# GTC Congestion Management Process

# Technical Documentation

GENESEE TRANSPORTATION COUNCIL

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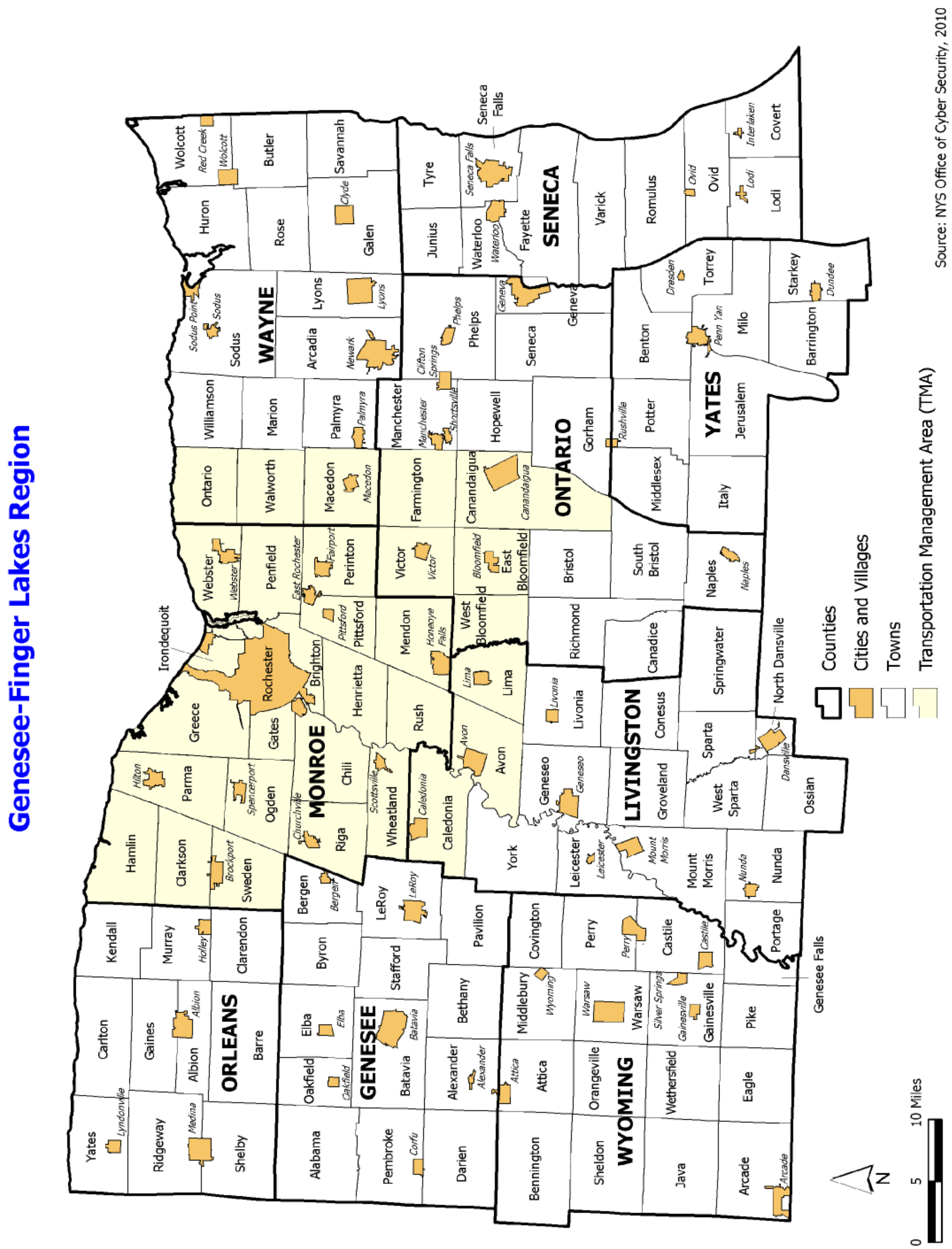



**Map 1**: The Genesee-Finger Lakes Region. The GTC CMP addresses congestion management in the Transportation Management Area, the shaded area including Monroe County and the surrounding municipalities in Livingston, Ontario and Wayne Counties.

# Section 1 - Introduction

## 1.1: Purpose of the Congestion Mitigation Process

The Congestion Mitigation Process (CMP) is a systematic approach to traffic congestion management that provides accurate, up-to-date information on transportation system performance regarding congestion and an assessment of strategies to address it. As defined by the United States Department of Transportation, congestion management is the application of strategies to improve transportation system efficiency and reliability by reducing the adverse impacts of congestion on the movement of people and goods. Effective congestion management is important because excessive delay has deleterious impacts on communities, causing an increase in travel times, fuel consumption, vehicle emissions, and emergency response times, as well as lost productivity.

## 1.2: Basis in Federal Legislation

In 1991 Congress enacted the Intermodal Surface Transportation Efficiency Act (ISTEA), a transportation authorization bill that provided guidance and funding for national transportation infrastructure investments. ISTEA designated urbanized areas with populations of 200,000 people or more as Transportation Management Areas (TMA), and required Metropolitan Planning Organizations (MPO) within each TMA to develop a Congestion Management System (CMS). The CMS was intended to support effective infrastructure investment decisions by identifying the sources and locations of congestion and proposing potential solutions.

Subsequent transportation authorization acts, including the Transportation Equity Act for the 21st Century (TEA-21), enacted in 1998; the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU), enacted in 2005; and the current authorization, Moving Ahead for Progress in the 21st Century (MAP-21), enacted in 2012; carried forward this requirement. SAFETEA-LU changed the program designation from "Congestion Management System" to "Congestion Management Process" to reflect the idea that managing congestion is an ongoing process that must be closely integrated into broader regional transportation planning activities to achieve maximum effectiveness.

Federal legislation mandates that each CMP include the following six elements:

1. Methods to monitor and evaluate the performance of the multimodal transportation system, identify the causes of recurring and non-recurring congestion, identify and evaluate alternative strategies, provide information supporting the implementation of actions, and evaluate the efficiency and effectiveness of implemented actions;
2. Definition of congestion management objectives and appropriate performance measures to assess the extent of congestion and support the evaluation of the effectiveness of congestion reduction and mobility enhancement strategies for the movement of people and goods. Since levels of acceptable system performance may vary among local communities, performance measures should be tailored to the specific needs of the area and established cooperatively by the State(s), affected MPO(s), and local officials in consultation with the operators of major modes of transportation in the coverage area;

3. Establishment of a coordinated program for data collection and system performance monitoring to define the extent and duration of congestion, to contribute in determining the causes of congestion, and evaluate the efficiency and effectiveness of implemented actions. To the extent possible, this data collection program should be coordinated with existing data sources (including archived operations/ITS data) and coordinated with operations managers in the metropolitan area;
4. Identification and evaluation of the anticipated performance and expected benefits of appropriate congestion management strategies that will contribute to the more effective use and improved safety of existing and future transportation systems based on the established performance measures. The following categories of strategies, or combinations of strategies, are some examples of what should be appropriately considered for each area: Demand management measures, including growth management and congestion pricing; traffic operational improvements; public transportation improvements; ITS technologies; and, where necessary, additional system capacity;
5. Identification of an implementation schedule, implementation responsibilities, and possible funding sources for each strategy (or combination of strategies) proposed for implementation; and
6. Implementation of a process for periodic assessment of the effectiveness of implemented strategies, in terms of the area's established performance measures. The results of this evaluation shall be provided to decision makers and the public to provide guidance on selection of effective strategies for future implementation.

GTC, as the designated MPO for the nine-county Genesee-Finger Lakes Region which includes the Rochester TMA, is charged with the development and implementation of the GTC CMP. The Rochester TMA, which includes all of Monroe County plus the adjacent developed areas of Livingston, Ontario, and Wayne counties, is the geographic area covered by the GTC CMP.

### 1.3: Basis in the Long Range Transportation Plan

The *Long Range Transportation Plan (LRTP) for the Genesee-Finger Lakes Region 2035*, adopted by the GTC board in June 2011, provides the strategic framework for transportation system policy, planning, and investment decisions in the region. The content of the LRTP is organized around four "guiding principles," which describe how transportation infrastructure and services link to the social and economic vitality of the region. Congestion management is an important element in each of these guiding principles:

1. Plan for People

   Local officials and decision-makers often consider infrastructure and services the end results of the transportation planning process. However, the LRTP focuses on the impacts on people that the plan will have. Congestion management is important to the community because reducing delay and uncertainty increases the time that residents have for other activities, whether it be work, education, recreation, or simply more time with family and friends.

2. Place Matters

   Different places have different transportation needs. The need for congestion management, however, is a common theme of all areas. While not all roads and locations within the TMA are congested, it is worthwhile to factor in congestion management practices for transportation projects in all locations to either address existing congestion or prevent future congestion growth. Congestion management strategies must be tailored to the needs of specific locations and, to be most effective, must consider all available modes of transportation as well as both supply- and demand-side approaches.

3. Maximize Existing Assets

   Traditionally, transportation planners and engineers have used infrastructure expansion projects as a solution to problems such as increasing traffic congestion and travel times. However, funds for such projects have become extremely limited and road expansion is generally no longer a viable alternative. More economical solutions are available that are often equally, if not more, effective. Congestion reduction can be achieved through Intelligent Transportation Systems (ITS) deployments, including traffic signal timing coordination and optimization, traffic cameras, and traveler information services. In addition, travel demand-related solutions such as alternate modes of transportation, transit-supportive development patterns, and alternate work hours/locations may also decrease congestion.

4. Accept Uncertainty

   Given the anticipated funding limits on transportation infrastructure projects during the next several years, the most effective way to address traffic congestion may be to integrate congestion mitigation into other projects. Stand-alone congestion reduction projects may not have enough benefits to be included in the Transportation Improvement Program or a member agency's capital improvement plan. However, by developing a bridge or highway rehabilitation project that can also reduce congestion through lane restriping, a member agency can accomplish an infrastructure preservation project as well as realize operational improvements.

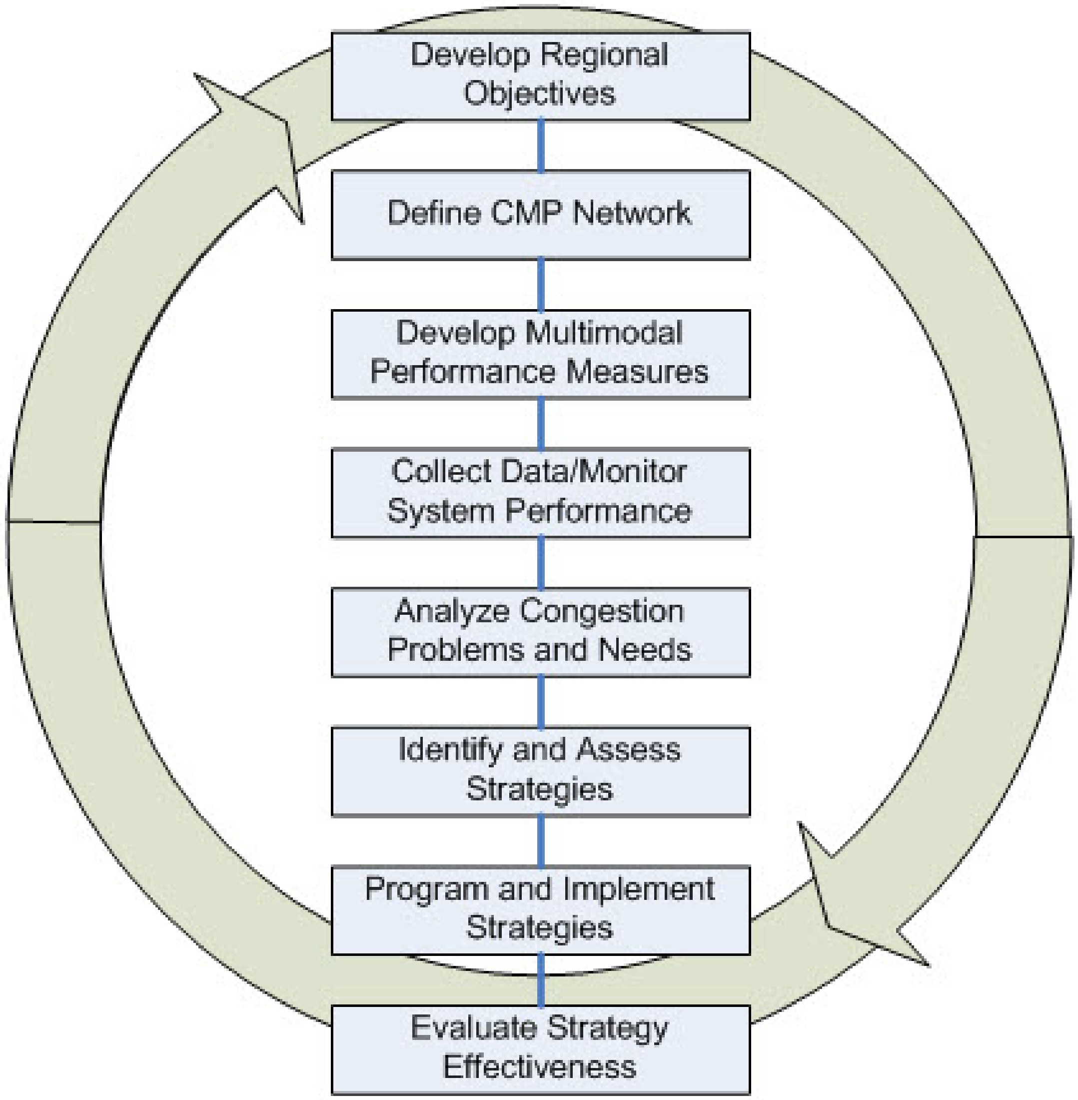
The LRTP identified 25 recommendations that address congestion management. Please refer to Section 5, LRTP Recommendations, for a list of recommendations related to congestion management as well as their associated representative projects and supporting activities. The CMP expands on commentary and information presented in the LRTP by providing a more thorough assessment of current congestion trends in the region and identifies potential solutions.

### 1.4: CMP Elements

The Federal Highway Administration (FHWA) provides guidance on CMP development and implementation. FHWA created a "process model" that breaks down the CMP development process into eight elements. The process model is not intended to serve as a step-by-step guide to that process, but rather is intended to convey the key actions needed to prepare an effective CMP. Some actions depicted in the model may be revised on an ongoing basis or periodically updated as part of the LRTP development process, while other actions may be fixed for long periods of time. All of the actions are linked together in a cyclical framework.

A brief discussion and assessment of each element, focused on its relevance for the GTC CMP, follows the process model graphic depicted on the following page.

**Figure 1: Congestion Management Process Model**




Source: *Congestion Management Process: A Guidebook*. Page 9. FHWA, 2011.

1. Develop Regional Objectives for Congestion Management: Objectives define the CMP's desired outcome and provide overall direction to its actions. The objective of the GTC CMP is:

   *To enhance the mobility of people and goods in the Genesee-Finger Lakes Region by advancing coordinated multi-modal and corridor-level solutions that mitigate existing and avoid future excess delay through initiatives that yield improved regional transportation system performance now and in the future.*

2. Define CMP Network: The CMP network includes both the geographical scope as well as the transportation system elements analyzed by the CMP. The geographic scope of the GTC CMP is the Rochester TMA. The system elements include all Interstates, principal and minor arterials, and major and minor collector roads in the TMA, as well as local roads in the vicinity of special event venues.

3. Develop Multimodal Performance Measures: A CMP should identify how traffic congestion is defined and measured. The GTC CMP identifies congested road segments with the Travel Time Index (TTI), a measurement of travel delay. The TTI is the ratio of travel time during the peak period to the time required to make the same trip at free-flow speeds. It is calculated by dividing the peak period travel time by the free-flow travel time. A TTI value of 1.3, for example, indicates that a 20-minute trip in free-flow conditions requires 26 minutes during the peak period. The TTI ratio is a useful measurement because it provides an easily calculated and readily understandable congestion measure.

   As discussed in Section 3, Performance Monitoring and Measurement, congested links that experience Recurring Capacity Related Delay are those with a TTI of 1.25 or greater. The TTI may also be used to identify potential locations of Non-Recurring Incident-Related Delay. These are locations where a traffic incident occurring prior to or during the peak period has the potential to generate significant delay. While the TTI does not directly measure non-recurring congestion, road segments with recurring delay will experience even greater delays should non-recurring congestion occur there.

4. Collect Data/Monitor System Performance: The CMP should identify what data is needed for analyzing traffic congestion and how it will be collected. Section 3 discusses the data collection process, including data needs, location and frequency of data collection, and how the selected performance measures monitor congestion conditions.

5. Analyze Congestion Problems and Needs: A CMP should identify the locations and causes of congestion. Please see Section 2, Delay Typologies, for a description of the three types of congestion analyzed in this CMP and Section 4, Congested Locations, for a discussion of the location of congestion in the Rochester TMA.

6. Identify and Assess Strategies: The CMP should identify potential congestion management strategies and assess their practicality. There is a broad array of potential congestion reduction strategies, but they are not always feasible or desirable. Section 5 discusses all the strategies included in the *LRTP 2035* that include a congestion management element. Section 6 lists all potential congestion management strategies that could be applied in the Rochester TMA and briefly reviews their benefits, costs, and expected impacts.

7. Program and Implement strategies: The CMP should provide direction on which of the congestion management strategies will be enacted and how they will be managed. The GTC CMP actions, which are also recommendations in the LRTP, are folded into the LRTP implementation schedule and are anticipated to follow that schedule.

8. Evaluate Strategy Effectiveness: The CMP should include a process to evaluate the effectiveness of congestion management actions and identify lessons gleaned from successful congestion management practices in the region. Section 3 of the GTC CMP includes commentary on how the CMP performance measures will be used to track the effectiveness of congestion management strategies.

## 1.5: Congestion Trends

National

Traffic congestion is a growing nation-wide problem that is receiving increased attention from both the private and public sectors. A 2011 IBM Global Services report on transportation and economic development stated that traffic congestion "negatively impacts the quality of life by decreasing personal and business productivity, lowering air quality, creating noise pollution, adversely impacting health, [and] lead[s] to the waste of nearly 1.9 billion gallons of fuel each year."[1] Many reports and studies published by the United States Department of Transportation identify traffic congestion as a problem that burdens travelers and businesses with greater costs due to increased travel times and reduced travel time reliability.

The Urban Mobility Reports published by the Texas Transportation Institute (TTI) provide the most accurate surveys of national congestion trends currently available. Published annually since 1982, the Urban Mobility Reports allow for analyses of nation-wide congestion trends over the past 30 years.

The Urban Mobility Reports analyze travel times and congestion trends in the 101 largest American metropolitan areas. The report organizes these areas into four categories: Very Large (over three million in population), Large (over one million and less than three million in population), Medium (over 500,000 and less than one million in population), and Small (less than 500,000 in population). Rochester is classified as a Medium-sized metropolitan area.

The 2011 Urban Mobility Report observes that "congestion, by every measure, has increased substantially" since the Urban Mobility Report was first published and clearly shows how traffic congestion and the resultant delay is an increasing problem for the American economy. The report identifies the following key findings for 2010:

- 1.9 billion gallons of wasted fuel (fuel consumed as a result of traffic delays)
- 4.8 billion hours of extra time (time lost due to traffic delays)
- 101 billion of delay and fuel costs (costs associated with increased delivery times)

Congestion continues to impact travelers during peak periods. Peak period delay for the average commuter grew from 14 hours in 1982 to 34 hours in 2010, an increase of 20 hours. In 2010 commuters wasted 14 gallons of fuel (equivalent to a week's of fuel for the average driver) in peak period delays, more than doubling the six gallons of fuel wasted in 1982. The phrase "rush hour" no longer applies to most metropolitan areas because peak periods often last far longer, rising to six hours for the largest metropolitan areas.

Furthermore, congestion is increasingly spreading into non-peak times as well. Approximately 40 percent of total delay occurs outside peak periods, during the middle of the day and at night, when travelers and shippers typically expect free-flow conditions. In addition to disrupting personal travel, non-peak congestion may impact freight shipments, delaying deliveries and costing shippers additional fuel, driver time, and vehicle wear and tear.

[1] Mary Keeling and Gerard Mooney, *Transportation and Economic Development: Why Smarter Transport is Good for Growth* (IBM Global Services, Somers, N.Y., 2011), 3.

Congestion is not limited to large cities, but is a concern for medium and small cities as well. Growing congestion in medium and small cities may make those places less attractive to businesses looking to locate where they will not be impacted by travel delay, thus reducing a key competitive advantage of those places.

Regional

The Greater Rochester TMA does not experience the congestion-related delays that larger metropolitan areas regularly do. According to the Urban Mobility Report, travel times in Rochester rank favorably when compared to other metropolitan areas. Of the 101 urban areas analyzed in the report, Rochester ranks 76 with approximately 6.4 million hours of delay per year, well below the average delay of about 9.5 million hours per year for medium-sized cities. Rochester area motorists consume an estimated 1.2 million gallons of excess fuel; also well below the average of 2.2 million gallons of excess fuel consumed by medium-sized cities.

Travel times in the Rochester area look especially favorable when compared to travel times in the Very Large metropolitan areas. These areas record an average of approximately 187.9 million hours of delay per year and about 90.7 million gallons of excess fuel, which masks tremendous disparities: the country's most congested urban area, Los Angeles, accounts for a massive 521.4 million hours of delay and consumes an excess of 278.3 million gallons of fuel per year. However, direct comparisons between the Rochester area and regions like metropolitan Los Angeles are not especially useful for regional planning efforts given significant differences in population size, geography, economy, development patterns, and transportation modes.

In addition to the Urban Mobility Reports, other publications assign a favorable rank to the Rochester area in terms of travel times. In March 2011 the financial services publication Kiplinger ranked Rochester as the best city in the United States for commuters. Kiplinger used factors such as average commute mileage, average yearly delays per commuter, and average gallons of wasted fuel to determine city rankings. Rochester, with yearly delays per commuter of 12 hours and yearly wasted fuel of 11 gallons, compared favorably to the national average of 34 hours of delay and 28 gallons of wasted fuel.[2] In April 2008 a Forbes article on commute times in American cities also assigned Rochester a favorable ranking and noted that it had the lowest annual delay of any of the 75 cities analyzed for the article.[3]

However, while the Rochester area performs well in national congestion rankings, there are still delay issues that should be dealt with in order to address regional safety, efficiency, reliability, and air-quality concerns. In addition to recurring capacity-related delay, which occurs as the result of demand outpacing the supply of road space during peak periods, planned event-related delay (delay caused by planned special events such as road construction and community events) and non-recurring incident-related delay (delay caused by vehicle crashes) also impact travel in the region. Section 2 of the CMP discusses the three types of delay that impact this region in greater detail.

[2] Susannah Snider, "10 Best Cities for Commuters," Kiplinger, March 1, 2011.
[3] Matt Woolsey, "Best and Worst Cities for Commuters," Forbes, April 25, 2008.

Changes in the regional economy and development patterns during the second half of the twentieth century contributed to the growth of traffic congestion. In the mid-twentieth century, when the regional expressway system was designed and built, the area's main employment centers included downtown Rochester and large industrial facilities on the City's northwest side, such as Kodak Park and the General Motors plant. However, as the number of employees at these centers decreased during the later decades of the twentieth century, congestion pressures on the roads around them also fell. Simultaneously, as employment grew in locations such as the University of Rochester/Strong Memorial Hospital and in suburban service-oriented business parks along the I-490 corridor between Brighton and Victor, congestion on nearby roads increased. As a result, today some locations are over-served by the region's road network while demand has outpaced the supply of road space in other locations.

Regional development patterns also play a crucial role in explaining the locations and causes of traffic congestion. Post-World War II automobile-oriented suburban development typically forces travelers to use private cars for all trips, including short, local trips that in pre-war neighborhoods could be accomplished by walking or transit. This type of suburban development, coupled with the opening of the New York State Thruway in 1954 that reoriented long-term growth patterns in metropolitan Rochester towards the south-central towns of Monroe County, resulted in the growth of extensive suburban areas accessible primarily by car. In addition, many urban neighborhoods were reconstructed to better accommodate automobiles by widening streets, building urban expressways, and developing extensive parking infrastructure.

Congestion pressures on local roads rose because even with the construction of new roads and the expansion of existing ones, demand for road space grew faster than the system's ability to absorb it. In the Greater Rochester area, as in metropolitan areas throughout the United States, expanding the supply of road space without an equal emphasis on managing demand for that space contributed to congestion growth by encouraging increased automobile use. This trend was furthered by the promotion of land use and development policies that prioritized automobiles over other modes of transportation. The GTC CMP seeks to manage congestion in the Rochester TMA by addressing the demand for road space as well as by increasing the supply of it primarily through non-traditional operational improvements.

*Downtown Rochester is a major employment, cultural, and recreational center for the region. The CMP will help mitigate congestion impacts on travel to, from, and within the downtown area.*

## Section 2: Delay Typologies

The GTC CMP classifies all types of travel delay into the following three categories:

1. Recurring Capacity-Related Delay
2. Planned Event-Related Delay
3. Non-Recurring Incident-Related Delay

The impacts of travel delay are often broadly similar regardless of category; however, each of the three delay typologies has different causes that influence applicable solutions. Initiatives aimed at reducing congestion caused by one type of delay may not be appropriate for managing congestion caused by another type of delay. The congestion management recommendations in Section 5 include solutions for all three types of delay.

The following sections define each type of delay, explain where in the region it occurs, describe the general issues that each type of delay causes for transportation system users, and identify potential solutions. For a complete list of available solutions, please refer to Section 6, Congestion Management Strategies Toolbox.

### 2.1: Recurring Capacity-Related Delay

Definition

Recurring Capacity-Related Delay is the predictable daily increase in demand for road space that exceeds available capacity. This type of delay is typically caused by commuters during morning and evening peak periods.

In addition, seasonal traffic patterns may contribute to recurring delay. Examples include demand for access to regional commercial centers during the holiday shopping season and increased traffic on and around university campuses when students arrive and depart at the beginning and end of the academic year.

Location

Recurring Capacity-Related Delay typically occurs at "bottlenecks" in the transportation system, such as expressway interchanges and arterial intersections where demand for road space is greater than the intersection's capacity to handle that demand. A second source of this type of delay is uncoordinated traffic signals, which may not be timed for maximum throughput, thus limited the number of vehicles served by an intersection.

Impacts

Typical impacts of Recurring Capacity-Related Delay include increased travel times, driver frustration, fuel consumption, vehicle emissions, and incident response times. These impacts collectively decrease the efficiency, reliability, and safety of the transportation system by imposing additional costs and uncertainties on system users.

Solutions

- Capacity Expansion – Traditionally, capacity expansion projects involved widening roads to add travel lanes. However, these types of projects can be costly, disruptive, and have a lengthy implementation timeframe; they also burden the community with additional long-term operations and maintenance costs. As a result, traditional capacity expansion projects should only be considered for unique and critical projects of regional significance. However, capacity expansion can be accomplished in other ways, such as restriping a road to add or reconfigure travel lanes or deploying Intelligent Transportation Systems (ITS) instrumentation to better manage existing lanes.
- Traffic Signal Synchronization – Coordinating traffic signal timing plans at intersections along heavily traveled corridors reduces congestion by increasing vehicle throughput and streamlining traffic flows to and from side streets, access roads, and driveways.
- Traveler Information Systems – Services such as 511NY and Highway Advisory Radio, along with ITS instruments such as Dynamic Message Boards (DMS), provide real-time information to travelers that allow them to adjust their routes based on a range of factors such as incidents, roadwork, weather conditions, and congestion.
- Mode Choice – A multi-modal transportation system offers travelers a choice of how to reach their destinations. Shifting modes from private automobiles to buses, bicycles, and walking (for short trips within neighborhoods) reduces demand for road space.
- Land Use and Development Patterns – Expansive, automobile-dependent suburban land-use and development patterns can be redeveloped over time to better support the increased use of alternate modes of transportation, including transit and bicycling, as well as improved pedestrian connections between neighborhoods. As a result travelers can select the optimal mode for their trip rather than relying on their car at all times.


*The Regional Traffic Operations Center (RTOC) serves as the hub of ITS operations in the Rochester TMA. The region's investments in ITS infrastructure, including traffic signal management, traffic cameras, dynamic message signs, and road weather information stations, are crucial underpinnings of ongoing congestion management activities.*

## 2.2: Planned Event-Related Delay

Definition

Planned events are scheduled activities that can cause delay on the region's roadways. The Long Range Transportation Plan (LRTP) 2035 identified two categories of Planned Event Delay: 1.) Programmed construction work that reduces roadway capacity and 2.) Special events such as concerts, festivals, and sports games that occur in regional venues and place a greater than normal demand on the road system around those venues.

Road construction generally causes delay by reducing the space available for vehicles to move, thus creating traffic bottlenecks. Construction activities may not increase the number of vehicles using a road, but they often it more difficult for the same number of vehicles to pass through a specific location. In comparison, special events typically cause delay because they attract a large number of vehicles to a specific site during a relatively narrow time frame. Available road space for vehicles to move through may remain the same, but the number of vehicles attempting to pass through that space can dramatically increase. The result is the same as a reduction of road space due to construction work – a traffic bottleneck.

An important congestion management consideration for planned events is that they may cause delay in locations far away from the event site. For example, the movement of large construction vehicles and equipment to and from a work zone could impede traffic flow on roads miles away from the work zone. Certain special events, such as a marathons, parades, or festivals may entail road and intersection closures, thereby reducing the availability of road space for traffic. There are a broad range of options available to address these scenarios as discussed below.

Location

Planned Event-Related delays occur in the vicinity of the TMA's special event venues, including stadiums, theatres, and performing arts centers; parks and fairgrounds; and college campuses. In addition, planned events include scheduled road work in designated work zones.

Delays occurring as a result of planned work road may occur anywhere on the transportation system. Minimizing travel delay is one of the considerations factored into detour route and work zone planning by regional transportation management agencies.

Impacts

Typical impacts of Planned Event-Related Delay include increased travel times, fuel consumption, vehicle emissions, and incident response times. In addition, this type of delay may restrict access to special event venues. Like Recurring Capacity-Related Delay, this type of delay decreases the efficiency, reliability, and safety of the transportation system.

Solutions

- Work Zone Management – Deploy ITS instrumentation, such as portable DMS, in the vicinity of work zones to provide real-time guidance to motorists. Modify traffic signal timing to better manage traffic flows that may change as the result of construction. Publicize information about the work zone (location, start/end times) through traveler information systems.

*Effective work zone management helps mitigate the impacts of congestion resulting from construction activities.*

- Traveler Information Systems – Transportation management agencies can provide information about planned events to travelers via resources such as 511NY, as well as through agency websites, press releases, and email and text message alerts. DMS may be used to guide traffic to/from an event.

- Traffic Management Plan – In coordination with event organizers, transportation management and law enforcement agencies preparing for special events frequently plan for the following considerations:
    - Site Access/Egress – Determine how attendees will access the venue of a special event, what modes of transportation the venue will support, how entry to and exit from the venue will be managed.
    - Parking – Determine how event parking will be managed, how motorists will pay for parking, how motorists will be guided to/through parking areas.
    - Pedestrian Access – Identify how pedestrians will obtain access to the site, where pedestrian crossings will be, ascertain whether or not crossing guards are needed to facilitate pedestrian movements.
    - Traffic Flow – Determine how traffic flows on roads and through intersections will be managed, which (if any) intersections need to be closed off, whether or not reverse travel lanes will be instituted to increase road capacity to better handle traffic moving to/from the event.
    - Traffic Control – Determine what traffic signal timing/phasing modifications are needed to handle increased or re-routed traffic flows. Identify what temporary traffic control devices (reflectors, barrels, portable DMS, etc.) will be deployed. Coordinate with law enforcement to determine if officers will be deployed to manage intersections or kept on stand-by in the vicinity in case they are needed.
    - Traffic Monitoring – Determine the benefits of monitoring traffic conditions in real time. Identify what personnel/ITS deployments are needed to monitor traffic conditions.
    - Traffic Incident Management – Identify the lead incident command agency prior to the event. Station resources needed to address potential traffic incidents in the vicinity of the event area/work zone to reduce response times. Identify access/egress points that may be closed off during the event and are either unavailable for use by emergency services or need to be reopened for them.

## 2.3: Non-Recurring Incident-Related Delay

Definition

Non-Recurring Incident-Related Delay occurs as the result of traffic incidents that block travel lanes or, in extreme cases, cause road closures. Incident-related delay may range from a few minutes for a minor vehicle crash to a long-term road or bridge closure resulting from a major commercial vehicle crash, such as a hazardous materials spill.

Due to its unpredictable nature, this type of delay is frequently the most disruptive and frustrating for travelers. Recurring congestion can be factored into trip planning, but there is no way to anticipate the location or duration of incident-related delay. This is especially true for incidents that occur during peak periods on roads that already experience Recurring Capacity-Related Delay. The combination of these two delay types may have serious deleterious impacts on travel times, causing significant disruptions.

Location

Non-Recurring Incident-Related Delay may occur at any location in the transportation system. Depending on the severity of the incident, impacts may be felt many miles away from the location of the incident.

Impacts

Like the other types of delay, typical impacts of Non-Recurring Incident-Related Delay include increased travel times and fuel consumption, as well as uncertainty about when travelers and freight will arrive at their destinations. This type of delay increases the risk of secondary incidents, which are incidents that occur as a direct result of the disruptions caused by a primary incident. Secondary incidents are often more severe than the original incident because they tend to occur in congested traffic with highly variable speeds and sudden stops. In addition to crashes, secondary incidents include engine stalls and overheating, and vehicles running out of fuel. These impacts collectively decrease the efficiency, reliability, and safety of the transportation system by imposing additional costs and uncertainties on system users.

Solutions

- Traffic Signal Timing Adjustments – Traffic signals can be manually retimed to minimize incident-related delay. For example, if an incident on an expressway causes traffic to divert onto a parallel arterial road, traffic signals along that arterial can be reprogrammed to facilitate through traffic in order to better handle the increased volume.

- Traveler Information Systems – Transportation management agencies provide information about incidents to travelers via resources such as 511NY, as well as through agency websites, press releases, and email and text message alerts. DMS are used to alert motorists of incidents and guide traffic to alternate routes. These measures reduce public exposure to potential hazards, such as a hazardous materials spill, and limit congestion in the vicinity of incident scenes.

- Reduce incident detection, verification, and notification times – ITS elements such as CCTV traffic cameras can be deployed at strategic locations on the transportation network to provide traffic operations center personnel with real-time images of road conditions. These images allow operations center personnel to detect and verify incidents and notify law enforcement and fire and rescue services.

- Reduce incident clearance times – Law enforcement and fire and rescue agencies can use "Quick Clearance" techniques to speed up incident scene clearance, thus minimizing disruption to traveler and freight movements. Reducing incident clearance times also reduces the likelihood of secondary incidents.

- Reduce incident occurrences – Past safety efforts have focused on protecting travelers in the event of an incident, but in the future the emphasis will be on preventing incidents from occurring. The application of Connected Vehicle (CV) technologies is expected to reduce incident occurrences by providing new safety features and automated collision-avoidance systems.


*Effective incident scene management clears wrecks and restores normal traffic flow with minimal disruption to travelers. Quick Clearance practices also reduce the risk of secondary incidents, further improving both traveler safety and limiting the exposure of first responders to traffic hazards.*

## Section 3: Performance Monitoring and Measurement

The GTC CMP uses performance measures to monitor delay and associated changes over time. This section of the CMP discusses the overall benefits of using performance measures to monitor congestion and track the impacts of mitigation activities, the specific measures selected to identify and monitor congested locations in the Rochester TMA, and the data required to assess congestion trends and the impacts of congestion management strategies.

The Federal Highway Administration CMP Guidebook identifies four major dimensions of congestion, including:

1. Intensity – The relative severity of congestion that impacts travel.
2. Duration – The amount of time the congested conditions persist before returning to an uncongested state.
3. Extent – The number of system users or components affected by congestion.
4. Variability – The changes in congestion that occur on different days or at different times of day.

The performance measures selected for the GTC CMP address all these dimensions. Performance measurement data provides a complete overview and allow for a thorough assessment of congested conditions within the Rochester TMA.

### 3.1: Performance Measures Overview

Performance measures allow organizations to quantitatively track and manage progress towards achieving goals set out in a plan, such as the *LRTP 2035*. Performance measurement is the process by which organizations assess the progress made towards achieving their goals. The basic purpose of using performance measures in a CMP is to monitor a region's progress towards managing congestion.

Transportation agencies have moved towards the increased use of performance measures for three main reasons. First, there is a greater demand for accountability and improved transportation system performance from the general public, elected officials, and decision-makers. Secondly, agencies continually search for new and better management techniques to ensure that limited public resources are prudently invested for maximum effect. Lastly, there is widespread recognition that broad changes in the environment in which transportation agencies function requires effective strategic planning to satisfy diverse community needs and measure success in meeting them.

As discussed in the CMP Guidebook, performance measures serve multiple purposes, including:

1. Tracking progress towards meeting regional objectives;
2. Identifying specific congested locations to address;
3. Assessing congestion mitigation strategies, programs, and projects; and
4. Communicating system performance to the public, elected officials, and decision-makers.

The performance measures used by the CMP can be applied at two levels:

1. Regional Level – To measure the performance of the regional transportation system.
2. Local (Corridor, Segment, Intersection) Level – To identify congested locations and measure the performance of individual road segments or system elements.

Differentiating between these two levels is important because regional trends may mask local congestion problems. For example, the travel time along a major corridor may be well below congested levels. However, one segment of the corridor may suffer from severe congestion. If the congestion on that segment is not addressed, it could eventually impact traffic on other segments and increase delay along the entire corridor.

### 3.2: GTC Congestion Scale

As discussed in Section 1, a road segment with a TTI of 1.25 or greater is considered congested. However, there are varying degrees of congestion, ranging from congestion that causes barely noticeable delay to severe congestion that significantly increases delay and its associated costs. The following "Congestion Scale" was developed for the GTC CMP to help visualize the severity of recurring capacity delay.

The Congestion Scale classifies congested road segments into two main categories: Delay and Excess Delay. It further breaks down the two main categories into five sub-categories, which provide an additional level of detail for analysis and a fine-grained understanding of congested locations. Road segments experiencing Delay include those segments with minimal, minor, and moderate congestion. Road segments experiencing Excess Delay include those segments with congested or severely congested conditions. The meanings of each sub-category are described below.

| **Congestion Scale for Recurring Capacity Related Delay** | | | | | |
|---|---|---|---|---|---|
| **Categories:** | **Delay** | | | **Excess Delay** | |
| **Sub-Categories:** | **Minimal Congestion** | **Minor Congestion** | **Moderate Congestion** | **Congestion** | **Severe Congestion** |
| **Color Code:** | | | | | |
| **Travel Time Index (TTI):** | **<1.00** | **1.01-1.14** | **1.15-1.24** | **1.25-1.99** | **2.00>** |

The first sub-category in the Congestion Scale, Minimal Congestion, includes road segments where vehicles move steadily and safely at posted speeds without jostling for space on the road regardless of time of day. Traffic moving under Minimal Congestion conditions is typically considered the ideal state for all road segments at all times, but is usually not realistic to expect outside of off-peak hours due to demand for space on the road during peak periods. According to the Travel Time Data Collection Program, even during peak periods there are road segments that experience a TTI less than 1.00.

Traffic with a TTI below 1.00 may be categorized as "Free-Flow" on expressways. On signalized arterials traffic does not always move in free-flow conditions due to delay caused by stoppages for signal lights, pedestrian crossings, or any other event that occurs as part of normal traffic movements.

The second sub-category, Minor Congestion, includes segments where traffic volume has risen above Minimal Delay conditions and is just beginning to cause slight delays in travel time but has not yet reached meaningful, or even noticeable, levels of delay. For example, on a segment with a TTI of 1.05 a 20 minute trip would only take 21 minutes.

The third sub-category, Moderate Congestion, includes segments where traffic volume has risen above a TTI of 1.15. This will result in delay that may be noticeable but not meaningful. For example, a road segment with a TTI of 1.20 indicates that a trip taking 20 minutes under Minimal Delay conditions will take 24 minutes under Moderate Delay conditions. The primary importance of the Moderate Delay category is that it indicates where congestion could develop if a non-recurring event like a car crash happens there. The disruption to traffic flow caused by an incident could push the TTI up above 1.25, thus creating a congested segment. While this type of congestion is not technically recurring congestion, it does constitute the interface between recurring and non-recurring congestion types.

The fourth sub-category, Congestion, includes segments where travel times have risen above a TTI of 1.25. At this point, a trip will take about one-third longer than it would take under free-flow conditions; a trip that normally takes 20 minutes will take 25 minutes. A commonly considered national benchmark for congested road segments is a TTI of 1.30. The GTC CMP classifies congested segments as those with a TTI of 1.25 to 1.99, which captures segments approaching a TTI of 1.30. Delay on these segments is noticeable and trip times may be considered inconvenient, taking time away from more productive or enjoyable activities.

The fifth sub-category, Severe Congestion, includes segments with a TTI above 2.00, where a trip takes twice as long, or more, as it does under free-flow conditions. This means that a 20 minute trip will take at least 40 minutes. While there is no national standard that defines "severe congestion," a review of FHWA guidance on congestion mitigation indicates that severe congestion typically occurs as the result of a confluence of two or more events, such as a severe weather event that occurs during the evening commute period. Delay is noticeable and is more than inconvenient, consuming significant extra time and fuel.

*The TTI records the extent of travel delay. Traffic moving under free-flow conditions on expressways is the ideal state, but is typically not realistic to expect during periods of peak demand for road space. In addition, an incident that occurs during free-flow conditions can cause the rapid build-up of traffic queues, thus increasing delay in non-peak periods.*

## 3.3: GTC CMP Performance Measures

As discussed above, the performance measures used by the GTC CMP to track congestion in the Rochester TMA are derived from the LRTP 2035. The four CMP performance measures are:

1. Travel Time Index on Major Roadways
2. Transit On-Time Performance
3. Median Incident Clearance Time
4. Median Transit Load Factor

<u>Data Sets and Sources for each Performance Measure</u>

1. Travel Time Index - Travel Time Data Collection Program; Real Time Travel Data

As discussed previously, the Travel Time Index is the ratio of travel time during the peak period to the time required to make the same trip at free-flow speeds. It is calculated by dividing the peak period travel time by the free-flow travel time. A TTI value of 1.3, for example, indicates that a 20-minute free-flow trip requires 26 minutes during the peak period.

Prior to 2008, GTC relied on data generated by its travel demand model to identify congested road segments. However, this program did not provide the specificity needed to identify the extent and location of delay. As a result, in 2008 GTC implemented a travel time data collection program that produced reports on actual travel times for principal arterials, select minor arterials, and collectors. The floating car method used drivers designated by the transportation agency this program generated data sets that were used to identify congested road segments for the CMP.

Vehicle probe data is an improved means of monitoring traffic flow due to the greatly expanded number of data points generated. It delivers both speed and travel-time information for advanced traffic management systems and advanced traveler information services applications, as well as for supporting a myriad of other transportation management practices, including monitoring the impacts of construction activities, special events, and seasonal changes in traffic patterns.

One of the major benefits of using vehicle probe data to is that it allows for analysis of all three congestion typologies. In addition to identifying traffic patterns generated by routine recurring congestion, this data allows analysts to observe the impacts of planned special events and incidents on traffic movements.

Vehicle probe data is generated by two primary methods: GPS data obtained from onboard GPS devices and cellular phone signals obtained from mobile devices. The steady expansion of GPS and mobile data services during the previous five to six years has generated a vast data trove that transportation agencies, university research centers, and private data providers are continually mining and investigating for new uses and lessons.

The increasing availability of probe-based data has strengthened traveler demand for accurate real-time traffic information, which helps them better plan and manage trips. A further benefit of vehicle probe data is that it can be used to corroborate traffic data collected by system sensors.

In recognition of the increased availability and decreased costs of vehicle probe data, and interested in accessing the expanded analytical capabilities offered by this data, GTC implemented a new travel time data collection program in 2012 to obtain vehicle probe data. This data covers all four congestion elements (Intensity, Duration, Extent, and Variability) identified in the FHWA CMP Guidebook. It is expected to provide GTC and member agencies with an unprecedented overview of the spatial and temporal aspects of travel delay and will be crucial for informing ongoing efforts to understand, analyze, and manage traffic congestion in the Genesee-Finger Lakes Region.

2. Transit On-Time Performance – RTS on-time performance data

Transit On-Time performance documents the rate that buses stay on time to pick-up and drop-off customers. While there are many factors that can contribute to delay on a bus route, recurring delays on the same route at the same time each weekday may signify traffic congestion that keeps buses from adhering to schedule.

On-time performance data is supplied by RGRTA for buses operating on RTS routes. An on-time bus is defined as one that arrives at its stops no more than three minutes before the scheduled time and no more than six minutes afterwards. Early and late arrivals are problematic because customers who are planning to meet a bus at a specific time are dependent on that bus adhering to schedule; if the bus arrives too early or late then the customer may miss the connection. In addition to congestion, other issues that impact on-time transit performance include inclement weather, a greater than anticipated number of riders, and riders with special accessibility needs. These factors need to be consideration when analyzing transit on-time performance data.

All transit services in the Rochester area are provided by buses. As a result, many congestion management practices aimed towards improving vehicle circulation, such as traffic signal coordination and intersection/interchange reconfiguration, generally benefit bus operations. Still, buses have unique operational considerations that are often best met by transit-specific strategies, such Computer Aided Dispatch (CAD), electronic fare collection systems, and Transit Signal Priority (TSP), all of which may help reduce congestion.

3. Median Incident Clearance Time – NYSDOT and NYSTA TransAlert Notifications; NYSTA Computer Aided Dispatch (CAD) System; NYSDOT Highway Emergency Local Patrol (HELP) program; Probe-based Real-Time Traffic Data.

There are several potential sources of incident clearance times for roadways in the region. The NYS Thruway Authority collects incident clearance times through its Computer-Aided Dispatch (CAD) system, which records emergency services dispatching activities. For the NYS Thruway, this system provides the most accurate incident clearance data available.

NYSDOT does not have a comparable tracking system. However, incident clearance times are available for roads served by the Highway Emergency Local Patrol (HELP) program, which records the duration of the incidents that HELP trucks respond to.

Additional sources of traffic incident information are the TransAlert notifications provided by NYSDOT and the NYS Thruway Authority. These notifications are sent out for major incidents on interstates, parkways, other major state highways, and the Thruway. The TransAlert notifications are short e-mail messages distributed via the New York State Emergency Management Office's NY-ALERT system. Recipients receive provide real-time information about significant traffic incidents, including start and end times, the nature of the incident, its location, and additional data when available.

Clearance times cannot be calculated for all reported incidents because start and end times are not always reported. For instance, in 2011 the NYSDOT TransAlert system identified 336 major incidents in the Genesee-Finger Lakes region, but clearance times could be determined for only 265 of them (78.9 percent). The Thruway Authority TransAlert system identified 116 incidents during 2011, but clearance times could be determined for only 71 of them (61.2 percent). An additional concern with TransAlert notifications is that they are limited to major incidents and do not include minor incidents that could impact traffic.

Looking ahead, another source for traffic incident duration will be real-time travel data. While this data does not specifically measure incident clearance times, it will reveal the impacts of incidents on traffic movements and provide an accurate view of how incident-related congestion affects the TMA. Generated from vehicle probes and available for 24 hours-per-day, 365 days-per-year, timeframes, this type of data will provide a more thorough understanding of traffic patterns and movements throughout the TMA.

4. Median Transit Load Factor - RTS Routes/passenger counts

The Median Transit Load Factor is the ratio of the number of passengers to the number of seats on a bus. A ratio of 1.0 indicates that all of the seats on a bus are occupied. A ratio greater than 1.0 indicates that there are standing passengers who cannot find seats. The industry standard for determining crowding on a bus using the transit load factor is 1.25 or greater, which indicates that all the seats are full and an additional 25 percent of the passengers are standing. However, in situations where many passengers make short trips, such as along a corridor with closely-spaced bus stops, a transit load factor that rises above 1.25 does not necessarily indicate that the bus is overcrowded.

The median transit load factor is a measure of accessibility. A bus that is overcrowded when it reaches a stop cannot take on additional passengers, so riders at that stop find that they cannot access the transportation system. The median transit load factor is a useful measure for transit managers to use when considering adding capacity, such as an articulated bus or additional buses, to a high-demand route.

The ability of the median transit load factor to track demand for service on bus routes makes it a viable CMP performance measure because it shows where the greatest demand for transit services are. Expanding capacity on routes with a median transit load factor consistently above 1.25 may encourage additional bus ridership, increasing use of an alternative mode to single-occupancy vehicles and thereby reducing congestion pressures.

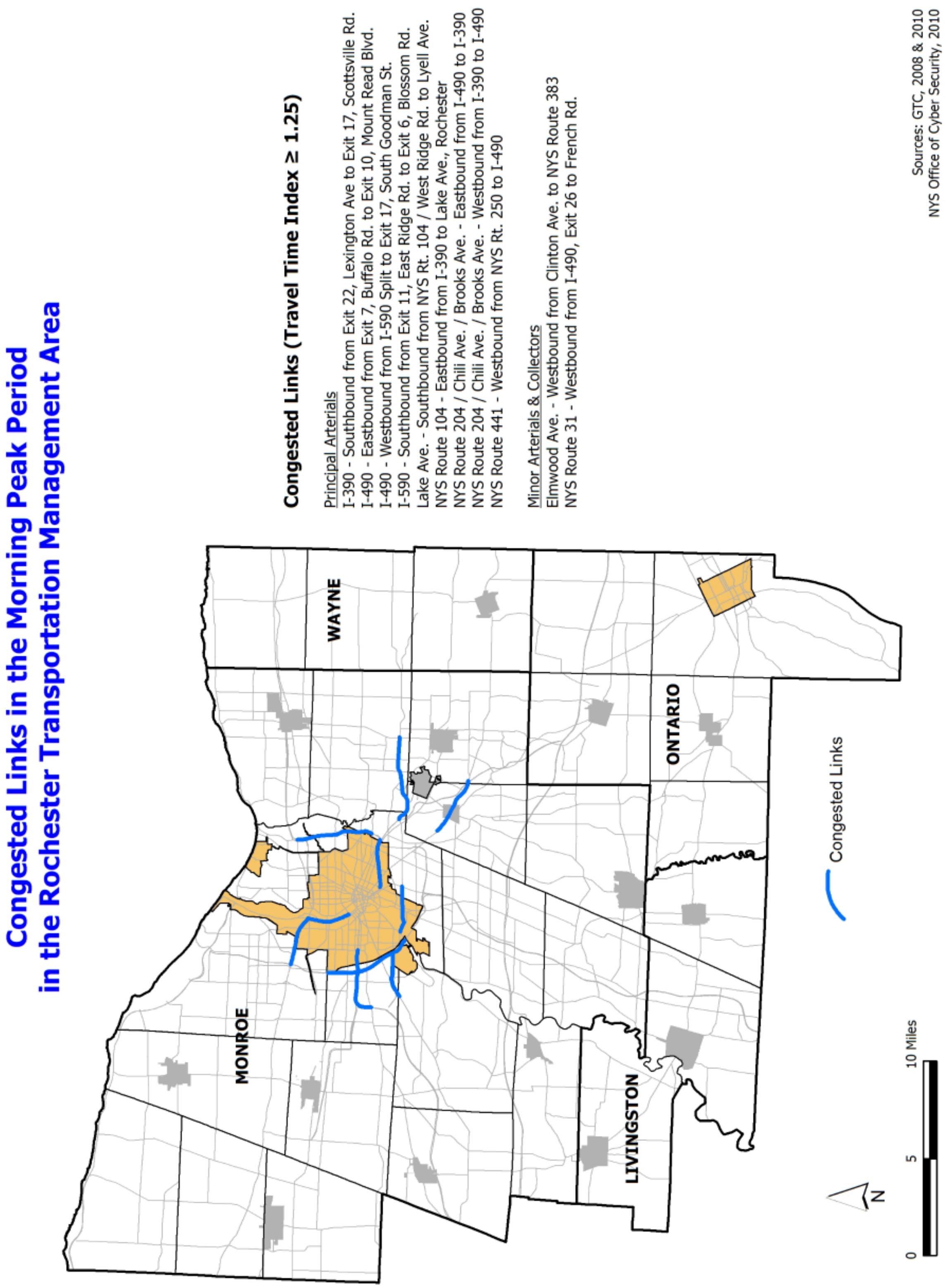
## Section 4 - Congested Locations

This section of the CMP identifies specific locations in the Rochester TMA that experience excess delay due to one or more of the three delay types discussed in Section 2. Multiple sources of information were used to identify congested locations. Road segments with Recurring Capacity-Related Delay were identified by the Travel Time Data Collection Program (TTDCP). Planned Event-Related Delay occurs on the infrastructure elements providing access to special event sites and venues. Lastly, Non-Recurring Incident-Related Delay could occur anywhere on the transportation system, but is most disruptive when it occurs on a road segment that is already experiencing congestion due to recurring delay.

### 4.1: Recurring Capacity-Related Delay

The following tables and associated maps identify road segments that experience excess delay due to recurring congestion. Recurring congestion occurs during the morning and evening peak periods and reflects routine daily fluctuations in regional travel patterns. As discussed previously, this program used the floating-car method to identify congested segments, but in the future it will use real-time travel data to obtain more thorough and detailed results that will facilitate analysis of regular seasonal changes in traffic flow in addition to routine daily fluctuations. Only one segment in the TMA ranked as "Severely Congested." All other segments are classified as "Congested" according to the CMP Congestion Scale.

| **Table 1: Morning Peak Period Congested Segments** | | | |
|---|---|---|---|
| **Principal Arterials** | | | |
| Road: | Direction: | Segment: | TTI: |
| I-390 | Southbound | Lexington Avenue (Exit 22) to Scottsville Road (Exit 17) | 1.33 |
| I-490 | Eastbound | Buffalo Road (Exit 7) to Mount Read Boulevard (Exit 10) | 1.92 |
| I-490 | Westbound | I-590 split to South Goodman Street (Exit 17) | 1.29 |
| I-590 | Southbound | East Ridge Road (Exit 11) to Blossom Road (Exit 6) | 1.67 |
| Lake Avenue | Southbound | West Ridge Road (NYS Route 104) to Lyell Avenue | 1.45 |
| West Ridge Road (NYS Route 104) | Eastbound | I-390 to Lake Avenue | 1.33 |
| NYS Route 204/Chili Avenue/Brooks Avenue | Eastbound | I-490 to I-390 | 1.37 |
| NYS Route 204/Chili Avenue/Brooks Avenue | Westbound | I-390 to I-490 | 1.41 |
| Penfield Road (NYS Route 441) | Westbound | Fairport Nine Mile Point Road (NYS Route 250) to I-490 | 1.32 |
| **Minor Arterials and Collectors** | | | |
| Elmwood Avenue | Westbound | Clinton Avenue to Scottsville Road (NYS Route 383) | 1.25 |
| Monroe Avenue (NYS Route 31) | Westbound | I-490 (Exit 26) to French Road | 1.28 |



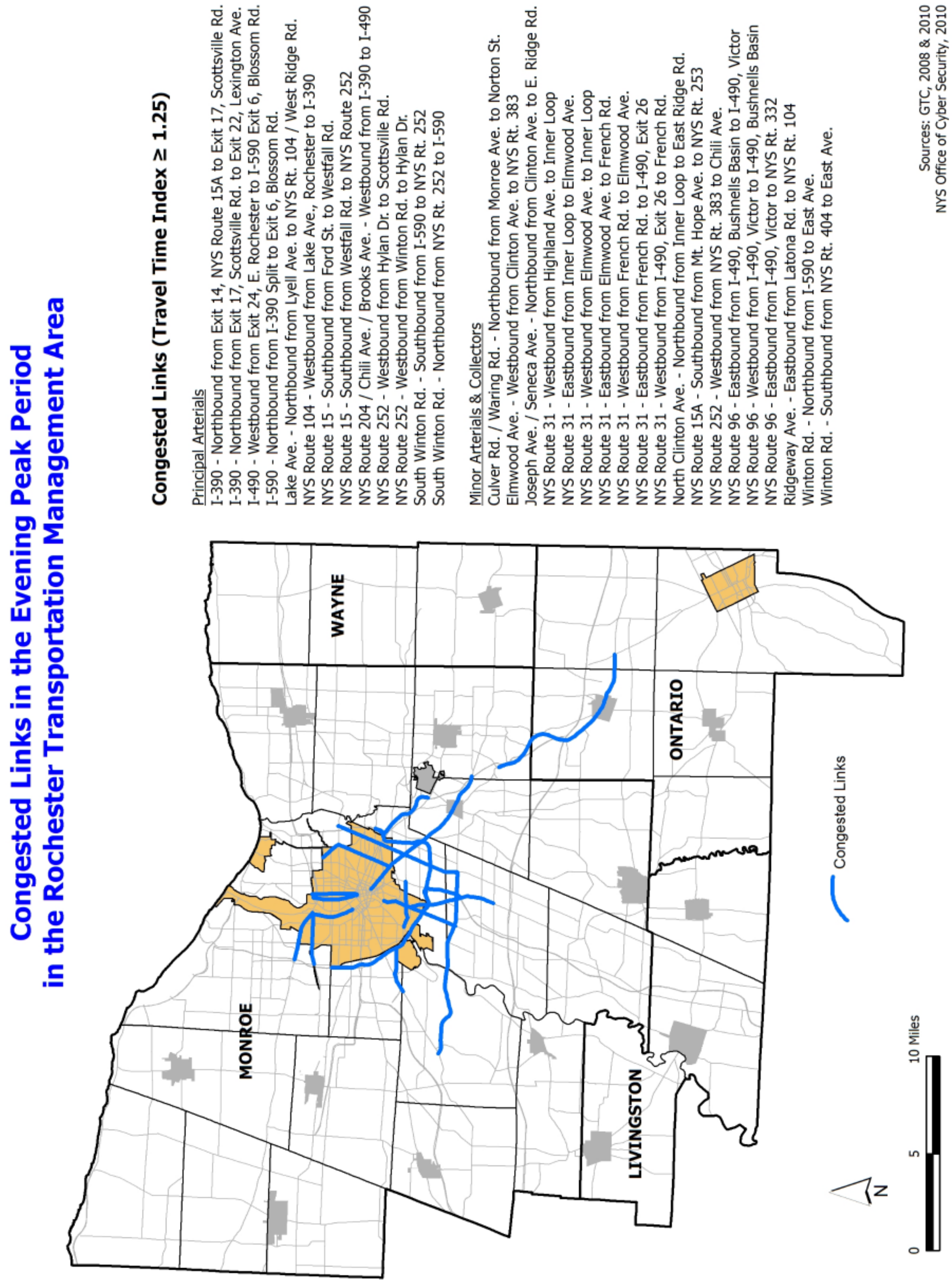

**Map 2:** Travel Time Index data shows the location of congested road segments in the morning peak period.

| Table 2: Evening Peak Period Congested Segments | | | |
|---|---|---|---|
| **Principal Arterials** | | | |
| Road | Direction | Segment | TTI |
| I-390 | Northbound | NYS Route 15A (Exit 14) to Scottsville Road (Exit 17) | 1.52 |
| I-390 | Northbound | Scottsville Road (Exit 17) to Lexington Avenue (Exit 22) | 1.50 |
| I-490/I-590 | Westbound | West Commercial Street (Exit 24) to Blossom Road (Exit 6) | 3.48* |
| I-590 | Northbound | I-390 Split to Blossom Road (Exit 6) | 1.33 |
| Lake Avenue | Northbound | Lyell Avenue to West Ridge Road (NYS Route 104) | 1.64 |
| West Ridge Road (NYS Route 104) | Westbound | Lake Avenue to I-390 | 1.52 |
| Mt. Hope Avenue (NYS Route 15) | Southbound | Ford Street to Westfall Road | 1.25 |
| West Henrietta Road (NYS Route 15) | Southbound | Westfall Road to Jefferson Road (NYS Route 252) | 1.28 |
| NYS Route 204/Chili Avenue/Brooks Avenue | Westbound | I-390 to I-490 | 1.35 |
| Jefferson Road (NYS Route 252) | Westbound | Hylan Drive to Scottsville Road | 1.25 |
| Jefferson Road (NYS Route 252) | Westbound | Winton Road to Hylan Drive | 1.37 |
| South Winton Road | Northbound | Jefferson Road (NYS Route 252) to I-590 | 1.35 |
| South Winton Road | Southbound | I-590 to Jefferson Road (NYS Route 252) | 1.30 |
| **Minor Arterials and Collectors** | | | |
| Culver Road/Waring Road | Northbound | Monroe Avenue to Norton Street | 1.32 |
| Elmwood Avenue | Westbound | Clinton Avenue to Scottsville Road (NYS Route 383) | 1.33 |
| Joseph Avenue/ Seneca Avenue | Northbound | Clinton Avenue to East Ridge Road | 1.25 |
| Monroe Avenue (NYS Route 31) | Westbound | Elmwood Avenue to Inner Loop | 1.35 |
| Monroe Avenue (NYS Route 31) | Eastbound | Elmwood Avenue to French Road | 1.62 |
| Monroe Avenue (NYS Route 31) | Westbound | French Road to Elmwood Avenue | 1.25 |
| Monroe Avenue (NYS Route 31) | Eastbound | French Road to I-490 (Exit 26) | 1.34 |
| Monroe Avenue (NYS Route 31) | Westbound | I-490 (Exit 26) to French Road | 1.29 |
| North Clinton Avenue | Northbound | Inner Loop to East Ridge Road | 1.48 |
| East Henrietta Road (NYS Route 15A) | Southbound | Mt. Hope Avenue to Lehigh Station Road (NYS Route 253) | 1.29 |

**Table 2 Continued**

| | | | |
|---|---|---|---|
| Beaver Road/ Ballantyne Road (NYS Route 252) | Westbound | Scottsville Road (NYS Route 383) to Chili Avenue | 1.31 |
| Pittsford Victor Road (NYS Route 96) | Eastbound | I-490 (Bushnells Basin) to I-490 (Victor) | 1.27 |
| Pittsford Victor Road (NYS Route 96) | Westbound | I-490 (Victor) to I-490 (Bushnells Basin) | 1.36 |
| Pittsford Victor Road (NYS Route 96) | Eastbound | I-490 (Victor) to Rochester Road (NYS Route 332) | 1.29 |
| Ridgeway Avenue | Eastbound | Latona Road to West Ridge Road (NYS Route 104) | 1.25 |
| Winton Road | Northbound | I-590 to East Avenue | 1.30 |
| Winton Road | Southbound | Empire Boulevard (NYS Route 404) to East Avenue | 1.28 |
| *Currently, this segment shows the only instance of Severe Congestion as defined by the GTC Congestion Scale (see Section 3) recorded in the Rochester TMA. However, future assessments may identify additional locations of recurring Severe Congestion due to anticipated improvements in data completeness. | | | |

*RTOC personnel monitor road conditions in real-time. ITS field equipment allows them to identify traffic back-ups and adjust traffic signal timing patterns to clear vehicle queues and reduce delay. They can also quickly detect and verify incidents, thus improving emergency response and reducing incident-related delay.*




**Map 3:** Travel Time Index data shows the location of congested road segments in the evening peak period.

## 4.2: Planned Event-Related Delay

Areas where planned-event delays occur include thoroughfares in the vicinity of the region's special event venues. The following table identifies the key special event venues located in the Genesee-Finger Lakes Region. This table includes all venues that can accommodate more than 5,000 people and/or are located in/near downtown Rochester, where the region's greatest concentration of venue facilities is located.

**Table 3: Special Event Venues**

| Venue: | Capacity: |
|---|---|
| Darien Lakes Performing Arts Center* | 21,600 |
| CMAC Performing Arts Center* | 14,928 |
| Frontier Field | 14,500 |
| Rochester War Memorial/Blue Cross Arena | 14,000 |
| Sahlen's Stadium (formerly Marina Auto Stadium/PAETEC Park) | 13,768 |
| Eunice Kennedy Shriver Stadium (SUNY Brockport) | 10,000 |
| Monroe County Fair and Exposition Center (Dome Arena) | 8,600 |
| Gordon Field House (Rochester Institute of Technology) | 7,000 |
| Edwin Fauver Stadium (University of Rochester) | 5,000 |
| Growney Stadium (St. John Fisher College) | 5,000 |
| Main Street Armory | 5,000 |
| Rochester Riverside Convention Center | 5,000 |
| Eastman Theatre | 3,549 |
| Auditorium Theatre | 2,464 |
| Geva Theatre | 732 |

*These facilities are located outside of the TMA. However, given their regional significance as entertainment destinations, congestion management practices implemented for venues within the TMA are also recommended for use at these facilities.

This list should not be interpreted as an exhaustive catalog of *all* potential locations in the TMA where large-scale planned events take place. For example, several regional parks host community events such as the annual Lilac Festival at Highland Park and concerts at Ontario Beach Park, which attract many attendees. Places like the Corn Hill and Park Avenue neighborhoods in the City of Rochester and many of Monroe County's suburban village centers host popular festivals that draw large crowds. In addition, road races such as the Rochester Marathon and the JP Morgan Chase Corporate Challenge may cause planned-event related delay due to road closures.

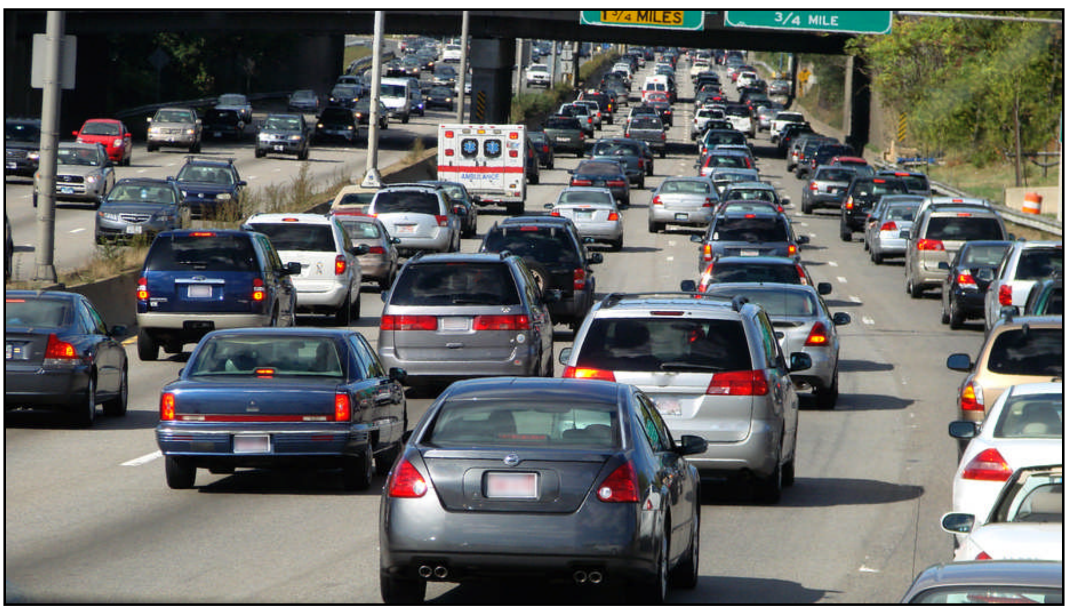
Delays caused by planned work road may occur anywhere on the transportation system. One of the primary considerations that transportation management agencies use when establishing detour routes and setting up work zones is the minimization of travel delay.

## 4.3: Non-Recurring Incident-Related Delay

Non-Recurring Incident-Related Delay can occur at any location on the regional transportation network. Major weather events such as blizzards and ice storms may have region-wide implications for travelers, while more localized events such as flooding can still disrupt travel if key infrastructure nodes are impacted.

Incident location and timing plays a key role in congestion. Incidents that occur late at night on major arterials may have a negligible impact on traffic as long as they are cleared before the start of the morning peak period. Conversely, a major incident that occurs during the evening peak period on a minor arterial in the vicinity of an expressway interchange could cause traffic to back-up onto the expressway mainline, thus increasing the risk of secondary incidents.

Incident-related delay may be especially problematic when it occurs in locations and at times already impacted by recurring delay. The combination of routine peak-period congestion and congestion caused by an incident can generate significant travel delays. An analysis of crash location data obtained from New York State's Accident Location Information System (ALIS) did not reveal any meaningful correlation between crash locations and road segments with recurring congestion. However, rapid response to and quick clearance of incidents on road segments with recurring congestion will help minimize disruption caused by the convergence of recurring capacity-related and non-recurring incident-related delay.




*One benefit of reducing traffic congestion is that first responder vehicles can access and clear incident scenes faster, thus mitigating the impacts of incidents on routine traffic movements.*

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## Section 5 - Congestion Management Recommendations

The *Long Range Transportation Plan (LRTP) 2035* identified 53 recommendations that best address the region's transportation needs. These recommendations are organized into three sections: Preservation and Maintenance, System Management and Operations, and Expansion. Each recommendation is accompanied by supporting commentary that discusses its contribution to the ongoing improvement of the transportation system.

The importance of congestion management is a common theme that runs throughout the *LRTP 2035*. While no plan recommendations are dedicated specifically to it, 25 of the recommendations include an element that address it. This reflects the decision to integrate congestion management practices into routine transportation planning, management, and operation activities.

This section of the CMP presents recommendations excerpted from Chapter VI of the *LRTP 2035* that are intended to advance congestion management in the Rochester TMA. The "Supportive Actions" and "Representative Projects/Ongoing Activities" are excerpted from the Recommendation Advancement Plans (RAPs) developed to provide guidance on the implementation of LRTP recommendations.

The LRTP recommendations were prioritized based on need and funding availability. They were then assigned one of the following implementation timeframes:

- Immediate: Federal Fiscal Years (FFYs) 2011-2014 (aligns with the current TIP)
- Near-Term: FFYs 2015-2019 (October 1, 2014 through September 30, 2019)
- Medium-Term: FFYs 2020-2025 (October 1, 2019 through September 30, 2025)
- Long-Term: FFYs 2026-2035 (October 1, 2025 through September 30, 2034)
- Ongoing: FFYs 2015-2035 (all FFYs of the *LRTP 2035*)

This section of the CMP will be revised following the completion of future LRTP updates. New recommendations addressing congestion management activities that are added to the LRTP will be included, while outdated or completed recommendations will be revised or removed. This revision process will keep the LRTP and CMP recommendations synchronized to ensure that there is a uniform approach at both the policy and project levels to congestion management activities in the Rochester TMA.

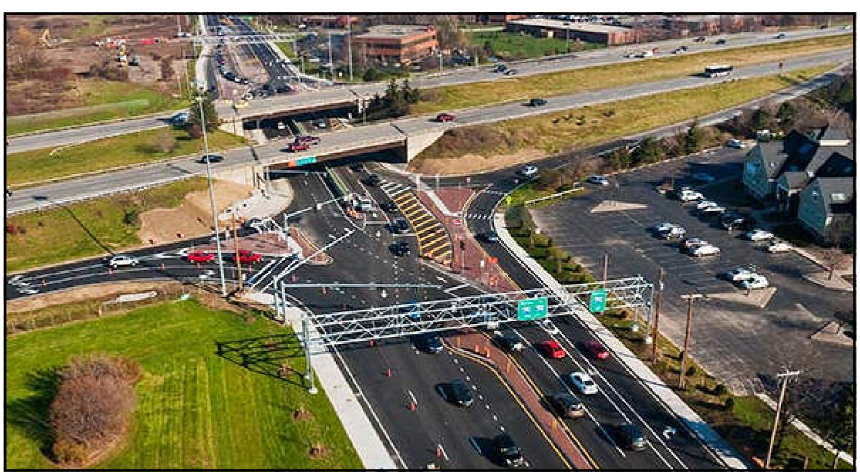
*Effective congestion management strategies treat the transportation system as an integrated whole by addressing multiple modes, including passenger cars, buses, pedestrians and bicycles, and the linkages between and among those modes.*

## 5.1: Preservation and Maintenance

1. Improve the function of interchanges on major roadways (i.e., Interstates and other Principal Arterials) through improved design that reduces delay and improves mobility – Immediate/Near-Term

   **Supportive Actions:**
   - Action 1: Reconfigure major interchanges and intersections that have safety, mobility, or access issues. Reconfiguration, which will entail the reconstruction of the interchange or intersection, could be either a stand-along project or part of a larger corridor reconstruction effort.
   - Action 2: Promote alternative interchange/intersection design options in member agency infrastructure projects.
   - Action 3: Deploy ITS elements as part of the reconstruction of interchanges and intersections.

   **Representative Projects/Ongoing Activities:**
   - The I-490/I-390/NYS Route 390 reconstruction project: This complex interchange on Rochester's west side will be reconfigured to improve access, safety, and mobility on NYS Route 390. This project will include adding new lanes to reduce or eliminate weaving, realigning the northbound NYS Route 390 off-ramp to Lyell Avenue to Lee Road, reconfiguring curves, lengthening several on- and off-ramps, and enhancing the separation of adjacent on- and off-ramps to improve safety. This project is intended to accomplish a range of goals, including improving safety, operations, and infrastructure conditions; enhancing the road's appearance; reducing environmental impacts; and promoting economic development opportunities in the area.
   - The I-390/Kendrick Road interchange project: Currently, there is no direct access to Kendrick Road to or from I-390. In the future, as the University of Rochester campus expands southwards from the River Campus along the Kendrick Road corridor towards I-390, there will be a greater need for multi-modal access to the sites flanking Kendrick Road. As a result, NYSDOT is planning to construct a new interchange that will link the I-390 expressway directly to Kendrick Road without requiring traffic to exit the expressway and use local streets to reach the campus. This interchange will divert some of the traffic that uses Mt. Hope Avenue, Elmwood Avenue, and Crittenden Boulevard to access the campus, thereby reducing congestion and delay on streets around the campus and better using available lane space on the I-390 expressway.
   - The I-590/Winton Road interchange project: A "Diverging Diamond Interchange" (DDI) opened in October 2012 at this interchange. This design eliminates left turns from Winton Road northbound onto the I-590 westbound entrance ramps, thus improving safety by removing the possibility of crashes occurring due to vehicle conflicts at this turn. In addition, the interchange is designed to make traffic move more smoothly through the interchange, thus reducing delay.



*An aerial view of the Diverging Diamond Interchange at the junction of I-590 and Winton Road in the Town of Brighton. Opened in October 2012, this is the first Diverging Diamond Interchange in New York State.*

2. Improve the function of intersections through improved design that increases safety, reduces delay, and improves mobility – Ongoing

**Supportive Actions:**

- Action 1: Reconfigure major interchanges and intersections that have safety, mobility, or access issues. Reconfiguration, which will entail the reconstruction of the interchange or intersection, could be either a stand-along project or part of a larger corridor reconstruction effort.
- Action 2: Promote alternative interchange/intersection design options in member agency infrastructure projects.
- Action 3: Deploy ITS elements as part of the reconstruction of interchanges and intersections.

**Representative Projects/Ongoing Activities:**

- Mt. Hope Avenue/Crittenden Boulevard/East Henrietta Road Intersection: This intersection has been improved by two projects. In 2011, under the East Henrietta Road project, the fifth leg (Fort Hill Terrace) was removed. In 2012, under the Mount Hope Avenue project, Crittenden Boulevard was shifted toward the south to align it more opposite East Henrietta Road, which also reduced the size of the intersection. A raised median was added on Mount Hope Avenue to control access near the intersection. A gas station on the northwest corner, which had many safety problems at its driveways, was also eliminated by the project. Southbound left turns were changed to protected only and the east/west movements are planned to be changed from split phased to concurrent.

- Roundabouts: During the past decade, roundabouts have emerged as a popular alternative for traditional intersection design. Roundabouts are designed to keep traffic slowly but continuously moving through an intersection, thus reducing traffic queuing, vehicle emissions, and vehicle speeds. This leads to decreased travel times, improved air quality, and greater public safety. Roundabouts are readily adaptable to many different places (urban, suburban, and rural), but they are not appropriate for all intersections.

  The first roundabout on public roads in Monroe County was opened in 2005 at the intersection of Plymouth Avenue, Ford Street, and Exchange Street in the City of Rochester. In 2006, a roundabout was constructed at the intersection of NYS Route 251 (Rush Mendon Road) and NYS Route 65 (Clover Street) in Mendon. In 2011, a roundabout at the intersection of NYS Route 19 (North Main Street), East Avenue, and West Avenue at the northern edge of the Village of Brockport was opened. However, the most extensive use of roundabouts in the region at this time is on NYS Route 590 in the Town of Irondequoit, where four intersections were reconfigured with roundabouts as part of a larger road reconstruction project that transformed a decrepit expressway into an attractive boulevard leading drivers to the lake. A roundabout at the complex five-way intersection of Broad Street, Court Street, and Broadway in the City of Rochester opened in August 2012.

3. Advance Access Management recommendations contained in completed UPWP-funded studies as part of rehabilitation and reconstruction highway projects – Near-Term/ Medium-Term

**Supportive Actions:**

- Action 1: Local governments will integrate Access Management techniques into local planning and zoning polices and regulations.
- Action 2: Develop arterial corridor studies where access management solutions would reduce recurring congestion. Potential examples include NYS Route 252 (Jefferson Road), NYS Route 404 (Ridge Road), and NYS Route 31 (Monroe Avenue).

**Representative Projects/Ongoing Activities:**

- Clinton Avenue and St. Paul Street Two-Way Conversion Study: The City of Rochester is currently overseeing a study that determines the feasibility of converting Clinton Avenue (currently one-way northbound) and St. Paul Street (currently one-way southbound) into two-way streets. Two-way traffic patterns are seen as a way to improve customer and employee access to businesses as well as freight pick-up and delivery. In addition, two-way traffic is expected to be slower, which will encourage bicycle and pedestrian movements along these corridors and allow for greater street-life.
- Routes 5 & 20 and State Route 364 Multi-Modal Safety and Access Improvement Study: Ontario County is interested in improving the safety and accessibility of sites such as the Constellation Brands/Marvin Sands Performing Arts Center (CMAC) and the Finger Lakes Community College (FLCC) campus and linking these facilities to area retail and residential developments. This project will involve consideration of access management techniques as a means of improving access and circulation in this area.
- Circulation, Parking and Accessibility (CAP) Studies: The purpose of CAP studies is to identify potential improvements to traffic circulation, parking, and accessibility in villages, hamlets, and city neighborhoods. To date, GTC has completed six CAP studies for the communities of Perry (2008), Macedon (2008), Hilton (2008), Geneseo (2009), Fairport (2010), and the Brown's Square neighborhood in the City of Rochester (2010). CAP studies for the Villages of Webster and Scottsville were started in 2012. CAP studies are not limited to access management recommendations, but identified improvements to circulation, parking, safety and aesthetics typically include common access management techniques.

4. Support development that more fully considers and integrates transportation needs (e.g., transit-supportive, cluster, etc.) by creating and providing associated information materials for local planning and zoning boards – Immediate/Near-Term

**Supportive Actions:**

- Action 1: Brown Bag Lunch Series. Facilitate a brown bag lunch series for local planners, Department of Public Works (DPW) officials, and elected officials (hosted by local planning/DPW departments) to discuss not only specific issues related to transportation-land use but also various decision making options, such as how to get the most from subdivision/site plan review; how best to prepare for Planning Board meetings; what can be accomplished with SEQR; model codes and review processes. Canvass municipal and county planners for exact topics of discussion. Produce slide presentations, handouts, and meeting materials, as necessary.

**Representative Project/Ongoing Activities:**

- College Town on Mt. Hope: The University of Rochester is spearheading the redevelopment of a 14-acre site bounded by Mt. Hope Avenue on the east, Elmwood Avenue on the north, Crittenden Boulevard on the south, and the Strong Hospital complex on the west. Redevelopment will include the demolition of all existing structures on the site and the construction of a new, mixed use development with retail, office, residential and hotel space in five new multi-story structures. Redevelopment also includes a new 1,525 space parking structure, 464 surface parking spaces, 149 underground parking spaces, and construction of a new east-west street connecting East Drive and Mount Hope Avenue. The City of Rochester is supporting the project by rebuilding the section of Mt. Hope Avenue by the project into a pedestrian and transit-supportive boulevard.

## 5.2: System Management and Operations

5. Upgrade regional communications infrastructure for greater integration of transportation agency operations – Ongoing

**Supportive Actions:**
- Action 1: Identify locations where upgrades of existing communications infrastructure are needed. In jointly managed corridors, member agencies will collaborate to generate the most Return-on-Investment (ROI) on infrastructure projects.
- Action 2: Identify new communications capabilities that operators are interested in developing.

**Representative Project/Ongoing Activities:**
- ITS Phase III CCTV Deployment Project: This project will focus on expanding the conduit system and upgrading coaxial cable to fiber optics, as well as the addition of new CCTV cameras that were previously identified but not installed as part of the Phase I and II projects.
- Communications Conduit Replacement Phase III Project: Phases I, II, and III of the Communications Conduit for Monroe County Facilities project resulted in the installation of new county-owned conduit in locations where the county's conduit lease agreements with RG&E expired. The conduit network used by MCDOT includes conduit owned by the State, County, City, and RG&E. However, given increases in RG&E lease rates, it became more cost-effective for the county to install its own conduit for its fiber optic lines rather than continuing to lease conduit space from RG&E. The new conduit maintains the integrity of the regional communications system and provide greater control and flexibility to transportation system operators.
- System Fiber Conversion Project: MCDOT is replacing coaxial cable with fiber optic lines. Fiber optics lines are an improvement over coaxial cable because they can transmit greater quantities of data. As of January 2013, 82% (346 of 423) of signaled intersections have been converted from coaxial cable to fiber optic lines. This conversion is planned to be completed by 2015.

6. Deploy ITS instrumentation along and in First Priority Critical Operations Corridors and Areas as identified in the *ITS Strategic Plan for Greater Rochester* – Near-Term/Medium-Term

**Supportive Actions:**
- Action 1: Transportation management agencies will use the ITS Strategic Plan as a guide to the deployment of ITS instrumentation in the region. Member agencies will hold an annual discussion (potentially as part of the regular TMC meeting schedule) to review implementation progress and the ITS Strategic Plan.

**Representative Projects/Ongoing Activities:**
- NYS Route 390 ITS Deployment: NYSDOT is currently installing ITS elements, including traffic cameras and DMS, along NYS Route 390 between NYS Route 104 and the Lake Ontario State Parkway. This deployment project will "fill in" the gap along this section of the region's expressway network. NYS Route 390 is located in a First Priority Critical Operations Corridor as defined in the ITS Strategic Plan.
- NYS Route 104/NYS Route 590 Deployment: NYSDOT is currently designing the ITS instrumentation that will be deployed along NYS Routes 104 and 590. These elements will help fill in the gaps in ITS coverage on expressways on the City's north and east sides. These routes are included in the First Priority Critical Operations Corridor as defined in the ITS Strategic Plan.

7. Deploy ITS instrumentation along and in Second Priority Corridors and Areas of Regional Operations Significance as identified in the *ITS Strategic Plan for Greater Rochester* – Medium-Term/Long-Term

**Supportive Actions/Ongoing Activities:**

- Action 1: Transportation management agencies will use the ITS Strategic Plan as a guide to the deployment of ITS instrumentation in the region. Member agencies will hold an annual discussion (potentially as part of the regular TMC meeting schedule) to review implementation progress and the ITS Strategic Plan.

**Representative Project/Ongoing Activities:**

- The Diversion Route Planning Initiative: This project will identify the most suitable diversion routes for Principal Arterials in the Genesee-Finger Lakes Region in order to minimize disruptions to and improve safety for the traveling public when isolated events result in temporary road or bridge closures. Based on the results of this study, recommendations on the deployment of ITS instruments along designated diversion routes may be made.


*ITS instrumentation such as this overhead Dynamic Message Sign provides real-time traffic alerts to motorists, helping them make informed travel decisions. Information broadcast on DMS can direct motorists away from congested locations, thus reducing the build-up of traffic queues and the likelihood of secondary incidents.*

8. Replace ITS instrumentation when necessary with next generation technologies along and in Critical Operations Corridors and Areas and Corridors and Areas of Regional Operations Significance as identified in the *ITS Strategic Plan for Greater Rochester* – Long-Term

**Supportive Actions:**

- Action 1: Identify next generation ITS technologies for deployment in the region. Examples of next generation ITS technologies include the increasing use of cloud computing in ITS and vehicle operations, ongoing migration to mobile, user-based data and information systems, tailored to the unique requirements of each individual user, and connected vehicle (CV) technology.
- Action 2: Transportation management agencies will deploy next generation ITS technologies when replacing damaged and worn-out ITS instruments. This is considered a long-term action; however, member agencies should remain up-to-date on next generation ITS advances and developments so that they can address next generation deployments as opportunities arise.

**Representative Projects/Ongoing Activities:**

- Current ITS deployment projects in the Greater Rochester area are aimed at filling in the gaps where no ITS instruments are located. Traffic Signal System expansion, CCCTV cameras, Dynamic Message Signs, Road Weather Information System stations, and other elements will be added to the regional transportation network over the next several years. However, these elements are largely enhanced versions of the first ITS elements deployed in the region and are not a fundamental departure in terms of capabilities from those initial ITS deployments. Looking ahead, as more advanced capabilities become available, NYSDOT and MCDOT will consider deploying these technologies on the regional road network. The single most important improvement expected over the next several years is the increasing linkage between the sources of data; i.e. traffic signals and their associated detection systems, traffic cameras and RWIS stations, and the consumers of data, i.e. transportation system users who can access the data in real time.

9. Develop integrated/coordinated interchange and arterial signal timing systems and plans – Ongoing

**Supportive Actions:**

- Action 1: Periodically update existing traffic signal timing plans to reflect changes in the transportation system. Changes that would warrant signal timing plan updates include new developments that increase/decrease/change traffic flow, reconfigured interchanges/intersections, large-scale access management projects that change traffic patterns, and new traffic signals. New signals may necessitate implementing timing plan updates for nearby signals because the new signals could cause significant timing changes at existing ones.
- Action 2: Identify corridors, interchanges, and intersections where signal timing plans are needed to improve safety and efficiency. Expand the use of actuated signals and/or increase the use of signal coordination where appropriate.
- Action 3: Utilize the GTC Travel Demand Model to help forecast future signal retiming needs.
- Action 4: NYSDOT and MCDOT will develop emergency signal timing plans for critical interchanges and corridors that can be implemented in the event of a major incident. These plans could be incorporated into emergency response drills.

**Representative Projects/Ongoing Activities:**

- Traffic Signal Retiming: NYSDOT and MCDOT operate the majority of traffic signals in the Rochester TMA. These two agencies are continually monitoring and adjusting signal timing based on observed real-time conditions as well as planned events.

10. Monitor advances in and, as appropriate, implement IntelliDrive$^{SM}$ to provide networked wireless communications between vehicles, infrastructure, and personal communications devices – Medium-Term/Long-Term

**Supportive Actions:**

- Action 1: Identify potential Connected Vehicle (CV)/IntelliDrive$^{SM}$ deployments for the region and program into policy, planning, and funding documents where appropriate.
- Action 2: In conjunction with the ITS Strategic Plan recommendations, deploy CV-supportive ITS elements in the region.

**Representative Project/Ongoing Activities:**

- There are no current or planned IntelliDrive$^{SM}$/Connected Vehicle (CV) deployments in the Rochester TMA. However, GTC continuously monitors new advancements in this field to identify potential applications of these technologies in the area and to ensure that regional ITS operations has the ability to support future CV operations.

11. Install AVL and weather information instrumentation on public fleets to maximize vehicle routing and serve as floating, real-time data sensors – Immediate/Near-Term

**Supportive Actions:**

- Action 1: Deploy AVL technology on City of Rochester fleet vehicles, beginning with snow and ice control and waste management vehicles.
- Action 2: Develop AVL deployment studies for municipal fleets. These studies would describe the reasons why fleet managers are interested in AVL, the intended uses of data generated by AVL and the parameters of AVL deployment. These considerations may vary from one fleet to the next. The studies should highlight ways in which AVL can address a broad range of municipal fleet management concerns.
- Action 3: Develop a real-time information portal* to allow the public to access City of Rochester fleet vehicle data; later expand region-wide to include NYSDOT, NYSTA, and County fleet vehicles. *This portal can be modeled on modeled on the City of Ann Arbor's online snowplow AVL tracking system.
- Action 4: Continue the integration of regional travel information with the 511NY website by linking the fleet vehicle data available in the web-portal developed in Action Item #3 to 511NY.

**Representative Project/Ongoing Activities:**

- DES AVL/Weather Sensor ITS Project: In 2011 the City of Rochester implemented a project to improve the efficiency of its DES fleet dispatching process. DES fleet vehicles, including snow plows and dump trucks, will be equipped with automatic vehicle locator (AVL) sensors that will enable more efficient dispatching services, thus reducing fleet VMT and fuel consumption.

  AVL enables better management of public works vehicles, optimized routing, and improved salting and snow plowing of streets, which facilitates improved traffic flow during winter conditions. It improves safety and security for vehicle operators and generates real-time travel information for the general public. Awareness of these conditions may encourage drivers to use alternate routes, thus reducing delay and crashes and associated traffic congestion. Currently, NYSDOT uses AVL on traffic signal maintenance vehicles, but has not equipped other vehicles with this technology. NYSTA-Buffalo Division does not use AVL on its maintenance vehicles, but its Authorized Towing Garages have trucks equipped with it.

12. Install relevant pedestrian ITS instrumentation at identified intersections and crossings to reduce vehicle/pedestrian crashes – Ongoing

**Supportive Actions:**

- Action 1: Implement Safe Routes to School Programs.
- Action 2: Implement the Monroe County Audible/Tactile Pedestrian Signal Device Study.
- Action 3: Implement the Countdown Pedestrian Program.

**Representative Projects/Ongoing Activities:**

- Safe Routes To School (SRTS) Programs: SRTS programs promote deliberate efforts to increase and encourage children to walk and bicycle to school by improving safety to and from schools.
- The Monroe County Audible/Tactile Pedestrian Signal Device Study: This study sets out a process to prioritize the installation of accessible pedestrian signal devices at county-managed intersections. This study developed the methodology now used by Monroe County to prioritize the installation of accessible pedestrian signals.
- The Countdown Pedestrian Program: Monroe County and NYSDOT will be upgrading pedestrian signal indications to the countdown type over the next several years. This is anticipated to improve pedestrian safety.

13. Continue the implementation of and expand Technology Initiatives Driving Excellence (TIDE) for RTS – Ongoing

**Supportive Actions:**

- Action 1: RGRTA will continue deploy Advanced Public Transit System (APTS) elements via the TIDE program in order to improve the efficiency and safety of transit operations.
- Action 2: Expand the accessibility of transit information by developing new information sources, such as expanding the information available on 511NY and through mobile apps.
- Action 3: Complete the deployment of APTS elements on the Livingston Area Transportation Service (LATS) and use the experiences of this service as a guide to future APTS deployments in rural transit service areas.

**Representative Projects/Ongoing Activities:**

- TIDE Program: In 2007 RGRTA began implementing the TIDE program. TIDE is intended to improve the management and operation of the RTS fleet through a broad range of technical applications. Applications include improved vehicle maintenance via a sensor system that detects potential mechanical problems and alerts operators before a problem occurs; Automatic Vehicle Location (AVL), which allows dispatchers to track vehicles as they move through their routes; automatic stop announcements, which provide a verbal notification to riders when a bus reaches a stop; electronic fare collection, which speeds the collection process and more efficiently collects/records payments; and improved traveler information, which includes the deployment of electronic signs at key bus stops that provide real-time information on when the next bus will arrive, and e-mail and text-message service alerts.
- LATS APTS Project: The LATS Advanced Traveler Information System (ATIS) went live on August 16, 2012. This system includes five ATIS signs displaying real-time updates on bus arrivals; four signs are on the SUNY Geneseo campus and one sign is located at the Geneseo Wegmans. The system includes text message capabilities for customers. In addition to the signs, all LATS vehicles will be equipped with automatic vehicle location (AVL) technology. The LATS ATIS system is fully monitored from the RGRTA main campus, which will mean better efficiency in operations mainly during off hours. LATS is RGRTA's second largest subsidiary when measured by ridership.


*The TIDE program aims to improve customer service through more efficient maintenance and operation of the RTS bus fleet. Improving transit services attracts discretionary riders, thus reducing the number of vehicles on the road and, in turn, reducing congestion.*

14. Develop Integrated Corridor Management (ICM)-based Regional Concepts of Transportation Operations (RCTOs) to improve interagency collaboration and coordination – Immediate/ Near-Term

**Supportive Actions:**

- Action 1: Develop a Greater Rochester Regional Concept of Transportation Operations (RCTO). The RCTO will consist of a high-level "umbrella" Memorandum-of-Understanding (MOU) signed by participating agencies along with supporting technical memoranda.
- Action 2: Develop targeted RCTO Modules. Each module will address a specific topic of concern identified during the RCTO development phases, such as after-hours staffing of the RTOC or road construction updates provided to RTS.
- Action 3: Member agencies will continue to hold regular bi-monthly TMC Meetings. Using the results of the 2011 TMC Assessment Survey as a starting-point, periodically reassess the TMC to identify potential operational improvements.

**Representative Projects/Ongoing Activities:**

- Greater Rochester RCTO: The RCTO will include several elements, including an inventory of current conditions, identification and discussion of the operations areas, identification of communications gaps, and an action plan for implementing the RCTO. Most importantly, the RCTO will result in a mutually-agreed upon memorandum-of-understanding (MOU) that will provide guidance to agencies seeking to implement program-specific interagency agreements.

15. Execute the interagency agreements necessary to implement protocols contained in the ICM-based RCTOs – Near-Term/Medium Term

**Supportive Actions:**

- Action 1: Develop a Greater Rochester Regional Concept of Transportation Operations (RCTO). The RCTO will consist of a high-level "umbrella" Memorandum-of-Understanding (MOU) signed by participating agencies along with supporting technical memoranda.
- Action 2: Develop targeted RCTO Modules. Each module will address a specific topic of concern identified during the RCTO development phases, such as after-hours staffing of the RTOC or road construction updates provided to RTS.
- Action 3: Member agencies will continue to hold regular bi-monthly TMC Meetings. Using the results of the 2011 TMC Assessment Survey as a starting-point, periodically reassess the TMC to identify potential operational improvements.

**Representative Projects/Ongoing Activities:**

- As part of the RCTO development process, a series of interagency agreements were identified for participating agencies to implement. These agreements are expected to improve the quality of interagency coordination and communications. They will address topics such as joint communications infrastructure management; CCTV traffic camera feed management, road closure notifications, and joint operations at the Regional Traffic Operations Center.

16. Continue federal funding for Regional Traffic Operations Center (RTOC) staffing, including continued 24-hour operations and cross-training of NYSDOT and Monroe County staff – Ongoing (Near-Term for cross-training)

**Supportive Actions:**

- Action 1: Formally created a set-aside of federal funding for Regional Traffic Operations Center (RTOC) staffing, including continued 24-hour operations and cross-training of NYSDOT and Monroe County staff.

**Representative Projects/Ongoing Activities:**
- The Transportation Improvement Program includes annual funding that supports the NYSDOT RTOC staff and operations, Monroe County RTOC staff and operations, and NYSDOT contracts for supplemental staffing to support overnight RTOC operations.

17. Continue federal funding for the NYSDOT Highway Emergency Local Patrol (HELP) Program to decrease delay and increase safety on major highways by providing emergency roadside service to disabled vehicles – Ongoing

**Supportive Actions:**
- Action 1: Continue federal funding for the Highway Emergency Local Patrol (HELP) Program.

**Representative Projects/Ongoing Activities:**
- Currently, NYSDOT's HELP trucks patrol three sections, or "beats," along the TMA expressway network. These trucks provide basic assistance to disabled vehicles, addressing congestion by facilitating quick clearance and reducing the likelihood of secondary incidents. The Transportation Improvement Program includes annual funding that supports this program.


*A NYSDOT HELP Truck on scene. HELP trucks provide a range of valuable services, which mitigate congestion through rapid incident response and clearance.*

18. Continuously identify ways to increase and improve real-time travel information – Ongoing

**Supportive Actions:**
- Action 1: NYSDOT will display travel times on ground-mounted Dynamic Message Signs (DMS).
- Action 2: Regional transportation management agencies will continue to expand the type and quantity of traveler information available on the 511NY website, such as road conditions, travel times, traffic camera feeds, links to parking guidance systems, and other agency websites that provide information on topics such as weather conditions, public transit, tolls, and road closures/incidents.

- Action 3: Member agencies will identify potential smart-phone applications (apps) that can be developed to provide increased traveler information to system users. Potential apps would information on traffic congestion and incidents, travel times, public transit, parking, tolls.

**Representative Projects/Ongoing Activities:**
- Post Real-time Travel Data on Agency Websites: Several regional agencies including MCDOT and NYSTA provide real-time traveler information on their agency websites. Travel information available on the NYSTA website includes traffic camera images, scheduled lane closure alerts, traffic incident email alerts, HAR broadcasts, and information on what motorists should do in the event of an incident. An interactive mapping system allows travelers to obtain up-to-date travel information for the sections of the Thruway they will be driving on. MCDOT provides traffic camera images on its website, as well as an interactive map showing the location of reported traffic incidents. Travelers can access these websites before and during travel to plan a trip or modify a trip to better respond to current conditions.
- Post Real-time Travel Data on third-party websites: NYSDOT and MCDOT provide traffic camera feeds to TrafficLand, a company that aggregates and delivers live traffic video over the Internet (TrafficLand.com) and on TV. TrafficLand aggregates thousands of CCTV video feeds from multiple DOT traffic camera networks. TrafficLand services currently include thousands of cameras from dozens of cities worldwide. Developed as a public-private partnership, TrafficLand works with local, state and federal government agencies and commercial enterprises to leverage existing video camera networks and repurpose these resources to maximize the benefits delivered to partner agencies and the traveling public.
- Display Travel Times on DMS: NYSDOT is currently working on a pilot program to display real-time travel times on DMS across the region. This will update motorists on the expected amount of time it will take them to reach their destination. This service will assist motorists in determining how long it will take them to complete a trip or with choosing an alternate route if their original route will take longer due to a work zone, incident scene, etc. Travel times for the pilot program will be calculated manually and will be displayed on a limited number of signs. The success of this pilot program will determine whether or not it is expanded into other corridors.

19. Initiate the Greater Rochester Regional Commuter Choice Program to consolidate information on and allow comparative assessment of transportation options – Immediate

**Supportive Actions:**
- Action 1: Implement the roceasyride.org website.
- Action 2: Grow the user base at roceasyride.org to improve its usefulness to participants.
- Action 3: Continually improve the site to maintain its long-term viability and relevance to the community.

**Representative Projects/Ongoing Activities:**
- Roceasyride: The website http://www.roceasyride.org was officially launched at a press event held on April 6, 2012. An *Administrative Manual for Employers and Organizations* that wish to use the site has been developed and distributed on request to interested parties. Promotional materials have been developed and distributed to Monroe County, the City of Rochester, members of the Rochester Business Alliance, and others. Promotional materials and the Administrative Manual are available for download on the site, which also includes links to the online version of the *2009 Edition of the Greater Rochester Area Bicycling Map*, current Google Traffic conditions for the Greater Rochester Area, the New York 511 Travel Planning site, and other resources. As of May 4, 2012, the site has 132 registered users.

20. Continuously upgrade the 511NY Program to expand information on statewide travel conditions and options – Ongoing

**Supportive Actions:**

- Action 1: Regional transportation management agencies will continue to expand the type and quantity of travel information available on the 511NY website, such as travel times, traffic camera feeds, links to parking guidance systems, and other agency websites that provide information on topics such as weather conditions, public transit, tolls, and road closures/incidents.
- Action 2: Member agencies will identify potential smart-phone applications (apps) that can be developed to provide increased traveler information to system users. Potential apps would information on traffic congestion and incidents, travel times, public transit, parking, tolls.

**Representative Projects/Ongoing Activities:**

- Integrate Resources into 511NY: 511NY provides a central "clearinghouse" of information for travelers in New York State. Travelers can access traffic cameras to check road conditions, plan a trip using local transit services, arrange for carpools, and obtain specific information about various aspects of the state's transportation system, such as what a bridge toll is or where a bike path leads. Recently, feeds from MCDOT's traffic cameras were linked to 511NY and can now be seen on the 511NY website. This website is expected to offer greater resources to travelers in the future, especially with regards to planning multi-modal trips, as more agencies and data sources are linked into it.

21. Integrate the Greater Rochester Regional Commuter Choice Program with the 511NY Program – Near-Term/Medium-Term

**Supportive Actions:**

- Action 1: Work with 511NY site administrators to request relevant links be provided from that site to the Commuter Choice site.
- Action 2: Monitor the links between www.roceasyride.org and the 511NY site for functionality and opportunities for improvement.

**Representative Projects/Ongoing Activities:**

- Roceasyride: The Greater Rochester Commuter Choice Program website http://www.roceasyride.org was launched on April 6, 2012. At this time, the Roceasyride website includes limited integration with the 511NY Program; it is used to provide access to the Transit Trip Planning provided by the 511NY Program. Staff continues to monitor the 511NY system with respect to transit trip planning and the status of statewide ridesharing.

22. Improve or install (as appropriate) wayfinding signage in business, cultural, and other unique districts as well as interregional travel facilities – Near-term/Mid-Term

**Supportive Actions:**

- Action 1: Convene a wayfinding summit/roundtable of economic development and tourism entities (GRVA, RBA, Finger Lakes region chambers of commerce, Finger Lakes Tourism Alliance, county transportation officials, etc.) to gauge need for regional wayfinding system or regional coordination of wayfinding.
- Action 2: Inventory and assessment of existing signage.
- Action 3: Advocate for a New York State initiative similar to Pennsylvania's Regional Wayfinding Signing Program.

**Representative Projects/Ongoing Activities:**

- Center City Pedestrian Circulation and Wayfinding Study: In 2012 the City of Rochester developed a wayfinding study to improve the visitor wayfinding experience within Rochester's Center City. The plan identifies ways to enhance and connect existing pedestrian wayfinding devices and systems. The plan recommendations will link various existing sign systems, build upon the newly installed vehicular wayfinding system directing motorists to key destinations, and create a seamless and unified travel experience throughout downtown Rochester.
- Clinton Avenue and St. Paul Street Two-Way Conversion Study: See Recommendation 3 on page 32 for a full description of this project. One benefit of this study is expected to improve wayfinding in downtown Rochester, a key business and cultural district in the TMA.
- Genesee Riverway Trail Wayfinding System: The Genesee Riverway Trail is an off-road trail for walking, running and bicycling along the Genesee River. It extends from the Erie Canal north through downtown Rochester to Lake Ontario, linking scenic, historic, and cultural sites, and connects to both the Erie Canal Heritage Trail and the Genesee Valley Greenway. The trail is marked by a system of wayfinding and interpretive signs featuring a unique design that "brands" the trail and facilitates effective navigation.

*Wayfinding signs, such as those along the Genesee Riverway Trail that runs through downtown Rochester, help travelers navigate unfamiliar routes and locate destinations. Trails can be used as commuter routes for alternate modes of transportation, such as pedestrians and bicyclists.*

## 5.3: Expansion

23. Design and implement a mobility management program that coordinates existing and future services of public, not-for-profit, and private transportation providers.

**Supportive Actions:**
- Action 1: Develop a Business Plan for a Regional Mobility Management Program (RMMP).
- Action 2: Implement the RMMP based on outcomes of Action #1.

**Representative Projects/Ongoing Activities:**
- *Coordinated Public Transportation/Human Services Transportation Plan for the Genesee-Finger Lakes Region Update* (Coordinated Plan): This plan was approved by the GTC Board on June 16, 2011, and includes the development of a mobility management program for the region as a key recommendation. Currently, several counties in the region offer limited mobility management services. These existing services, however, lack the resources needed to provide a coordinated, comprehensive family of transportation options spanning jurisdictional and organizational boundaries. In addition to the Coordinated Plan, a number of strategic plans for public transportation have been developed for the counties in the region as part of the UPWP. Many of these plans include recommendations relevant to the coordination of public and human services transportation and cross-boundary issues.

24. Increase the frequency of fixed-route public transportation services in the Regional Urban Core, Sub-Regional Urban Cores, Mature Suburbs, Employment Centers, Medical/Health, Higher Education, and Airport places – Near-Term/Medium-Term

**Supportive Actions:**
- Action 1: Develop a Feasibility Assessment and Implementation of Suburban and Neighborhood Shuttles.
- Action 2: Develop a Feasibility Assessment and Implementation of College Circulators.
- Action 3: Continue to support improved coordination between land use and public transportation.

**Representative Projects/Ongoing Activities:**
- RTS Bus Route Planning: RTS conducts ongoing assessments of its bus routes and schedules to improve efficiency and provide the most cost-effective service by analyzing trip-level and stop-level ridership and fare data on fixed route services.
- RGRTA studies: RGRTA has prepared Transit-Supportive Development Guidelines, a Suburban Transit Station Study, and a Transit Signal Prioritization Study utilizing UPWP funds. All of these studies support this recommendation. *Driving Forward*, *RGRTA Agenda 2012-2015*, states that one of the Authority's three priority strategies going forward will include the assessment of the feasibility of, and the implementation of, a college circulator and neighborhood shuttles.
- *Ontario County Area Transportation System (CATS) Fixed Route Evaluation* (February 2010): This study includes findings and strategies in support of this recommendation.

25. Construct satellite transit stations in the City of Rochester and assess their feasibility in Mature and Recent/Emerging Suburbs – Near-Term/Medium-Term

**Supportive Actions:**
- Action 1: Continue to Support Planning and Investment Decision Making that Encourages and Advances Transit Supportive Development.

**Representative Projects/Ongoing Activities:**

- The Suburban Transit Station Study: This study was prepared to assess the performance and effectiveness of the current RTS park-and-ride route structure and further refine and define the suburban transfer center concept. This study was completed through the market analysis of potential sites and determined that in the short term the development of Suburban Transit Stations in the region is unlikely to be financially sustainable. As noted above, however, RGRTA is actively participating in the transit aspects of the College Town development. College Town is envisioned as a community oriented, mixed-use development containing retail, residential, office, and recreational uses with structured parking and a transit station to serve both the future customers and residents of College Town and the thousands of people who now travel to this second most active destination of the RTS system for employment and health services on a daily basis.
- CityGate: Located at Monroe County's former Iola Campus, this development is envisioned as a major activity center and trip generator with high-density urban characteristics, to define a project scope for the transit element of the project and identify a mechanism that will enable New York State grant funds to be invested in the project for the benefit of public transit.

## Section 6 — Congestion Management Strategies Toolbox

Earlier sections of the CMP identified the locations and causes of traffic congestion. Federal regulations require a CMP to consider congestion management strategies that manage demand, reduce single occupant vehicle travel, and improve transportation system management and operations. These alternatives provide cost-effective strategies to traditional capacity expansion projects, which may only be considered in conjunction with associated strategies to manage future demand and improve operations.

The following list of congestion management strategies is a broad overview of all potential congestion management strategies that could be applied. However, not all strategies listed here are recommended for use in the Rochester TMA. The effectiveness of congestion strategies depends on how well they are tailored to specific conditions and locations. The techniques discussed below differ dramatically in scale, scope, and purpose; however, they can all be used to mitigate congestion. The strategies are categorized as either supply-driven or demand-driven; then further broken-down by facility type.

### Congestion Management Strategies

<u>Supply-Driven</u>

1. Urban Freeways – Design
   - 1.A. Provide Additional Lanes without Widening Freeways
   - 1.B. Provide Additional Lanes by Widening Freeways
   - 1.C. Geometric Design Improvements (Freeways)
   - 1.D. Eliminate Bottlenecks
   - 1.E. Provide High Occupancy Vehicle (HOV) Lanes

2. Urban Freeways – Operations
   - 2.A. Incident Management
   - 2.B. Highway Information Systems
   - 2.C. Ramp Metering
   - 2.D. Highway Pricing Strategies
   - 2.E. Work Zone Management

3. Arterials and Local Streets – Design
   - 3.A. Intersection/Interchange Improvements
   - 3.B. Expand Arterial and Local Roads
   - 3.C. Geometric Design Improvements (Arterials and Local Roads)
   - 3.D. Arterial Access Management
   - 3.E. Reversible Traffic Lanes
   - 3.F. Traffic Calming and Street Space Management
   - 3.G. One-Way Conversion
   - 3.H. Two-Way Conversion
   - 3.I. Superstreet Arterials

4. Arterials and Local Streets – Operations
   - 4.A. Traffic Signal Coordination
   - 4.B. Improved Traffic Control Devices
   - 4.C. Parking Supply Management
   - 4.D. Arterial Monitoring and Management
   - 4.E. Enforcement
   - 4.F. Turn Prohibitions
   - 4.G. Bicycle and Pedestrian Networks
   - 4.H. Freight Movement Management
   - 4.I. Truck Restrictions
   - 4.J. Construction Site Access

5. Public Transportation Services
   - 5.A. System/Service Operational Improvements – Fixed Route and Express Buses
   - 5.B. Fare Structures
   - 5.C. System/Service Expansion: Rail/Fixed Guideway Transit Facilities
   - 5.D. Joint Development
   - 5.E. System/Service Operational Improvements – Paratransit Services
   - 5.F. Transit-Oriented Development (TOD)
   - 5.G. Transit Signal Priority (TSP)
   - 5.H. Park and Ride Facilities

<u>Demand-Driven – Transportation Demand Management (TDM)</u>

6. Site-Specific and Area-Wide Strategies
   - 6.A. Alternative Modes of Transport
   - 6.B. Alternative Travel Hours
   - 6.C. Negotiated Demand Management Agreements
   - 6.D. Complementary TDM Support Measures
   - 6.E. Alternative Workplace Locations
   - 6.F. Traveler Information Systems
   - 6.G. Growth Management
   - 6.H. Transit Supportive Design Guidelines
   - 6.I. Parking Demand Management
   - 6.J. Trip Reduction Ordinances
   - 6.K Congestion Pricing
   - 6.L Auto-Restricted Zones

**Supply-Driven Strategies**

1. Urban Freeways – Design

1.A. Provide Additional Lanes without Widening Freeways

Definition: Increase capacity on existing infrastructure by restriping, using shoulders during peak hours (left shoulder preferred), and reducing lane widths where possible.

Congestion Mitigation Impacts: Increased capacity; improved mobility.

1.B. Provide Additional Lanes by Widening Freeways

Definition: Increase freeway capacity by building new traffic lanes. New lanes may range from minor additions, such as an auxiliary lane to better handle merging and diverging movements, to large-scale construction that adds many miles of new travel lanes.

Congestion Mitigation Impacts: Increased capacity; long-term congestion and demand increase.

1.C. Geometric Design Improvements (Freeways)

Definition: Adjustments to the number and arrangement of travel lanes at intersections or on limited segments of a roadway. Interchange improvements may include restriping, channelization, modifying intersection angles, and improving corner radii. Segment improvement may include expressway auxiliary lanes, passing lanes, truck climbing lanes, widened shoulders, and reversible lanes.

Congestion Mitigation Impacts: Improved mobility; increased safety.

1.D. Eliminate Bottlenecks

Definition: Reconfigure bottleneck sites, such as intersections and interchanges with high traffic volume, to improve traffic flow.

Congestion Mitigation Impacts: Improved mobility; increased safety; decreased emissions, potential creation of new bottlenecks at other sites.

1.E. Provide High-Occupancy Vehicle (HOV) Lanes

Definition: HOV lanes are exclusive lanes for high-occupancy vehicles (buses, vanpools, or carpools). HOV lanes increase average vehicle occupancy and person throughput while reducing congestion and emissions. HOV lanes may be separate travel lanes with special markings to designate their status or reversible lanes where traffic direction changes depending on conditions; i.e., traffic flows into a city during the morning peak period and away from the city during the evening peak period.

Congestion Mitigation Impacts: Increased people-moving capacity on highways; decreased emissions; decreased travel times; increased transit reliability.

2. Urban Freeways – Operations

2.A. Incident Management

Definition: Incident management involves the coordination of three stages: detection/verification; response/clearance; recovery/information. The aim of incident management should be to quickly and efficiently clear incident scenes without endangering first responders or the traveling public. This returns the roadway to normal operations sooner and reduces the likelihood of secondary incidents. Many incidents are vehicle disablements that can be quickly cleared.

Congestion Mitigation Impacts: Reduced incident-related delay; fewer secondary incidents.

2.B. Highway Information Systems

Definition: Communicate dynamic information regarding existing traffic conditions to travelers en-route on the transportation system. These capabilities include technologies such as Dynamic/Variable Message Signs (DMS/VMS), Highway Advisory Radio (HAR), and in-vehicle/handheld systems such as Geographic Positioning Systems (GPS) and personal travel assistants.

Congestion Mitigation Impacts: Reduced speeds of vehicles nearing queues (fewer secondary crashes); diversion to alternate routes/modes.

2.C. Ramp Metering

Definition: Ramp meters are modified traffic signals placed at the end of highway entrance ramps. This controls the flow of vehicles onto highways by breaking up platoons of vehicles attempting to enter the highway, thus streamlining the merge process. Delays may be incurred for ramp traffic, but mainline capacities are protected and overall operational efficiency is improved.

Congestion Mitigation Impacts: Increased freeway capacity; reduced short freeway trips; increased volume/capacity ratio on highways; decreased crash rate.

2.D. Highway Pricing Strategies

Definition: Levy fees for driving during peak travel times or under congested conditions. Place a surcharge on parking in congested areas. Use electronic toll collection systems to ease congestion at toll booths.

Congestion Mitigation Impacts: Diversion to alternate routes; mode switches; destination changes; increased trip chaining.

2.E. Road Work Zone Management

Definition: Manage road work zones to mitigate their impact on traffic. Limit work activities to off-peak travel hours; phase work activities on a daily, weekly, or seasonal basis to minimize traffic impacts; conduct a public awareness program in advance of road work; identify and promote alternate routes; promote ridesharing or transit use.

Congestion Mitigation Impacts: Improved throughput around road work zones; minimized vehicle delays and speed reductions; reduced crash rate.

3. Arterials and Local Streets – Design

3.A. Intersection/Interchange Improvements

Definition: Improve intersection/interchange operations. Key design principles include: reduce the number of conflict points among vehicular movements; control relative speed of vehicles entering or leaving the intersection; coordinate the type of traffic control devices used with volume of traffic; select the proper intersection design to manage traffic volume; high volumes may require separate turn lanes; avoid multiple and compound merging/diverging maneuvers; separate conflict points; favor heaviest and fastest flows to minimize hazards and delay; reduce the area of conflict through channelization; segregate non-homogenous flows; and design for bicycle and pedestrian access. In select locations consider non-traditional intersection/interchange designs, such as roundabouts and diverging diamond interchanges, as a means of increasing traffic throughput, reducing delay and emissions, and improving safety.

Congestion Mitigation Impacts: Reduced crash rates; increased intersection efficiency and throughput; decreased emissions, reduced speeds at intersections.

3.B. Expand Arterial and Local Roads

Definition: Expand the capacity of existing arterials and local roads by adding travel lanes. Expansion may include building new lanes alongside existing lanes, extending lanes, or building new roads in select locations.

Congestion Mitigation Impacts: Increased traffic capacity; long-term congestion and demand increase; potential reduction of efficiency and increase in travel times.

3.C. Geometric Design Improvements (Arterials and Local Roads)

Definition: Adjustments to the number and arrangement of travel lanes at intersections or on limited segments of a roadway. Intersection improvements include restriping, channelization, adding turn lanes, installing traffic islands, modifying intersection angles, and improving corner radii. Segment improvement may include passing lanes, truck climbing lanes, bus turnout lanes, widened shoulders, one-way couplets, and reversible lanes.

Congestion Mitigation Impacts: Improved mobility; increased safety.

3.D. Arterial Access Management

Definition: Control spacing, location, and design of driveways, medians/median openings, intersections, traffic signals, and freeway interchanges. Potential improvements include: physically restricting left turns; restricting curb cuts and direct access driveways; eliminating parking; locating intersections at no less than minimum intervals; constructing frontage roads to collect and funnel local business traffic.

Congestion Mitigation Impacts: Reduced crash rate; improved throughput; fewer conflict points.

3.E. Reversible Traffic Lanes

Definition: One or more lanes designated for one direction for part of day and other direction for another part. They are meant to provide an extra lane(s) for use by dominant direction of travel. They should be used if there is evidence of congestion, notably recurring congestion, as well as adequate capacity at access points, and are especially effective on bridges and in tunnels.

Congestion Mitigation Impacts: Increased capacity at peak periods.

3.F. Traffic Calming and Street Space Management

Definition: According to the Institute of Transportation Engineers (ITE), traffic calming is "…the combination of mainly physical measures that reduce the negative effects of motor vehicle use, alter driver behavior, and improve conditions for non-motorized street users." Traffic calming is focused on lowering vehicle speeds and reducing traffic volumes, most often using physical/operational changes to streets themselves.

Congestion Mitigation Impacts: Increased transit use; increased bicycle and pedestrian decreased automobile and truck traffic, decreased bicycle/pedestrian conflicts; reduced crash rate.

3.G. One-Way Conversion

Definition: One-way conversion is the process of converting two-way streets to a one-way traffic pattern. This reduces intersection delays caused by vehicle turning movements and pedestrian conflicts. It may provide space for lane-width adjustments that increase the capacity of existing lanes or provide additional lanes for bicycles and buses. Permit improvements in public transit operations such as routings without turnback loops and permit turns from more than one lane at more intersections than possible with two-lane operation. However, one-way streets may have negative (real or perceived) impacts on businesses by limiting access to them, and may complicate traffic movements and wayfinding initiatives by limiting route options.

Congestion Mitigation Impacts: Increased speeds and capacity; less congestion on adjacent streets.

3.H. Two-Way Conversion

Definition: Two-way conversion is the process of converting one-way streets into streets with two-way traffic patterns. While one-way streets can be effective at moving heavy traffic through certain locations, two-way streets may be better options in other areas because they improve access to adjacent properties and distribute traffic over multiple thoroughfares. In addition, transforming one-way streets into two-way streets may reduce vehicle speeds, thus improving pedestrian and bicyclist circulation, and benefit way-finding initiatives by providing travelers with more options to reach a destination.

Congestion Mitigation Impacts: Increased speeds and capacity; less congestion on adjacent streets; increased accessibility.

3.I. Superstreet Arterials

Definition: Superstreets work by redirecting left turn and through movements from side streets and driveways. Instead of allowing those movements to be made through a standard two-way median opening, a superstreet directs those movements to a one-way median opening downstream of the intersection by a right turn. Drivers then make a U-turn around the median and proceed straight along the road or make a right turn onto a side street or driveway. This design reduces delay because drivers are not stuck waiting to make left-hand turns or for traffic from cross-streets to clear the intersection. It improves safety be eliminating the conflict points created by left-turning traffic. It can also increase intersection capacity, and can often be developed within existing right-of-way.

Congestion Mitigation Impacts: Increased throughput at major intersections; reduced crash rates.

4. Arterials and Local Streets – Operations

4.A. Traffic Signal Coordination

Definition: Coordinate traffic signals by updating signal equipment and making timing plan improvements. This technique includes computerized, interconnected, synchronized, and remotely-controlled signal systems, traffic signal removal/installation, and improved signal maintenance.

Congestion Mitigation Impacts: Increased intersection efficiency and throughput; reduced delay and crash rates, more efficient use of existing road space.

4.B. Improved Traffic Control Devices

Definition: There are three classes of signs: regulatory, warning, and guide/informational. These signs are meant to reduce the level of driver uncertainty that can lead to congestion and crashes. Markings include lanes, symbols, words, object markers, and delineators.

Congestion Mitigation Impacts: Reduced crash rate; improved traffic flow; increased intersection efficiency and throughput.

## 4.C. Parking Supply Management

Definition: Parking supply management techniques control the availability of, and demand for, parking in a region or sub-region. The various techniques are as follows:

- On-Street Parking: increase or decrease the supply; change mix of short/long-term parking; institute parking restrictions (peak/off-peak, alternate, durations, prohibitions); permit programs; preference programs; loading zone regulations
- Off-Street Parking: increase or decrease the supply (zoning regulations, slow growth, build new); change mix of short/long-term parking; restricted/preferential parking
- Fringe and Corridor Parking: fringe/peripheral parking; park and rides; preferential parking
- Pricing: change rates (increase/decrease, free in CBD, differential); merchant shopper discounts (stamps, tokens); employer subsidies
- Enforcement and Adjudication: non-police enforcement personnel (ticketing, towing, booting); administrative; judicial
- Marketing: advertising (brochures, maps, media); convenience programs
- Shared parking: two or more land uses can share same parking spaces thereby devoting less land area to parking; may cause parking shortage if land uses change
- Special Event Parking Management: develop and institute parking management plans for special events such as concerts, professional sports games, or festivals

Congestion Mitigation Impacts: Decreased traffic demand; increased throughput; reduced cruising for parking.

## 4.D. Arterial Monitoring and Management

Definition: Arterial monitoring and management involves incident detection, verification, and follow-up action (e.g., service patrols, roving tow vehicles, traveler information system, real-time transit information at stops or via email/text alerts); intersection monitoring (e.g., loop detectors, signal systems, CCTV monitoring); parking control/management on arterials with more enforcement.

Congestion Mitigation Impacts: Reduced incident-related delay; improved traffic flow.

## 4.E. Enforcement

Definition: Enforcement includes education and outreach efforts needed to inform the public of changes to be made and their expected benefits. More enforcement officials are needed in beginning to reinforce need for behavioral changes. Law enforcement agencies should be included in the planning process. Actions should be designed to provide for self-enforcement when possible; fines should be reasonable so as to not invoke a backlash. There could be significant expenses involved in strict enforcement, however the benefits may be substantial.

Congestion Mitigation Impacts: Enforcement supports implemented mitigation actions.

4.F. Turn Prohibitions

Definition: Discourage/prohibit undesirable traffic turning movements while facilitating high priority movements and desired traffic control schemes. Turn prohibitions can be in effect all day long or during peak hours. Desirable vehicular paths should be clearly defined, safe speeds encouraged, and conflict points separated.

Congestion Mitigation Impacts: Reduced crash rate; increased intersection efficiency and throughput; decreased delay.

4.G. Bicycle and Pedestrian Networks

Definition: Encourage non-motorized travel by providing continuous, connected sidewalks for pedestrians and clear, visible lanes and trails for bicyclists. Facilitate movement through improved bicycle/pedestrian wayfinding systems. Origins and destinations should be linked with both on-street and off-street routes.

Congestion Mitigation Impacts: Decreased emissions; increased non-SOV mode share; increased bicyclist and pedestrian safety.

4.H. Freight Movement Management

Definition: Changes in delivery schedules, terminal location, and delivery zones helps minimize unnecessary congestion that occurs due to mixing of different vehicle types. These activities involve: traffic management; improvements at shipping/receiving points; reducing operational/physical constraints; changes in business operating practices or public policy; and investment in rail. Urban goods can be moved during off-peak hours.

Congestion Mitigation Impacts: Reduced overall congestion; improved goods movement through region.

4.I. Truck Restrictions

Definition: Separate trucks from passenger vehicles and pedestrians by prohibiting trucks to travel on certain roadways, instituting height and weight restrictions, and limiting truck traffic to certain times of the day.

Congestion Mitigation Impacts: Increased capacity; decreased travel times; improved safety.

4.J. Construction Site Access

Definition: Coordinate the location of access points to construction sites, manage traffic flow around these points, and manage construction vehicle movements on and around the site to minimize disruptions to travelers on surrounding streets.

Congestion Mitigation Impacts: Increased capacity and efficiency on arterials; decreased shipping costs to construction sites; decreased incidents.

5. Public Transportation Services

Improving transit services in conjunction with other strategies such as parking management, congestion pricing and development strategies can increase vehicle occupancy and decrease congestion. There are three basic types of transit: rail/fixed guideway (including busways), bus, and paratransit.

5.A. System/Service Operational Improvements – Fixed Route and Express Buses

Definition: Operational improvements increase the productivity and cost-effectiveness of transit lines and services. Fixed-route buses provide service on a regularly scheduled basis along a specific route with buses picking up and discharging passengers at specified locations. Express buses operate without stops or a limited number of stops and are geared towards commuters in outlying suburbs.

There are a number of operational strategies and route planning devices to improve transit service. For instance, flexibly-routed smaller buses servicing suburban commercial and office complexes can be implemented at the area or network level (e.g., route extensions, timed transfers, network realignment, feeders into line-haul services). This service can focus on route structure and reliability (e.g., point/route deviation, zonal service, route replacement/consolidation, changes in route departures, use of computer aided dispatch (CAD) and automatic vehicle locator (AVL) devices), or can provide improved passenger services (e.g., bus shelters, passenger information, trailblazing to stations, marketing, or consolidated fares/passes). Transit vehicles should be fitted with bicycle racks. Routine replacement of aging vehicles reduces maintenance expenses and offers riders up-to-date services. Off-peak ridership is more sensitive to changes in service. Ridership often responds more favorably to more frequent service than decreased travel times, and it is important to minimize the need for transfers.

Congestion Mitigation Impacts: Increased transit ridership; increased non-SOV mode share; decreased emissions.

5.B. Fare Structures

Definition: Differentiation in fare structure can be used to enhance mobility options for target markets or to provide added incentive in specific geographic areas. Fare structures can be differentiated by traveler or trip types.

Traveler types include:

- Demographic/socioeconomic aspects (e.g., age, income)
- Affiliation (e.g., employee, student)
- Mobility-impaired
- Frequency of use
- Payment method
- Time commitment of purchase (e.g., one-time, annual)

Trip types include:

- Specific origin/destination points

- Transit trip length or duration
- Quality of service (e.g., speed, crowding) by line or corridor
- Quality or price of competing service (e.g., congestion, tolls)
- Timing of trip
- Routing of trip
- Direction of trip
- Use of complementary modes
- Size of travel party

There are other reasons for differentiated fare structures, such as:
- Market building fare reductions
- Sales commissions for fare media distribution channels
- Joint promotion with other businesses or uses for payment media
- Two-part fare structures (e.g., time-based subscription with a use-based charge)

Fare elasticity is an important consideration. This is the ratio of percent change in transit ridership over percent change in fare. For every 1% increase/decrease in fares, ridership is expected to increase/decrease 0.2-0.4%. Although the transit industry is increasingly embracing market-based pricing, there is concern about the equity implications of charging one individual more than another for same trip.

Congestion Mitigation Impacts: Increased transit ridership; increased non-SOV mode share; decreased emissions.

5.C. System/Service Expansion: Rail/Fixed Guideway Transit Facilities

Definition: This form of service expansion can move large numbers of persons quickly, efficiently and reliably. There are generally four different options for this strategy:

- Automated Guideways/Peoplemovers: Circulation systems relying on automated guideway technology to provide direct service to stations. Suited for use in high-density urban sites, often used as connections to high-capacity, high-speed services.

- Light Rail: Medium capacity (<20,000 persons/hour) service operating on either grade-separated or reserved right-of-way, mixed traffic (streetcars), or a combination. Passenger platforms can either be low or high-level. Operation is usually manual and can occur either individually or in trains and can couple/uncouple easily. Suited for service to non-residential concentrations of 35-50 million square feet and residential areas with nine units per acre. Light rail is much less expensive than heavy rail due to its flexibility, but has less carrying capacity.

- Commuter Rail: Operates between urban centers and suburbs, often using mainlines with high-speed locomotives or self-propelled cars in trains. Best suited for service in areas with more than 100 million square feet of non-residential development. Can come on-line easier and faster than other forms. It may be the cheapest rail service to build, but typically incurs heavy operating costs. Commuter rail conflicts with freight rail and is not convenient for handling reverse commutes or mid-day/off-peak commutes.

- Heavy Rail: High speed (~80 mph), high capacity (>20,000 persons/hour); exclusive right-of-way with multiple car trains, sophisticated signaling, platform loading at stations; third rail power supply and high degree of automation. Best suited for high-density areas (>12 units/acre) and high level of non-residential development (>50 million square feet). This is the most expensive transit option.

Congestion Mitigation Impacts: Increased transit ridership; increased non-SOV mode share; decreased emissions.

5.D. Joint Development

Definition: Joint development actions share the costs and/or revenue associated with transit stops and stations. Such actions are typically taken in conjunction with a rail transit station. Numerous options for joint development are available.

Revenue-sharing actions include:
- Leases: transit agency leases parcels, development rights, or unimproved space to developers or commercial tenants
- Facility Connection Fees: fee to connect a project to a transit station
- Land Sales
- Benefit Assessment Districts: special districts around transit stations where landowners pay on a pro-rated basis to help finance the public facility
- Tax Increment Financing (TIF): the property tax base in a special district is frozen and all gains above that point are earmarked for financing a transit facility
- Transit Impact Fee: developers are required to make one-time contribution to account earmarked for funding transit facilities needed to accommodate growth
- Negotiated Payments: negotiate with landowners to pay for transit investment

Cost-sharing actions include:
- Voluntary Agreements: transit agencies and developers agree to reduce each others' costs through coordination
- Incentive-Based Agreements: public authorities grant developers a bonus in exchange for partial or full-funding of on-site public infrastructure
- Mandatory Programs: developers are required to finance certain actions as a precondition to receiving a building permit

Congestion Mitigation Impacts: Reduced number of vehicle trips.

5.E. System/Service Operational Improvements – Paratransit Services

Definition: Paratransit services include carpools, vanpools, subscription buses, shared-ride taxis, and route deviation services, which are transit services that deviate up to a certain distance from a route to pick-up passengers who cannot reach a regular stop. These services are best suited for highly dispersed travel patterns in low-density areas. Private/contracted delivery of non-traditional services is cheaper and generally more cost-effective than public delivery. The greatest barriers to successful paratransit service are restrictive regulations, subsidized bus fares, and the prevalence of free parking.

Congestion Mitigation Impacts: Increased transit ridership.

5.F. Transit-Oriented Development (TOD)

Definition: TOD is typically characterized as dense, mixed-use development located within a five-to-ten minute walk of a transit stop. TOD requires local governments to establish a land use planning policy that promotes transit use. It is imperative that easy and convenient access to transit facilities is provided as well as other services that are supportive of transit. Increases transit use to employment centers; occurs in regions with a vision of a desired settlement pattern; occurs in regions where political culture supports transit; requires high quality transit service; and requires stations with development potential.

Congestion Mitigation Impacts: Increased non-SOV trips; trip generation more evenly distributed throughout day and week; decreased VMT.

5.G. Transit Signal Priority (TSP)

Definition: A TSP system equips buses with transponders that communicate with receivers on traffic signals. The signals are programmed to activate or extend green-light phases to better accommodate transit vehicles in through or turn lanes. TSP helps late buses recover time, while making it easier for on-time buses to stay on schedule.

Congestion Mitigation Impacts: Increased transit system reliability and efficiency.

5.H. Park and Ride Facilities

Definition: Location for transfer from low-occupancy (e.g., automobile, bicycle) to high-occupancy (e.g., bus, rail) modes. There are three types of park and ride facilities: remote (suburban/satellite location with express service to destination); local (on local bus route, non-express); or peripheral (CBD edge to intercept cars before entering city streets). Park and ride facilities must be convenient, safe, and easy-to-use; and can be either exclusive or shared-use.

Congestion Mitigation Impacts: Travel time savings; reduced parking demand at destinations; increased non-SOV mode share; reduced vehicle emissions.

**Demand-Driven Strategies – Transportation Demand Management (TDM)**

TDM is any action or set of actions aimed at influencing people's travel behavior in such a way that alternative mobility options are presented and/or congestion is reduced.

6. Site-Specific and Area-Wide Strategies

6.A. Alternative Modes of Transport

Definition: Encourage commuters to use modes of transportation other than the single-occupant vehicle. Ridesharing (i.e., carpool or vanpool) is one option. Ridesharing programs can be either company-sponsored, third party, or owner-operated and can be provided at four levels: regional, sub-regional by government, sub-regional by private employers, or residential. Another option is non-motorized transportation (i.e., bicycling and walking). It is important to provide an environment conducive to biking and walking. Bicycle lockers or racks should be found near destinations.

Congestion Mitigation Impacts: Decreased VMT, SOV trips, emissions, costs; reduced congestion and parking demand.

6.B. Alternative Travel Hours

Definition: This strategy takes into consideration the times that the majority of commuters use roads to get to work. Changing those times can dramatically affect the numbers of drivers on the roads during traditional peak hours. One option is the staggered work hour concept where groups are assigned different times to begin work. This allows workers to travel at times when traffic moves more freely and transit is less crowded. A second option is flextime, which allows employees to choose their own schedules within employer-set guidelines. A third option is the compressed workweek, which consists of a four-day workweek in ten-hour days. This has a double impact since there is one day of commuting eliminated and the early arrivals and late departures means that workers are traveling during off-peak periods.

Congestion Mitigation Impacts: Reduced peak hour traffic, transit crowding, and parking pressures; decreased VMT (compressed work week).

6.C. Negotiated Demand Management Agreements

Definition: Publically-mandated private sector involvement in traffic mitigation as a condition of individual development approval. In this, a municipality would set a traffic reduction goal (e.g., minimum level of ridesharing, specific number of auto trips) that can vary in degree of prescription concerning implementation. These are similar to trip reduction ordinances except negotiated demand management agreements are focused on a particular site and so do not provide area-wide consistency in trip reduction.

Congestion Mitigation Impacts: Increased ridesharing and transit trips; auto trip-making shifts to non-peak hours.

## 6.D. Complementary TDM Support Measures

Definition: The effectiveness of TDM programs is related to the extent which complementary support measures encourage their use. These complementary support measures could include financial incentives such as transportation allowances, bicycle/pedestrian subsidies, carpool/vanpool subsidies, and transit fare subsidies.

There are also assistance programs that can accomplish similar goals, such as:
- Commuter information centers/information booths/fairs
- New hire orientations
- Marketing
- Rideshare match
- Company-owned/leased vanpool
- Employer/landlord parking agreements
- Preferential or free parking for High Occupancy Vehicles (HOVs)
- Guaranteed/Emergency Ride Home programs

As mentioned previously, flexible work schedules (e.g., flextime, telecommuting, compressed workweek) will help further TDM as will rewards programs such as newsletter recognition or prize drawings and other things such as childcare centers, auto service, and assorted on-site services.

Congestion Mitigation Impacts: No direct impacts.

## 6.E. Alternative Workplace Locations

Definition: Also known as telecommuting, alternative workplace locations replace the traditional workplace with an alternative site. Telecommuting can occur either at home, at regional worksites, or at a neighborhood telecommuting center. Implementation of such a program requires the support of upper management.

Congestion Mitigation Impacts: Decreased commuter trips, VMT, emissions, and cold starts.

## 6.F. Traveler Information Systems

Definition: Traveler Information Systems provide multi-modal traveler information for all system services so that travelers can make informed decisions on mode and route choice, or even whether the trip should be made. Information is available for both pre-trip and en-route elements of trip making. In the Rochester area, the 511NY system provides traveler information including weather conditions, road work, and incident locations, while the regional commuter choice program, Roceasyride, provides an online trip planning tool that helps commuters identify alternate options (transit, carpool, bicycling) to single-occupancy vehicles.

Congestion Mitigation Impacts: Reduced travel times, increased network efficiencies; diversion to alternate routes/modes.

6.G. Growth Management

Definition: Growth management is the use of public policy to regulate the location, geographic pattern, density, quality, and rate of development. New development is linked to the existing capacity of infrastructure and level of service desired; if new development exceeds the ability of existing infrastructure to provide service that infrastructure is upgraded. Promoting infill development helps maximize the use of existing public infrastructure, including transportation facilities. TOD (see above, 5.F) is a form of growth management.

Congestion Mitigation Impacts: Efficient transit service provision; reduced infrastructure costs; reduced congestion; reduced demand.

6.H. Transit-Supportive Design Guidelines

Definition: Transit-Supportive Design Guidelines enhance mobility and access by promoting mixed-use, pedestrian and transit-oriented site planning. Similar to transit-oriented development (TOD), this type of development would have more transit trips and bicycle/pedestrian trips than typical auto-oriented development. Design standards would be established for: transit stops, street configuration (connectivity), pedestrian connections, commercial configuration (clustering), building entries, building setbacks, mixed housing, parks, parking configuration, and other pertinent elements.

Congestion Mitigation Impacts: Increased non-SOV trips; trip generation more evenly distributed throughout day and week; decreased emissions; increased transit trips and non-motorized mode trips.

6.I. Parking Demand Management

Definition: According to research by professor Donald Shoup at the University of California, Los Angeles, 99 percent of all automobile trips receive free parking. Parking management programs must be implemented across a wide area to be effective. Parking management techniques may be viewed from two sides: pricing management and supply management.

Pricing management strategies include:

- Impose or increase fees or surcharges for single occupant vehicles or long-term paring at public facilities
- Carpool/vanpool price preference
- Tax on parking providers
- Impose parking pricing mechanisms through regional regulations
- Tie investment in road improvements to implementation of advanced parking management strategies
- Remove or reduce employer-provided parking subsidies
- Reverse "early bird" incentives that encourage long-term commuter parking
- Provide preferential pricing to HOV users
- Develop parking regulations and pricing that reflect true parking costs

Supply management strategies include:

- Off-street parking requirements in zoning regulations
- On-street parking regulations
- Publicly-funded/subsidized parking facilities

Congestion Mitigation Impacts: Reduced vehicle trips; increased use of non-SOV modes.

6.J. Trip Reduction Ordinances

Definition: Trip Reduction Ordinances use the community's regulatory authority to limit trip generation from a development site. These ordinances can potentially achieve more significant trip reductions because they usually cover an entire local political subdivision rather than just an individual project. These spread the burden more equitably between existing and future development.

Congestion Mitigation Impacts: Increased ridesharing and transit trips; shift auto trip-making to non-peak hours.

6.K. Congestion Pricing

Definition: Congestion pricing programs charge motorists who wish to drive during peak periods or on congested facilities using tolls, entrance fees, parking charges, etc. Drivers can react to congestion pricing by either: paying the charge, adopting another mode, using another route, including more passengers to share the cost, or foregoing the trip. Six types of congestion pricing exist around the world: parking surcharges in congested areas; point pricing at a specific location; cordon pricing (vehicles are charged upon crossing a boundary); zone pricing (vehicles in a particular zone are charged a fee); pricing based on distance traveled in congested areas; or pricing based on time spent on congested facilities.

Congestion Mitigation Impacts: Increased mode shift; improved air quality; shift auto trip-making to non-peak hours.

6.L. Auto-Restricted Zones

Definition: Commonly referred to as pedestrian or transit malls, auto-restricted zones are any areas where vehicular travel is prohibited or restricted in some manner. This can be achieved through either physical barriers to auto access; parking controls; exclusive use lanes; or turn prohibitions. Three reasons to create an auto-restricted zone are: (1) to preserve and enhance the vitality of urban centers; (2) to improve the environmental quality of urban centers; (3) to encourage the use of non-auto modes.

Congestion Mitigation Impacts: Reduced pedestrian delay and/or pedestrian congestion; increased transit usage.

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