The Capital Region
Congestion Management Process
2023 Update

Draft for Public Review, November 1, 2023

CAPITAL REGION Transportation Council

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Disclaimer

This report was funded in part through grants from the Federal Highway Administration and Federal Transit Administration, U.S. Department of Transportation. The views and opinions of the authors and agencies expressed herein do not necessarily state or reflect those of the U. S. Department of Transportation.

The recommendations in this report are conceptual in nature and do not commit any entities to discussed projects. The concepts presented in this report may need to be investigated in more detail before any funding commitment is made. Undertaking additional engineering or other follow up work will be based upon funding availability.

Executive Summary

Traffic congestion in the Capital Region in 2022 cost travelers an estimated 16.5 million extra hours in travel time and $323 million dollars in value of lost time. (Source: National Performance Management Research Dataset). This congestion results in wasted fuel, wasted time, harmful vehicle emissions, and increased supply chain costs. The Congestion Management Process (CMP) is a systematic and data-driven process for identifying congestion problems and the appropriate congestion management strategies to treat them. A successful CMP offers many benefits to the travelling public by making the regional transportation system safer, greener, more efficient, and improving quality of life for all travelers.

In the 2023 Congestion Management Process Report, the methodology and initial findings of the CMP are presented. The report includes:

- Multimodal congestion performance measures and baseline values for these measures.
- Summary of extensive stakeholder and public engagement.
- Analysis of congestion problems in each county.
- List of congestion management strategies, covering eight categories of approaches to congestion management. Many of these strategies focus on leveraging cost-effective technologies to get the most performance we can out of the region's transportation infrastructure.
- Policies and procedures relating to integrating CMP findings into the Transportation Council's upcoming long-range Metropolitan Transportation Plan update and Transportation Improvement Plan update, including identification of potential funding sources and capital programming approaches for CMP implementation.
- Next steps that will be performed as part of the cyclical and ongoing CMP process.

About the Capital Region Transportation Council

The Capital Regional Transportation Council is the designated Metropolitan Planning Organization (MPO) carrying out federal requirements for cooperative transportation planning and programming within the metropolitan area that includes Albany, Rensselaer, Saratoga (except the Town of Moreau and the Village of South Glens Falls), and Schenectady Counties. For more information, please visit our website at https://www.capitalmpo.org/.

Above: traffic congestion on Hoosick Street (NY-7) in Troy creates mobility challenges for commuters and local residents alike. Photo courtesy of Creighton Manning Engineering.

Introduction

What is the Congestion Management Process?

Each day, the 853 thousand residents of the Capital Region make 3.2 million trips by auto, transit, walking, or biking, totaling more than 21 million miles of daily travel. Travelling isn't always smooth – in 2022, traffic congestion added an additional 16.5 million hours of travel time (Source: National Performance Management Research Dataset). This congestion results in wasted fuel, wasted time, harmful vehicle emissions, and increased supply chain costs.

The Congestion Management Process (CMP) is a systematic approach to managing congestion using accurate and up-to-date transportation system performance data to identify congestion problems and implement congestion management strategies. A successful CMP offers many benefits to the travelling public by making the regional transportation system safer, greener, more efficient, and improving quality of life for all travelers.

In the past, the Transportation Council's CMP was a component of the *New Visions 2050* Metropolitan Transportation Plan. As part of the 2023 update, the CMP has been expanded into a distinct planning process in advance of the region's next Metropolitan Transportation Plan update. The new CMP will also inform the use of federal funding in the Transportation Improvement Program for projects that implement congestion management strategies.

Federal Requirements

The Congestion Management Process (CMP) is one of the core planning processes required of all Metropolitan Planning Organizations with more than 200,000 population. As defined in federal regulation, the CMP must serve as a systematic process that "provides for a safe and effective integrated management and operation of the multimodal transportation system".

The CMP is linked to two other high-level planning processes: The Metropolitan Transportation Plan and the Transportation Improvement Program. Per federal guidance, the congestion management objectives should draw from the regional vision and goals that are articulated in the Metropolitan Transportation Plan.

In federal regulation, emphasis is placed on performance-based planning processes that identify strategies and projects that contribute most effectively toward performance targets. This emphasis was established under the MAP-21 legislation in 2012 and continued in the recent Bipartisan Infrastructure Law in 2021. For the CMP, the relevant performance measures were established in the System Performance Measures Final Rule published in 2017. These measures relate to improving the reliability of vehicle and freight travel on the National Highway System. Additional performance measures used in the CMP draw from the regional vision and goals established in the Metropolitan Transportation Plan.

Refer to Code of Federal Regulations 23 CFR 450.322 for more information on federal requirements related to the CMP.

What are the Causes of Congestion?

The Federal Highway Administration groups the causes of congestion into the following seven categories:

Physical Bottlenecks – where travel demand exceeds road capacity; for example, at lane reductions, merge areas at interchanges, steep grades and sharp curves, etc.

Traffic Incidents – events that disrupt normal traffic flow, such as crashes, breakdowns, or debris in the road.

Work Zones – construction activities may reduce the number or width of travel lanes or result in temporary roadway closures.

Weather – inclement weather including rain or snow.

Traffic Control Devices – stop signs, railroad crossings, and traffic signals may impede traffic. Improvements to signal timing and technology may improve traffic flow.

Special Events – travel demand may increase during sporting events, cultural events, skiing weekends, concerts, and other events.

Fluctuations in Normal Traffic – even normal day-to-day variability in travel demand can lead to traffic congestion.

Understanding which factors contribute toward congestion at a location of concern is critical in selecting the appropriate congestion mitigation strategies.

Congestion is also characterized as either **recurring** (congestion that occurs at a predictable time of day or day of the week, such as the evening rush hour), or **non-recurring** (congestion that is unpredictable and results from a temporary disruption such as a crash, a work zone, or inclement weather).

Recurring congestion is commonly associated with commuter rush-hour travel in the morning and evening. On commercial corridors, recurring congestion can occur mid-day and on weekends.

In the Capital Region, recurring congestion is observed on many signalized arterials, including NYS Route 5, NYS Route 7, US-9, and US-4.

Strategies such as traffic signal technology improvements and travel demand management can treat recurring congestion.

Non-recurring congestion is associated with temporary disruptions such as crashes, vehicle breakdowns, work zones, inclement weather, and special events.

In the Capital Region, non-recurring congestion is observed on interstate highways including I-87 and I-90.

Strategies such as next-generation traffic incident management and road weather management can treat non-recurring congestion.

Understanding the causes contributing to congestion on each roadway facility, and whether the congestion is recurring or non-recurring, is crucial in selecting effective congestion management strategies.

What are the Costs of Congestion?

Congestion costs us more than just our time. According to the Federal Highway Administration, traffic congestion can result in the following costs:

Personal time costs – Time is money - according to the Texas Transportation Institute, the time value of delay is $19.64 per person-hour or $30.26 per vehicle-hour. For trucks, the cost is higher at $55.24 per vehicle-hour (with far greater costs when supply chains are impacted).

Fuel costs – In 2019, 6.2 million gallons of extra fuel were consumed due to congestion in the Albany-Schenectady metro area alone. Wasted fuel also produces emissions that are harmful to human health and to global climate.

Vehicle maintenance and depreciation costs – Most notably, tires and brake systems experience greater wear in stop-and-go traffic.

Freight and supply chain costs – The rise of 'just-in-time' supply chain management strategies means that trucks often deliver goods as they are needed - making delays far more costly.

Costs to household services – Plumbers, electricians, HVAC technicians, and on-call trades of all kinds can make fewer calls per day when delayed by traffic, leading to loss of productivity and higher prices for customers.

Costs to emergency services – Medical, fire, and police services may be delayed from attending to emergency situations. This can have far greater than just monetary costs.

Costs to regional economic vitality – Congestion on commuter routes can reduce employment opportunities for workers and make commercial development undesirable. Higher transportation costs are passed onto other sectors of the economy.

Integrating the CMP into the Transportation Planning & Programming Process

Federal regulations require that the CMP be developed, established, and implemented as an ongoing part of the metropolitan planning process. The CMP is required to provide system-wide performance measures and strategy recommendations that can be reflected in the Metropolitan Transportation Plan and the Transportation Improvement Program (TIP).

The CMP Regional Objectives are drawn from the Planning & Investment Principles established in the *New Visions 2050* Metropolitan Transportation Plan. Adopted in 2020, the *New Visions 2050* principles are in turn based upon the ten metropolitan planning factors established under the FAST Act transportation legislation. Among these are planning factors that relate to improving the safety and security of the transportation system, supporting economic vitality, protecting the environment, and more. Of principle importance to the Congestion Management Process is the mobility planning factor: *"Increase accessibility and mobility of people and freight"*.

The CMP provides performance measures on all roadway facilities in the CMP Network. The CMP also provides strategy recommendations for each roadway facility as informed by transportation research literature, national best practices promoted by the Federal Highway Administration, and guidance received from the CMP Advisory Group. These performance measures and strategy recommendations will be incorporated into the Metropolitan Transportation Plan.

In addition, the CMP will prepare recommended candidates for corridor studies to be conducted by The Transportation Council and partner agencies as funding allows. These corridor study recommendations will be based upon careful examination of roadway facility performance measures and local context factors. The scope of each corridor study will be designed to prepare concepts and recommendations for effective projects with greater competitiveness for federal funding.

Federal regulations require that CMP performance measures and strategies be considered in the development of the Transportation Improvement Program (TIP). The TIP is the list of federally funded (or otherwise regionally significant) transportation projects. TIP projects are selected to reflect investment priorities established in the Metropolitan Transportation Plan. The next update to the TIP is expected to begin in late 2024. Transportation Council staff will work with the TIP Task Force to ensure that candidate TIP projects consistent with CMP strategy recommendations are considered for programming as funding permits. Federal funds may be used for cost-effective Intelligent Transportation Systems (ITS) and Transportation Systems Management & Operations (TSMO) projects. Federal funds for design-only projects may also be used to help prepare projects to pursue discretionary grants.

CMP Advisory Group

The Regional Operations & Safety Advisory Committee (ROSAC) served as the advisory group for the 2023 CMP update. The ROSAC meets quarterly on a continuing basis to discuss topics relating to traffic operations, safety, and other transportation topics of a technical nature. ROSAC members provided valuable review and input on the CMP update process and outcomes during its 2023 meetings. The committee is comprised of representatives from:

- New York State Department of Transportation, Region 1 and Main Office
- Capital District Transportation Authority (CDTA)
- Capital District Regional Planning Commission (CDRPC)
- Governor's Traffic Safety Committee
- U.S. Environmental Protection Agency, Region 2
- Federal Highway Administration, NY Division
- Representatives from county and municipal governments
- Local private sector consulting firms

Public Involvement

Public input is crucially important to the CMP, as public perception of traffic congestion may differ considerably from what the raw travel time data suggests. The CMP provides a great opportunity for public interaction, as traffic congestion is also one of the transportation topics that members of the public are most eager to weigh in on. It is important to examine both 'big data' mobility datasets and the aggregate of public input together in order to holistically characterize congestion across the region.

An online public survey was open from May 5, 2023 through August 14, 2023. The survey was prepared using Survey123, a platform developed by Esri to collect spatial survey data. In total:

- 231 individual residents from 52 ZIP codes across the Capital Region participated.
- These individuals reported 407 congested locations.
- Survey takers left 98 general comments and 217 site-specific comments.

The results of the public survey are summarized later in this report, and the public input received was used in conjunction with travel time data analysis to identify areas of congestion need.

Multimodal Travel

The Congestion Management Process does not only address personal vehicle travel – it considers the safe and effective management of the multimodal transportation system, including freight, transit, and non-motorized travel. Specific performance measures relating to truck travel time reliability and transit service reliability are calculated and analyzed across the CMP Network. In addition, many strategy recommendations relating to promoting safe non-motorized travel are made, as shifting travelers out of vehicle traffic and onto safe bicycle and pedestrian facilities can help alleviate traffic congestion.

According to mobility data provider Replica, approximately 85% of the daily trips made in the Capital Region are made in private auto vehicles either as a driver or as a passenger, 1.5% are made using transit, 13.6% are walking trips (defined as walking trips with a sustained stop at a destination; excluding short walks around the block, etc.), and 0.2% are bicycle trips. Strategies that provide travelers with more transportation mode choices may help shift travel off congested roadways.

Estimated Daily Trips by Mode in the Capital Region in September 2023

Private Auto:
2.1 million trips

Transit:
45,000 trips

Auto Passenger:
450,000 trips

Walking:
410,000 trips

Biking:
5,100 trips

Source: Replica.

Air Quality, Public Health, and Climate Change

Traffic causes air pollution – idling vehicles and slow-moving vehicles emit air pollution at much greater per-mile rates than vehicles traveling at free-flow speeds. Congestion management strategies can help promote the smooth flow of traffic and reduce emissions from stop-and-go traffic.

As required by the Clean Air Act, the U.S. Environmental Protection Agency has identified six "criteria air pollutants" that are harmful to human health and to the environment. These pollutants are largely emitted by motor vehicles and are known to cause respiratory inflammation, asthma, cardiovascular mortality, and other adverse health effects. These pollutants are:

- **Ground-level Ozone** – forms through reaction of pollutants emitted by motor vehicles; contributes to asthma and other respiratory illness.
- **Particulate Matter** – including 'soot' and other microscopic particles that affect lung function when inhaled.
- **Carbon Monoxide** – motor vehicles are the primary source of carbon monoxide in the U.S.; reduces capacity of blood to carry oxygen.
- **Lead** – following the elimination of lead gasoline in the 1990s, lead is no longer emitted by motor vehicles.
- **Sulfur Dioxide** – mostly emitted by power generation and industry.
- **Nitrogen Dioxide** – mainly emitted by motor vehicles; causes respiratory symptoms, especially in children with asthma.

Congestion management strategies can help reduce these harmful pollutants and improve public health. It is important to consider not only the quantity of pollutants emitted, but also to consider levels of exposure and at-risk populations. Emissions in downtown areas or near schools and colleges result in greater exposure. Children are the primary at-risk population, and adults with respiratory or cardiovascular conditions are considered at-risk as well.

Above: traffic congestion on I-87 near Exit 7. Per-mile emission rates of slow-moving vehicles can be up to four times greater than vehicles moving at free flow speeds. Photo courtesy of Creighton Manning Engineering.

In addition, the transportation sector is the largest contributor of greenhouse gas emissions. Transportation was responsible for 27% of greenhouse gas emissions in the United States in 2020, slightly more than power generation (25%) and industry (24%).

Motor vehicle emissions account for 83% of transportation-related carbon emissions. Personal vehicles are responsible for 58% of transportation emissions, and commercial trucks and buses emit 25%. Air, pipeline, rail, and water transportation accounts for the remaining 17%.

In 2019, congestion in the Albany-Schenectady metro area alone caused an extra 61,915 tons of carbon dioxide to be emitted.

Many of the congestion management strategies discussed in this document are eligible for Carbon Reduction Program funding as they are expected to reduce greenhouse gas emissions. The Carbon Reduction Program is a new federal funding source introduced in the Bipartisan Infrastructure Law. Eligible projects include "advanced transportation and congestion management technologies", certain public transit projects, and more.

Impact of COVID-19 on Mobility

In March 2020, regional vehicle miles travelled declined significantly due to the COVID-19 pandemic. However, according to mobility data vendors such as Inrix and Google, vehicle miles travelled in the Transportation Council planning area had recovered to their pre-COVID baseline levels by late 2020. Some data vendors suggest that VMT is higher now in 2023 than it was pre-COVID.

COVID has had a lasting impact on regional travel in a number of ways:

Work-from-home: According to Replica, 8.8% of residents of the Capital Region continue to work from home as of Fall 2021 (up from 1.6% in 2019).

Remote learning: Schools, and especially colleges and universities, now have the option of hosting classes virtually online, which may reduce the number of school trips taken on roads.

Tele-health: routine medical appointments are now often done over the phone, or via Zoom or similar online platforms.

Local deliveries: E-commerce continues to increase in market share, spurred by an increase in home shopping due to COVID. Meal and grocery delivery services are also more common.

In October 2022, Transportation Council staff published a technical memorandum entitled *COVID Traffic Trends Post-2020*. Traffic data collected at 45 locations throughout the planning area were compared against pre-COVID counts conducted in 2019 or earlier at the same sites. The memo reported that the following trends were observed:

- Traffic on roadways directly serving office complexes was still lower than pre-COVID levels (down an average of 40% on these roadways).
- Traffic on roadways directly serving colleges and universities was still 12% lower than pre-COVID levels, suggesting lower enrollment or more remote learning.
- Locations on the Freight Priority Network or otherwise serving freight facilities saw a traffic reduction of 9.6%; however, these counts showed an increase of 30% in truck volumes.
- On all types of roadways, peak period traffic saw greater reduction than daily traffic, suggesting that traffic is spread more evenly throughout the day.

Travel patterns have shifted due to COVID and will continue to shift moving forward. The Congestion Management Process will make use of the most recent mobility data available; in most cases, the data used in this report was collected in 2022 and 2023. As travel patterns continue to evolve, it will be important to maintain the CMP as an ongoing process to ensure it reflects current transportation trends.

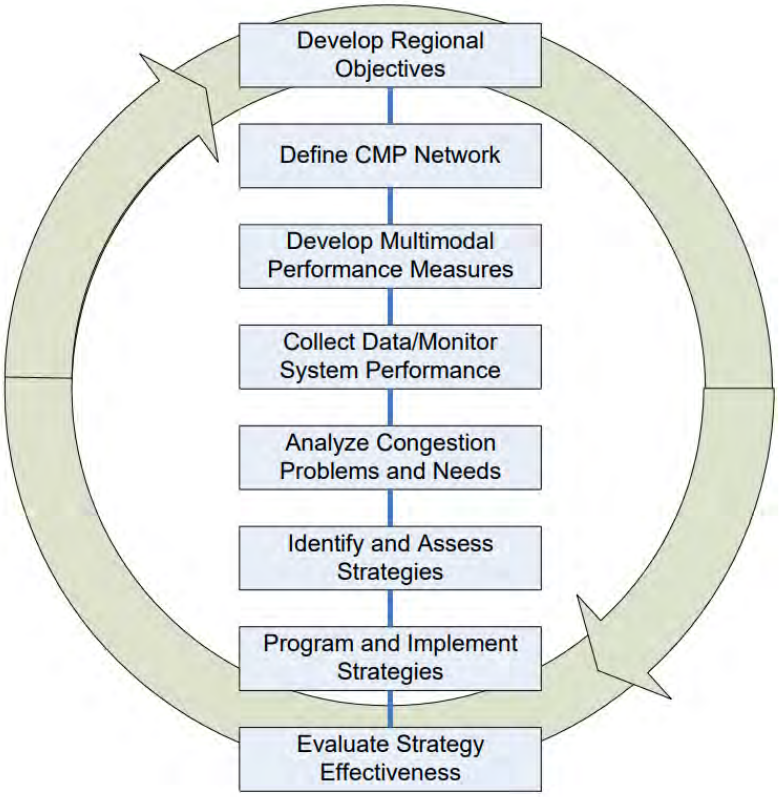
As part of the ongoing Congestion Management Process, data on regional vehicle-miles travelled provided by NYSDOT will be monitored to determine how travel patterns compare to pre-COVID levels.

FHWA Congestion Management Process Guidebook

The methodology used in this report is based on the recommended eight-step process described in the Federal Highway Administration Congestion Management Process Guidebook. The guidebook describes federal regulations relating to congestion management and incorporates best practices from CMPs across the country. The guidebook describes the systematic, data-driven, and performance-based process recommended for effective investment in congestion management.

The guidebook emphasizes effective resource allocation as a beneficial outcome of a successful CMP. Transportation funding is limited; it is important to prioritize the right strategies for the right locations.

Elements of the Congestion Management Process



Source: FHWA Congestion Management Process Guidebook

The guidebook refers to these eight steps as 'actions', recognizing that there are iterations within the sequence, and that the process is cyclical and ongoing. These eight actions are:

1. **Develop Regional Objectives for Congestion Management** – define the desirable outcomes of a successful CMP; these objectives draw from principles established in the *New Visions 2050* Metropolitan Transportation Plan and from the ten federal planning factors established in transportation legislation.

2. **Define CMP Network** – determine which roadway facilities may experience congestion and have sufficient data available for analysis.

3. **Develop Multimodal Performance Measures** – determine how to define and measure congestion on both a regional scale and on individual roadway facilities.

4. **Collect Data and Monitor System Performance** – collect data and calculate performance measures (as defined in step 3) for all roadways in the CMP network (as defined in step 2).

5. **Analyze Congestion Problems and Needs** – determine what congestion problems are present and what the treatable sources of congestion may be. Prioritize facilities for further analysis and future investment.

6. **Identify and Assess Strategies** – via review of peer CMPs, review of national best practices, and consultation with regional partner agencies, determine what strategies are available to mitigate congestion, and in which contexts they should be used.

7. **Program and Implement Strategies** – for each roadway facility, determine which strategies (defined in step 6) may be effective in mitigating congestion. Incorporate strategies into the Metropolitan Transportation Plan and identify funding options through the Transportation Improvement Program and other state and local sources.

8. **Evaluate Strategy Effectiveness** – following implementation, congestion strategies will be monitored for effectiveness to inform future decision making.

The following eight sections of this report will follow the eight-step process as described above and in the Congestion Management Process Guidebook.

Planning for Reliability

In the past, congestion planning relied heavily upon indirect measures of congestion, such as volume-to-capacity ratios. While useful for infrastructure planning, these proxy measures are not a direct measure of traveler experience or perception, and they do not account for the non-recurring congestion that makes up more than half of all traffic delay.

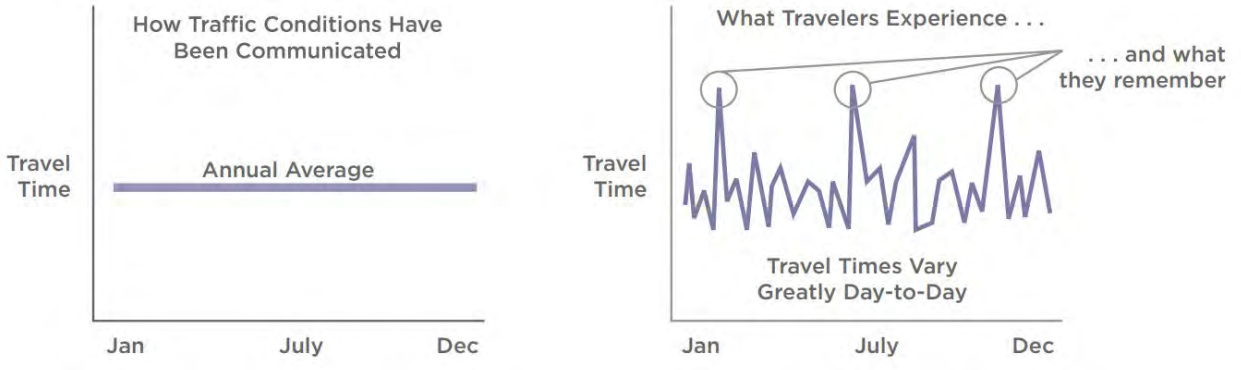
Today, the broad availability of travel time data allows for more direct measures of traveler experience. Many of the measures used in this report are measures of travel time reliability.

Federal guidance emphasizes the importance of planning for reliability. In 2015, the Federal Highway Administration published *Incorporating Reliability into the Congestion Management Process: A Primer*. This publication details national best practices on using reliability-based performance measures and strategies. These practices have been integrated into this CMP update.

Travel time reliability is the variation in travel time for the same trip from day to day. Highly variable or unpredictable travel times make it difficult for commuters to get to work on time, for travelers to reach appointments or events on time, for transit buses to maintain their schedules, and for freight shippers to plan shipments. Uncertainty over travel times leads to ineffective travel decisions that waste time and money.

Average travel times do not effectively communicate congestion issues. If a traveler must reach their destination by a certain time, then they must budget far more than the average travel time to ensure on-time arrival.

Typical Travel Time Reporting versus What Travelers Experience

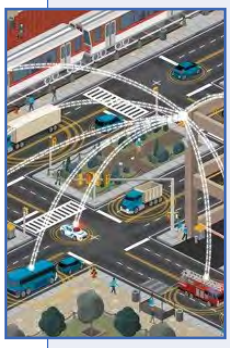


Source: *Incorporating Reliability into the Congestion Management Process: A Primer.* Federal Highway Administration.

ITS & TSMO

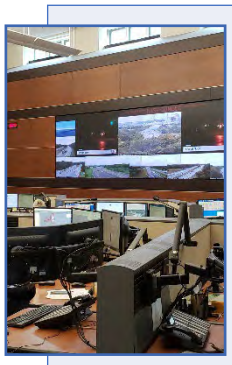
In the right context, roadway expansion can be an effective congestion management strategy – but it is costly. Highway and bridge infrastructure has ongoing maintenance costs that must be paid indefinitely. Roadway expansion can also facilitate growth that must be managed wisely to ensure the best outcomes for local communities.

Before investing in infrastructure expansion, we must first ensure that congestion cannot be addressed through more cost-effective technology and roadway management strategies. Many effective congestion management strategies fall into two categories: Intelligent Transportation Systems (ITS) and Transportation Systems Management and Operations (TSMO). These strategies focus on getting the most mobility performance as we can out of existing infrastructure.



Intelligent Transportation Systems (ITS) – ITS refers to the use of communications technologies to improve transportation safety and mobility.

Examples of ITS projects include traffic signal coordination, computerized traffic signal control, transit signal priority, variable message signs, traveler information systems, electronic toll collection, autonomous vehicles, and more.



Transportation Systems Management and Operations (TSMO) – TSMO is a general term for strategies that optimize the performance of the existing transportation network (in contrast to the construction of new infrastructure).

Many TSMO strategies involve the use of ITS.

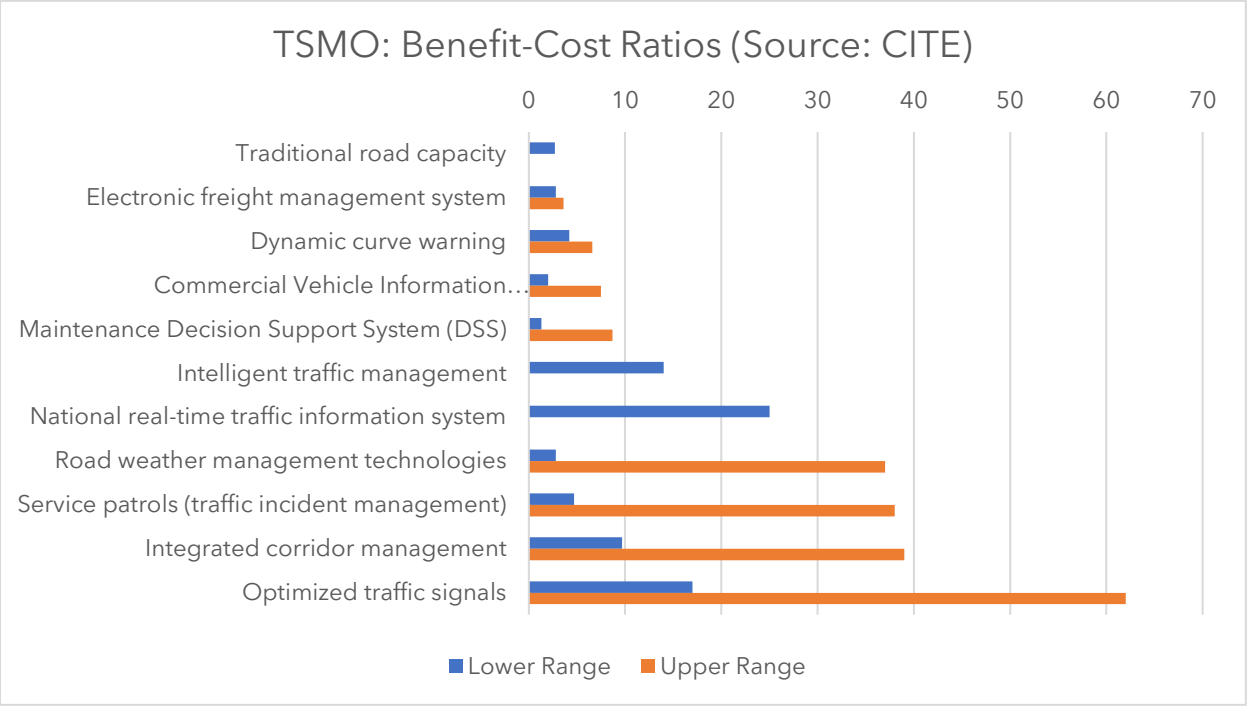
Examples of TSMO strategies include work zone management, traffic incident management, special event management, road weather management, and more.

Many TSMO strategies are discussed in the New York State DOT Transportation Systems Management and Operations Strategic Plan.

Deployment of TSMO strategies is essential to treating congestion on our region's roadways. According to the Center for Innovative Transportation Education (CITE):

- Nationally, approximately 40% of congestion is caused by bottlenecks – thus, only 40% of congestion is directly treated by traditional construction projects such as road widenings. TSMO seeks to treat the 60% of congestion that is 'non-recurring' – attributable to accidents, inclement weather, special events, poor signal timing, etc.
- Construction and maintenance are essential – but are costly and reactive. TSMO aims to get the most out of existing infrastructure proactively and may reduce the need for costly capital improvements.
- Many state DOTs are investing in TSMO and elevating Operations to the level of a core program area along with construction and maintenance.
- Per CITE: "Today's circumstances demand that agencies adapt their business practices. In a world of limited funding, rapid technological advances, greater accountability to customers and with a better understanding that a significant amount of user delay is due to non-recurring causes, transportation agencies must increasingly devote resources to effectively operating and maintaining the infrastructure that's in place before making major investments in expanded capacity."

Due to the relatively low cost of implementation, many TSMO strategies have been found to have benefit-to-cost ratios exceeding those of capacity expansion projects:



Emerging Technologies

New and innovative technologies may have a significant impact on travel patterns in the coming years. It is impossible to forecast the impact of these technologies on the Capital Region with certainty. Ongoing monitoring of travel-related performance measures as part of the Congestion Management Process may help illuminate the impact of these emerging technologies.

Autonomous personal vehicles: If fully autonomous vehicles grow in market share, travelers may choose to make more trips due to the ease and convenience of having a robot chauffeur. This may lead to an increase in per capita vehicle-miles traveled.

Autonomous shuttles and taxis: Transit providers face driver shortages that limit the expansion of transit services. Autonomous shuttles are being tested in trials around the country and may provide an option to address workforce shortages. Autonomous taxis are being tested in San Francisco and may serve a crucial role in providing on-demand transit options as the technology matures.

Electric vehicles: According to the U.S. Department of Energy, there is a strong inverse correlation between gas prices and per capita vehicle-miles traveled. As electric vehicles become more common, they may insulate regional travel behavior against fluctuations in fuel prices. Low-cost renewable energies may enable even lower travel costs. While beneficial in many ways, this could lead to increased congestion.

Micromobility: Common in many cities, electric bicycles and electric scooters may be rented to make short trips and intermodal 'last-mile' connections.

Above: traffic on US-4 in Troy and North Greenbush, near Hudson Valley Community College. Photo courtesy of WSP.

Regional Objectives for Congestion Management

The purpose of the Congestion Management Process (CMP) is to provide a systematic approach to managing congestion using accurate and up-to-date transportation system performance data to identify congestion problems and implement congestion management strategies. A successful CMP offers many benefits to the travelling public by making the regional transportation system safer, greener, more efficient, and improving quality of life for all travelers.

Per federal guidance, The Transportation Council has established Regional Objectives for Congestion Management to guide the development and implementation of the process. These objectives define what the region wants to achieve regarding congestion management and are an essential part of the performance-based approach to congestion planning.

The CMP Regional Objectives are drawn from the Planning & Investment Principles established in the *New Visions 2050* Metropolitan Transportation Plan. Adopted in 2020, the *New Visions 2050* principles are in turn based upon the ten metropolitan planning factors established under the FAST Act transportation legislation.

Each objective is based upon one or more Planning & Investment Principles from the *New Visions 2050* Metropolitan Transportation Plan, and each objective has one or more performance measures used to measure progress toward the objective. The objectives and their associated performance measures are designed to be measurable using available data sources and realistically achievable within a defined timeframe.

Regional Objectives for Congestion Management

Improve Mobility and Accessibility – Mobility refers to the ease of moving people, goods, and services. Accessibility refers to the ability to access desired destinations, including jobs and essential services. By reducing congestion and improving travel time reliability, both can be improved.

New Visions 2050 Principles supported: Maintain travel reliability, Move freight efficiently, Invest in transit, Provide essential mobility for all.

Objective: Improve regional travel time reliability to below 2019 levels

Reduce Economic Impact of Congestion – Transportation costs are passed on to all sectors of the economy that rely on roadways for movement of goods and services. Reducing congestion has broad benefits for the regional economy.

New Visions 2050 Principle supported: Support economic development.

Objective: Reduce total cost of delay to below 2019 levels

Improve Supply Chain Resiliency – Delayed freight vehicles can cause supply chain disruptions and increase transportation costs. Implementing good congestion management practices on the highway freight network can help strengthen supply chain resiliency.

New Visions 2050 Principles supported: Move freight efficiently, Support economic development.

Objective: Improve truck travel time reliability to below 2019 levels

Improve Safety – Traffic congestion causes crashes, especially rear-end collisions in queues and right-angle crashes at intersections. Improving the reliability of traffic flow can help reduce these types of crashes. Caution must be used to ensure that strategies that improve travel times do not facilitate excessive speeding.

New Visions 2050 Principle supported: Invest in safety.

 Objective: Achieve regional safety performance targets

Reduce Emissions – Slow-moving vehicles stuck in stop-and-go traffic may emit emissions at up to 4x the normal rate. Vehicle emissions are harmful to human health and contribute to climate change. Improving the reliability of traffic flow and reducing vehicle stops will reduce emissions, providing benefits to local health and global climate. New York state has committed to reducing greenhouse gas emissions to 60% of 1990 levels by 2030, and 15% of 1990 levels by 2050.

New Visions 2050 Principle supported: Preserve the environment.

 Objective: Limit greenhouse gas emissions to 60% of 1990 levels by 2030

Improve Quality of life – Time spent in traffic is time away from friends, family, and the activities you enjoy. Successful congestion management strategies will result in less travel frustration and more time spent being productive and enjoying life.

New Visions 2050 Principle supported: All of the above.

 Objective: Make progress toward all five performance targets described above

Congestion Management Process Network

The Transportation Council Planning Area is comprised of four counties: Albany County, Schenectady County, Rensselaer County, and Saratoga County (excluding the Town of Moreau and Village South Glens Falls). This planning area is home to 853 thousand residents in 77 municipalities forming a diverse array of urban, suburban, and rural communities. The communities are interconnected with a network of state and local roadways that carry 21.3 million vehicle-miles of travel each day (according to the NYSDOT 2021 Highway Performance Monitoring System). As part of the Congestion Management Process, an analysis network of roadways has been broadly established to include all roadways which may experience accessibility and mobility challenges.

The Congestion Management Process Network is the set of roadway facilities for which the full CMP methodology is performed. On each roadway facility on the network:

- Travel time data is collected and analyzed,
- Multi-modal performance measures are calculated,
- Congestion problems and needs are analyzed, and
- Specific congestion mitigation strategy recommendations are made.

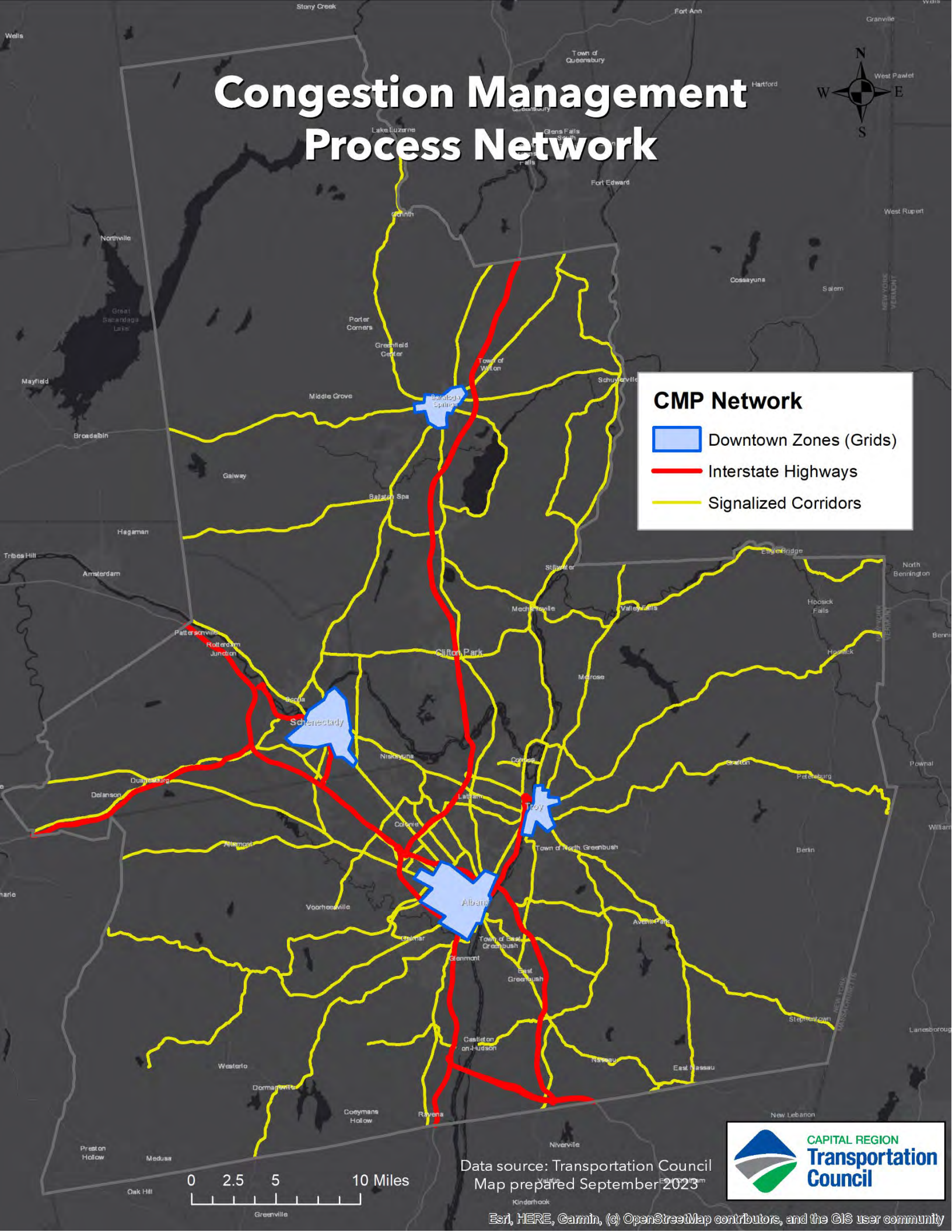
The Congestion Management Process Network is defined to include all major regional roadways that carry significant travel between communities or within a community. The network also includes many signalized roadways that may experience traffic congestion at some time of day. The network is defined to include:

- All interstate highways and all US Routes
- All other roadways on the National Highway System (with sufficient data)
- All signalized roadways with at least 10 traffic signals or at least 10,000 vehicles per day (for which sufficient data is available)

In addition, downtown urban areas with dense traffic signal networks have also been defined and added to the Congestion Management Process Network. Zones are defined in City of Albany, City of Schenectady, City of Troy, and City of Saratoga Springs where many signalized local roads form grids. These zones contain many roadways that are similar in nature and will receive strategy recommendations relating to traffic signal operations and are therefore analyzed together as groups.

In total, 34 roadway facilities and downtown zones will be analyzed. The map on the following page shows the extent of the Congestion Management Process Network.

Congestion Management Process Network



Data source: Transportation Council
Map prepared September 2023

CAPITAL REGION Transportation Council

Congestion Management Process Corridors

Corridor	Type
Interstate 90	Interstate
Adirondack Northway	Interstate
NYS Thruway	Interstate
Interstate 88	Interstate
Interstate 787	Interstate
Interstate 890	Interstate
Saratoga Springs	Downtown Zone
Troy	Downtown Zone
Schenectady	Downtown Zone
Albany	Downtown Zone
US 9	Signalized Corridor
US 9W	Signalized Corridor
NY 9P	Signalized Corridor
NY 9N	Signalized Corridor
NY 7	Signalized Corridor
NY 67	Signalized Corridor
NY 66	Signalized Corridor
NY 50	Signalized Corridor
NY 5	Signalized Corridor
NY 443	Signalized Corridor
NY 43	Signalized Corridor
NY 40	Signalized Corridor
US 4	Signalized Corridor
NY 32 & NY 787	Signalized Corridor
NY 29	Signalized Corridor
US 20	Signalized Corridor
NY 2	Signalized Corridor
NY 155	Signalized Corridor
NY 151	Signalized Corridor
NY 150	Signalized Corridor
NY 146	Signalized Corridor
NY 85	Signalized Corridor
Washington & Fuller	Signalized Corridor
Everett Road	Signalized Corridor

Multimodal Performance Measures

Traffic congestion varies considerably over the course of one day, or from one day to the next, or from one roadway to another. In order to assess congestion system-wide in a structured way, the Congestion Management Process uses performance measures to quantify where and when congestion occurs and how severe the congestion is. A performance measure is a numerical score calculated for a region or individual roadway that can be tracked over time. Performance measures serve many roles:

- To identify congested locations;
- To prioritize congested locations for investment;
- To identify the appropriate strategies for each congested location;
- To track progress toward regional objectives;
- To assess the impact of implemented congestion mitigation strategies; and
- To communicate CMP recommendations to the decision-makers and the public.

Performance measures are used at both the Regional Level and the Corridor Level:

Regional level - these performance measures characterize the total magnitude of congestion, or the average performance of roadways, across the entire regional system.

Many of these measures are required by federal regulations, such as the Level of Travel Time Reliability on Interstate Highways and on the rest of the National Highway System. Regional level measures are also helpful in monitoring the impact of COVID on traffic.

Corridor level - on a smaller scale, performance measures are assessed for individual roadways or groups of roadways.

Corridor level measures are used to identify which locations experience unacceptable levels of congestion and should be prioritized for investment, and to determine which congestion management strategies may be appropriate for each facility.

The Congestion Management Process is multimodal, considering not only personal vehicle travel but all modes of road transportation. As such, performance measures are also established to assess freight, transit, and non-motorized travel:

Freight – The reliability of truck travel times is of critical importance to the freight industry. The rise of local delivery services during COVID and the growth of 'just-in-time' supply chain management strategies mean that truck travel time reliability is more important than ever. By monitoring truck travel time reliability, and by identifying strategies to improve it, the CMP can contribute toward improving regional economic vitality and supply chain resiliency.

Transit – The Capital Region's sole provider of fixed-route transit service is CDTA. A broad variety of performance measures are published by CDTA in their monthly performance reports and annual route performance reports. These measures relate to transit ridership, on-time percentages, safety, and more. Performance measures relating to transit ridership and transit trip reliability are used in the Congestion Management Process.

Non-motorized travel – Providing non-motorized transportation options can shift travelers off congested roadways. Estimates of non-motorized travel share, including walking trips and bicycle trips, can be obtained from mobility data vendors.

National Performance Management Research Dataset

Many of the performance measures used in this report are calculated using data from the National Performance Management Research Dataset (NPMRDS). This dataset is purchased by the US Department of Transportation and made available to transportation agencies nationwide for the purpose of congestion management planning.

NPMRDS Dashboard for the Transportation Council Planning Area

The NPMRDS provides travel time data for all major roadways and for all hours of the day dating back to 2016. The data is sourced from probe vehicles – vehicles with GPS-enabled devices, including smartphones or on-board GPS. The data is anonymized and aggregated before being published.

The NPMRDS data may be viewed and analyzed using an online suite of tools developed by the University at Albany AVAIL (Albany Visualization and Informatics Labs) team. The AVAIL tools are used to calculate region-wide performance measures, and to examine individual roadways. More information may be found on the AVAIL NPMRDS website.

Performance Measures – Definitions

The performance measures used in the Congestion Management Process are defined on the following pages. They fall into three categories:

- **Regional Level Performance Measures – Federally Required**: Since the MAP-21 transportation legislation in 2012, all states are required to report certain system performance measures to the US Department of Transportation on an annual basis. These measures relate to the reliability of travel time on Interstate Highways and on the National Highway System. These measures are useful for monitoring the efficiency of high-level roadways that carry traffic between communities and important arterials within communities.

- **Regional Level Performance Measures – Additional Measures**: Other performance measures are defined that relate to total magnitude of delay, the cost of delay, the total number of vehicle-miles travelled, transit ridership, non-motorized trips, safety, and emissions. These additional measures give us a more complete picture of regional travel and its impacts on the economy and public health.

- **Corridor Level Performance Measures**: These measures are calculated for each roadway facility in the region for the purpose of locating congested locations, identifying the appropriate strategies for each, and prioritizing roadways for investment.

Regional Level Performance Measures – Federally Required

Since the MAP-21 transportation legislation in 2012, all states are required to report the following three system performance measures to the US Department of Transportation on an annual basis.

Level of Travel Time Reliability – Interstate: Defined as the 80th percentile travel time divided by the 50th percentile travel time. This value represents consistency, or 'reliability', of travel times. For example, a reliability value of 1.5 suggests that, during the worst 20% of time periods, travel will take 1.5 (or more) times longer than the median travel time.

An example application of this value is for commute planning: if your commute takes 30 minutes on a normal (median) day, but the reliability value for the highway you take to work is 1.5, then you must budget 45 minutes for your commute to ensure you will be on time to work at least 80% of the time.

A value close to 1.0 is considered 'reliable', and a value greater than 1.5 is considered 'unreliable'. This value is calculated for each interstate highway segment using travel time data from all days of the year, 6:00am to 8:00pm. The percentage of segments that are 'reliable' is reported.

In 2022**, 99.8% of person-miles travelled on Interstates in the Capital Region were 'reliable'**. Note that this value is the average for all Interstate segments for all time periods; some specific segments were far less reliable than this.

Level of Travel Time Reliability – Non-interstate National Highway System: Same as above, but for all road segments on the National Highway System that are not interstate highways. This includes many signalized arterials and other major roadways.

In 2022**, 94.6% of person-miles travelled on non-Interstate National Highway System roads in the Capital Region were reliable**. Note that this value is the average for all such segments for all time periods; some specific segments were far less reliable.

Truck Travel Time Reliability – Interstate: Defined as the 95th percentile travel time divided by the 50th percentile travel time. This measure differs from the other reliability measures by using the more stringent 95th percentile (rather than the 80th) and including overnight travel periods in the calculation.

The average value for all freight-miles travelled on all Interstates in the Capital Region is reported. A value close to 1.0 is considered highly reliable, and values above 1.5 are considered unreliable.

In 2022, **the Truck Travel Time Reliability value in the Capital Region was 1.22**, indicating that trucks must budget an additional 22% travel time to ensure on-time delivery of goods at least 95% of the time. This value is typical of upstate New York areas and is more reliable than the value of 2.59 for the New York City area.

Regional Level Performance Measures – Additional Measures

The following performance measures are used to supplement those required by federal legislation. These measures are also calculated at the regional level and can be monitored year-to-year.

Total Excessive Delay: Defined as the total amount of extra time spent in congested conditions on all roadways (with available data) when travel speed is below a delay threshold. This measure is reported in person-hours of delay. For this measure, the threshold speed is 60% of observed free-flow speed or 21 mph, whichever is greater. On signalized arterials, some proportion of delay is not caused by congestion but rather by normal signal operation, which is included in this calculation. The data source for this measure is the NPMRDS.

In 2022, **the total excessive delay in the Capital Region was 16,458,973 person-hours**.

Cost of Delay: Defined as the total personal time cost of all delay annually due to congestion. This is calculated by multiplying the total excessive delay by $19.64 per person-hour. This hourly cost of delay value is published by the Texas Transportation Institute in their annual Urban Mobility Report (Appendix C: Value of Time). Note that this value only includes the personal time cost of delay and does not include other costs such as wasted fuel and vehicle wear-and-tear. Note also that it does not include costs related to freight delay.

In 2022, **the total cost of delay in the Capital Region was $323 million**. Note that this value only includes the personal time cost of passenger vehicle travel and does not include costs related to freight delay.

Vehicle-miles Travelled: Defined as the total number of vehicle-miles travelled on all roadways in the region. This measure declined in 2020 due to COVID but has since recovered. This measure is estimated annually by NYSDOT under the Highway Performance Monitoring System and is reported to USDOT.

In 2021, **the total vehicle-miles travelled in the Capital Region was 7.7 billion vehicle-miles**. 2022 VMT is not yet available.

Transit Ridership: Defined as the total number of riders on all CDTA services each month. This measure declined in 2020 due to COVID but has since recovered. This measure is published monthly by CDTA as part of their Monthly Performance Report.

In August 2023, **the total monthly ridership on CDTA was 1,352,892 rides**. The two-year mean ridership was 1,133,210 per month. Transit ridership declined during COVID but has since recovered to pre-COVID levels.

Transit On-Time Performance: Defined as the percentage of CDTA trips that maintained on-time performance (departing 0-10 minutes within the scheduled time). This measure is published monthly by CDTA as part of their Monthly Performance Report. Congestion management strategies such as Transit Signal Priority and Transit Queue Jump Lanes can be used to improve on-time performance.

In August 2023, **the CDTA on-time performance was 70.01%.** The two-year mean on-time performance was 74%.

Non-motorized Trips: Defined as the total number of trips taken by non-motorized modes (walking and biking) as estimated by Replica. Replica defines a walking trip as a trip with a sustained stop at a destination (short walks around the block are excluded). Note that these are rough estimates only based on aggregated smart phone location data; there is no exact count of non-motorized trips.

In March 2023, **Replica estimates there were 430,000 walking trips and 5,000 biking trips** in the Capital Region.

CO_2 Emissions: Defined as the total CO_2 emissions from all vehicles on all roadways with available data. The data source for this measure is the NPMRDS combined with vehicle emission rates from the US Environmental Protection Agency MOVES software.

In 2022, the **total CO_2 emissions in the Capital Region were 2,168,267 tons**. This value includes all vehicles on all roads with data availability in the NPMRDS.

Number of Fatalities and Number of Serious Injuries: Defined as the total number of fatalities and serious injuries resulting from motor vehicle crashes in the Capital Region each year. This figure is updated annually and reported as a 5-year rolling average due to the random nature of fatal crashes. The rate of fatalities, rate of serious injuries (per 100 million vehicle-miles travelled) and the number of non-motorized fatal and serious injuries are also monitored for safety performance management.

From 2016 to 2020 in the Capital Region, the five-year average number of **fatal crashes per year was 51.8**, and the five-year average number of **serious injury crashes per year was 629.0**. The fatality rate during this period was 0.64 fatal crashes per 100 million vehicle-miles travelled, and the rate of serious injury crashes was 7.89 per 100 million vehicle-miles travelled. The five-year average number of non-motorized fatal and serious injury crashes was 93.4 per year.

How Does the Capital Region Compare?

Each year, congestion performance measures are calculated for New York State and for each MPO region in the state by the University at Albany Visualization and Informatics Lab (AVAIL). In 2022, the Capital Region had the second highest peak-hour excessive delay (PHED) measure and the highest delay per capita of any upstate NY MPO. Selected peer regions are shown in the table below.

Metropolitan Planning Organization	Major City	2020 Census Population	2022 Peak-hour Excessive Delay (PHED)
Greater Buffalo-Niagara Regional Transportation Council (GBNRTC)	Buffalo	1,166,902	5,671,472
Genesee Transportation Council (GTC)	Rochester	897,947	2,320,967
Capital Region Transportation Council (Transportation Council)	Albany	853,346	4,425,849
Syracuse Metropolitan Transportation Council (SMTC)	Syracuse	512,693	1,788,759
Orange County Transportation Council (OCTC)	Goshen	401,297	1,447,155
Dutchess County Transportation Council (DCTC)	Poughkeepsie	295,921	832,902
Herkimer-Oneida Counties Transportation Study (HOCTS)	Utica	292,260	675,614
Binghamton Metropolitan Transportation Study (BMTS)	Binghamton	218,797	260,626

Corridor Level Performance Measures

These performance measures are calculated for individual roadway segments for the purpose of identifying and prioritizing congested locations. The definitions of each measure are presented here. Maps of the measures are presented in the following section.

Total Excessive Delay and Total Excessive Delay per mile: Defined as the total amount of extra time spent in congested conditions on all roadways (with available data) when travel speed is below a delay threshold. This measure is reported in person-hours of delay. For this measure, the threshold speed is 60% of observed free-flow speed or 21 mph, whichever is greater. On signalized arterials, some proportion of delay is not caused by congestion but rather by normal signal operation, which is included in this calculation. The data source for this measure is the NPMRDS.

For the purpose of comparing and prioritizing roadway facilities, Total Excess Delay per mile is used. Different road segments have different lengths (generally, road segments are longer in rural areas). Normalizing per mile allows for all segments to be compared against one another.

Level of Travel Time Reliability: Defined as the 80th percentile travel time divided by the 50th percentile travel time. This value represents consistency, or 'reliability', of travel times. For example, a reliability value of 1.5 suggests that, during the worst 20% of time periods, travel will take 1.5 (or more) times longer than the median travel time. A value close to 1.0 is considered 'reliable', and a value greater than 1.5 is considered 'unreliable'.

This measure is the same as that calculated for the Regional Level measure but is calculated for individual roadway segments for the purpose of screening for the most congested locations on each roadway facility.

Truck Travel Time Reliability: Defined as the 95th percentile travel time divided by the 50th percentile travel time. This measure differs from the other reliability measures by using the more stringent 95th percentile (rather than the 80th) and including overnight travel periods in the calculation. A value close to 1.0 is considered highly reliable, and values above 2.0 are considered unreliable. This value is designed to better reflect trip planning decisions made by freight operators.

This measure is the same as that calculated for the Regional Level measure but is calculated for individual roadway segments for the purpose of screening for the most congested locations on each roadway facility.

Above: Blue Line Bus Rapid Transit bus. Photo courtesy of CDTA.

Data Collection and System Performance Monitoring

The Congestion Management Process is designed to take a systematic, data-driven, and performance-based approach to identifying efficient congestion management investments. Data collected from a variety of sources is monitored and analyzed to determine congestion needs.

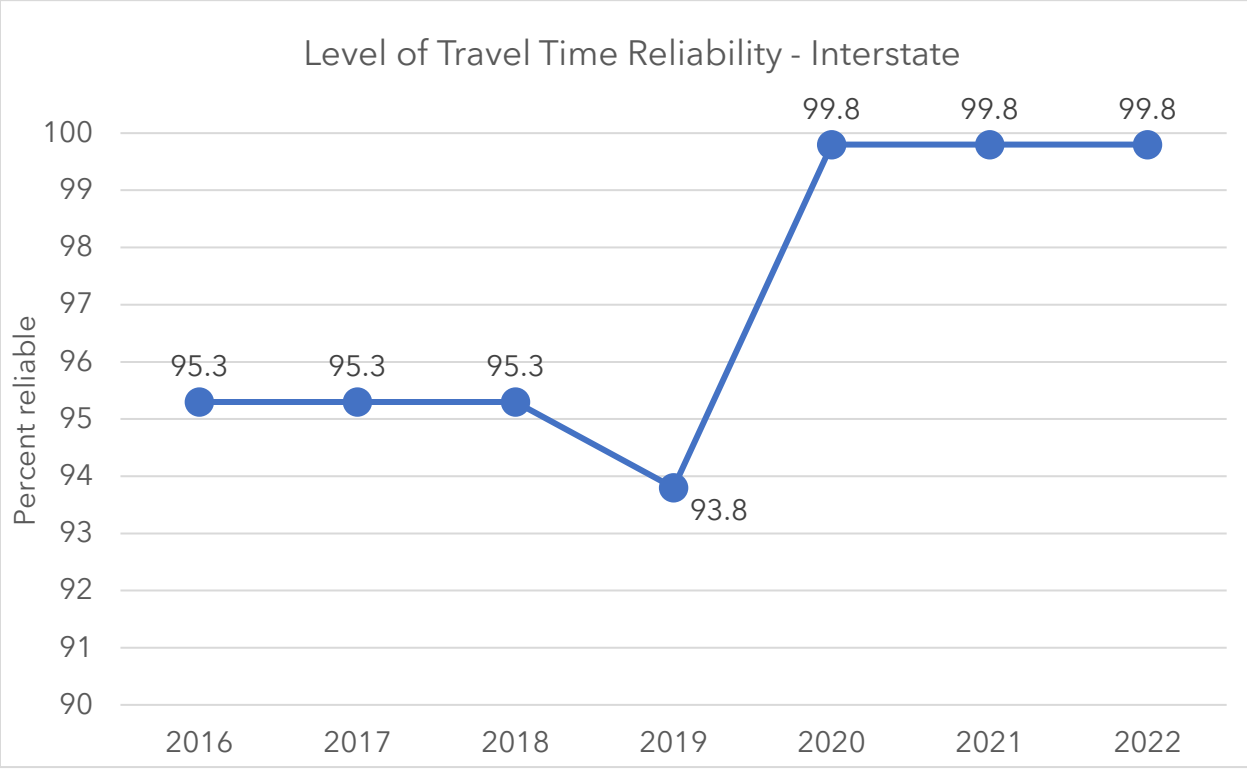
The performance measures presented in this section are defined in the previous section of this report (Multimodal Performance Measures). For many of these measures, data is available extending back several years that can be analyzed for trends. For each measure, the specific data source is defined.

In this section, Regional Level Performance Measures will be presented first, followed by Corridor Level Performance Measures.

Regional Level Performance Measures

Level of Travel Time Reliability – Interstate: Historic data for this measure is available beginning in 2016. The data source for this measure is the NPMRDS, which is discussed in the previous section.

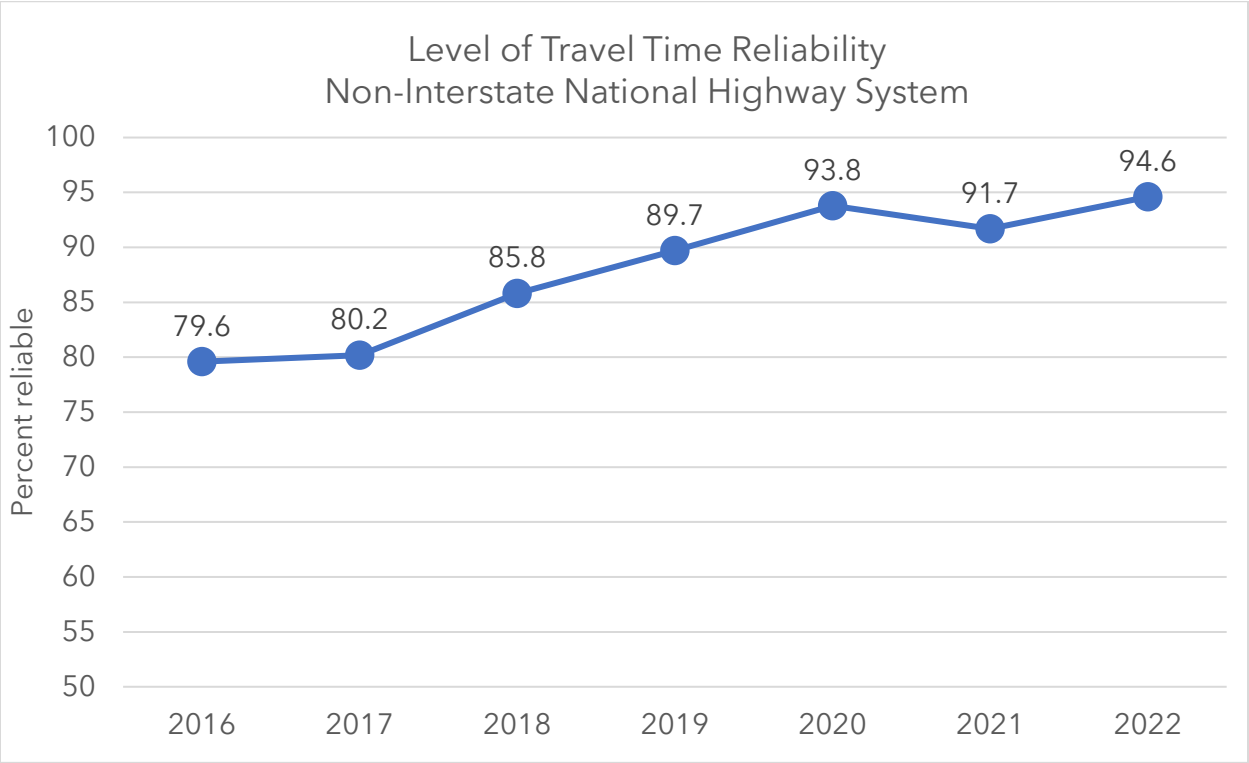
The graph below shows the percentage of vehicle-miles traveled on Interstate highways that are considered 'reliable' – that is, with a travel time reliability value of less than 1.5. Travel was reliable for 95% of vehicle-miles in 2016, 2017, and 2018. Reliability declined slightly in 2019, then improved in 2020 due to the decline in traffic caused by COVID. The travel time data suggests that travel reliability has remained high on Interstate highways in 2021 and 2022.



Level of Travel Time Reliability – Non-interstate National Highway System: Historic data for this measure is available beginning in 2016. The data source for this measure is the NPMRDS.

The graph below shows the percentage of vehicle-miles traveled on Non-interstate National Highway System roads that are considered 'reliable' – that is, with a travel time reliability value of less than 1.5. Most of these roadways are signalized arterials, resulting in worse reliability of travel times than Interstate highways.

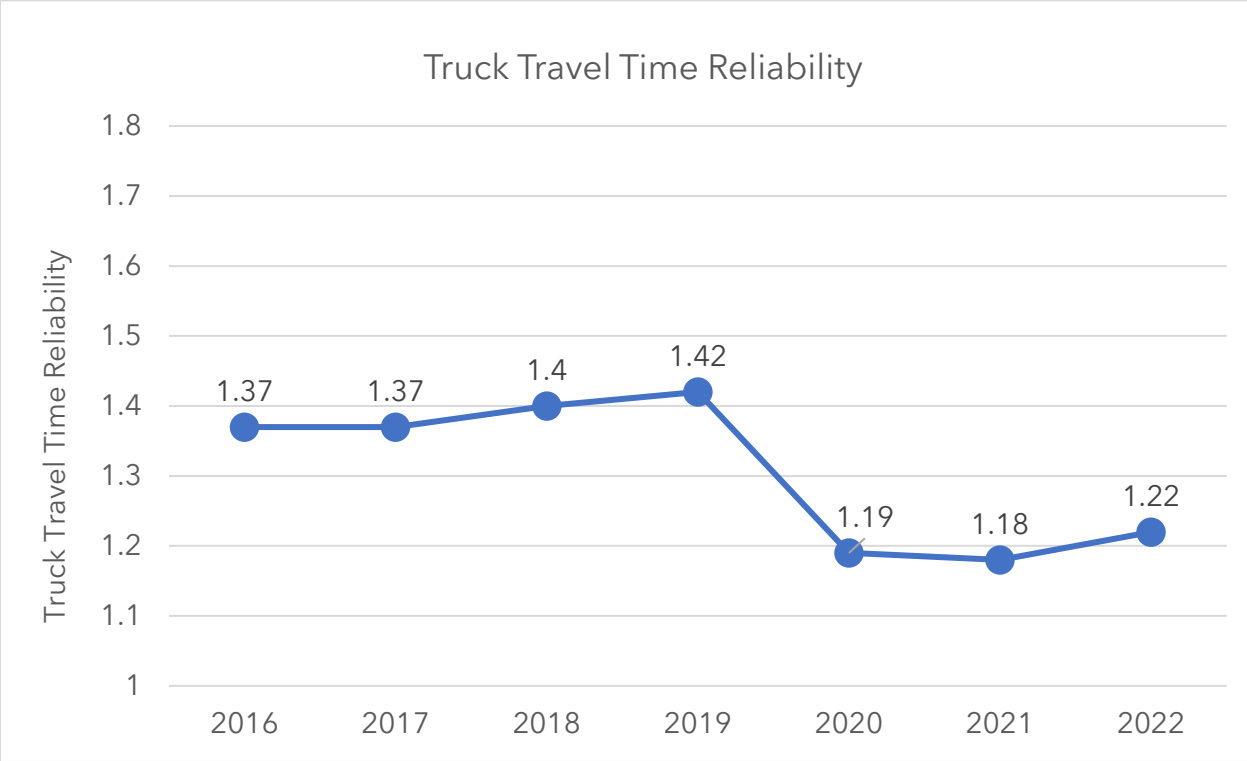
The travel time data from the NPMRDS suggests that this measure has been steadily improving since 2016 in the Capital Region, even prior to COVID.



Truck Travel Time Reliability – Interstate: Historic data for this measure is available beginning in 2016. The data source for this measure is the NPMRDS.

The graph below shows the value of Truck Travel Time Reliability each year on Interstate highways in the Capital Region. A value of 1.0 represents highly reliable travel times, and a value of 1.5 or above suggests highly unreliably travel times.

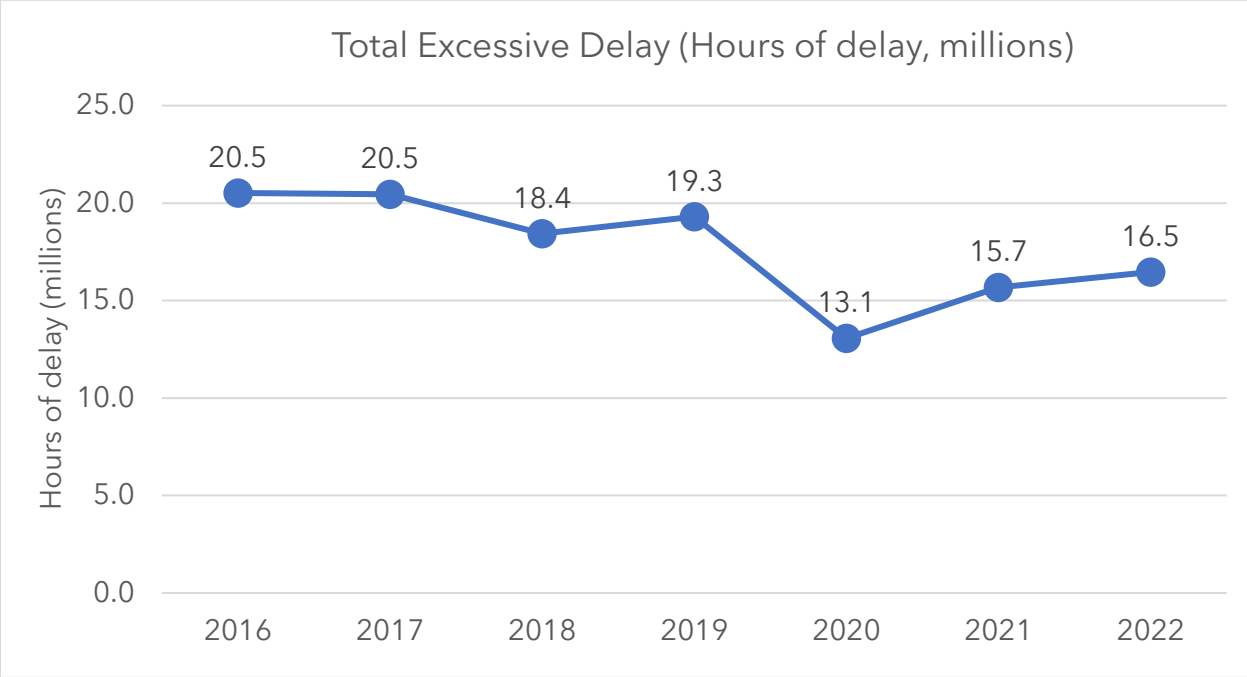
Truck Travel Time Reliability held steady at approximately 1.4 from 2016 through 2019. This suggests that trucks must budget an additional 40% travel time to ensure on-time delivery at least 95% of the time. This measure improved in 2020 due to COVID traffic reduction and has remained at approximately 1.2 since then.



Regional Level Performance Measures – Additional Measures

Total Excessive Delay: Historic data for this measure is available beginning in 2016. The data source for this measure is the NPMRDS.

The graph below shows Total Excessive Delay on all Capital Region roadways (for which data is available through the NPMRDS). The dataset suggests that total delay was roughly 20 million vehicle hours per year prior to 2020 and declined to 13.1 million hours in 2020 due to COVID. Delay rose somewhat in 2021 and 2022, but has not yet recovered to pre-COVID levels, likely due to less peak-hour travel.



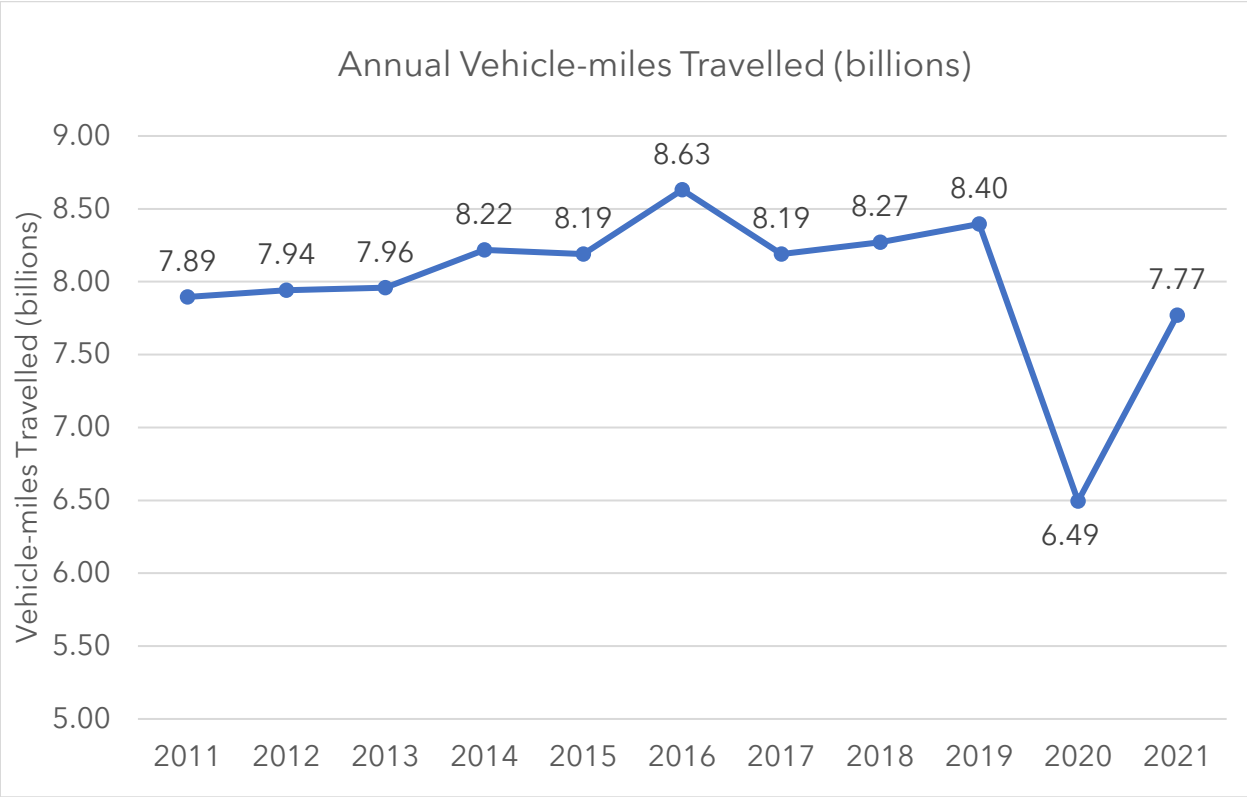
Cost of Delay: This value is calculated by multiplying the total excessive delay by $19.64 per person-hour, the hourly cost of delay value as published by the Texas Transportation Institute in their annual Urban Mobility Report. The Cost of Delay follows the same trend as Total Excessive Delay.

	2016	2017	2018	2019	2020	2021	2022
Cost of Delay ($, millions)	$403.00	$401.68	$362.07	$378.99	$256.56	$307.80	$323.25

Vehicle-miles Travelled: The total number of vehicle-miles travelled on all roadways in the region is estimated annually by New York State DOT under the Highway Performance Monitoring System.

Historic data for this measure is available back to 2011. Vehicle-miles travelled climbed gradually from 7.89 billion in 2011 to 8.4 billion in 2019. COVID caused a decline in regional VMT, which mostly recovered in 2021, but not yet to pre-COVID levels.

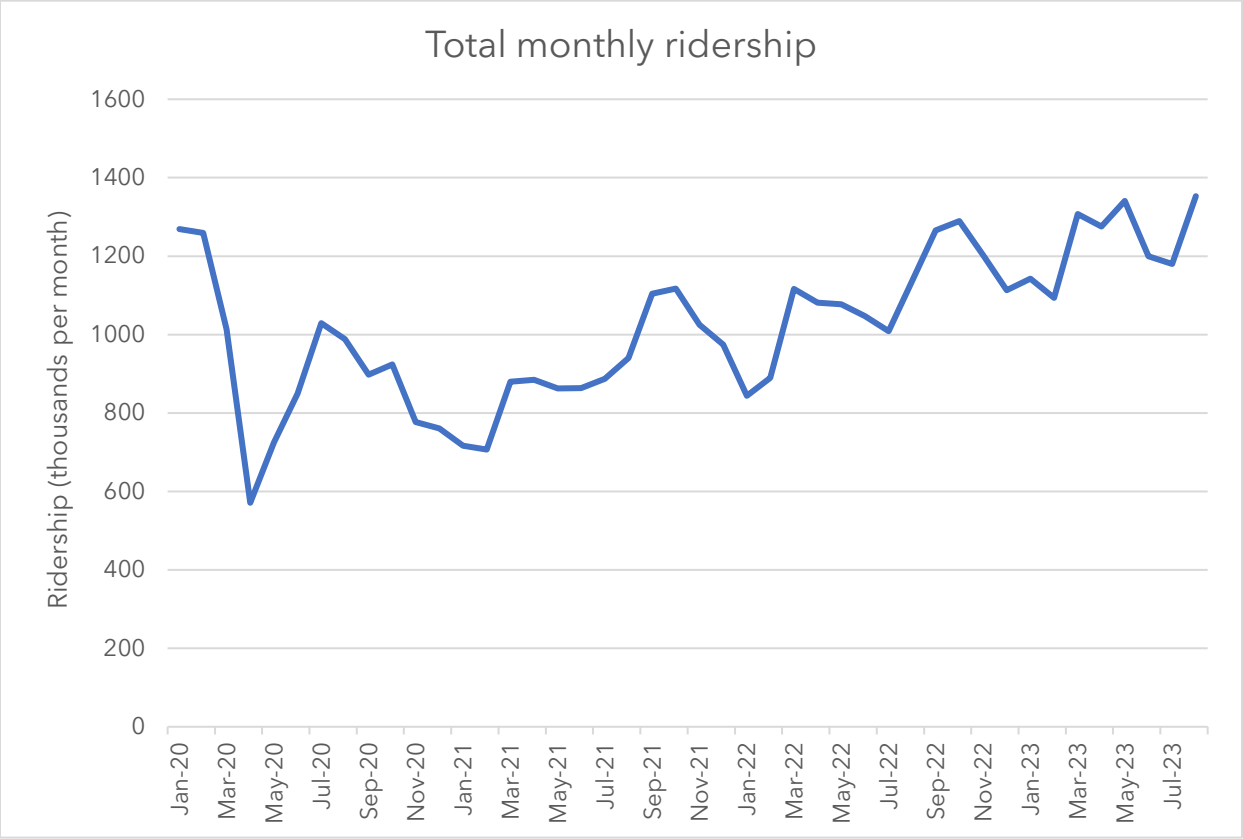
Data for 2022 is not yet available. When published, the 2022 data will help determine the degree to which travel has changed due to COVID. This data source will be monitored as part of the ongoing Congestion Management Process.



Transit Ridership: CDTA is the sole fixed-route transit provider for the Transportation Council planning area. In FY 2021, CDTA operated 300 transit vehicles across 55 bus routes with 2,640 bus stops, carrying a total of 9.8 million transit trips. An estimated 389 thousand residents live within 1/4 mile of CDTA service - as such, investing in transit may be an effective strategy for congestion management. CDTA continues to expand its service area, with service to Montgomery County beginning in 2022.

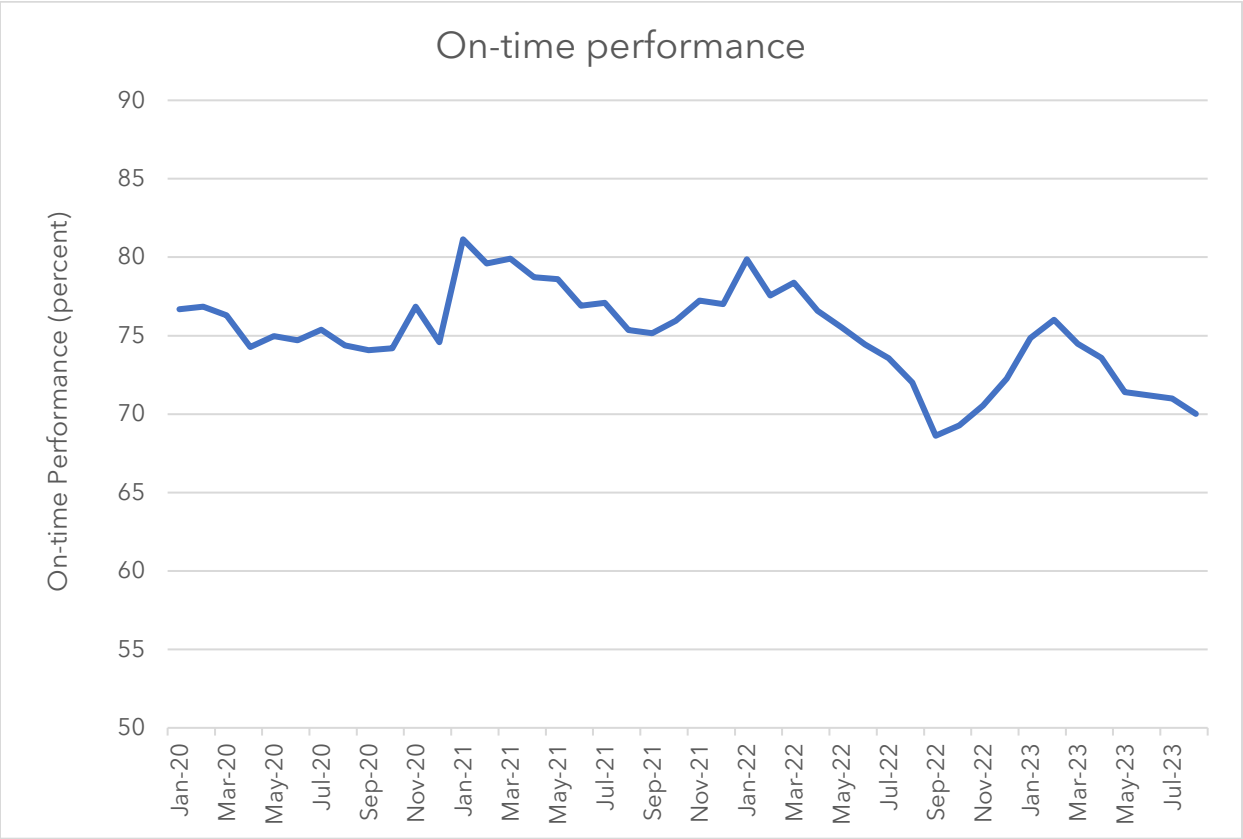
Ridership data was collected dating back to January 2020 from CDTA Monthly Performance Monitoring reports.

Prior to COVID, average total monthly ridership was 1.3 million (over the two-year period prior to March 2020). Following the beginning of COVID, ridership fell sharply and reached a low of 570,000 riders per month in April 2020. Since then, ridership has recovered to pre-COVID levels, with 1.3 million riders in March 2023. Note that ridership is somewhat seasonal, with fewer riders in winter.



Transit On-time Performance: On-time Performance data was collected dating back to January 2020 from CDTA Monthly Performance Monitoring reports.

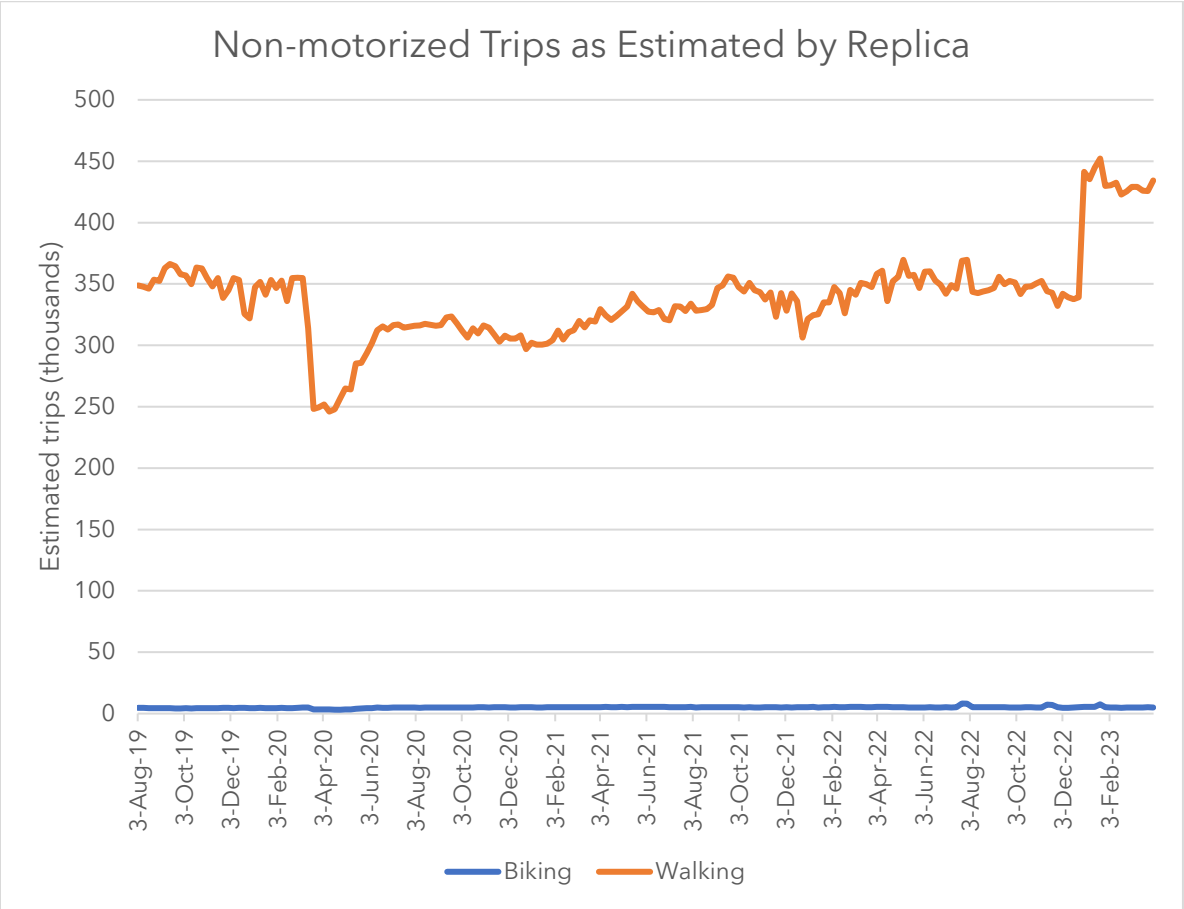
Prior to COVID, the system-wide On-time Performance was approximately 75% (over the two-year period prior to March 2020). Since then, On-time Performance has fluctuated, and is generally higher in the winter (January 2021 and 2022 peak at approximately 80%).



Non-motorized Trips: Data is available from Replica dating back to 2019. Note that Replica defines a walking trip as a trip with a sustained stop at a destination (short walks around the block are excluded).

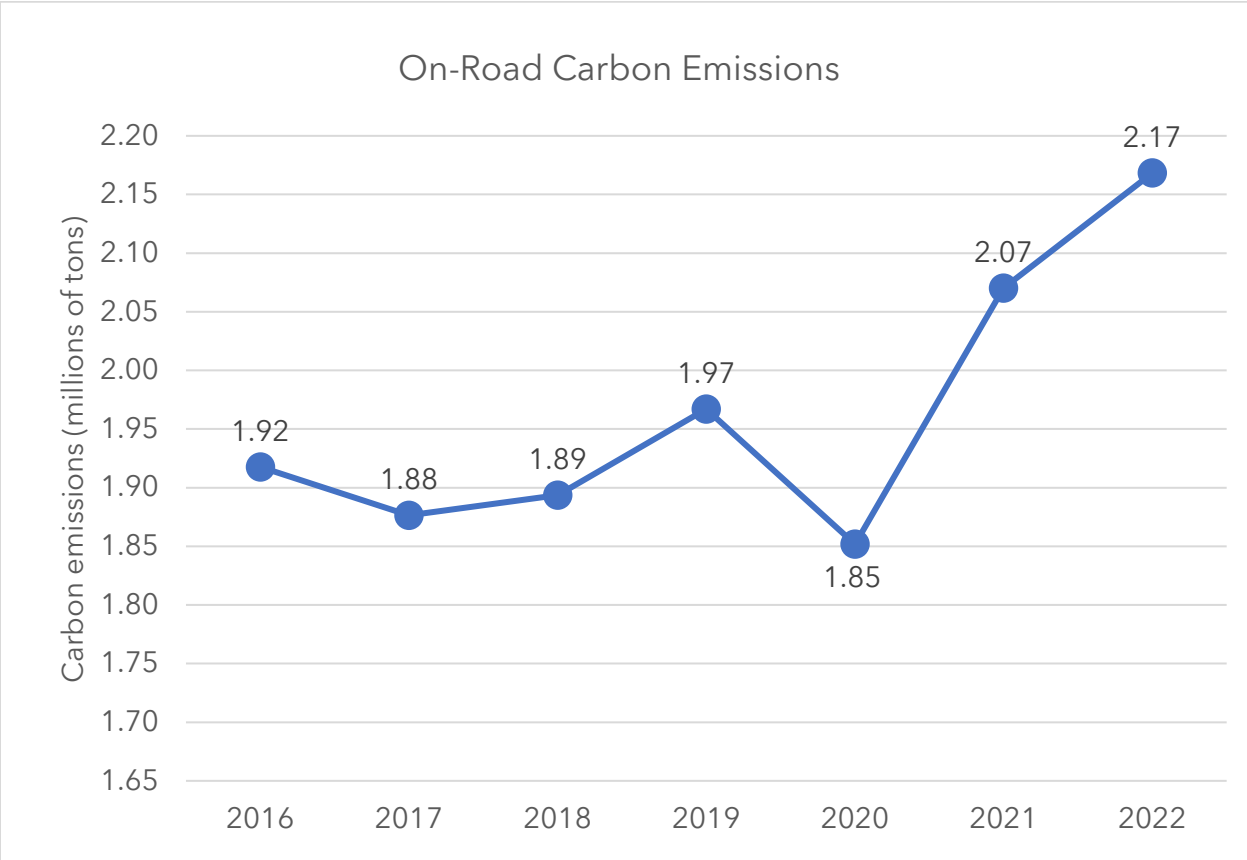
Walking trips hovered at approximately 350,000 per day prior to COVID and dropped to 250,000 in March 2020. Since then, walking trips have recovered to pre-COVID levels. Biking trips remain at approximately 5,000 trips per day throughout this timeframe.

The sudden spike in estimated walking trips beginning in January 2023 (on the right side of the graph below) does not reflect a real trend and is likely an artifact of an adjustment made to Replica's travel model.



CO_2 Emissions: Estimates of on-road carbon emissions are available dating back to 2016. The data source for this measure is the NPMRDS combined with vehicle emission rates from the US Environmental Protection Agency MOVES software.

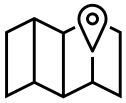
According to this estimate, on-road carbon emissions fell in 2020 but have since increased to greater than pre-COVID levels.



Number of Fatalities and Number of Serious Injuries: Historic data is available dating back to 2013. This performance measure has been estimated twice since the performance monitoring requirements were enacted. The 5-year average is reported as crash data fluctuates from year-to-year due to the random nature of crashes. The number of fatalities and serious injuries dropped slightly between the two reporting periods, but the rates remained essentially the same.

Safety Performance Measure	2013-2017 5-year Average	2016-2020 5-year Average
Number of Fatalities	53.4	51.8
Rate of Fatalities (Fatalities per 100 million vehicle miles traveled)	0.65	0.64
Number of Serious Injuries	652.8	629.0
Rate of Serious Injuries (Serious Injuries per 100 million vehicle miles traveled)	7.92	7.89
Number of Non-motorized Fatalities and Nonmotorized Serious Injuries	97.8	93.4

Corridor Level Performance Measures



Corridor level data is available to view in an online map at https://arcg.is/0j8Tyf.

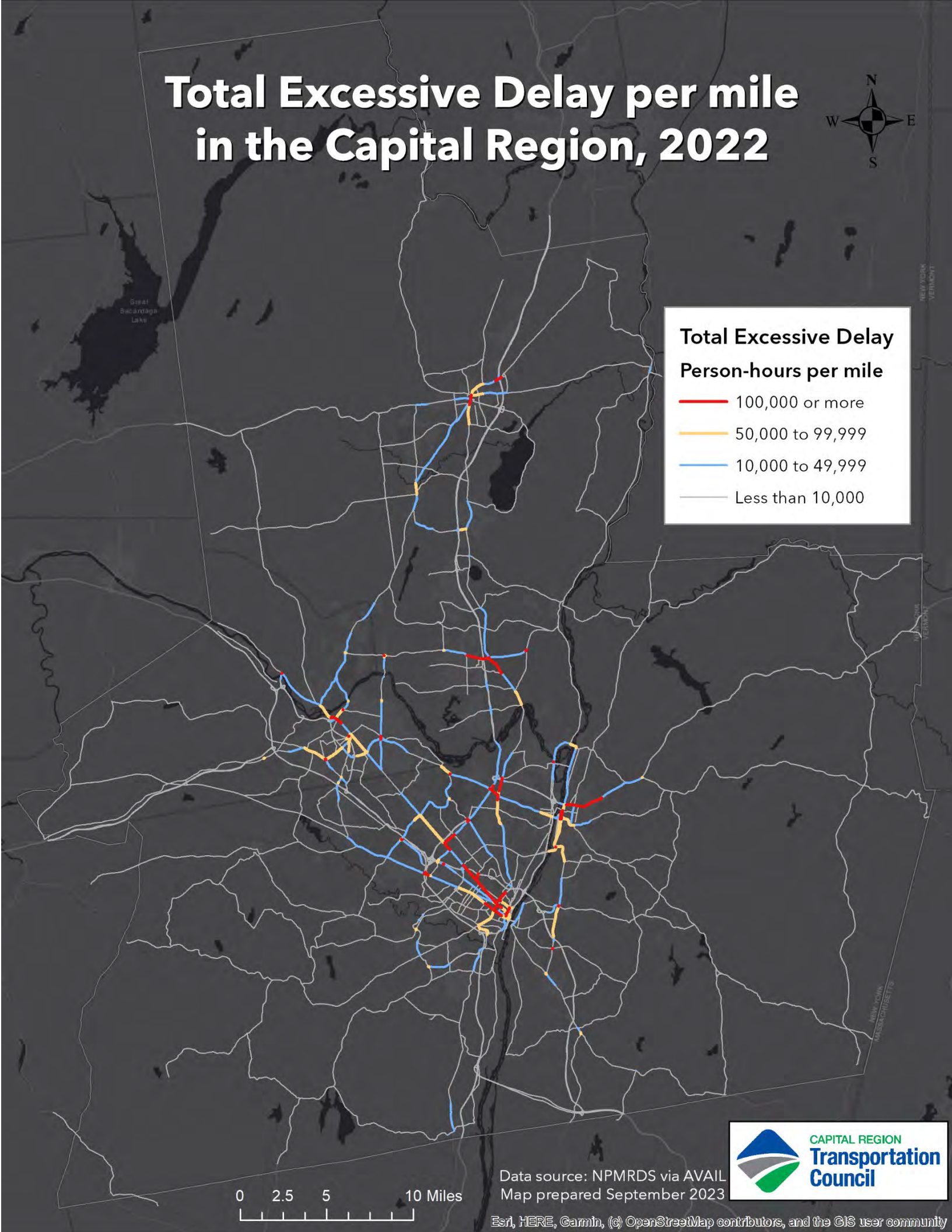
Total Excessive Delay and Total Excessive Delay per mile: The map on the following page shows Total Excessive Delay per mile on each roadway segment in the region with NPMRDS data availability. Total Excessive Delay is defined as the total amount of extra time spent in congested conditions on all roadways (with available data) when travel speed is below a delay threshold. For this measure, the threshold speed is 60% of observed free-flow speed or 21 mph, whichever is greater.

Delay is reported in annual person-hours on each roadway segment. The data is displayed on a per-mile basis so that roadway segments with different lengths can be compared against one another.

Roadway segments with Total Excessive Delay exceeding 100,000 person-hours per year are displayed on the map in red. These segments include many signalized arterials that experience recurring congestion, including NYS Route 7 (Hoosick Street and Hoosick Road) in Rensselaer County, NYS Route 5 (Central Ave) in Albany County, and NYS Route 146 in Saratoga County.

Note that Total Excessive Delay includes delay resulting from all causes including traffic congestion, crashes, construction, special events, and weather events. On signalized roadways, some proportion of Total Excessive Delay is delay caused by the normal operation of traffic signals.

Total Excessive Delay per mile in the Capital Region, 2022



Data source: NPMRDS via AVAIL
Map prepared September 2023

CAPITAL REGION Transportation Council

Level of Travel Time Reliability: The map on the following page shows the Level of Travel Time Reliability on each roadway segment in the region with NPMRDS data availability. Level of Travel Time Reliability is defined as the 80th percentile travel time divided by the 50th percentile travel time.

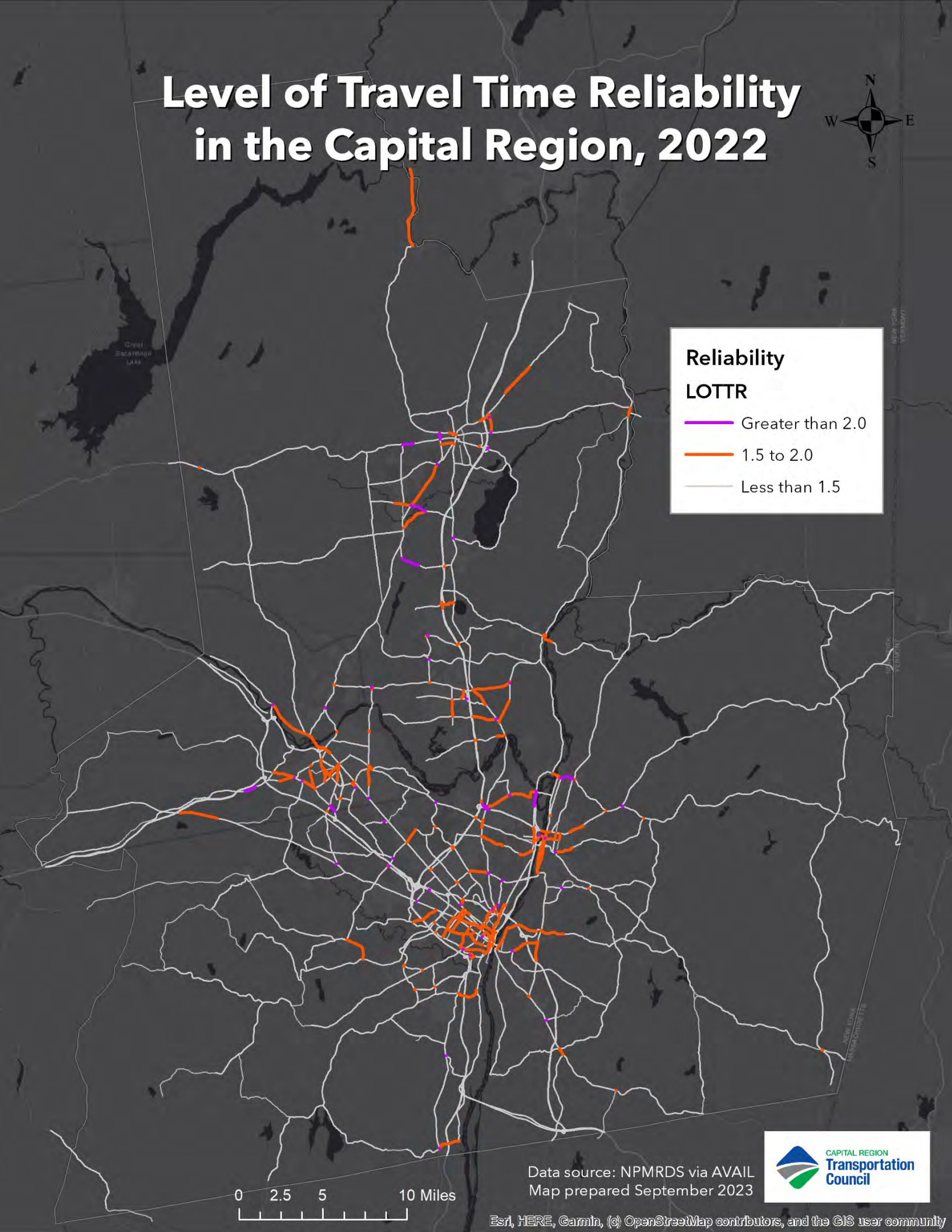
This value represents consistency, or 'reliability', of travel times. For example, a reliability value of 1.5 suggests that, during the worst 20% of time periods, travel will take 1.5 (or more) times longer than the median travel time.

A Level of Travel Time Reliability value of 1.5 or greater is considered unreliable. A value of 2.0 or greater is considered highly unreliable, as travel time on these segments is more than double the median travel time during 20% of time periods.

As seen on the map, a number of short segments near intersections have reliability values of 2.0 or greater, indicating bottlenecked conditions at these intersections. Many roadways in urban areas, including Albany, Troy, Clifton Park, Saratoga Springs, and Schenectady, have reliability values greater than 1.5 on long stretches of signalized roadways. Some segments are so consistently congested that they register as 'reliable' (with a reliability value less than 1.5) because the congestion is consistent and predictable. For example, Hoosick Street in Troy has a reliability value of 1.27 despite having very high delay.

Certain strategies that seek to improve the reliability of traffic flow, such as Adaptive Traffic Signal Control, may be more appropriate on roadways with poor Level of Travel Time Reliability.

Level of Travel Time Reliability in the Capital Region, 2022



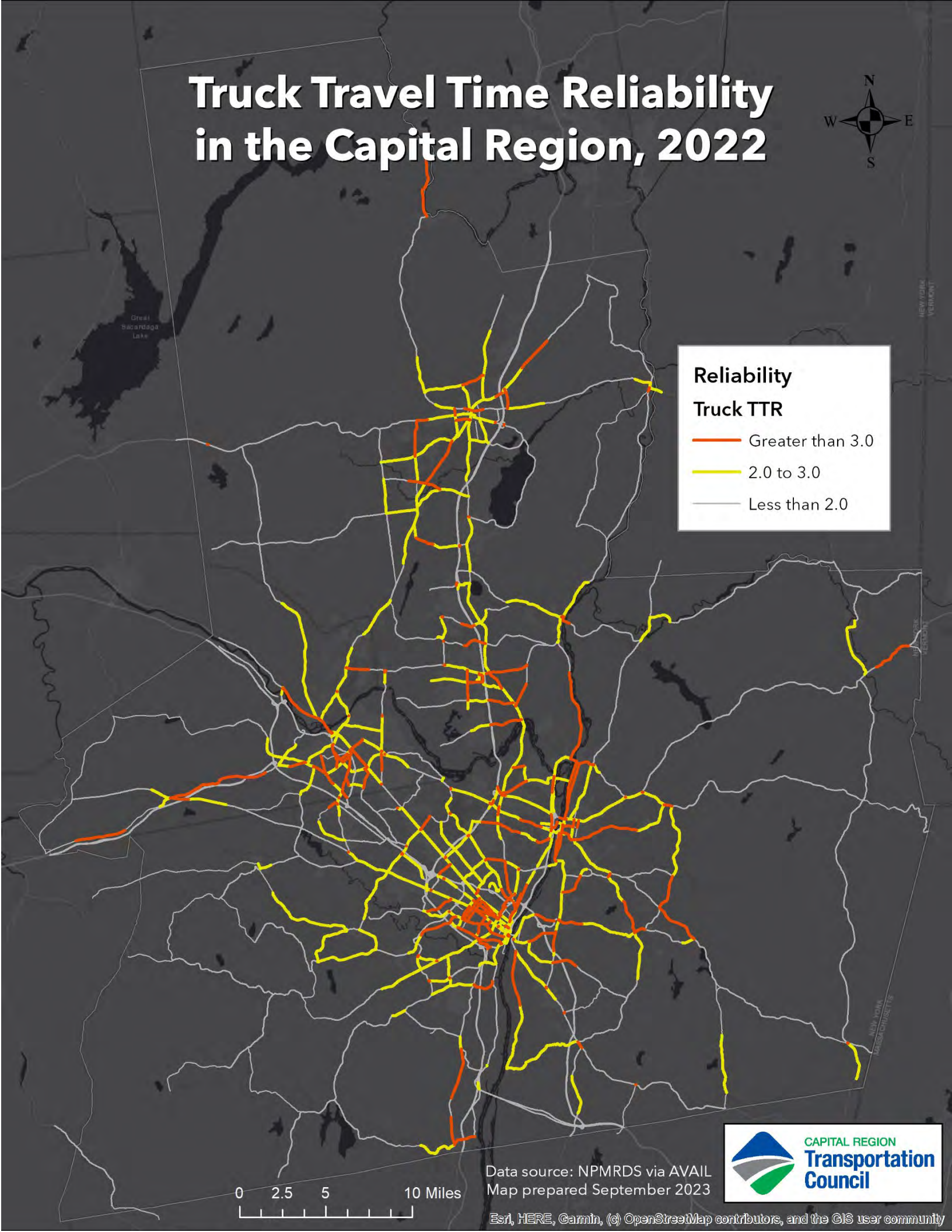
Data source: NPMRDS via AVAIL
Map prepared September 2023

CAPITAL REGION Transportation Council

Truck Travel Time Reliability: The map on the following page shows Truck Time Reliability on each roadway segment in the region with NPMRDS data availability. Truck Travel Time Reliability is defined as the 95th percentile travel time divided by the 50th percentile travel time. This value is very similar to Level of Travel Time Reliability but is more stringent (using the 95th percentile rather than the 80th) and includes overnight travel periods in the calculation. This value is designed to better reflect trip planning decisions made by freight operators.

A Truck Travel Time Reliability value of 2.0 or greater is considered unreliable. A value of 3.0 or greater is considered highly unreliable, as the freight operator may need to budget three times the median travel time while traveling on these segments to ensure on-time delivery.

The map shows that many roadway segments, especially those serving urbanized areas, have Truck Travel Time Reliability values of 2.0 or even 3.0 or greater. This illustrates the challenge faced by the freight community. Trips through urban areas must budget considerably more travel time when on-time delivery of goods is required.


Truck Travel Time Reliability in the Capital Region, 2022
N
W
E
S
Great Sacandaga Lake
NEW YORK VERMONT
Reliability
Truck TTR
Greater than 3.0
2.0 to 3.0
Less than 2.0
0 2.5 5 10 Miles
Data source: NPMRDS via AVAIL
Map prepared September 2023
CAPITAL REGION Transportation Council
Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community

Congestion Problems and Needs

Before the appropriate congestion management strategies can be identified, it is necessary to identify where unacceptable levels of congestion occur and the causes of congestion at these locations.

The region's congestion problems and needs have been aggregated from the following five sources:

Data: Congestion performance measures, including Excessive Delay and Travel Time Reliability, as defined and summarized in previous sections of this report

Stakeholders: Needs identified by state and local planning partners through stakeholder input

Public: Needs identified by the public through the Public Survey and social media

Traffic Forecasts: Locations expected to experience greater congestion in the future due to traffic growth through 2050, as identified through travel demand forecasting

Equity & Environmental Justice: Locations where traffic congestion occurs in equity/environmental justice areas as identified in the Capital Region Transportation Council's Environmental Justice/Title VI Analysis

The results of each of these analyses are presented on the following pages. Many congested locations were identified through more than one of the analyses listed above. A summary of congested locations is presented at the end of this section.

Most Congested Locations (Analysis of Travel Time Data)

Congestion performance measures were calculated for each roadway segment in the Congestion Management Process network (refer to the earlier Multimodal Performance Measures section of this report for full definitions and data sources for these measures). The University at Albany AVAIL Team developed a 'Composite Score' measure that combines measures of travel time reliability with measures of delay into a single comprehensive score. The Composite Score is used to identify roadway segments and corridors that experience high levels of excessive delay, poor travel time reliability, or some combination of both.

Based on the 2022 Composite Score rankings, the top 10 most congested Interstate Highway locations and the top 15 most congested signalized roadways were identified as areas of congestion. The identified areas are summarized by county below. The

Albany County Interstate Highway locations:

- **NY-7 Westbound in Latham, I-787 to I-87** – this segment is considered as an Interstate for the purpose of this analysis due to being a limited access freeway. The junction with I-87 is a known congestion bottleneck in peak periods.
- **I-87 Northbound in Latham, NY-155 (Watervliet Shaker) to Twin Bridges** – this portion of I-87 experiences peak period commuter congestion. The bridges of the Mohawk River act as a bottleneck due to the narrow shoulders.
- **I-90 Westbound in Albany, near Exits 2, 3, and 4** – this portion of I-90 carries an estimated 108,000 vehicles per day in both directions. The data suggests the westbound direction experiences greater delay.
- **I-90 Westbound in Albany, Exit 2 through junction with I-87** – high merging and weaving volumes on I-87 northbound before the Wolf Road exit (2E) contribute to backups at this location.
- **I-87 Southbound in Colonie, Exit 2W to junction with I-90** – high lane changing volumes and the one-lane off ramp to I-90 creates a bottleneck at this location.

Albany County Signalized Roadway locations:

- **Everett Road, Central Avenue to I-90 ramps in Albany** – the signalized intersections at the top of the I-90 ramps experience long queues, high turning volumes, and long cycle lengths that contribute to delay. High directionality of travel in the morning and afternoon is observed due to commuter traffic.
- **Troy-Schenectady Road (NY-7/NY-2) near interchange with I-87 in Latham** – this busy single-point interchange and its approach roads provide access to I-87 and many commercial developments in the vicinity.
- **US-9/Northern Boulevard/Henry Johnson Boulevard, south of I-90 Junction in Albany to Washington Avenue** – the large I-90 junction provides access to and from northern and downtown Albany. Long queues are observed as free-flowing traffic exits I-90 and must pass through signalized intersections before dispersing.
- **Central Avenue (NY-5) in Colonie, I-87 ramps to Fuller Road** – this section of Central Avenue provides access to I-87, Wolf Road, Colonie Center, and the Northway Plaza. Busy CDTA bus stops are present here, with frequent pedestrian crossings of Central Avenue as a result. Certain vehicle queues take multiple cycles to clear during peak periods.
- **Albany Shaker Road near I-87 in Colonie** – this corridor provides access to Wolf Road, I-87, and the Albany International Airport. Growth in commercial development in the vicinity of the airport has led to traffic growth in this area. Certain vehicle queues take multiple cycles to clear during peak periods.

Rensselaer County Interstate Highway locations:

Rensselaer County contains part of I-90 and the Berkshire Connector; however, congestion on these freeways did not fall in the top ten for Interstate highways in the region.

Rensselaer County Signalized Roadway locations:

- **US-4 near NY-43 in North Greenbush and East Greenbush** – this corridor serves commercial and commuter traffic in Rensselaer County, and is home to a FedEx distribution facility, a Wal-Mart Plaza, Target Plaza, and other trip generators. This roadway runs parallel to I-90 between its interchanges with US-4 and NY-43. This location also received numerous reports of congestion in the public survey.
- **NY-7 Hoosick Street in Troy and Hoosick Road in Brunswick** – this roadway received the highest number of reports of traffic congestion from the public survey. NY-7 carries

traffic over the Hudson River and connects to an I-787 interchange west of the river. A series of tightly spaced congested signalized intersections on Hoosick Street in Troy are a common source of mobility complaints from pedestrians and drivers. East of Lake Ave, NY-7 becomes Hoosick Road in Brunswick, carrying traffic to commercial and residential developments on the corridor and interstate travel to Vermont.

- **US-4 in Troy, Federal Street to NY-378** – US-4 operates as a pair of one-way roadways in Troy, providing the main north/south travel way through the City. High pedestrian activity, tightly spaced signals, stop-controlled intersections, on-street parking, and high density of side streets characterize this urban corridor.
- **Northern Drive (NY-142) in Troy** – this roadway carries a relatively low number of vehicles compared to other locations on this list (about 10,000 vehicles per day), and therefore has comparatively low total vehicle-hours of delay. However, Northern Drive's poor Level of Travel Time Reliability brings this location up to #15 on the list. Unusual roadway and intersection geometry, along with the lack of alignment with the Broad Street Bridge over the Hudson River, contribute toward highly unreliable travel times at this location.

Saratoga County Interstate Highway locations:

- **I-87 Southbound in Halfmoon, Exit 8A to Twin Bridges** – this portion of I-87 carries heavy commuter traffic, and the bridges over the Mohawk River act as a bottleneck due to the narrow shoulders.
- **I-87 Southbound in Wilton/Saratoga Springs, vicinity of Exit 15** – this interchange serves a busy commercial and commuter corridor.
- **I-87 Southbound in Clifton Park, Exit 9 to Exit 8A** – Exit 9 (NY-146) and Exit 8A (Grooms Road) form busy interchanges with growing commercial and residential areas.

Saratoga County Signalized Roadway locations:

- **NY-146 in Clifton Park and Halfmoon, Maxwell Drive to US Route 9** – this location also received numerous reports of congestion from the Public Survey and local stakeholders in Saratoga County. Clifton Park and Halfmoon have experienced considerable population growth in recent years, and this location serves numerous commercial and residential developments and carries traffic to I-87.
- **NY-50 near I-87 in Saratoga Springs and Wilton** – NY-50 provides access to I-87 and several commercial plazas in the area. Population growth in the Town of Wilton in recent years may contribute additional trips to this corridor.
- **Broadway (US-9), Washington Street (NY-29) to NY-50 Ballston Avenue and Circular Street, Saratoga Springs** – Broadway is the main north/south road through

downtown Saratoga Springs. Pedestrian mobility and access to local businesses is a high priority on this corridor.

- **US-9 near Grooms Road in Clifton Park and Halfmoon** – this portion of Route 9 runs parallel to I-87 and often carries diverted traffic when there is an incident on the Interstate. Residential and commercial growth have occurred around the Route 9 corridor.

Schenectady County Interstate Highway locations:

- **I-890 Eastbound in Rotterdam, junction with I-90 and 5S to Exit 2** – traffic volume on this portion of I-890 is relatively light; additional stakeholder outreach is needed to determine if congestion here is problematic.
- **I-890 Westbound in Rotterdam, Exits 2A and 2B to Exit 1B** – this portion of I-890 is the westbound terminus with I-90; as above, stakeholder outreach is needed to determine if congestion here is problematic.
- **I-890 Westbound in Schenectady, Exit 5 (Broadway) to Exit 4C (Washington Ave)** – the signalized intersection of Washington and State near Schenectady County Community College forms a congestion bottleneck which may back up onto the ramp.

Schenectady County Signalized Roadway locations:

- **I-890 Ramps/Washington Avenue/State Street/NY-5 in Schenectady** – this corridor near Schenectady County Community College connects Schenectady to I-890 through a series of signalized intersections on State Street. High delay is also observed on Erie Boulevard. Travelers and trucks taking NY 5 to Scotia, Glenville, and points west and north also use this access to I-890.
- **Balltown Road, Union Street to Central Avenue in Niskayuna** – Balltown Road carries commuter traffic through the Town of Niskayuna and provides access to large commercial plazas and residential areas.

Congestion Needs Identified Through Stakeholder Input

The Transportation Council solicited all member agencies for input on congestion needs. Member agencies were asked to express their community's or agency's mobility needs and what specific congestion challenges they face, either locally or regionally. Input was also solicited on congestion management strategies. Additional stakeholder outreach was conducted through meetings with the Regional Operations and Safety Advisory Committee (ROSAC), other Transportation Council advisory groups, and targeted stakeholder meetings.

The following Congestion Needs were expressed by member agencies:

City of Mechanicville stated that the City experiences congestion at intersections along Central Avenue (US-4/NY-32, running north-south through the City). The signalized intersections with South Street, Park Avenue, Hill Street, and Saratoga Avenue were noted as congested. These intersections may benefit from timing optimization, signal upgrades, or other operational improvements. Another congested location noted by the City was the intersection of North Main Street and Route 67 (near the Mechanicville Bridge over the Hudson River) which sees delays at rush hour.

Town of Wilton stated that the Town faces localized short-term delays usually associated with the start or end of school days. Student drop-off/pick-up contributes toward congestion. The Town is interested in working with school districts to find solutions. Other communities in the region have noted rising student drop-off/pick-up and associated queuing at schools. Town of Wilton also noted that the I-87 corridor experiences congestion, and that slow-moving commercial vehicles in the left lanes may contribute. This type of congestion may be treatable through "keep right except to pass" signage, if appropriate.

Town of Halfmoon expressed that east-west travel in the Town is a challenge. There is a notable lack of collector and minor arterial roads for east-west travel. Peak hour congestion is observed along NY-146, NY-236, US-9, and County Route 91 and 94. Development in nearby areas has contributed to traffic growth on these roadways and on the local network. The Town is partnering with NYSDOT and Saratoga County on implementing congestion management strategies at certain locations. The Town also noted that strategies such as Traffic Incident Management and Traveler Information Systems may be effective on NY-146 and US-9, which form a corridor with I-87.

Saratoga County stated that the relative lack of public transportation in southern Saratoga County is a mobility need and suggested that the US-9 corridor may have potential market

density for service. The area around NY-146 and US-9 was noted as severely congested; this area was also identified as a top congested area in the data analysis. The County suggested that Adaptive Traffic Signal Control may be an effective strategy on signalized arterials. County Route 109 was noted as an emerging east-west route experiencing growth, especially in truck traffic. The County noted that the I-87/US-9 Integrated Corridor Plan from 2012 should be rebooted, and that the Transportation Management Center in Latham could be leveraged to implement many plan findings. US-9 was suggested as a good candidate for complete streets study from the Mohawk River to Ushers Road. Finally, the County suggested that the US-9 corridor could be considered for Bus Rapid Transit (BRT). The County concluded by expressing that optimizing our current facilities should be emphasized.

City of Schenectady stated that the portion of Broadway that passes underneath I-890 is an area with congestion challenges. This section of Broadway passes through a series of tightly spaced signalized intersections that also serve Crane Street and the I-890 on-ramps and off-ramps.

Members of the **Regional Operations and Safety Advisory Committee** supplied these additional comments:

- I-87 southbound onto I-90 is an area with heavy traffic congestion.
- Traffic congestion on Balltown Road extends further than the data suggests and should include the segment between Union Street and Nott Street.
- Many congestion management strategies rely on technology that require a specialized skillset to maintain. Care should be taken to ensure these ITS deployments can be cared for once in place.
- In addition to implementation cost, we should examine the life cycle cost of each strategy and the personnel costs required to maintain them.

Capital District Transportation Authority (CDTA): Transportation Council staff met with CDTA staff in September 2023 to discuss the Congestion Management Process. CDTA is the sole provider of fixed-route transit service in the Capital Region. Public transit is an essential congestion management tool, as one bus can hold as many as 30 cars worth of travelers. CDTA staff shared the following valuable input:

- CDTA has a number of upcoming service expansions. The 'Purple Line' will open as the third Bus Rapid Transit Route, serving Washington and Western Avenues in the City of Albany, and improving access to major destinations such as the UAlbany campus and Crossgates Mall. CDTA also acquired Greater Glens Falls Transit and has expanded service to Montgomery County.
- CDTA has begun work on its Transit Development Plan.

- CDTA supports congestion management strategies such as Queue Jumps and Transit Signal Priority. These strategies can improve reliability of transit service on routes where they are implemented.
- Currently, Transit Signal Priority is only installed on existing Bus Rapid Transit lines. CDTA is amenable to installing this technology on other routes as well.
- CDTA is amenable to expanding transit on-demand and suggested that the Congestion Management Process may be able to assist in finding candidate locations for on-demand service. On-demand service and other transit service expansions may be constrained by driver availability. Workforce development strategies should be included in the CMP.
- An ongoing challenge is to attract "Choice" riders, who have access to transit but choose to drive personal vehicles. CDTA ridership has recovered very well post-COVID compared to transit agencies nationwide, but attracting or incentivizing choice riders remains a challenge.
- CDTA noted that they invest significantly in the region's infrastructure, including signal upgrades, sidewalk upgrades, and even roundabout construction.
- CDTA noted that one data need is more mature and sophisticated travel time data at the street level. Real-time speed data would assist with operations planning and traveler information systems.
- CDTA also noted that autonomous vehicles are an emerging technology that may impact transit operations. Autonomous shuttles are being piloted elsewhere in the country, and pilot or demonstration projects may be appropriate in the Capital Region as well.
- CDTA noted the following locations as areas of mobility concern:
    - Central Avenue Corridor – peak hour congestion impacts regular bus service and Red Line Bus Rapid Transit operations. Safety concerns have been raised by riders and drivers.
    - Washington Avenue Extension – this route is frequently used by CDTA buses, and congestion results in delays and operational challenges. Safety issues at intersections are also of concern.
    - I-787 Access Points – congestion and safety challenges often occur at key access points to I-787, especially during rush hours and special events.
    - Crossings of Major Rivers – crossings such as the Dunn Memorial Bridge and Patroon Island Bridge are critical transit corridors, and congestion on these bridges can lead to service disruption and safety concerns.

New York State Department of Transportation (NYSDOT): Transportation Council staff met with NYSDOT Region 1 and Main Office staff in September 2023. A variety of congestion management topics were discussed, and NYSDOT staff offered the following valuable input:

- NYSDOT staff noted that Route 7 between I-87 and I-787 is built like an Interstate (limited access freeway with median) and should be considered as an Interstate in the CMP analysis. Staff also noted that this segment of Route 7 experiences congestion in the westbound segment near the I-87 interchange.
- Staff also noted that I-87 southbound to the I-90 west ramp is known to be congested.
- NYSDOT stated that it is important to consider Land Use Strategies, as many of the top congested locations experienced considerable changes in land use in recent years.
- NYSDOT stated that their current work program emphasizes maintenance and preservation of the existing infrastructure, and they do not want to widen existing signalized arterials due to the cost of implementation. They noted that they are amenable to capacity additions when funded through developer mitigation costs. NYSDOT is also amenable to spot treatments to treat bottlenecks, such as adding turning lanes where needed.
- Staff noted that one of the locations that received the most comments from the public survey ("Five Corners" intersection in Rotterdam) had temporary signals in place over the summer which may have contributed to the high number of comments at this location.
- Region 1 is currently installing communications technology at all of the approximately 600 signals they maintain. This technology will enable improvements to signal operations and deployment of ITS. They are also working to add non-intrusive vehicle detection technology (such as video or radar-based detection) at signalized intersections.
- Main Office staff noted that the State is working on standardizing the software used at Transportation Management Centers, including the Region 1 facility in Latham. They are also working to provide live traffic data to the Transportation Management Centers to assist with incident detection and management.
- DOT does not use roundabouts for congestion management, but do consider them a valuable safety improvement measure, and is willing to build more where locals collect mitigation funds from developers.
- NYSDOT supports adjusting the Transportation Council's Transportation Improvement Program (TIP) scoring process to make CMP projects more competitive. NHPP may be an appropriate funding source for CMP implementation on National Highway System roadways. The new Carbon Reduction Program is another candidate funding source. NYSDOT would prefer not to use STPBG for CMP implementation due to its broad eligibility.
- NYSDOT states that the Transportation Council's TIP Task Force should be involved in CMP implementation discussions. NYSDOT would be supportive of fixing congested Interstate ramps if agreeable to the TIP Task Force. NYSDOT would also support signal optimization projects.

- One avenue for CMP implementation could be to fund design-only projects to help them compete for discretionary funding programs.
- NYSDOT noted that many of the Capital Region's bridges over the Hudson River are coming to the end of their intended service lives and may need replacement in the short-to-medium term. If one of these bridges were to be closed, it would cause traffic congestion on the other bridges and the roads that lead to them.
- The Dunn Memorial Bridge carrying US-9 and US-20 over the Hudson River has mobility challenges, and the ramps on the Rensselaer side face frequent back-ups.
- DOT staff emphasized that they are ramping up efforts to improve traffic signal technology, and that spot treatments at Interstate interchanges are important. Interstate highway mainlines typically have capacity to spare, and backups occur mainly at ramps.
- NYSDOT Region 1 staff expressed that congestion is a common source of complaints from the public, and that they would support the use of federal funding for cost-effective ITS and TSMO projects including signal upgrades and signal retiming.

Congestion Needs Identified Through Public Input

Data cannot tell the whole story – public perception of congestion may differ from what the data suggests. Broad public input is needed to ensure that the analysis reflects what the traveling public experiences.

The Transportation Council conducted a Congestion Management Process public survey in the summer of 2023. The survey was prepared using Survey123, an online survey tool developed by Esri to collect spatial survey data. Survey takers were able to identify specific locations of traffic concern by placing pins in the online map. Survey takers could leave comments specific to each location, or general comments about their travel experience in the region.

The survey was open from May 5 through August 14, 2023. The survey was broadcast via The Transportation Council's website and social media, emailed to ROSAC members, and shared by some ROSAC members through their social media. A transit-themed flyer was created for CDTA and shared through their social media. The response was strong:

- In total, there were 231 individual survey responses from 52 different ZIP codes.
- These individuals reported 407 congested locations.
- Survey takers left 98 general comments and 217 site-specific comments.

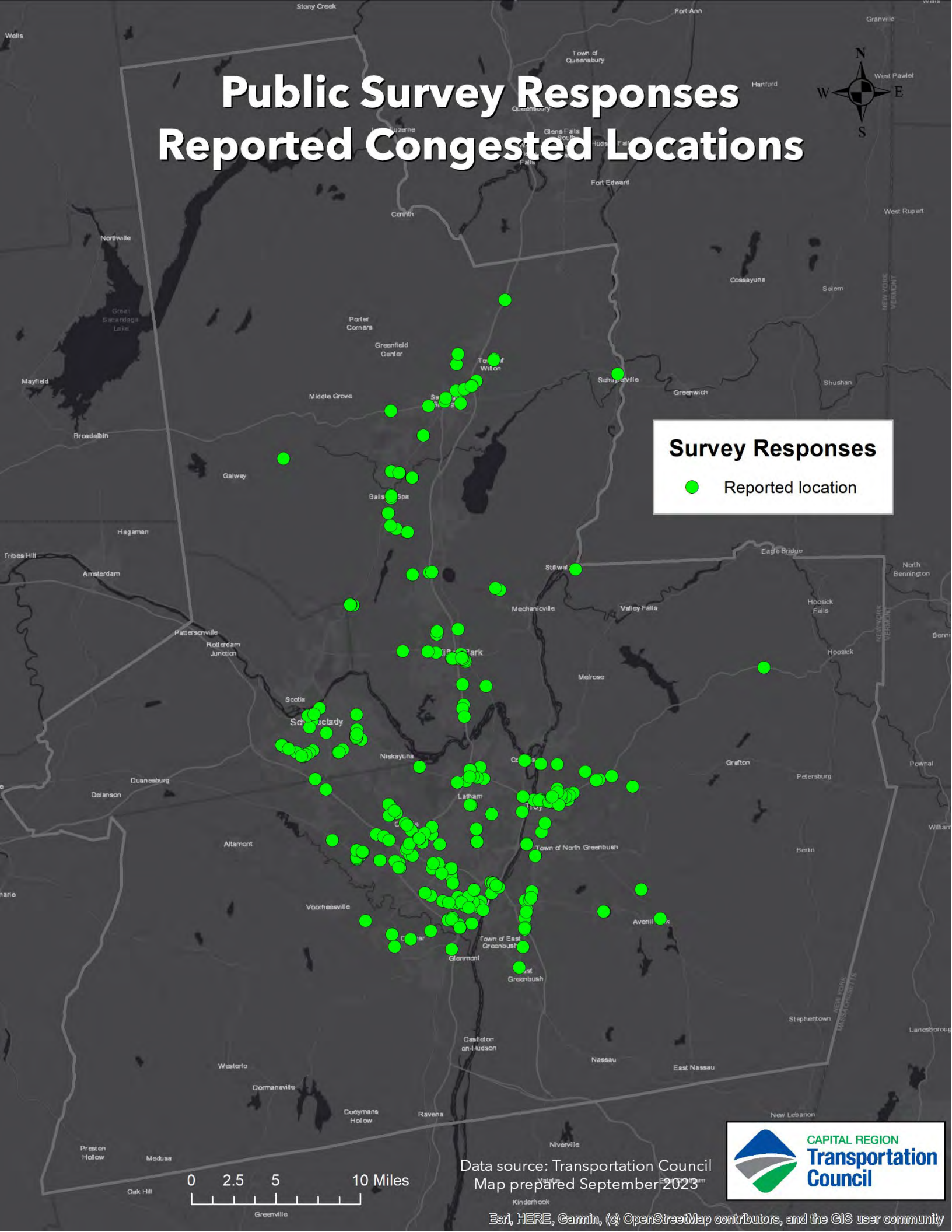
The general comments are summarized below. Site-specific comments will be summarized on their respective Corridor Profile reports, which will be prepared as part of the ongoing process.

- Several commenters did not see much or any issue with congestion in the Capital Region, particularly when compared to other metropolitan areas that commenters previously lived.
- Many comments mention active transportation infrastructure expansion and/or improvement to encourage modal shift to address congestion, particularly within Albany. Both pedestrian and bicycle infrastructure were mentioned numerous times
- Many comments also pointed to transit expansion to address congestion. Suggestions ranged from new service in the Northway corridor and to the Airport to more frequent and reliable existing service. There were also suggestions to improve transit operations such as bus lanes, queue jumps, and transit signal priority.
- Commenters also addressed various land use issues such as development and growth in already congested areas, particularly cited on Route 7 (Hoosick Street/Road) in Troy and Brunswick. One respondent emphasized that adding more commercial development without the infrastructure to support it should not be allowed. Some comments cited the need for more dense housing and development to shift modal distribution and length of trips.

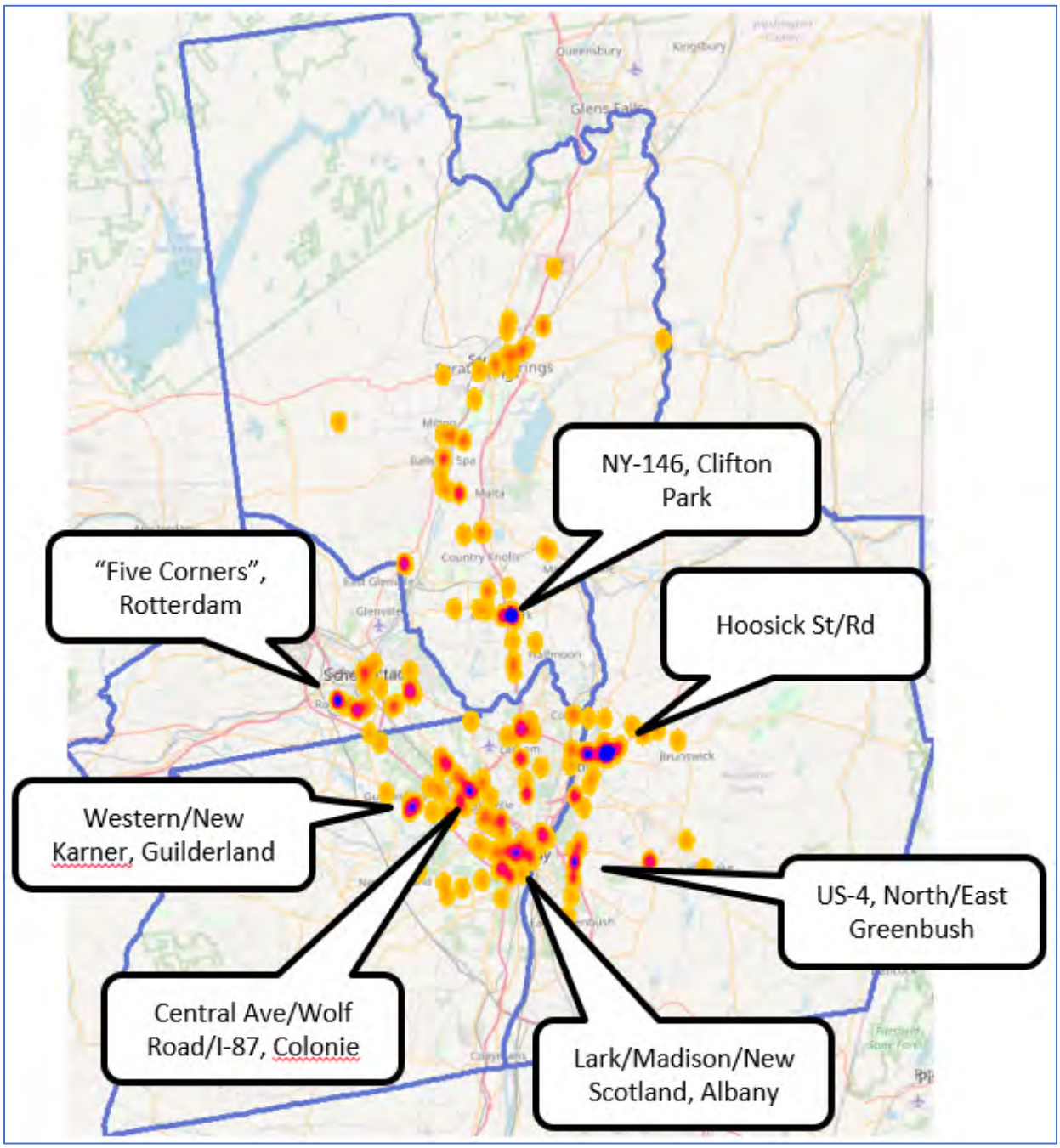
- Incident management and its relationship to network capacity was cited several times, particularly in the Northway/Rt. 9 corridor and Rt. 7 in Troy and Brunswick.
- Intersection operations were cited in many locations, as well as general comments. Several comments suggested more widespread adoption of roundabouts. A few cited the need for better signal timing and other Intelligent Transportation Systems. Others simply cited a deficiency in operations without a specific remedy.
- A few commenters suggested adding capacity, though usually referring to specific places not as a general remedy. While only one comment explicitly did not want to see added capacity, most comments implied either ambivalence or lack of desire to increase capacity.
- The balance of the comments were non-specific comments indicating a general dislike of congestion, cynicism toward any solutions, and one calling for speed enforcement on the Northway.

The map on the following page shows the 407 reported congested locations from the public survey.

Public Survey Responses
Reported Congested Locations



The density of reported locations can be visualized using a heat map. On the map below, dark blue areas represent locations where 10 or more survey takers reported experiencing traffic congestion. There is a strong correlation between the Total Excessive Delay performance measures and the survey responses. The locations with the highest density of congestion reports are noted on the map.



Future Traffic Forecasts

According to the Capital District Regional Planning Commission, the population of the Capital District is expected to increase by about 30,000 through the year 2050. However, this growth is not uniformly distributed across the region. Some communities are forecast to have a slight population decline, while others a significant population increase. The greatest growth is forecast to occur in Saratoga County (about 20,000), followed by Albany County (about 10,000). Growth is mainly expected in suburban communities such as the Towns of Colonie, Guilderland, Bethlehem, Clifton Park, Halfmoon, Malta, and Wilton. The Transportation Council will work with our partner agencies to better understand and forecast expected growth in the region and its impact on the transportation network. Growth should be facilitated wisely to ensure that roadways operating near capacity do not become over-capacity in the coming years.

As part of the ongoing Congestion Management Process, the Transportation Council will prepare traffic forecasts as an additional approach to identifying areas of congestion need.

Congestion in Equity & Environmental Justice Areas

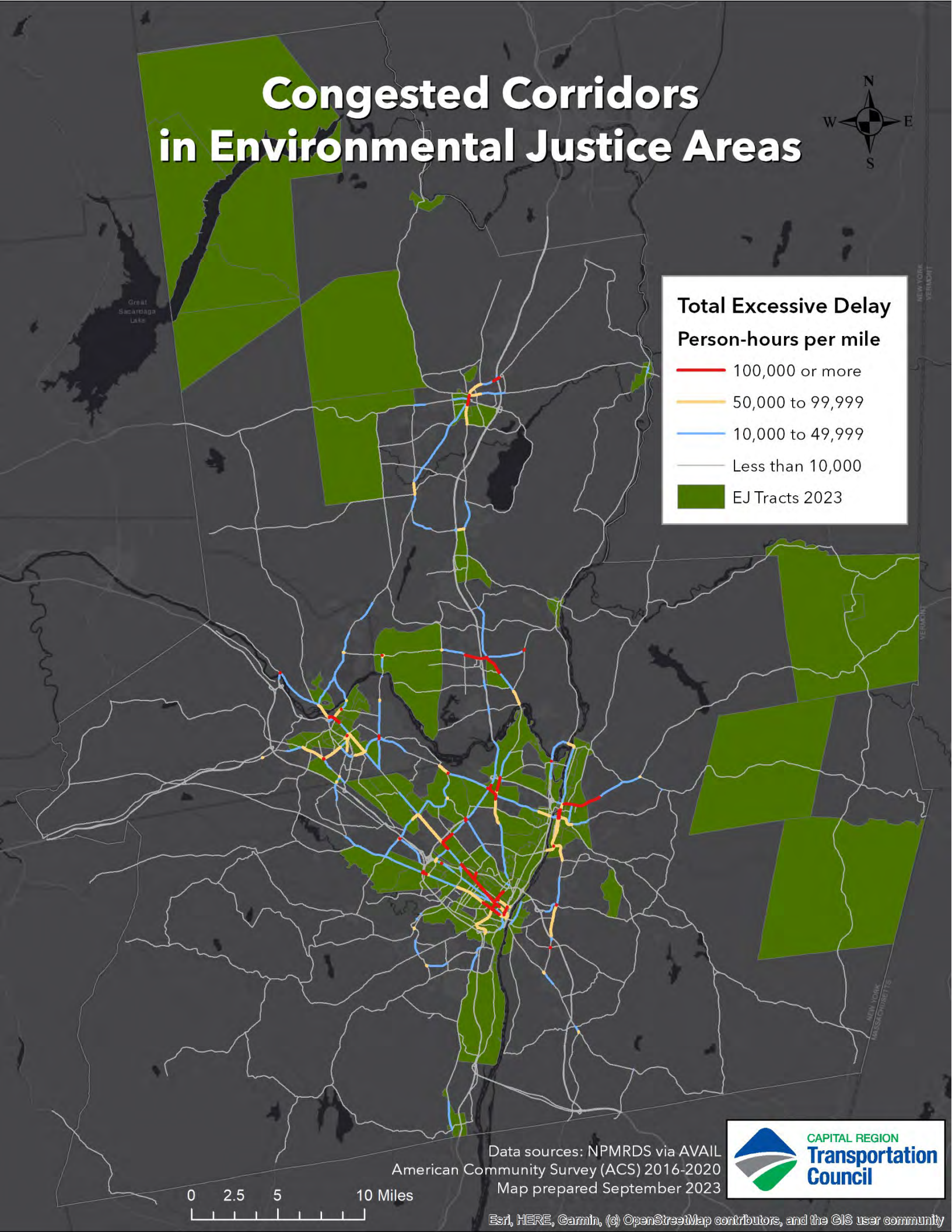
Many of the congested locations in the Capital Region are within census tracts identified as Environmental Justice Tracts by the Transportation Council. In the January 2023 report 'Environmental Justice/Title VI Analysis', Transportation Council staff conducted an analysis of socioeconomic data available from the U.S. Census Bureau's American Community Survey (5-year estimates, 2016-2020). Tracts with a higher percentage of low-income households or minority residents were designated as Environmental Justice Tracts. The map on the following page shows these tracts highlighted in green.

Traffic congestion presents mobility and public health challenges for residents of Environmental Justice areas:

- Accessing jobs and essential services becomes more challenging.
- Crossing a congested roadway as a pedestrian is hazardous.
- Idling vehicles emit emissions that harm public health. In locations where housing is close to roadways, residents will face higher exposure to harmful emissions.
- Noise pollution is also a concern, and high traffic volume and excessive speed can contribute to increased noise.
- Infill development in these areas may be constrained by available roadway capacity.

Implementing effective congestion management strategies in Environmental Justice areas will improve personal mobility, access to services, and quality of life for the residents of these areas.

Congested Corridors in Environmental Justice Areas



Data sources: NPMRDS via AVAIL
American Community Survey (ACS) 2016-2020
Map prepared September 2023

CAPITAL REGION Transportation Council

Congestion Management Strategies

Finding the right solutions for diverse congestion problems is the main challenge of the Congestion Management Process. Transportation Council staff conducted a literature review of peer agency practices and published research to identify potential congestion management strategies and the contexts in which they are applied.

Effective congestion management strategies focus on at least one of the following:

- **Getting more performance from the infrastructure we have** – smarter traffic signals, improved access management practices, providing adequate turning lanes, improved traffic incident management, and many other strategies can improve traffic flow without adding new through lanes.
- **Providing transportation choices** – sidewalks and bike lanes can help shift short trips out of cars. One transit bus can carry 30 cars worth of travelers. Employer-based strategies such as flexible work hours and work-from-home policies can reduce commuter traffic. Emerging technologies such as micromobility (e-scooters and e-bikes for hire) can provide further transportation choices.
- **Advancing technology** – advances in computerized traffic signal technology, such as Adaptive Signal Control, can greatly improve traffic flow on signalized roadways. Numerous other Intelligent Transportation Systems (ITS) and Transportation Systems Management and Operations (TMSO) strategies leverage technology to improve traffic flow and safety.
- **Diverse and compact development** – there is no one-size-fits-all home type that suits the needs of all residents. Providing diverse housing options in each neighborhood can reduce commute times. Compact and mixed-use development can also help shorten vehicle trips and make walking more attractive.
- **Adding capacity only where needed** – when more cost-effective strategies have been attempted or ruled out, and where congestion remains at unacceptable levels, then strategic capacity additions may be considered. New capacity can facilitate growth, but poorly managed growth can create new mobility challenges.
    - New connector roads can be built to relieve congestion on a parallel road while also allowing for compact urban infill development.
    - Spot widenings can treat congestion bottlenecks on roadways that otherwise have capacity to spare.

Finding the right suite of treatments for congested roadways will be part of the ongoing CMP process and will be continued following CMP adoption. Stakeholder collaboration will be key. Best practices from peer agencies and the research literature will be followed. Each of the 34 individual facilities identified in the CMP network will receive a small, focused set of strategies based on the performance measures observed on the facility.

Above: roundabout on Route 9W in Glenmont. Photo courtesy of Creighton Manning Engineering.

Many strategies listed are already in use in certain locations in the region. This list is intended to serve as a menu of strategy options when examining solutions for a congested corridor.

The strategies listed in this section have been sourced from research literature from FHWA, FTA, Transportation Research Board, Texas Transportation Institute, and peer MPO Congestion Management Processes. Additional strategies may be sourced from upcoming planning efforts including CDTA's Transit Development Plan and the New York State Transportation Master Plan.

Congestion management strategies have been organized into the following eight categories. Note that many strategies overlap with two or more categories and are listed under one heading.

- **ITS & TSMO** – Intelligent Transportation Systems (ITS) and Transportation Systems Management and Operations (TMSO) strategies leverage technology and efficient management of existing infrastructure. Adaptive signal control, traffic incident management, work zone management, road weather management, and other strategies fall under this heading.
- **Transportation Demand Management** – these strategies seek to promote alternatives to single-occupancy vehicle travel to reduce overall travel demand. These strategies may encourage commuter carpooling or vanpooling, facilitate transit and non-motorized travel, promote employer-based strategies such as flexible work hours and work-from-home, and more.
- **Public Transit** – making transit more attractive or accessible may reduce the number of vehicles on the road. Transit strategies form three subcategories: Operations Strategies that seek to make transit travel times more reliable; Capacity Strategies that increase the frequency or extent of service; and Accessibility Strategies that improve intermodal connections to transit stops.
- **Bicycle and Pedestrian** – shorter trips can be facilitated on safe sidewalks, bicycle lanes, and multi-use sidepaths and trails, reducing the number of vehicles on the road and providing transportation options.
- **Access Management** – these strategies include policies and design guidance that minimize the number of driveways and intersecting roads accessing a higher-level roadway facility. Examples include reducing the density of curb cuts, placing curb cuts on signalized side streets to better accommodate left-turning vehicles, designing commercial developments to share one larger access point rather than several smaller driveways, and using right-in right-out access where appropriate.
- **Land Use** – policies that support compact development, mixed-use development, transit-oriented development, and urban infill can reduce trip lengths and make non-motorized travel more attractive. Land use regulations can also incorporate TDM strategies to make it easier to choose non-single-occupancy vehicle modes of travel.
- **Parking** – parking management strategies and parking information systems may help reduce traffic in areas where parking is limited and hard to find during peak demand.
- **Roadway Capacity** – per federal guidance, where more cost-effective strategies have been attempted or ruled out, capacity additions may be considered. Strategic removal of bottlenecks on facilities that otherwise have capacity to spare can greatly improve traffic flow. New service roads can relieve congestion on parallel roads while allowing for infill development.

ITS & TSMO Strategies

Many effective congestion management strategies fall into two related categories: Intelligent Transportation Systems (ITS) and Transportation Systems Management and Operations (TSMO). ITS & TSMO seek to leverage technology to improve roadway and transit operations. These strategies focus on getting the most mobility performance as we can out of existing infrastructure. New York State DOT has prepared a Statewide TSMO Plan that discussed many of these strategies in more detail. The Transportation Council should work with partner implementing agencies to ensure that ITS deployments use consistent communications standards to ensure interoperability.

This category is further divided into Interstate Highway Strategies and Signalized Roadway Strategies:

Interstate Highway Strategies

Next-Generation Traffic Incident Management (TIM) – emerging technologies and incident management techniques can be used to reduce congestion and improve traveler and responder safety. Strategies include back-of-queue warning systems, navigation-app notification of active responders in the vicinity, notification-based incident detection using crowdsourced data, and more. Next-Generation TIM was a recent Federal Highway Every Day Counts initiative.

Traffic Incident Management (TIM) Committee – supporting the establishment of a multidisciplinary TIM committee can help foster collaboration among responders and roadway operators. Incident response and clearance times could be examined as potential performance measures if a suitable data source could be established.

Work Zone Management – this suite of strategies aims to reduce work zone duration, provide traveler information about work zones, and improve worker safety. Strategies include coordinating road projects, adopting improved lane closing policies, work zone speed management, and more. More information can be found here.

Special Event Management – concerts, fairs, festivals, sporting events, college graduations, and other large public events can create traffic congestion and parking challenges that take hours to resolve. Advance planning and coordination with event managers to develop traffic control plans, protocols, and procedures can help mitigate traffic impacts. More information can be found here and here.

Road Weather Management – strategies such as temperature probes to detect icing conditions, one pass clearing operations, trailer plows (tow plows) and wing plows, and employer-based strategies such as flexible work hours can help mitigate congestion caused by

snow events. ITS assets such as variable message signs can also be used to provide advance warning of inclement weather. More information can be found here.

Ramp Flow Control/Ramp Metering – Signals installed on freeway on-ramps can control the frequency at which vehicles enter the flow of traffic, often at a rate dependent on freeway traffic volume and speed. A 2023 study of I-270 in Maryland found that the implementation of ramp metering resulted in a 13% to 17% travel time savings, with morning peak period congestion noticeably reduced. More information can be found here.

Variable Speed Limits – this Federal Highway Administration Proven Safety Countermeasure can reduce freeway crashes by up to 34%. This strategy can improve speed harmonization, reducing hard braking events and preventing traffic jams from forming. More information can be found here.

Queue Warning – Queue warning systems use vehicle sensors to determine the presence of downstream congestion or crash-prone conditions and warn drivers of these conditions on overhead dynamic message signs. Drivers are then more likely to expect slowing traffic, hard braking or other erratic traffic flow, which may reduce the crash risk. In Minnesota, the state's queue warning system "MN-QWARN" has reduced crashes on a segment of I-94 by 22%.

Pavement Recycling Technologies – emerging in-place pavement recycling technologies can reduce work zone duration and, in some cases, save money. Strategies include rubblization/full depth reclamation and cold in-place asphalt recycling.

ICM (Integrated Corridor Management) – corridors may contain parallel roadways serving the same flows of people and goods and would benefit from being operated cooperatively. According to the USDOT Intelligent Transportation System Joint Program office, "Through an ICM approach, transportation professionals manage the corridor as a multimodal system and make operational decisions for the benefit of the corridor as a whole." An ICM Plan was prepared for the I-87/US-9 corridor in 2015. This ICM Plan should be refreshed with modern ITS.

Modern Interchange Geometrics – Innovative interchange designs, including varieties of single-point interchanges or Diverging Diamond interchanges, can promote smooth traffic flow while also reducing crash rates. Interchange Geometrics was the subject of a Federal Highway Every Day Counts initiative.

VMS/Traveler/Freight Information Systems – Variable Message Signs (VMS) can be used to warn motorists of traffic congestion, incidents, road closures, work zones and more. Modern traveler and freight information uses in-vehicle devices to provide real-time messages to travelers about freight parking availability, transit delays, and more.

Transportation Management Centers (TMCs) – TMCs are multi-jurisdictional facilities that house DOT or toll agency staff and responders under one roof. TMCs facilitate rapid collaboration among these agencies for crash response, special event traffic management, road weather management, and more. The TMC in Latham, operated by NYSDOT and the New York State Police, monitors traffic cameras, operates Variable Message Signs, and dispatches HELP trucks and other responders to crash incidents.

Signalized Roadway Strategies

Signal Retiming/Coordination – according to the Federal Highway Administration's Traffic Signal Timing Manual, traffic signal timing optimization may achieve a benefit-to-cost ratio of greater than 40:1 due to the low cost of implementation. On roadways with closely spaced signals, coordination techniques may be used to further improve traffic flow. The Transportation Council's Regional Signal Timing Program study, initiated in 2023, is in the process of optimizing timings on three corridors in the region.

Advanced (Adaptive, etc.) Signal Control – advanced signal control systems, such as Adaptive Traffic Signal Control (ASCT), can use real-time sensor data to continuously distribute green time equitably for all traffic movements. These systems may be suitable for signalized arterials with highly variable traffic. Adaptive Signal Control was the subject of a Federal Highway Every Day Counts initiative.

Real-time ATSPMs/Central Signal Control – with Automated Traffic Signal Performance Measures (ATSMPs), real-time hardware status and traffic data can be provided by traffic signals to signal operators to assist with timing improvements and maintenance. Utah DOT maintains an online dashboard with real-time and archived data from over 2,000 signals available to planners and engineers to support transportation studies.

Upstream Detection – Upstream (or mid-block) detection can provide signals with additional sensor data to adjust timing in real-time to accommodate platoons of arriving vehicles. "Dilemma-zone" detectors can detect oncoming vehicles that would arrive on yellow or red and extend the green time by a second or two to safely pass them through the intersection.

Roundabouts – Roundabouts save lives – according to the Federal Highway Administration, roundabouts cut crash rates in half, and reduce fatal and serious injury crashes by 78% or more. Roundabouts can also promote smooth traffic flow and reduce vehicle emissions, as most vehicles no longer need to come to a complete stop.

Intersection Turn Lanes – left turn lanes safely remove left-turning vehicles from the through lanes, reducing crashes and promoting traffic flow. Left turn lanes must be long enough to accommodate demand and not spill back into the through lanes. Right turn lanes similarly remove slowing vehicles from through lanes. Two-way left turn lanes can be used to safely

accommodate mid-block turns in areas with mid-block driveways. Adequate turn lanes are essential to safe and efficient vehicle movement on signalized arterials.

Access Management – high driveway density is problematic for both safety and traffic flow. Strategies to improve access management include driveway consolidation, driveway relocation (ideally onto signal-controlled side streets), limiting allowable movements at driveways (such as right-in/right-out), moving driveways out of intersection approaches, providing adequate turning lanes, connecting parcels together with service roads, and more. Corridor Access Management is an FHWA Proven Safety Countermeasure, and may reduce fatal and serious injury crashes by 25% or more on urban/suburban arterials.

Transportation Demand Management Strategies

Transportation Demand Management (TDM) strategies seek to promote alternatives to single-occupancy vehicle (SOV) travel to reduce overall travel demand. This category is subdivided into Employer-based TDM Strategies, which require partnership with regional employers for implementation, and Regional/Local TDM Strategies, which may be implemented by public entities. TDM is related to other strategy categories including Public Transit Strategies, Accessibility Strategies, and Bicycle & Pedestrian Strategies.

Employer-based TDM Strategies

Work-From-Home Policies – telecommuting reduces traffic volume, congestion, and vehicle emissions during peak periods by removing commuter vehicles from the road. According to Inrix, remote work remains much higher than pre-COVID levels in American cities, with 10-30% of workers remaining remote.

Flexible Work Hours ("Staggered start") – on many commuter roadways, peak period congestion occurs from 8 a.m. to 9 a.m. and 5 p.m. to 6 p.m. due to many office-based jobs working nine to five. Allowing employees to work earlier or later gives them the option to avoid peak traffic.

Compressed Work Week – giving employees the option to work four 10-hour days instead of five 8-hour days reduces commuter trips as well.

Encourage Carpooling – employers may encourage employees to carpool and may even offer incentives for doing so, such as discounted or reserved parking.

Sponsor Vanpools – employers can sponsor a subsidized vanpool program for workers with long commutes. A vanpool is a group of people who lease a van for the purposes of commuting to work together. They share the responsibilities of driving and vehicle upkeep in exchange for a lower-cost commute. Employers can offer the Qualified Transportation Fringe Benefit to their employees who vanpool to work.

Universal Access Programs – employers, colleges and universities, and apartment complexes can partner with transit providers to subsidize the cost of ridership for their employees, students, and residents. UAP is effective on existing transit routes where no service expansion is needed. CDTA has established Universal Access partnerships with many regional organizations.

Regional/Local TDM Strategies

Employer Outreach and Incentive Programs – outreach to large employers to provide information on TDM strategies, such as ridesharing programs, may help promote adoption of these programs. Funding may be provided to employers who participate to help offset costs.

Regional Carpool/Vanpool Matching – In the Capital Region, carpool and vanpool matching for commuters is provided by Capital Moves, the Capital Region affiliate of 511NY Rideshare. Park and Ride lots can further help facilitate ridesharing.

Education/Outreach Programs to Encourage Biking/Walking – outreach programs may include walking and biking to school/work events, in-classroom instruction programs, walking school buses, social media campaigns, and more.

Incentives for Ridesharing or Taking Transit to Special Events – public agencies may partner with employers and event organizers to provide increased transit service or shuttle services to special events, reducing parking demand and relieving traffic congestion. Venues may offer rideshare incentives such as discounted or favorable parking.

Discount/Reward Programs – offering discounted transit fares to targeted populations (such as "Choice Riders") may promote transit usage. Reward programs can help build habits by offering incentives for repeat riders.

Targeted Bus and Shuttle Service – bus and shuttle services may be targeted at trip generators such as large businesses, hospitals, schools, and universities, providing travel options and reducing parking demand.

Youth Transit Pass Programs – habits built in youth are carried into adulthood, and children who become comfortable riding transit are more likely to continue to ride as an adult. Discounted transit fares may be offered to high school and college students to get them familiar with the available transit system. CDTA offers a Summer Fun Pass, allowing children to ride at a discounted rate over the summer.

Mobility on Demand – in addition to fixed route services, transit providers may offer on-demand service, with riders requesting a ride via a smartphone app. These services can provide first or last-mile connections, filling gaps in the fixed route network. CDTA offers FLEX On-Demand shuttle service via its Navigator app.

Dynamic Pricing on Toll Facilities – dynamic pricing may help shift traffic to off-peak periods on congested toll facilities. Dynamic Pricing uses Variable Message signs to display real-time toll costs to drivers, increasing driver awareness of trip costs and encouraging them to travel off-peak. In the Capital Region, the New York State Thruway and Berkshire Connector and the only toll facilities.

High-occupancy vehicle ("Carpool") Lanes – on freeways, lanes may be designated as HOV lanes, encouraging carpools, vanpools, and transit use. Managed lanes are most effective on freeways that serve large commuter populations.

Transportation Management Associations (TMAs) – a TMA is an association of employers and other entities, such as universities, that promotes transportation options and provides support services to its membership in order to reduce traffic congestion and facilitate the movement of people and goods within an area.

Public Transit Strategies

Enhancing access to public transit and increasing service and facility capacity is a proven strategy for managing congestion. These public transit strategies aim to enhance the safety and convenience of transit users while making public transportation more appealing.

Operations Strategies

Optimized Transit Service Schedules and Stop Locations – Optimizing transit services involves realigning routes, schedules, and stop locations to improve reliability, efficiency, and the overall attractiveness of using public transit.

Real-time Schedules & Arrivals – Providing real-time transit data to transit users, including information on schedules and arrivals, and offering user-friendly apps to enhance the transit experience. More information on technology-based transit improvements can be found here.

In the Capital Region, CDTA provides real-time bus location information via its online Service Map.

Transit Signal Priority – Transit Signal Priority (TSP) allows buses to get through intersections faster by modifying the length of red and green traffic lights as buses approach the intersections. TSP is useful along roadways with congested intersections, and it can also complement bus lanes. If repeated across multiple intersections along the roadway, the small time savings at each intersection may add up to significant time savings along the entire length of the bus route. More information on TSP can be found here.

In the Capital Region, Transit Signal Priority is currently implemented on the CDTA Red Line and Blue Line Bus Rapid Transit routes.

Queue Jumps – Queue jumps improve bus routes' speed and efficiency by allowing buses to pull ahead of general traffic at intersections with traffic lights. This tool is useful along roadways with congested intersections where full bus lanes may not be possible. Like TSP, if repeated across multiple intersections along the roadway, the small time savings at each intersection may add up to significant time savings along the entire length of the bus route. In the Capital Region, queue jumps are used on Central Ave in Colonie at the intersections with Wolf Road and New Karner Road. More information on TSP can be found here.

Bus Rapid Transit (BRT) – BRT systems utilize some combination of dedicated lanes, busways, traffic signal priority, off-board fare collection, elevated platforms, and/or enhanced stations to deliver faster, more efficient service. BRT is often a cheaper, more flexible alternative to fixed-route transit. More information on BRT can be found here.

In the Capital Region, CDTA operates BRT lines under its 'BusPlus' branding. The BusPlus Blue Line operates on the 15-mile corridor along the Hudson River and has more than 2 million boardings annually. The BusPlus Red Line operates on the 17-mile stretch of Route 5 between downtown Schenectady and downtown Albany, with 1.8 million boardings annually. The new

BusPlus Purple Line, beginning in November 2023, will provide BRT service along the Washington & Western corridors, serving destinations including the University at Albany and Crossgates Mall.

Transit Workforce Development – Transit agencies nationwide are facing staffing challenges. In response, the Federal Transit Administration initiated a Workforce Development Initiative to provide grant funding and technical support aimed at recruitment, retention, safety, and development of transit staff. More on the Workforce Development Initiative can be found here.

Capacity Strategies

Bus Lanes – bus lanes separate bus traffic from general vehicular traffic and congestion, thereby improving their bus routes' speed and reliability. More information on Bus Lanes can be found here.

Bus On Shoulders During Peak Periods – Bus shoulders separate bus traffic from general vehicular traffic and congestion, thereby improving their bus routes' speed and reliability. These lanes typically repurpose a boulevard's, highway's, or expressway's shoulder (breakdown lane) for bus use. These lanes are useful on high-speed roadways that are typically congested during peak periods (rush hours), but they can be used during other congested periods too. More information on Bus on Shoulders can be found here.

Increase Frequency of Service – Increasing the frequency of bus services involves the reduction of headways and the extension of operational hours. This approach aims to provide transit users with more frequent and readily available transportation options, reducing waiting times and enhancing overall transit accessibility.

Expansion of Transit Network – The expansion of the existing transit network could include the addition of new routes, bus stops, service types, or increased service frequency. By broadening the scope of transit offerings, this strategy seeks to improve and incentivize transit utilization, by catering to a wider range of user needs and preferences.

Demand-response Transit – Demand-response transit includes non-fixed route, flexible transit services like CDTA's Flex service. Demand-response transit provides door-to-door service by customer request and requires advanced scheduling by the customer. More information on demand-response transit can be found here.

Accessibility Strategies

Improvements to Pedestrian Facilities Near Stops – Enhancing pedestrian facilities that provide access to transit stations and stops are essential infrastructure to encourage safe and convenient access to public transit.

Provisions for Bicycles on Transit Vehicles and at Transit Stops – Enhancing provisions for bicycles on transit vehicles and at transit stops encourages more potential users to utilize the public transit system. Many CDTA buses have bike racks on the front for this purpose.

Bicycle and Pedestrian Strategies

Building safe and accessible bicycle and pedestrian facilities can help shift shorter trips out of cars, reducing congestion and improving air quality. These strategies may be used in conjunction with Public Transit strategies to provide first and last-mile connections to transit. Pedestrian facilities are particularly effective in high-density areas with limited parking supply.

Sidewalks and Crosswalks – safe walking facilities can help shift trips out of vehicles, especially in high-density areas. Federal Highway's STEP (Safe Transportation for Every Pedestrian) Program identifies a number of treatments that can be used to improve the visibility and safety of pedestrian facilities. Gaps in sidewalk connectivity should be filled and designed for all user groups.

Leading Pedestrian Intervals (LPIs) – traffic signals may be re-timed to provide 3 to 7 seconds for pedestrians to enter the crosswalk before giving the green light to conflicting turning movements. LPIs increase pedestrian visibility and raise the likelihood of motorists yielding to pedestrians. LPIs are an FHWA Proven Safety Countermeasure, reducing pedestrian crashes by 13%.

Passive Pedestrian Detection – emerging technologies allow traffic signals to detect the presence of pedestrians via sensors, without relying on pedestrians using push-buttons. These technologies may help improve pedestrian safety and improve traffic flow by allowing the signal to provide safe crossing intervals when pedestrians are present.

Bicycle Lanes – bike lanes reduce traffic stress by providing dedicated space on a roadway. Bike lanes help make bicyclist positioning more predictable to motorists and reduce conflicts. Protected bike lanes, separated by a painted median or raised curb, further improve safety. Bike lanes should connect key destinations such as transit stations, shopping districts, employment centers, recreational areas, neighborhoods, and popular commuting routes.

Bicycle Routes and Multi-Use Trails – dedicated walking and biking facilities that run parallel to major roadways or connect major destinations also help shift trips off the road. These facilities can often be built in otherwise constrained right-of-ways, such as behind parcels, on utility lines, or Rails-to-Trails.

Bike Share and Micromobility – bike share programs such as the CDPHP Cycle! Program allow users to check out a bike using a smartphone app, providing an additional first and last-mile travel option. Emerging micromobility options, such as e-scooter or e-bike sharing, are rapidly proliferating in cities nationwide. These programs complement existing transit services, effectively extending the range of each transit stop.

Many bicycle and pedestrian strategies are discussed in more detail in the Transportation Council's Complete Streets Design Guide.

Access Management Strategies

Access Management refers to the design and control of where vehicles enter or leave a roadway. High density of driveways and side streets impedes traffic flow and creates high-crash conditions. Applying best practices in Access Management can improve traffic flow and reduce crashes by as much as 25-31% on urban and suburban arterials.

Reduce Driveway Density – closing underutilized driveways, consolidating two or more parcels into a single driveway, and relocating driveways to side streets can reduce the number of access points. This is most easily implemented during the site plan phase. In retrofit situations, public agencies must work with property owners to implement Access Management strategies.

Managing Spacing of Intersection and Access Points – uniformly spaced signals can help traffic flow by enabling more effective traffic signal timing coordination. Spacing access points evenly raises driver awareness of where vehicles are expected to enter or exit the roadway.

Limiting Allowable Movements – limiting driveways to right-out only, or right-in right-out, can improve traffic flow and safety. Left turns can more safely be accommodated on signalized side street intersections, by U-turns at traffic signals, or at roundabouts downstream.

Placing Driveways Away from Intersections – driveways close to signalized intersections create conflict with queued vehicles and turning vehicles. Driveways should be placed as far from busy intersections as possible. Driveways near intersections should be restricted to right-in right-out.

Raised Medians – on high-volume arterials where left turns can't be safely accommodated, raised medians may be used to direct left-turning vehicles to signalized intersections to U-turn.

Adequate Turning Lanes – turning lanes should be of adequate length so as not to spill back into travel lanes, impeding traffic and creating a crash hazard. Two-way left turn lanes in the center of the roadway can improve safety on roadways with high driveway density. Dedicated turning lanes at intersections are a FHWA Proven Safety Countermeasure.

Connections Between Parcels – where possible, parcels should be connected in the rear to allow travelers to visit more than one destination without re-entering the major roadway. This strategy is effective on commercial corridors and mixed-use corridors, where travelers are likely to visit more than one destination.

Service and Frontage Roads – lower speed service roads that run parallel to larger arterials can accommodate travelers making more than one stop without re-entering the major roadway.

Shared Access – particularly effective for mixed-use developments, several parcels can share one major access point, such as a signalized intersection. A local example in the Capital Region can be found at Winter Creek Blvd off US-9 in Latham, where an apartment complex and several retail sites share one signalized driveway, greatly reducing driveway density in the area.

Land Use Strategies

This suite of strategies aims to reduce travel times by reducing distances between housing, places of employment, and essential services. Land Use strategies also seek to promote better street network connectivity, connections to transit service, and promoting infill development in lieu of sprawl.

Provide Housing Options – there is not a 'one size fits all' type of housing. A balance of single-family and multi-family housing options should be provided in each neighborhood to ensure households seeking to relocate closer to jobs and essential services have options in each neighborhood.

Mixed Use Development – mixed-use zoning can greatly reduce trip lengths by allowing residential and commercial uses in the same area, or in some cases, in the same building. Developments with ground-floor retail and apartments on the upper floors enable retail trips to be made by walking and reducing vehicle dependence.

Transit-Oriented Development – compact development near existing transit stops can promote transit usage without the need for service expansions. New developments can be designed in cooperation with transit providers to ensure efficient transit service in the future. Transit-oriented development may feature amenities such as bike racks near transit stops and sidewalk connections to nearby destinations.

Redevelopment and Infill – allowing infill development of vacant parcels and incentivizing redevelopment of underutilized parcels helps keep communities compact, reducing travel times and improving walkability. Caution must be taken to ensure that the roadway network has the capacity to take on the additional trips from redeveloped parcels.

Improving Street Network Connectivity – dead-end or cul-de-sac side streets off congested roadways contribute to further congestion, as travelers on these side streets have no choice but to drive on the congested roadway for all their trips. Improving street continuity where possible can give travelers options for avoiding congested roadways. Caution must be used to avoid placing traffic on formerly low-volume residential streets that may reduce walkability and safe driveway access.

Mitigation Costs – in the Capital Region, the Town of Colonie and Town of Malta maintain area-wide Generic Environmental Impact Statements (GEIS) that have provisions for collecting transportation mitigation costs from developers. These costs vary based on the number of trips the development is expected to generate, and how these trips pass through congested roads

and intersections. These programs have helped Colonie and Malta collect millions of dollars to fund transportation improvements such as intersection improvements, turning lanes, and service roads. Transportation Council staff assist these communities by using the regional Travel Demand Model to model the traffic impacts of proposed developments.

Parking Strategies

Parking management strategies and parking information systems may help reduce traffic in areas where parking is limited and hard to find during peak usage periods. Managing parking and providing real-time information can help prevent roadway networks from becoming overburdened, especially during special events.

Real-time Parking Information – sensors installed in parking garages and other paid parking lots can monitor parking availability and provide real-time availability information via smartphone apps. These systems can reduce congestion caused by drivers looking for available parking spaces. These systems can also provide notices of parking facility closures.

Parking Management – parking in downtown areas is in limited supply, and some cities are choosing to manage parking supply as a means of reducing traffic in congested areas. Dynamic pricing on parking meters and lots can be used to raise parking rates during periods of peak congestion. Smartphone apps can be used to provide information on parking rates to drivers, and lower rates can divert them to less congested zones.

Park-and-Ride Lots – park-and-ride lots allow commuters to park their vehicles and then take transit, carpool, or vanpool to work. Lots vary in size, and parking is typically free (or low cost compared to parking in a downtown area). Amenities such as covered waiting areas may be provided. Park-and-ride lots are effective when combined with Transportation Demand Management strategies that encourage carpooling and vanpooling. Lots are typically located outside of congested downtown areas.

Remote Parking for Special Events – concerts, fairs, festivals, sporting events, college graduations, and other large public events can generate very high parking demand. Parking areas may take hours to fill before the event or to empty out after. Providing discounted or favorable parking for high-occupancy vehicles may reduce parking demand. Providing shuttles to remote parking lots can help spread the traffic impact and reduce queueing times.

Curbside Management – this emerging suite of strategies grew in importance following COVID, with the growth of local deliveries that occupy curbside space in downtown areas. Curbside management strategies seek to inventory, optimize, allocate, and manage available curb space in high-density areas to maximize mobility, safety, and access for residents and businesses that rely on curbside space.

Roadway Capacity Strategies

Per Federal guidance, strategies that add single-occupancy vehicle capacity to roadways may be considered only after more cost-effective operational strategies are attempted or ruled out. Strategic removal of bottlenecks on facilities that otherwise have capacity to spare can greatly improve traffic flow. Spot widenings to add new turning lanes can add capacity without adding new through lanes. New service roads can relieve congestion on parallel roads while allowing for infill development.

Intersection Turning Lanes – turning lanes should have sufficient capacity to prevent frequent spillback into through lanes. Appropriately sized turning lanes improve both traffic flow and safety by reducing conflicts between turning vehicles and through-moving vehicles. Dedicated turning lanes are a FHWA Proven Safety Countermeasure.

Spot Widenings – on signalized arterials, short segments of roadway may be widened by adding additional turning lanes or through lanes to treat highly localized bottlenecks. Strategic mid-block widenings to accommodate busy driveways or side-streets may remove bottlenecks on roadways that otherwise have capacity to spare. Spot widenings are typically short (one to three blocks) and can improve mobility around major trip generators.

Parcel Connections and Service Roads – on commercial or mixed use corridors, connections behind parcels can help travelers visit multiple destinations without returning to the congested major roadway between trips. Lower speed service roads that run parallel to larger arterials can also help accommodate travelers making more than one stop without re-entering the major roadway.

Interchange Geometrics – in the Capital Region, many of the most congested locations on Interstate Highway facilities are at junctions. Regional traffic patterns may have shifted considerably since these facilities were built, and interchange ramp configurations should be reevaluated to ensure each ramp has sufficient capacity for modern traffic volumes.

There are two types of interchanges: service interchanges connect freeways to non-freeway facilities (usually signalized arterials), and system interchanges connect two or more freeway-level facilities. Modern service interchange designs, such as single-point interchanges or Diverging Diamond interchanges, can promote smooth traffic flow while also reducing crash rates. In the Capital Region, many system interchanges are 'stack' or cloverleaf-like designs, which may be reevaluated with a modern lens to reduce land use footprint and better accommodate today's traffic flows. Interchange Geometrics was the subject of a FHWA Every Day Counts initiative.

New Roads and Road Widenings – per Federal guidance, these strategies are to be considered options of last resort, as new roads and road widenings carry ongoing maintenance costs that must be paid in perpetuity. When considering new roads and road widenings, benefits and costs must be studied and weighed against one another. New capacity may facilitate growth and economic development in the areas they serve, and may bring effects such as vehicle emissions, noise, traffic, and safety impacts to nearby communities. For roadways that only experience non-recurring congestion caused by crashes or other events, widenings may do little to treat the congestion. New capacity may provide congestion relief in areas where unmet demand does not exceed the new supply.

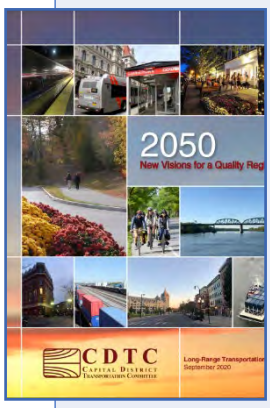
Above: Geyser Road Trail in Saratoga Springs. Photo Courtesy of GPI.

Programming and Implementation

Candidate projects that implement strategies consistent with CMP strategy recommendations may be considered for federal funding through the Transportation Council's TIP and may pursue discretionary funding opportunities as they arise. Federal regulations require that the CMP include: "Identification of an implementation schedule, implementation responsibilities, and possible funding sources for each strategy (or combination of strategies) proposed for implementation."

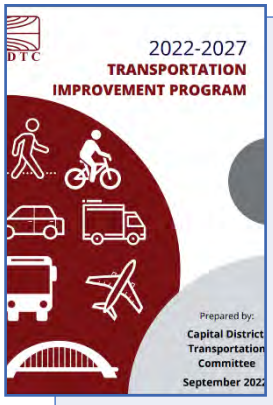
Transportation Council staff will work with the TIP Task Force to create an updated scoring process for the upcoming TIP update in 2024. The TIP Task Force met in October 2023 to discuss how best to connect CMP recommendations to funding. Task Force members expressed support for utilizing federal funding for projects that implement cost-effective CMP strategies, such as signal technology upgrades and timing improvements, as funding allows. Congestion needs will be balanced against other regional priorities such as infrastructure maintenance. Projects that implement CMP strategies should also be encouraged to pursue discretionary funding sources, such as TAP-CMAQ and federal grant opportunities, as they become available in order to reduce demand for more flexible federal funds. Use of state funding through the Regional Economic Development Councils and NYS Department of Environmental Conservation's Climate Smart Communities Program, among others, should also be encouraged.

In addition, federal regulations require that the performance measures and strategies identified in the Congestion Management Process must be reflected in the Long-Range Metropolitan Transportation Plan and considered in the development of the Transportation Improvement Program. Both of these planning products are expected to be updated shortly after the adoption of the CMP. The implementation timeframe of both planning products is discussed on the following page.



Metropolitan Transportation Plan (MTP) - the next update to the region's long-range MTP is expected to begin in 2024 with adoption in 2025.

The multimodal performance measures idenfitied in the CMP (including both the Regional-level and Corridor-level measures) will be incorporated into the upcoming MTP update. These system performance measures will be used in conjunction with performance measures derived from other planning focus areas to identify and priortize locations of transportation need and future projects. CMP strategies will be incorporated into the MTP as well.



Transportation Improvement Program (TIP) - the next update to the region's TIP is expected to begin in Fall 2024 with adoption in 2025. This document lists all projects programmed with federal funding for a five-year period.

The TIP project application and scoring process will be updated in early-mid 2024 prior to the project solicitation. The updated process will include a path to funding for projects consistent with CMP strategy recommendations. A CMP project category or set-aside of funding may be considered.

Implementation Schedule

The next update to the region's Transportation Improvement Program (TIP) is expected to begin in Fall 2024 with adoption in 2025. The updated TIP is expected to cover Federal Fiscal Years 2025 through 2030. The implementation schedule for projects consistent with CMP recommendations will fall within this timeframe. Projects may be programmed with design phases in the early years of the TIP and construction phases in the following years.

The long-range Metropolitan Transportation Plan (MTP) update will begin in 2024 with adoption in 2025. The MTP will have a planning horizon of no less than 20 years as of the date of adoption. The performance measures and strategies developed for the CMP will be integrated into the updated MTP and will be used to inform short-range and long-range actions over this timeframe.

In addition, discretionary and competitive funding opportunities may continue to arise that fall outside the scope of traditional MPO processes but would serve as funding sources for CMP implementation. Examples of grant programs in the recent Bipartisan Infrastructure Law include RAISE (Rebuilding American Infrastructure with Sustainability and Equity), INFRA (Nationally Significant Multimodal Freight and Highway Projects), MEGA (National Infrastructure Project Assistance Program), ATTAIN (Advanced Transportation Technology and Innovation) and more. It should be noted that the federal Congestion Relief Program is only for urbanized areas with a population of at least 1 million and is therefore not available for our region. Grant programs are also offered by New York State, including opportunities such as the Annual Consolidated Funding Application (CFA) and the Climate Smart Communities Program.

The CMP will be maintained as an ongoing process with an annual refresh of the data and performance measures, along with identification of any shifts in congested locations and emerging congestion needs. As such, the recommendations provided by the CMP will remain up-to-date and can be drawn from as competitive grant opportunities become available.

Implementation Responsibilities

The Capital Region Transportation Council is responsible for integrating the CMP into the upcoming MTP and TIP updates as discussed above. The Transportation Council will work closely with its TIP Task Force to ensure that the updated TIP project selection process allows for consideration of projects that implement CMP recommendations as funding allows. Both updates will involve close collaboration with state, regional, and local planning partners from across the region through the Transportation Council's advisory groups and other channels.

The Federal Highway Administration recommends two approaches for integrating CMP analyses into regional prioritization of strategies in the CMP Guidebook:

> **Use the CMP in criteria for prioritizing projects in the MTP and/or TIP** – this process varies considerably among MPOs, but usually involves developing a scoring system that rewards projects that seek to implement a CMP strategy in a congested area. The Transportation Council's scoring process will be reworked to ensure that cost-effective ITS and operations projects may be competitive for TIP funding.
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> **Explicitly set aside funding for congestion management projects** – some MPOs set aside a certain percentage of available funding explicitly for CMP implementation. Such a set-aside may operate as a standalone solicitation (per FHWA, "The CMP can be used to define criteria for rapid allocation of funds to solve straightforward congestion problems."), or as part of the larger TIP project solicitation. The Transportation Council will work with its TIP Task Force to determine which approach may work best for CMP implementation.

Roadway owners are responsible for preparing TIP project applications and competitive grant applications for roadways identified in the CMP as congested locations. Most of the roadways in the CMP network are maintained by NYSDOT, the Thruway Authority, or Cities. The Transportation Council will disseminate the analysis and recommendations of the CMP to these roadway owners and work with these entities to incorporate appropriate strategies into projects involving congested facilities. The Transportation Council will also work with CDTA to ensure that recommendations relating to transit operations are incorporated into projects as appropriate. Local municipalities that are home to NYSDOT-maintained roadways will also be involved to ensure that local context and needs are considered in harmony with CMP recommendations.

Funding Sources

Funding sources programmed in the TIP that may be used for CMP implementation include:

Surface Transportation Block Grant Program (STBGP): The majority of STBGP funds are obligated in urbanized areas in proportion to their share of the state's population. MPOs have discretion over their urban area's share of these funds (STBGP-Urban). Eligible activities include transit capital projects, operational improvements, bicycle and pedestrian projects, innovative ITS projects, and more.

National Highway Performance Program (NHPP): The NHPP supports the maintenance and performance of the National Highway System (NHS). Eligible activities include bike/ped improvements, traveler information systems, infrastructure based ITS, and more. Many of the roadway facilities identified as congested in the CMP are on the National Highway System.

Transportation Alternatives Program (TAP) and Congestion Mitigation and Air Quality (CMAQ): Nearly all congestion management strategies are eligible for one or both of these funding sources. The TAP program funds projects that support multimodal mobility, including bike/ped infrastructure. The CMAQ program funds a broad range of traffic operations and ITS projects. It should be noted that CMAQ funding is not directly available to the Transportation Council as our region is not in non-attainment for any National Ambient Air Quality Standards but is instead available through a statewide solicitation.

Carbon Reduction Program: This new funding source was introduced in the Bipartisan Infrastructure Law and has broad eligibility similar to the CMAQ program. Eligible projects include transit projects, on-road and off-road bike/ped trails, advanced transportation and congestion management technologies, and certain projects that improve traffic flow that do not involve new capacity.

Design-Only Funding: To help prepare projects to compete for discretionary funding opportunities as they become available, projects may receive TIP funding for the Design phase only. This would enable a more accurate scope and cost estimate to be developed, which may assist in competing for discretionary funds.

The Transportation Council's TIP project selection process will be updated to ensure that projects that are consistent with CMP recommendations may score competitively for the funding sources listed above in the upcoming FY 2025-2030 TIP Update.

Additional funding sources not programmed directly in the TIP may include:

Developer Mitigation Funds: The Transportation Council assists the Town of Colonie and Town of Malta with their GEIS programs by preparing a transportation review of each proposed development and estimating a mitigation cost. Developer costs have been used to fund roadways, roundabouts, intersection upgrades, and access management improvements in these towns. Other communities could consider implementing GEIS programs to raise revenue from developers to implement congestion mitigation projects.

Discretionary Fund Sources: a variety of discretionary grants are available from USDOT for projects relating to Operations, Technology Deployment, Climate and Sustainability, and other CMP topic areas. A dashboard of discretionary funding opportunities is available at https://www.transportation.gov/grants/dashboard. Projects consistent with CMP recommendations may be considered for design-only funding to make them more competitive for discretionary grants as they become available. Grant opportunities offered by New York State include the Annual Consolidated Funding Application (CFA) and the Climate Smart Communities Program.

Corridor Studies

Each year, the Transportation Council conducts a number of concept development studies through its Community and Transportation Linkage Planning Program. Corridors identified as congested locations in the CMP may be effective areas for further study to identify how the recommended strategies would best be implemented in the context of their communities.

These studies may take the form of:

Corridor Concept Development Study: On signalized corridors, concept development studies could help to develop optimized signal timings, improvements to vehicle detection, improvements to access management, concepts to enhance multimodal mobility, and other improvements.

Integrated Corridor Management (ICM) Study: Transportation corridors often contain many parallel roadways serving the same flows of people and goods and would benefit from being operated cooperatively. According to the USDOT Intelligent Transportation System Joint Program office, "Through an ICM approach, transportation professionals manage the corridor as a multimodal system and make operational decisions for the benefit of the corridor as a whole." An ICM Plan was prepared for the I-87/US-9 corridor in 2015. This ICM Plan should be refreshed with modern ITS.

Systems Engineering Analysis (SEA) Study: Per FHWA, an SEA is required for all ITS projects using Federal funds per Title 23 CFR 940.11. These studies involve developing a Concept of Operations, defining System Requirements, and preparing a high-level design to ensure the interoperability of ITS systems and consistency with the Regional ITS Architecture. SEA studies may be used to help scope out projects involving Adaptive Signal Control, real-time signal analytics, traveler information systems, variable message signs, and other connected technologies.

Corridors that were subjects of concept development studies by the Transportation Council in recent years include Hoosick Road in the Town of Brunswick and US-4 in North & East Greenbush. As part of the ongoing CMP process, additional areas of congestion need will be identified as candidates for future studies.

Evaluation of Strategy Effectiveness

The final step in the eight-action Congestion Management Process is to evaluate the effectiveness of strategies that have been implemented so as to better inform future strategy selection. Per the FHWA Congestion Management Process Guidebook, this can be done using two general approaches:

> **System-level performance evaluation**: by monitoring regional-level performance measures (such as Level of Travel Time Reliability, Total Delay, regional vehicle-miles traveled, transit ridership, and more) year-over-year, we can determine if the region is moving toward improved mobility, or if congestion is getting worse. Monitoring trends can also help to determine if regional growth is being managed well, or if development on congested corridors is leading to worsening mobility metrics.
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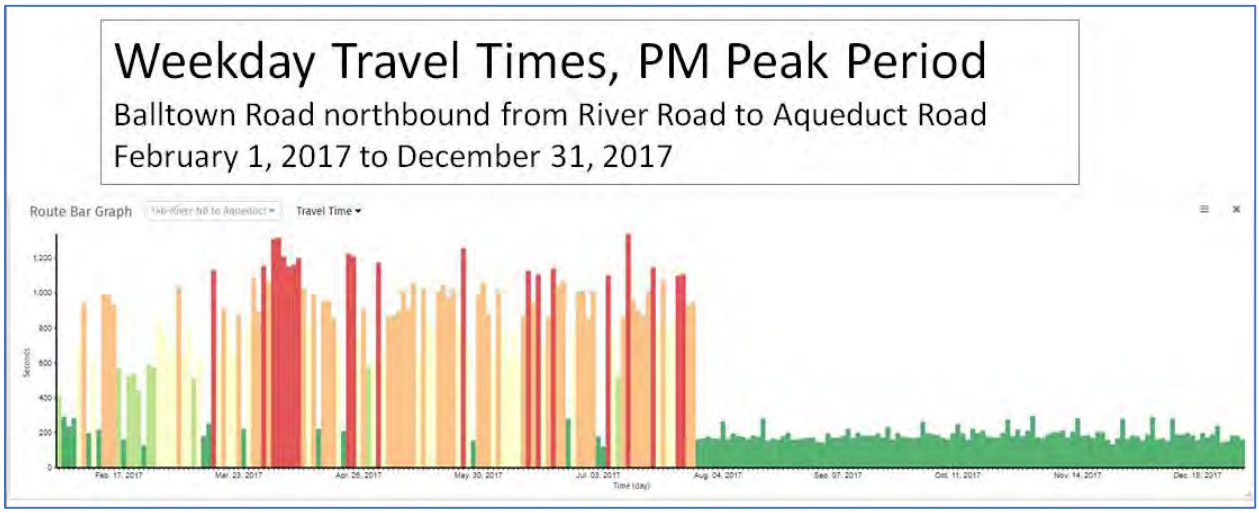
> **Strategy effectiveness evaluation**: Project-level analyses can help determine the effectiveness of specific strategies. Strategies found to be highly effective should continue to be promoted and implemented, while strategies found not to be effective may be re-evaluated. Project-level analyses may take the form of a before-and-after study.

An example before-and-after study prepared for the prior Metropolitan Transportation Plan update is presented below. The Rexford Bridge carries NY-146 over the Mohawk River. In 2017, a parallel bridge was built with an additional travel lane in each direction. In addition, a congested signalized intersection at the south end of the bridge was replaced with a roundabout. Travel times on NY-146 from before and after the opening of the new bridge were compared. The travel time analysis shows that delay was reduced and travel times became much more reliable following the completion of construction.

Above: Rexford Bridge before (left) and after (right) construction



Above: Travel times on Balltown Road before (left) and after (right) construction

Following implementation, all congestion strategies will be monitored for effectiveness to inform future decision making.

Next Steps

The Congestion Management Process will be maintained as an ongoing planning process. Using the methodology and policies outlined in this document, ongoing tasks will be performed in the coming years to ensure that the Transportation Council maintains an up-to-date understanding of mobility needs in the region. Ongoing tasks include:

- Performance measurement data will be refreshed annually as updated data becomes available.
- Traffic forecasts will be prepared to better understand which roadways will experience congestion concerns in the future.
- Strategy recommendations will be made for individual facilities. The online mapping tool will be updated to include corridor-level performance data and recommendations.
- Field visits will be conducted to congestion locations to gather additional ground-level data and help identify effective congestion management strategies.
- Performance measures and public comments collected by the CMP will be provided to future planning studies.
- Ongoing stakeholder collaboration will ensure that when a congested area is being studied, recommendations of the CMP will be considered.
- Before-and-after studies will be conducted to determine the effectiveness of implemented strategies, which will inform future strategy selection.