TRI-COUNTY REGIONAL
PLANNING COMMISSION
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# DRAFT
# Congestion Management Process

"Keeping the Region Moving Efficiently, Reliably, and Safely"

**February 28, 2017**

**Prepared by the Tri-County Regional Planning Commission**
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## Purpose

The Congestion Management Process (CMP) is a systematic and regionally-accepted approach for measuring and diagnosing the causes of current and future congestion and provides accurate, up-to-date information on transportation system performance and assesses alternative strategies for congestion management that meets the identified regional need. A CMP is required in metropolitan areas with population exceeding 200,000, known as Transportation Management Areas (TMAs). Federal requirements state that in all TMAs, the CMP shall be developed and implemented as an integrated part of the metropolitan transportation planning process. This CMP will be an on-going process, fully integrated into the TCRPC's transportation planning process. It is a "living" document, continually evolving to address the results of performance measures, concerns of the region, new objectives and goals, and up-to-date information on congestion issues.

The CMP uses an objectives-driven, performance-based approach to planning for congestion management. Through the use of congestion management objectives and performance measures, the CMP provides a mechanism for ensuring that investment decisions are made with a clear focus on desired outcomes. This approach involves screening strategies using objective criteria and relying on system performance data, analysis, and evaluation.

In Transportation Management Areas that are in non-attainment of ozone or carbon monoxide (CO) standards, Federal funds may not be expended for any new project that will significantly increase the carrying capacity for single-occupant vehicles (SOV's) unless the project results from a CMP. For the tri-county region, a significant increase in carrying capacity for SOV's is defined as a project that adds one or more through-travel lanes for a distance in excess of one mile or more on a roadway classified as a Collector or higher on the Federal functional class map for the area.

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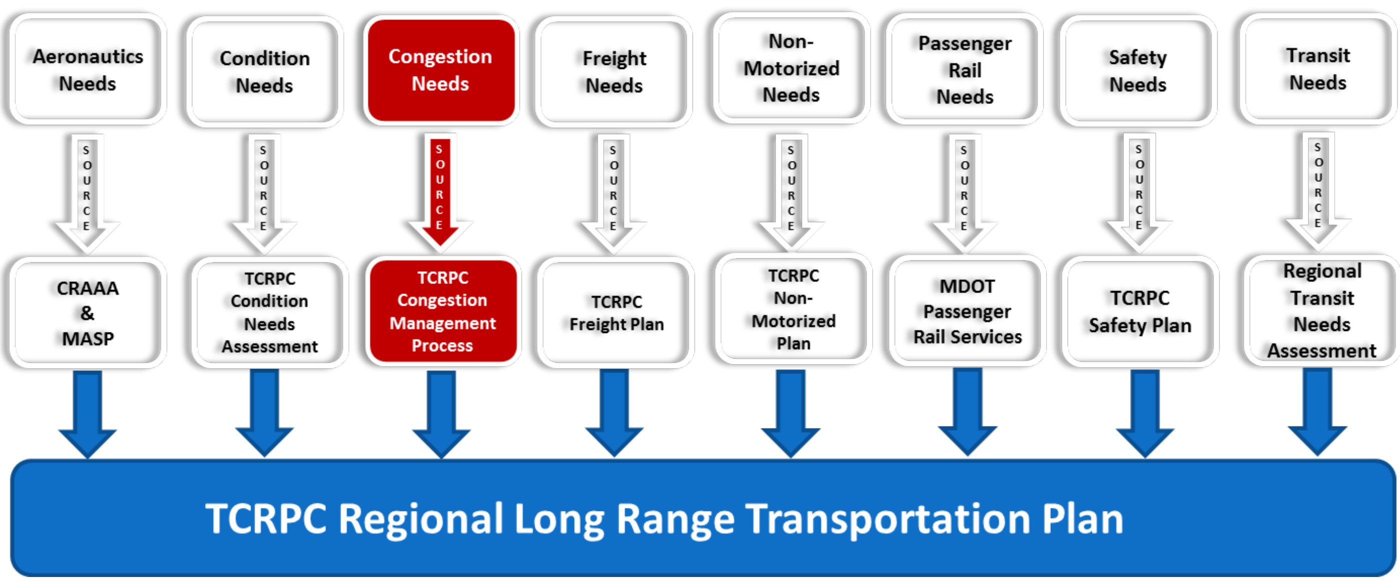
## How does the CMP fit into the TCRPC Transportation Planning Process??

There are eight unique areas of focus for the TCRPC Transportation Planning Process. These include aeronautics needs, pavement condition needs, congestion needs, freight movement reliability needs, non-motorized needs, passenger rail needs, safety needs, and transit needs. The TCRPC develops or updates its long range transportation plan every four years. Each of the elements listed make up the core of the regions long range transportation planning efforts. During the four years between plan adoptions, the TCRPC is working on each of the elements of the planning process to ensure that a comprehensive understanding of the transportation needs is well documented and shared with an informed public. Keeping each of the elements in the forefront allows for the most up to date information and analysis of transportation needs in region.

The graphic below shows how the CMP fits into the overall TCRPC Transportation Planning process:



## Congestion Management within the Tri-county region

The Congestion Management System (CMS) was first introduced by the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 and continued under the successor law, the Transportation Equity Act for the 21st Century (TEA-21). The CMS was intended to augment and support effective decision making as part of the overall metropolitan transportation planning processes.

In the early 1990's TCRPC staff developed a CMP (then called Congestion Management System CMS) to meet the federal regulations and serve the transportation planning needs of the region's urbanized area. That CMS included a method to provide information on the performance of the transportation system and on alternative strategies to alleviate congestion and enhance mobility. The CMS emphasized effective management of existing facilities through use of travel demand and operational management strategies. In cases where these methods are deemed ineffective to resolve the congestion issue of a corridor, capacity enhancing projects may be selected as the preferred alternative.

Whereas previous laws referred to this set of activities as a "congestion management system" (CMS), more recent surface transportation authorization law, refers to a "congestion management process," reflecting that the goal of the law is to utilize a process that is an integral component of metropolitan transportation planning.

While the CMS was often treated as a stand-alone data analysis exercise or report on congestion, the CMP is intended to be an on-going process, fully integrated into the metropolitan transportation planning process. The CMP is a "living" document, continually evolving to address the results of performance measures, concerns of the community, new objectives and goals of the MPO, and up-to-date information on congestion issues.

## Congested Defined

Highway congestion is caused when traffic demand approaches or exceeds the available capacity of the highway system. Though this concept is easy to understand, congestion can vary significantly from day to day because traffic demand and available highway capacity are constantly changing. Traffic demands vary significantly by time of day, day of the week, and season of the year, and are also subject to significant fluctuations due to recreational travel, special events, and emergencies (e.g. crashes and evacuations). Available highway capacity, which is often viewed as being fixed, also varies constantly, being frequently reduced by incidents (e.g. crashes and disabled vehicles), work zones, adverse weather, and other causes.

To add even more complexity, the definition of highway congestion also varies significantly from time to time and place to place based on user expectations. An intersection that may seem very congested in a rural community may not even register as an annoyance in a large metropolitan area. A level of congestion that users expect during peak commute periods may be unacceptable if experienced on Sunday morning. Because of this, congestion is difficult to define precisely in a mathematical sense – it represents the difference between the highway system performance that users expect and how the system actually performs.

Congestion can also be measured in a number of ways – level of service, speed, travel time, and delay are commonly used measures. However, travelers have indicated that more important than the severity, magnitude, or quantity of congestion is the **reliability of the highway system**. People in a large metropolitan area may accept that a 20-mile freeway trip takes 40 minutes during the peak period, so long as this predicted travel time is reliable and is not 25 minutes one day and 2 hours the next. This focus on reliability is particularly prevalent in the freight community, where the value of time under certain just-in-time delivery circumstances can be significant.

The ability to identify and measure different types of congestion is key to developing appropriate responses. **Recurring congestion** is defined as the relatively predictable congestion that either exists today or is predicted to exist in the future, caused by routine traffic volumes operating in a typical environment. **Non-recurring congestion** is defined as unexpected or unusual congestion caused by unpredictable or transient events such as accidents, inclement weather, or construction. For the purposes of the TRCPC CMP, system reliability will be measured as a performance measure for the region’s transportation network.

## Recurring Congestion

The TCRPC determines a roadway is congested when the total number of vehicles exceeds the number of vehicles that roadway was designed to safely carry for a 24-hour period of time. For instance, a 2-lane road in a suburban area may be designed to carry 13,200 vehicles per day. When the count reaches an average volume of 13,201 vehicles per day, that facility is deemed “congested”. This does not mean that adding capacity will occur, merely the facility will be flagged as deficient and studied further to determine a means to alleviate that congested situation.

In most situations, a remedy somewhat less than added capacity is selected as the preferred alternative. This represents a change of focus from past years when a widening project may have been the only solution considered. The TCRPC takes this conservative approach in an effort to provide a transportation infrastructure that is sustainable and still meets the demands and expectations of the traveling public and freight haulers throughout the region.

Future (2045) volume is determined using the TCRPC travel demand model built on the TransCAD software platform. The TCRPC travel demand model includes elements such as roadway and transit networks, and population and employment data to calculate the expected future demand for transportation facilities. Within the model, mathematical equations are used to represent each individual's decision making process of: "Why", "When", "Where", and "How" to make the trip, and "What" route to follow to complete the trip. The model results for these individual choices are combined so that the aggregate impacts of roadway vehicle volumes and transit route ridership on the average travel times can be determined

TCRPC staff processes the model output and develops a list of facilities that are expected to be deficient by the year 2045. This list is the basis for programming corridor related capacity deficiencies on the network that are included in the 2045 Long Range Transportation Plan. This deficiency list is then analyzed using the cafeteria options listed in Appendix A to determine the most efficient sustainable options for alleviating the congested conditions projected to occur in the future. Maps on pages 10-11 depict the current and future deficiencies as identified through this process.

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Map of Current Capacity Deficiencies

To Be added during the Long Range Plan Development

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Map of Projected 2045 Deficiencies

To Be added during the Long Range Plan Development

## Corridor Progression/Operations

In many instances the roadway facility has not exceeded its designed capacity yet congestion will be experienced. Most times this congestion is caused by delay experienced at signalized intersections. Individual road segments can operate as they were designed, only to have a poorly timed signals cause unnecessary delay to the traveling public.

While corridor progression is vital to keeping people and goods moving efficiently, individual intersections may need upgrades both geometric and technological to maximize efficiency. TCRPC will strive to maximize efficiencies along identified corridors of significance. These corridors have been selected because of their significant contribution to moving people and goods throughout the region. A map depicting these corridors is shown on the following page. Through focused investment, these key corridors can be upgraded and will move people and goods as efficiently as possible. A list of identified deficient intersections within the identified corridors of significance is listed in Appendix C.

The primary operational cost for the system as it is presented here is signalized intersections. There are three primary costs that are traditionally funded through the MPO, upgrades of the physical signals including the heads, controller boxes, detectors etc., communications upgrades, and optimizing the signals to work in unison, moving people and goods throughout the region as efficiently as possible. Upgrades and communications investments are done on the entire federal aid system. The optimization efforts are focused on key transportation corridors throughout the region noted earlier.

There is no proven template for determining need for this area of the transportation system. For this reason, staff will use the current funding levels as the basis for future needs projections.

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Corridors of Significance

Map

## Signal/Corridor Upgrades

As is the case with the entire transportation system, signal equipment wears out or becomes obsolete and needs replacement/upgrading. There are several hundred signalized intersections on the federal aid system in the area. The reliability of this equipment is crucial to the continued and efficient operation of the transportation system. Typically, one or two corridors can be upgraded in a year's time. Over the period of 15-20 years most of the major corridors could be retrofit with the latest technology.

A map depicting all of the regions signalized intersections is on page 14.

## Communications Upgrades

The ability for the individual intersection controllers to communicate with other controllers and a centralized control center is important to maintaining traffic flows in the region. Technology is being deployed that will allow for improved signal timing and real time operation of the signal system in times of planned and unplanned events that are outside the normal operating conditions of the system. These communications upgrades will make the system more responsive to real time demand.

## Corridor Progression/ Signal Optimization

The third piece in the transportation operations puzzle is Corridor Progression/Signal Optimization. This process determines an optimized signal timing plan that utilizes all available technology and data to allow the corridor to operate as efficiently as possible and allow for maximum capacity, possibly eliminating the need for costly added through lanes. As travel patterns change over time, these efforts will need to continue to maintain the maximum efficiency of the system.

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Signalized Intersections

MAP

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Non-recurring Congestion

Non-recurring congestion includes the development and deployment of strategies designed to mitigate traffic congestion due to non-recurring causes, such as crashes, disabled vehicles, work zones, adverse weather events, and planned special events. Approximately half of all congestion is caused by temporary disruptions that take away part of the roadway from use – or "nonrecurring" congestion.

The three main causes of nonrecurring congestion are: incidents ranging from a flat tire to an overturned hazardous material truck (25 percent of congestion), work zones (10 percent of congestion), and weather (15 percent of congestion). Nonrecurring events dramatically reduce the available capacity and reliability of the entire transportation system. This is the type of congestion that surprises the traveling public. We plan for a trip of 20 minutes and we experience a trip of 40 minutes. Travelers and shippers are especially sensitive to the unanticipated disruptions to tightly scheduled personal activities and manufacturing distribution procedures.

Aggressive management of temporary disruptions, such as **incidents, work zones, weather,** and **special events** can reduce the impacts of these disruptions and return the system to "full capacity."

In recent years, a great deal of time and funding has been dedicated to this form of congestion. The deployment of Intelligent Transportation Systems (ITS) that includes cameras and automated detection on the freeways and main arterials has greatly advanced the areas capabilities when it comes to detecting and responding to non-recurring congestion.

Another tool in addressing non-recurring congestion is the implementation of a courtesy patrol. To improve the safety and efficiency of the freeway system, many cities and states have implemented a Freeway Service Patrol (FSP). Although the name, hours of service, operational procedures, and equipment may vary from one location to the next, the goal remains the same: to clear incidents as quickly as possible and reduce the likelihood of congestion and secondary incidents. The services provided vary depending on the situation, and typically range from providing assistance to emergency responders at the scene of a crash, to changing a flat tire or providing gas to a stranded motorist.

While congestion may not yet be to a point where a service patrol is warranted on the roadways in the region, this approach should be considered in future reviews of the TCRPC CMP.

**CMP Characteristics**

The 2017 version of the TCRPC Congestion Management Process consists of 8 major characteristics. These characteristics include:

CMP Characteristics

1. Develop Congestion Management Objectives
2. Identify Area of Application
3. Define Network of Interest
4. Develop Performance Measures
5. Institute System Performance Monitoring Plan
6. Identify/Evaluate Strategies
7. Implement Strategies/Improvements
8. Monitor Effectiveness

1. <u>Congestion Management Objectives</u>

Historically TCRPC has traditionally relied on measures that related to capital improvements such as volume to capacity (V/C) and level of service (LOS). This revision of the CMP does not completely abandon that traditional approach. Current and future V/C and LOS are measures that TCRPC will continue to monitor. This new TCRPC CMP places a new emphasis on operations oriented measures.

Operations oriented measures are intended to focus on the experience of the system users. This approach is able to address non-recurring congestion where the traditional approach could not. This shift in focus allows for a transition from facility oriented measures such as traffic counts and speed, to trip related, user oriented measures such as mobility. TCRPC and its member transportation facility providers will strive to improve system performance by enhancing Mobility, Reliability, Productivity and Safety.

The following are objectives designed to address many types of congestion on many types of facilities:

*Objective 1 – Improve transportation system productivity by addressing capacity deficient miles on the federal aid system by funding improvements that provide sufficient capacity for the movement of people and goods throughout the region. Capacity is defined as 24-hour highway capacity or daily seats available on transit.*

*Objective 2 – Enhance mobility by reducing overall travel times and delays along “network of interest” by providing adequate intersection capacity for the throughput of people and freight and by strengthening the efficiency of corridor operations through continued investment in signal timing/progression efforts.*

*Objective 3 – Increase the reliability of the transportation system and reduce travel delay caused by incidents through enhancement of real time automated incident detection technologies and working toward improved response protocol when incidents are identified.*

2. Geographic Area of Application

For each of the three CMP objectives, "Areas of Application" must be determined. At a minimum the Area of Application should be the MPO study area. For the TCRPC CMP this Area of Application has been determined to be all of Clinton, Eaton and Ingham Counties. The map on page 19 depicts the Area of Application for the TCRPC CMP.

3. Network of Interest

A "Network of Interest" is the specific transportation subset within the Area of Application that will be the focus of a particular portion of the CMP. Traditionally, the entire MPO Metropolitan Area Boundary (MAB) would be the area of focus for the CMP. The TCRPC "Network of Interest: is defined as the entire National Highway System network.

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## Figure 1 – TCRPC MAP – Area of CMP Application

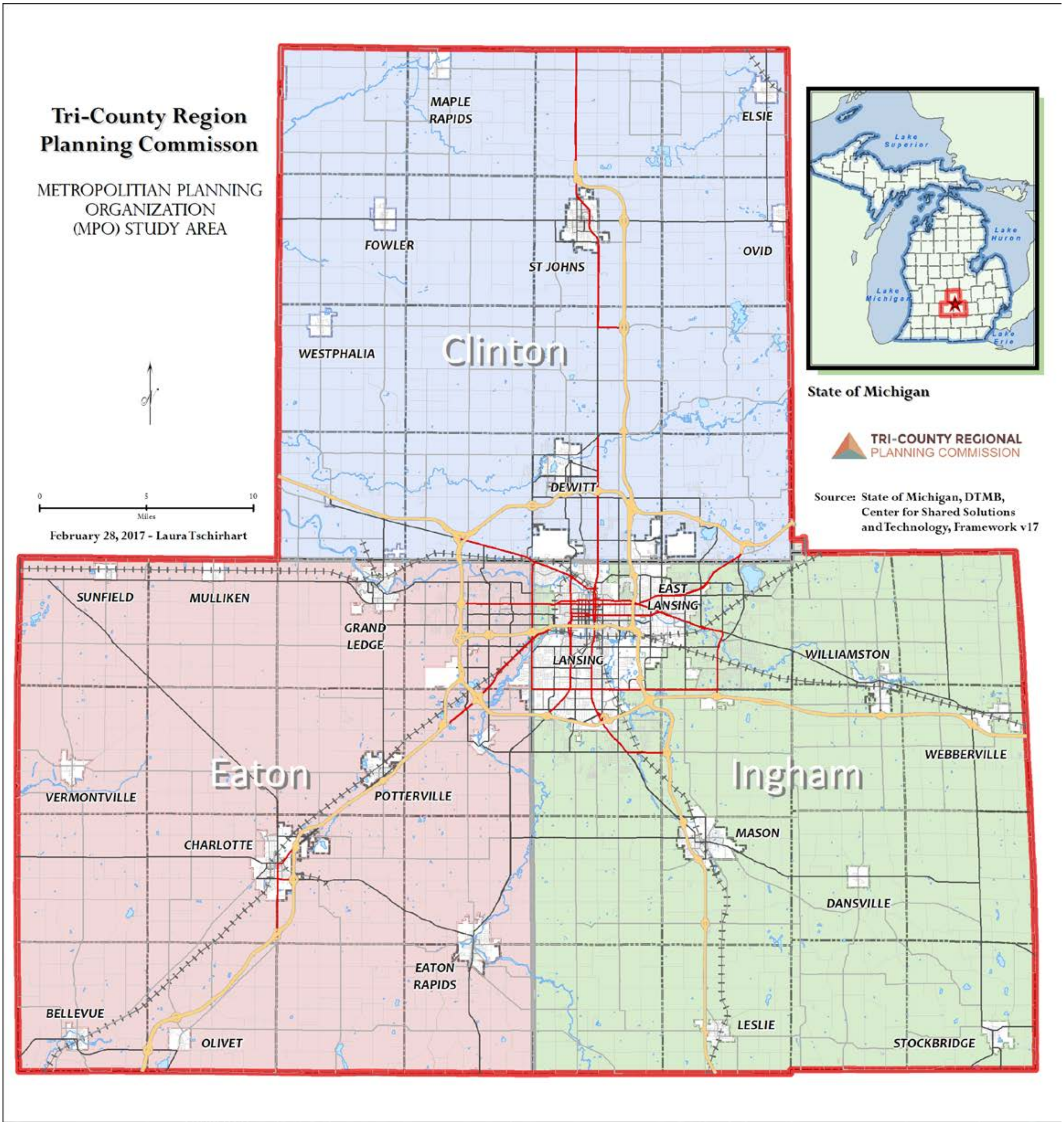

**Figure 2 – Network of Interest (NHS)**

## 4. Performance Measures

When signed into law on July 6, 2012, MAP-21 transformed the Federal-aid highway program by establishing new requirements for performance management to ensure the most efficient investment of Federal transportation funds. Performance management increased the accountability and transparency of the Federal-aid highway program and provided a framework to support improved investment decision making through a focus on performance outcomes for key national transportation goals.

As recipients of Federal-aid highway funds, the TCRPC is required to document how transportation investments made in an urban area achieve performance targets that make progress toward the defined national goals. For congestion reduction the national goal is to achieve a significant reduction in congestion on the National Highway System (NHS). A map of the NHS network in the region is shown on page 17.

The FHWA established numerous measures for assessing the performance of the transportation system. Two measures assess reliability: (1) Percent of Person-Miles Traveled on the Interstate System That Are Reliable (the Interstate Travel Time Reliability measure); and (2) Percent of Person-Miles Traveled on the Non-Interstate NHS That Are Reliable (the Non-Interstate NHS Travel Time Reliability measure). Together they are the Travel Time Reliability measures. Both of these measures assess Level of Travel Time Reliability (LOTTR), defined as the ratio of the 80th percentile travel time to a “normal” travel time (50th percentile). Data are derived from the travel time data set using either the National Performance Management Research Data Set (NPMRDS) or equivalent.

Two additional measures were established under the CMAQ program (the CMAQ measures) including two measures for traffic congestion: (1) Annual Hours of Peak-Hour Excessive Delay Per Capita; and (2) Percent of Non-SOV Travel where SOV stands for single-occupancy vehicle. Data for these two measures are derived from the travel time data set of NPMRDS. The second measure is a new measure developed to recognize the role of lower-emissions modes in meeting air quality goals.

The TCRPC will report baseline condition/performance and progress toward the achievement of all applicable targets in a system performance report in the metropolitan transportation plan.

## 5. System Performance Monitoring Plan

Historically, the availability of data has been the greatest challenge when determining if performance measures are meeting their mark. The TCRPC area is no different. Beginning in 2016 the TCRPC began an effort to collect traffic data on the entire 2,027 miles if the network. This information combined with travel time data gleaned from the National Performance Management Research

Data Set (NPMRDS) will provide the region with valuable data that can determine the success of the measures implemented to address congestion in the region.

For Objective 1 (*Improve transportation system productivity by addressing capacity deficient miles on the federal aid system)* there will be a twofold approach to the performance monitoring plan. The first step will be to maintain the traffic count database on the entire network. Count data will be collected at each location in the modeled network. Second, TCRPC will maintain a transportation travel demand model to project the impact of transportation and development projects will impact congestion levels on the transportation system.

For Objective 2 (*Enhance mobility by reducing overall travel times and delays along "network of significance")* The performance monitoring plan will involve collecting travel times for each of the identified "Network of Interest". In addition, intersections within the "Network of Interest" that exceed LOS "D" will be flagged for review. This review will take place as updates are made to the signal progression plans (every 5-7 years). A report will be generated for each MPO Long Range Plan (every 3-4 years) that identifies deficient intersections, efforts made to alleviate congested conditions, and the results of those efforts.

6. <u>Identify/Evaluate Strategies</u>

Selection of the appropriate performance measures, analytical tools, and available data enables the identification of congested locations. Congestion may be recurring or non-recurring; the CMP should be capable of analyzing both types of congestion. Recurring congestion, which takes place at predictable intervals at particular locations, can generally be traced to a specific cause, such as a physical bottleneck or to conditions such as sun glare. Causes of non-recurring congestion may be more difficult to isolate, and solutions may require non-traditional strategies.

The TCRPC CMP provides information about a wide range of congestion management strategies applicable to the tri-county region. Using a CMP "cafeteria plan", the MPO committees can select the appropriate solution for recurring congested locations.

The intent of the CMP "cafeteria plan" is to provide a reference for the development of alternative strategies for consideration when Major Investment Studies (MIS) and Corridor Studies are required. These efforts which may be conducted within the context of the Lansing metropolitan transportation planning process will lead to an identified preferred alternative or set of preferred alternatives. Preferred alternatives that do not require this level of further analysis may proceed directly to the MTP as identified.

TCRPC CMP strategies include:

A. Highway Projects;
B. Transit Projects;
C. Intelligent Transportation System (ITS) and Transportation System

Management (TSM) Strategies;
D. Transportation Demand Management (TDM) Strategies;
E. Land Development Strategies
F. Bicycle and Pedestrian Projects; and
G. Access Management Strategies;

*A. Highway Projects*

The Metro Transportation Plan for the area presents the potential highway infrastructure projects that may be applicable for the tri-county region. The regional travel demand model is the primary analysis tools to assess transportation impacts.

*B. Transit Projects*

Transit services and infrastructure projects have traditionally been implemented in regions to provide an alternative to automobile travel potentially reducing peak-period congestion and improving mobility and accessibility for commuters. Transit projects reduce system wide VMT, improve corridor and system wide accessibility, improve roadway travel times, and decrease congestion on the roadway system. While much of the identified congestion in the region is in spot locations, when congested corridors are identified through the MTP process, CATA and TCRPC staff will work cooperatively to determine if a transit solution might be a viable alternative.

*C. Intelligent Transportation System (ITS) & Transportation System Management*

Intelligent Transportation System (ITS) and Transportation System Management (TSM) strategies have traditionally focused on improving the operation of the transportation system without major capital investment and cost. While ITS strategies may be costly compared to more traditional TSM strategies, their relative congestion reduction impacts can be significant. Appendix A presents the ITS and TSM strategies that may be applicable for the tri-county region. The strategies identified in Appendix A can build upon current ITS initiatives in the region such as the traffic signal coordination program.

*D. TDM Measures*

Transportation demand management (TDM) strategies are used to reduce travel during the peak, commute period. They are also used to help the area meet air quality conformity standards, and are intended to provide ways to provide congestion relief/mobility improvements without high cost infrastructure projects. Appendix A presents the TDM strategies that may be applicable for the region. These strategies can potentially build upon current initiatives being implemented in the region such as the local ride share program, funded through the MPO. CATA maintains the regions ride share program which is charged with determining and implementing the strategies that are deemed appropriate for the region.

*E. Land Development Strategies*

Land development strategies have been used in some areas to manage transportation demand on the system, and to help agencies meet air quality conformity standards. Land development strategies can include limits on the amount and location of development until certain service standards are met, or policies that encourage development patterns better served by public transportation and non-motorized modes. The TCRPC Regional Growth strategies strive to work with local jurisdictions to plan for land development strategies that strike an appropriate balance between land use and transportation.

*F. Bicycle and Pedestrian Projects*

Non-motorized modes of transportation, such as biking and walking, are often overlooked as alternatives for alleviating congestion. Investments in these modes can increase safety and mobility in a cost-efficient manner, while providing a zero-emission alternative to motorized modes. The strategies listed can be implemented in the area with relatively little cost, but tend to have local rather than system wide impacts. The effectiveness of an investment in non-motorized travel depends heavily on coordination with local land use policies and connections with other modes, such as transit, for longer distance travel. Safety and aesthetics should also be emphasized in the design of bicycle and pedestrian facilities in order to increase their attractiveness.

*G. Access Management*

Access management is a broad concept that can include everything from curb cut restrictions on local arterials to minimum interchange spacing on freeways. Restricting turning movements on local arterials can reduce accidents and prevent turning vehicles from impeding traffic flow. Similarly, eliminating merge points and weaving sections at freeway interchanges increases the capacity of the facility. The access management strategies listed in Appendix A are applicable to the area, and can be used in either the modification or original design of a facility.

## 7. Implement Strategies/Improvements

This step involves the implementation and management of the defined strategies. TCRPC will work closely with its member operating agencies that have participated in the CMP process throughout the implementation of congestion management strategies and activities. It is at this point that information gathered through the CMP process will be applied to establish priorities in the Metropolitan Transportation Plan and Transportation Improvement Program thereby facilitating the implementation of the congestion management process. This ensures a linkage between the CMP and funding decisions.

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## Integration into MPO planning process

The TCRPC CMP is only one component of the overall metropolitan planning process. It is integrated with the Metropolitan Transportation Plan (MTP), Transportation Improvement Program (TIP) and MIS and Corridor Studies through its data and analysis functions. The process for the MTP works as follows:

1). Using the model results from the TCRPC Travel Demand Model, TCRPC staff identifies corridors or locations within corridors that are projected to exceed their designed 24-hour vehicle capacity.

2). Depending on the level of congestion expected to occur in the future year, TCRPC working with other stakeholders (CATA, MDOT, local jurisdictions) apply elements listed within the "cafeteria plan" that do not add single occupant vehicle capacity in an attempt to alleviate the congested conditions in the future. An analysis is completed to determine if this process was successful in alleviating congestion. Projects/programs that result from this analysis typically get completed using local funding.

3). If the congestion could not be alleviated using non-capacity adding alternatives, a determination is made whether or not the congestion expected to occur is severe enough to warrant added capacity or if the condition is something that the region can manage or "live with".

4). If non-capacity adding alternatives are selected, an analysis of constraint is then completed to determine if the facility is constrained in any manner. Constraint can come in many forms including but not limited to financial, environmental, physical, political and general consensus.

5). Only after all other alternatives have been exhausted does TCRPC turn to adding capacity to a facility. If a determination is made that adding capacity is required, an analysis of the least intrusive cross section is completed and forwarded as the preferred alternative.

The relationships to the MTP and TIP are summarized below.

<u>Relationship to the MTP</u>

The TCRPC CMP is related to the development of the regional Metropolitan Transportation Plan in three ways:

- The CMP provides system performance information which may be used by TCRPC staff to identify corridors or segments for detailed analysis in Corridor or Major Investment Studies, as recommended by the MTP; and

- The CMP Cafeteria Plan provides alternative congestion management strategies for consideration in MIS and Corridor Studies, which ultimately provide recommendations for preferred strategies to be incorporated into the MTP.

- The CMP provides system performance information for local jurisdictions which sponsor improvements. This information may influence their recommended projects for corporation in the MTP.

## Relationship to the TIP

The TCRPC CMP is related to the development of the regional Transportation Improvement Program in three ways:

- The CMP provides system performance information for project sponsors, which may influence their recommended projects for incorporation in the TIP;

- The CMP provides system performance information for use by TCRPC in evaluating projects nominated for inclusion in the TIP; and

- The CMP provides information about alternative congestion management strategies considered for SOV capacity projects to be advanced using federal funds.

## Relationship to Major Investment Studies (MIS) and Other Special Studies

The TCRPC CMP is related to the development of MIS and Corridor Studies in two ways:

- The CMP provides system performance information which may be used by TCRPC to identify corridors or segments for detailed analysis in Corridor or Major Investment Studies; and

- The CMP Cafeteria Plan provides alternative congestion management strategies for consideration in MIS and Corridor Studies. When traffic congestion is referenced in the Purpose and Need statement for an MIS, the MIS should consider the congestion management strategies included in the TCRPC CMP Cafeteria Plan as a starting point for the development of alternative strategies. This does not preclude the MIS from considering other strategies that may not be in the CMP Cafeteria Plan, nor does it require that the MIS select a strategy from the CMP Cafeteria Plan as the preferred alternative.

Relationship to the Regional Intelligent Transportation Systems (ITS) Architecture

All ITS strategies implemented from the CMP Cafeteria Plan will be consistent with the Regional ITS Architecture. TCRPC will ensure that both the Regional ITS Architecture and the CMP Cafeteria Plan are reviewed for consistency and reconciled as necessary when either is updated.

### Regionally Significant Projects not in CMP

Occasionally, regionally significant projects on facilities not included on the CMP network are implemented for reasons not related to congestion relief. Due to the fact that all federal aid urban facilities in the study area are included in the TCRPC CMP, only new facilities would fall into the category of regionally significant facilities not in the CMP. In these cases, CMP cafeteria options are followed as described below:

- An analysis of alternatives, including TDM and TSM, is conducted in the context of a Major Investment Study, Corridor Study or development of a NEPA Environmental Document to develop the preferred strategy for the project;
- The development of alternatives for the MIS, Corridor Study or NEPA Document includes a review of the strategies catalogued in the TCRPC CMP cafeteria plan;
- The documentation of the study describes how the CMP cafeteria plan strategies were addressed in the development of the preferred strategy.

8. Monitoring Strategy Effectiveness

TCRPC as administrators of the CMP will periodically evaluate the effectiveness of strategies identified through the CMP. TCRPC will continue to utilize the performance measures developed through the CMP to determine the effectiveness of the selected strategies. In assessing the degree to which the CMP strategies addressed the identified congestion, TCRPC will also assess the issue of how well, and to what extent the strategies were implemented, and will continue to consider factors that may have contributed to the success or failure of the selected projects or programs. This evaluation will take place prior to each full update of the regions Metropolitan Transportation Plan and reported to the TCRPC Committees as the data/reports are completed.

This approach will require a plan to collect pre-implementation data, as well as make preparations for an ongoing monitoring process. This ongoing monitoring should isolate even marginal changes in system performance that may be associated with the improvement.

Based on the feedback from the assessment process, TCRPC will make appropriate adjustments. These adjustments may be with respect to the strategies considered, or may reflect back to the performance measures used; the data collection and management component of the process; or the analytical methods and tools applied. The CMP will be subject not only to periodic review, but to a timetable for upgrading the tools and methods to keep pace with current practice.

## Recommendations

For the CMP to be integrated into the Long Range Plan and subsequently into the Transportation Improvement Program (TIP), the various sections of the CMP need to be put into a format that can be implemented. The following is a series of recommendations that are structured in a manner that allows for relative ease of implementation.

### Recommendation: Recurring Congestion

Objective 1 (*Improve transportation system productivity by addressing capacity deficient miles on the federal aid system)* emphasizes the reduction of deficient miles on the federal aid system. To address this objective, a list of deficient corridors was developed and can be found in Appendix E. In addition, the list contains recommended solutions to the identified deficiencies. Every attempt is made to minimize the disruption to neighborhoods and communities by avoiding where possible invasive pavement widening projects as the primary solution.

**Note: Cost estimates for the recommendations that follow will be included upon the next iteration of the MTP.**

The first recommendation is to implement the solutions in Appendix B. If the recommendations in Appendix B are implemented this objective will be met.

**Recurring Congestion Solutions - Cost: $xx,xxx,xxx**

### Recommendation: Corridor Progression/Operations

Objective 2 (*Enhance mobility by reducing overall travel times and delays along "corridors of significance")* emphasizes an operations approach to reducing delay by using technology to improve traffic flow along corridors of significance.

The second recommendation is to create a regional inventory of all signalized intersections. There has been a great deal of investment in improved technologies over the past decade and that this investment might not be being fully utilized due to a lack of low cost equipment that precludes the intersection from using the technology that is currently present and working at its optimum ability. Considering an increasing amount of congestion is the result of intersection delay, attention to these low cost fixes would be a good investment.

The third recommendation is to allocate funding for geometric and technological upgrades at the many intersections with identified capacity need.

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These actions would meet the intent of Objective #2.

The following is an estimate of need for the system. It is based on recent funding levels and has been inflated (1.5%/year) over time.

| Task | Average Annual Need | 25 year Long Term Need |
|---|---|---|
| Geometric Upgrades | $ xxx,xxx | $xx,xxx,xxx |
| Signal/Corridor Upgrades | $ xxx,xxx | $ x,xxx,xxx |
| Communications Upgrades | $ xxx,xxx | $ x,xxx,xxx |
| Corridor Progression | $ xxx,xxx | $ x,xxx,xxx |
| Intersection Asset Inventory | $ xxx,xxx | $ xxxxxxxx |
| **Total** | **$x,xxx,xxx** | **$xx,xxx,xxx** |

**Corridor Progression/Operations Solutions - Cost: $xx,xxx,xxx**

Recommendation: Non-Recurring Congestion

*Objective 3 – Increase the reliability of the transportation system and reduce travel delay caused by incidents by continuing enhancement of real time automated incident detection technologies and working toward improved response protocol when incidents are identified.*

The fourth recommendation is to moderately expand to the regional ITS network.

| Task | Annual Need | Long Term Need |
|---|---|---|
| Operations/Maintenance | $xxx,xxx | $xx,xxx,xxx |
| Moderate Expansion | $xxx,xxx | $xx,xxx,xxx |
| **Total** | **$x,xxx,xxx** | **$xx,xxx,xxx** |

**Non-Recurring Congestion Solutions - Cost: $xx,xxx,xxx**

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## Appendix A

## Cafeteria Plan Alternatives

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## TCRPC Congestion Management Process
## Cafeteria Plan Alternatives
### Potential Highway Strategies in the TCRPC CMP Cafeteria Plan

| Strategies/Projects | Mobility Benefits |
|---|---|
| ***Alternative: Increasing Number of Lanes without Highway Widening*** | |
| Uses "excess" width in the highway cross section used for breakdown lanes or median | • Increase Capacity |
| ***Alternative: Geometric Design Improvements*** | |
| This includes widening to provide shoulders, additional turn lanes at intersection, improved auxiliary lanes to improve merging and diverging. | • Increase mobility<br>• Reduce congestion by improved, sight lines improving bottlenecks<br>• Increase traffic flow and improve safety |
| ***Alternative: HOV Lanes*** | |
| This increases corridor capacity while at the same time provides and incentive for single-occupant drivers to shift to ridesharing. These lanes are most effective as part of a comprehensive effort to encourage HOVs, including publicity, outreach, park-and-ride lots, and ride share matching services. | • Reduce Regional Trips VMT<br>• Increase Vehicle Occupancy<br>• Improve Travel Times<br>• Increase Transit use efficiency<br>• Reduce Regional VMT |
| **Alternative: Highway Widening by Adding Lanes** | |
| Traditional Method for relieving congestion | • Increased capacity, reduced congestion in the short term<br>• Long term effects depends on local conditions |

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## Potential Transit Strategies in the TCRPC CMP Cafeteria Plan

| Strategies/Projects | Congestion and Mobility Benefits |
|---|---|
| *Alternative: Implementing Park-and-Ride Lots* | |
| These can be used in conjunction with HOV lanes and/or express bus services. They are particularly helpful transit for encouraging HOV use for longer distance commute trips. | • Reduced regional VMT<br>• Increase mobility and transit efficiency |
| *Alternative: Increasing Bus Route Coverage or frequencies* | |
| This provides better accessibility to transit to a greater share of the population. Increasing frequency makes transit more attractive to use. | • Increase transit ridership<br>• Decrease travel time<br>• Reduce daily VMT |
| *Alternative: Bus Rapid Transit (BRT)* | |
| Provides more attractive transit mode by removing typical bus delay and carrying more passengers. | • Increase transit ridership<br>• Decrease travel time<br>• Reduce daily VMT |

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## Potential ITS/TSM Strategies in the TCRPC CMP Cafeteria Plan

| Strategies/Projects | Congestion and Mobility Benefits |
|---|---|
| ***Alternative: Ramp Metering*** | |
| This allows freeways to operate at their optimal flow rates, thereby speeding travel and reducing collisions | • Decreased Travel Time |
| Alternative: *Highway Information Systems* | |
| These systems provide travelers with and real-time information that can be used to make trip and route choice decisions. | • Reduced travel times and delays<br>• Peak period travel shift |
| Alternative: *Advanced Traveler Information Systems* | |
| This provides an extensive amount of data to travelers, such as real time speed estimates on the web or over wireless devices, and transit vehicle schedule progress. | • Reduced travel times and delays<br>• Peak period travel shift |
| *Alternative: Traffic Signal Coordination/Activation* | |
| This improves traffic flow and reduces emissions by minimizing stops on arterial streets. | • Improve travel times and delays<br>• Reduce the number of stops |
| *Alternative: Freeway Incident Detection and Management Systems* | |
| This is an effective way to alleviate nonrecurring congestion.  Systems typically include video monitoring, dispatch systems, and sometimes roving service patrol vehicles. | • Reduce Accident delay<br>• Reduce travel time |

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## Potential TDM Strategies in the TCRPC CMP Cafeteria Plan

| Strategies/Projects | Congestion and Mobility Benefits |
|---|---|
| *<u>Alternative: Alternative Work Hours</u>* | |
| This allows workers to arrive and traditional commute period. It can be on a scheduled basis or a true flextime. | • Reduce peak period VMT<br>• Improve travel time for participants |
| *<u>Alternative: Telecommuting</u>* | |
| This involves employees to work at home or regional tele-commute center instead of going into the office. They might do this all the time, or only one or more days per week. | • Reduce VMT<br>• Reduce SOV trips |
| *<u>Alternative: Mixed-Use Development</u>* | |
| This allows many trips to be made without automobiles. People can walk to restaurants and services rather than use their vehicles | • Increase walking trips<br>• Reduce SOV trips<br>• Reduce VMT & VHT |
| *<u>Alternative: Ridesharing</u>* | |
| This is typically arranged/encouraged through employers or transportation management agencies (TMA), which provides ride-matching services. | • Reduce work related VMT<br>• Reduce SOV trips |

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## Potential Land Development Strategies in the TCRPC CMP Cafeteria Plan

| Strategies/Projects | Congestion and Mobility Benefits |
|---|---|
| *Alternative: Transit-Oriented Development* | |
| This clusters housing units and/or businesses near transit stations in walkable communities | • Decreased SOV share<br>• Increased transit usage<br>• Decreased vehicle trips |
| *Alternative: Infill and Densification* | |
| This takes advantage of infrastructure that already exists, rather than building new infrastructure on the fringes of the urban area. | • Decreased SOV share<br>• Increased transit usage<br>• Decreased VMT per HH |

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## Potential Non-Motorized Strategies in the TCRPC CMP Cafeteria Plan

| **Strategies/Projects** | **Congestion and Mobility Benefits** |
|---|---|
| *Alternative: New Sidewalks and Designated Bicycle Lanes on Local Streets.* | |
| Enhancing the visibility of bicycle facilities and increased mobility and access to pedestrian facilities increases the perception of safety. In many cases, bike lanes can be added to existing roadways. | • Increased mobility/access<br>• Increased non-motorized mode share<br>• Reduced incidents |
| *Alternative: Improved Bicycle Facilities at Transit Stations and Other Destinations* | |
| Enhancing the visibility of bicycle facilities and increased mobility and access to pedestrian facilities increases the perception of safety. In many cases, bike lanes can be added to existing roadways | • Increase bicycle share<br>• Reduced congestion at major trip generators incidents |
| Alternative: *Improved Safety of Existing Bicycle and Pedestrian Facilities.* | |
| Maintaining lighting, signage, striping, traffic control devices, and pavement quality, and installing curb cuts, curb extensions, median refuges, and raised crosswalks can increase bicycle and pedestrian safety. | • Increase Non-Motorized mode share<br>• Reduced incidents |
| Alternative: *Exclusive Non-Motorized Rights-of-Way.* | |
| Abandoned rail rights-of-way and existing parkland can be used for medium- to long distance bike trails, improving safety and reducing travel times. | • Increase mobility<br>• Reduced congestion on nearby roads |

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## Potential Access Management Strategies in the TCRPC CMP Cafeteria Plan

| Strategies/Projects | Congestion and Mobility Benefits |
| --- | --- |
| ***Alternative: Left Turn Restrictions; Curb Cut and Driveway Restrictions*** | |
| Turning vehicles can impede traffic flow and are more likely to be involved in crashes. | • Increase capacity<br>• Improved mobility/travel time |
| ***Alternative: Turn lanes and New or Relocate Driveways and Exit Ramps*** | |
| In some situations, increasing or modifying access to a property can be more beneficial than reducing access | • Increase capacity/efficiency<br>• Improved mobility/safety<br>• Improved travel times |

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## Appendix B

## TCRPC Congestion Management Process Analysis Documentation

**(To be completed with 2045 MTP)**

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## Appendix C

## Locations of Signalized Intersections with Capacity Related Needs

**(To be completed with 2045 MTP)**

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## Appendix D

## Identified Capacity Deficiencies

**(To be completed with 2045 MTP)**