STRATEGIC PLAN
FOR THE
METROPOLITAN WASHINGTON
MANAGEMENT, OPERATIONS, AND
INTELLIGENT TRANSPORTATION SYSTEMS
(MOITS) PLANNING PROGRAM

DRAFT

National Capital Region Transportation Planning Board
Metropolitan Washington Council of Governments

Draft 1.4

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[Acknowledgements section to be added.]

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1. INTRODUCTION

This document presents the Strategic Plan for the Management, Operations, and Intelligent Transportation Systems (MOITS) Technical Subcommittee and program of the National Capital Region Transportation Planning Board (TPB), for improving regional transportation services in the Metropolitan Washington Region in support of the Transportation Planning Board's (TPB) regional goals and objectives. This Strategic Plan shall be used to describe the plan for regional management, operations, and use of technology for transportation systems, define, develop, and advocate for funding to implement regional projects, and to advise member agencies on management, operations, and transportation technology deployments for meeting common regional goals and objective.

This Strategic Plan presents the background of MOITS; the planned regional strategic direction organized around nine technical emphasis areas; best practices for consideration by member agencies in developing and delivering regional transportation systems and services; methods and metrics for program assessment and support; and the planned future direction for regional transportation activities divided into a short term, mid-term and long term time frame.

2. BACKGROUND

The Management, Operations, and Intelligent Transportation Systems (MOITS) Technical Subcommittee is an advisory subcommittee of the National Capital Region Transportation Planning Board (TPB). The TPB is the federally designated Metropolitan Planning Organization (MPO) for the region, and plays an important role as the regional forum for transportation planning. The TPB prepares plans and programs that the federal government must approve in order for federal-aid transportation funds to flow to the Washington region. MOITS Technical Subcommittee helps ensure that the regional transportation plans include and reflect operations and technology issues.

TPB's metropolitan planning activities are described in the federally-mandated annual Unified Planning Work Program (UPWP) for the region, listing the tasks and program areas that will be addressed in a given year's work activities. The TPB UPWP includes a task for "MOITS Planning", also referred to in this document as the MOITS program. Note that a reference to "MOITS" may refer either to the committee, or to the program, or both.

This section provides an overview of MOITS roles and responsibilities, how they evolved over time, and the relationship of MOITS missions and programs to other stakeholders and groups in the region. The specific roles, responsibilities and relationships of these partners and how their activities are related are also described.

2.1 Mission and History of MOITS

2.1.1. TRANSPORTATION PLANNING BOARD CONTEXT OF MOITS

The National Capital Region Transportation Planning Board (TPB) is the federally designated Metropolitan Planning Organization (MPO) for the Washington region, and plays an important role as the regional forum for transportation planning. The TPB prepares plans and programs that

the federal government must approve in order for federal-aid transportation funds to flow to the Washington region. The TPB is hosted at the Metropolitan Washington Council of Governments (COG), which also provides staffing and administrative support (COG/TPB staff) to the TPB.

The TPB is advised by a number of task forces, committees, and subcommittees. Two groups focus on transportation systems management, operations and technology, the Management Operations and Intelligent Transportation Systems (MOITS) Policy Task Force and the MOITS Technical Subcommittee.

TPB and MOITS members include representatives from state, county, local, and transit agencies located in the jurisdictions shown on the map below.

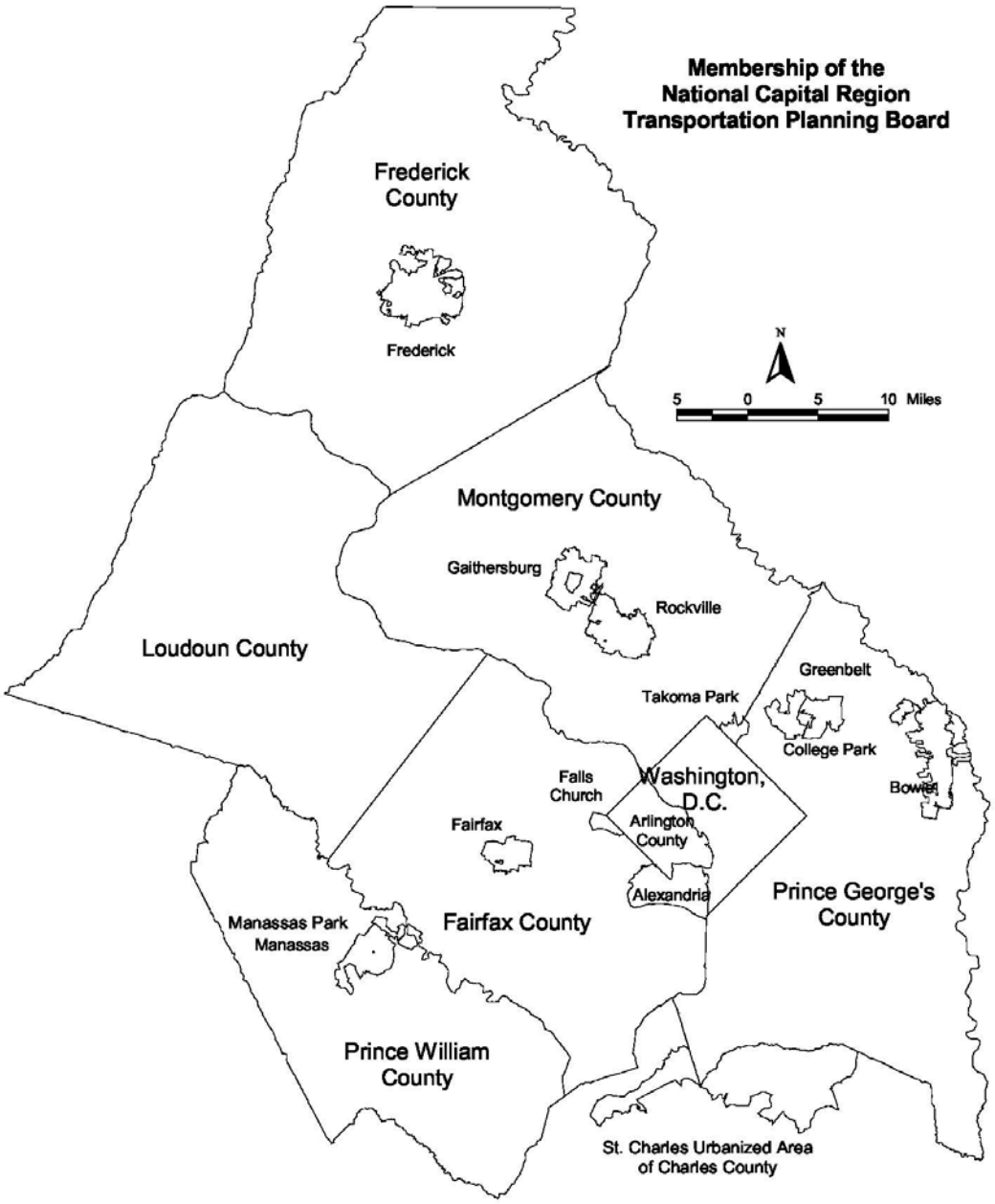

Figure 1: Map Illustrating the Jurisdictions of Members of the TPB

2.1.2. HISTORY

What are now the MOITS Policy Task Force and MOITS Technical Subcommittees began in 1997 as the TPB's Intelligent Transportation Systems (ITS) Task Force. In 2000, separate MOITS Policy and MOITS Technical Task Forces were formed to better accommodate the interest of the TPB in ITS policy issues. In 2001, the scope of the task forces was broadened from just ITS technology to include transportation management and operations, and the names were changed to the MOITS Task Forces.

In the aftermath of the 9/11 attacks, MOITS also played a temporary role as a regional emergency transportation preparedness committee. In 2006, a separate emergency transportation committee, the Regional Emergency Support Function 1 (RESF-1) Committee, was established, and MOITS returned primarily to the non-emergency activities it undertook pre-9/11. MOITS and RESF-1 work closely together on areas of mutual interest. For more information, see Section 2.6.

In 2007, there was a further reorganization to convert the MOITS Technical Task Force into a permanent standing MOITS Technical Subcommittee, reporting to the TPB, as do other TPB subcommittees, through the main TPB Technical Committee. Though the reporting chains of the two MOITS groups are somewhat different, they generally meet jointly because of their shared interests.

2.1.3. COMMITTEE ORGANIZATION

See Figure 2 for the general organization chart of the committees under the TPB. The MOITS Policy Task Force is appointed by and reports directly to the TPB. The MOITS Technical Subcommittee is a subcommittee of the TPB Technical Committee; the TPB Technical Committee in turn provides the main conduit of technical advice to the TPB on the breadth of topic areas covered in TPB metropolitan transportation planning activities. The MOITS Technical Subcommittee coordinates with its sister committees under the TPB as necessary.

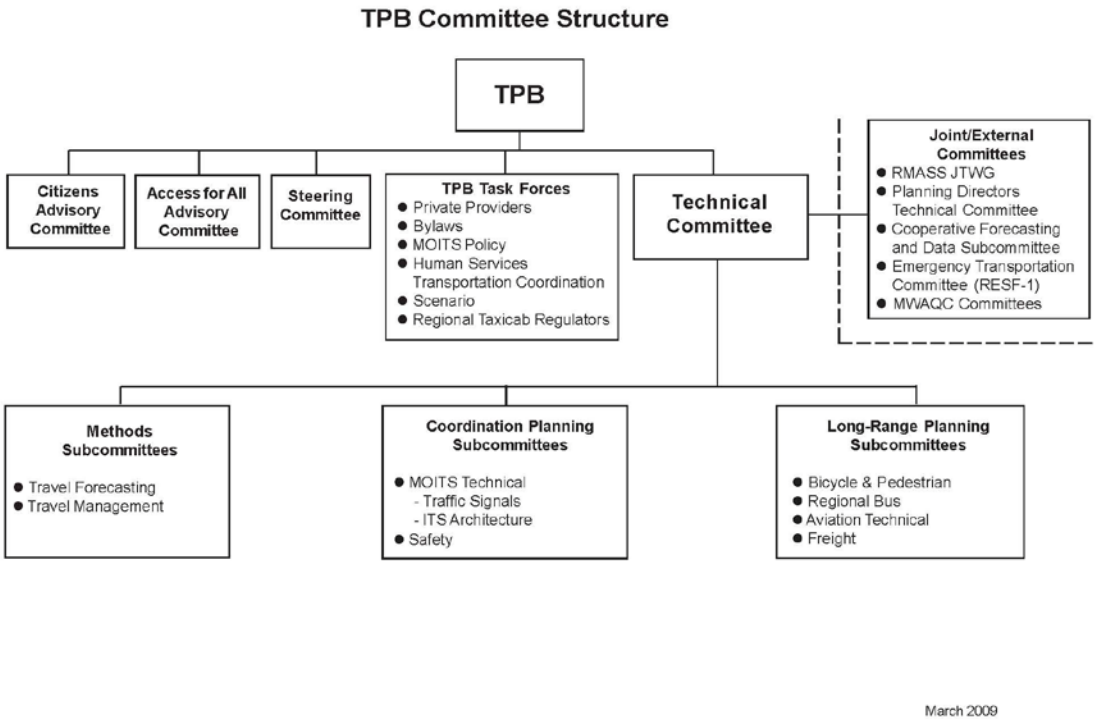

Figure 2: Organization Chart for TPB Committees

2.1.4. MISSION STATEMENTS

MOITS Policy Task Force: The MOITS Policy Task Force is appointed by the TPB to examine regional policy issues in the transportation management, operations, and technology areas.

The missions of the TPB Management, Operations, and ITS Policy Task Force are:

- To advise the TPB on policy matters of the management and operations of the region's transportation system, and on policy matters of ITS.
- To identify, develop, and build consensus on policies regarding the management and operations of the region's transportation system, and regarding ITS, recognizing individual state, local, and operating agency authority.
- To provide policy direction to the TPB Management, Operations, and ITS Technical Task Force.

The goals of the TPB Management, Operations, and ITS Policy Task Force are:

- To foster mutually beneficial policy coordination and consensus among TPB member agencies on the management and operations of the region's transportation system, and on ITS.

- To help ensure consideration in the region of projects and strategies that will promote efficient systems management and operation.
- To help further the goals, objectives, and strategies of the TPB Vision in the management and operations of the region's transportation system, and in the region's ITS activities.

MOITS Technical Subcommittee: The current mission statement has been updated in conjunction with this Strategic Plan, replacing the last version adopted in March 2001. The missions of the MOITS Technical Subcommittee are:

- To advise the TPB, the TPB Management, Operations, and ITS Policy Task Force, the TPB Technical Committee, and other TPB subcommittees on technical matters of the management and operations of the region's transportation system, and on ITS.
- To provide a forum for advice, information sharing, and coordination among TPB member agencies, implementers of ITS projects, and other interested parties regarding technical aspects of the management and operations of the region's transportation system, and regarding ITS.
- To provide technical guidance to particular transportation management, operations, or ITS projects as necessary.

Historically, the mission statement has provided the guidance needed for MOITS in its planning. The current update addresses related activities that have arisen since 2001, including the Regional Emergency Support Function (1) Transportation Committee and the Metropolitan Area Transportation Operations Coordination (MATOC) Program (see Section 2.6).

2.2 National State of the Practice

Strategic Planning for ITS is most often incorporated into the efforts to develop regional architectures and consider the broader practices of how the technologies will be deployed on a wide scale in a manner such that the various technologies can integrate together over time. Transportation agencies often develop strategic plans that link transportation services to an ITS or Enterprise Architectures and then to specific planned projects. Many of these strategic plans follow a systems engineering process and take advantage of using functional requirements to describe how a technical system should operate without specifying or committing to a particular technology. These practices have meet with increased success in deploying new technical systems for transportation while lowering the cost and increasing the reliability of those systems.

Planning for Operations

The national state of the practice continues to evolve in expanding operations planning as a part of the transportation planning process. The U.S. Department of Transportation has promoted a number of MOITS-related activities under the umbrella of its “Planning for Operations” effort, encouraging states and regions to be active in this area. This provides the context of guidance for MOITS activities, as well as the context of potential future federal funding under the successor legislation to SAFETEA-LU.

What Is Planning for Operations? According to the U.S.DOT’s www.plan4operations.dot.gov web site:

Planning for Operations is a joint effort between operations and planning that encompasses the important institutional underpinnings needed for effective Regional Transportation Systems Management and Operations. Planning for Operations includes three important aspects:

1. *Regional transportation operations collaboration and coordination activity that facilitates Regional Transportation Systems Management and Operations,*
2. *Management and operations considerations within the context of the ongoing regional transportation planning and investment process, and*
3. *The opportunities for linkage between regional operations collaboration and regional planning.*

The federal Planning for Operations effort delves into a number of the topic areas that are covered in this MOITS Strategic Plan, including the Congestion Management Process (see Section 2.4.4), ITS Architecture (see Section 2.5), freeway and arterial management, and traveler information. Federal guidance under the Planning for Operations effort has provided significant guidance and direction to this plan.

Air Quality and Travel Efficiency

The national state of the practice is also evolving to better address air quality when planning management, operations, and intelligent transportation systems. Nationally, transportation activities have been tied in part to the need to reduce air pollution, notably under the Clear Air Act (1990). Under federal laws and regulations, transportation planning in the Washington region is heavily influenced by air quality planning. The region's long-range plan, the CLRP, must undergo an air quality analysis to ensure that the projects in the plan, when considered collectively, contribute to the air quality improvement goals embodied in the Clean Air Act. A series of tests are performed with computer models that predict how much air pollution will be generated over the next 25 years by facilities in the plan, and how much the air will be improved by cleaner gasoline standards and many other factors.

In order to meet air quality standards, the region may adopt into the CLRP Transportation Emission Reduction Measures (TERMs), such as ridesharing and telecommuting programs, improved transit and bicycling facilities, clean fuel vehicle programs or other possible actions. Management, operations, and technology activities can make good TERMs.

The Clear Air Act focused on pollutants often associated with metropolitan areas, including carbon monoxide (CO) and oxides of nitrogen (NOx). In recent years, there has also been an emerging focus on the threat of greenhouse gases, notable carbon dioxide (CO2). Preliminary analysis by TPB staff under a "What Would It Take" scenario undertaken specifically for greenhouse gas planning [insert endnote], has shown that management, operations, and technology activities are promising in contributions to reducing greenhouse gases. Such strategies would be undertaken as part of range of activities, and undertaken for a combination of air quality and congestion management reasons. Overall, this is a topic area that the MOITS committees should continue to monitor for potential contributions that management, operations, and technology could make.

Strategic Planning for ITS is most often incorporated into the efforts to develop regional architectures and consider the broader practices of how the technologies will be deployed on a wide scale in a manner such that the various technologies can integrate together over time.

2.3 Strategic Plan Development Process

The development of the strategic plan followed a systems engineering methodology using spiral (or iterative) development.

The MOITS Technical Committee identified the nine technical emphasis areas for regional activities. COG/TPB led a procurement effort to obtain consulting services for the development of the Strategic Plan and selected the team of Trichord, Inc. with support for Trevilon, Inc. and Daniel Consultants, Inc. COG/TPB staff and the consultant team worked closely together in performing tasks to collate existing information on regional activities, stakeholder activities, and their current status; developing and outline for the Strategic Plan, and working with the Strategic Plan Advisory Group to develop the details of the Strategic Plan.

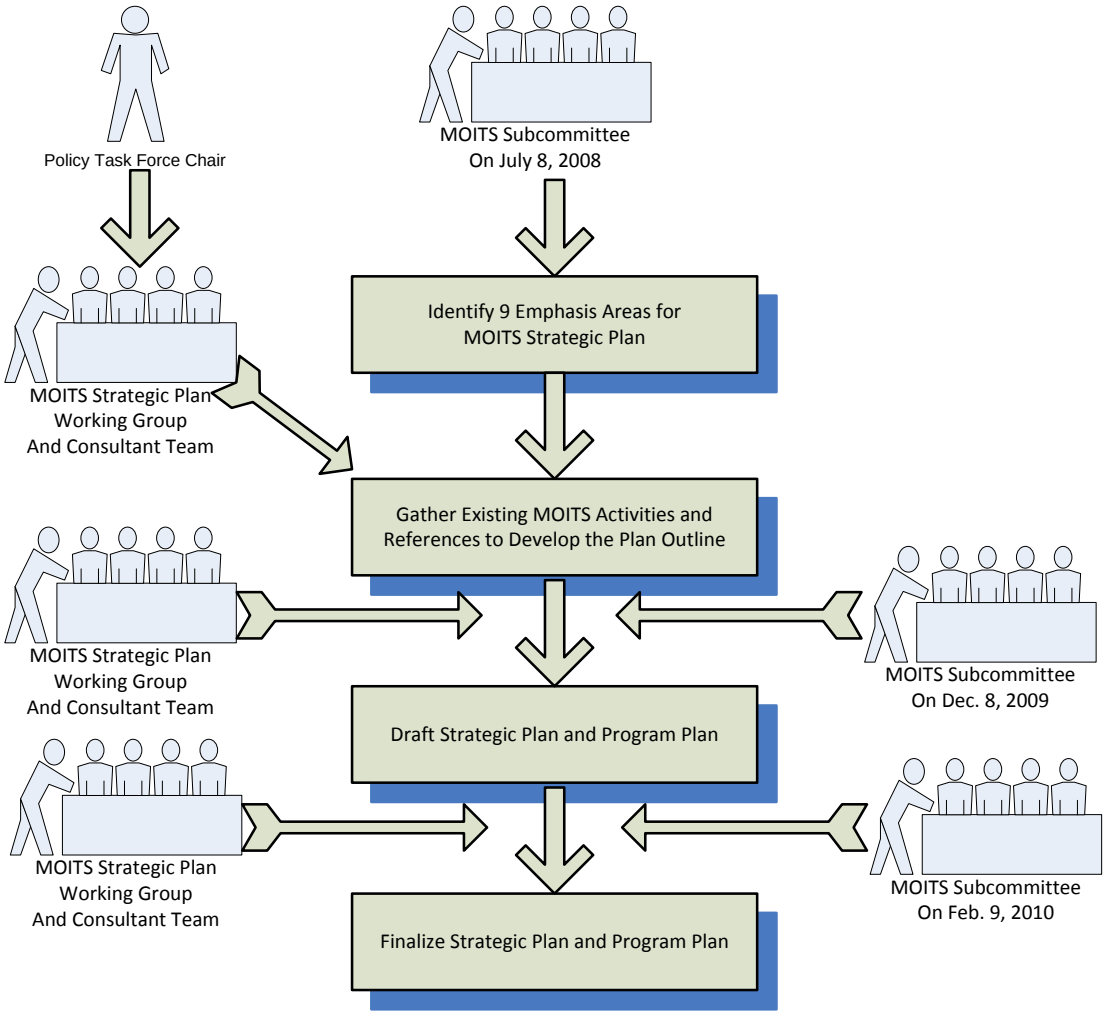

Figure 3: MOITS Strategic Plan Development Process

Figure 3 illustrates the process followed in the development of this Strategic Plan. The result of the work is this MOITS Strategic Plan and an associated Draft Regional Program Plan.

The Strategic Plan is a living document. As new systems and services are implemented, the planned direction for additional work will evolve. The Strategic Plan process should be repeated and updated every three years to assure that the most recent advances in regional transportation services and systems are correctly documented.

2.4 Review of Related State, Regional, and Local Efforts

This section highlights some of the state and local efforts and programs that support or contribute to maintaining and improving Regional Operations undertaken by individual state and local entities in the region that are related to current programs or may support emphasis areas identified by MOITS in this strategic plan.

The efforts identified below include technical projects and programs, as well as non-technical effort that focused on stakeholder involvement, technology transfer, and information sharing.

2.4.1. DISTRICT OF COLUMBIA

CapTOP

The District of Columbia Department of Transportation (DDOT) is developing a next-generation software application called the Capital Traffic Operation Platform (CapTOP) to support the daily operations needs of the Traffic Management Center (TMC). A fully-developed CapTOP will encompass all needs and requirements of DDOT's Advanced Traffic Management System (ATMS).

The District Department of Transportation (DDOT) Traffic Management Center (TMC) plays a critical role in managing the traffic and mitigating the adverse impacts of incidents and special events on the District's transportation system. The new CapTOP system is the core of the Advanced Traffic Management System (ATMS). As envisioned by DDOT, CapTOP will evolve into a system to provide centralized management of traffic management activities, including management and operation of ITS devices, and traffic management for planned and unplanned incidents and events that impact transportation in the District. CapTOP will facilitate the exchange of transportation-related information across a variety of agencies within the region, and provide an integrated interface to a number of traffic-management related systems. DDOT commissioned the development of operational and functional requirements documents to form the basis for the detailed design and implementation of the CapTOP.

DC ITS Architecture

The District of Columbia has initiated development of an ITS Architecture. A summary of proceedings from a 2-day workshop is expected in early 2010.

[To be expanded.]

2.4.2. MARYLAND

CHART

The Coordinated Highways Action Response Team (CHART) is Maryland's highway operations element for the state's Intelligent Transportation Systems (ITS) program. The program is a joint effort of the Maryland Department of Transportation (MDOT), Maryland State Highway Administration (MDSHA), Maryland Transportation Authority (MdTA), and the Maryland State Police (MSP), in cooperation with federal, other state, and local agencies.

- **The 2008 CHART Non-constrained Deployment Plan (NCDP),** updated every two years, is intended to depict an ideal perspective of how CHART should be operating several years in the future without applying functional, budgetary, political, or time constraints. It provides a framework for tracking the latest technologies and operational applications available to the CHART Program. The NCDP has been a valuable tool for identifying projects within the MDOT Consolidated Transportation Program
- **CHART System Business Area Architecture (BAA) document** defines the current and future CHART system operational vision. This includes: business processes for relationships to organizations, technology, and facilities; defined, distributed, and integrated applications and data entities across platforms and locations; a system architecture at the conceptual level for technical infrastructure; and scheduled releases within the business change program.
- **CHART M&O Rural Strategic Deployment Plan** was developed to define the Management and Operations/ITS Planning and Development needs of rural Maryland that would lead to reduced seasonal highway congestion, better information to motorists concerning evacuation and emergency procedures, and, improved communication with other parts of the State and neighboring regions. This Plan focuses on strategies to support weather, evacuation, seasonal/everyday traffic, special events, and safety issues within the rural parts of Maryland.
- **511.** The Maryland DOT and Maryland State Highway Administration have issued an RFP and received proposals for the development of a state-wide 511 system in Maryland. The current expectation is that the resulting MD511 system will potentially be running by the summer of 2010. That system is intended to interface with other 511 systems in the region, including VA 511 and any potential DC 511.

Prince George's County TRIP Center

The Prince George's County Traffic Response and Information Partnership (TRIP) Center was established to effectively manage the operations of the county's transportation system. The Center provides Department of Public Works and Transportation (DPW&T) personnel with enhanced capability to monitor and control transportation operations by collecting and analyzing traffic data, as well as disseminating relevant transportation information to the general public, transportation providers, emergency service providers, public schools and area businesses.

The TRIP Center uses a proprietary state-of-the-art multiple architectural system to manage the county's traffic signal system. This system allows staff to install, manage and support traffic signaling devices, Portable Dynamic Message Signs (DMS), Temperature Probes and Speed Awareness Radar Trailers throughout the county. TRIP Center staff monitors activity on county

roadways on a real-time basis. Staff can make adjustments when needed, respond to unexpected traffic patterns or incidents and provide up-to-the-minute information to various users so that operational agencies can help travelers adjust their routes and use of transit and/or para-transit systems to current road conditions.

Montgomery County ATMS

The Montgomery County Traffic Management Center (TMC) represents systems and personnel involved in roadway maintenance and construction, traffic control, snow removal, and other traffic engineering services within the County. Specific ITS program operations include the advanced traffic response system, traffic signal control system, camera video surveillance system, traveler advisory radio system, GPS technology for vehicle based tracking, a fiber optic based communication system, and other systems within Montgomery County.

TMC staff monitor and have the ability to modify traffic signal timing in response to local operational conditions, including incidents. The TMC has a CHART workstation, and shares data through RITIS. Montgomery County operates an aerial traffic surveillance plane (MC-10) to identify traffic problems while monitoring several radio frequencies (air traffic reporters, County Police, Fire & Rescue, Maryland State highway Administration and MSP). Service patrols operate on arterial roadways in Montgomery County. Montgomery County DOT has developed a web interface to the County's ATMS VIDEO MONITORING SYSTEM that allows the public to view our traffic monitoring cameras.

The Montgomery County TMC is co-located with Montgomery county emergency management operations. The county has an incident management team, which combines the capabilities of the Advanced Traffic Management System (including the Transportation Management Center) with police, fire and rescue, environmental protection and transportation agencies. The team meets on a regular basis to discuss and implement improvements to the County's incident management program.

The County's TMC maintains a close working relationship with the SHA (through the SOC and TOC 3), State and County police, fire departments, VDOT, and the Statewide Incident Management (SIM). In addition, Montgomery County participates in the I-95 Corridor Coalition Information Exchange Network (IEN). There are IEN nodes at the SOC and Montgomery County TMC through which these agencies can exchange data to other members of the Coalition.

Maryland Transportation Operations Summit

The first Maryland Transportation Operations Summit, held on May 1, 2009, allowed participants to engage in an open dialog to explore opportunities for coordinating transportation operations among modes, jurisdictions and levels of government. The first-of-its-kind summit brought together Maryland state, regional and local transportation and public safety agencies to discuss current national perspectives on highway and transit operations; current status of highway and transit operations in Maryland; agency plans and visions for improving and mainstreaming operations in Maryland; and next steps for expanded and integrated agency efforts to enhance operations. Agency and other spokespersons from Maryland and Virginia offered assessments on state and national progress on an operations continuum. They shared their

respective plans for achieving agency operational visions. A 2nd summit was planned for 2010, but has been delayed because of budget concerns.

Regional Operations Coordination Committees

Baltimore and DC ROCC Planning Initiatives: the Baltimore and Washington, DC Regional Operation Coordination Committees (ROCCs) include representatives from agencies with a stake in transportation operations within their respective regions. [Note: though referred to as "DC ROCC", that group has convened Maryland agencies and focused on Suburban Maryland jurisdictions and issues.] The purpose of the ROCC is to identify multi-agency transportation coordination issues in the region, define projects and needed resources to address those issues, and to foster regional cooperation in transportation management. CHART has historically provided staff coordination and resources for projects originated in the ROCCs, primarily related to regional incident management initiatives.

2.4.3. VIRGINIA

The McDonnell Public Safety and Transportation Operations Center (MPSTOC)

The McConnell Public Safety and Transportation Operations Center (MPSTOC) is on West Ox Road at the Fairfax County Parkway, housing the Fairfax County Department of Public Safety Communications (9-1-1 Communication Center), the Office of Emergency Management and the county's Emergency Operations Center, along with the Virginia State Police Division 7 dispatchers and call-takers. MPSTOC is a nerve center of an integrated system of advanced technologies including computer software, traffic cameras, lane control strategies, ramp meters, reversible control gates, and HOV lane restrictions. From the MPSTOC, VDOT monitors and manages traffic, recognizes and responds to incidents, and instantly delivers information to motorists in using the newly deployed Advanced Transportation Management System (ATMS)m central software platform. VDOT MPSTOC is responsible for monitoring and managing traffic conditions on more than 100 miles of roads including I-495, I-95/395, and I-66.

Also located in MPSTOC is the VDOT Signal Operations. The Signal Center installs, monitors, controls and maintains over 1400 traffic signals in the three counties in Northern Virginia. VDOT NRO MPSTOC - Signal Center is able to manage traffic flow continuously, monitor the real-time signal status, collect traffic flow information, and adjust signal timing from a centralized traffic signal control system. VDOT NRO MPSTOC - Signal Center also operates signals in the three counties in Fredericksburg and in the process migrating those signals into the centralized system.

Virginia 511

Virginia has a 511 system that provides state-wide traveler information to users via a variety of media. It is envisioned as a "one-stop" resource of all the real-time information travelers need to make better travel decisions. The 511Virginia.org Web site includes information on all state-maintained highways, live camera fees, as well as links to information about transit options, trip planning, special events, work zones, and weather information. Users can also sign-up to receive personalized traffic alerts sent directly to the e-mail or mobile device. Users can design a personalized homepage and/or subscribe to automated alerts. The 511 telephone service is free of charge and available 24 hours a day.

Tysons Corner Traveler Information Displays

VDOT in partnership with Macerich deployed five 50" LCD monitors throughout the Tysons Corner Center Mall. The traveler information displays show real-time traffic conditions, images from traffic cameras, transit routes and schedules, travel options, and construction updates. The purpose of these monitors is to provide shoppers with information so they can make informed decisions about their trips. For example, after seeing real-time video images with congestion on I-495 or the longer than normal estimated travel time to the shopper's destination, a shopper may elect to stay at the mall longer rather than sitting in traffic or contribute more congestion to the roadway network. Additionally, the displays are being used to promote alternative transportation options for shoppers. The monitors displays bus schedules and maps as well as resources for starting carpools, vanpools, and teleworking. Finally, the displays provide up-to-date news on two major construction projects near the mall – Dulles Rail project and I-495 HOT Lanes project.

This project also utilized estimated travel time data from the I-95 Corridor Coalition's SafeTrip-21 Program and funded by VDOT in partnership with several regional multimodal stakeholders, including Macerich, Virginia Megaprojects, Dulles Rail project, Virginia Department of Rail and Public Transportation, Fairfax County DOT, WMATA, I-95 Corridor Coalition and Inrix, Arlington County, Loudoun County, and Prince William County.

VDOT Northern Regional Operations (NRO)

VDOT NRO was established in 2006 when VDOT consolidated the roadway operations divisions from the Commonwealth's nine transportation construction districts into five Regional Operations Directorates. NRO included all of the Northern Virginia District and parts of the Fredericksburg District. The shift to an operations culture represented a transition from traditional transportation management – which focused primarily on construction and maintenance – to one that included roadway operations a critical component to enhance mobility, increase safety and security, and improve highway operational performance.

VDOT Northern Regional Operations (NRO) Planning

VDOT NRO developed a unique methodology for planning and delivery of its Operations Program. The process unifies strategic and tactical planning, project development, investment analysis, budgeting, performance tracking, and evaluation of the program. In doing so, the process conforms to FHWA Rule 940, emphasizing the Systems Engineering Process, and ensuring sound investment decisions are made. This Planning and Program Delivery (PPD) process consists of five phases: Planning, Program Development, Fiscal Programming, Program Delivery, and Program Evaluation.

- Planning – The NRO Strategic Plan (November 2008) identified the vision, goals, objectives, and associated performance measures that NRO should address over the next 4 – 6 years as well as the strategies that the region plans to implement to achieve its goals and objectives. VDOT has been on the fore front of developing and using the ITS Architecture since 2000 (www.vdot-itsarch.com/). A recent update in 2009 expanded the architecture scope to include interfaces between non-VDOT systems (different from original VDOT-centric architecture) and new systems such as MPSTOC, HOT Lanes, and VDOT statewide systems such as 511 and VATraffic. Furthermore, NRO developed inter-related Master Plans for vehicle

detectors, CCTV, and DMS with priority ranking. The Master Plans lay the groundwork and provide a roadmap for systematic ITS device upgrades and expansions in NRO. While master concept of operations, high-level requirements, traceability matrices, and device location GIS database are the output of the Master Plan, it provides efficiency for the ITS device project development and NRO's readiness for deployment.

- Program Development – NRO utilizes multiple sources to identify project needs annually through Strategic Plan, Architecture, ITS Decision Support Tool (www.vdot-itsdst.com), and input from NRO staff and upper management. Regardless of a project's source, the project must be consistent with the aforementioned long-range plans, and mapped to goals and objectives in the Strategic Plan. NRO managers worked together in a workshop forum to prioritize goals and objectives from the Strategic Plan and in using a prioritization model developed by NRO planners all proposed projects will receive a ranking score. This ranking score and eligibility to various funding sources guide NRO's annual investment decision.
- Program Delivery – NRO developed several tools to assist project managers develop and deliver the funded ITS projects. One is the Rule 940 User's Guide and Checklist. This guide identifies the activities that need to be performed at difference phases during an ITS project and by whom to ensure the project conforms to Rule 940 and follows the Systems Engineering process. NRO's User's Guide has been cited as an example by FHWA to other States' attempting to conform to Rule 940. Another tool is the Concept of Operations Template which provides a standard format for developing a concept of operations. The template is based on the ANSI / AIAA standard (G-043+1992) and the IEEE standard (P1362 V3.2). Both tools can be downloaded from www.vdot-itsarch.com.

VDOT Performance Monitoring

The Virginia DOT has established a performance monitoring system to collect and present data on performance for safety, roadway condition (such as congestion, travel speeds on HOV lanes, and pavement condition), finance, project management, and other measures. Traffic incident management-related data are also collected. Public access to information is provided on-line on the DASHBOARD (http://dashboard.virginiadot.org/).

Virginia Department of Rail and Public Transit

The VDRPT developed an ITS Strategic plan that builds on the current extensive transit ITS deployment in Virginia to outline a coordinated approach to deploying transit ITS technologies across the state. The plan considers key technology that provide the means to automatically monitor and report on the performance of the transit service to validate improvements, and introduce remedial measures as appropriate. One example is CAD/AVL to track the real-time location of the transit vehicles, which in turn enables advanced traveler information via a variety of media such as web, phone and text as well as performance monitoring and data collection for enhanced planning activity. The associated in-vehicle technology and communications can be leveraged for other security and management applications such as passenger counters and on-board cameras. This plan considers opportunities for transit to contribute to a number of regional or state-wide initiatives which should be pursued with the cooperation of multiple transit and transportation stakeholders. These include participation in the statewide 511 program, provision of real time traveler information at key activity centers and on priority corridors, and the creation of low cost vehicle tracking and customer information solutions. There are also opportunities for

common wireless communications systems and open data access. The resulting cross-cutting and regional initiatives that should be pursued by DRPT in the short term are summarized in the plan.

The regional efforts identified below are recent or on-going efforts by COG/TPB and other entities that currently support or have the potential to support COG/TPB efforts associated with emphasis areas.

2.4.4 METROPOLITAN WASHINGTON REGION

2.4.4.1 MWCOG/TPB Projects

Regional ITS Architecture

TPB staff have developed and maintain the Metropolitan Washington Regional ITS Architecture (MWRITSA) for the Metropolitan Washington Region. The MWRITSA is a constantly evolving description of the region's systems, architecture flows, data flows, and interfaces. As regional projects are deployed, TPB staff updated the regional architecture to describe the relationship and interfaces between regional systems.

Section 2.6 describes the MWRITSA in more detail and how it relates to the MOITS Strategic Plan.

Congestion Management Process (CMP)

The Regional Congestion Management Process (CMP) is a federally required component of the metropolitan transportation planning process. The CMP is to address the systematic management of traffic congestion and provision of information on transportation system performance. The CMP includes information from regional Travel Monitoring programs addressing recurring congestion, as well as information on non-recurring congestion as examined in the Management, Operations, and Intelligent Transportation Systems (MOITS) program. Demand management strategies considered and implemented through the regional Commuter Connections Program are important CMP components. Systems management, operations, and engineering strategies are examined in conjunction with the MOITS program.

National Capital Region Financially Constrained Long-Range Transportation Plan (CLRP)

The Financially Constrained Long-Range Transportation Plan identifies all regionally significant transportation projects and programs that are planned in the Washington metropolitan area between 2009 and 2030. The projects and programs that go into the CLRP are developed cooperatively by governmental bodies and agencies represented on the National Capital Region Transportation Planning Board (TPB). [Combine the CLRP and TIP sections.]

TIP Transportation Improvement Plan(TIP)

The Transportation Improvement Program (TIP) is a 6-year financial program that describes the schedule for obligating federal funds to state and local projects. The TIP contains funding information for all modes of transportation including highways and HOV as well as transit capital

and operating costs. State, regional and local transportation agencies update the program each year to reflect priority projects in the CLRP.

Freight Planning Study

In 2007, TPB commissioned a regional freight planning study for the metropolitan area which examined the state of freight movement in the region, and identified ways to improve consideration of freight in the regional transportation planning process. The TPB is working to bolster the involvement of freight considerations and stakeholders in its processes, and coordinating with freight planning activities of the District of Columbia, Maryland, and Virginia Departments of Transportation. The TPB Freight Subcommittee was launched in April 2008 and now holds bi-monthly meetings.

Regional Emergency Coordination Plan SM

The RECP was developed by COG in partnership with local, state, federal, and private sector organizations to strengthen regional communication and coordination in the event of a regional incident, disaster, or emergency. At the heart of the RECP SM is a 24/7 communications capability, called the Regional Incident Communication and Coordination System (RICCS)SM. Local, state, and federal officials can be linked and share information within 30 minutes or less of an emergency. The RECPSM also establishes an incident tracking system, with information available on a secure Web site.

Regional Emergency Support Function (R-ESF) #5—Information and Planning facilitates the collection, processing, and dissemination of information among regional jurisdictions and organizations before, during, and after a regional incident or regional emergency. This function enhances substantive regional dialogue and communication by facilitating information sharing with all of the R-ESFs, and others, as necessary in an integrated and coordinated manner.

Performance of Regional High Occupancy Vehicle Facilities

During FY2008, COG/TPB staff prepared a report entitled, "2007 Performance of Regional High-Occupancy Vehicle Facilities on Interstate Highways in the Washington Region: An Analysis of Passenger and Vehicle Volumes." In the spring of FY2009, for the Central Employment Area Cordon Count, staff will collect all traffic data and will coordinate transit data collection among various transit providers in the region. The end product for this task will be data files ready to process in FY2010.

Regional Transportation Data Clearinghouse

This effort by COG/TPB staff recognizes that efficient access to a comprehensive data set containing current and historic data on the characteristics and performance of the region's transportation system is vitally important for transportation planning, air quality analysis, models development, congestion management and project evaluations. During 2009, the staff worked to expand formal arrangements with local, state, WMATA, and other regional agencies to transfer data to and from the Regional Transportation Data Clearinghouse, and updated Clearinghouse databases with FY 2007-FY 2008 highway and transit performance data, as they become available. This updated data will include AADT traffic volume estimates, hourly directional traffic volume and classification counts as well as transit ridership data received from

WMATA,PRTC, VRE, MTA and local transit agencies including Ride-On, The Bus, ART, , and the Fairfax Connector systems.

2.4.4.2 Major Regional Activities

The Regional Integrated Transportation Information System (RITIS)

The Regional Integrated Transportation Information System (RITIS) is an automated system that supports MATOC activities by compiling real-time traffic and transit data from agencies around the region; consolidating the data into a common format; and enabling the data to be shared with agencies, the media, and the public. RITIS was developed and is maintained by the Center for Advanced Transportation Technology Laboratory at the University of Maryland. It is an automated system that pushes and pulls real time transportation information throughout the region.

CapWIN

The Capital Wireless Information Net (CapWIN) is a regional coalition of public safety and transportation agencies across Maryland, Virginia, the District of Columbia, and the Federal Government whose mission is to enable and promote interoperable data communications, operational data access, and incident coordination and situational awareness across jurisdictions and disciplines. Currently the CapWIN Membership includes over 4,500 users drawn from 80 local, state, and federal agencies operating in Maryland, Virginia, and the District of Columbia. They represent law enforcement, transportation, fire/EMS, and emergency services. Users include members of large state agencies such as the Maryland State Police; small agencies such as the Police Department in Galax, Virginia; transportation agencies such as the District of Columbia Department of Transportation; and emergency response organizations such as the American Red Cross (National Capital Area). CapWIN users transmit more than 15,000 messages each day, both internally and across agencies.

CapWIN has implemented an operating system that delivers data to personnel in the field across disciplines and agency boundaries. It has created a set of software products and services that supports field operations of law enforcement, fire/EMS, and transportation agencies. The CapWIN Software Solution Suite is a set of Government Off-the-Shelf (GOTS) standards-based solutions that give users access to multiple data sources, (for example, law enforcement systems in the three states, Maryland drivers license photos, and regional transportation incident data). Two mobile client applications—one for laptops and one for handheld devices—support field access to law enforcement and other data sources, secure instant messaging, and incident coordination tools.

CapWIN's technical infrastructure was designed by a coalition of representatives from public safety and transportation agencies across Maryland, Virginia and the District of Columbia. Based on national data exchange standards, the CapWIN system uses standard web services components that can be easily adapted to evolving mobile communication technologies, and to the requirements for compatibility with legacy agency infrastructures.

CapWIN plays a significant role in transportation systems in the region because CapWIN shares data with RITIS.

MATOC

The Metropolitan Area Transportation Operations Coordination (MATOC) program is an effort undertaken by several agencies within the region to improve regional coordination for responding to transportation events and incidents. MATOC seeks to

- Addresses secondary transportation impacts of regional incidents as a first priority;
- Integrate with day-to-day transportation operations and systems at member TMCs;
- Indicate the status of the transportation system;
- Proactively filter and tailor information for the user;
- Disseminate traveler information with minimal delay;
- Act as a central data compilation and dissemination system;
- Ensure that SOPs and MOUs in place for regional incidents;
- Identify and use different procedures for different levels of incidents.

With MATOC in place, travelers in the Washington, DC, metropolitan area should experience safer, more reliable journeys on all modes of transportation. While congestion at the usual rush-hour bottlenecks will still be a fact of life, delays from incidents such as traffic accidents, construction, and disabled vehicles will be minimized through the use of traffic management and incident response strategies that are coordinated at the regional level. Travelers should also be able to obtain information on current travel conditions through an array of traveler information sources, allowing them to make better-informed travel decisions. Transportation agencies in the region can develop stronger working relationships and realize operational efficiencies from shared resources, equipment, and expertise. The region's air quality should be improved by a reduction in congested vehicle travel. In emergency situations, regional coordination and communication helps ensure that transportation networks continue to function, so that citizens can efficiently move away from or avoid danger.

SmarTrip (WMATA)

[To be developed.]

Regional Transit Activities

[To be developed.]

2.5 Relationship to Regional ITS Architecture Development

The Metropolitan Washington Regional ITS Architecture (MWRITSA) is a technical translation of a strategic plan vision, planned regional projects, and currently deployed technical systems. TPB staff maintains the Metropolitan Washington Regional ITS Architecture for the Metropolitan Washington Area. This architecture, developed prior to the development of the strategic plan, has influenced the development of the Strategic Plan by defining the goals,

objectives, major system components, and key interactions among regional stakeholders and systems.

The Regional ITS Architecture describes how regional entities relate to each other.

The MWRITSA is a framework for describing and developing integrated transportation systems technology. The Regional Architecture is intended to provide a regional ITS framework for the foreseeable future, to define and validate ITS operations of regional significance, and to address national and statewide conformity in accordance with federal law and guidance. The architecture aims to ensure knowledge of ITS operations across the region, encouraging appropriate systems integration and enhanced technical systems interoperability.

The MWRITSA is a constantly evolving description of the region's systems, architecture flows, data flows, and interfaces. The projects identified by this Strategic Plan and the associated Draft Regional Program Plan will likely result in refinements to the Regional Architecture as those projects are implemented.

This is a part of the natural evolution of any architecture or high-level planning document. The Architecture is useful in defining the overall vision for the region, but this vision is constantly revised based on real-world feedback received from the efforts to realize that vision.

The Regional ITS Architecture feeds input to the MOITS Strategic Plan

The MWRITSA identifies the Market Packages applied in the region based on the definitions in the National ITS Architecture. Market Packages are a convenient grouping of transportation system services defined within the National ITS Architecture. The MOITS Technical Committee revisited all Market Packages and prioritized strategic Market Packages for the region in a workshop on July 8, 2008. Workshop participants used the long list of 91 market packages to determine a short list of emphasis areas. The MOITS Technical Committee identified nine emphasis areas to move forward in this strategic plan.

- ITS Data Warehouse
- Multi-Modal Coordination
- Transit Signal Priority
- Interactive Traveler Information
- Transportation Operations Data Sharing
- HOV Lane Management
- Regional Traffic Management
- Regional Parking Management
- Maintenance and Construction Activity Coordination

The MOITS Strategic Plan refines the Regional ITS Architecture

The regional ITS architecture identifies general regional projects that are then defined with additional specificity in the strategic plan. Such information will refine the regional ITS architecture.

The MOITS Strategic Plan describes where we are going and how to get there

While the regional ITS architecture addresses the detail of interconnections and information flow among Metropolitan Washington Area systems and stakeholders, the strategic plan focuses on both a short and a long-range strategy for implementing ITS strategies in the region. It provides a road map for the region in the interest of maximizing the operations and efficiency of regional transportation systems. Regional ITS Architecture has specific elements, services, information exchanges and projects as its outputs. What is missing in the list of architecture outputs is a strategy for how ITS will be deployed over time, and MOITS Strategic plan fills this gap.

Figure 4 shows the relationship between the architecture, the strategic plan and other planning processes.

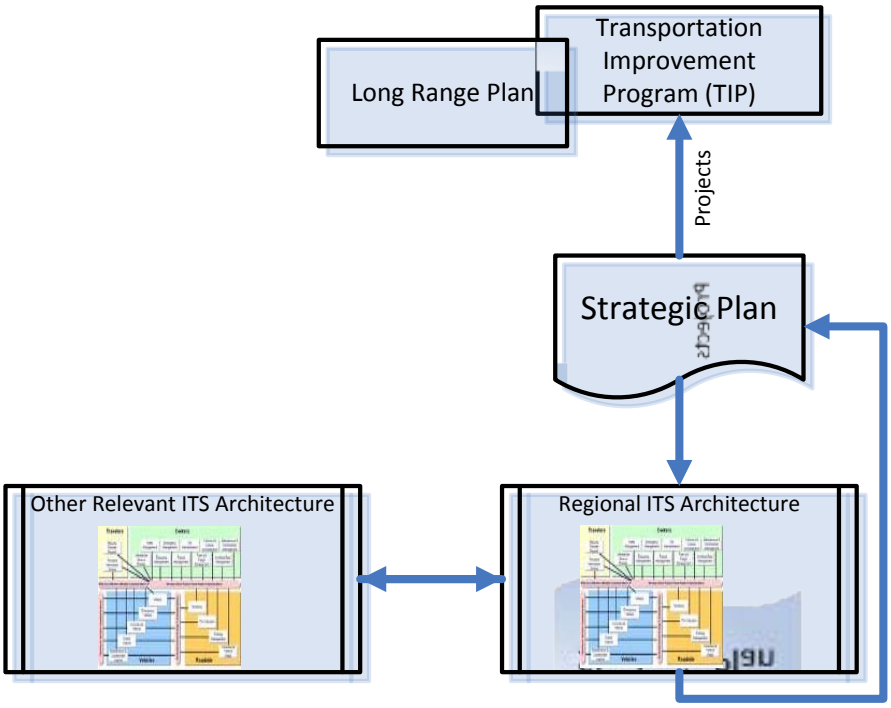

Figure 4: Relationship between the Regional ITS Architecture and the Planning Process

2.6. Relationship to Other Plans and Activities

The MOITS committee is responsible for planning regional transportation efforts supported by the participating member agencies. Two other entities (MATOC and RESF-1) also have a transportation planning function and even an operations function.

Figure 5 illustrates the relationship between MOITS, MATOC, and RESF-1. Each entity has either a primary or secondary role in performing specific regional functions. Where an entry appears blank, the entity has no purview for that particular role. Where an entity has a primary purview, the entry means that of the three entities represented by MOITS, MATOC, and RESF-1, that particular entity has the primary purview of the three entities for addressing that role. Other external entities or agencies may also have input to that role. For example, MATOC has primary purview for RITIS where MOITS and RESF-1 have no direct purview for RITIS.

However, in 2009, RITIS received a grant of Urban Area Security Initiative funds from the Department of Homeland Security and an associated mandate to include transit information in its data collection activities. RITIS has additional requirements to meet in addition to any requirements defined by MATOC.

Role	MOITS	MATOC	RESF-1	Other
Long-Range Planning				
Input to regional long-range transportation plans	**PRIMARY**	**Secondary** Liaison with MOITS	**Secondary** Liaison with MOITS	
Input to regional emergency plans	**Secondary** Liaison with RESF-1	**PRIMARY**		
Evacuation Planning	Support Awareness of Plans	Awareness of Plans	**Secondary** Liaison w/RESF-5	RESF-5
Strategic Planning	For MOITS programs Identify future regional interagency projects	For MATOC programs For operational planning	Input to regional emergency management strategic planning process	
Explore new and emerging technologies	**PRIMARY**	**Secondary** Liaison with MOITS	**Secondary** Liaison with MOITS	
Annual Planning, Processes and Programming				
Transportation in UASI Grants Process	Secondary Liaison with RESF-1	Secondary Liaison with RESF-1	PRIMARY	
Transportation Improvement Plan (TIP)	PRIMARY	Secondary Liaison with MOITS	Secondary Liaison with MOITS	
Other grants and funding	Maintain Awareness Propose potential projects	PRIMARY Securing MATOC Funding	Maintain Awareness Propose potential projects	
Congestion Management Process	Systems management, operations, and engineering strategies			
On-Going Regional Programs and Activities				
Regional ITS Architecture	Regional ITS Standards Update Regional ITS Architecture			
RITIS		**PRIMARY**		
REAL-TIME ACTIVITIES (DURING INCIDENTS)				
Operational duties	None	Defined transportation information notification	None	Jurisdictions
Deploy or manage assets	None	None	None	Jurisdictions
Communications/notifications to public	None	Provide transportation information to existing	None	

		wholesale outlets		
Activities and Efforts				
After Action Reviews	Maintain awareness of issues for long-range planning	Regional Transportation Incidents	Secondary role with RESF 5/EM leadership for declared or major emergencies.	
Table-Top Exercises	Secondary Liaison with RESF-1 and MATOC	**PRIMARY** Regional Transportation Incidents	PRIMARY for RESF-1 Secondary role for RESF-5	

Figure 5: Roles and Responsibilities of Related Regional Entities

3.0 MOITS STRATEGIC DIRECTION

The strategic direction for the management, operations, and intelligent transportation systems committee is guided by the regional vision, goals, and objectives adopted by the TPB. The MOITS committee will continue to follow a number of strategies to achieve the regional goals and objectives and plans to concentrate on nine technical emphasis areas to improve regional capabilities.

3.1. Vision

The Transportation Planning Board has adopted the following vision statement for the Metropolitan Washington Region:

In the 21st Century, the Washington metropolitan region remains a vibrant world capital, with a transportation system that provides efficient movement of people and goods. This system promotes the region's economy and environmental quality, and operates in an attractive and safe setting--it is a system that serves everyone. The system is fiscally sustainable, promotes areas of concentrated growth, manages both demand and capacity, employs the best technology, and joins rail, roadway, bus, air, water, pedestrian and bicycle facilities into a fully interconnected network.

3.2. Goals

In support of the Regional Vision, the Transportation Planning Board has adopted eight goals for the Metropolitan Washington Region. The MOITS committee supports all of the regional goals and concentrates its efforts on activities primarily related to goals 3 and 4:

Goal 1. The Washington metropolitan region's transportation system will provide reasonable access at reasonable cost to everyone in the region.

Goal 2. The Washington metropolitan region will develop, implement, and maintain an interconnected transportation system that enhances quality of life and promotes a strong and growing economy throughout the entire region, including a healthy regional core and dynamic regional activity centers with a mix of jobs, housing and services in a walkable environment.

Goal 3. The Washington metropolitan region's transportation system will give priority to management, performance, maintenance, and safety of all modes and facilities.

Goal 4. The Washington metropolitan region will use the best available technology to maximize system effectiveness.

Goal 5. The Washington metropolitan region will plan and develop a transportation system that enhances and protects the region's natural environmental quality, cultural and historic resources, and communities.

Goal 6. The Washington metropolitan region will achieve better inter-jurisdictional coordination of transportation and land use planning.

Goal 7. The Washington metropolitan region will achieve an enhanced funding mechanism(s) for regional and local transportation system priorities that cannot be implemented with current and forecasted federal, state, and local funding.

Goal 8. The Washington metropolitan region will support options for international and inter-regional travel and commerce.

3.3. Objectives

Each goal addressed by the MOITS committee has a number of related objectives.

Objectives for Goal #3:

1. Adequate maintenance, preservation, rehabilitation, and replacement of existing infrastructure.
2. Enhanced system safety through effective enforcement of all traffic laws and motor carrier safety regulations, achievement of national targets for seatbelt use, and appropriate safety features in facility design

Objectives for Goal #4:

1. Reduction in regional congestion and congestion-related incidents.
2. A user-friendly, seamless system with on-demand, timely travel information to users, and a simplified method of payment.
3. Improved management of weather emergencies and major incidents.
4. Improved reliability and predictability of operating conditions on the region's transportation facilities.
5. Full utilization of future advancements in transportation technology.

3.4. Strategies

The MOITS committee follows a number of strategies when addressing objectives under each goal.

Strategies directly addressing Goal #3 are:

1. Factor life-cycle costs into the transportation system planning and decision process.
2. Identify and secure reliable sources of funding to ensure adequate maintenance, preservation, and rehabilitation of the region's transportation system.

3. Support the implementation of effective safety measures, including red light camera enforcement, skid-resistant pavements, elimination of roadside hazards, crash prevention, and better intersection controls.

Strategies directly addressing Goal #4 are:

4. Deploy technologically advanced systems to monitor and manage traffic, and to control and coordinate traffic control devices, such as traffic signals, including providing priority to transit vehicles where appropriate.
5. Improve incident management and prevention capabilities in the region through enhanced detection technologies, improved incident response, and various warning systems.
6. Improve highway lighting, lane markings, and other roadway delineation through the use of advanced and emerging technologies.
7. Establish a unified, technology-based method of payment for all transit fares, public parking fees, and toll roads in the region.
8. Utilize public/private partnerships to provide travelers with comprehensive, timely, and accurate information on traffic and transit conditions and available alternatives.
9. Use technology to manage and coordinate snow plowing, road salting operations, and other responses to extreme weather conditions, and to share with the public assessments of road conditions and how much time it will take to clear roadways.
10. Use advanced communications and real-time scheduling methods to improve time transfers between transit services.
11. Develop operating strategies and supporting systems to smooth the flow of traffic and transit vehicles, reduce variances in traffic speed, and balance capacity and demand.
12. Maintain international leadership in taking advantage of new technologies for transportation, such as automated highway systems and personal rapid transit.

3.5. Tactics

The MOITS Strategic Plan identifies the following significant regional tactics for achieving the regional strategies, goals, and objectives vital for effective regional transportation system management:

- Provision and availability of regional situational awareness of transportation system conditions, and of incidents or factors that may impact transportation conditions
- Development and sharing of regionally coordinated standard operating procedures
- Informing travelers in a timely and effective manner so those travelers will make good transportation decisions
- Integration of technical systems and processes to maximize interoperability and ensure the beneficial and synergistic impacts of those systems working together.

Regional situational awareness includes real-time information concerning the status of the transportation network and transportation assets, static information concerning schedules and resources, and dynamic information concerning evolving transportation conditions.

Regional standard operating practices are practices followed when coordinating with other regional stakeholders. These practices include procedures for coordinating daily regional operations and responding to incidents, events, or conditions with significant regional impact.

Informing the traveler includes providing correct and timely transportation information to public agencies, media outlets, independent service providers, and the general public.

Regional integration includes connecting technical systems between member agencies, establishing regional standard operating procedures, and sharing information in support of regional operations.

3.6. Emphasis Areas

The MOITS committee members have determined that the tactical needs for management, operations and ITS, on a regional basis, are captured within the following nine emphasis areas as derived from the National ITS Architecture:

1. ITS Data Warehouse
2. Multi-modal coordination
3. Transit signal priority
4. Interactive traveler information
5. Transportation operations data sharing
6. HOV lane management
7. Regional traffic management
8. Regional parking management
9. Maintenance and construction activity coordination

These nine emphasis areas define the scope of activities of the MOITS Committee. Regional projects can support one or more emphasis areas and thus support one or more regional tactic, regional strategy, objective, and goal. A tactic is a method or technique for achieving a strategy. Emphasis areas seek to implement a strategy using a tactic. Emphasis areas map to strategies. The tactic is a method for achieving the strategy.

Figure 6 maps each emphasis area to one or more regional strategies.

	Strategy											
	1.Factor Life Cycle Costs	2. Secure Reliable Funding	3. Support Safety Measures	4.Deploy Traffic Management technology	5. Improve Incident Management	6. Use Roadway Delineation Technologies	7. Use Unified payment technology	8.Provide traveler information	9. use technology to mange extreme weather responses	10. use transit time transfer methods	11. Develop operating strategies & supporting systems	12. maintain international leadership in technologies
ITS Data Warehouse	x	x	x	x	x			x	x		x	
Multi-modal coordination	x	x					x	x	x	x	x	x
Transit signal priority	x	x		x						x	x	x
Interactive traveler information	x	x	x					x	x			
Transportation operations data sharing	x	x	x	x	x			x	x		x	
HOV lane management	x	x	x	x		x		x			x	x
Regional traffic management	x	x	x	x	x				x		x	
Regional parking management	x	x		x			x	x				x
Maintenance & constr. activity coordination	x	x	x					x	x			

Figure 6: Mapping Emphasis Areas to Regional Strategies

The following sections describe the details of each emphasis area. The description starts with a formal definition of the emphasis area adapted from the corresponding market package in the National ITS Architecture. The description then includes a summary of the current regional status for the emphasis area, a discussion of the current regional gaps and strategic direction and planned activities for the emphasis area.

3.6.1. ITS DATA WAREHOUSE

Definition and Regional Scope

This emphasis area includes all the data collection and management capabilities provided by an ITS Data Mart, and adds the functionality and interface definitions that allow collection of data from multiple agencies and data sources spanning across modal and jurisdictional boundaries. It performs the additional transformations and provides the additional metadata management features that are necessary so that all this data can be managed in a single repository with consistent formats. The potential for large volumes of varied data suggests additional on-line analysis and data mining features that are also included in this market package in addition to the basic query and reporting user access features offered by the ITS Data Mart.

The ITS Data Warehouse provides a focused archive that houses data collected and owned by a participating agency, district, private sector provider, research institution, or other organization within the region. This focused archive includes data covering multiple transportation modes and jurisdictions that is collected from an operational data store and archived for future use. It provides the basic data quality, data privacy, and metadata management common to all ITS archives and provides general query and report access to archive data users.

An ITS Data Warehouse will assist the region by providing the ability to record and analyze current traffic conditions, traffic patterns and incidents. The jurisdictional complexity of the metropolitan Washington area makes this a key emphasis area for the MOITS committee. The metropolitan area includes a number of different agencies and jurisdictions with different lines of responsibility and accountability. As a result, while there is an operational need to share data among the various agencies in the metropolitan area, there is also an administrative need to pass data up through the lines of responsibility. For example, data from the Northern Virginia ATMS needs to be shared with other transportation agencies within the metropolitan area as well as with the central office of VDOT. The Regional Data Warehouse allows the separation of regional operational functions from statewide or agency wide administrative data functions.

An ITS Data Warehouse will provide a single storage site for all of the regional data; the existence of this data warehouse will not replace the systems needed for each agency, rather it will replicate the data from all metropolitan area agencies so that users in the area will be able to easily access appropriate data from any agency.

This emphasis area relates to Regional Strategies #1, 2, 11, and 12, as further refined below:

- *Strategy 1: Factor life-cycle costs into the transportation system planning and decision process.* When planning projects for a regional data warehouse, life-cycle benefits and costs for each project must be considered.

- *Strategy 2: Identify and secure reliable sources of funding to ensure adequate maintenance, preservation, and rehabilitation of the region's transportation system.* Prior to initiating any project for regional data warehouse, reliable sources of funding to ensure adequate maintenance, preservation, and rehabilitation of the enhancement without jeopardizing existing operations must be identified and secured.
- *Strategy 11: Develop operating strategies and supporting systems to smooth the flow of traffic and transit vehicles, reduce variances in traffic speed, and balance capacity and demand.* A regional data warehouse provides the data and information required to develop regional operating strategies and also provides information to the technical systems used to smooth traffic flow.
- *Strategy 12: Maintain international leadership in taking advantage of new technologies for transportation, such as automated highway systems and personal rapid transit.* A regional data warehouse takes advantage of the latest technologies in data collection and information dissemination especially when supporting other regional functions.

Current Regional Status

Regional stakeholders have multiple data stores within each agency. Most of these data stores contain data specific to that agency. To facilitate regional coordination and management, the agencies need to share their data with each other. Data to share with each other includes sensor data, incident information, schedule information, travel time information, and current status of ITS related assets such as Variable Message Signs and even bus location data.

In 2002, the region undertook the development of the Regional Integrated Transportation Information System (RITIS), which collects a great deal of regional transportation information for both real-time and archive use. The University of Maryland currently hosts and manages RITIS. All of the partner agencies support the continuation and enhancement of such a system and recognize that RITIS acts as the region's de facto ITS Data Store.

RITIS forms the foundation for enhanced regional activities related to data sharing, traveler information, and multi-modal coordination. RITIS currently compiles, stores, and shares sensor data, incident data, and transit schedules.

Current Regional Gaps

RITIS is the region's de facto data store. RITIS was primarily developed as a real-time information system and as such there is still significant room to enhance the data warehouse functionality of the system.

While RITIS provides a base level archive, several key challenges remain before the region can truly realize an ITS Data Warehouse. RITIS is dependent upon the data sources provided by the member agencies. This data needs improved coverage (e.g., Dulles Toll Road); consistent data elements, formats, and quality; and reduced restrictions on data dissemination due to agency contractual agreements. In order to become the region's data warehouse, capabilities within RITIS need to be improved and information forwarded and shared through RITIS needs enhancement.

Regional data needs to be enhanced in four technical areas:

- Increased data coverage
- Standardization of regional data
- Incorporation of data for significant regional corridors
- Transformation of regional data into regional information

In addition to technical issues related to data collection and information dissemination, administrative and operational issues need to be addressed. Funding and institutional support for an expanded RITIS role needs to be identified. As the Regional Data Warehouse evolves, new support requirements will emerge. The MOITS Committee will need to confirm that the University of Maryland will continue to meet those evolving requirements or identify a new administrative structure to manage, operate, and maintain the Regional Data Warehouse that can support regional 24-7 operations.

Strategic Efforts and Planned Projects

The Regional Data Warehouse provides the foundation for regional capabilities in traffic management, traveler information, and transportation coordination. RITIS is the best candidate for evolving to a regional data warehouse.

In order to support these regional capabilities, the region will need to first define a more standardized method for sharing information and implement the various features to support the shared data archiving needs. In addition, the member agencies should highlight the importance of filling the existing gaps in data collection so that this information can also be captured. Finally, the agencies need to jointly develop a standard agreement to be used when member agencies enter agreements with third party providers to provide transportation data to enable regional data sharing.

The following potential projects will assist the region in deploying a regional ITS Data Warehouse:

- Document a regional Concept of Operations for the Data Warehouse
- Document regional data requirements and system requirements for the Data Warehouse
- Develop model agreements for third party use of transportation data from the Data Warehouse
- Review/Update MOUs for sharing data between agencies
- Identify and tailor regional TMC and ITS standards
- Identify and tailor regional data standards
- Document/define regional meta-data requirements
- Document regional design guidelines
- Upgrade RITIS to Data Warehouse functionality
- Operate and maintain the regional Data Warehouse.

3.6.2. MULTI-MODAL COORDINATION

Definition and Regional Scope

This emphasis area establishes two-way communications between multiple transit and traffic agencies to improve service coordination. Multi-modal coordination between transit agencies can increase traveler convenience at transit transfer points and clusters (a collection of stops, stations, or terminals where transfers can be made conveniently) and also improve operating efficiency. Transit transfer information is shared between Multi-modal Transportation Service Providers and Transit Agencies.

This emphasis area relates to Regional Strategies #1, 2, 7, 8, and 10, as further refined below:

- *Strategy 1: Factor life-cycle costs into the transportation system planning and decision process.* When planning multi-modal coordination projects, the TPB must consider life-cycle benefits and costs.
- *Strategy 2: Identify and secure reliable sources of funding to ensure adequate maintenance, preservation, and rehabilitation of the region's transportation system.* Prior to initiating any multi-modal coordination project, the TPB must identify and secure reliable sources of funding to ensure adequate maintenance, preservation, and rehabilitation of the enhancement without jeopardizing existing operations.
- *Strategy 7: Establish a unified, technology-based method of payment for all transit fares, public parking fees, and toll roads in the region.* In order to achieve a unified method of payment for all transit fares, public parking fees, and toll roads, projects will need to harmonize the technologies used by the different multi-modal agencies.
- *Strategy 8: Utilize public/private partnerships to provide travelers with comprehensive, timely, and accurate information on traffic and transit conditions and available alternatives.* In order to provide comprehensive and accurate information on traffic and transit conditions and available alternatives, the region will need to deploy multi-modal coordination projects that include public/private partnerships.
- *Strategy 10: Use advanced communications and real-time scheduling methods to improve time transfers between transit services.* Multi-modal coordination projects offer the potential to use advanced communications and real-time scheduling methods to improve time transfers between transit services.

Current Regional Status

The metropolitan area includes a number of transit agencies offering multiple opportunities to enhance information sharing to better coordinate operations. Many of the non-transit agencies can also benefit from sharing information.

WMATA is the largest transit organization in the Metropolitan Region and often takes the lead in advancing transit capabilities. All transit providers in the region are active in advancing the technical capabilities of the transit systems and coordinating other modes of transportation.

RITIS is the current system for sharing transit and traffic information. In 2009, RITIS received a grant of Urban Area Security Initiative funds from the Department of Homeland Security and an associated mandate to include transit information in its data collection activities. Static or pre-

planned schedule information is currently shared among transit agencies. Real-time info sharing between transit to transit centers and transit to traffic centers is ad hoc. An exception is Montgomery County in that Montgomery County has collocated traffic and transit centers and they share information on a real-time basis.

The MOITS Technical Subcommittee can serve as the forum for the consensus building process to determine next steps for multi-modal communication including consideration of technical requirements for improved information sharing through RITIS.

Current Regional Gaps

In order to realize better information sharing, the region needs to identify the information to be shared among the various participants and then to develop the necessary systems to enable better coordination. The enhanced coordination can be provided through various means including providing integrated information to the public and coordinating schedules on-line.

In addition, the multi-modal coordination can be improved by working together to develop regional transportation plans in response to special events. For example, if there is a major rail problem that results in the introduction of a bus bridge between stations, the traffic signals along the route should be retimed to accommodate the extra passenger traffic that should be expected along that corridor.

Strategic Efforts and Planned Projects

The following potential projects will assist the region in deploying multi-modal coordination:

- Identify and tailor ITS standards to meet regional needs
- Explore and analyze integration of real-time traffic and transit data into trip planning applications
- Develop a multi-modal regional trip planning tool
- Export real-time AVL data from WMATA to TMCs and signal systems
- Export real-time AVL data other transit agencies to TMCs and signal systems
- Export AVL and passenger count data to the Data Warehouse
- Explore uses of AVL data for improved regional project planning
- Explore uses of AVL data for improved multi-modal coordination.

3.6.3. TRANSIT SIGNAL PRIORITY

Definition and Regional Scope

> *This emphasis area determines the need for transit priority on routes and at certain intersections, and requests transit vehicle priority at these locations. The signal priority may result from limited local coordination between the transit vehicle and the individual intersection for signal priority or may result from coordination between transit management and traffic management centers. Coordination between traffic and transit*

management is intended to improve on-time performance of the transit system to the extent that this can be accommodated without degrading overall performance of the traffic network.

This emphasis area relates to Regional Strategies #1, 2, 3, 4, 10, and 11, as further refined below:

- *Strategy 1: Factor life-cycle costs into the transportation system planning and decision process.* When planning projects for transit signal priority, the TPB must consider life-cycle benefits and costs for each project.
- *Strategy 2: Identify and secure reliable sources of funding to ensure adequate maintenance, preservation, and rehabilitation of the region's transportation system.* Prior to initiating any project for transit signal priority, the TPB must identify and secure reliable sources of funding to ensure adequate maintenance, preservation, and rehabilitation of the enhancement without jeopardizing existing operations.
- *Strategy 4: Deploy technologically advanced systems to monitor and manage traffic, and to control and coordinate traffic control devices, such as traffic signals, including providing priority to transit vehicles where appropriate.* Transit signal priority projects deploy technologically advanced systems that provide priority to transit vehicles, where appropriate.
- *Strategy 10: Use advanced communications and real-time scheduling methods to improve time transfers between transit services.* Transit signal priority projects use advanced communications and real-time scheduling logic to improve average travel times on bus routes and to improve on-time performance of transit vehicles and thereby improve time transfers between transit services.
- *Strategy 11: Develop operating strategies and supporting systems to smooth the flow of traffic and transit vehicles, reduce variances in traffic speed, and balance capacity and demand.* Transit signal priority projects allow operating agencies to smooth the flow of transit vehicles so that they maintain on-time performance with minimal disruption to the overall traffic stream.

Current Regional Status

Transit ridership, bus schedule reliability, and regional mobility are issues affecting transit providers in the region. Transit Signal Priority is one technique being considered by MOITS members for addressing these issues. Many stakeholders believe that increased transit ridership can be achieved through schedule reliability improvements with an associated increase in regional mobility.

Initial deployments of this technology are currently operational along select routes in the District, Arlington County, and Fairfax County. The 2009 WMATA priority corridor network study identified a number of WMATA bus corridors with high ridership that may especially benefit from bus operations improvements, such as transit signal priority. The region’s 2009 TIGER grant application included transit signal priority within its vetted effort that went through the TPB approval process.

The MOITS Technical subcommittee coordinates planning activities with the TPB Regional Bus Subcommittee.

Current Regional Gaps

The deployments of this technology are currently very limited and technical challenges are still being addressed. Examples of the on-going challenges include:

- Lack of opportunities for joint traffic/transit planning
- The multiplicity of traffic signal technologies deployed in various jurisdictions in the region, including multiple proprietary systems, challenge the ability to implement a multi-jurisdictional TSP system
- Insufficient data shared among vehicles, transit agencies, and traffic agencies
- A tradeoffs between infrared versus radio frequency technologies

Strategic Efforts and Planned Projects

The following potential projects will assist the region in deploying transit signal priority:

- Create a venue for joint traffic/transit operations planning
- Develop a Regional Transit Signal Priority Process that will:

  Identify route segments in region with excessive bus delay

  Evaluate TSP technologies and identify communication strategy

  Identify what transit agencies must purchase to place on buses and what DOTs need for signal control
- Implement transit signal priority along initial inter-jurisdictional corridors.

3.6.4. INTERACTIVE TRAVELER INFORMATION

Definition and Regional Scope

This market package provides tailored information in response to a traveler request. Both real-time interactive request/response systems and information systems that "push" a tailored stream of information to the traveler based on a submitted profile are supported. The traveler can obtain current information regarding traffic conditions, roadway maintenance and construction, transit services, ride share/ride match, parking management, detours and pricing information. Although the Internet is the predominate network used for traveler information dissemination, a range of two-way wide-area wireless and fixed-point to fixed-point communications systems may be used to support the required data communications between the traveler and Information Service Provider. A variety of interactive devices may be used by the traveler to access information prior to a trip or en route including phone via a 511-like portal and web pages via kiosk, personal digital assistant, personal computer, and a variety of in-vehicle devices. This market package also allows value-added resellers to collect transportation information that can be aggregated and be available to their personal devices or remote traveler systems to better inform their customers of transportation conditions. Successful deployment of this market package relies on availability of real-time transportation data

from roadway instrumentation, transit, probe vehicles or other means. A traveler may also input personal preferences and identification information via a "traveler card" that can convey information to the system about the traveler as well as receive updates from the system so the card can be updated over time.

This emphasis area relates to Regional Strategies #1, 2, 11, and 12, as further refined below:

- *Strategy 1: Factor life-cycle costs into the transportation system planning and decision process.* When planning projects for a regional traveler information, the TPB must consider life-cycle benefits and costs for each project.
- *Strategy 2: Identify and secure reliable sources of funding to ensure adequate maintenance, preservation, and rehabilitation of the region's transportation system.*. Prior to initiating any project for regional traveler information, the TPB must identify and secure reliable sources of funding to ensure adequate maintenance, preservation, and rehabilitation of the enhancement without jeopardizing existing operations.
- *Strategy 8: Utilize public/private partnerships to provide travelers with comprehensive, timely, and accurate information on traffic and transit conditions and available alternatives.* Traveler information has multiple business models and roles for participating entities. The participating agencies in the region shall act primarily as a wholesaler of traveler information to multiple retail outlets such as media organizations and private sector partners. On a case by case basis, a participating agency may provide regional traveler information to the general public.
- *Strategy 9: Use technology to manage and coordinate snow plowing, road salting operations, and other responses to extreme weather conditions, and to share with the public assessments of road conditions and how much time it will take to clear roadways.* Participating agencies will share assessments and clearance times regarding road conditions especially during extreme weather conditions.
- *Strategy 12: Maintain international leadership in taking advantage of new technologies for transportation, such as automated highway systems and personal rapid transit.* A regional data warehouse takes advantage of the latest technologies in data collection and information dissemination especially when supporting other regional functions.

Current Regional Status

The state of Virginia currently operates a statewide 511 system. The state of Maryland is developing and deploying a statewide 511 system. The District of Columbia is exploring traveler information options and has a strong interest in multi-modal traveler information.

Local traveler information activities are also on-going. For example, VDOT is currently deploying non-interactive information displays in Tysons Corner to give shoppers real-time information for the Tysons Corner area. Several private sector companies provide traveler information such as Google, NAVTEQ Traffic, and MetroNetworks. Traveler information products and services from the private sector have been quickly evolving.

Current Regional Gaps

At present there is not any integrated, interactive traveler information system that adequately covers all routes and modes of transportation for the entire metropolitan area.

The region needs improved coordinated data collection, data fusion, and traveler information dissemination.

The region needs increased traffic data and sensor coverage. This data can come from both public sector traffic sensors and private sector traffic data services.

Methods for delivering traveler information continue to evolve. Interactive voice recognition systems have become passé and travelers are becoming more interested in data applications on cell phones and the Internet. Regional agencies need to be ready to support these new methods for disseminating real-time traveler information.

Strategic Efforts and Planned Projects

Within the metropolitan region, there is a need to improve these services. One of the initial efforts should be to enhance the ability to determine regional travel times. Other capabilities include being able to provide all raw traveler information data to outside sources in a standardized format so that they can enhance this data and provide it to the public themselves. Once these enhancements are in place, a seamless regional personalized trip planning service can be put into place.

The following potential projects will assist the region in deploying interactive traveler information:

- Enhance regional travel time determination – analyze travel time calculation techniques, data holes and gaps, determine how best to address holes, and make recommendations to owning agencies, harmonize regional practices for calculating travel times
- Develop RITIS into a regional traveler information data engine
- Determine roles and responsibilities of public sector in ATIS e.g. wholesale vs. retail responsibilities and associated business model
- Identify and tailor ITS standards to meet regional needs
- Provide data feeds to third parties and encourage app development by third parties
- Provide regional traveler information web site with phased deployment of features including a regional congestion map on the Internet and regional incident alerts (MATOC alerts)
- Develop integrated metropolitan area trip-planning tools for the public.

3.6.5. TRANSPORTATION OPERATIONS DATA SHARING

Definition and Regional Scope

This emphasis area makes real-time transportation operations data available to transportation system operators. The Information Service Provider collects, processes, and stores current information on traffic and travel conditions and other information

about the current state of the transportation network and makes this information available to transportation system operators, facilitating the exchange of qualified, real-time information between agencies. Using the provided information, transportation system operators can manage their individual systems based on an overall view of the regional transportation system. The regional transportation operations data resource represented by the Information Service Provider may be implemented as a web application that provides a web-based access to system operators, an enterprise database that provides a network interface to remote center applications, or any implementation that supports regional sharing of real-time transportation operations data.

This emphasis area relates to Regional Strategies #1, 2, 4, 5, and 11, as further refined below:

- *Strategy 1: Factor life-cycle costs into the transportation system planning and decision process.* When planning projects for regional operational data sharing, the TPB must consider life-cycle benefits and costs for each project.
- *Strategy 2: Identify and secure reliable sources of funding to ensure adequate maintenance, preservation, and rehabilitation of the region's transportation system.* Prior to initiating any project for regional operational data sharing, the TPB must identify and secure reliable sources of funding to ensure adequate maintenance, preservation, and rehabilitation of the enhancement without jeopardizing existing operations.
- *Strategy 4: Deploy technologically advanced systems to monitor and manage traffic, and to control and coordinate traffic control devices, such as traffic signals, including providing priority to transit vehicles where appropriate.* Regional operational data sharing projects integrate technologically advanced systems that allow for regional monitoring of traffic conditions and travel times.
- *Strategy 5: Improve incident management capabilities in the region through enhanced detection technologies and improved incident response.* Regional operational data sharing projects allow agencies to share information about incidents thereby allowing improved incident response.
- *Strategy 11: Develop operating strategies and supporting systems to smooth the flow of traffic and transit vehicles, reduce variances in traffic speed, and balance capacity and demand.* Regional operational data sharing projects allow agencies to share real-time information regarding current conditions, thereby allowing agencies to better manage facilities and balance capacity and demand.

Current Regional Status

Each of the regional management centers currently collects a great deal of information that would be of value to the other centers and much of this data is sent to RITIS. Enhancements to RITIS continue to be refined and implemented.

The region recognizes that procedures, coordinated traffic management, and data sharing are closely related. Integration of data sources through RITIS leads to new capabilities and the identification and definition of new data requirements.

MATOC is a significant consumer of shared transportation operations data. The MATOC facilitator monitors information sources and provides targeted information to stakeholders as needed to enable timely regional coordination of the transportation impacts of incidents.

Transit operations information sharing could use improvement. Schedule information is readily available and shared via RITIS. Rail operations alerts and significant bus operations alerts are posted to the RITIS web site. Traffic managers may benefit from these alerts and additional transit information in real-time.

Current Regional Gaps

Much of the data from operating agencies have different data quality standards and different data sharing restrictions that make it difficult to present the data in a meaningful and concise manner. In addition, the coverage area for the information needs to be expanded.

A further limitation comes from a lack of a unified understanding of what constitutes data and what constitutes information. A regional consensus is beginning to form but the region can still take additional efforts to define the differences between raw data and processed information and when each should be shared and used. A regional consensus on definitions of data and information would help members better define operational processes and develop data sharing agreements.

Strategic Efforts and Planned Projects

The key to realizing regional operational data sharing is to clearly define the preferred mechanism for exchanging data. This interface can then be added to each agency system as those systems are normally upgraded and expanded.

The following potential projects will assist the region in deploying transportation operations data sharing:

- Identify and tailor ITS standards to meet regional needs
- Enhance regional travel time determination – analyze travel time calculation techniques, data holes and gaps, determine how best to address holes, and make recommendations to owning agencies
- Develop RITIS into a regional traveler information data engine that performs data fusion
- Provide data feeds to third parties and encourage app development by third parties
- Identify and tailor regional data standards
- Document/define regional meta-data requirements
- Document regional design guidelines
- Upgrade RITIS to Data Warehouse functionality
- Analyze data to determine new capabilities in traffic management and traveler information.

3.6.6. HOV LANE MANAGEMENT

Definition and Regional Scope

This emphasis area improves the operation of managed lanes through the use of operational policies to provide preferential treatment to managed lanes using reserved

lanes and exclusive rights-of-way that may vary by time of day. Vehicle occupancy detectors may be installed to verify HOV compliance and to notify enforcement agencies of violations.

This emphasis area relates to Regional Strategies #1, 2, 3, 4, 6, 11, and 12 as further refined below:

- *Strategy 1: Factor life-cycle costs into the transportation system planning and decision process.* When planning projects for managed lanes, the TPB must consider life-cycle benefits and costs for each project.
- *Strategy 2: Identify and secure reliable sources of funding to ensure adequate maintenance, preservation, and rehabilitation of the region's transportation system.* Prior to initiating any project for managed lanes, the TPB must identify and secure reliable sources of funding to ensure adequate maintenance, preservation, and rehabilitation of the enhancement without jeopardizing existing operations.
- *Strategy 3: Support the implementation of effective safety measures, including red light camera enforcement, skid-resistant pavements, elimination of roadside hazards, and better intersection controls.* Managed lane projects should support the implementation of effective safety measures by providing for smooth and understandable transitions between managed lanes and general-purpose lanes.
- *Strategy 4: Deploy technologically advanced systems to monitor and manage traffic, and to control and coordinate traffic control devices, such as traffic signals, including providing priority to transit vehicles where appropriate.* Managed lane projects use technologically advanced systems to monitor and manage the managed lane facilities.
- *Strategy 6: Improve highway lighting, lane markings, and other roadway delineation through the use of advanced and emerging technologies.* Managed lane projects can improve roadway delineation through the use of advanced technologies that help travelers understand managed lane restrictions.
- *Strategy 11: Develop operating strategies and supporting systems to smooth the flow of traffic and transit vehicles, reduce variances in traffic speed, and balance capacity and demand.* Managed lanes are one type of system that is able to smooth the flow of traffic and transit vehicles.
- *Strategy 12: Maintain international leadership in taking advantage of new technologies for transportation, such as automated highway systems and personal rapid transit.* The usage of managed lanes is one way in which the region will maintain international leadership in taking advantage of new technologies for transportation.

Current Regional Status

Virginia operates a number of traffic signals that grant access to managed lanes based on time-of-day operation (e.g. shoulder operations on I-66). In addition, the on-going project to install HOT lanes on I-495 is expected to use sensors to automatically detect vehicle occupancy; the results of this project will be of interest to the region to determine if this technology should be widely deployed.

The region also includes HOV lanes designated by striping and static signage e.g. I-66, I-270, and US 50.

The Maryland Inter-County Connector, currently under construction, shall manage lanes through variable tolls even though it is not designated as an HOV facility.

Current Regional Gaps

While the region does have a number of managed lane facilities on radial freeways, these facilities do not currently provide a seamless network. The I-495 HOT lanes will connect the radial facilities in Virginia, but the region should consider expanding this network of managed lane facilities.

The rules for the using managed lanes vary throughout the region in terms of:

- Hours of operation
- Hybrid and motorcycle restrictions
- Occupancy requirements
- Tolling options

In addition, the various facilities also use different infrastructure design standards for:

- Access mechanisms
- Buffering between managed lanes and unmanaged lanes

In order to minimize confusion to the driving public, efforts should be made to harmonize the operation and design of these facilities and to ensure adequate signage.

Strategic Efforts and Planned Projects

The following potential project will assist the region in enhancing its managed lane operations:

- Develop a regional managed lanes operational coordination process that includes summit meetings to address topics in HOV management, traveler information, and operational procedures.

3.6.7. REGIONAL TRAFFIC MANAGEMENT

Definition and Regional Scope

> *This emphasis area provides for the sharing of traffic information and control among traffic management centers to support regional traffic management strategies. Regional traffic management strategies that are supported include coordinated signal control in a metropolitan area and coordination between freeway operations and arterial signal control within a corridor. This emphasis area includes communications links and integrated control strategies that enable integrated inter-jurisdictional traffic management. The nature of optimization and extent of information and control sharing is determined through working arrangements between jurisdictions. This emphasis area relies principally on roadside instrumentation and adds hardware, software, and fixed-point to fixed-point communications capabilities to implement traffic management strategies that are coordinated between allied traffic management centers. Several levels*

of coordination are supported from sharing of information through sharing of control between traffic management centers.

This emphasis area relates to Regional Strategies #1, 2, 3, 4, and 11 as further refined below:

- *Strategy 1: Factor life-cycle costs into the transportation system planning and decision process.* When planning regional traffic management projects, the TPB must consider life-cycle benefits and costs for each project.
- *Strategy 2: Identify and secure reliable sources of funding to ensure adequate maintenance, preservation, and rehabilitation of the region's transportation system.* Prior to initiating any regional traffic management project, the TPB must identify and secure reliable sources of funding to ensure adequate maintenance, preservation, and rehabilitation of the enhancement without jeopardizing existing operations.
- *Strategy 3: Support the implementation of effective safety measures, including red light camera enforcement, skid-resistant pavements, elimination of roadside hazards, and better intersection controls.* Regional traffic management should support the implementation of effective safety measures by ensuring that communications among centers are constantly available.
- *Strategy 4: Deploy technologically advanced systems to monitor and manage traffic, and to control and coordinate traffic control devices, such as traffic signals, including providing priority to transit vehicles where appropriate.* Regional traffic management projects use technologically advanced systems to monitor and manage traffic, and to control and coordinate traffic control devices, such as traffic signals.
- *Strategy 11: Develop operating strategies and supporting systems to smooth the flow of traffic and transit vehicles, reduce variances in traffic speed, and balance capacity and demand.* Regional traffic management allows agencies to balance capacity and demand by coordinating their operational strategies in response to current conditions.

Current Regional Status

The metropolitan area is already actively pursuing regional traffic management policies. Signals are coordinated across jurisdictional boundaries and agencies frequently work together in planning for, responding to, and managing events.

Current Regional Gaps

Despite current efforts, there are still many opportunities to enhance regional traffic management.

Coordinated traffic signal timing is a proven way to improve traffic operations with a high return on investment; in order to maximize the benefits, signal plans must be updated regularly. Thus, the agencies need to devote a regular budget item to working with each other on regional routes to make sure that signal plans are up-to-date.

Integrated corridor management also offers a significant potential to improve traffic operations, but currently, freeway operations remain separate from signal operations. In order to improve corridor wide operations, signal operations should be better coordinated with ramp metering operations and traveler information alerts.

Active Traffic Management (ATM) strategies have been implemented overseas with the focus of mitigating congestion and incident prevention. The Metropolitan Washington Region should raise the awareness of these technology applications to enhance member DOTs' own traffic management capabilities.

In addition, communications between regional centers need to be better standardized to ensure consistent interpretation and usage rights of the data. Once there is agreement on the data to be exchanged, the agencies should develop a set of regional performance goals.

Communications also need to be moved to agency facilities rather than relying upon the Internet, which would likely become unavailable during a time of crisis when they are needed most.

Finally, there is a need to better coordinate operations across jurisdictional boundaries. This would include coordinating standard operating procedures and response plans for situations that cross boundaries, such as inaugurations, evacuations, hazmat spills, major construction projects, etc. Opportunities to convene involved operations personnel regionally have been rare. MATOC can provide a promising new venue for enhanced regional multi-agency operations planning

Strategic Efforts and Planned Projects

The following potential projects will assist the region in deploying regional traffic management:

- Signal optimization and re-optimization along regional corridors
- Deployment of Integrated Corridor Management technologies on significant regional corridors
- Identify and tailor ITS standards to meet regional needs
- Establish regional performance goals
- Connect centers via reliable communications media
- MATOC Expansion
- Development of regional standard operating procedures
- Development of regional transportation plans for major events
- Strengthen MOITS components of the CMP.

3.6.8. REGIONAL PARKING MANAGEMENT

Definition and Regional Scope

> *This emphasis area supports communication and coordination between equipped parking facilities and also supports regional coordination between parking facilities and traffic and transit management systems. This emphasis area also shares information with transit management systems and information service providers to support multimodal travel planning, including parking reservation capabilities. Information including current parking availability, system status, and operating strategies are shared to enable local parking facility management that supports regional transportation strategies.*

This emphasis area relates to Regional Strategies #1, 2, 3, 4, 7 and 8 as further refined below:

- *Strategy 1: Factor life-cycle costs into the transportation system planning and decision process.* When planning regional parking management projects, the TPB must consider life-cycle benefits and costs for each project.
- *Strategy 2: Identify and secure reliable sources of funding to ensure adequate maintenance, preservation, and rehabilitation of the region's transportation system.* Prior to initiating any regional parking management project, the TPB must identify and secure reliable sources of funding to ensure adequate maintenance, preservation, and rehabilitation of the enhancement without jeopardizing existing operations.
- *Strategy 3: Support the implementation of effective safety measures, including red light camera enforcement, skid-resistant pavements, elimination of roadside hazards, and better intersection controls.* Regional parking management will implement effective safety measures by providing travelers with better information about their ultimate parking destination and thereby avoiding dangerous last-second maneuvers.
- *Strategy 4: Deploy technologically advanced systems to monitor and manage traffic, and to control and coordinate traffic control devices, such as traffic signals, including providing priority to transit vehicles where appropriate.* Regional parking management projects use technologically advanced systems to monitor parking and manage traffic by guiding drivers to available parking.
- *Strategy 7: Establish a unified, technology-based method of payment for all transit fares, public parking fees, and toll roads in the region.* Regional parking management projects have the potential to help unify the payment method among transit fares, parking fees, and toll rod charges.
- *Strategy 8: Utilize public/private partnerships to provide travelers with comprehensive, timely, and accurate information on traffic and transit conditions and available alternatives.* Regional parking management projects offer the potential to inform travelers of parking difficulties at key locations and thereby improve the overall efficiency of the transportation network.

Current Regional Status

Currently, parking is primarily managed on an individual agency basis. The District is considering efforts to better manage on-street parking through variable parking rates, multi-space parking meters, smart loading zones, and pay-by-phone capabilities. Virginia is considering how to better manage parking with metro stations along the I-66 corridor as a part of its integrated corridor management efforts.

Current Regional Gaps

A challenge that the area faces is the limited amount of parking available at many Metro stations and park-n-ride lots. Commuters are often hesitant to spend time searching for a parking space at such a facility once they have had a negative experience and only create extra traffic when they spend time searching when none is available. Providing these commuters with information as to the availability of parking will improve traffic conditions while also promoting the efficient use of facilities.

Finally, most regional parking lots require payment by either cash or credit cards, but Metro lots require payment by SmartTrip. This causes confusion for many non-regular Metro-riders who get to the exit gate only to learn that they have to purchase a separate card to exit.

Strategic Efforts and Planned Projects

The following potential projects will assist the region in deploying regional parking management:

- Pilot project to demonstrate real-time parking management at Park & Ride lots
- Real-time parking management at key Metro stations
- Real-time parking management for commuter lots
- Identify and tailor ITS standards to meet regional needs (to advertise the parking information)
- Discussions to consider harmonizing regional payment options (long-term).

3.6.9. MAINTENANCE & CONSTRUCTION ACTIVITY COORDINATION

Definition and Regional Scope

> *This emphasis area supports the dissemination of maintenance and construction activity to centers that can utilize it as part of their operations, or to the Information Service Providers who can provide the information to travelers.*

This emphasis area relates to Regional Strategies #1, 2, 3 and 8 as further refined below:

- *Strategy 1: Factor life-cycle costs into the transportation system planning and decision process.* When planning maintenance and construction activity coordination projects, the TPB must consider life-cycle benefits and costs for each project.
- *Strategy 2: Identify and secure reliable sources of funding to ensure adequate maintenance, preservation, and rehabilitation of the region's transportation system.* Prior to initiating any maintenance and construction activity coordination project, the TPB must identify and secure reliable sources of funding to ensure adequate maintenance, preservation, and rehabilitation of the enhancement without jeopardizing existing operations.
- *Strategy 3: Support the implementation of effective safety measures, including red light camera enforcement, skid-resistant pavements, elimination of roadside hazards, and better intersection controls.* Maintenance and construction activity coordination will implement effective safety measures by ensuring that nearby activities will not present travelers with confusing or disruptive traffic patterns.
- *Strategy 8: Utilize public/private partnerships to provide travelers with comprehensive, timely, and accurate information on traffic and transit conditions and available alternatives.* Maintenance and construction activity coordination projects offer the potential to improve traveler information by providing the shared information to all information service providers.

Current Regional Status

The region currently shares information about maintenance and construction on an ad hoc basis.

Current Regional Gaps

The information sharing about maintenance and construction activities should be enhanced with the use of automated tools that can ensure all projects are relayed to all affected organizations and that all organizations will be able to better manage how these projects will affect their own plans.

No current venue exists for the coordination of maintenance and construction schedules among regional stakeholders.

Strategic Efforts and Planned Projects

The following potential projects will assist the region in deploying maintenance and construction activity coordination:

- Twice a year summit to share planned maintenance and construction activity in each jurisdiction
- Analysis of what information is needed to coordinate maintenance & construction activities and work zones
- Integration of maintenance and construction activities into regional transportation plans and operating procedures
- Develop an information sharing tool for sharing maintenance and construction information e.g. enhance RITIS to pull planned roadway closure information due to maintenance and construction activities to identify potential conflicts across agency boundary

4. BEST PRACTICES

The *TPB Vision* calls for a transportation system that maximizes the use and benefit from use of advanced technology, joins rail, roadway, bus, air, water, pedestrian and bicycle facilities into a fully interconnected network, is fiscally sustainable, promotes areas of concentrated growth, and manages both demand and capacity.

In order to achieve these goals, the MOITS Technical Subcommittee has developed the following series of recommended best practices for consideration by the member agencies and jurisdictions. For this document, the term “best practice” is defined as a process or activity anticipated to be especially effective in achieving a desired outcome. Another criterion for a best practice, for the purposes of this document, is that designation as a best practice should be substantially “beyond debate” among stakeholders; it must be widely agreed. Overall, agencies can use these best practices to help achieve the regional vision, goals, and objectives. Member

agencies and jurisdictions have already fully or partially implemented many of these recommended practices.

Included best practices are either within the emphasis areas of the Strategic Plan, or are particularly supportive of those areas. Note that best practices that are associated with regional activities (e.g., the Regional ITS Data Warehouse), rather than agency/jurisdiction activities, are documented as part of the project descriptions for those activities in the Program Plan. This Best Practices section, however, will document individual agency or jurisdictional actions anticipated to help support regional activities. The MOITS Technical Subcommittee serves as a continuing forum for identifying and promoting best practices.

This document divides the identified best practices into overarching best practices and then best practices associated with each emphasis area. Each best practice is structured as a recommended general action by stakeholder agencies or jurisdictions.

Overarching Best Practices

A. Address management, operations, and technology needs in all planning, project development, and program development activities.
    1. Include considerations of management, operations, and technology in all stages of project planning design and construction from initial concept through implementation.
    2. Account for future evolution of management, operations, and technology requirements when planning transportation projects and adopt designs that facilitate future improvements.
    3. Ensure adequate funding for management, operations, and technology staff and facilities including procurement, design, and proper maintenance.

B. Take into account in all planning, project development, and program development activities how management, operations, and technology could address critical needs.
    1. Consider how management, operations, and technology can improve safety when planning transportation projects; adopt designs that facilitate safety improvements.
    2. Consider how management, operations, and technology can help address the needs of persons with disabilities, particularly regarding traffic signals operations and traveler information.
    3. Consider how management, operations, and technology can improve security when planning transportation projects and adopt designs that facilitate security improvements.

C. Plans developed should be objectives-driven and performance-based.
    1. Plans should be in accordance with guidance provided by the U.S. Department of Transportation, particularly on its www.plan4operations.dot.gov web site.

2. Plans should use metrics that are specific, measurable, agreed, relevant, and time-based (SMART).
3. Factor life cycle costs into the planning and decision making process.

D. Support management, operations, and technology needs in all ongoing agency or jurisdictional transportation activities.

1. Use available technologies to the greatest extent possible to support goals.
2. Take maximum advantage of transportation information and information sharing.
3. Enable sharing and use of a reliable and secure regional communications backbone for sharing video, data, and voice.
4. Meet user needs and provide customer service through seamless multi-modal operations.

E. Support management, operations, and technology needs through the use of engineering practices and standards.

1. Follow a robust systems engineering process in the development and implementation of all management, operations, and technology deployments.
2. Use well defined, well designed, consistent open system interfaces using appropriate technical standards.
3. Agencies should have a jurisdictional ITS architecture and design guidelines and/or an enterprise architecture coordinated with the national, state, and regional ITS architecture, and coordinated with regional design guidelines.
4. Costs and convenience of transportation services should be considered.

F. Coordinate operations among agencies and across jurisdictional boundaries.

1. Each agency should develop standard operating procedures, and these should be coordinated among agencies.
2. Operations activities should be sustained for long-term continuity, and sustainable funding should be ensured.
3. Activities should be pursued and deployed through consensus-building and agency buy-in.

ITS Data Warehouse

A. Agencies and jurisdictions should participate in the regional process to define and coordinate the parameters of ITS data warehousing.

1. The use of data for multiple purposes, including for appropriate uses other than the original purpose, should be supported and facilitated.
2. Stakeholders should coordinate to ensure that format or availability changes are appropriately accommodated through proper change/configuration control.

3. Stakeholders should participate in memorandums of understanding (MOUs) to define data sharing, security, and access.

B. The ITS data collection and warehousing practices of agencies and jurisdictions should be undertaken in ways to enable and facilitate data sharing and use.

1. Data formats should be consistent among data sources.
2. Methods to ensure the accuracy and timeliness of data should be utilized.
3. Agencies and jurisdictions should provide data to the warehouse in a way that supports continuous operation of the data warehouse 24/7/365.
4. Stakeholders should agree upon consistent meta-data requirements.
5. Data should be on line and available for analysis.

Multi-modal Coordination

A. Operating agencies should develop and maintain the ability to provide operations status information in real time to other operating agencies on the same facility or in the same corridor, to support multi-modal coordination.

1. Buses and other appropriate agency vehicles (e.g., snowplows) should have automated vehicle location (AVL) systems to facilitate multi-modal data sharing.
2. Multi-modal data should be made available for outside developers to build their own information applications.
3. Stakeholders should provide appropriate multi-modal traveler information to the traveler information function.

B. Operating agencies should consider and utilize operations information from all relevant agencies in real time to maximize the efficiency and effectiveness of multi-modal operations on a facility or in a corridor.

1. Bus transit agencies should perform inter-service transfer coordination at major transfer points.
2. Stakeholders should utilize AVL data made available across agencies.
3. Traffic operators should maintain a real-time understanding of the traffic conditions under their purview as well as transit conditions on that same facility or corridor; similarly, transit operators should maintain a real-time understanding of traffic conditions and incidents.
4. Systems to provide center-to-center communications between transit and traffic operators should be deployed and maintained.

Transit Signal Priority

A. Transit and traffic signal technologies deployed in the region should accommodate the ability to provide transit signal priority, to provide decision makers that option if they so choose.

1. Stakeholders should take into account both procedural and technical considerations, and their interaction.
2. Stakeholders should coordinate equipment and technology needs among traffic management (e.g. signals), transit management (e.g. on board systems), and emergency vehicles (e.g. preemption).

B. Robust data on transit ridership and operations, traffic conditions, and related issues should be collected, used, shared, and provided to decision makers to facilitate informed decisions on transit signal priority.

1. Data should include where there are bus operational issues or delays, and passenger count data to know how many people are being served.
2. Data should include schedule adherence information.
3. Movement of people should be considered in addition to movement of vehicles.
4. The air quality impacts of transit signal priority or other arterial management strategies should be considered.
5. Information provided to decision makers on transit signal priority should be in the context of other potential arterial management and transit management strategies.
6. System-wide traffic impacts of priority service calls should be taken into account.
7. The highest level of transit customer service feasible without degrading traffic safety should be provided.

Interactive Traveler Information

A. Agencies or jurisdictions should provide real-time traveler information individually and in coordination with one another.

B. Traveler information provided should be multi-modal in nature to enable travelers to make the best choices for themselves.

C. Agencies and jurisdictions should provide travel time information (such as on highway variable message signs or at major transit centers).

D. Stakeholders should make traveler information available through a variety of technological means, both directly and through private sector information service providers.

Transportation Operations Data Sharing

A. Agencies and jurisdictions should participate in the real-time regional transportation operations data sharing system to support regional situational awareness of traffic and transit systems conditions.

1. Transportation information should serve multiple needs (e.g. traveler information, emergency management, traffic management).

2. Data sharing by agencies and jurisdictions should support a regional perspective and regional situational awareness.
3. Agencies and jurisdictions should make real-time data available to the regional system.
4. Agencies and jurisdictions should define and adopt standard operating procedures that include data sharing and appropriate associated communications to ensure mutual situational awareness among stakeholders, especially during incidents.
5. Stakeholders should develop and adopt memorandums of understanding (MOUs) regarding providing and sharing traveler information.
6. Stakeholders should use regional situational awareness to help individual agencies better manage their own systems better and coordinate with other stakeholders.
7. Regional situational awareness should be multi-modal.
8. Data and data formats should be consistent among data sources.
9. Regional data fusion should be used to look for new information in patterns or clusters to create new knowledge.
10. Both real time and archived data should be used to aid the understanding of regional situational awareness.

B. Data sharing should be facilitated through proper mechanisms and formatting.

1. Agencies and jurisdictions should ensure accuracy and timeliness of data.
2. Data sharing mechanisms should be up and running as close to 24/7/365 as feasible.
3. Metadata standards should be agreed upon regionally and used consistently by agencies and jurisdictions.
4. Agencies and jurisdictions should be on the lookout for gaps in data and find ways to address those gaps.
5. Data sharing activities should be consistent with and build upon the ITS Data Warehouse best practices noted in the ITS Data Warehouse section above.
6. Stakeholders should have a written security policy for traveler information that is consistent with the ITS Data Warehouse security policy.

HOV Lane Management

A. Both technology and operating procedures should be to address managed lanes operations issues and inter-facility coordination.

B. Facilities should have rules and procedures that are easy for drivers to understand and associated signage visible to drivers at key locations.

C. Agencies and jurisdictions should provide travel times for managed lanes in comparison to conventional lanes.

D. Stakeholders should perform inter- facility coordination on operating hours, policies, procedures, and prices.

E. Stakeholders should participate in periodic managed lanes summit meetings to maintain inter-facility coordination.

Regional Traffic Management

A. Agencies and jurisdictions should coordinate traffic management.

    1. Agencies and jurisdictions should coordinate traffic signal timing across jurisdictional boundaries.

    2. Agencies and jurisdictions should coordinate corridor operations, perform integrated corridor management, and coordinate operations between freeways and arterials.

    3. Agencies and jurisdictions responsible for managing arterials should facilitate operations for buses and bus rapid transit.

    4. Agencies and jurisdictions should provide timely and accurate transportation systems condition and incident information to traveler information service providers.

B. Agencies and jurisdictions should coordinate agency traffic management activities with regional coordination and data sharing activities (e.g. MATOC).

    1. Agencies and jurisdictions should use standard operating procedures coordinated across jurisdictional boundaries.

    2. Agencies and jurisdictions should use technology to enable control of systems from multiple facilities or across agencies as a way to provide emergency backup.

    3. Agencies and jurisdictions should develop plans in accordance with relevant state and national laws for daily operations, special events, and emergencies (e.g. evacuation events).

    4. Agencies and jurisdictions should develop regional plans for special events (e.g. inauguration, national celebrations, other major gatherings) while supporting RESF-1 development of emergency transportation plans (e.g. evacuation).

Regional Parking Management

A. Agencies and jurisdictions should include parking information in transportation information.

B. Agencies and jurisdictions should include parking location, availability, and price information in parking information.

C. Agencies and jurisdictions should use information to manage parking supply and demand.

1. Make sure that travelers should have information available to them whether there is a park and ride or transit option for their travel.
2. Use parking availability information to help manage traffic and make travel more efficient; consider how pricing affects travel demand.
3. Considerations of commercial vehicle parking/loading zones should be included in parking management activities.
4. Agencies and jurisdictions should share parking information with other traffic and transit information systems.
5. Utilize technology to minimize infrastructure cost and maximize reliability (e.g. pay by mobile phone).

D. Agencies and jurisdictions should coordinate regarding parking for special events or during emergencies.

Maintenance and Construction (M/C)

A. Agencies and jurisdictions should use agreed regional procedures to share M/C information among all stakeholders (not just ad hoc information).
   1. Agencies and jurisdictions should share amalgamated planned and real time M/C information with ISPs and TMCs.
   2. Stakeholders should hold periodic regional summits to share M/C information.
   3. Agencies and jurisdictions should coordinate projects that are near agency/jurisdictional boundaries or that might significantly impact other stakeholders.

B. Agencies and jurisdictions should use computer/automated systems to facilitate information sharing, including visualization on maps.

C. Agencies and jurisdictions should outreach to the public regarding anticipated impact of M/C on transportation.

5. PROGRAM ASSESSMENT AND SUPPORT

The activities associated with the MOITS Technical Subcommittee are consistently assessed to quantify the benefits from regional efforts. Performance measures are used to quantify the progress and benefits of management, operations, and ITS. Cost benefits analysis is used to show the efficiency and return on investment when using public funding. With dedicated consistent funding, the MOITS program can be properly measured from year to year. Agency stakeholders can support regional efforts at many different levels of collaboration.

5.1. Performance Measures

Performance measures quantify the improvement in the transportation system as a result of specific regional programs and services and also measure the efficiency and effectiveness of those regional efforts.

The MOITS Technical Subcommittee will use two types of performance measures: Regional Performance Measures and Programmatic Performance Measures.

In support of regional performance measures, the MOITS Technical Subcommittee supports and uses performance measures used in the Congestion Management Process and augments those metrics with three new metrics that will be enabled through the implementation of new regional capabilities and metrics that quantify safety.

The regional performance measures fall into four categories:

1. Data for Direct Assessment of Current (or future background) condition
2. Calculated performance measures/indicators for congestion assessment
3. Calculated regional indices that reflect travel conditions and the traveler's experience
4. Calculated performance measures that summarize safety

Specific performance measures in each category are shown in Figure 7.

Data for Direct Assessment of Current (or future background) Conditions	Calculated performance measures/indicators for congestion assessment	Calculated regional indices that reflect travel conditions and the traveler's experience	Compiled performance measures that summarize safety
Traffic volumes	Volume-to-capacity (V/C) ratio	Travel Time Index	Number of regional incidents
Facility capacity	Level of service	Buffer Time Index	Average duration of incidents
Speed	Person miles traveled/Vehicle miles traveled	Planning Time Index	Total No. of fatalities
Vehicle density	Truck hours of travel		No. of fatalities by mode
Vehicle classification	Person hours of delay/vehicle hours of delay		Total No. of injuries
Vehicle occupancy (no. of passengers)	Modal shares		Total No. of injuries by mode

Transit ridership	Vehicle trips		
	Emission reduction benefits		

Figure 7: Regional Performance Measures by Category

Performance measures related to Data for Direct Assessment of Current (or future background) Conditions and Calculated performance measures/indicators for congestion assessment are defined by the Congestion Management Process. Compiled performance measures that summarize safety indicate key factors that may impact or be impacted by MOITS-related activities. Because the Calculated regional indices that reflect travel conditions and the traveler's experience are new to the MOITS program, these performance measures deserve more detailed definition.

The Travel Time Index is a metric that measures regional congestion. This metric has often been used by the Texas Transportation Institute in their annual survey of the most congested cities/regions in the United States. The Travel Time Index is the Peak Period Travel Time divided by the Free Flow Travel Time. The higher the travel time index, the more congested the area.

Travel Time Index = Peak period travel time / Free flow travel time

The Buffer Time Index is a metric that measures the reliability of the transportation system. The Buffer Time Index is the 95^{th} percentile travel time minus the average travel time with the quantity divided by the average travel time. This metric can be used by a knowledgeable commuter to estimate how much time should be allocated to an individual trip to assure that they arrive at their destination on time. The commuter's knowledge of local traffic conditions at different times of the year is captured in this metric through the use of the average travel time over the course of the year.

Buffer Time Index = (95^{th} percentile travel time – average travel time)/average travel time

The Planning Time Index is also a metric that measures the reliability of the transportation system. This metric can be used by tourists and commuters who are not experienced in traveling throughout the region. The Planning Time Index is the 95^{th} percentile travel time divided by the free flow travel time. This metric captures the reliability of the transportation network based upon expected conditions for a particular day or hour of travel.

Planning Time Index = 95^{th} percentile travel time / free flow travel time

The implementation of the Regional Data Warehouse and sharing of transportation operations data allows the calculation of the Regional Indices.

Programmatic Performance Measures fall into three categories: operations performance measures, planning performance measures, and infrastructure performance measures.

Figure 8 shows Programmatic Performance Measures by category.

Operations	Planning	Infrastructure
Incident Duration	% Sustained Funding	% Properly Maintained
Clearance Time	% of Regional Program Funded	# Coordinated Construction & Maintenance Projects
Free Flow Travel Time	# Projects Undertaken	
Average Travel Time	# MOITS Program Plan Projects Complete	
95th percentile travel time point to point	# Participating Stakeholders	
No. of Regional Incidents		
% Adherence to Transit Schedules		
Timeliness (Delay) of Information		

Figure 8: Programmatic Performance Measures

The MOITS technical subcommittee is tied to the congestion management process and would like to ensure that the congestion management process considers MOITS strategies in the evaluation of regional performance while using the technical metrics of Figure 7.

5.2. Benefits, Cost, and Return on Investment

Deploying, operating, and maintaining intelligent transportation systems provides a significant return on investment.

The US Department of Transportation has been collecting benefits and costs for ITS and Operations deployments and strategies for a number of years. The ITS Benefits database (www.itsbenefits.its.dot.gov), maintained by the Research Innovative Technology Administration (RITA) is an excellent resource for locating evidence of the return of investment that could be achieved through specific strategies and activities.

The information cited in this section focuses on strategies and elements of Management, Operations, and ITS that are relevant to the emphasis areas defined by the MOITS technical subcommittee. The return on investment can vary by emphasis area.

Regional Traffic Incident Management

Large returns on investment have been consistently documented over the past decade associated with the deployment of traffic incident management technologies, in combination with efforts to foster and continually enhance the ability of agencies and responders to share information, collaborate, cooperate, and coordinate. This domain is central to MOITS mission and objectives. Annual evaluations of the Maryland State CHART incident management system shows reductions in average incident duration in the range of 28 percent, which translates into an estimated 377 fewer secondary incidents. Results of this order of magnitude have been demonstrated other regions across the country.

Integrated Corridor Management Strategies

Integrated Corridor Management (ICM) strategies that promote integration among freeways, arterials, and transit systems can help balance traffic flow and enhance corridor performance; simulation models indicate benefit-to-cost ratios for combined strategies range from 7:1 to 25:1. The U.S. DOT developed a simulation model to test the potential impacts of integrating ITS in major transportation corridors. The following results were reported:

- HOT lane and highway traveler information were consistently the most effective ICM investments. Converting an existing HOV lane to a HOT lane produced a benefit-to-cost ratio that ranged from of 14:1 to 39:1.
- Highway traveler information produced a large benefit, especially in the case of unexpected events such as a major incident. In this case, the benefit-to-cost ratio ranged from 16:1 to 25:1.
- Transit traveler information produced less benefit than highway traveler information, but the impact remained positive with a benefit-to-cost ratio of 16:1. Up to four percent of travelers shifted modes in response to a major incident.
- In high-demand conditions, arterial signal coordination produced a benefit-to-cost ratio that ranged from 12:1 to 20:1. In medium-demand conditions the benefit-to cost ratio ranged from 4:1 to 13:1.
- Combining multiple ICM strategies produced a benefit-to-cost ratio that ranged from 7:1 to 25:1. The AMS framework applied to the Test Corridor was able to dynamically adjust the price of HOT lanes in response to changing traffic conditions, provide traveler information to identify potential alternate routes and transit options, update ramp meters, and adjust arterial signal timings.

Overall, the model calculated a 10-year benefit of approximately $570 million with approximately one half of that benefit the result of ICM strategies applied during high demand/major incident days (representing 25 percent of commute days).

Regional Parking Management

In European cities, advanced parking information systems have reduced traffic volumes related to parking space searches up to 25 percent. Display of available parking on variable message

signs for drivers showed reductions of up to 25 percent in downtown traffic volumes related to searching for parking spaces and have shown enhanced use of transit and improved use of park-and-ride lots serving transit when drivers are informed that parking is full.

Outside San Francisco, a transit-based smart parking system contributed to an increase in transit mode share, a decrease in commute time and a reduction in total VMT. Specifically, this study found a sizable increases in transit mode share of 5.5 more transit commutes per month for on-site work commutes, decreased average commute time an average of 5 percent for a 50 minute commute, and Reduction in total vehicle-miles-traveled per participant of 9.7 miles per month.

Data Archiving

The availability of appropriate, accurate, data is essential to manage and operate transportation systems; data is needed on the structure, status, use and behavior of the entire transportation system. A study evaluating data archiving at more than 60 organizations found that data warehousing generated an average return on investment of 401 percent over three years. The potential return on investment for data archiving and data sharing activities have not been specifically studied at the regional level, however; the availability of data from individual operating agencies is essential to efforts to monitor and evaluate system performance and the return on investment for regional and/or multi-agency efforts.

Signal Re-Timing, Coordination, and Optimization

The Institute of Transportation Engineers (ITE) estimates that traffic signal improvements can reduce travel time by 8 to 25 percent. Across the nation, traffic signal retiming programs have resulted in travel time and delay reductions of 5 to 20 percent, and fuel savings of 10 to 15 percent. Researchers at Oak Ridge National Laboratory estimate that poor signal timing causes 296 million vehicle hours of delay. Appropriate timing of traffic signals can decrease congestion, improve air quality, reduce fuel consumption, and minimize aggressive driving behavior. Optimizing signal timing produces average benefit-to-cost ratios that approach 40 to 1. Across the nation, traffic signal retiming programs have resulted in travel time and delay reductions of 5 to 20 percent and fuel savings of 10 to 15 percent.

Simulations indicated that using a decision support tool to select alternative traffic control plans during non-recurring congestion in the Disney Land area of Anaheim, California could reduce travel time by 2 to 29 percent and decrease stop time by 15 to 56 percent.

Transit Signal Priority

Studies and evaluations of the use of transit signal priority strategies have been conducted in a wide range of environments. No clear consensus has emerged about the general effectiveness of Transit Signal Priority, in part, because each agency implementing these strategies can have differing goals, and there are often conflicting issues, needs, and concerns among the various stakeholders. The benefits of Transit Signal Priority vary depending on type and degree of application. Successful implementations of Transit Signal Priority have, however shown demonstrated benefits that include 12 to 18% reductions in running times and substantial increases in running speeds and service reliability, particularly for Bus Rapid Transit (BRT)

applications. Transit agencies should examine route-specific opportunities and constraints, and assess corridor market potential for transit services prior to implementing BRT running way improvements. With numerous BRT systems currently in operation information on the costs and effectiveness of BRT components is readily available.

Air Quality/Greenhouse Gases

[To be developed.]

5.3. Funding

Regional activities may have funding and resource needs not covered within individual agency budgets or staffing.

While no dedicated funding stream exists for regional implementation efforts, each participating agency usually brings a portion of the necessary funding to bear to implement a regional project or activity. This funding comes from existing funding sources within each agency and heavily depends on each agency's priority and political environment.

Because funding is currently performed on an ad hoc basis, consistent regional progress is slowed.

MOITS participants should seek a dedicated funding stream for regional efforts. Until that funding stream is available, the MOITS participants will continue to use funding as available from the operating agencies and seek to supplement that funding with federal grants and other ad hoc funding pools.

Potential funding streams include dedicating some funding through existing allocations within MOITS member agencies, redirecting CMAQ funding for congestion management as appropriate, and/or asking participating jurisdictions to provide a base level of funding in order to match federal funds or private sector contributions.

MOITS activities are regional in scope and cross both state lines and local jurisdictional boundaries. Funding from member agencies would most likely come from existing local budgets rather than from statewide budget items.

5.4. Stakeholder Collaboration

Members of the MOITS Technical Subcommittee have been working together to address regional transportation operations issues. Activities undertaken by the MOITS technical committee are based upon a developed consensus among the participating agencies with support from technical and political leaders of each agency.

When working together, the participating agencies can use different levels of collaboration to accomplish a project or activity.

At a regional level, many related entities work within the region. These entities include the MOITS technical committee, MATOC, and RESF-1. Each entity has defined their general roles and responsibilities and coordinates and cooperates with other regional entities.

Transportation issues span a range of topics from traffic management, transit management, multi-modal coordination, public safety, and emergency management. The MOITS technical

committee collaborates with other regional entities when addressing issues related to those topics.

5.4.1. LEVELS OF COLLABORATION

MOITS participants undertake many regional activities that require different levels of collaboration. Not all activities require the same level of collaboration. The MOITS technical committee has defined three levels of collaboration:

- Coordination
- Regional Collaboration
- Collective action

Coordination occurs when two or more stakeholders are addressing a similar issue. Under coordination, the stakeholders act independently to address the issue for their jurisdiction but communicate their actions and are aware of the actions of the other stakeholders. Each stakeholder will take action as appropriate to change their practice or procedure to be compatible with other stakeholders. Each stakeholder acts independently but communicates with and considers the actions of other stakeholders to work for a mutual regional benefit.

Regional Collaboration occurs when two or more stakeholders are addressing a regional issue that requires scheduled coordination under a mutually developed plan. Resources of each stakeholder are managed by the individual stakeholder to meet the schedule and programmatic activities of the plan. Regional collaboration adds a time and programmatic factor to "coordination" with stakeholder management of stakeholder resources.

Collective action occurs when two or more stakeholders are addressing a regional issue that requires extensive coordination of resources owned by each stakeholder. Collective action typically includes a mutually agreed upon plan, pooled funding, an identified lead agency for handling procurement and contract management, and use of independent third parties such as contractors. All stakeholders develop a mutually acceptable plan, provide resources to be managed by the lead agency, and perform oversight of the plan by participating in an oversight group or steering committee

The different levels of collaboration can be viewed as a triangle where coordination forms the base, regional collaboration forms a middle level, and collective action forms the point. Figure 9 illustrates the levels of collaboration.

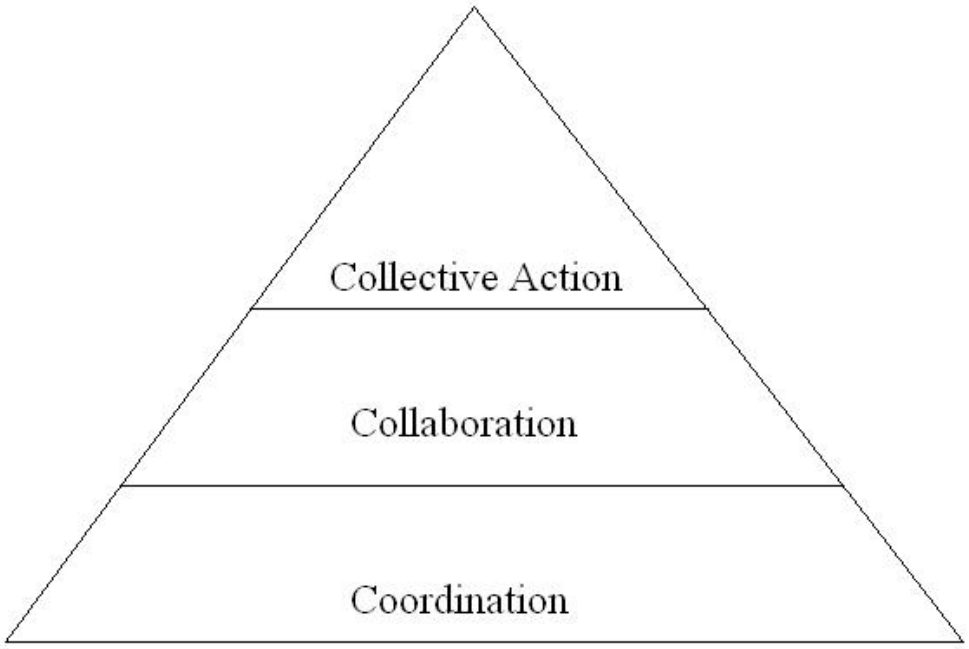

Figure 9: Levels of Collaboration

Participating stakeholders determine the appropriate level of collaboration on a per project basis. The level of collaboration depends upon a number of factors such as the scope and complexity of the project, administrative requirements associated with funding sources, available staff time, and operating processes within each participating agency. (See Section 4.0 Best Practices for details on activities performed at each level of collaboration.)

5.4.2. General Roles and Responsibilities

MOITS, the participating member agencies, and other regional entities such as MATOC and RESF-1 have different general roles and responsibilities. MOITS is a regional planning group addressing on-going management, operations, and transportation technology issues. MATOC is an operating entity that coordinates information for regional incident response. RESF-1 is a planning group dealing with emergency management issues.

MOITS provides technical support and advice to these other entities as requested.

5.4.3. ROLES AND RESPONSIBILITIES FOR REGIONAL TRAFFIC MANAGEMENT

The MOITS Technical Subcommittee is a planning group that advises the TPB on and provides a forum for development, discussion, and coordination of regional transportation projects. MOITS has no operational responsibility.

MATOC performs a coordination function for regional incidents. MATOC provides regional situational awareness of transportation operations in the National Capital Region (NCR) through the communication of consistent and reliable information that enables operating agencies and the traveling public to make effective and timely decisions. MATOC develops the tools and processes needed to facilitate coordinated operating agency responses.

Regional Emergency Support Function-1 convenes and provides emergency transportation expertise to the regional public safety process. RESF-1 has a planning role for emergency management where MOITS has a planning role for transportation management.

MOITS provides technical support and advice as required to these other two groups.

5.4.4. ROLES AND RESPONSIBILITIES FOR TRANSIT AND MULTI-MODAL ACTIVITIES

MOITS supports transit and multi-modal activities but has not been the primary venue for coordinating these functions; such coordination occurs within WMATA or its family of committees.

WMATA, as the largest transit operator, hosts a number of committees and efforts that directly address transit technology and transit operations. These activities are coordinated with MOITS but could be expanded. Transit agency representatives participate in MOITS and help assure that transit and multi-modal considerations are reflected in all MOITS activities. Individual transit agencies are responsible for daily transit operations.

The TPB hosts the Regional Bus Subcommittee and this committee advises the TPB on how best to integrate bus considerations in the CLRP.

5.4.5. LIAISON TO PUBLIC SAFETY AND EMERGENCY MANAGEMENT

Many different federal, state, local, and regional entities have a significant interest in public safety and emergency management. Within the TPB framework, MOITS, RESF-1, and each operating agency have public safety and emergency management priorities, activities, and requirements.

Over the past few years, the roles and responsibilities of each interested entity have become clearer. MOITS provides technical advice as necessary to public safety and emergency management entities. RESF-1 performs emergency transportation planning with input and advice from MOITS. RESF-1 deals with emergency preparedness planning within the context of public safety and Department of Homeland Security (DHS) planning for the transportation sector. MOITS addresses the management, operations, and technical aspects of regional planning within the USDOT mandated metropolitan transportation planning process. RESF – 1 coordinates with other public safety committees on procedures followed during emergencies. MOITS provides a forum for discussing transportation operating procedures for every day transportation activities as well as for incident management (for incidents that do not rise to a level of major regional emergencies).

MOITS and RESF-1 provide advice and comments to each other to assure that regional interests are represented in both USDOT and DHS planning.

6. FUTURE DIRECTION

The future direction of the MOITS technical committee emphasizes addressing regional needs in support of the TPB's vision statement and goals. The MOITS technical committee supports all eight regional goals and concentrates activities in support of goal 3 and goal 4. The MOITS Technical Subcommittee shall facilitate accomplishment of the objectives and strategies of the goals by defining regional projects that improve regional situational awareness, regional operating practices, regional traveler information, and regional integration.

The MOITS Technical Subcommittee will continue to advise the TPB on management, operations, and intelligent transportation systems issues as they relate to the CLRP, provide a forum for information exchange among the member agencies, define projects of regional interest and provide a forum for providing advice on specific projects.

The MOITS technical committee shall continue to perform its customary role while pursuing a renewed focus on defining multi-agency regional transportation projects to address regional needs, improve regional coordination and cooperation, and assist member agencies. These regional projects shall support the nine technical emphasis areas derived from the regional and national ITS architecture.

This strategic plan refines the traditional activities of the MOITS technical committee by defining and detailing emphasis areas, presenting a draft program plan for achieving the goals and objectives of the TPB, describing best practices for use by member agencies, and defining near term, mid-term, and long term regional activities.

The MOITS technical committee shall define and plan regional multi-agency projects, provide a venue for coordination, provide technical advice to the TPB, and support and advocate significant regional projects. These projects and activities fall into three time frames: near term activities, med term activities and long term activities. The attached Draft Regional MOITS Program Plan presents specific activities to be performed.

6.1. Near Term Regional Activities

[To be developed.]

6.2. Mid-Term Regional Activities

[To be developed.]

6.3. Long Term Regional Activities

[To be developed.]

6.4. Significant Regional Projects

[To be developed.]