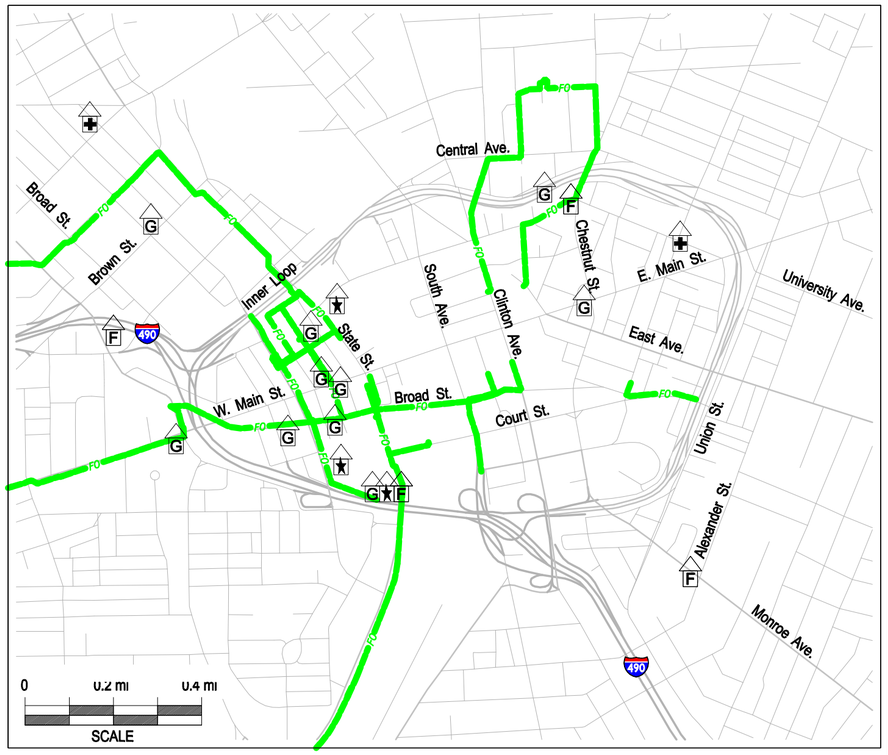

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Component	Existing	Proposed
Coaxial	CX	CX
Fiber Optic	FO	FO
Twisted Pair	TP	TP
Interconnect Cable Hardwire		
Building of Interest		

Police Station

Hospital / ER / Ambulance

Fire house

government / town hall

County Boundary

Municipal Boundary

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Currently Planned Communications Implementation

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Section 4: Planning and Policy Framework for ITS

Overview

The purpose of this section is to provide the regional transportation planning context for the ITS Strategic Plan. Existing regional transportation goals, plans, and documents are described, especially with regards to their relationship to regional ITS.

Enormous progress has been made in the Greater Rochester region towards implementing the goals of its 1996 IMAGE Report. This document set a vision for deployment of first- and second-generation ITS technologies that have served the region well in the ensuing period.

This section explores existing and emerging directions, regionally and nationally, in how ITS technology is planned, implemented, operated, and funded, as well as emerging transportation policy themes that shape the context in which the new ITS strategic plan will be developed.

"ITS and related technologies and strategies should be integrated into all future transportation planning efforts…"

Long Range Transportation Plan for Genesee-Finger Lakes Region, 2005-2025

Regional Transportation Goals

Per the current LRTP[1] for the Genesee-Finger Lakes Region the GTC's mission is "to maximize the contribution of the transportation system to the social and economic vitality of the 9-county Genesee-Finger Lakes Region."

In accordance with that mission, the LRTP established seven regional transportation goals:

- Support the economic vitality of the metropolitan area, especially by enabling global competitiveness, productivity, and efficiency.
- Increase the safety of the transportation system for motorized and non-motorized users.
- Increase the ability of the transportation system to support homeland security and to safeguard the personal security of all motorized and non-motorized users.
- Increase the accessibility and mobility options available to people and freight.
- Protect and enhance the natural environment, cultural heritage and community appearance, and promote energy conservation.
- Promote efficient system management and operations.
- Facilitate partnerships in planning, financing, and the execution of transportation initiatives.

ITS can serve as a useful tool in helping the region accomplish each of these goals:

[1] Long Range Transportation Plan for the Genesee-Finger Lakes Region (LRTP), 2007-2027 Update.2005-2025. Genesee Transportation Council.

- By managing congestion and improving incident detection and response, ITS can improve the efficiency and reliability of regional roadways. This in turn, supports the efficiency, productivity, and economic competitiveness of the region.
- ITS can provide transportation surveillance to increase the safety and security of the region's transportation infrastructure.
- ITS can increase the operational efficiency of public transportation options and support the dissemination of traveler information to the general public – leading to increased mobility options.
- By increasing the effective capacity of regional transportation networks, ITS can reduce the need for traditional transportation expansion, thereby preserving the natural environment. By reducing delay and supporting multimodal transportation alternatives, ITS can also offer environmental and conservation benefits to the region as well.
- ITS can provide the raw data and decision-making tools to assist in efficient system management and operations.
- By facilitating interagency information sharing, ITS can assist in developing transportation partnerships.

In short, ITS can play an integral role in addressing many of the region's transportation priorities. The LRTP summarizes this view in the following quote:

> "ITS and related technologies and strategies should be integrated into all future transportation planning efforts as well as the design of major reconstruction and rehabilitation projects. The region should continue to financially support the expansion of ITS efforts and should work to continually improve the organization of those efforts. Continued expansion of surveillance and information collection/dissemination through the use of fiber optic communications, cameras, Highway Advisory Radio (HAR), and Dynamic Message Signs (DMS) is encouraged."

ITS Plans and Architectures

In addition to the 1996 IMAGE Report, several other ITS plans and architectures have been developed for the region. This ITS Strategic Plan is intended to be consistent with and build off these prior efforts. These efforts include:

- **NY State ITS Architecture/Region 4 ITS Architecture:** This ITS architecture provides a high-level overview of existing and planned ITS elements in the region and the information flows among ITS subsystems and stakeholders. Necessary modifications to this architecture, if any, will be submitted to NYSDOT subsequent to the development of this ITS Strategic Plan.
- **New York Moves ITS Program Status Report, June 2007:** This status report highlights the ITS success stories in the region, particularly interagency success of the RTOC. It mentions statewide plans to use their Conditions Acquisition and Reporting

The NYSDOT Region 4 ITS Architecture present a vision for interconnectivity of ITS systems at the regional and state levels.

System(CARS) system to inform the NYSDOT statewide traffic conditions website. They are also in the process of conducting research into statewide Commercial Vehicle Operations (CVO) initiatives such as online e-credentialing and mainline e-screening. In addition, a Statewide ITS Strategic Plan is in development, but has not yet been released to the public.

- **Port of Rochester Intelligent Transportation Systems (ITS) Project Architecture Case Study, October 2003:** In this case study a project-level ITS architecture was developed for the Port of Rochester. ITS elements for the port included a traveler information website, information kiosks, DMS, international border crossing electronic clearance systems, and supporting communications links.

In the development of this ITS Strategic Plan Update, these prior plans and architectures have been taken into consideration to avoid duplication of effort.

Portrayal of ITS in Past Federal Transportation Legislation

Federal ITS emphasis has evolved from technology demonstration and system interconnectivity in the past, to a comprehensive Transportation System Management and Operations (TSMO) focus today.

The IMAGE Report, like many of its peers, was created in the wake of the passage of the Intermodal Surface Transportation Efficiency Act(ISTEA), in early 1991. Since ISTEA and since IMAGE, there have been two reauthorizations of the federal transportation legislation: the Transportation Equity Act for the 21st Century (TEA-21) in 1998 and the Safe, Accountable, Flexible, Efficient Transportation Act: A Legacy for Users (SAFETEA-LU) in 2005. The next reauthorization was due in 2009, although current estimates anticipate its passage in late 2010 or 2011.

Associated with the progress of federal transportation legislation has been a dramatic transformation of thinking regarding ITS plans. In simple and somewhat glib terms, ISTEA promoted ITS deployment, TEA-21 promoted coordination of technologies and their deployment, and SAFETEA-LU promoted the coordination of technology deployment with regional goals and transportation needs and outcomes.

In the mid-nineties, many cities, regions, and states developed ITS plans to qualify for special federal funding programs. There were “model deployments” and other proof of concept demonstration projects which were intended to kick start implementation of transportation technology around the country, and to demonstrate their viability and merit.

By the time TEA-21 was being drafted, ITS faced criticism because of the piecemeal manner in which it was being deployed. Lack of interoperability (technological and operational) was a chief complaint, and partners had begun to recognize the problems associated with implementing ITS without adequate regional coordination. Thus, with TEA-21 in 1998 came various requirements for implementing agencies to coordinate their efforts. ITS Architecture development was the central focus of this effort. ITS Architectures were intended to provide a

framework for staged implementation of technology consistent with an interagency, regional vision, and to ensure technological interoperability among those systems.

Under TEA-21, a majority of ITS projects were funded through earmarks and other categorical funding programs. This perpetuated the disconnect between ITS deployments and the metropolitan planning regime that had been created by ISTEA. By the time SAFETEA-LU was being crafted, funding pressures and the desire to bridge that planning gap prompted policy makers to encourage linking planning with ITS. As part of this, they also emphasized ITS as a tool to implement broader operational strategies, such as incident management, in concert with other non-technological tools and policies intended to meet common operational objectives.

ITS deserves recognition as a permanent and vital component of the region's overall transportation infrastructure and investment strategy.

"Mainstreaming" of ITS into Regional Planning and Funding

The passage of SAFETEA-LU may have created as many questions as answers in this department, but subsequent rulemaking and guidance have attempted to provide clarity. In general, the prevailing view is that transportation planning identifies goals, such as safety and reliability. Operational strategies, such as incident management, should be considered along with physical solutions, from resurfacing to realignment to capacity expansion. Within this framework, ITS technologies can then be viewed as *enabling tools* to implement *operational strategies* that themselves address broadly-accepted regional *goals*.

By linking potential ITS deployments with planning outcomes and goals, it is hoped that funding for ITS can more often come from the "mainstream" planning process. This is possible, the thinking goes, now that technology investments can be compared to "conventional" projects on a more apples-to-apples basis.

For ITS projects, the demise of earmark and categorical funding sources means that technology and other system management initiatives face more competition from conventional infrastructure expansion and preservation projects drawing upon the same pot of funds. The linkage of ITS projects with regional planning needs, therefore, is increasingly essential to demonstrating that they too contribute towards widely understood planning goals like safety and mobility (and therefore are equally worthy of funding).

In many cases, ITS projects (e.g. better signal coordination in lieu of roadway widening) may be able to address certain needs far more cost-effectively than conventional infrastructure projects. This can potentially increase the appeal of ITS and system management techniques provided that the linkage to regional goals is clearly articulated, and provided the results of ITS investments are demonstrated through quantitative system performance measures.

Future Directions in ITS Strategic Planning

In terms of this evolutionary pattern, it is hard to say where the next reauthorization, due in 2009 but postponed until at least 2010, might lead. Most likely there will be a continued emphasis on TSMO principles that are performance-based and provide practical, cost-effective alternatives to "building our way out of congestion."

Whether or not the next reauthorization sets aside funding for a TSMO program, regions that demonstrate the linkage between ITS and regional transportation goals when 'making the case' for ITS investment are likely to be more successful in implementing their programs in a fiscally-constrained, level-playing-field funding environment.

Demonstrating results of ITS investment through performance measures (e.g., reduction in hours of delay due to congestion) will further build the case for sustained technology investment for both capital and operating expenditures. In fact, ITS and system management strategies are also uniquely suited to address performance-based regional planning mandates like the Congestion Management Process.

As noted at the outset, many ITS plans have yet to be updated from when they were originally written in the early or mid nineties. Practice varies among regions as to whether ITS plans are integrated with or stand alone from the Metropolitan Planning Organization's (MPO) Transportation Plan. In many places, this depends upon the agency that is leading the ITS planning initiative. Where it is led by the DOT and where that DOT's region exceeds the MPO's jurisdiction, it may be less likely to be subsumed into the LRTP. But circumstances clearly vary on this.

Fundamentally, the state of the practice suggests that ITS planning, regardless of how it is documented, should be responsive to the goals and outcomes outlined in the prevailing transportation plan. It is for this reason that this ITS Strategic Plan acknowledges the potential contributions of ITS and TSMO investment to meeting regional transportation goals.

ITS can be particularly effective tool in combating non-recurring sources of congestion measured by the Congestion Management Process.

GTC Congestion Management Process (CMP)

By Federal mandate, the Genesee Transportation Council, like other large Metropolitan Planning Organizations in the United States, maintains a Congestion Management Process (CMP, formerly Congestion Management System) to inform the transportation planning and investment decision-making process.

The objective of the CMP is to systematically evaluate and address the root causes and locations of congestion in the region, due either to high volumes of flow or non-recurring events such as traffic accidents or weather.

The CMP process established by GTC includes the collection of actual travel time data through the use of the GPS-based "floating car" method. Actual travel time data using this method has been collected for all Principal Arterials in the TMA and data will be collected for select Minor Arterials and Collectors in spring 2010.

In the absence of actual travel time data, the CMP has used and continues to use a volume-to-capacity ratio (v/c) of 0.9 or higher (as identified through the regional travel demand model) to identify roadway segments that are considered to be congested. In addition, locations that are classified as High Accident Locations are considered congested if the v/c is 0.7 or higher. This is an attempt to identify and quantify the impacts of non-recurring events, which are an increasing and significant component of overall regional congestion levels.

CMP congestion locations are subsequently considered in the regional transportation project development process and in identifying candidates for more in-depth study. GTC has developed a program and a toolkit of solutions aimed to reduce the prevalence and severity of congestion in the region.

The Congestion Management Process is relevant to regional ITS Strategic Planning in several ways:

- ITS technologies and TSMO strategies are a powerful toolkit to address sources of congestion in a cost-effective manner, particularly non-recurring congestion.
- ITS technologies and TSMO may offer the only viable strategies in transportation corridors that are physically or environmentally constrained, or where more conventional treatments like capacity expansion are cost prohibitive or would bring unintended or undesirable consequences.
- ITS systems in the field can collect transportation system data that allows for more efficient and effective quantification of regional CMP needs.
- Similarly, ITS technologies can be used to support CMP performance measurement, e.g., before-and-after studies, to demonstrate the efficacy of CMP solutions on the root problems they are intended to address.
- The formal linkages between the Federally mandated CMP process and the regional transportation planning and project development cycles are an important avenue for formalizing and "mainstreaming" the ITS and TSMO into the regional transportation dialogue.
- The CMP has been fully incorporated into the GTC policy, planning, and investment decision making processes via its inclusion in the current LRTP.

ITS in the Project Development Process

Intelligent Transportation Systems are considered in the Policies and Actions for Operations and Management in the LRTP Transportation

projects and studies are encouraged to consider ITS and TSMO improvements in broader transportation investments or assessments.

On the whole, however, ITS planning within the project development process has informal or ad hoc elements. The TMC, as an ad hoc entity itself, does not have a formal role in the project nomination or review process (however, many of the participating agencies within the TMC are extensive participants in transportation planning and funding). Operational benefits are evaluated, appropriately, against a wide range of other safety, mobility, environment, economic, and social factors.

Most ITS investments are not funded with dedicated revenue streams for ITS or operations; as such revenue streams for TSMO investment and ongoing operational costs such as staffing, facilities, and materials are uncertain from year to year.

Study participants acknowledge that greater awareness and understanding of the benefits and investment needs of ITS and TSMO within the broader transportation community and among policy makers is a prerequisite to increased "mainstreaming" of ITS funding as well as increased investment levels and more constant funding streams from year to year. However, to date the region's strong commitment to TSMO and associated ITS deployment has ensured continuous funding.

The Federal transportation authorization that replaces SAFETEA-LU may include dedicated programs for systems operations or an emphasis on total transportation system performance and associated measurement. While speculative at this time, such developments would further strengthen the position of ITS and TSMO within the overall transportation investment scheme, with positive implications for these activities in the Greater Rochester region.

In the future, ITS will rely more heavily on mainstream transportation project funding sources.

Therefore, ITS and operations must be 'at the table' when regional investment and funding decisions are being made.

Transportation System Performance Measurement

In recent years, the GTC and its partner agencies have been working to develop regional transportation system performance measures.

Federal regulations require performance measures as part of the CMP discussed above. Additionally, GTC has developed a set of candidate performance metrics to measure the amount of change, if any, required to the policies and actions of the LRTP between the present time and the next anticipated update of the LRTP in June 2011.

Details of the regional performance measures are contained within the LRTP document. The performance measures are shown on the following page.

Existing performance measures with potential direct applicability to measuring the need for and efficacy of ITS and TSMO investments are marked with an *asterisk (*)* in the following table.

As discussed in the CMP section, ITS can both support data collection for performance measurement, as well as use performance

measurement as a means to quantify the sometimes abstract or unfamiliar transportation benefits of operations strategies.

Existing GTC LRTP Performance Measure	Measure of	Mode(s)
Average Travel Time*	-Congestion	-Highway and Bridge -Public Transit
Average Travel Time to Work*	-Mobility	-Highway and Bridge -Public Transit -Bike and Pedestrian
Average Travel Time on Major Roads with Above Average Truck Traffic*	-Mobility	-Goods Movement
Average Travel Speed*	-Mobility -Congestion	-Highway and Bridge
Minutes of Excess Delay per Trip*	-Mobility -Congestion	-Highway and Bridge -Goods Movement
Volume/Capacity Ratio (Level of Service)	-Mobility -Congestion	-Highway and Bridge
Percent Travel Time in Congested Conditions*	-Mobility -Congestion	-Highway and Bridge -Goods Movement
Passengers per Seat on Transit Buses (Load Factor)	-Mobility -Transit Congestion	-Public Transportation
Variance in Travel Time (Reliability)*	-Mobility -Non-recurring Congestion	-Highway and Bridge -Public Transportation -Goods Movement
Accident Rate	-Safety	-Highway and Bridge -Bike and Pedestrian
Emission Level	-Environmental Protection	-Highway and Bridge -Public Transportation -Goods Movement
Percent Pavement “Fair” or Better	-System Preservation -Mobility	-Highway and Bridge -Public Transportation -Goods Movement -Bike and Pedestrian
Percent Low Income with ¼ Mile of Transit	-Accessibility	-Public Transportation
Energy Usage	-Environmental Protection	-Highway and Bridge -Public Transportation -Goods Movement
User Cost per Mile per Trip*	-Operational Efficiency	-Highway and Bridge -Public Transportation

Performance measures demonstrate the efficacy of regional investments in achieving transportation priorities and goals.

Historically, the direct impacts of ITS Investment have been difficult to quantify.

Travel Time Reliability Measures for Transportation Operations

Travel Time Reliability is emerging as one of the most direct and intuitive measures of the benefits of ITS and TSMO strategies. A variety of measures can capture reliability of the traveler experience on the network. This is because reliability of trips entails the variations in delay, or lack thereof, due to recurring and non-recurring congestion phenomena.

Emerging Travel Time Reliability performance metrics include the following:

Travel Time Reliability Performance Measure	Definition
Travel Time Index (TTI): Ratio of Congested to Free-Flow Travel Time	TTI = Congested Travel Time/ Free Flow Travel Time
Planning Time Index (PTI): Index of total travel time needed required to arrive on time 95 percent of the time in peak	PTI = 95 Percentile Travel Time/ Free Flow Travel Time
Buffer Time Index (BTI): Index of additional travel time "buffer" required to arrive on time 95 percent of the time in peak	BTI = (95% TT – Average TT)/ Average Travel Time

It is important that performance measures take advantage of existing or readily obtainable data (as data collection can be very costly) and are intuitive to the target audience. Travel Time Reliability metrics have advantages in this regard because:

- They relate system performance to travel time, a widely-understood metric of transportation performance
- Reliability metrics capture a wide variety of causes of traffic congestion, as well as the end benefit of a wide range of ITS and TSMO strategies.
- Measures are adaptable to multiple data collection methods (sampling, automated data collection) and also scale of measurement (corridor, region-wide, etc.).

Initially, the region should initiate travel time reliability performance measurement on a modest scale using existing, readily obtainable data at first. The measurement program can grow over time as additional data becomes available and as experience is gained in capturing and analyzing travel time reliability phenomena.

Other Candidate Performance Measures for Operations

Many aspects of TSMO may be candidates for use as performance measures depending on specific program goals being analyzed.

System Management Area	Sample Measures
Incident and Emergency Management	- Incident Response Time - Incident Clearance Time
Expressway Management	- Measures of Travel Time Reliability
Arterial Management	- Measures of Travel Time Reliability
Integrated Corridor Management	- Combination of Expressway, Arterial, and/or Transit measures in a given corridor
Parking Management	- Parking Occupancy - Distribution of Parking Demand
Winter Maintenance	- RWIS Geographic Coverage - Safety Measures
Traveler Information Dissemination	- System Availability - Geographic Coverage - Modal Coverage - Usage (e.g. 511 calls, web hits) - Number of alerts/messages

Summary

The longstanding culture of cooperation and coordination from the days of the IMAGE Report through to today's ongoing activities of the RTOC and TMC have engendered a recognition and integration of ITS and TSMO in the planning process that is ahead of many regions of the country. The relevance of these concepts to the region's broader transportation needs is acknowledged in the region's LRTP.

Nonetheless, there are opportunities to strengthen these planning and operations relationships in several key areas:

- Formalizing treatment of ITS and TSMO in the transportation project development process.
- Leveraging ITS and TSMO as a cost-effective toolkit for the regional CMP, and using the CMP as an avenue for funding and implementation of ITS infrastructure.
- Use of ITS as a tool for performance data collection, as well as development of performance measures that explicitly capture the transportation benefits of technology and operations investments to quantify their contributions to regional goals.
- Increased planning and policy-maker awareness of ITS and TSMO activities in the region as well as benefits, cost-effectiveness, future investment needs, and quantification of the

net contributions of those investments to broadly recognized goals.

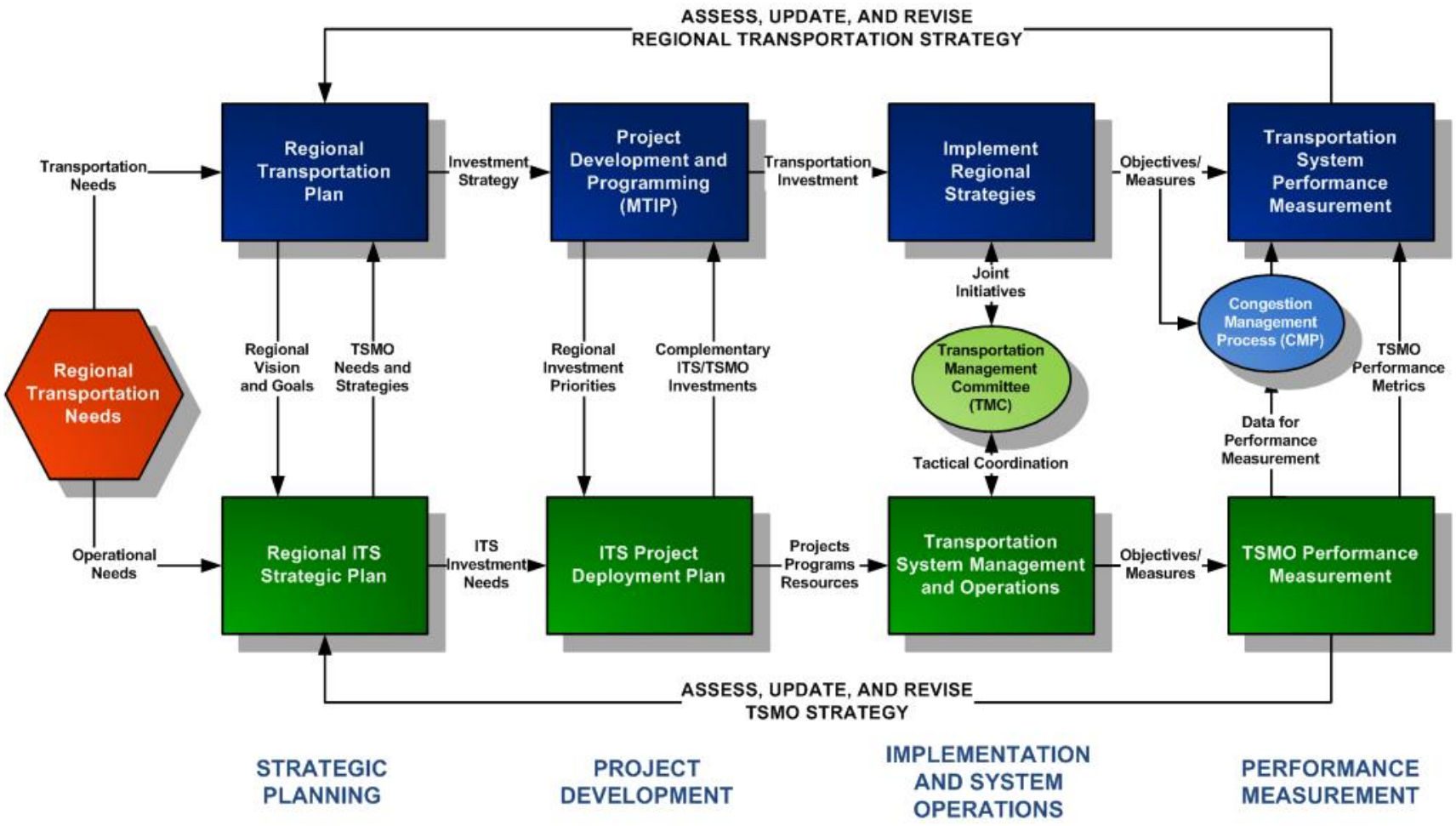
ITS, and the ITS strategic planning process, have evolved over the years from an initial “laboratory” setting of proof-of-concept projects funded by dedicated programs to an increasingly integrated, intermodal, and interagency endeavor. After a period of initial focus on technological interoperability, trends in recent years have increasingly treated ITS within the broader operational and regional planning contexts.

As the Greater Rochester region updates its vision for TSMO and how ITS enables this, it is important to ensure that the ITS strategic plan mirrors regional transportation goals, thereby helping to “make the case” that ITS investment is a relevant and cost-effective way to help address these goals.

Establishing this linkage will ensure that the recommendations of the plan resonate with the policy makers and funding agencies who are increasingly involved in funding ITS projects through “mainstream” programs, and will provide a basis for implementation of quantitative performance measures.

Understanding the relationship of the plan to regional objectives and emerging national transportation policy priorities provides a sound basis for developing objectives, policies, and projects that reflects the continued assimilation of ITS into institutional, policy, and funding landscape of Rochester’s transportation infrastructure.

The following diagram summarizes key links between the regional transportation planning process and Transportation System Management and Operations activities throughout the TSMO lifecycle of planning, implementation, operations, and evaluation.



Key Linkages between Planning and Operations in the Greater Rochester Region

Section 5: System Management Needs and Opportunities

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Overview

This chapter summarizes regional transportation system management and operations needs identified by stakeholders, organized by general theme.

This documentation of regional needs serves as the basis of developing transportation system management alternatives as discussed subsequently in this report.

Because multiple agencies coordinate in the management and operation of the regional transportation network, these needs are presented by theme area rather than by agency. Topics are organized as follows:

- Incident and Emergency Management
- Public Transportation Management
- Expressway Management
- Arterial Management
- Integrated Corridor Management
- Parking Management
- Winter Weather and Operations Management
- Traveler Information Services
- Communications Infrastructure

Incident and Emergency Management

The Greater Rochester region has made incident and emergency management a high priority. Successful investments in ITS technology have left the region well-positioned to build off its success and further its incident and emergency management capabilities.

The joint housing and operation of agencies at the RTOC is cited as a national example of interagency cooperation. In order to build on its success, multiple stakeholders recommended expanding multi-agency training and education opportunities to provide regional first responders with better information regarding the RTOC and its capabilities.

Stakeholder agencies have expresses the need for improved communications and cooperation with agencies outside of the RTOC. In particular, there is a perceived lack of awareness and coordination among local emergency responders and law enforcement about what RTOC can do. There is also a need for improved training among local agencies on how to manage incident scenes while minimizing unnecessary disruption to the transportation system, without compromising the safety of first responders.

Additional cross-training may help first responders better understand RTOC capabilities as well as help first responders better understand the downstream impacts and safety risks associated with highway incident management activities. Furthermore, additional lines of communication

Closer engagement of local emergency responders and law enforcement is an important step in improving regional incident and emergency management.

between RTOC and the Thruway Authority are opening up and additional bridges should be created to better share information and resources.

Multi-agency training would also reinforce the Unified Incident Command structure necessary for handling the multiple objectives of incident management. This multi-agency training may also result in improved quality of field information, especially as it relates to HAZMAT spills, fatality/injury information, and incident duration estimates. Also, to better take advantage of the RTOC, stakeholders recommended establishing and maintaining strong communications links and protocols between the RTOC and local and state emergency management agencies.

The region's traffic cameras have proven themselves extremely useful to both transportation and public safety agencies. Stakeholders identified expanding traffic camera coverage, as well as providing additional traffic flow detection, as a regional priority. In particular, stakeholders recommended placing cameras and detectors on the interstates outside the City of Rochester feeding into the Thruway. The possibility of sharing Rochester Police Department law enforcement cameras for emergency and incident management purposes has also been suggested to extend the coverage of the existing system.

To improve the region's incident response capabilities, stakeholders suggested moving to more pre-planned, scenario-based response plans in the future. Additional diversion planning taking into account prioritizing multiple incidents was also identified as a regional need. GTC is beginning to address this need via its Diversion Route Planning Initiative that will identify the most suitable alternate routes to major roadways in the region, minimizing disruptions resulting from road or bridge closures.

Also, the region is interested in taking advantage of new technology and upgrading signal systems to allow for greater remote signal control and adaptive signal response.

In addition to improving incident detection, providing travelers with information regarding incidents was also deemed important. Stakeholders suggested installing new HAR beacons, procuring additional portable DMS, and further integration with the proposed statewide 511 system as ways to increase dissemination of traffic incident information to the general public.

Public Transportation Management

Rising fuel prices, increased concern for environmental sustainability, and the aging of the population contribute to an increased regional need for more public transit, improved transit operations, and improved coordination among transportation agencies. RGRTA has been investing in a core suite of transit technologies through its Technology Investment Driving Excellence (TIDE) program. This program includes CAD/AVL, passenger counters, passenger information systems, stop annunciation, surveillance cameras, transit signal priority, and other techniques to improve the customer experience and operational efficiency.

Increased service reliability and efficiency have motivated substantial investment in transit technology at RGRTA.

The region is very supportive of RGRTA's TIDE program. The ITS technologies included as part the TIDE program should allow RGRTA to improve its operational efficiency as well as provide additional real-time traveler information to its customers. The TIDE program's focus on traveler information, operational efficiency, as well as traveler safety and security should assist in improving public perception of transit alternatives.

In addition to continued regional support for RGRTA's TIDE program, other opportunities to support transit management include continued interagency coordination with regards to implementing transit signal priority in the region. Examples include Transit Signal Priority (which involved interoperability of transit management and traffic signal control systems) and communications infrastructure sharing to reach RGRTA field devices in remote locations (e.g. park-and-ride surveillance).

Additionally, RGRTA's transit dispatch center can benefit from receiving real-time road conditions information from regional transportation agencies, to facilitate proactive response to incident and emergency conditions that affect RGRTA operations during the service day.

NYSDOT and MCDOT have been collaborating on the development of an extensive regional management infrastructure for signalized arterials.

Expressway Management

With the region experiencing growth in non-recurring traffic events, traffic management activities have taken on increasing regional importance. This includes, construction-related congestion and detours, and congestion caused by incidents, inclement weather, and large-scale planned events. The goal of the region is to provide travelers with a more predictable commute; collecting better travel data and providing that information to the general public.

Safety is also a primary concern of expressway management. Prompt identification and removal of accidents, along with warning motorists approaching the area of the accident, are critical to operating the expressway system.

In terms of data collection, the region is interested in getting a better handle on travel times – examining cost-effective automatic data collection measures such as installing RTMS or collecting anonymous transponder tag data.

In terms of providing traveler information to the general public, the region's objective is to disseminate the information through multiple outlets and attempt to customize the data to specific traveler needs as much as possible. As such, the region is interested in integration with the statewide 511 program. The region is also interested in providing more camera views to the public, either through public sector websites or perhaps through exploring public-private partnerships (PPP).

As already discussed as part of incident and emergency management, expanded and/or upgraded surveillance and monitoring equipment are also seen as advantageous technologies. Installing these technologies on expressways will support not only incident management functions, but congestion and expressway management functions as well. The region can build upon its existing communications infrastructure and head-end equipment to support greater field control.

Arterial Management

Many of the same regional goals and needs identified for expressway management also apply to arterial management. In addition to the need for expanding traffic camera coverage and increased deployment of traffic detection technology, the region is interested in expanding its signal coverage in the central portion of the TMA.

As part of its signal system expansion, the region needs to develop a strategy for future ATMS integration. There are several viable strategies available, such as specifying a regional ATMS preference and/or adopting a "wait and see" approach to ongoing National Transportation Communications for Intelligent Transport Systems Protocol (NTCIP) standards development. Regardless of the regional ATMS integration strategy adopted, the region should consider developing standards for signal timing. In addition to pursuing more responsive and adaptive signal systems, stakeholders have discussed the need for coordinating manual and simultaneous coordination of separate signal systems.

Other arterial management needs include:

- Continuing the practice of placing CCTV cameras to benefit multiple disciplines and agencies.
- Improving camera awareness in the area.
- Improving ability to spot maintenance issues.
- Developing a common mapping application and common data interfaces for interagency sharing of arterial information.

"Integrated Corridors" may include combinations of expressways, arterials, freight corridors, and transit.

Integrated Corridor Management

FHWA defines integrated corridor management as "the coordination of individual network operations between parallel facilities that creates an interconnected system capable of cross network travel management." In short, integrated corridor management consists of coordinating the operations of transportation networks that are often managed separately (such as expressway, arterial, transit, and/or freight networks) for the purpose of more effectively managing congestion and increasing trip reliability of a complete travel corridor.

Integrated corridor management represents promising escalation in the level of coordinated transportation operations in the region. Several of the efforts that would be part of a coordinated integrated corridor management strategy have been discussed as part of the incident management, public transportation management, expressway management, and arterial management sections.

Furthermore, regional agencies indicated a desire to pursue several other initiatives:

- Implementing a more proactive use of ramp signals (i.e., traffic signals at the arterial entrance/exit to an expressway ramp) to improve interchange operations and coordination with adjacent County or municipal signals along a given arterial.

Most delay on the region's expressways are due to non-recurring accidents or incidents.

- Examining IntelliDrive (formerly the USDOT Vehicle Infrastructure Initiative, or VII) initiatives as the technology becomes more widespread, proven, and cost-effective.
- Identifying opportunities for improving goods movement in identified freight corridors in order to maintain the region's economic competitiveness.

Parking Management

Parking management is seen by the City of Rochester as an opportunity to provide a useful service to travelers, while at the same time promoting the economic competiveness of the region, and reducing the congestion and negative environmental impacts associated with drivers searching for parking.

The City is interested in parking management technologies to handle parking for special events downtown and at the Port of Rochester. It is envisioned that parking management technology would assist drivers in locating available parking in real-time. This information would need to be delivered to drivers prior to key decision points.

Also, on-street parking meters are being updated to take advantage of new technologies. In downtown Rochester, multi-space " pay and display" are being deployed to replace aging coin parking meters. These new meters accepting credit card payments, thereby reducing revenue collection overhead and maintenance costs. Also, by accepting credit cards, these systems provide customers with the added convenience of not having to carry coins.

Parking guidance information could potentially be provided to drivers at intercept points on the approaches to the Rochester central business district, providing information on parking availability and reducing both CBD congestion as well as motorist frustration, particularly during special events.

Traveler information is provided through a combination of field systems as well as by leveraging statewide investments like 511.

Special events and congestion cause by the 'parking search' are two motivations for improved parking management.

Winter Maintenance and Operation

Given the region's weather conditions, improving the effectiveness and efficiency of winter maintenance is an ongoing regional need.

To address this need, stakeholders have suggested additional investment in RWIS to collect weather data for the region. Also, installing AVL on snow plows and maintenance equipment is seen as a way to better monitor and manage winter maintenance activities, including application of treatment materials in a manner that is appropriate for roadway conditions, temperature, and precipitation types.

Traveler Information Services

Improved traveler information is seen as a way to reduce incident-related traffic congestion, support public transit alternatives, improve public safety, and assist in other regional transportation goals. As previously mentioned, the region is interested in:

- Providing information on real-time road conditions, construction activities, special events, bridge openings, detours, and other sources of recurring and non-recurring congestion.
- Expanding its HAR and portable DMS capabilities to support roadside traveler information services.
- Further integration with the state's 511 program (both the Interactive Voice Response (IVR) telephone service and the associated web presence).
- Working with trip planning websites and further exploring the role of the private sector in disseminating traveler information.
- Providing popular camera views to the public via public websites or through public-private partnerships.

Regional sharing communications infrastructure supports ITS implementation while reducing deployment and maintenance costs for participating agencies.

Communications Infrastructure

As the region's ITS deployments continue to proliferate, there will be a corresponding need to expand the region's communications infrastructure. Also as more transportation data becomes available, there is increasing recognition of the benefits of exchanging this data with partners across multiple disciplines and jurisdictions. The region will need to plan its communications infrastructure investments to fill in gaps in the infrastructure network. The region is also interested in taking advantage of the fiber optic backbone on the New York State Thruway to connect the region with other regions in the state, including NYSDOT headquarters in Albany.

As the region expands its communications infrastructure, stakeholders recognize the need to formalize interagency agreements and relationships to provide effective coordination of resources and ensure that institutional relationships continue beyond the current group of stakeholders. There may be additional regional partnerships that can be forged to support the deployment of multi-agency communications infrastructure, for example, with the Rochester Police Department and other public safety agencies.

Additionally, personnel requirements and current space constraints to house equipment at the RTOC need to be taken into consideration in the expansion of regional ITS infrastructure.

Section 6: Transportation System Management and Operations (TSMO) Initiatives

Overview

The purpose of this section is to outline the future initiatives for Transportation System Management and Operations identified by stakeholders as means of meeting regional and agency objectives.

These initiatives have been grouped by general theme along with an accompanying goal and stated stakeholder objectives. Several initiatives are cross-cutting initiatives – providing services and benefits across multiple themes. For these cross-cutting initiatives, multiple reference numbers are assigned. Also, a timeframe has been recommended for each initiative.

For the purposes of this plan, the timeframes have been defined as follows:

- Near-Term: 0 - 5 years
- Medium-Term: 5-10 years
- Long-Term: More than 10 years

Initiatives in the Long Term, more than 10 years into the future, are beyond the planning horizon for this study. However, these initiatives are important for establishing the region's ITS vision, anticipating how Near-and Medium-Term initiatives contribute to that vision, and relating the ITS strategy to the Greater Rochester region's overall long range transportation strategy.

Why Define TSMO Strategies for the Region?

ITS systems are the 'enabling technologies that allow the region to effectively manage and operate the transportation system. However, there are really four key elements of a TSMO program that must work together to effectively implement TSMO strategies. These are:

- Plans and Policies
- Personnel
- Resources (assets as well as capital and operating funding)
- Enabling ITS Technologies

Defining regional TSMO strategies as an integral part of the ITS deployment strategy:

- Establishes a traceable relationship between those investments and regional transportation needs;
- Informs future ITS technology investment requirements to implement the operational strategies;
- Identifies agency roles and responsibilities;
- Promotes integrated thinking about interagency and intermodal coordination opportunities; and
- Highlights the investment in people, assets, and infrastructure needed to support operations on a day to day basis.

Summary of System Management and Operations Initiatives

Stakeholder initiatives have been organized into the following general themes:

- Incident and Emergency Management (IE) – Eight (8) initiatives identified.
- Public Transportation Management (PT) – Eighteen (18) initiatives identified.
- Expressway Management (EM) – Six (6) initiatives identified.
- Arterial Management (AM) – Seven (7) initiatives identified.
- Integrated Corridor Management (IC) – Eight (8) initiatives identified.
- Parking Management (PM) – Nine (9) initiatives identified.
- Winter Maintenance (WM) – Three (3) initiatives identified.
- Traveler Information (TI) – Five (5) initiatives identified.
- Communications Infrastructure (CI) – Three (3) initiatives identified.

It should be noted that many of these initiatives address multiple regional needs and are therefore included in several different general themes.

Incident and Emergency Management

Description: Detection, verification, response, management, and recovery of incidents and emergency situations in the Greater Rochester area.

Goal: Provide for prompt, safe response to traffic incidents and emergency management scenarios to increase safety and minimize congestion, disruptions, and loss of capacity associated with traffic incidents.

Objectives:

- Formalize existing incident management procedures and protocols through a Regional Concept for Transportation Operations that documents institutional roles and responsibilities using a scenario-based approach.
- Increase involvement and participation of emergency response agencies in incident management, including knowledge of best practices for traffic management and awareness/access to ITS tools.
- Improve cross-training of operations staff to enable MCDOT and NYSDOT staff to cooperatively manage incidents and operate ITS system on the other agency's systems during incident situations.
- Improve public access to traveler information about incident situations through a variety of traveler information media
- Develop a regional, multiagency system for incident and event reporting that is consistent with federal guidelines (SAFETEA-LU Sec 1201).
- Plan for future integration of regional ITS infrastructure with NYSDOT statewide Advanced Traffic Management System (ATMS) and incident reporting tools.
- Fill in gaps or "blind spots" in existing instrumented corridors to improve incident detection, verification, and response capabilities.
- Provide for phased expansion of traffic management infrastructure on additional expressway and arterial corridors based on prioritized operational needs.
- Increase the level of NYSDOT and MCDOT central signal system control along critical corridors throughout the urbanized and rural portions of the region to improve the ability to implement alternative signal plans in response to incidents and real-time conditions.

Relevant Regional Needs:

- Detection of incidents and disruptions through video or field reports.
- Dissemination of incident information to general public through media, HAR, and DMS signs.
- Coordinated response to incidents and emergency situations with NY State Police (co-located at RTOC).

Key Opportunities and Challenges:

- Expansion of regional traffic data collection devices and cameras
- Increased participation of local first responders (police, fire, EMS) in regional response plans and utilization of ITS technology
- Multi-agency training to improve awareness of RTOC capabilities
- Additional scenario-based incident response and diversion planning
- Provision of incident information to the public via 511 integration, DMS, and HAR
- Use of data to support performance measurement of system management programs

Incident and Emergency Management Initiatives

Ref. #	Description	Timeframe	Lead Agency	Participating Agencies	Progress Milestones
IE1 EM1 AM2 IC2 WM1	Develop a Regional Concept for Transportation Operations for Incident Management using a corridor-based approach.	Near	MCDOT NYSDOT NYSTA	GTC Law Enforcement/ Emergency Management	• Development of an RCTO and execution of related agreements
IE2 EM2 TI1	Identify and instrument gaps in regional traffic and incident management ITS infrastructure based on operations needs.	Medium	NYSDOT MCDOT	NYSTA GTC	• Infill instrumentation deployment
IE3 EM3 TI2	Phased expansion of ITS infrastructure to additional regional corridors based on prioritized need.	Medium-Long	NYSDOT MCDOT	NYSTA GTC	• Instrumentation of additional corridors based upon operational priorities
IE4 CI2	Expand communications and provide system integration to support increased NYSDOT and MCDOT centralized signal control capabilities.	Medium	NYSDOT MCDOT	Other comm. asset owning agencies	• Integration of additional signalized intersections into the NYSDOT central system
IE5 EM4	Improve integration and joint operations management of the NY Thruway corridor with expressways managed by NYSDOT and MCDOT, including incident response, and traveler information, and infrastructure sharing.	Near	NYSDOT NYSTA	Law Enforcement/ Emergency Management	• Development of a scenario-based joint operating concept • Execution of interagency agreements • Integration of ITS systems and operations
IE6 EM5	Increase availability of incident and traffic information through traveler information media – 511, HAR, DMS, third-party services, etc., including comparative travel time information.	Medium	NYSDOT	Third-party information providers	• New or enhanced traveler information reporting of real-time expressway and incident conditions, including travel time reporting
IE7	Provide education and outreach to local law enforcement agencies on traffic and incident management best practices and coordinated regional plans and ITS infrastructure.	Near	NYSDOT MCDOT	Law Enforcement/ Emergency Management	• Conduct agency outreach and training • Increase local agency involvement in incident response

IE8	Facilitate cross-training of MCDOT and NYSDOT staff to allow for greater flexibility to respond to incident and emergency situations on the network using RTOC staff.	Near	NYSDOT MCDOT		• Cross-training and certification of staff on both MCDOT and NYSDOT systems • Execution of related interagency agreements
IE9 EM7 AM8	Identify the most suitable diversion routes for major roadways in the region to minimize delay and improve safety for the travelling public when road or bridge closures occur.	Near	GTC	MCDOT NYSDOT NYSTA Law Enforcement agencies	• Diversion route plans for Principal Arterials for production and distribution to relevant agencies
IE10	Evaluate system redundancy, and off-site backup for the RTOC to ensure resiliency in emergency situations.	Near	NYSDOT MCDOT	NYSP	• Needs assessment/feasibility study for RTOC enhancements and backup

Public Transportation Management

Description: Dispatch and management of public transportation network in the Greater Rochester area.

Goal: In partnership with other regional agencies, implement a suite of advanced technologies through public transportation agency initiatives to increase the efficiency, safety, and convenience of public transportation in Greater Rochester.

Objectives:

- Improve the quality and convenience of the transit customer experience through the application of advanced transit technologies
- Implement transit technologies in a phased, expandable, and upgradeable manner in accordance with agency business objectives and anticipated positive impact on the customer experience
- Improve the ability of RGRTA vehicles to maintain schedule through implementation of Transit Signal Priority (TSP) in partnership with regional agencies, as well as enable initiation of Bus Rapid Transit (BRT) service (as appropriate)
- Increase the quality, timeliness, breadth, and availability of transit traveler information, leveraging traveler information investments by regional partners
- Accommodate emerging and flexible electronic fare media as a valid transit fare payment method.
- Expansion of select technology elements into Livingston County (LATS) and possibility other operating divisions in the future (e.g. WATS, CATS)
- Improve coordination with regional transportation management agencies to increase the ability to maintain transit operations and schedule in real time
- Improve coordination with regional law enforcement and emergency management agencies both to assist in regional crises and also to better respond to events on RGRTA vehicles and property
- Explore, where possible, opportunities for systems integration and sharing of infrastructure with partner agencies to maximize functionality and return on investment
- Explore the initiation and deployment of advanced technologies on the Ontario County Area Transit System

Relevant Regional Needs:

- Population dispersal (outer ring suburbs) and aging of population
- Need for satellite transit centers and suburb-to-suburb links
- Increasing public transportation alternatives and the attractiveness of these alternatives
- Dissemination of public transport information via a variety of methods
- Potential introduction of BRT through the use of technology and other improvement

Key Opportunities and Challenges:

- Completion of RGRTA TIDE program
- Collaboration with regional agencies for (Transit Signal Priority) TSP implementation
- Use of existing and future traffic data and surveillance to improve regional transit operations
- Integration with statewide and regional traveler information initiatives
- Use of transit vehicles as ‘data probes’
- Use of transit ITS information to support regional planning
- Opportunities to coordinate signal upgrades with TSP implementation

Public Transportation Management Initiatives

Ref. #	Description	Timeframe	Lead Agency	Participating Agencies	Progress Milestones
PT1	Development of an agency strategic plan for future implementation of transportation technology initiatives	Near	RGRTA CATS	GTC	• Development of a transit technology implementation plan
PT2	Implement onboard wireless internet (wifi) access for passengers	Near	RGRTA		• Rollout of onboard passenger wifi
PT3	Expansion of select TIDE elements into Livingston County (LATS) – CAD/AVL and traveler information	Near	RGRTA		• Implementation of TIDE elements into the LATS system
PT4	Expansion of select TIDE elements into other operating divisions	Medium-Long	RGRTA		• Implementation of TIDE elements into other operating divisions
PT5	Implement vehicle prognostics for increased service reliability and decreased maintenance costs	Near	RGRTA		• Implementation of onboard vehicle prognostic systems
PT6	Full implementation of the TIDE transit technology program elements	Medium	RGRTA		• Implementation of TIDE elements in accordance with the agency strategic plan
PT7	Develop an implementation strategy for Transit Signal Priority (TSP) based upon operational requirements and service level objectives	Near	RGRTA	MCDOT NYSDOT City of Rochester	• Development of a phased TSP implementation plan
PT8	Phased implementation of Transit Signal Priority (TSP) in key corridors within the RTS service area	Near-Medium	RGRTA	MCDOT NYSDOT City of Rochester	• Execution of memoranda of agreement with partner traffic management agencies • Staged implementation of TSP in the region in accordance with priorities identified in the TSP plan.

PT9	Implement upgraded, validating fareboxes electronic payment capabilities to replace aging fare collection system and support more robust fare policies and fare media (including smart cards)	Medium	RGRTA	Partner institutions with fare agreements (e.g. schools, universities, institutions)	• Farebox replacement study • Implementation of replacement fareboxes
PT10	Implementation of transit security systems (security CCTV, call boxes) at key passenger facilities (e.g. transit centers, park and ride lots)	Medium	RGRTA	Law enforcement agencies	• Deployment of CCTV surveillance infrastructure
PT11	Incorporation of transit traveler information to regional and/or statewide traveler information sources (e.g. 511 telephone traveler information system) to increase accessibility of transit traveler information	Medium	RGRTA CATS	NYSDOT other regional traveler information providers	• Incorporation of transit traveler information into regional/state systems
PT12	Implementation of on-street transit traveler information at key system hubs (e.g. downtown Rochester transit shelters, park-and rides, future satellite transit centers)	Medium	RGRTA	City of Rochester, towns and villages in Monroe County	• Implementation of field traveler information deployments at key hubs
PT13	Development of user-tailored (e.g. stop arrival systems) or subscription-based transit traveler information services	Medium	RGRTA		• Implementation of tailored traveler information systems
PT14	Provision of detailed transit service information or data feeds to third-party application developers or information providers, similar to Google transit.	Medium	RGRTA	Third-party developers and information providers	• Development of transit data feeds and/or a developer portal • Execution of associated agreements with third party providers
PT15	Publish transit data to a regional data archive for planning, performance measurement, and operational analysis purposes.	Long	RGRTA CATS	GTC potential host agencies	• Incorporation of transit data into a future regional data archive
PT16 IC6	Incorporate real-time traffic information feed from the Regional Transportation Operations Center (RTOC) into RGRTA dispatch to improve system response to real-time conditions and traffic incidents affecting service.	Medium	RGRTA	MCDOT NYSDOT	• Establishment of a real-time link and interface at RGRTA for traffic information

PT17	Incorporate real-time interface with the Monroe County Emergency Operations Center (EOC) into RGRTA to assist with regional emergency management and transit system crisis response	Medium	RGRTA	MCDOT NYSDOT	• Establishment of a real-time link and interface at RGRTA for emergency management information
PT18	Partner with regional agencies on communications (fiber) and other infrastructure sharing to maximize deployment efficiency and minimize costs	Medium	RGRTA	MCDOT MCDES NYSDOT	• Development of infrastructure sharing agreements in concert with future deployment projects

Expressway Management

Description: The coordinated monitoring and operation of limited-access highways in the Greater Rochester region, including interchanges where expressways interface with the regional arterial system (discussed separately).

Goal: Increase ability to manage the region's expressways in support of more reliable and predictable commute times.

Objectives:

- Formalize existing expressway management procedures and protocols through a Regional Concept for Transportation Operations that documents institutional roles and responsibilities, especially sharing of roadway conditions data.
- Provide for phased deployment of ITS technology to collect more real-time travel time data, particularly along major commuting and freight corridors.
- Improve public access to expressway travel time information through a variety of media.
- Plan for future integration of regional ITS infrastructure with NYSDOT statewide Advanced Traffic Management System (ATMS).

Relevant Regional Needs:	Key Opportunities and Challenges:
• Maintaining regional traffic flow • Managing recurring traffic congestion • Prompt detection and management of incidents and disruptions • Dissemination of traffic information to general public • Data collection for planning and performance monitoring	• Coordination of expressway operations with the NY Thruway • Provision of real-time travel time information to travelers • Expansion of regional traffic data collection devices and cameras to support operations • Use of detector data for system performance monitoring • Development of common mapping applications and data interfaces for interagency sharing of expressway data. • Integration with Statewide ATMS and traveler info systems

Expressway Management Initiatives

Ref. #	Description	Timeframe	Lead Agency	Participating Agencies	Progress Milestones
EM1 IE1 AM2	Develop a Regional Concept for Transportation Operations addressing expressway management and sharing of roadway conditions data.	Near	NYSDOT	NYSTA GTC Law Enforcement Emergency Response	• Development of an RCTO and execution of related agreements
EM2 IE2	Identify and instrument gaps in regional expressway management ITS infrastructure based on operations needs.	Medium	NYSDOT	NYSTA GTC	• Infill instrumentation deployment
EM3 IE3	Phased expansion of ITS infrastructure to additional regional expressway corridors based on prioritized need.	Medium-Long	NYSDOT	NYSTA GTC	• Instrumentation of additional corridors based upon operational priorities
EM4 IE5	Improve integration and joint operations management of the NY Thruway corridor with expressways managed by NYSDOT and MCDOT, including incident response, and traveler information, and infrastructure sharing	Near	NYSDOT NYSTA	Law Enforcement	• Development of a scenario-based joint operating concept • Execution of interagency agreements • Integration of ITS systems and operations
EM5 IE6	Increase availability of incident and traffic information through traveler information media – 511, HAR, DMS, third-party services, etc., including comparative travel time information.	Medium	NYSDOT	Third-party information providers	• New or enhanced traveler information reporting of real-time expressway and incident conditions, including travel time reporting
IE9 EM6 AM8	Identify the most suitable diversion routes for major roadways in the region to minimize delay and improve safety for the travelling public when road or bridge closures occur.	Near	GTC	MCDOT NYSDOT NYSTA Law Enforcement agencies	• Diversion route plans for Principal Arterials for production and distribution to relevant agencies
EM7	Study feasibility of alternative applications to manage congestion in region if and when appropriate (e.g. tolling, HOV, etc.)	Long	GTC	NYSTA NYSDOT MCDOT	• Development of alternative strategies study

Arterial Management

Description: Coordinated monitoring and operation of arterial streets in the Greater Rochester area, including interchanges where the regional arterial system interfaces with limited-access expressways. Unlike expressway management, traffic control is more 'active,' allowing more direct control in how traffic is managed.

Goal: Improve region's capability to manage traffic and respond to incidents on arterial roadways.

Objectives:

- Promote migration to interconnected signalized corridors.
- Deploy ITS technology (sensors, cameras, signal control infrastructure, etc.) in a manner that supports traffic management along key regional arterials.
- Extend shared, regional communications infrastructure to support multi-agency ITS investment in key corridors
- Integrate central systems to support remote, integrated arterial management.
- Support development of corridor-specific traffic signal timing optimization programs.
- Update and upgrade asset management tools to identify and help resolve maintenance issues.

Relevant Regional Needs:	Key Opportunities and Challenges:
• Maintaining regional traffic flow in key travel corridors across jurisdictional boundaries • Managing recurring and non-recurring traffic events on arterial streets • Prompt detection of incidents and disruptions • Dissemination of traffic information to general public	• Regional, centralized signal coordination and management • Coordination of arterial management with expressway management operations • Provision of travel time information to travelers • Expansion of regional traffic data collection devices and cameras, including mobile devices • Building new conduit paths to extend wired system coverage • Utilizing wireless technology where wired connections cannot reach economically • Integration of ATMS • Improving camera coverage • Improving ability to detect and respond to equipment maintenance issues

Arterial Management Initiatives

Ref. #	Description	Timeframe	Lead Agency	Participating Agencies	Progress Milestones
AM1	Develop a detailed Integrated Corridor Management feasibility study to guide system implementation and evaluate potential benefits and infrastructure requirements	Near	NYSDOT MCDOT	NYSTA GTC NYSDOT Law Enforcement Emergency Response	• Development of the plan and execution of related agreements
AM2 IE1 EM1	Develop a Regional Concept for Transportation Operations addressing joint management of parallel facilities in designated corridors	Near	NYSDOT MCDOT	NYSTA GTC NYSDOT Law Enforcement Emergency Response	• Development of an RCTO and execution of related agreements
AM3 IC3	Implementation of instrumentation, signage, and other systems in support of key arterials.	Medium	NYSDOT MCDOT	NYSTA GTC NYSDOT Law Enforcement Emergency Response	• Instrumentation of designated diversion route corridors
AM4 IC4	Improve integration of interchange signals and adjacent arterial signal systems in response to real-time traffic conditions	Medium	NYSDOT MCDOT	NYSTA GTC NYSDOT Law Enforcement Emergency Response	• Development of integrated/coordinated interchange signal and arterial signal systems
AM5	Improve integration of central systems to support arterial management.	Medium	MCDOT NYSDOT	NYSTA GTC	• Integration of central systems
AM6	Develop a detailed arterial corridor management plan, defining corridor-specific traffic signal timing optimization patterns.	Long	MCDOT NYSDOT	NYSTA GTC NYSDOT MCDOT	• Development of integrated/coordinated signal corridor timing plans
AM7	Disseminate and develop asset management tools for ITS devices to support issue identification and resolution.	Long	NYSDOT	GTC	• Update and upgrade of asset management tools
IE9 EM6 AM8	Identify the most suitable diversion routes for major roadways in the region to minimize delay and improve safety for the travelling public when road or bridge closures occur.	Near	GTC	MCDOT NYSDOT NYSTA Law Enforcement agencies	• Diversion route plans for Principal Arterials for production and distribution to relevant agencies

Integrated Corridor Management

Description: Integrated corridor management (ICM) involves operational coordination of the region's transportation networks that are often managed separately; such as expressways, arterials, transit, and/or freight networks; for the purpose of more effectively managing congestion and increasing trip reliability. ICM seeks to optimize the efficiency across the entire roadway network regardless of classification or jurisdiction.

Goal: Promote joint management of parallel facilities (expressway and arterial) that are operationally linked and service common travel corridors to improve overall efficiency and coordination of the complete, multimodal network

Objectives:

- Develop a joint regional feasibility for ICM operations and infrastructure deployment in the Greater Rochester Region to address corridors of high need and potential benefit.
- Formalize operating agreements (Regional Concept for Transportation Operations) that documents institutional roles and responsibilities under a variety of integrated corridor management scenarios.
- Deploy ITS technology in a manner that supports official NYSDOT expressway diversion route management (surveillance, signal control, traveler information etc.) to assist in management of diversion scenarios.
- Provide real-time connection and interfaces between expressway, arterial, and transit management systems to facilitate multimodal coordination.
- Provide comparative travel time information on parallel routes, to facilitate route selection by motorists and better balance traffic flows with available capacity.

Relevant Regional Needs:

- Coordination of the region's expressway, arterial, transit, and freight networks
- Increased interagency information sharing and coordination

Key Opportunities and Challenges:

- Coordination of expressways and parallel arterial corridors
- Need to identify key freight and commuter mobility corridors as a framework for integrated management
- Deployment of ITS to complement defined expressway diversion plans
- Implementing more "proactive" ramp signal strategies
- Exploring application of future Intellidrive in-vehicle technologies and strategic initiatives
- Maintaining the efficiency of the region's freight corridors to promote economic competitiveness
- Coordination with RGRTA to manage disruptions in transit corridors
- Trucks traveling on routes with low-clearance bridges

Integrated Corridor Management Initiatives

Ref. #	Description	Timeframe	Lead Agency	Participating Agencies	Progress Milestones
IC1 AM1	Develop a detailed Integrated Corridor Management feasibility study to guide system implementation and evaluate potential benefits and infrastructure requirements	Near	MCDOT NYSDOT	NYSTA GTC NYSDOT Law Enforcement Emergency Response	• Development of the plan and execution of related agreements
IC2 IE1 EM1 AM2	Develop a Regional Concept for Transportation Operations addressing joint management of parallel facilities in designated corridors	Near	NYSDOT MCDOT	NYSTA GTC NYSDOT Law Enforcement Emergency Response	• Development of an RCTO and execution of related agreements
IC3 AM3	Implementation of instrumentation, signage, and other systems on designated and informal expressway diversion routes	Medium	NYSDOT MCDOT	NYSTA GTC NYSDOT Law Enforcement Emergency Response	• Instrumentation of designated diversion route corridors
IC4 AM4	Improve integration of interchange signals and adjacent arterial signal systems in response to real-time traffic conditions	Medium	NYSDOT MCDOT	NYSTA GTC NYSDOT Law Enforcement Emergency Response	• Development of integrated/coordinated signal corridor timing plans and central control capabilities
IC5	Improve corridor management in key freight corridors based on outcomes of the regional freight study	Medium	GTC	MCDOT NYSDOT	• Development of a freight corridor instrumentation plan • Instrumentation and coordination of key freight corridors.
IC6 PT16	Provide real-time traffic information to RGRTA dispatch to assist in transit management and diversions based upon corridor conditions	Near	RGRTA	MCDOT NYSDOT	• Development of a real-time center-to-center link from RTOC to RGRTA

IC7	Development of over-height vehicle detection and warning systems on corridors with low clearance bridges.	Long	MCDOT NYSDOT		• Development of overheight vehicle detection system.
IC8	Explore Intellidrive advance vehicle technologies to provide drivers with real-time corridor information.	Long	NYSDOT MCDOT	GTC	• Development of a feasibility assessment of Intellidrive technologies.

Parking Management

Description: Parking management includes the provision of real-time parking availability information to the general public, managing parking for special events, and exploring new parking technologies to support regional parking and transportation goals. Parking management is an opportunity to provide a useful service to travelers, while at the same time promoting the economic competiveness of the region, and reducing the negative congestion and emissions impacts associated with the parking search.

Goal: Promote convenience and efficient utilization and management of on- and off-street parking facilities in downtown Rochester and other key destinations through the application of advanced technologies.

Objectives:

- Reduce congestion caused by the 'parking search' in the central business district by providing accurate, real-time parking availability information.
- Reduce congestion, delay, and inconvenience of parking due to surges in demand during large-scale special events.
- Promote the use of electronic payments for parking management, such as credit cards, smart cards or other stored value media, cell phones, and/or electronic toll tags (E-ZPass).
- Increase the efficiency, flexibility, user convenience, and revenue potential of on-street parking through implementation of electronic multi-space metering.

Relevant Regional Needs:

- Parking management for special events in downtown Rochester and at the Port of Rochester
- On-street parking meters updated to provide greater convenience and support regional parking goals
- Need to load balance parking among facilities within the downtown area
- Coordination with a transit circulator system to connect underutilized facilities

Key Opportunities and Challenges:

- Identification of parking management technologies
- Location of signs/development of information dissemination method
- Service and maintenance of parking information infrastructure and new parking meter technology
- Possible addition into the 511 system
- Incorporation of E-Z Pass as a method of payment for garages or special events
- Incorporation of fusion or regional mobility cards

Parking Management Initiatives

Ref. #	Description	Timeframe	Lead Agency	Participating Agencies	Progress Milestones
PM1	Develop a multi-agency parking management plan for special events, leveraging the ITS assets available in the region to better manage event-related parking and circulation based on real-time information and traveler information tools	Near	City of Rochester	MCDOT NYSDOT GTC Law enforcement agencies	• Development of a parking management operations plan
PM2	Display parking event information on Dynamic Message Signs operated by NYSDOT and MCDOT to provide improved guidance on parking availability from the regional highway network.	Near	City of Rochester	MCDOT NYSDOT Law enforcement agencies	• Execution of a cooperative agreement to provide parking information on DMS
PM3	Implement an on-street parking guidance system indicating real-time parking availability at facilities across downtown Rochester	Medium	City of Rochester	MCDOT (ongoing maintenance)	• Implementation of an on-street parking guidance system
PM4	Incorporate event parking information into the NY State 511 telephone traveler information system and website	Medium	City of Rochester	NYSDOT	• Incorporation of parking information into NYSDOT traveler information tools
PM5	Jointly promote parking and event traffic information availability (e.g. through 511 or DMS) in event promotions and advertisements	Medium	City of Rochester	Event producers and venue managers	• Implementation of joint marketing programs for event parking and traffic information
PM6	Expand on-street multi-space parking meters to replace existing, mechanical coin-operated single space meters (including credit card payment)	Near	City of Rochester		• Implementation of multi-space meters in downtown Rochester
PM7	Implement a pilot project for electronic payment using electronic toll collection tags (e.g. E-ZPass) for off-street garages and/.or special events.	Near	City of Rochester	NYSTA (E-ZPass consortium)	• Implementation of an electronic toll tag parking payment program

PM9	Incorporate emerging, electronic or regional payment media (e.g. smart cards, E-ZPass, Monroe County Zoom Lane, cellular phones) as a valid payment mechanism for on-street and off-street (garage) parking in Rochester	Long	City of Rochester	Other regional electronic payment participants – e.g. RGRTA, NYSTA	• Introduction of electronic media for parking payment at City facilities

Winter Maintenance

Description: Collection and provision of real-time weather and road condition information, and management of maintenance vehicles and resources to effectively manage adverse winter weather conditions' impact of the transportation network. The objective of winter maintenance is to improve the efficiency and effectiveness of winter maintenance activities, ultimately resulting in improved traveler safety.

Goal: Promote the efficient and cost-effective allocation of resources to respond and manage winter conditions on regional roadways in support of improved traveler safety.

Objectives:

- Expand deployment of RWIS stations to collect additional real-time information on road and weather conditions
- Phased deployment of AVL on snow plows to assist in resource allocation and management.
- Promote increased sharing of road/weather information amongst regional transportation agencies and with the general public.

Relevant Regional Needs:	Key Opportunities and Challenges:
• Adverse weather conditions • Lake effect snows that are difficult to predict • Increasing costs of winter maintenance resources (salt, sand, etc.)	• Expansion of RWIS to collect weather data • Deployment of CAD/AVL on maintenance vehicles • Providing RWIS data to transportation stakeholders and general public

Winter Maintenance Initiatives

Ref. #	Description	Timeframe	Lead Agency	Participating Agencies	Progress Milestones
WM1 IE1 EM1 AM2 IC2	Develop a Regional Concept for Transportation Operations addressing sharing of roadway conditions data.	Near	NYSDOT MCDOT	Towns NYSTA GTC RGRTA Law Enforcement Emergency Response	• Development of an RCTO and execution of related agreements
WM2	Develop and deploy additional RWIS stations based on regional operational priorities	Medium-Long	NYSDOT		• Deployment of RWIS
WM3	Deploy AVL technology on region's snow plows to aid in resource allocation and management.	Near-Medium	NYSDOT City of Rochester, Counties Cities Towns Villages	MCDOT NYSDOT	• Deployment of AVL on snow plows

Traveler Information

Description: Provision of real-time traveler information to the general public, including incident information, construction plans, special events, weather, road conditions, bridge openings, travel times, transit options, etc.

Goal: Provide timely and accurate multimodal information to regional travelers in order to inform the traveler decision-making process, reduce traveler anxiety, and help manage travel demand.

Objectives:

- Collect additional real-time traffic information on key roadways.
- Provide support for statewide 511 traveler information efforts.
- Expand provision of real-time traveler information through a variety of media, including telephone and web applications.
- Explore opportunities to expand traveler information options through public-private partnerships.

Relevant Regional Needs:	Key Opportunities and Challenges:
• Reducing traffic congestion • Mitigate impacts of traffic incidents and congestion • Support a multimodal transportation system • Improve public safety • Management of Planned Events	• Expansion of regional traffic data collection devices and cameras • Provision of traveler information to the public via 511 integration, DMS, and HAR • Expanding trip-planning capabilities to include regional multimodal transportation options • Exploring potential for private sector participation in traveler information dissemination • Potential public partnerships for DMS sign deployment/outdoor advertising for revenue

Traveler Information Initiatives

Ref. #	Description	Timeframe	Lead Agency	Participating Agencies	Progress Milestones
TI1 IE2 EM2	Identify and instrument gaps in regional ITS infrastructure based on operations needs	Medium	NYSDOT MCDOT	NY Thruway GTC	• Infill instrumentation deployment
TI2 IE3 EM3	Phased expansion of ITS infrastructure (including equipment such as RTMS, TRANSMIT, VMS, HAR, etc.) based on prioritized need.	Medium-Long	NYSDOT MCDOT	NY Thruway GTC	• Instrumentation of additional corridors based upon operational priorities
TI3	Assessment of the feasibility of a regional web portal for consolidating traveler information, including camera feeds	Medium-Long	NYSDOT	NY Thruway GTC MCDOT	• Feasibility assessment of web portal
TI4	Develop interface to provide information to upstate 511 system.	Medium	NYSDOT		• Development of 511 interface
TI5	Study of private-public partnership (PPP) opportunities for providing traveler information to media outlets.	Long	NYSDOT	NY Thruway GTC	• Development of PPP study.

Communications Infrastructure

Description: As the region's ITS deployments continue to proliferate, there will be a corresponding need to expand the region's communications infrastructure. Also, as more transportation data becomes available, there is increasing recognition of the benefits of exchanging this data with partners across multiple disciplines and jurisdictions.

Goal: Expand communications infrastructure to support current and future ITS system needs.

Objectives:

- Identify and fill in gaps in the region's fiber-optic communications network.
- Explore the full potential of wireless communication technology where wired connections are not cost effective.
- Formalize interagency agreements and relationships regarding communications sharing.
- Leverage existing communications infrastructure to connect the region with other statewide transportation agencies and stakeholders.

Relevant Regional Needs:	Key Opportunities and Challenges:
• Increasing planned deployment of ITS technologies. • Increased coordination and exchange of ITS information.	• Expansion of fiber-optic communications network. • Increased utilization of wireless technology. • Development of a regional communications plan. • Exploring formalized interagency agreements. • Exploring opportunity to connect to existing NYSTA fiber-optic communications backbone to connect region with the rest of the state. • RTOC space requirements to house additional equipment • Personnel to operate and maintain expanded communications and ITS infrastructure

Communications Infrastructure Initiatives					
Ref. #	**Description**	**Timeframe**	**Lead Agency**	**Participating Agencies**	**Progress Milestones**
CI1	Identify gaps in regional communications infrastructure based on operations needs as part of regional communications plan, including potential integration with extended emergency management, law enforcement, and/or other public agencies.	Medium	NYSDOT MCDOT	NYS Thruway GTC City of Rochester MCDES	• Development of regional communications plan.
CI2 IE4	Expand communications and provide system integration.	Medium-Long	NYSDOT MCDOT	NYS Thruway GTC City of Rochester	• Expansion of communications network.
CI3	Development of formal interagency agreements concerning communications infrastructure sharing.	Medium-Long	NYSDOT MCDOT	NYS Thruway GTC City of Rochester	• Feasibility assessment of web portal

Section 7: Ten-Year ITS Deployment Strategy for Greater Rochester

Overview

The ITS Deployment Plan describes a strategy for implementing Intelligent Transportation Systems in the Greater Rochester region over the next ten years and beyond. The ITS Deployment Plan addresses both urbanized (inside the TMA) and rural areas within the 9-county GTC planning region.

The ITS Deployment Plan was developed in consultation with members of the Steering Committee to identify and prioritize future deployment corridors through a series of workshops and breakout project planning meetings. This section of the ITS Strategic Plan contains the results of this collaboration. Several factors or "Building Blocks" were taken into account in developing the Deployment Plan, as shown in the following table.

Building Blocks of the ITS Deployment Plan	Key Considerations
Transportation System Management and Operations (TSMO) Initiatives and Priorities for the Region	What ITS deployment and supporting facilities/personnel are required to implement the TSMO Initiatives defined within the ITS Strategic Plan, and where should this infrastructure be located?
Regional Transportation Needs and Goals	What are the region's transportation needs, what is the potential contribution of ITS in meeting those needs?
Agency Transportation Priorities	How can ITS investments be related to the specific priorities of individual participating agencies who are ultimately responsible for funding, implementing, operating, and maintaining the system?
Future Transportation Conditions	Where is the region anticipating growth in traffic congestion and delay that does not exist today?
Existing ITS Infrastructure and networks	Where are there gaps between the anticipated transportation needs of the region and the ITS infrastructure that exists today?
Future Capital Investments in the Transportation System	Where have capital investments to maintain or expand capacity been planned or programmed for the region, and are there complementary ITS investments that should be considered?
Interconnection of Agencies and Infrastructure	How can ITS infrastructure investment promote connections among agencies and devices in the region, to promote a more integrated system in the future?

ITS Deployment Priorities

Stakeholder agencies of the Steering Committee identified two key levels of priority for ITS deployment.

ITS Deployment Priority Group	Description
Group 1: Critical Operations Target Areas	• High priority targets for ITS deployment in critical Transportation corridors • Focus of discretionary ITS projects and infill investments to maximize system management capabilities • Includes currently Planned and Programmed ITS investments
Group 2: Corridors of Regional Operations Significance	• Corridors where enhanced operational capabilities and supporting ITS infrastructure are warranted • Implement ITS infrastructure as opportunities arise to achieve gradual build-out • Use “Complete Streets” approach to implement technology as part of capital projects in these corridors • Monitor and re-assess as transportation characteristics evolve, especially in rural areas

The Ten Year ITS Strategy map illustrates the distribution of Group 1 and Group 2 Corridors within the region.

Group 1: Critical Operations Target Areas

Group 1 - Critical Operations Target Areas includes the entire urban core of Monroe County, including center city Rochester, and radial arterials and expressways emanating from the core. These have been identified as critical due to the volumes of traffic, and access to commercial and employment uses, as well as their propensity for congestion and delay due to non-recurring events. The City of Rochester presents additional opportunities for parking and special events management (downtown and port areas), as well as high concentrations of future transit infrastructure.

Strengthening and integrating arterial and expressway management capabilities, as well as deployment of transit management technologies like Transit Signal Priority, have been raised as primary TSMO objectives.

Forming a ring around the urban core are Geographic Areas of Interest, including the perimeter of the City of Rochester and parts of the adjoining towns of Greece, Gates, Chili, Brighton, Pittsford, East Rochester, Penfield, and Webster.

Group 1 Target Areas	Select Locations in Group 1*
Expressways	• Inner Loop • I-390 (Henrietta-Brighton) • NY 390 (Gates-Greece) • I-490 (Inside of I-390 and I-590 Loop) • I-590 and NY 590 • I-90 (NYS Thruway)
State Highways	• NY 31 (Rochester) • NY 33 (Rochester) • NY 96 (Rochester) • NY 104 (Rochester) • NY 104 (Greece-Webster) • NY 256 (Rochester-Irondequoit) • NY 261 (Rochester-Irondequoit) • NY 383 (Rochester-Chili)
Urban Arterials	• Downtown Rochester and select Arterial Streets City-wide • Other Arterials within Geographic Areas of Interest (see map)
Geographic Areas of Interest	Portions of: • Rochester • Greece • Chili • Brighton • Irondequoit • Webster • Penfield • East Rochester • Pittsford • Perinton • Henrietta • Victor • Farmington • Brockport • Sweden • Ogden

*See Ten Year ITS Strategy Map for a complete view of locations in the region.

The New York State Thruway is also identified as a critical Group 1 corridor given its importance as both a regional and interstate travel and trade corridor, and the operational relationships with the rest of the region. Urbanization in southern Monroe County, particularly the Thruway interchange areas of Henrietta (Exit 46) and Victor/Farmington (Exit 45), accentuate this growing operational relationship with NYSDOT and County facilities.

Slightly removed from the contiguous areas of the urban core, the Brockport/Sweden area was identified as a Group 1 target area owing to growth in congestion in the NY 531/19 corridors.

For Group 1 Corridors where ITS technology is deployed today, the focus of future investment is on infill, upgrade, and integration of systems

to round out the management capabilities of the corridors. Examples include expanding central control capabilities of NYSDOT signals; implementing transit signal priority and traveler information devices, and deploying additional surveillance in network "blind spots."

Group 2: Areas of Regional Operations Significance

Group 2 – Areas of Regional Operations Significance have been identified by stakeholder agencies targets for expanding the proactive transportation system management and operations capabilities of the region through ITS deployment. Considered in tandem with the Group 1 Areas, they describe a 'build-out' vision for the regional ITS system over the 10-year planning horizon and beyond.

In general, Group 2 corridors have limited or no ITS deployment. While operationally important, there may be barriers to near-term ITS deployment. (e.g. limited communications infrastructure).

Group 2 Areas of Significance	Select Locations in Group 2*
Expressways	• I-390 (Henrietta-Avon) • I-490 (Gates - NYS Thruway) • I-490 (Victor - I-590) • Lake Ontario State Parkway (Greece)
State Highways	• NY 5 (Batavia Center) • NY 5 (Darien Center-Darien Lake) • NY15 (I-90 to I-590) • NY 15A (Henrietta – Brighton) • NY 18 (Greece-Irondequoit) • NY 31 (Gates – Rochester) • NY 31 (Brighton-Perinton) • NY 33 (Batavia –Corfu) • NY 63 (Batavia Center) • NY 77 (Darien Center/Darien Lake) • NY 96 (Pittsford-Victor) • NY 98 (Batavia Center) • NY 250 (Webster-Fairport) • NY 252 (Henrietta -Pittsford) • NY 286 (Rochester-Penfield) • NY 332 (Victor-Canandaigua) • NY 350 (Ontario – Macedon) • NY 404 (Rochester-Ontario) • NY 441 (Penfield) • NY 531 (Gates-Brockport)
Urban Arterials	• Refer to Map
Geographic Areas of Interest	Portions of: • Gates • Chili • Fairport • Perinton • Macedon

	• Canandaigua • Farmington • Batavia • Darien Center

*See Ten Year ITS Strategy Map for a complete view of locations in the region.

Group 2 encompasses many of the radial and circumferential arterial highways and expressways outside of the immediate urban core, such as Interstates 390 and 490 leading to the New York State Thruway, and NYSDOT arterial highways such as NY531 to the west of Rochester and NY 404 to the east. Portions of Gates, Chili, Fairport, Perinton, and Macedon, as well as the NY 332 Corridor and central Canandaigua, are also designated as Geographic Areas of Interest in Group 2.

To the east, in Genesee County, Batavia and Darien Center have been designated as Group 2 Geographic Areas of Interest as well. This includes the town/village centers as well as the state highways impacted by special events at the Darien Lake Theme Park and Darien Lake Performing Arts Center. These events were identified by Stakeholder Agencies as requiring special attention to both state highway and Thruway operations to respond to the surge in traffic and congestion associated with these events.

The commercial strip in Groveland (Livingston County) along NY 63, parallel to Interstate 390, is another outlying corridor of significance in Group 2.

In developing the plan, stakeholder agencies acknowledged that future designations in other rural county centers, such as those in Darien Center, Batavia, and Groveland, may be warranted within the 10-year planning horizon based on conditions that are unforeseen today.

Other Regional ITS Initiatives

Note that the Transportation System Management and Operations (TSMO) Initiatives (Chapter 6) highlights a number of regionally-significant, multi-agency projects that do not manifest themselves in a purely geographic sense. These include:

- **Transit Technology** deployment and integration of RGRTA TIDE systems, including multi-agency initiatives associated with Transit Signal Priority deployment, real-time conditions information sharing to support transit operations, traveler information dissemination, and communications infrastructure sharing.
- **Center-to-Center Integration** of traffic, transit, and emergency management facilities in the region by sharing surveillance, communications, and control functionality. Foremost among the Center-to-Center integration needs is the operational and technological integration of the NYSDOT/MCDOT Regional Traffic Operations Center with the New York State Thruway Statewide Traffic Operations.

- **Dissemination of Traveler Information**, leveraging agency tools as well as statewide investment in the NY 511 telephone traveler information system and website.
- **Parking Management and Information** initiatives in Downtown Rochester and the Port of Rochester area.
- **Emergency Management and Security**, including protection of critical infrastructure
- **Winter Maintenance** including onboard snowplow Automatic Vehicle Location (AVL) integration, road weather data collection and dissemination, and improved interagency coordination during winter weather events.
- **Regional Data Collection and Archiving** to support planning and performance measurement of both TSMO initiatives and overall transportation system performance.

Additionally, there are numerous opportunities to build upon the region's strong, collaborative interagency working relationships to support TSMO initiatives. These are detailed in the Section 8*, Recommendations for Regional Transportation System Management and Operations Coordination*.

Using the Deployment Plan to Guide ITS Project Development and Implementation

In developing the ITS Deployment Plan, stakeholder agencies emphasized the need for flexibility in project development to account for evolving needs, priorities, and funding opportunities.

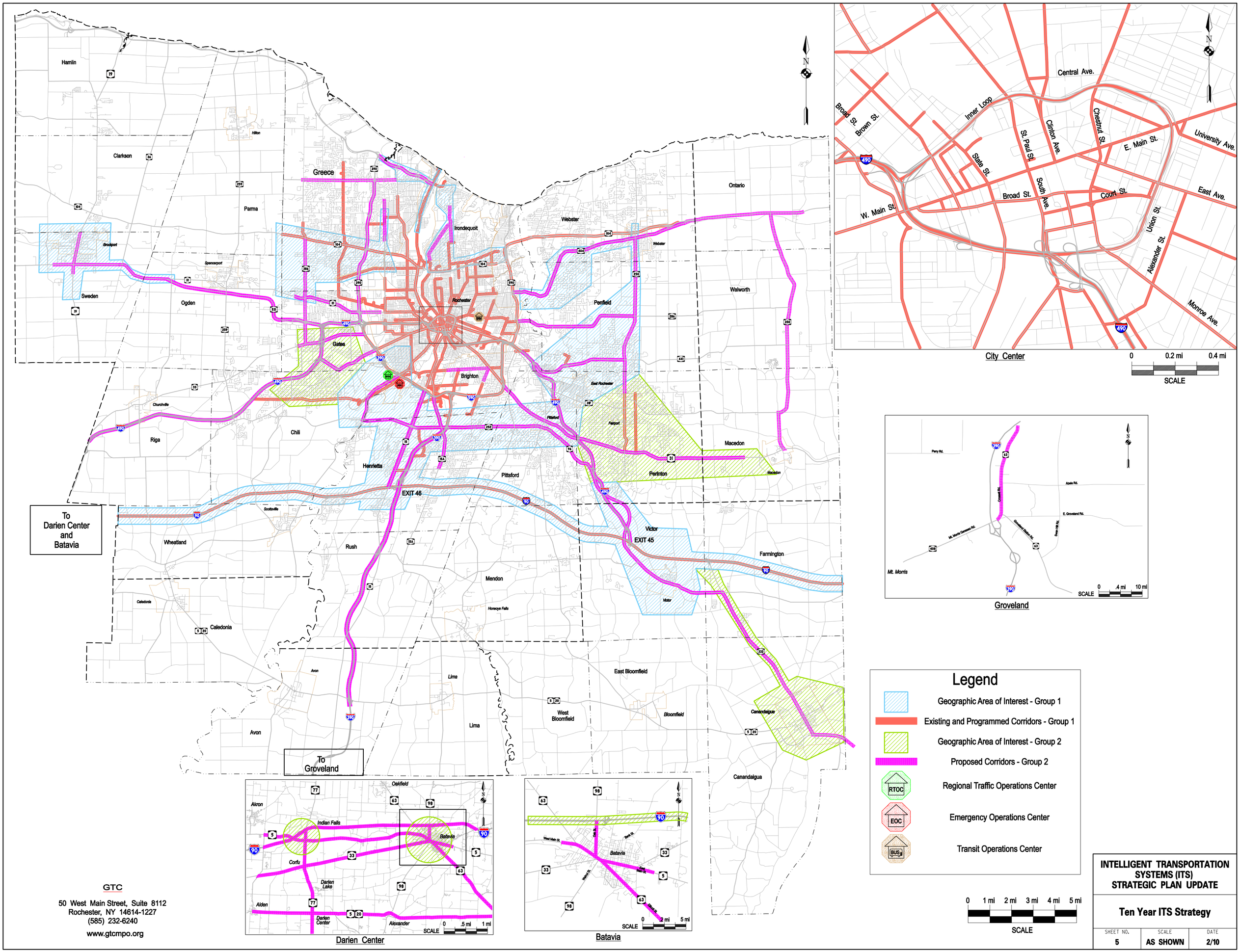
The tactical effort of scoping and implementing specific projects over the course of the next ten years is the mechanism by which regional agencies will realize the ITS deployment vision set out in the Strategic Plan.

The ITS Deployment Plan is intended to serve as a template to support the project development process, regional collaboration (Chapter 8), and integration to TSMO and ITS into the regional planning process (Chapter 4).

The following table illustrates how the Deployment Plan, and the overall ITS Strategic Plan, can guide ITS project scoping and implementation.

Using the ITS Strategic and Deployment Plans as a Guide for ITS Project Development

Project Stage	Using the ITS Deployment and Strategic Plans as a Guide
Identification	• Identify priority TSMO project investment needs (Group 1) through the multi-agency Transportation Management Committee • Through the TIP project development and review cycle, work with project proponents on complementary TSMO and ITS needs within Group 1 or Group 2 corridors
Development	• Identify specific TSMO Initiatives (Chapter 6) that pertain to the project area of interest, and identify affected agencies • Initiate discussion among affected agency partners to address TSMO objectives within the scope of the project • Identify infrastructure coordination and sharing opportunities
Funding	• Identify funding opportunities drawing from the range of affected parties and project objectives • Evaluate tradeoffs/synergies between TSMO and traditional capital infrastructure investments • Incorporate TSMO and ITS components into projects to strengthen grant applications and project scoring
Implementation	• Work with partner agencies to refine the project requirements and Concept of Operations • Coordinate with corridor improvement and reconstruction projects to implement ITS and/or provisions for future devices


Hamlin
Clarkson
Greece
Parma
Ontario
Webster
Irondequoit
Brockport
Spencerport
Sweden
Ogden
Rochester
Penfield
Walworth
Gates
Brighton
East Rochester
Churchville
Riga
Chili
Pittsford
Fairport
Macedon
Henrietta
Perinton
EXIT 46
Scottsville
Wheatland
Rush
Victor
EXIT 45
Farmington
Mendon
Caledonia
Honeoye Falls
Avon
Lima
East Bloomfield
West Bloomfield
Bloomfield
Canandaigua
Canandaigua
To Darien Center and Batavia
To Groveland
Central Ave.
Inner Loop
Broad St.
Brown St.
State St.
St. Paul St.
Clinton Ave.
Chestnut St.
E. Main St.
University Ave.
W. Main St.
South Ave.
Court St.
East Ave.
Union St.
Alexander St.
Monroe Ave.
City Center
0 0.2 mi 0.4 mi
SCALE
Perry Rd.
Avels Rd.
E. Groveland Rd.
Mt. Morris
0 .4 mi 10 mi
SCALE
Groveland
Oakfield
Akron
Indian Falls
Batavia
Corfu
Darien Lake
Alden
Darien Center
Alexander
0 .5 mi 1 mi
SCALE
Darien Center
West Main St.
Batavia
0 2 mi 5 mi
SCALE
Batavia
Legend
Geographic Area of Interest - Group 1
Existing and Programmed Corridors - Group 1
Geographic Area of Interest - Group 2
Proposed Corridors - Group 2
RTOC
Regional Traffic Operations Center
EOC
Emergency Operations Center
BUS
Transit Operations Center
0 1 mi 2 mi 3 mi 4 mi 5 mi
SCALE
GTC
50 West Main Street, Suite 8112
Rochester, NY 14614-1227
(585) 232-6240
www.gtcmpo.org
INTELLIGENT TRANSPORTATION SYSTEMS (ITS) STRATEGIC PLAN UPDATE
Ten Year ITS Strategy
SHEET NO. 5
SCALE AS SHOWN
DATE 2/10

Section 8: Recommendations for Regional Transportation System Management and Operations (TSMO) Coordination

Overview

This section provides a summary of recommended initiatives to promote and advance cooperation of Transportation System Management and Operations on a regional level within the spirit of cooperation that has helped Greater Rochester achieve the current level of coordinated operations seen today.

The following recommendations are regional and cross-cutting in nature and are intended to complement the Future Systems Management and Operations Initiatives that are mode-or function-specific and which are presented in detail in Section 6.

The following initiatives may be undertaken by one or a few lead agencies on behalf of the region, addressed through the regional planning process, or pursued through the efforts of the Transportation Management Committee as appropriate and desired by agencies in the region.

Benefits of Regional Coordination

As stated in the introduction to this plan, there are many advantages, operationally and financially, to a coordinated approach to ITS planning, deployment, and operations in the region. Specific benefits include:

- More integrated ITS projects and systems that address the complex, multimodal transportation needs faced by the region and its “total transportation system.”
- Increased functionality of ITS systems that provide value in response to multiple needs simultaneously.
- More cost-effective investment through sharing of infrastructure and systems by multiple agencies.
- Increased opportunities for cost sharing among participating agencies.
- Improved competitiveness for discretionary and emerging funding opportunities that require interagency or multimodal coordination.
- Improved coordination and integration of ITS investments into the multimodal regional transportation planning process.
- Consistency with the New York Statewide ITS Architecture and the USDOT National ITS Architecture, which envision connected, multimodal systems within the region and across the state.

Recommended Regional Coordination Initiatives

Many of the Future Systems Management and Operations Initiatives outlined in this plan will require sustained cooperation on many levels to ensure their successful and implementation. These include:

- Interagency Coordination through the Transportation Management Committee (TMC)
- Mainstream ITS into the Regional Planning and Project Development Process
- Articulate Regional Concepts for Transportation Operations (RCTOs)
- Formalize Interagency Agreements
- Implement Regional Data Management
- Implement Performance Measures that Capture System Management Needs and Benefits
- Manage Communications Infrastructure at a Regional Level
- Foster Resource Sharing and Knowledge Transfer among Agencies
- Support Advocacy and Awareness of ITS and TSMO Benefits to the Region

Interagency Coordination through the Transportation Management Committee (TMC)

The Transportation Management Committee, or TMC, should continue to play a central role in regional ITS and TSMO coordination as an ad hoc body consisting of representatives of agencies that plan, design, operate, and fund Intelligent Transportation Systems Infrastructure in the region.

As a nationally-recognized example of best practice in regional ITS collaboration, the TMC provides a forum for a variety of interagency dialogue and problem solving, including most of the recommended coordination initiatives described in this section.

Recommendation: Continue to support the Transportation Management Committee as an ad hoc, multi-agency, and voluntary forum to address regional ITS and TSMO coordination issues in the greater Rochester Region

TMC activities should include but not be limited to: operations reviews; project and strategic planning; operations reviews/debriefs; training; outreach and advocacy; and seeking new and sustainable funding sources.

Adjust and adapt the scope and mandate of the TMC's activities to reflect the evolving coordination needs.

Mainstream ITS into the Regional Planning, Project Development, and Investment Decision-Making Processes

TSMO, and the ITS technologies that enable many TSMO strategies, can have direct and cost-effective benefits in addressing the key transportation needs of the region. Particularly in the case of non-recurring congestion or corridors that are constrained by physical or other factors, ITS and TSMO offers alternatives or complements to conventional transportation investments and therefore should be incorporated consistently within the transportation planning process and the allocation of transportation funding.

Recommendation: Further Integrate ITS and Transportation System Management and Operations strategies and projects in the regional transportation planning process, as stipulated in the Policies and Actions of the GTC Long Range Transportation Plan and TIP project selection priorities.

Articulate Regional Concepts for Transportation Operations (RCTOs)

The increased complexity of operational strategies at the regional level requires coordination of resources, personnel, and systems across the region. Incident and special events management are two examples where agencies in the region have recognized and reaped the benefits of pre-planning and implementing coordinated response plans in a coordinated, interagency, and intermodal fashion.

Future System Management and Operations Initiatives, such as transit signal priority, parking management for special events, and integrated corridor management will deepen technological and institutional linkages among agencies even deeper that they are today.

On the national level, the idea of Regional Concepts for Transportation Operations, or RCTOs, has emerged as a tool for articulating and documenting the institutional agreements and operating plans that underscore successful ITS coordination and implementation of a system management strategy on a regional level.

According to USDOT, a Regional Concept for Transportation Operations is “derived through sustained collaboration among stakeholders….and contains the shared regional objective for transportation operations and what is needed to achieve that objective – specifically physical improvements, relationships and procedures, and resource arrangements.”

System Management Areas where development of a Regional Concept of Transportation Operations may include, but are not limited to: Expressway Management, Arterial Management, Incident and Emergency Management, Integrated Corridor Management,

Construction/Special Event Management, Traveler Information, and Winter Maintenance.
GTC, in its role as the regional coordinator of Transportation System Management and Operations, is well suited to spearhead the development of these multi-agency RCTOs, in close cooperation with transportation operating agencies.

Recommendation: Develop, document, and maintain Regional Concepts for Transportation Operations for key elements of the regional TSMO program in Greater Rochester.

Formalize Interagency Agreements

Interagency coordination for ITS implementation, including cost and infrastructure sharing, has traditionally been accomplished through informal or 'handshake' agreements in the Greater Rochester region.

While this approach is a testament to the quality of the working relationships in the region, the increased complexity, scale, and fiscal implications of infrastructure sharing, technological, technical/data standards, and operational procedures can expose participating agencies to unnecessary risks due to changes in personnel or agency policy over time.

It is recommended that obligations and expectations for interagency participation in ITS be documented through signed memoranda of understanding in the future.

Recommendation: Initiate a practice of developing and executing written interagency memoranda of understanding among agencies involved in interagency ITS planning, funding, operations, and maintenance.

Implement Regional Data Management

Many ITS systems generate voluminous data in the course of operations. However, it is only when this data is collected, stored and analyzed that it reveals useful information for performance measurement, system planning, design, and/or before-and-after studies, to name a few applications.

Data generated from ITS systems, and potentially through emerging Intellidrive vehicle infrastructure in the future, can be harnessed for a variety of operational and planning purposes if it is adequately preserved and accessible to users from multiple agencies. There are several examples from around the United States of regional, multi-agency data archives that are being leveraged for these purposes.

The region should consider the future benefits of a regional data management and archiving program to take advantage of ITS data. This infrastructure can begin with simple periodic snapshot of data and build

to a more complete repository over time as the need and analytical capabilities of member agencies increases.

Future federal direction in transportation system performance measurement and data reporting may provide guidance as to the requirements of this regional data management infrastructure.

Recommendation: Plan for development and implementation of a regional data management infrastructure, including a regional data archive to support planning and engineering analysis of ITS systems, such as before-and—after studies and other performance metrics.

Implement a regional real-time third-party information portal to support data exchange with private Information Service Providers (ISPs) and potentially other statewide ITS systems that can draw upon operations data generated by regional agencies.

Implement Performance Measures that Capture System Management Needs and Benefits

As noted previously in this report, measures of the benefits of TSMO investments have typically been difficult to capture, due to the complex nature of activities such as incident management and the nature of non-recurring congestion. However, performance measurement is important from an accountability perspective and in response to the need to demonstrate the efficacy of ITS and TSMO programs against broadly-recognized regional transportation needs.

Measures of travel reliability are emerging as one of the more direct yet simple measures of the effectiveness of transportation system management and operations. The region should implement a reliability measurement, using existing data if possible, as well as other mode or function-specific measures that allow for benchmarking of ITS and TSMO initiatives and investments.

With the implementation of data archiving capabilities, either at the regional or agency level, additional, more complete measures of travel time reliability and total transportation system performance may be derived. Such data can elevate the region's overall ability to better evaluate a broad array of transportation system performance measures.

Recommendation: Advance the regional performance monitoring program to capture the benefits of ITS and TSMO investments.

Manage Communications Infrastructure on a Regional Level

Additionally, many regional fiber sharing arrangements currently occur through 'handshake' agreements among participating agencies, which

exposes ITS system functionality to changes in the network, personnel, and/or policies.

Informal management of communications limits efficient evaluation, management, and cost sharing potential of regional communications infrastructure.

Recommendation: Implement a regional communications infrastructure master planning and inventory process to document existing capacity and current use.

Implement an ongoing process for management and documentation of future communications-sharing arrangements through formalized agreements or an interagency 'permit' process.

Foster Resource Sharing and Knowledge Transfer among Agencies

It is both a requirement of increasing technological complexity, as well as a benefit of regional collaboration, that sharing of resources, skills, and personnel should be a part of an effective regional TSMO program.

A concrete example is cross-training of MCDOT and NYSDOT operations personnel in the Regional Traffic Operations Center so that staff of one agency each can perform certain job functions of the other agency during major events, off hours, or staffing shortages.

The concept of skill and resource sharing can extend to other areas as well, including maintenance technicians (signals, communications, etc.) incident response teams (e.g. HELP patrols and State, County or Local Police), or other supporting functions. For example, NYSDOT has made recent advances in the use of wireless technology for ITS communications that can be shared with the MCDOT staff.

The TMC can also facilitate knowledge sharing among peers through hands-on training, course sponsorship, incident debriefs, and operations exercises to ensure ongoing peer-to-peer learning, both within the region and with respect to lessons from other regions around the country.

Recommendation: Cross-train operations and maintenance staff to provide complementary support to reinforce regional capacity to implement TSMO practices and operate ITS infrastructure.

Identify and develop formal and informal training opportunities to increase the technical and professional knowledge base within the region's operations community.

Support Advocacy and Awareness of ITS and TSMO Benefits to the Region

In an increasingly complex transportation environment and an increasingly competitive funding arena for transportation investment, it is more important than ever for transportation policy makers, transportation professionals, elected officials, and the general public to understand and

see proof of the efficacy of public investment in ITS infrastructure and ongoing TSMO programs.

Even within agencies that participate in operations day-to-day, other departments or decision makers may be only vaguely aware of ITS and TSMO activities and benefits, if at all.

Compared to the era of the IMAGE Report, ITS funding is evolving away from the "laboratory" setting of demonstration projects and dedicated funding streams to a more open structure whereby these investments must compete fairly with other needs, such as infrastructure preservation.

In order to ensure a sustainable and adequate funding level for ITS and TSMO in Greater Rochester, it is imperative that audiences beyond the transportation operations community understand:

- The relationship of TSMO programs to broadly-recognized regional transportation issues;
- Successful examples of ITS and TSMO at work *today i*n the region;
- Quantified benefits and performance measures to support operations claims;
- An articulation of the needs and expected future benefits of ITS and TSMO investment that the region is asked to fund.

Recommendation: Undertake activities to promote awareness and understanding of ITS and TSMO benefits and needs at the policy maker level, within the broader transportation community, among the general public, and within all departments and levels of the region's operating agencies.