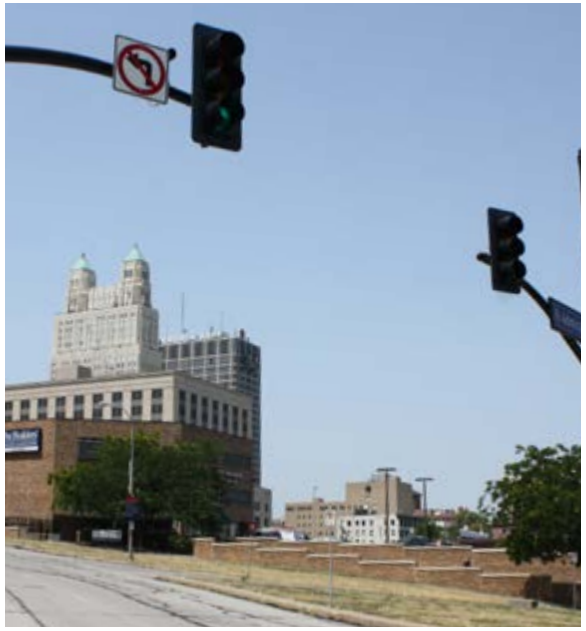
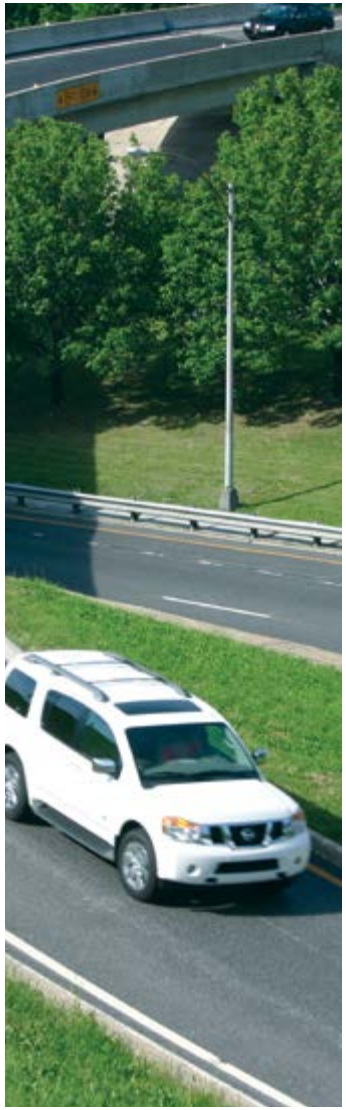
7.0 TRANSPORTATION MANAGEMENT

The Kansas City region has invested considerable effort and resources in the design and implementation of its regional multimodal transportation system. As a result of this investment, the region enjoys an expansive, safe and reliable network that, when compared to peer cities, performs at a high level and remains relatively free of traffic congestion.[1] However, a different story has begun to emerge in recent years. Issues such as higher-than-average growth rates, vehicular congestion levels, increased environmental awareness, volatile energy prices, homeland security concerns, limited travel alternatives and diminishing financial resources now challenge the ability of the transportation system to meet the region's needs.

In the Kansas City metro, transportation decision makers have focused increasingly on the use of transportation management in response to these challenges. Transportation management is an integrated approach to maximizing the performance and efficiency of the existing transportation system through the implementation of multimodal, intermodal and often cross-jurisdictional systems, services and projects. Transportation management strategies are generally less costly than major capacity improvements and may constitute cost-effective alternatives to major highway and transit capital projects. In addition, transportation management strategies are generally viewed as more environmentally friendly, having positive impacts on air quality and energy consumption as compared to capital-intensive alternatives.





Transportation management strategies include a broad range of activities that generally fall into two categories — Transportation System Management (TSM) and Transportation Demand Management (TDM). TSM strategies are improvements focused on increasing the performance and efficiency of the existing system. They include freeway management, traffic signal coordination, transit-signal priority, ramp metering and high-occupancy vehicle (HOV) lanes. TDM strategies are intended to reduce or shift the demand for travel and include alternative work schedule programs and activities to encourage transit use, carpooling and telecommunication. Other transportation management strategies include intelligent transportation system (ITS) techniques, such as traveler information services, automatic vehicle location, intelligent vehicle technologies, freight management and incident management programs that improve regional coordination and collaboration for more efficient emergency response.

At their core, most transportation management strategies are related to congestion management through improved system performance of existing transportation resources and are proven, solid approaches. These strategies can achieve a more significant impact when they are implemented as part of a comprehensive program of improvements. The most recent authorization of the national surface transportation program continues the use of a Congestion Management Process (CMP), recognizing that transportation stakeholders can best address congestion management through a comprehensive and cooperative process.

MARC developed a CMP to meet the unique needs of the Kansas City area. The CMP includes ongoing activities that provide information on the performance of the transportation system and alternative strategies to alleviate congestion and enhance mobility. The CMP emphasizes effective management of existing facilities using travel demand and operational strategies. It also provides valuable input and assessment capabilities for planning efforts such as the Metropolitan Transportation Plan (MTP), the Transportation Improvement Program (TIP) and regional transportation system studies at the corridor or activity-center level.

In support of the CMP, the *Transportation Outlook 2040* Policy Framework establishes a specific system performance/congestion management objective to sustain reliable travel times and minimize travel delays. Figure 7.1 displays the performance measures and thresholds used to measure and define congestion for the purposes of the CMP.

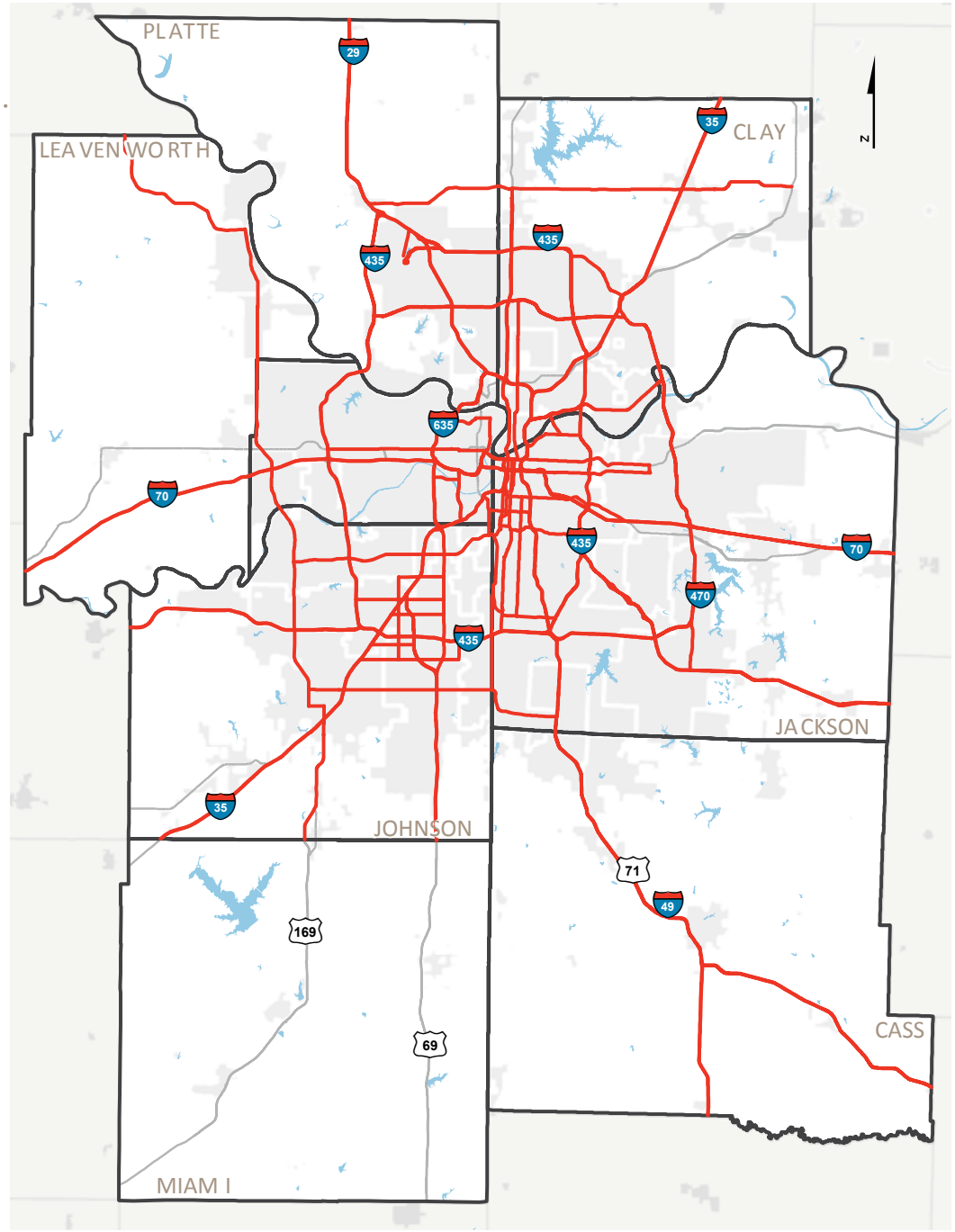
Figure 7.1: Congestion performance measures

Measure	Congestion threshold
Observed-to-posted speed ratio	50% or less
Travel Time Index (TTI)[2]	1.5 or greater
Volume-to-capacity ratio	1.2 or greater

Figure 7.2: Congestion Management Network, 2011

As part of the *Transportation Outlook 2040* update, MARC and regional stakeholders reviewed all projects using the Congestion Management Network (CMN) as a frame of reference. Each applicant was asked to detail which strategies from the CMP Toolbox — a set of potential congestion-reduction and mobility strategies — were incorporated into the project's scope of work. Projects on congested segments of the CMN and those that incorporated multiple CMP Toolbox strategies received priority.

The comprehensive and coordinated approach of the CMP is also evident in transportation technology investments made in the region. The regional ITS architecture for the Kansas City region is a specific framework to document and ensure institutional agreement and technical integration for the implementation of ITS projects. The architecture defines which system pieces are linked and the information exchanged between them. It also supports comprehensive planning and deployment activities, along with the coordination of information and efforts that enable efficient and effective operations.



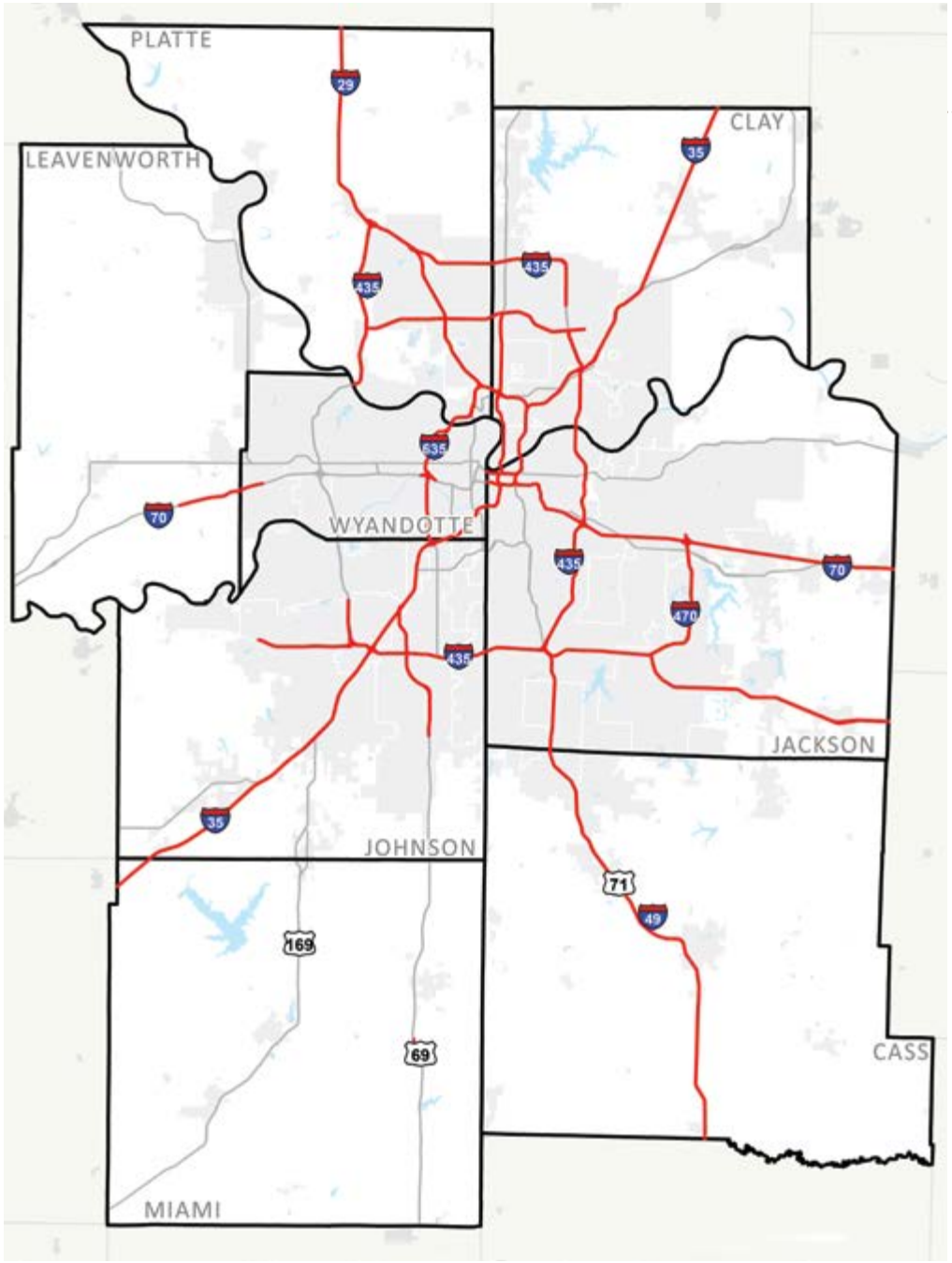


Figure 7.3: KC Scout network

A key element of transportation management in the region is the Kansas City Scout freeway-management system, a cooperative, bistate effort led by the Kansas and Missouri Departments of Transportation. Of the management strategies deployed in the region, Scout is the most comprehensive effort to optimize the performance of the transportation system. The Scout system manages traffic on more than 100 miles of continuous freeways in the Kansas City metro, and is coordinated with traffic management activities on I-70 across Missouri and Kansas, from St. Louis to the Kansas/Colorado border.

Using technology such as cameras, sensors and electronic message boards, Scout monitors the freeway system to automatically detect traffic problems and incidents, and quickly relays traffic information to motorists. Scout also uses information to coordinate more efficient emergency response to traffic incidents and to dispatch motorist-assist services to help clear roadways, reduce delay and aid travelers.

Scout recently implemented additional strategies to improve the performance and efficiency of the system. These include a pilot implementation of ramp metering along I-435 that aims to reduce congestion through freeway access management and mainline traffic flow improvement. In addition, the launch of “My KC Scout,” a web-based service, provides customized, current information to personal devices such as mobile phones, tablets or computers about freeway travel conditions,

weather, public safety and other critical information that impact travelers. A similar system specifically for the freight industry was also recently deployed.

While the Scout system works to manage the freeway system, the region also has a program to manage traffic flow on the arterial system. Operation Green Light (OGL) is a cooperative effort among more than 20 local and state government stakeholders that improves traffic signal coordination on major routes throughout the Kansas City area, especially those that cross city and state boundaries. This coordination helps reduce delay, improve traffic flow, reduce emissions that contribute to air pollution and climate change, and improve incident response. The current OGL network includes nearly 700 traffic signals. It may join with the Kansas City Scout freeway-management system to provide comprehensive traffic management and incident-response capabilities. In addition, several local jurisdictions maintain arterial traffic management centers linked with Operation Green Light and extend similar benefits to their local arterial networks.

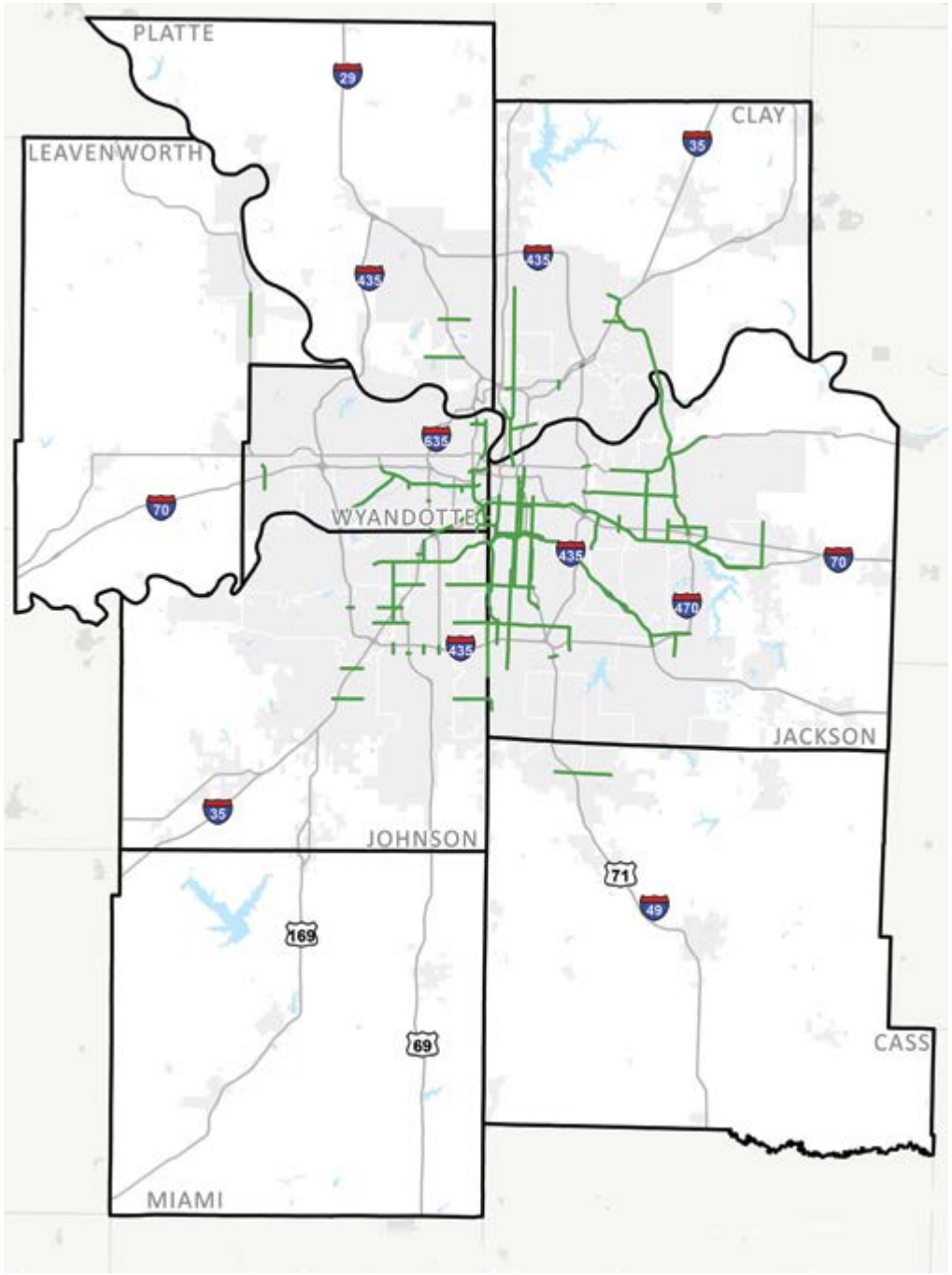


Figure 7.4: Operation Green Light network

The Kansas City region has used its strong transportation infrastructure to help establish itself as a hub for freight-related business over the last several decades. Improvements to the performance and efficiency of the regional transportation system is important to maintain this momentum and increase the region's prominence in the freight industry. In addition to the benefits of the KC Scout and Operation Green Light systems, two important freight-related technology deployment projects — the Trade Data Exchange (TDE) and the Cross-Town Improvement Project (C-TIP) — are used in the region. The TDE provides real-time cargo visibility and security while increasing efficiency in the supply chain. C-TIP coordinates cross-town truck traffic to reduce empty truck movements between intermodal terminals in the Kansas City area through the tracking of intermodal assets and wireless information distribution to truckers. C-TIP also provides environmental benefits through emissions reductions from more efficient freight traffic in the region.

Public transportation provides another vital transportation management opportunity. Both the Kansas City Area Transportation Authority (KCATA) and Johnson County Transit (JCT) have invested in automatic vehicle locator (AVL) systems. These systems provide a backbone to deploy other technologies and strategies and provide real-time information on the location and schedule adherence of area transit vehicles. Using this information, transit providers have implemented the use of real-time information signs to provide arrival information for passengers. They can make improvements to internet and mobile technology services to enhance traveler information. In addition to technological improvements, bus-on-shoulder operations are used on some routes to improve transit service during congested conditions. These technologies and operations can improve the user experience, reduce delays for transit riders and increase the attractiveness of transit as an alternative to automobile travel.

As the central TDM element in the Kansas City area, MARC's RideShare program offers assistance and information for individuals and employers about efficient, affordable commuting alternatives, such as carpooling and vanpooling, transit and flexible work schedules. These efforts help to increase vehicle occupancy, reduce system demand and vehicle emissions, and lower the amounts of vehicle miles traveled in the region.

The RideShare program offers a Guaranteed Ride Home service that provides commuters with transportation in the event of an emergency. The GRH service removes a major obstacle for many commuters who would like to use alternate modes of transportation.

Another demand reduction approach is the use of high-occupancy-vehicle (HOV) and managed-lane facilities. These management strategies can lessen congestion while increasing the number of people moved in the area during peak-hour traffic. HOV strategy benefits are similar to other TDM efforts and can be increased when combined with transit and ridesharing programs to provide a more comprehensive approach.

Historically, the feasibility HOV lane implementation has been considered at a corridor level rather than at the regional level. However, with the renewed interest in system preservation and the impact of energy prices on commuting patterns, MARC completed a study in 2009 to clarify a potential regional approach to HOV and managed lanes. The study included a number of recommendations about beneficial incremental improvements that are being implemented in the region, such as transit bus-on-shoulder operations and the expansion of KC Scout to all major freeways.

The study also documented the feasibility of a regional approach to HOV and managed lanes and considered various funding strategies.

Area stakeholders are also moving forward with the implementation of a regional 5-1-1 traveler information system. 5-1-1 traveler information systems can integrate information about work zones, traffic incidents, weather, mode choices and other issues on the regional transportation network. A 5-1-1 system can make significant improvements to system performance and safety by helping travelers identify optimal transportation alternatives and avoid congestion and other incidents.

Needs assessment

In the short term, the transportation management needs of the region focus on addressing existing problems, including efficient, quick response to incidents on freeway and arterial systems. Incidents along these systems account for a significant amount of area congestion. Through continued investment in and coordination among KC Scout, Operation Green Light and local arterial management systems, the region can benefit from more timely incident identification, enhanced traveler information and improved use of the arterial system as diversion routes. Additionally, expansion of existing motorist assist programs and implementation of integrated corridor management can potentially create substantial reductions to incident-related congestion.

A newer strategy puts all of these elements together to manage corridors rather than larger, more individualized networks. Through Integrated Corridor Management (ICM), various partner agencies manage the transportation corridor as a system rather than the more traditional approach of managing individual assets.[3] System partners manage the corridor as an integrated asset to improve travel time reliability and predictability, help manage congestion and empower travelers with better information and more choices. Metropolitan Kansas City has a number of potential candidates for an ICM approach, as noted in Figure 7.5.

Managing demand on the regional transportation system can help maximize past and present system investments. For example, higher vehicle occupancy means that more people travel in fewer vehicles, which allows the transportation network to handle more passenger travel. Fewer vehicles on the road means fewer emissions per passenger. Additionally, a higher vehicle occupancy rate suggests a more affordable transportation system since ridesharing is typically cheaper than driving alone. Investments that encourage the use of carpools and vanpools can have a significant influence on system operations.

Figure 7.5: Potential ICM corridors

Route	Limits
I-70	Downtown to I-470
I-35	Edgerton to 7th Street
I-435 / I-470	K-10 to US-50

Gains can also be made to reduce system-wide demand through investments that increase the attractiveness of public transportation. The expansion of existing transit signal priority systems, introduction of automatic fare collection and enhanced traveler information improve the on-board experience and on-time performance of transit and can increase ridership, lessen transportation system demand and reduce emissions.

The proactive approach should, generally, focus on longer term needs that first prevent and then address potential problems. As the region continues to grow, expansion of the management systems will include the entire metropolitan area. The deployment of programs, technologies and facilities that provide alternatives to single-occupant vehicles represent viable, long-term strategies will also address system management.

Identification and evaluation of congestion management strategies

The identification and evaluation of congestion management strategies is a key step in the regional Congestion Management Process (CMP) which is integrated into the metropolitan planning process. The CMP involves analysis and planning work conducted by multiple stakeholders including project sponsors and MARC staff. Through the CMP, MARC works with planning partners to identify congested locations and select appropriate management strategies. The identification and evaluation of alternative strategies normally occurs in the context of a detailed planning study.

An important resource of the CMP is the MARC Congestion Management Toolbox that includes an extensive list of multi-modal strategies covering a broad range of policy, operational and infrastructure approaches for congestion management. The toolbox was updated in 2013 and expands the types of strategies, add more contemporary strategies, and include additional information of relevance to practitioners. For each strategy, the toolbox provides a suitability assessment of for a particular type of congestion or performance issue. To facilitate the identification and evaluation of the anticipated performance and expected benefits of appropriate strategies, the toolbox provides a qualitative assessment of the costs and benefits of each strategy. Benefits are described in terms of relative impact to performance measures established in the plan. Figure 7.6 provides a summary of Congestion Management Strategies in the toolbox.

Figure 7.6: Summary of congestion management strategies

Major categories	No. of strategies	Benefits	Costs	Examples
Highway	11 strategies identified	Increase capacity, mobility and traffic flow.	Vary from low to high depending on strategy. Constructing new rights of way results in higher cost than design improvements.	HOV lanes, super street arterials, highway widening, acceleration and deceleration lanes, and design improvements.
Transit	19 strategies identified	Shifting modeshare, increasing transit ridership, reduce VMT and provide air quality benefits.	Vary from low to high depending on strategy. Constructing new transit travelways is higher cost than improving service frequencies.	Increasing coverages and frequencies, new fixed guideway travelways, employer incentive programs, signal priority, and intelligent transit stops (technical improvements).
Bicycle and Pedestrian	8 strategies outlines	Decrease auto modeshare, reduce VMT and provide air quality benefits.	Low to moderate.	New sidewalks and bike lanes, improved facilities near transit stations, bike sharing, and exclusive rights of way.
TDM	11 strategies identified	Reduce peak period travel, reduce single occupancy vehicles and VMT.	Low to moderate.	Alternative work hours, telecommuting, road pricing and toll roads.
ITS and TSM	20 strategies identified	Reduce travel time, reduce stops, reduce delays and increase safety.	Vary, but tend to be low to moderate. Large scale projects involving new infrastructure and devices higher cost.	Signal coordination, ramp metering, highway information systems and service patrols.
Access Management	11 strategies identified	Increase capacity, efficiency, mobility and reduce travel time.	Vary from low to high and include, design, implementation and maintenance costs	Turn restrictions, turn lanes, frontage roads and roundabout intersections
Land Use	6 strategies identified	Decrease single-occupancy vehicle trips, increase walk trips, increase transit modeshare and air quality benefits.	Low to moderate and involve establishing ordinances and may require economic incentives to encourage developer buy-in.	Infill, TOD development and improved density.
Parking	7 strategies identified	Increase transit use, reduce VMT and generate revenue.	Low to moderate but require economic incentives to encourage developer buy-in.	Preferential parking for HOVs, park and ride lots and advanced parking systems.
Regulatory	10 strategies identified	Decrease VMT, air quality benefits, increase safety and generate revenue.	Vary	Carbon pricing, VMT fee, pay as you drive insurance, auto restriction zones and truck restrictions

As previously mentioned, congestion management strategies from the MARC Congestion Management Toolbox were prioritized and incorporated into the scope of work for projects as part of *Transportation Outlook 2040*. The toolbox provides alternative strategies to consider in corridor studies and environmental documents. When local agencies in the region find themselves considering congestion management projects, they can use the toolbox like a checklist. They will consider each item in the toolbox and, in turn, determine whether a strategy (or a range of strategies) and the relevant actions or projects have a reasonable potential for providing benefits to the corridor or study area that is being evaluated. If a promising strategy shows is identified, it may be evaluated in detail using the regional model and applicable post-processing tools suggested in the toolbox.

The toolbox update includes a quantitative evaluation of the effectiveness of congestion management strategies previously implemented in the Kansas City region. Three local congestion management strategies were evaluated to demonstrate techniques and provide a framework for evaluating benefits and costs of toolbox techniques. This provides examples of use of available data to estimate the benefits of several strategies. The Tool for Operations Benefit/Cost (TOPS-BC) developed by FHWA was used to evaluate two congestion management strategies. The evaluation results for all three congestion management strategies are summarized in Figure 7.7.

The MARC Congestion Management Toolbox is available on the Congestion Management Process web page.

Figure 7.7: Quantitative analysis example of congestion management strategies

Strategy	Travel Time benefits*	Net benefits	Benefit/cost ratio
Lee's Summit arterial signal coordination	$3,604,932	$2,909,004	4.61
I-435 ramp metering	$2,160,292	$7,157,966	19.97
I-35 Bus-on-shoulder**	$5,700/year	n/a	n/a

*Cost of congestion (per commuter) is a *Transportation Outlook 2040* performance measure.

**A custom spreadsheet was developed for the analysis of this strategy because required inputs for TOPS-BC were not available.

Strategies

7.1: Implement Intelligent Transportation Systems (ITS) and other technology based programs to manage transportation systems.

a. Maintain and expand Operation Green Light and local jurisdiction arterial management system programs.

b. Maintain and expand the Kansas City Scout freeway management system program.

c. Study and deploy regulatory or pricing strategies (HOV/HOT, ramp metering), where appropriate.

d. Maintain and enhance the regional 5-1-1 system.

e. Update and maintain the regional ITS architecture.

f. Expand transit signal priority programs.

7.2: Implement Travel Demand Management (TDM) programs to reduce the number of single-occupant vehicles.

a. Support placemaking initiatives.

b. Implement Automatic Fare Collection for transit.

c. Increase the use of bicycle/pedestrian detection systems at intersections.

d. Maintain and expand Rideshare and vanpool programs.

7-3: Use planning and coordination to address complex transportation management issues.

a. Study and deploy Integrated Corridor Management (ICM) where appropriate

b. Develop and maintain incident management plans.

Transportation Outlook 2040			
Policy framework strategies and goals:	7-1: Implement ITS	7-2: Manage travel demand	7-3: Planning and coordination
Economic vitality	X	X	X
Placemaking		X	
Equity	X		X
Transportation choices		X	X
Safety and security	X	X	
System condition	X		X
System performance	X	X	
Public health	X	X	X
Environment	X	X	X
Climate change and energy use	X	X	

Notes:

1 Traffic congestion is a condition on road networks that occurs as use increases, and is characterized by slower speeds, longer trip times and increased vehicular queuing.

2 Travel Time Index is defined as ratio of the average peak period travel time as compared to a free-flow travel time.

3 For more information regarding Integrate Corridor Management, visit http://www.its.dot.gov/icms/.