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16. Abstract

Increased traffic congestion is a result of many sources including increasing demand and lagging supply. Responding to increasing congestion, agencies from the federal government to local townships have turned to congestion management, or mitigation. Congestion mitigation is delivered through a variety of techniques. The Michigan Department of Transportation (MDOT) recognized a need to assist state and local agency partners to identify potential congestion mitigation strategies and improve collaboration. Texas Transportation Institute (TTI) researchers developed "A Michigan Toolbox for Mitigating Congestion." The team conducted several tasks in development of the Toolbox. The TTI team reviewed and consulted previous congestion toolboxes for strategy identification, toolbox elements, and toolbox style. The research team implemented a survey of metropolitan planning organizations throughout the country to gather agency experiences with congestion mitigation strategies. Finally, the research team reviewed congestion management processes of four Michigan transportation management areas and performed interviews of metropolitan planning organization staff. Working closely with the MDOT staff, researchers identified 47 strategies to include in the Toolbox. The Toolbox, written in a user-friendly format, provides for each strategy a description, techniques to implement each strategy, data requirements, lessons learned, impacts, and contact information and resources for more information. The Toolbox serves as both a useful desk reference for practitioners and an educational tool for elected officials.

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DEVELOPING A CONGESTION MITIGATION TOOLBOX

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EXECUTIVE SUMMARY

Traffic congestion has historically increased throughout the nation and within the state of Michigan, especially in or near urban areas. Traffic congestion has no one clear definition as it is relative to the motorists subjected to it. The increased traffic congestion is a result of many sources including increasing demand and lagging supply. Demand has increased through increases in licensed drivers, greater automobile availability to households, and general economic demands. Supply, or capacity, has lagged as funding resources have become scarcer as attention in many states has turned to system preservation. In response to increasing congestion, agencies from the federal government to local townships have turned to congestion management, or mitigation. Congestion mitigation can be delivered through a number of different techniques. For those professionals charged with providing these solutions, a comprehensive set of techniques is valuable. This set of techniques forms a “toolbox” that must serve the needs of transportation staff and provide relevant, concise information.

The Michigan Department of Transportation (MDOT) recognized a need to assist state and local agency partners to identify potential congestion mitigation strategies and improve collaboration. This project’s objective was to develop a comprehensive toolbox of congestion mitigation strategies with value-added information on the success of the projects, typical barriers to implementation, and their solutions. Researchers from the Texas Transportation Institute (TTI) conducted research leading to development of “A Michigan Toolbox for Mitigating Congestion.” Working closely with the MDOT staff, researchers identified 47 strategies to include in the Toolbox. The Toolbox provides for each strategy a description, techniques to implement each strategy, data requirements, lessons learned, impacts, and contact information and resources for more information.

The research team conducted several tasks in development of the Toolbox. First, a comprehensive literature review was conducted focusing on publications since 2000. Over 700 documents were reviewed. The TTI team reviewed and consulted previous congestion toolboxes for strategy identification, toolbox elements, and toolbox style. The research team implemented a survey of metropolitan planning organizations throughout the country to gather agency experiences with congestion mitigation strategies. Finally, the research team reviewed congestion management processes of four Michigan transportation management areas and performed interviews of metropolitan planning organization staff. These four activities led to the development of the Toolbox.

Written in a user-friendly format, the Toolbox serves as both a useful desk reference for practitioners and an educational tool for elected officials, often acting through public policy boards. The congestion mitigation strategies documented and presented within the Toolbox will ultimately provide physical benefits to the users of Michigan’s roadway network. The Toolbox has the potential to be regarded as a cornerstone tool in public discussion and strategizing to mitigate local and regional congestion. The Toolbox also has the potential to provide consistency across MDOT Regions and Transportation Service Centers (TSCs), along with consistency with MDOT’s partnering agencies including the 12 metropolitan planning organizations (MPOs), the 14 regional planning commissions (RPCs), and even villages, cities, townships, and counties throughout the state.

1.0 INTRODUCTION

As a result of increasing demand and lagging supply, traffic congestion has been increasing over the last 20 years. Traffic congestion synonymous with delays is no longer a "big city" problem as smaller communities are experiencing growth in traffic congestion, for example, along state routes through a village or township. Agencies from the federal government to local townships have turned to congestion management, or mitigation. Congestion mitigation can be delivered through a number of different techniques. For those professionals charged with providing these solutions, a comprehensive set of techniques is valuable. This set of techniques forms a "toolbox" that must serve the needs of transportation staff and provide relevant, concise information.

The Michigan Department of Transportation (MDOT) recognized a need to assist state and local agency partners to identify potential congestion mitigation strategies and improve collaboration. This project's objective was to develop a comprehensive toolbox of congestion mitigation strategies with value-added information on the success of the projects, typical barriers to implementation, and their solutions. Researchers from the Texas Transportation Institute (TTI) conducted research sponsored by MDOT to develop "A Michigan Toolbox for Mitigating Congestion." Working closely with the MDOT Research Manager (RM), MDOT Project Manager (PM), and MDOT Research Advisory Panel (RAP), researchers identified 47 strategies to include in the Toolbox. For each strategy, the Toolbox provides a description, techniques to implement each strategy, data requirements, lessons learned, impacts, and contact information and resources for more information.

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2.0 OBJECTIVE

DEVELOPING A CONGESTION MITIGATION TOOLBOX

The four objectives of the research project were:

1. Identify and describe a wide range of strategies, common and emerging, used to mitigate traffic congestion.
2. Identify where the strategies have been implemented, what have made them a success, what barriers were faced, and how those barriers were overcome.
3. Identify the published benefit-to-cost ratio for each strategy to guide users in choosing the most cost effective projects.
4. Develop a toolbox that can be used to identify projects to reduce congestion.

3.0 SCOPE

ACCOMPLISHING PROJECT OBJECTIVES

The research team developed a congestion mitigation toolbox for the Michigan Department of Transportation through the following tasks:

1. Conduct a comprehensive literature review – Review of current research and practices, both national and international, to identify promising congestion mitigation strategies and any evaluation studies carried out on those strategies.
2. Develop a list of potential strategies – Based on the literature review; create a list of potential congestion mitigation strategies that MDOT should consider.
3. Survey other MPOs – Conduct a survey of MPO staff in other states to capture experiences and professional opinions of the identified mitigation strategies.
4. Review Michigan Transportation Management Areas & Congestion Management Processes – Survey regional planning staff involved with congestion mitigation to capture experience in Michigan with identified strategies.
5. Conduct a review of benefit-cost ratio analysis for each mitigation strategy – To allow practitioners to gauge the effectiveness of identified strategies.
6. Create a statewide toolbox to reduce congestion – Provide MDOT staff with a useful desk reference for practitioners and an educational tool for elected officials and citizens.

4.0 METHODOLOGY

LITERATURE REVIEW AND PLAN REVIEW

The research team reviewed over 700 articles, research papers, reports, and plan documents pertaining to congestion mitigation. The team focused on action steps, strategy costs, and agency experience with mitigation strategies.

Over 20 congestion management plans and toolboxes were reviewed. The plans and toolboxes are tools that describe the strategies and the prioritization and project selection process used by transportation management areas (TMAs) to address congestion in their metropolitan areas. To be designated a TMA, the urbanized area's population must exceed 200,000. Implementation of mitigation strategies occurs through the long-range planning documents commonly referred to as metropolitan transportation plans (MTP) and short-range planning documents referred to as transportation improvement programs (TIPs).

The review was a two-phase effort. The first phase utilized an extensive list of keywords related to congestion and mitigation strategies to perform database searches. The second phase occurred after development and calibration of the list of mitigation strategies in Task 2. The taxonomy of strategies developed in Task 2 provided greater focus on individual strategies for literature search. It allowed for a "drill-down" of specific mitigation strategies. The research team queried the same transportation databases on specific project types in the taxonomy (i.e., diverging diamonds) in the context of congestion mitigation to find information.

The annotated review below shows passages from papers, reports, and plans that are helpful to understanding individual strategies and creating the toolbox. In some cases, they are small pieces from much larger analyses and reports that are not specific to congestion mitigation.

IDENTIFICATION OF TOOLBOX STRATEGIES

The research team consulted several sources to develop the list of potential congestion mitigation strategies. These sources included previous work completed by the research team and other resources available through an Internet search. The abbreviated list of resources (organized by date published) used was:

- FHWA Congestion Reduction Toolbox (Accessed January 4, 2011), http://www.fhwa.dot.gov/congestion/toolbox/index.htm.
- Designing Walkable Urban Thoroughfares: A Context Sensitive Approach (2010), Institute of Transportation Engineers.
- Urban Street Geometric Design Handbook (December 2008), Institute of Transportation Engineers.
- Richmond Area MPO CMS Toolbox (July 2008), Cambridge Systematics.
- Active Traffic Management: The Next Step in Congestion Management (July 2007), American Trade Initiatives.
- Mountainland Association of Governments CMP (March 2007), Cambridge Systematics.
- Traffic Congestion and Reliability: Trends and Advanced Strategies for Congestion Mitigation (September 2005), Cambridge Systematics.

- Travel Rate Improvement Program — 2005 Update (September 2004), Texas Transportation Institute.
- South Jersey Transportation Planning Organization CMS: Phase II Update (June 2003), Parsons Brinkerhoff.
- MARC Enhanced CMS Toolbox (December 2001), Cambridge Systematics.
- Handbook of Selected Congestion Mitigation Techniques in the United States (October 1998), Texas Transportation Institute.
- CATS Congestion Mitigation Handbook (September 1998), Metro Transportation Group, TransCore, WSA.
- Use and Evaluation of Transportation Control Measures (September 1994), Texas Transportation Institute.
- A Toolbox for Alleviating Traffic Congestion (1989), Institute of Transportation Engineers.

After collection and review of the noted references, the research team prepared a detailed outline list of strategies organized around two broad categories: supply/system management and demand management. Under these categories, several strategies classes were identified. Within strategy classes, more specific action strategies were identified.

A preliminary list of strategies was prepared and submitted for review and discussion. This preliminary list included 307 items (categories, classes, and actions). The research team facilitated a web conference in February 2011 with the project management team. The purpose of this meeting was to discuss the preliminary list of strategies to gain feedback on classes and actions to eliminate, modify, or add. At the conclusion of this web conference additional correspondence between the research team and the project manager yielded minor changes to the potential list.

A condensed list of strategies was reviewed with the project management team in March 2011. At that time, only two outstanding feedback items were expected from Michigan DOT staff. That feedback was received in late March 2011.

SURVEY OF METROPOLITAN PLANNING ORGANIZATIONS

The research team developed a comprehensive survey instrument. The survey asked respondents questions concerning 211 congestion mitigation strategies within 37 categories. Questions for each strategy included if the strategy was previously implemented or was planned, the success of the project, its ease of implementation, identity barriers encountered, solutions to those barriers, cost of the strategies, and calculated or documented benefit/cost ratios. A copy of the printed survey instrument is provided in Attachment A.

The survey was developed to be accessed and answered via website. The research team used Survey Monkey® to administer the survey. A survey invitation was sent to 369 metropolitan planning organizations listed in the FHWA MPO database. Duplicate contacts for two MPOs in the same region were removed. The invitation was sent via email to each respondent the first week of March 2011. The survey was officially closed to responses on April 1, 2011. Figure 1 displays a typical survey invitation.

«GreetingLine»

My name is Jason Crawford of the Texas Transportation Institute at Texas A&M University. Our office is conducting a study for the Michigan Department of Transportation to create a congestion mitigation toolbox. You are receiving this request to participate in our study because the Anywhere MPO has had direct involvement in development and/or implementation of congestion mitigation strategies.

We are conducting a web-based survey pertaining to states and MPO experiences with congestion mitigation strategies. We estimate the survey may take up to 60 minutes to complete, depending on your answers to questions. Your agency's responses may be generalized or cited in summaries or reports produced for this study.

If you agree to participate in this survey, please complete this survey by March 25, 2011.

Click below to access the web-survey.
https://www.surveymonkey.com/s/Congestion_Mitigation_Survey

Your participation is voluntary.

If you have any follow-up questions regarding this study, please feel free to contact me at jcrawford@tamu.edu or 817-462-0534. Thanks for your support of this research study!

We look forward to hearing back from you.

Sincerely,
Jason A. Crawford, Principal Investigator

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Figure 1. Example e-mail invitation to potential respondents.

SURVEY OF MICHIGAN TRANSPORTATION MANAGEMENT AREAS

The TMAs in the State of Michigan have developed and implemented a Congestion Management Process (CMP) as mandated by federal transportation legislation. The TMAs with CMPs are:

- Genesee County Metropolitan Planning Commission (GCMPC).

- Grand Valley Metro Council (GVMC).
- Southeast Michigan Council of Governments (SEMCOG).
  (The Ann Arbor TMA is within this MPO).
- Tri-County Regional Planning Commission (TCRPC).

The research team collected information from the four Michigan TMAs and their CMPs through document review and personal interviews with agency staff. The document review targeted current CMPs to gather project information. The CMPs were acquired and reviewed for depth of information, consistency, and approach.

The research team supplemented the project information found with telephone and e-mail interviews of key personnel at the agencies. Close attention was given to the success of strategies in Michigan in comparison with national experience.

Following the guidelines of the Institutional Review Board of The Texas A&M University System, personal identity of respondents has been withheld in order to maintain confidentiality.

REVIEW OF BENEFIT-COST ANALYSES

In conjunction with the literature review, the project team searched available technical literature, federal government reports, and individual project analyses, when found, for benefit-cost ratios (BCR) for individual congestion mitigation strategies. The review focused on more recent analysis of strategies to ensure benefit-cost ratios found were based on current models and planning assumptions. Upon completion of the review, the BCRs were compiled and described in a technical memorandum.

DEVELOPMENT OF TOOLBOX

The research team created a template for the design and layout for the Toolbox concurrently with other project tasks. Discussions were held with the research team's internal communications group, and Toolbox designs and formats were created, reviewed, and improved upon until team consensus was reached. The goal of the Toolbox design discussions was to create a user-friendly, visually appealing handbook. The proposed Toolbox design was forwarded to the MDOT project team for review and approval.

Upon completion of preparatory project tasks, the research team drafted individual section strategies based on the information compiled in the previous tasks and according to the approved format. The drafts were forwarded to TTI's internal communications group for posting into the design template. This process continued until the Toolbox was fully assembled.

5.0 DISCUSSION OF RESULTS

LITERATURE REVIEW

With few exceptions, they followed the same basic pattern: a list of candidate strategies with some description of individual strategies including applicability, level of impact, and coordination with other strategies. None of the reviewed CMPs provided specific strategy costs, cost-effectiveness (except as description), or analysis methodology. This fact should not imply that they are deficient planning tools by any means. The plans reviewed simply did not link the characteristics of a mitigation strategy with detailed analysis and outcomes. It is common for the planning documents to not include detailed analyses, but rather present a planning vision, process, and actions to reach regional goals.

There is a multiplicity of invaluable federal and state guidebooks focused on development, implementation, and analysis of specific congestion mitigation strategies. Planners and practitioners are strongly urged to consult these handbooks when developing congestion mitigation programs. Most of the guides and handbooks are available for review and download on the relevant agency websites.

The literature on congestion mitigation follows trends in federal research priorities and institutional interest. For example, currently there is a large number of works on active traffic management (ATM). This phenomenon tends to "crowd out" other topics within the field. It also makes difficult discovery of hard data on cost, effectiveness, and lessons learned for other strategies. Another phenomenon is the lack of research on individual strategies although they are consistently listed as candidate strategies in plans. Improving street continuity is a good example. The concept is straightforward and is implied by a street improvement program, but almost no research or analysis of its impacts on congestion mitigation is available.

Congestion Management Process

The CMP is intended to be a flexible approach to transportation problem solving that builds upon years of experience in congestion management. The CMP is intended to support transportation decision making, as an integral part of the planning process. While the process may be supported by a program or system of data collection, monitoring, and analysis (a "congestion management system"), and may produce reports detailing alternative strategies and projects designed to address specific congestion problems (a "congestion management plan"), the CMP is a set of tools for identifying and addressing congestion throughout the long range planning and project development cycle.

A white paper developed by Flanigan warns that MPOs that have long-standing congestion management programs or systems may be challenged in the transition to a fully integrated long range transportation process that makes congestion management a "core" activity, as opposed to an isolated, stand-alone process. While there are many available technical methods that can assist in assessing the state of congestion in a given region, MPOs may be challenged in developing and maintaining these tools for their own regions (Flanigan, 2008).

The ability to acquire and maintain the level of data collection and management is also a significant hurdle in many areas. Different operating agencies may have quite different and distinct data collection and management systems. Even if data is collected into a regional data archive, many of these differences in how each agency collects, processes, and formats data may remain. MPOs may encounter significant barriers in consolidating information and reconciling these different data management practices (Flanigan, 2008).

The difficulties inherent in understanding and using data from multiple agencies underscore the need to involve the appropriate players from transportation system operating agencies, both at the policy and technical level. These challenges apply as well to attracting and retaining professional staff to manage the CMP. While obtaining the necessary level of commitment and continuity of involvement from agency staff is a formidable challenge, bringing together operations personnel and policy level representatives from multiple operating agencies can also offer tremendous opportunities for creating formal and informal networks and working relationships. Creating a CMP "team" can deliver real benefits by transforming "stakeholders" into partners in pursuing effective congestion management strategies (Flanigan, 2008).

Parsons Brinkerhoff provides a process of evaluation and weighing mitigation strategies based on the following criteria:

- Effectiveness – How effective is the strategy in dealing with the problem(s)?
- Lead-time – How long will it take for implementation and results to be felt?
- Technological feasibility – Are existing technologies available?
- Physical feasibility – Are there physical or geometric constraints?
- Cost and financial viability – Is cost too high? Does a potential funding source/mechanism exist?
- Institutional interface – Are there major institutional issues? Is there a supportive implementation agency?
- Public acceptance – Is there strong public opposition?

For challenges and lessons learned, the Delaware Valley Regional Planning Commission (DVRPC) noted a broad challenge has been communicating why the CMP is important to the hundreds of individuals who need to buy into it for the process to work. Specific challenges have come from using many large databases of varying quality with differing data definitions. Another challenge is using the power of computing to better select strategies and develop complimentary packages of solutions for congested corridors. DVRPC has not found a robust sketch-level program available to complete this required step in the CMP process.

One lesson learned at DVRPC is that geographic information systems (GIS) help in the CMP. GIS improves understanding of available data, allows data to be analyzed in new ways, eases the process of updating information in the future, and helps create understandable and interesting graphics. The most important lesson DVRPC would share with others regarding the CMP or Tracking Progress is to start with a relatively simple approach so the task can be completed and have an impact. The next iteration can always be more sophisticated.

Researchers analyzed deployments of congestion mitigation strategies. They noted that combinations of strategies, or *congestion relief packages*, proved to be more effective than simply deploying individual strategies (Cambridge Systematics, 2005).

Thirteen state departments of transportation (DOTs) were surveyed by researchers at the Kentucky Transportation Center. When asked to mention the most useful or best congestion mitigation measure, the responses suggested two broad conclusions. First, the most popular measures are not level-of-service (LOS) or volume-to-capacity ratio. Rather, they are the relatively direct measures of either the average time to traverse the distance between two points or the average speed of vehicles, or estimated delay. Second, five of the states surveyed are using or trying to devise a more complex measure of congestion. These tend to build on measures of speed and time and then add additional factors to estimate the costs to the public of congestion. All 13 states surveyed implemented a variety of congestion management strategies. When asked to identify the most effective or best, the top four were:

- Incident management programs.
- Signal coordination.
- Traffic management centers.
- Access management.

Supply/System Management

FHWA Freeway Management and Operations Handbook recommends that any proposed roadway improvements should also be correlated with state and regional long-range transportation plans, TIPs, etc. As these improvements are generally considered capital projects, they may already be programmed or budgeted; or the proposed improvement might be readily incorporated into another programmed capital project in the same geographic area.

When analyzing and making decisions regarding potential improvements, it is important to remember that changes in traffic and operational patterns resulting from roadway improvements often have an impact that goes beyond the immediate facility that is being improved. Such issues must be considered in the analysis that precedes a decision to improve the roadway and increase capacity.

Traffic Operations

Traffic Operations mitigation strategies are well-represented in the professional and academic literature. These strategies have a clear impact on traffic congestion and are politically popular. The FHWA *Freeway Management and Operations Handbook* provides an excellent overview of the details, methods, and effects of traffic operations (FHWA, 2003).

Increasing Number of Lanes without Widening

Researchers have found this strategy will increase capacity and improve travel time reliability. Significant increases in capacity of up to 30 percent and more are possible (NCHRP, 1995). Sisiopiku found that the use of temporary shoulder lanes can have a very positive impact on traffic operations along I-65 when implemented in response to recurrent and/or non-recurrent congestion. In the study, the temporary use of the left northbound shoulder lane for two hours during the morning peak resulted in a reduction in the total network travel time by 34 percent and delay by 71 percent compared to current operations. Quantification of expected benefits and costs from deployment of temporary shoulder lanes along the I-65 corridor in Birmingham, Alabama, found benefit-cost ratios of 3.8 to 13.9:1 depending on the deployment scenario implemented (Sisiopiku et al., 2009).

Based on the results of a simulation model for I-95 in Virginia, Xiang et al. concluded that the *combination of hard shoulders and variable speed limits* would be an effective solution to reduce travel delay, delay the onset of congestion, reduce queue length, increase average speed, and increase average fuel economy. The use of right shoulder lanes upstream of exit ramps tested in the study provided some relief but had far less impact on network performance compared to the continuous left shoulder lane usage (Xiang et al., 2009).

Mehran and Nakamura (TRR 2124, 2009) proposed a methodology to estimate travel time reliability as a function of demand, capacity, weather conditions, and accidents; the methodology is capable of assessing the impacts of congestion relief schemes on travel time reliability. The proposed methodology was applied to evaluate the impacts on travel time reliability of opening the hard shoulder to traffic, through examining different dynamic lane operation schemes. Opening the hard shoulder to traffic during the peak periods resulted in significant improvements in travel time reliability, and the number of resulting accidents was also found to be cut by 26 percent, based on the assumptions made in the methodology. The proposed simulation model is site-specific and needs to be calibrated according to the characteristics of the expressway segment. To develop a comprehensive methodology, more generalized forms of speed–flow relationships are required.

Increase Number of Lanes by Widening/Lane Additions

FHWA notes that widening a freeway to provide additional lanes over several miles is classified as major reconstruction. It is considered a traditional strategy to mitigate congestion along a corridor or roadway. It is also not a mitigation strategy that is emphasized or given a high priority in Congestion Management Processes, including those in Michigan. Projects of this type are long term and require substantial planning, engineering, and public financial resources. Costs are shown in Table 1.

Table 1. Road Widening Costs per Lane Mile.

Area Type	Cost
Urban	
• Standard	\$2.4–6.9 million
• Higher density areas	\$7.3–15.4 million
Rural	
• Standard	\$1.6–3.1 million
• Environmentally Sensitive	\$5.8–9.9 million

Separate cost factors are used for urban and rural areas. In urban areas, widening costs are further disaggregated by the type of roadway (in 2006 dollars). In rural areas, costs depend upon highway functional class and terrain type. There are also higher construction costs in areas where widening might be especially difficult or costly, such as densely developed urban areas or environmentally sensitive rural areas. However, a project with a large number of bridges, complicated interchanges, major environmental issues, and other extreme engineering and environmental issues will result in a higher cost per lane-mile (FHWA, 2003).

Highway Ramp Closures/Reconfigurations

The FHWA *Ramp Management and Control Handbook* provides a comprehensive look at ramp management strategies. There are four commonly accepted and proven strategies to manage traffic on freeway ramps:

- Ramp closure.
- Ramp metering.
- Special use treatments.
- Ramp terminal treatments.

These strategies are not all mutually exclusive and may be combined to maximize their potential advantages (FHWA, 2006).

The decision to close a ramp permanently can be a very lengthy process. The many requirements include a detailed traffic analysis to show impacts associated with the closure; an extensive public outreach process to make sure that citizens are informed of the potential change and have an opportunity to provide input; and perhaps a temporary closure to observe and experience the actual impacts before a final decision is made (FHWA, 2006).

Diverging Diamonds

Gilbert Chlewicki, a consultant, and J.G. Bared, FHWA, are champions of the diverging diamond interchange and have published the fundamental literature addressing the concept. The diverging diamond interchange (DDI) developed from the concept of the synchronized split phasing design. The idea was to use the crossing over movement on an interchange design. The main goal was to better accommodate left-turn movements and potentially eliminate a phase in the signal cycle. The highway portion does not change but the movements off the ramps change for left turns. Through and left-turn traffic for the arterial road also maneuvers in a different manner from a conventional diamond interchange because the traffic crosses to the "wrong" side in between the ramps and signals.

The diverging diamond offers cost savings to DOTs through a smaller project template, reduced bridge length or width, and reduced right of way requirements. Missouri DOT noted that the cost for a diverging diamond interchange in Springfield was $2.9 million, using the existing bridge and not having to buy additional property. A standard interchange reconstruction would have cost about $8.5 million (Missouri DOT, 2010).

Loop Ramps Eliminating Left Turns

One solution to reduce delay and queuing is to construct a loop ramp that will feed the left-turn traffic onto the arterial without queuing at the intersection. Loop ramps are often used at cloverleaf interchanges. Bonneson et al. notes that they can be designed using a constant radius for the entire length of curve, or a 400- to 500-ft spiral can be used to transition to and from a 150- to 240-ft curve of constant radius. Loop ramps are often used in conjunction with collector-distributor roads along the major road to ensure that the design is consistent with driver expectancy, to minimize weaving on the major road, and to provide for a safe speed change for vehicles traveling between the intersecting streets (Bonneson et al., 2004).

Deceleration/Acceleration Auxiliary Lanes

The AASHTO Green Book provides practitioners with guidance about when to incorporate auxiliary lanes into roadway design. The key elements for acceleration/deceleration lanes are proper driver notification and allowing all deceleration to occur within the deceleration lane away from the mainline. The length and type of lane will depend upon the design speed of the mainline and the reduced speed of the first curve on the ramp (FHWA, 2003).

Configurations to Increase Queuing Capacity

FHWA defines configuring an entrance or exit ramp to increase queue capacity involves making geometric or operations changes to the ramp to expedite merging and diverging traffic on highways. These changes are designated ramp terminal treatments and include signal timing improvements, ramp widening, additional storage or new turn lanes on arterials, improved signing, and pavement markings on or adjacent to ramps.

Cambridge Systematics conducted an evaluation of the Minneapolis-St. Paul regional ramp meter program and noted the following benefits and impacts:

- Traffic Volumes and Throughput: After the meters were turned off, there was an average 9 percent traffic volume reduction on freeways and no significant traffic volume change on parallel arterials included in the study. Also, during peak traffic conditions, freeway mainline throughput declined by an average of 14 percent in the “without meters” condition.
- Travel Time*:* Without meters, the decline in travel speeds on freeway facilities more than offsets the elimination of ramp delays. This results in annual systemwide savings of 25,121 hours of travel time with meters.
- Travel Time Reliability: Without ramp metering, freeway travel time is almost twice as unpredictable as with ramp metering. The ramp metering system produces an annual reduction of 2.6 million hours of unexpected delay.
- Safety: In the absence of metering and after accounting for seasonal variations, peak period crashes on previously metered freeways and ramps increased by 26 percent. Ramp metering results in annual savings of 1,041 crashes or approximately four crashes per day (Cambridge Systematics, 2001).

Bottleneck Removal

The 2009 FHWA report, *Recurring Traffic Bottlenecks: A Primer – Focus on Low-Cost Operational Improvements*, provides a list of operational and geometric improvements to remove or reduce bottlenecks. From the report:

1. Shoulder conversions – involves using a short section of traffic bearing shoulder as an additional travel lane. Shoulder conversions are appropriate between interchanges or to

provide lane congruency with adjacent sections. The shoulder condition must be rated for use as a travel lane.

2. Re-striping merge or diverge areas to provide additional lanes, provide an acceleration/deceleration lane, extend the merge/diverge area, or improve geometrics to better serve demand.
3. Lane width reductions – involves reducing lane widths and re-striping to add an additional travel and/or auxiliary lane.
4. Modify weaving areas by adding collector/distributor or through lanes.
5. Ramp modifications – these could include ramp metering; widening, extending, closing, or consolidating ramps; or reversing entrance and exit ramps to improve operations.
6. Speed harmonization (variable speed limits) – adjusting speed limits when congestion thresholds have been exceeded and congestion and queue forming is imminent. Speed harmonization can also be used to promote safer driving during inclement weather conditions. This mostly European practice reduces the traffic "shock wave" that results through congested corridors, thereby delaying the onset of a breakdown in traffic conditions. The result is decreased headways and more uniform driver behavior, which indirectly benefit bottlenecks and chokepoints.
7. "Zippering," or self-metering that promotes fair and smooth merges – a motorist who is 10th in line knows that he will be 20th to merge into the single lane ahead. This helps to eliminate line jumpers that bull ahead, disrupt the queues, and often block adjacent lanes until they force their way in line. Usually this method of merging requires on-site enforcement, but often is exhibited by regulars who know the process and are willing to abide.
8. Improve traffic signal timing on arterials and ramp terminal intersections – will improve traffic flow and prevent ramp queues from backing up onto freeway main lanes.
9. Access management principles to reduce vehicular conflicts (hence, delays) on arterial corridors
10. Continuous flow intersections – unconventional at-grade intersections which eliminate one or more left-turn conflicts at a main intersection. This is achieved through dedicated left-turn bays located several hundred feet prior to the main intersection, which allow left-turning vehicles to move at the same time as through traffic. The left-turn traffic signal phase is eliminated, allowing more vehicles to move through the main intersection and thus reducing traffic congestion and delays. These at-grade intersections achieve traffic flow similar to grade-separated interchanges, but at a considerably lower cost.
11. High-Occupancy Vehicle (HOV) or reversible lanes.
12. Provide traveler information on traffic diversions.
13. Implement congestion pricing – congestion pricing entails charging fees or tolls for road use that vary by level of vehicle demand on the facility. The objective is to bring supply and demand into alignment. As public acceptance grows and legislative restrictions are relaxed, congestion pricing will increasingly be viewed by transportation practitioners as

a powerful and relatively easy to implement strategy to address bottleneck congestion (FHWA, 2009).

Researchers noted bottleneck removal involves careful detective work, and time spent on data collection and analysis will pay off handsomely; inadequate investigation of the specific causes and potential system effects can lessen the intended benefits. However, this type of improvement generally has an extremely high benefit/cost ratio. Many improvements can be made with simple restriping, while others may require more major construction, but which can still be funded for a fraction of normal capacity improvements. Bottleneck removal is analogous to intersection improvements in an arterial system; money spent on adding extra turning lanes for a short distance in an arterial system may preclude the need for widening an entire thoroughfare (Machemehl et al., 2001).

Geometric Design improvements

The Interactive Highway Safety Design Model (IHSDM) is a suite of software analysis tools for explicit, quantitative evaluation of safety and operational effects of geometric design decisions during the highway design process. It culminates a multiyear research and development effort conducted by the Federal Highway Administration.

IHSDM is intended for use throughout the highway design process from preliminary planning and engineering through detailed design to final review. It may be used both for projects to improve existing roadways and projects to construct new roadways. The 2003 release of IHSDM has initial focus on two-lane rural highways and has five evaluation modules: (1) policy review, (2) crash prediction, (3) design consistency, (4) intersection review, and (5) traffic analysis. Additional capabilities including a driver/vehicle module to provide measures of vehicle dynamics and evaluations of multilane rural highways are planned for future releases (FHWA, 2011).

Intersection Improvements

The American Association of State Highway and Transportation Officials (AASHTO) Green Book is the primary reference for geometric design improvements. AASHTO defines an intersection as "…the general area where two or more highways join or cross, including the roadway and roadside facilities for traffic movements within the area. Intersections are an important part of a highway facility because, to a great extent, the efficiency, safety, speed, cost of operation, and capacity of the facility depend on their design" (AASHTO, 2004).

The state of Michigan includes a variety of basic intersection types as well as alternative intersection designs to facilitate traffic flow. The basic intersection types include: three-leg or T, four-leg, multi-leg, and roundabouts. Selected alternative intersection designs in Michigan include (with a selected example):

- Median U-turn crossovers (the "Michigan Left Turn") (8-Mile Road in Detroit).
- Reverse Jughandle (M-53 [Van Dyke Ave] and 15-Mile Road).
- Quadrant Roadway (US 24 [Telegraph Road] and Plymouth Road).

- Jughandle and Quadrant Roadway (US 24 [Telegraph Road] and M-153 [Ford Road]).
- Ground Loops (Pennsylvania Avenue and Cedar Street).

MDOT's *Michigan Intersection Guide* provides the following as example strategies to improve safety and operations of signalized and unsignalized intersections:

Signalized Intersections:
- Reduce frequency and severity of intersection conflicts through traffic control and operational improvements (coordinating/optimizing signals).
- Reduce frequency and severity of intersection conflicts through geometric improvements (left-turn channelization, right-turn lanes).
- Improve geometry of pedestrian, bicycle, and transit facilities.
- Revise geometry of complex intersections.
- Construct special solutions.
- Improve sight distance at signalized intersections (remove obstructions).
- Improve driver awareness of intersections and signal control (signing, lighting, visibility).
- Improve access management near signalized intersections.
- Improve safety through other infrastructure treatments.

Unsignalized intersections:
- Improve management of access near unsignalized intersections.
- Reduce the frequency and severity of conflicts through geometric improvements (left-turn channelization, right-turn lanes).
- Improve pedestrian and bicycle facilities to reduce conflicts between motorists and non-motorists.
- Improve sight distance (remove obstructions).
- Improve driver awareness of intersections as viewed from the intersection approach (signing, lighting, visibility).
- Choose appropriate intersection traffic control to minimize crash frequency and severity.
- Guide motorists more effectively through complex intersections.

Auxiliary Lanes for Merging and Diverging

Recent research by the National Cooperative Highway Research Program (NCHRP) examined the safety and operational impacts of auxiliary lanes. In general, the research found that 1) auxiliary lanes have positive safety effects, and 2) at some ranges of traffic volumes and ramp spacings, auxiliary lanes provide major operational benefits.

In the NCHRP study, researchers found that an auxiliary lane between an entrance and an exit ramp corresponded to an approximately 20 percent reduction in crashes. Researchers found that the reduction applies nearly equally to both fatal plus injury crashes and property damage only crashes. Little effect on single vehicle collisions was found with the presence of the auxiliary lane. Researchers developed an equation to estimate the number of expected crashes between the physical entrance gore and physical exit gore on the freeway mainline. The equation is a function of the segment length, ramp spacing, volume upstream of the entrance ramp, entrance and exit ramp volumes, and the presence of an auxiliary lane.

In the same research, researchers investigated the operational benefits of auxiliary lanes through simulation modeling. Researchers found that regardless of ramp spacing, adding an auxiliary lane improved freeway speeds by 5 mph or more if at least one of the ramps had moderate to near-capacity volume (1,500–1,750 vehicle per hour per lane) (Ray et al., 2011).

Acceleration/Deceleration Lanes

AASHTO provides guidance for designing and locating deceleration and acceleration lanes. MDOT's *Michigan Intersection Guide* also provides a number of strategies that relate to turn lanes for signalized and unsignalized intersections:

- Install left-turn lanes (see MDOT *Traffic and Safety Note 605a* for warranting guidelines).
- Improve left-turn lane geometry.
    - Lengthen left-turn lane (see AASHTO for length guidance; TRB *Highway Capacity Manual;* and MDOT Geometric Design Guide VII-650 Series for recommended taper and storage lengths).
    - Provide positive offset for left-turn lanes (see AASHTO).
    - Delineate turn path for left turns.
- Four-lane to three-lane conversion.
- Construct right-turn lanes (see MDOT *Traffic and Safety Note 604a*).
- Lengthen right-turn lanes (see AASHTO for length guidance; TRB *Highway Capacity Manual;* and MDOT Geometric Design Guide VII-650 Series for recommended taper and storage lengths).

Turn bays reduce conflicts between vehicles by efficiently removing turning vehicles from the through traffic stream. Studies have shown the following positive effects of adding a left-turn bay:

- 25 percent to 50 percent reduction in crashes on 4-lane roads.
- Up to 75 percent reduction in total crashes at unsignalized access.
- 25 percent increase in capacity.

Studies have shown the following effects of adding a right-turn bay:

- 20 percent reduction in total crashes.
- Limit right-turn interference with platooned flow, increased capacity.

Commercial Vehicles Accommodations

Trucks have fundamentally different operating characteristics than passenger cars. These characteristics must be considered to provide appropriate geometry on roadways that have substantial heavy-truck use. Truck operating characteristics such as stopping sight distance, acceleration/deceleration on grades, driver eye height, minimum turn radius, and weight/power ratio all play a pivotal role in the planning and design of roadways to handle trucks. The following MDOT manuals provide guidance related to truck design elements and considerations:

- MDOT Michigan Intersection Guide.
- MDOT Geometric Design Guides.

- MDOT Sight Distance Guidelines.
- MDOT Roundabout Design Document.

Research in Texas recommended that "truck-friendly" design be used when forecast design year volumes were over 1,000 trucks per day. The research indicated that a reasonable criterion for considering special truck treatments is 5,000 trucks per day. The work further stated that at volumes of 25,000 Class 5+ trucks per day there would be justification for building a future separate truck roadway (Middleton, 2004).

There are limited studies of auto-truck separation for long-haul applications and in an urban setting. One study documents an estimated 15 percent reduction in crashes as a result of separating trucks and general-purpose traffic. Researchers investigated crash data along the New Jersey Turnpike where auto-only lanes are separated from auto/truck lanes to determine this crash reduction (Douglas, 2004).

One-Way Streets

According to AASHTO, Institute of Transportation Engineers (ITE), and the MDOT *Michigan Intersection Guide* one-way streets provide the following advantages and can provide increased capacity and facilitate multimodal improvements because of the following:

- Traffic capacity may be increased as a result of reduced midblock and intersection conflicts and more efficient operation of traffic control devices.
- Travel speed is increased as a result of reducing midblock conflicts and delays caused by slowing or stopped left-turning vehicles. The increase in the number of lanes in one direction permits ready passing of slow-moving vehicles.
- The number and severity of crashes is reduced by eliminating head-on crashes and reducing some types of intersection conflicts.
- Traffic capacity may be increased by providing an additional lane for through traffic. Although a two-way street with only one lane in each direction may not have sufficient width to accommodate two lanes in each direction, it may have sufficient width to accommodate three lanes in one direction when converted to one-way operation.
- The available street width is used fully through the elimination of need for a median. The lane-width adjustments can provide additional lanes for motor traffic, bicycles, buses, or parking.
- Permits improvements in public transit operations, such as routings without turnback loops (out on one street and return on the parallel streets).
- On-street parking that would otherwise have to be eliminated or curtailed may be retained.
- Permits turn from more than one lane and doing so at more intersections than would be possible with two-way operation.
- Redistributes traffic to relieve congestion on adjacent streets.
- Simplifies traffic signal timing by permitting improved progressive movement of traffic, and reducing multiphase signal requirements by making minor streets one-way away from complex areas or intersections.

- Allows pedestrians to only have to deal with traffic from one direction, reducing conflicts with vehicles.
- Provides more gaps for vehicles and pedestrians at unsignalized crossings.

The following disadvantages of one-way operation are cited by AASHTO and ITE:

- Travel distances are increased because certain destinations can be reached only by around-the-block maneuvers. This disadvantage is more prevalent if the street grid is composed entirely of one-way streets.
- One-way streets lead to wider pedestrian roadway crossings.
- One-way streets may be confusing to strangers.
- Emergency vehicles may be blocked by cars in all lanes at intersections waiting for signals to change.

One-way operation has a number of advantages and some disadvantages. According to AASHTO, the practitioner choosing between one-way or two-way operation must consider which type of operation serves the traffic demands most economically and with the greatest benefit to the adjacent property. While the proper choice of operation may be immediately obvious, in some cases a thorough study involving all relevant considerations may be needed. ITE provides additional guidance about when two-way streets should be made into one-way streets.

With the conversion of two-way streets to one-way streets, research has documented a 26 percent reduction in all intersection crash types and between a 33 and 43 percent reduction in all mid-block crash types (Gan et al., 2005).

Super Street Arterials

A super street works by redirecting left-turn and through movements from side streets. Instead of allowing those to be made directly through a two-way median opening, as in conventional design, a superstreet sends those movements to a one-way median opening 500 to 1000 feet downstream. Thus, a left turn from a side street will be made by a right turn then a U-turn, while a side street through movement will be made by a right turn, a U-turn, and another right turn (FHWA, 2004).

The super street intersection has only 18 conflict points—places where vehicle streams cross, merge, or diverge—while a conventional intersection with a two-way median opening has 32 points. Since each conflict point creates potential for a traffic accident, superstreets may be safer (Hummer, 2008).

The super street design is similar to the Median U-turn Intersection Treatment (MUTIT), or Michigan Left, but features a break in cross-street traffic that allows the signals on opposite directions of the arterial to operate independently. Arterial traffic can make direct left turns onto the cross-street. The cross-street thru and left-turn movements must use the directional U-turn crossovers (Hummer, 2008). Table 2 shows potential benefits and liabilities of this technique.

Table 2. Summary of Issues for Super Street Median Crossovers.

Characteristic	Potential Benefits	Potential Liabilities
Safety	Fewer conflict points	None identified
Operations	Improved delay for major street movements	Longer travel distance and time for minor street movements
Multimodal	None identified	Two-stage pedestrian crossing Potential way-finding challenges
Physical	None identified	Wide median needed
Socioeconomic	None identified	May result in restrictions to access
Enforcement, Education, and Maintenance	None identified	Potential for driver and pedestrian confusion

Reference: FHWA, 2004

Complete Streets

Completes is still at a young age at the national level. As a result, the literature is scarce as to the impacts of the policy strategy. There are still good definitions and overviews of Michigan legislation available. Complete Streets policy is aimed at producing roads that are safe and convenient for all users. Complete streets are not limited to a few designated corridors. Complete Streets policies strive for diversity on just about every thoroughfare. By adopting a Complete Streets policy, communities direct their transportation planners and engineers to routinely design and operate the entire right of way to enable safe access for all users, regardless of age, ability, or mode of transportation (Michigan Complete Streets Coalition, 2011).

The concept of Complete Streets originated in the 1970s in Oregon, although the term was not coined until 2003. The policy movement gained momentum in 2001 when the U.S. Department of Transportation issued design guidance in response to new language in the Transportation Equity Act for the 21st Century (TEA-21). The guidance document, "Accommodating Bicycle and Pedestrian Travel," states that "bicycling and walking facilities will be incorporated into all transportation projects unless exceptional circumstances exist." The three exceptions were roads where bicyclists or pedestrians are prohibited by law; where the costs are excessive (more than 20 percent of project costs); and where there is clearly no need. This opened up a greater share of an area's transportation network for consideration of other potential modes and users (McCann, 2005).

Public Acts 134 and 135 adopted in August 2010 by the State of Michigan requires MDOT to take specific actions in support of a Complete Streets planning approach.

Two main issues have arisen in the short experience of Complete Streets policy. First, finding enough right-of-way can be a challenge. Even if the right-of-way is in the transportation agency's hands, any widening, even for a sidewalk, may be rejected by local residents wanting to preserve existing landscaping and parking, or informal, private use of the right-of-way.

Second, fear of high public costs is an equally great obstacle. Complete Streets policies are not specially funded, and project budgets are sometimes set before bicycle and pedestrian facilities are considered (McCann, 2005).

Improving Street Continuity

There is very little academic and professional literature on the implementation and impacts of improving street continuity as a congestion mitigation strategy. It is listed as a candidate strategy in many mitigation guidebooks or a goal in city plans, but almost no mention of it as actually having been implemented.

TTI researchers provided a description of the strategy. The mobility provided by a roadway system is affected by its street continuity. A lack of continuous streets is a result from changes in the number of lanes or from inadequate planning for street location between neighboring developments. Capacity reducing changes in a street cross-section may include reduction in the number of lanes, reduction in lane width, reduction in lateral clearance to obstructions, reduction in median width, reduction in pavement quality, etc. Changes in alignment that affect street continuity include sharp horizontal or vertical curves. These types of curves can limit operating speeds in the vicinity of the facility. Discontinuity can also occur with secondary facilities within the right-of-way, such as bicycle and pedestrian facilities. Bicycle and pedestrian facilities may be disjointed in locations where facilities start and stop without connections to other bicycle/sidewalk facilities in the area (TTI, 2001).

Vehicle Use Restrictions

Collaborative effort between agencies is best for developing freight delivery restrictions in urban areas. Adequate curb space is essential to prevent double-parking of trucks. Off-street loading space in new buildings/developments should be provided in municipal zoning ordinances (Jones et al., 2009).

New York City conducted an Off-Hour Truck Delivery Pilot Program with 20 participants, funded by USDOT, which ran from late 2009 through 2010. In the New York City pilot program, receivers found that fewer deliveries during normal business hours allowed them to focus more on their customers, and that their staff was more productive as they waited less for deliveries that were tied up in traffic. Carriers found that their trucks could make more deliveries in the same amount of time; they saved money on fuel costs and could use a smaller fleet by balancing daytime and nighttime deliveries, and that legal parking was more readily available. Their drivers reported feeling safer and less stressed. A potential disbenefit of parking restrictions is the economic impact to businesses related to reduced parking. For turn restrictions, a potential disbenefit is increased VMT as vehicles circumvent restricted areas or avoid prohibited movements (Holguin-Veras et al., 2011).

Access Management

One way that MDOT implements access management through its Access Management Program is through the completion of access management studies that result in access management plans to guide MDOT, local municipalities, and developers in locating future access points and to provide local municipalities with direction for new (or updated) ordinances (Eisele and Frawley, 2010). Such plans are developed with consideration of the concepts and techniques identified in the *Michigan Access Management Guidebook* (Wycoff and Manning, 2001). Through the adoption of the access management plans and access management ordinances, many aspects of implementing access management are improved including (Eisele and Frawley, 2010):

- Local site plan review and approval processes include all responsible road agencies. This is facilitated when an access management committee is formed as the result of a study.
- Applications for driveway permits are reviewed by staff representing the member agencies of the access management committee prior to the site plan approval.
- Roadway reconstruction and resurfacing projects needs are reviewed in light of the access management plan to address access improvement opportunities.

MDOT teams with local transportation agencies to implement access management. Access management training and corridor access management planning is provided by MDOT. Municipalities can establish land development regulations such as subdivision controls or lot dimension requirements that can influence access issues. Often access issues can be improved when redevelopment occurs if the local transportation agency has appropriate ordinances in place.

Active Traffic Management

Mirshahi and other researchers (AASHTO, 2010; Sisiopiku, 2009) define active traffic management as the ability to dynamically manage recurrent and nonrecurrent congestion based on prevailing traffic conditions. Focusing on trip reliability, it maximizes the effectiveness and efficiency of the facility. It increases throughput and safety through the use of integrated systems with new technology, including the automation of dynamic deployment to optimize performance quickly and without the delay that occurs when operators must deploy operational strategies manually. When the combined operational strategies are implemented in concert, they fully optimize the existing infrastructure and provide measurable benefits to the transportation network and the motoring public.

Potential benefits include increased throughput, increased capacity, decreased primary and secondary incidents, more uniform speeds, decreased headways, more uniform driver behavior, increased trip reliability, and the ability to delay the onset of freeway breakdown.

A key component of active traffic management is the focus on customers and their needs. All of the operational strategies under the umbrella of active traffic management work to improve travel time reliability. They address the impacts of recurrent and nonrecurrent congestion while working proactively to prevent incidents that are major contributors to travel delays. While many of these strategies are not new to transportation professionals in the United States, their deployment in a coordinated and comprehensive manner within the framework of active traffic management represents a broader approach to addressing congestion by exhibiting a commitment to users and providing them with reliable travel times. They also signify the recognition of a link among incidents, their duration, and their impact on mobility for all users. Thus, customer reliability should be a critical gauge for all operational strategies as the United States moves forward with active traffic management.

In an era of limited resources, active traffic management is a significant drain on the limited funds an agency has available. However, it also represents an investment that should not be wasted so that its benefits can be realized. Thus, transportation and traffic management operations need to be a priority in the planning, programming, and funding processes for transportation. Legislation, policy, and financial resources are critical to the long-term success of active traffic management. Such resources help maintain and operate the system and ensure it adapts to new technologies to better serve customers. Thus, transportation agencies need to make the commitment to operations and make it a priority to maximize the benefits of infrastructure investment and to ensure sustainability and customer satisfaction through improved traffic operations.

Speed Harmonization

For speed harmonization, a deployed system actively manages the network and delays the onset of congestion under normal operating conditions. The system should include the following elements:

- Sufficient sensor deployment for traffic and weather monitoring to support the strategy.
- Adequate installation of sign gantries to ensure that at least one speed limit sign is in sight at all times.
- Placement of speed limit signs over each travel lane.
- An expert system that deploys the strategy based on prevailing roadway conditions without requiring operator intervention. It is critical that this expert system be reliable and accurate to gain the trust and acceptance of the public.
- Connection to a traffic management center that serves as the focal point for the system.
- Passage of enabling legislation and related laws to allow for dynamic speed limits.
- Uniform signing related to speed harmonization and its components.
- Modeling tools to assess the impacts of speed harmonization on overall network operations.
- Closed-circuit television cameras to support the monitoring of the system.
- Dynamic message signs to provide traveler information and regulatory signs as appropriate.
- Automated speed enforcement to deter violations (Sisiopiku, 2009).

For weather-related deployments, Sydney, Australia, implemented a fog warning system, which includes advisory speeds. During fog, the advisory speed limit is continuously adjusted to the speed of the preceding vehicle within the speed limit (Coleman, 1995). In Denmark, studies found that a dynamic message sign (DMS) indication of slippery road, fog, and other hazardous road conditions reduced the traffic mean speed by 1 to 2 km/h. When the speed harmonization sign showed a speed limit of 80 km/h instead of 100 km/h, the mean speed was reduced by 3.4 km/h. In adverse road conditions, such as black ice, the speed limit was lowered from 120 km/h to 100 km/h, and mean speed dropped by 5.1 km/h. The speed harmonization signs also reduced speed variance (Rämä, 2001). The Netherlands also deploy speed harmonization for weather conditions. Visibility sensors are used to measure the level of fog, and when visibility drops to 140 m or 70 m, the speed limit is dropped to 80 km/h or 60 km/h, respectively. After implementation of the speed harmonization during fog conditions, drivers reduced their speed by 8–10 km/h (Kuhn, 2004).

For congestion-related deployments, the United Kingdom has seen a decrease in emissions by 2 to 8 percent, a noise reduction around 0.7 decibels, 20 percent fewer property damage-only crashes, and 10 percent fewer injury crashes (Kuhn, 2004). Implementation has also resulted in an improvement in travel time reliability, a smoother flow, a better lane balance, and a calmer driving experience. Facilities in Germany with speed harmonization had travel times reduced by 5 to 15 percent, the number of crashes decreased by 30 percent, and a 5 percent increase in capacity (Kuhn, 2004). In Denmark, the implementation of speed harmonization resulted in speeds decreasing by less than 5 km/h and reduced speed variance. A survey showed that 46 percent of Danish travelers felt safer after the implementation (Kuhn, 2004).

The following are key factors to consider that can help facilitate successful deployment:

- The success of speed harmonization is closely linked to the extent to which drivers comply with the signing, so it is important that agencies communicate with the public and inform them of new measures and regulations as they are put in place.
- Speed harmonization needs to be implemented in response to an actual situation. If users do not believe the system is legitimate, compliance rates will be low. Therefore, if the reason for the new speed limit is not apparent, it should be explained through appropriate signing.
- Speed limit signs have to be visible to all vehicles; therefore, the signs are to be placed on gantries over every lane of traffic. DMS should be placed regularly to either give explanation for the lower speed limits or warn about extraordinary events.

Temporary Shoulder Use

Shoulder use, also known as hard shoulder running (HSR), is a dynamic measure designed to adapt roadway capacity to high traffic flow on a temporary basis. By allowing vehicles on the left or right shoulder under reduced speed limits, it is possible to serve a higher number of vehicles and avoid congestion, either totally or partially, during peak hours. The decision to implement shoulder use on a segment is taken by the operator in the traffic management center, although the need to open the shoulder is based on volume considerations. Two approaches to temporary shoulder use are implementations allowing all vehicles or only transit vehicles to use the shoulder (Kuhn, 2010).

- *Shoulder use for all vehicles* allows all vehicles on the roadway to utilize the designated shoulder when open. Traffic control devices over or adjacent to the shoulder instruct drivers when driving on the shoulder is permitted.
- *Transit-only shoulder use*, also known as a bus bypass shoulder (BBS) or bus on shoulder (BOS), allows only transit vehicles to utilize the designated shoulder under specific conditions and driving regulations. The bus drivers are instructed to use the shoulder under specific circumstances to ensure the safety of the operation and all the freeway users.

Sisiopiku also provided specific elements supporting this operational strategy including the following:

- Deployment in conjunction with speed harmonization.
- Passage of enabling legislation and related laws to allow the shoulder to be used as a travel lane.

- A policy for uniform application of the strategy through entrance and exit ramps and at interchanges.
- Adequate installation of sign gantries to provide operational information and to ensure that they are in sight at all times.
- Placement of lane control signals over each travel lane.
- Uniform signing and markings related to temporary shoulder use.
- Closed circuit television (CCTV) cameras with sufficient coverage to verify the clearance of the shoulder before deployment.
- Provision of pullouts at regular intervals with automatic vehicle detection to provide refuge areas for minor incidents.
- Provision of roadside emergency call boxes at emergency pullouts.
- Special lighting to enhance visibility of the shoulder.
- Advanced incident detection capabilities.
- Comprehensive incident management program.
- Connection to a traffic management center that serves as the focal point for the system.
- Dynamic message signs to provide guide sign information and regulatory signs to adapt to the addition of the shoulder as a travel lane (Sisiopiku, 2009).

Queue Warning

The basic principle of queue warning is to inform travelers of the presence of upstream queues, based on dynamic traffic detection and using warning signs and flashing lights. This strategy allows the traveler to anticipate a situation of emergency braking and limit the extent of speed differentials, erratic behavior, and queuing-related collisions. Queue warning can be used on its own with DMS placed on overhead gantries that show the symbol or word when a queue is close. It can also be included with speed harmonization and lane control signals to provide incident management capabilities. The system can be automated or controlled by a traffic management center (TMC) operator. Work zones also benefit from queue warning with portable DMS units rightfully placed upstream of expected queue points.

Sisiopiku advises that queue warning message displays should be implemented at regular intervals to warn of the presence of upstream queues based on dynamic traffic detection. Specific elements of the operational strategy should include the following:

- Deployment in conjunction with speed harmonization.
- Sufficient sensor deployment for traffic monitoring to support the strategy.
- Adequate installation of sign gantries to ensure that at least one queue warning sign is in sight at all times.
- An expert system that deploys the strategy based on prevailing roadway conditions without requiring operator intervention. It is critical that this expert system be reliable and accurate to gain the trust and acceptance of the public.
- Uniform signing to indicate congestion ahead.
- Connection to a traffic management center that serves as the focal point for the system.

Dynamic Merge Control

Dynamic merge control, or junction control, is used to dynamically meter or close specific lanes upstream of the interchange to manage access based on traffic demand. It is an operational treatment that addresses the geometric condition when the sum of both freeway general purpose lanes and merging lanes at an interchange is higher than the number of downstream general purpose lanes. A typical U.S. application of this condition would be a lane drop for one of the outside lanes or a merging of two inside lanes, both of which are static solutions. The intent is to provide priority access to the higher traffic stream. Dynamic merge control can be a permanent application at known bottlenecks, or it can be used temporarily until a downstream roadway is widened. It is a practical approach to handling varying demand on the main lanes and the merging lanes to effectively utilize existing capacity.

At merges from major interchange ramps, consideration should be given to dynamically metering or closing specific upstream lanes (dynamic merge control), depending on traffic demand. This strategy would incorporate existing ramp metering systems and could offer the potential of delaying the onset of main lane congestion and balancing demands between upstream roadways. Specific elements of the operational strategy should include the following:

- An expert system that deploys the strategy based on prevailing roadway conditions without requiring operator intervention. It is critical that this expert system be reliable and accurate to gain the trust and acceptance of the public.
- CCTV cameras to support the monitoring of the system.
- Installation of lane control signals over the main lanes and the ramp lanes with a signal over each travel lane.
- Adequate installation of sign gantries upstream of the deployment to ensure sufficient advance warning is provided to roadway users through the use of dynamic message signs.
- Adequate installation of sign gantries with dynamic message signs upstream of the deployment to provide guide sign information and regulatory signs to adapt to the changes in lane use.
- Uniform signing to indicate merge control is in use.
- Automated enforcement to deter violations.
- A bypass lane for emergency vehicles, transit, or other identified exempt users.
- Connection to a traffic management center that serves as the focal point for the system.

Dynamic Truck Restrictions

Dynamic truck restrictions require all truck traffic to use designated lanes in a dynamic manner during peak periods. The intent is to increase the homogeneity of speed on each lane and to minimize the disruption in traffic flow caused by heavy vehicles. The dynamic nature of the treatment allows for more flexibility in application as opposed to static restrictions. The activation of the signs indicating the presence of restrictions is usually automated and is triggered by real-time traffic volumes. The signs should be placed on overhead gantries for visibility.

In the Netherlands, until the dynamic aspect was introduced recently as a test, the restriction took place at fixed times of the day mainly during peak hours. The dynamic restriction is activated when necessary and is displayed on overhead gantries. The approval rates for the dynamic variation are better among truck drivers, and fewer violations were reported (Middelhem, 2006).

Some sections where speed harmonization is present also have dynamic truck restrictions that are implemented at the same time as the speed harmonization. The combination of these two strategies has reduced accidents enough to pay for itself in three years (Jarema et al., 1997).

Depending on the location, truck restrictions might not be a solution for a congestion problem. In England, a section of the M5 that regularly experienced congestion with up to 19 miles of queue was used as a pilot scheme for truck restrictions. The restriction applied to towing vehicles, buses, and heavy goods vehicles (HGV). Although the right lane usage by trucks increased from 84 to 91 percent, the levels of congestion were not significantly affected because the congestion was mainly due to car traffic.

The following are key factors to consider that can help facilitate successful deployment:

- Agencies will need to seek enabling legislation and related laws to allow dynamic truck restrictions.
- An expert system that deploys the strategy based on prevailing roadway conditions without requiring operator intervention is ideal. It is very important that this expert system by reliable and accurate in order to gain the trust and acceptance by system users.
- The installation of sign gantries needs to be sufficient to ensure that at least one sign displaying the restrictions is visible at all times.

Dynamic Traveler Information and Rerouting

An important component of transportation operations, dynamic rerouting and traveler information, is the practice of providing rerouting and traveler information in a dynamic manner to system users. The intent is to provide users with viable route alternatives, and the approach can be especially beneficial in helping reduce the impact of noncurrent congestion (Mirshashi et al., 2007). When the main road is congested, rerouting traffic on a parallel road to relieve further congestion can be an efficient strategy. The implementation can be automated, but needs to include detailed information about both roads, such as short range expected volumes, construction, or special events.

A study on dynamic rerouting and traveler information in Copenhagen, Denmark, suggested that more travelers followed the alternative route (up to 12 percent of the time) as the displayed travel time between the original and alternate route increased. The relatively low portion of route changers may be due to erratic displays on DMS at the time of deployment. Surveys conducted showed that 80 percent of the driving public was in favor of this system.

In the Netherlands, rerouting information is displayed using through full matrix DMS that provide useful information for drivers to make the appropriate decision based on their needs. These signs are usually set at entrances of cities. Evidence indicates that the use of these signs has helped reduce congestion. For instance, after implementation on the Amsterdam ring road, congestion dropped by 25 to 33 percent. Drivers give more credit to the provision of accurate information (62 percent) to DMS information than to radio (52 percent). In normal conditions, 8 to 10 percent of drivers are reacting to the information. This trend can have a major effect on roadway operations and recurrent congestion.

In England, an expert system in the TMC computes the remaining capacity on a facility and the anticipated demand for the duration of an incident. If the anticipated delay exceeds a set threshold, the demand on alternate routes and the presence of road works, weather problems, or special events is evaluated before communicating the alternate route to the traffic.

Intelligent Transportation Systems (ITS)

The Government Accountability Office (GAO) notes that in general, the promise of ITS for managing congestion has fallen short. Although USDOT established a vision to build an intelligent transportation infrastructure across the United States to save time and lives and improve the quality of life for Americans, DOT's deployment goal ended in 2005. Studies show that when implemented properly, ITS technologies can reduce congestion, as well as lead to other benefits such as improved safety and reduced emissions harmful to the environment. However, transportation agencies have been slow to adopt and deploy ITS technologies, facing many barriers along the way. Funding for ITS deployments, particularly for ongoing operations and maintenance costs, is critical to ensuring that ITS deployments are used effectively. However, such funding continues to be a problem for state and local governments. In addition, state and local transportation agencies do not always consider ITS when developing their transportation plans. Moreover, DOT does not have clear information on the extent to which areas have deployed ITS to meet their particular needs, nor does it have clear information on the operating status of ITS where it has been deployed. Limitations of DOT's efforts in measuring the deployment of ITS technologies, among other things, have reduced its ability to help state and local governments invest strategically in ITS (GAO, 2005).

Successful ITS deployment depends on selecting the appropriate level and types of ITS for the area, effectively integrating these technologies, and committing the necessary resources to operate and maintain them. We recognize that DOT has not been able to influence deployment through funding, and state and local governments are free to choose the extent to which they direct other federal highway funds to ITS. However, DOT has opportunities to assist metropolitan areas in developing appropriate, efficient, and cost effective transportation systems that include ITS. Although analyses of a project's cost effectiveness often do not drive transportation investment decisions—many factors, political as well as other, influence project selections—such analyses should be part of the decision-making process. And impact analysis of all highway projects, including ITS projects, would help decision makers view all tools together and make well-reasoned decisions about investment of their limited funds to develop the best possible transportation system. In addition, as the Secretary of Transportation indicated in 1996, providing national guidance is important to ensure ITS deployment. Nationally tracking measures for ITS deployment and operations would continue to support awareness of progress toward improved mobility and help states and local areas considering ITS determine how they could deploy and operate ITS technologies to help mitigate congestion and realize other benefits (GAO, 2005).

Service/Courtesy Patrols

Service patrol programs generally consist of trained personnel who use specially equipped vehicles to systematically patrol congested highways searching for and responding to traffic incidents. These programs operate under a variety of names: freeway service patrol, motorist assistance program, and courtesy patrol. State and local sponsoring agencies are using service patrols as a strategy to reduce traffic congestion, improve travel time reliability, and improve highway safety (FHWA, 2008). Service patrols and CCTV cameras allow for quicker identification of and response to incidents, a major source of non-recurring congestion (Cambridge Systematics, 2005).

Annual operating budgets for service patrol programs can range from $275,000 for District 5 in Pennsylvania to $19 million covering several urban areas in Florida. Funding can affect service areas, hours of operation, training, local and state staffing, and equipment (FHWA, 2008).

Advanced Traveler Information Systems (ATIS)

ATIS has become a viable congestion mitigation strategy in the last two decades due to implementation of ITS, increased development of internet capabilities, and the creation of the 511 calling code traveler information system. It increases efficiencies in a transportation network through:

- Time management – For example, changing a departure time to avoid or accommodate delays or inclement weather.
- Trip modifications – Changing the route of travel, the destination, or the mode of travel based on conditions or situations.
- Reduction in stress – Understanding the cause of a delay or the upcoming road conditions and an estimate of the impact to reduce driver stress (Deeter, 2009).

For commuters, research has shown three main information needs that ATIS can provide:

- Route-specific information describing the current travel time or speed of travel.
- Information about specific circumstances affecting travel (e.g., incidents, closures, major congestion).
- Current alerts of transit delays or service interruptions (Deeter, 2009).

Researchers have shown the effectiveness of ATIS applications in congestion mitigation (Xiao Qin et al., 2010; FHWA, 2011). However, deployment of systems has presented several challenges. These are:

- The traveler information that is being delivered receives limited use.
- A gap exists between what is possible in the state of the art in data collection, information generation, and delivery, and what occurs in today's state of practice.
- Both public and private traveler information providers face funding and budget challenges (Deeter, 2009).

Xiao Qin et al. described an advanced traveler information system (ATIS) designed to mitigate the work zone impacts on an I-39/90 bridge reconstruction project in Edgerton, Wisconsin. The ATIS would promote utilization of alternative routes and improve local road network performance. Field comparisons between ATIS presence and absence discovered different diversion patterns in each direction associated with traffic delay. Drivers remained on the freeway when the displayed delay was less than 15 minutes while more drivers chose to leave the freeway when the displayed delay time was greater or equal to 15 minutes. Further analysis indicated additional significant variables in causing a high diversion rate. These were: freeway volume, ramp exiting volume on normal days, and delay time. Researchers showed that the ATIS performed effectively in increasing work zone operational capacity and reaffirmed the effectiveness of ITS applications in congestion mitigation.

ITS Performance Measurement

Federal ITS performance measures, used to evaluate ITS programs, include:

- Safety.
  - Reduction in crash rates—Total, fatalities, and injury.
- Mobility.
  - Reduction in travel time delay.
  - Reduction in travel time variability.
  - Improvement in customer satisfaction.
- Efficiency.
  - Increased throughput.
  - Productivity.
  - Reduced travel costs.
- Energy and environment.
  - Reduced emissions.
  - Reduced energy consumption (Shaw, 2003).

NCHRP Synthesis 311: Performance Measures of Operational Effectiveness for Highway Segments and Systems: A Synthesis of Highway Practice provides a wealth of information pertaining to the development and use of performance measures in ITS applications.

Traffic Signals

Trueblood noted requirements for successful analysis of traffic signal programs:

- Data collection – Accurate existing information is highly important. This includes signal timing, peak hour volumes, and geometrics.
- Travel time runs – Key members of the time should conduct travel time runs to thoroughly understand traffic flow along each corridor.
- Depending on the goals of the project, the use of traffic simulation can provide added value. If traffic volumes are high, traffic simulation should seriously be considered.
- Synchro is an excellent tool for developing signal timing plans. The time-space diagram allows the user to adjust offsets based on their individual needs.
- Even small reductions during peak hours relate to benefits related to reductions in user delay and air emissions.
- Reductions in delay ranged from 5 percent to over 25 percent.

Shimazu and Yoshida (2005) analyzed an adaptive signal control system and observed that since the primary focus of signalization has been placed on congestion management, the traffic control system, which has been operated principally for the purpose of congestion mitigation, has mainly been evaluated against congestion length and travel-time delays. Along with the growing diversity and complexity of social issues, however, social demands on traffic control are also getting diversified to incorporate safety and environmental measures. In addition, in order to explain to the public the sophistication of traffic control enabled by introduction of STREAM and a resulting relief in traffic congestion in a comprehensible manner, it is of high importance to generate specific figures that represent reduction in travel time, congestion length, etc.

Therefore, a task flow to verify the effects of measures and to leverage the knowledge obtained from evaluation for further re-evaluation of traffic control goals is required henceforth, in addition to adjusting traffic control parameters to meet diversified needs for traffic smoothness, safety, environmental friendliness, etc.

Reversible Traffic Lanes/Changeable Lane Assignments

Reversible traffic lanes, also called changeable lane assignments, increase the directional capacity of a congested roadway by designating an additional lane from the non-congested direction to the congested side of the roadway. The strategy may be implemented by using combinations of lane control signals and conventional signal indications. While these functions are usually implemented on a time of day basis, they may also be implemented on a traffic responsive basis. This strategy requires special traffic controls to effect the desired movements. Two basic types of operations using surface street directional controls include:

- Reversible Flow – Dynamically operating a street as one-way inbound, one-way outbound, or two-way. Applications may include:
    - Heavy imbalance of directional traffic flow for relatively short periods such as in and out of central business districts.
    - No alternate solutions such as one-way pair or street widening.
    - Severe congestion and need to increase directional capacity.
    - Nearby parallel street capable of handling minor directional flow during peak one-way operation.
- Off-center lane movement – Partial reversal of traffic flow where only one or two lanes are reversed. Applications are similar to reversible flow.

Current techniques for controlling directional movement use signs or a combination of signs and lane control signals. Change of operational mode is usually on a time-of-day basis (FHWA, 2005).

Installation of a changeable lane assignment system as part of a major intersection reconstruction project in Houston was estimated to help provide a 5 percent reduction in volume-capacity ratio after implementation (HGAC, 2005).

Exclusive Lanes

Exclusive lanes use vehicle eligibility to achieve operational objectives. They provide an exclusive lane to certain vehicle classifications. Most often this lane is dedicated to buses or large trucks.

Exclusive bus-only lanes act to provide an incentive to transit riders. By providing a special lane for the exclusive use of buses, these vehicles achieve a travel time advantage as opposed to vehicles in the general-purpose lanes (Collier, 2004).

Truck lanes operate in much the same fashion as bus-only lanes. However, the objective is different. The goal in separating truck traffic from passenger traffic is to improve the flow of a facility and provide an increased level of safety by reducing possible conflicts between large trucks and other vehicles. Separate truck lanes may be feasible in areas where truck volumes exceed 30 percent of vehicular traffic, peak-hour volumes exceed 1,800 vehicles per lane-hour, and off-peak volumes exceed 1,200 vehicles per lane-hour (FHWA, 2008).

The most effective purpose built exclusive guideways are designed to serve several different public transport routes (for example, a bus tunnel in a downtown area) (Vidunas, 1998).

The method of separating exclusive lanes from other traffic is an important factor in determining their effectiveness. Painted lanes are least effective and lanes separated by barriers or on their own right-of-way are best (FHWA, 2008).

Research by Short indicated that Georgia carriers are willing to use optional TOT lanes when no cost exists, and that a pricing mechanism could successfully keep TOT lanes at free-flow levels. Results also indicate strong pressure from shippers regarding delivery times, thus leading Georgia carriers to conduct business during hours of peak highway/demand. Such information suggests that increased capacity is critical to reducing congestion, while attempts to change the times at which trucks operate by pricing trucks during peak periods may not address the issue (Short, 2007).

In February 2008, MDOT opened the state's first High Occupancy Vehicle (HOV) lane on a 5.25-mile stretch of Michigan Avenue (US-12) from Wyoming Avenue to the Detroit Central Business District. The HOV lane provided commuters with a transit alternative for reaching downtown during Gateway Project construction. The HOV lane accommodated buses, commuter vans, and carpool vehicles with two or more occupants. The lane formed through a partnership between the Detroit Department of Transportation (DDOT) and the Suburban Mobility Authority for Regional Transit (SMART) and enables them to jointly operate the Gateway Express, a new bus service for commuters.

Incident Management

The FHWA website offers over 30 publications pertaining to all aspects of developing, planning, adopting, and implementing traffic incident management programs. They are available at: http://www.ops.fhwa.dot.gov/publications/publications.htm#tim.

Traffic Incident Management (TIM) is a planned and coordinated process by multiple public agencies and private sector partners to detect, respond to, and remove traffic incidents and restore traffic capacity as safely and quickly as possible. Detection, response, and clearance strategies are greatly enhanced by ITS in a region.

The National Incident Management System, adopted in 2004, provides a more formal structure to TIM program and essential components as noted by FHWA in Table 3.

Table 3. TIM-NIMS Program Components.

TIM Program Areas	NIMS Concepts	TIM Program Concepts
Strategic	Preparedness	Planning Training and exercises Ensure readiness of personnel and equipment Mutual-aid agreements Multi-agency operations agreements TIM task forces and/or teams
Strategic	Resource Management	Identify and type resources Identify location of resources Mobilize resources Reimbursement
Tactical	ICS	On-scene command and control procedures
Support	Communications and Information Management	Develop information policies Develop interoperability standards Utilize common terminology Develop communication systems

Reference: Kreis, 2005

Thirteen state DOTs with implemented congestion management strategies were surveyed by researchers at the Kentucky Transportation Center. When asked to identify the most effective or best strategy, incident management programs were among the top four responses (Kreis, 2005).

Detection, Response, and Clearance

Data are collected through a communications infrastructure, a closed-circuit television system, and sensor detection system. The information is then used to make real-time traffic management decisions and provide motorists with information through dynamic message signs, radio travel advisories, and a telephone advisory system. Travelers may also access an interactive on-line GIS mapping service for major roads to obtain average speed, traffic conditions, and lane closures. Travelers can also view selected road conditions through online video links (AASHTO, 2010).

The cost for development and implementation of a 30-mile fully integrated freeway/incident management program as part of a freeway expansion/improvement project is $33.2 million, or $1.1 million per mile. Annual operations and maintenance costs will be $1 million per year.

The majority of the costs are for surveillance, detection, and information equipment and communications hardware. Information equipment includes detection technologies such as acoustic sensors, loops, and digital detectors, CCTV cameras, DMS and lane control systems, and supporting fiber-optic communications infrastructure (FHWA, 2010).

Using video surveillance capabilities at the San Antonio and Houston, Texas, traffic control centers, the project team examined a large number of freeway incidents. Detailed characterizations of the incidents, emergency responses, and effects upon freeway traffic were prepared. From this analysis, a clear need for a pathway for emergency vehicles to reach incident sites was identified. Additionally, a clear need for a haven for disabled or damaged vehicles was identified. Such a haven would permit faster incident clearing and a re-opening of main lanes. An obvious solution to both the access path and haven problems is a paved shoulder. This solution led to a recommendation to maintain a minimum 8 foot wide shoulder on at least the freeway right-side for freeways with three or fewer lanes and maintenance of minimum 8 foot wide paved shoulders on both the left and right freeway sides on freeways with more than three lanes per direction (Machemehl et al., 2001).

Information/Routing and Interagency Cooperation

The responsibilities of the multiple jurisdictions and agencies involved have the potential to overlap. Agencies must manage resources effectively, including technology, to maximize the effectiveness and safety of incident management efforts (FHWA, 2010).

The process involves a number of organizations, including:

- Law Enforcement.
- Fire and Rescue.
- Emergency Medical Services.
- Transportation.
- Public Safety Communications.
- Emergency Management.
- Towing and Recovery.
- Hazardous Materials Contractors.
- Traffic Information Media (FHWA, 2010).

Once a coordinated TIM program is in place, effective interoperable interagency communications and information exchange are vital.

Special Event Management

FHWA has published a user guide for managing PSE traffic titled *Managing Travel for Planned Special Events*. It states that several key criteria need to be considered when planning for planned special events (PSE) traffic management:

- Existence of limited road capacity to access the event venue and potentially limited parking capacity at the venue.
- Existence of fewer alternate routes to accommodate event and background traffic.
- Existence of limited or no permanent infrastructure for monitoring and managing traffic.
- Generation of trips from a multicounty region.

Recent research in special event management includes a Center for Urban Transportation Research (CUTR) study focusing on determining the causes of congestion on 10 intersections along US 301 in Starke, Florida, and developing strategies to alleviate recurring and nonrecurring congestion by using appropriate traffic signal technologies.

Remediation strategies were developed based on the analysis of traffic data collected in 2006 and 2007, assessment of historical traffic data from permanent count stations and associated regional special events, literature review of available signal technologies, and information collected from public and private agencies.

Recommended short-term strategies include implementing the following:

- Retime traffic signals to handle regular traffic condition during weekdays and weekends.
- Develop and implement special signal timing plans to handle traffic surges before and after University of Florida football games held in Gainesville.
- Upgrade traffic signal controllers if necessary to provide required functionality (CUTR, 2008).

Recommended mid-term strategies include the following:

- Synchronize time clocks among local controllers using global positioning system (GPS) time clock reference devices or through communication between local controllers on the US 301 corridor in Starke.
- Determine and install a traffic signal system software at TOC (Traffic Operation Center) or TMC to communicate with the master signal on the US 301 corridor in Starke.
- Install a CCTV camera with Pan, Tilt, Zoom (PTZ) capability at US 301 and Madison St. to monitor traffic on US 301 corridor.
- Provide a communication system between the master controller and TOC or TMC through Digital Subscriber Line (DSL) or wireless (4.9 GHz radio) to upload and download signal timing information, and monitor video at TOC or TMC.
- Develop the low-cost improvement suggestions through US 301.

Recommended long-term strategies include the following:

- Determine and select a low-cost adaptive traffic control – ACS Lite or an adaptive traffic control system available in the market such as SCATS, SCOOT, and RT-TRACS.
- Procure the adaptive traffic control system, adequate traffic controllers, signal system software, and communication system.
- Recruit transportation professionals to operate and maintain the adaptive traffic control system.

Lassacher et al. found several low-cost strategies to yield tangible benefits, namely signal retiming, manual traffic control, and road closures. Central to the successful application of the strategies discussed was interagency partnerships. Such partnerships allow agencies to identify the equipment and personnel, among other factors, that can be leveraged to manage a particular PSE. Strategies such as signal retiming, manual traffic control, and road closures were straightforward to implement and made a significant difference compared with previous seasons. These strategies were not extremely labor intensive (with the exception of manual control), but produced improvements or, at the very least, prevented further deterioration in operations from occurring (Lassacher at el., 2009).

Although these strategies were successful overall, it is important to recognize that there is always room for improvement. Some strategies will not work out as planned (in the case of this work, further signal timing adjustments will be needed at intersections adjacent to campus and at sites farther away) and will require modification. In addition, although several strategies are low-cost, financial resources are still required for their implementation. Thus, it is crucial for the party responsible for the event (e.g., a university athletic department) to recognize that its event is a source of disruption, and it is its responsibility to bear the costs of mitigating the impact. Without such recognition, the momentum of previous efforts and interagency partnerships will be lost, as will be the opportunity to proactively manage the traffic associated with an event (Lassacher, 2009).

Flexibility is the key to managing PSE traffic. For recurring events, overall management should be viewed as a work in progress, with modifications made as needed to the strategies used. Indeed, it is possible that some strategies may be found to not be producing their intended results and will need to be modified or dropped altogether. In the context of a recurring event, plans and strategies will need to be continually reviewed and addressed before and throughout its duration, as well as yearly. This review includes meetings with stakeholders to review past successes and challenges (and to present data analysis results, as available). A pre-event stakeholder meeting is also necessary to discuss needed improvements, areas of concern, and any ongoing or planned construction and improvement projects that may affect the PSE roadway network (CUTR, 2008).

Road Weather Management

Road Weather Management congestion mitigation strategies are deployed as components of a state and regional ITS. Effectiveness of programs is increased with technological applications disseminating information regarding adverse weather, road conditions, and agency resources. A significant portion of road weather management strategies pertain to winter maintenance and DOT asset management (FHWA, 2010). The traffic impacts of inclement weather can be significant. Table 4 displays the traffic flow reductions due to inclement weather.

Table 4. Freeway Traffic Flow Reductions due to Weather.

Weather Conditions	Freeway Traffic Flow Reductions			
	Average Speed	Free-Flow Speed	Volume	Capacity
Light Rain/Snow	3–13%	2–13%	5–10%	4–11%
Heavy Rain	3–16%	6–17%	14%	10–30%
Heavy Snow	5–40%	5–64%	30–44%	12–27%
Low Visibility	10–12%	--	--	12%

Reference: FHWA, 2010

Transit

Public transit is ideally suited to increase capacity and improve passenger flow in congested transportation corridors. In addition to improving mobility in general and in addressing recurring congestion, transit service (and ITS transit technologies and strategies, which improve transit service) is effective in addressing nonrecurring congestion caused by incidents, work zones, and planned special events. However, transit capacity in corridors is often underutilized because transit service is not flexible and convenient enough to accommodate the needs of all customers.

Mortensen discusses ITS transit technologies and strategies in integrated corridor management and finds public transit is ideally suited to increase capacity and improve passenger flow in congested transportation corridors. However, transit capacity in corridors is often underutilized because transit service is not flexible and convenient enough to accommodate the needs of all customers. ITS technologies and strategies improve the operations of individual transit systems, as well as support coordinated operations among transit systems. Improved service makes transit more appealing, which helps to increase ridership and reduce congestion in corridors. By integrating the management and control of transit and roadway operations, using ITS, further gains in corridor efficiency, and thus congestion mitigation, can be realized (Mortensen, 2008).

In addition to improving mobility in general and in addressing recurring congestion, transit service (and ITS transit technologies and strategies, which improve transit service) is effective in addressing nonrecurring congestion caused by incidents, work zones, and planned special events (Mortensen, 2008).

Aftabuzzaman analyzed public transport (transit) congestion relief impacts in Australia and found values at or between 4.4 and 151.4 cents (Australian 2008 dollars) per marginal vehicle km of travel with an average of 45.0 cents. Valuations are higher for circumstances with greater degrees of traffic congestion and also where both travel time and vehicle operating cost savings are considered (Aftabuzzaman, 2008).

Park-and-Ride Lots

The Environmental Protection Agency (EPA) has noted key characteristics of good park-and-ride lots. These include:

- Located conveniently near interchanges of HOV lane or major highway – The preferable location is within one quarter mile or adjacent to the roadway entrance ramp. Also, lot locations convenient to transit (rail or bus) are likely to experience greater use.
- Effective market capture area or distance that major park-and-ride facilities attract users is about 5 miles – According to several surveys, most lot users drove 5 to 7 miles, with a trip time of 12-20 minutes maximum.
- Location upstream of congestion – A site should be upstream of congestion and located on the side of the morning commute direction.
- Safety – A lot should be visible, well lighted, and preferably, have a telephone nearby. It should also be regularly patrolled by state police if it is a state-owned lot or by a security guard if it is a shared facility.
- Good ingress and egress – Safe and efficient traffic movement is a major concern. Access to the lot should be convenient to both transit and auto.
- Projected demand – Demand for park-and-ride spaces is based on analysis of individual travel corridors. Estimation of demand provides a guideline as to the most effective size for the lot.

- Visibility from roadways – The lot should be visible from freeways and major roadways. Visibility of facilities contributes to the recognition by passing motorists of their availability. Visibility of a lot is also a deterrent to vandalism.
- Signing/marketing – Motorists should be informed of the lot's location with directional roadway signs. Marketing is as important as planning and development of facilities. New lots should be promoted, as well as the overall park-and-ride program.
- Accessibility to high-occupancy vehicle (HOV) lanes – Sites located adjacent to HOV lanes, HOV priority ramps, or other priority facilities provide benefits to park-and-ride users. Coordination of the location of park-and-ride sites with HOV facility development can increase the usefulness and efficiency of both facilities.
- Fewer and larger (300 spaces or more) lots are preferable.
- Express bus transit service at the lot would help utilization.

ITS strategies such as traveler information systems and electronic payment systems can add to the convenience of park-and-ride lots. Internet availability providing users with the location of lots, transit stations in the vicinity, links to transit provider websites, and the location of telework centers would also benefit users (EPA, 1999).

Multimodal Transportation Centers

Multimodal transportation centers are places where interface occurs between transportation systems. The centers can be new facilities or an existing railroad passenger terminal, which has been or may be modified as necessary to accommodate several modes of transportation, including intercity rail service and some or all of the following: intercity bus, commuter rail, intra-city rail transit and bus transportation, airport limousine service, bicycle and pedestrian facilities, airline ticket offices, rent-a-car facilities, taxicabs, private parking, and other transportation services. The term also implies a high degree of connectivity and interchange between modes improving passenger convenience, reliability, and options for residents, commuters, and visitors. Such a facility, with its potential as a center of activity, may be a catalyst to help link and connect surrounding districts and support new development and employment growth.

Intermodal facilities can take several forms depending on their location, types of transit services offered, and passenger characteristics. In most cases, any specific facility will not fall neatly into one category but rather contain characteristics of two or more types.
- Intercity Terminal.
- Downtown Commuter Transit Center.
- Interchange – An interchange is a specialized intermodal facility that principally serves as a place for passengers to transfer between transit services.
- Park-and-Ride.
- On-Street Transit Facilities/Transit Mall.

The Troy/Birmingham Transit Center is currently being developed jointly by the two cities. The transit center will serve as a hub for regional public transportation, using existing Amtrak rail infrastructure along the Wolverine Corridor while providing a transfer point to SMART bus services, taxi, and sedan connections consistent with the Detroit Regional Mass Transit Plan. It will also create more transportation opportunities for patrons of the Oakland/Troy Airport. The projected total cost of the project is $9.9 million (City of Troy, 2011).

Freight Rail Improvements

Many improvements to freight rail movement include the development of intermodal transportation centers. These centers involve the consolidation of train-truck interactions with ground freight transport into one large location, thus increasing the efficiency of goods movement in a metropolitan region. These centers have become increasingly important to regional economic development plans over the last two decades. In some cases, these intermodal centers are developed adjacent to major airports with air cargo transport, thus combining three freight modes into one coordinated area.

Another aspect of freight rail improvement is railroad-highway crossing upgrades and safety improvements. These projects can provide congestion mitigation benefits along major arterials in metropolitan regions.

The DIFT Project has completed its environmental impact analysis and is entering its design phase. The project involves all four Class I railroads operating in Michigan—CSX, Norfolk Southern, Canadian National, and Canadian Pacific—and will consolidate their metropolitan freight hubs into an intermodal center in southwest Detroit (MDOT, 2009).

In the latest MDOT five-year plan, the department states that it will continue to respond to any economic development activity related to freight movement, while continuing to focus its efforts on safety and preservation. MDOT is expected to invest at least $42.3 million through the Capital Development Program, Freight Economic Development Program, and Local Grade Crossing Program. Projects planned for this five-year timeframe include the repair of two state-owned rail bridges, as well as freight-related economic development projects and safety enhancement projects at local railroad crossings.

Bicycle and Pedestrian

Three main factors affect the viability of bicycling and walking as alternative transportation:

- Trip distance, defined above as 5 miles or less for bicycles and less than one-half mile for pedestrians.
- Location of facilities along usable commuting routes.
- Overall network connectivity.
- Safety, both along the path or lane and at the destination site.
- Weather conditions, since inclement weather is not conducive to either mode (Pedestrian and Bicycle Information Center, 2011).

The EPA reports that the following local factors help to ensure a successful program:

- Short travel distances between residential areas and key trip attractions.
- High concentrations of people under age 40.
- Compatible infrastructure that can be modified into appropriate facilities.

- Areas with localized congestion or crowded parking facilities.
- Marketing and education efforts including maps and plans, safety training, promotions, and media events.

Factors that negatively affect bicycle and pedestrian programs are:

- Missing links in the network of lanes and trails.
- Lack of safe routes to work destinations.
- Conflicts with traffic laws that give preference to autos.
- Lack of facilities to accommodate activities (EPA, 1998).

Bicycle/pedestrian projects can lead to a reduction in vehicle trips, but the benefit is comparatively small and is a long-term strategy for a region. Most programs should have a conservative assumption of less than 1 percent reduction in vehicle trips in a region over the project lifetime (Douma, 2008).

EPA has estimated costs per ton of pollutant removed through the congestion mitigation/air quality (CMAQ) program as ranging from $551,000 per ton to $7.5 million per ton. Although provided in the context of air pollution reduction, the figures provide a basis for comparison to other project types for cost per trip removed (FHWA, 2008).

Another example is Kansas City's recently proposed 101-mile bicycle lane program. The city has computed a benefit-cost ratio of 11.73 for the entire program along with a 0.4 percent reduction in vehicle trips over 20 years. Analysts estimated a $10,473 annual benefit for congestion reduction for both bicycle and pedestrian modes (Mid-America Regional Council, 2009).

Reducing Construction/Maintenance Interference

Reducing interference in road construction and maintenance work zones requires a transportation management plan (TMP) that lays out a set of coordinated transportation management strategies and describes how they will be used to manage the work zone impacts of a road project. The scope, content, and level of detail of a TMP may vary based on the state or local transportation agency's work zone policy and the anticipated work zone impacts of the project.

There are three major components to a TMP:

- Temporary Traffic Control Plan (TTCP) – A TTCP is a common component for all projects and will contain information (plan sheets, details, special provisions, etc.) on how facility traffic will be maintained. This plan includes the specific traffic control devices, temporary pavement markings, and other such information that will assist travelers in traversing the work zone in a safe and efficient manner.
- Transportation Operations Plan (TOP) – The TOP contains strategies to address the operations and management of local transportation systems affected by the project. Such strategies will include items such as work zone ITS components, law enforcement, and incident management.
- Public Information Plan (PIP) – The PIP describes how project information will be communicated to affected parties, traveling public, and project stakeholders both prior to

and during construction operations. The plan also describes the most efficient method of communicating this information via local media, business groups, message signs, and other such strategies (FHWA, 2005).

In the state of Michigan, all potentially significant construction or maintenance projects are evaluated for possible mobility impacts to the transportation system by being reviewed against the thresholds for the following critical evaluation criteria:

- Volume to Capacity: Threshold – greater than 0.80.
- Travel Time: Threshold – greater than 10 minutes.
- Level of Service (LOS): Threshold – lower than or equal to LOS D or, LOS C if the current operation is LOS A.

Projects exceeding any one of the three evaluation criteria thresholds are considered significant and must have a project specific TMP developed and implemented. Mitigation measures to minimize travel delay are to be designed into the project (MDOT, 2010).

Demand Management

Work Schedule Changes

There are three main types of changes to work schedules:

- *Telecommuting* is work done on a regular basis from daily to once a week at an alternative work site such as the employee's home or a telecommuting center. A center is a facility that provides the employer, employee, and customers with all requirements to perform work and services without traveling to the employee's main work site and may be operated by a single or consortium of businesses.
- *Flextime* allows employees to set arrival and/or departure times with the approval of the employer in order to avoid traveling at peak traffic times, but all employees are present for some core period of the workday.
- *Compressed work weeks* are work scheduling programs that condense a standard number of work hours into fewer than five days per week or fewer than 10 days per two-week period. For example, four days at 10 hours per day or 80 hours over nine days.

The EPA Office of Mobile Sources has found that schedule change programs achieve greater success and gain employee approval if employers adopt the changes voluntarily with employee input. (CMAQ Report, 2002) The EPA also found that several factors should be considered when attempting to use work schedule changes as a congestion mitigation strategy:

- *Diminished benefits* as the decrease in work trip vehicle miles traveled (VMT) may be mitigated to some extent by increased non work travel for people working compressed work weeks. The potential exists that although employees may benefit from driving on their day off, congestion may not significantly improve overall. However, more trips are likely to be taken during off-peak congestion hours so that the time distribution of trips is widened, and congestion is mitigated in peak hours.
- *Potential reduction in ridesharing and transit use by employees* may occur because of variable work hours. Businesses should coordinate the schedule changes, whenever

possible, with transit and ridesharing services. Schedules for these services may need to be modified as a response to new arrival and departure times.

- *Pilot programs are recommended* for three to six months before committing to the changed hours so that the policies can be evaluated in terms of employee morale, productivity, and financial ramifications.
- *Applicability* of variable work hour strategies can be an issue for businesses. Organizations that rely heavily on process manufacturing usually need all workers to be present at the same time to work efficiently. Compressed work weeks may be a more suitable option for manufacturing plants than a flextime or staggered hours policy. Service businesses may be more able to rotate worker schedules and permit flextime policies.
- *Location* of the organization implementing a work schedule change may be a factor influencing success. Flextime policies may be more successful in areas of greater workplace density where associated traffic is highly concentrated around peak periods (EPA, 1992).

Land Use Development

The following strategies have been identified to support coordination of transportation and land use on a more widespread basis:

- State and regional agency leadership, funding, and technical assistance for regional planning and visioning efforts.
- Funding and technical assistance for implementation activities (e.g., area or site plan development, code revision, supportive infrastructure).
- Revision of transportation project selection criteria to reward transportation efficient land use policies and support investments consistent with regional land use objectives.
- Roadway and transportation facility planning and design practices to support Context Sensitive Solutions.
- Interagency partnerships and agreements (e.g., coordinated plan development, joint review processes).
- Analysis, education, and outreach regarding the transportation and other benefits of efficient growth patterns (Bartholomew, 2005).

At regional build-out, Smart Growth saves between $1.8 and $5.4 billion in transportation costs by eliminating half the congested lane miles which occur if current trends continue, preserves three townships of agricultural land/open space, and reduces pollutants by greater than 10,000 kilograms per day.

Strong linkages were established between regional land use and transportation goals, objectives, investment strategies, performance measures and project selection criteria and smart growth, along with auxiliary land use strategies such as access management and traffic impact studies.

The Regional Concept of Management and Operations for congested corridors, which is emerging from this approach, is being applied to all modes “from building façade to building façade,” is performance based and considers safety, wide nodes, narrow roads, road diets, traffic calming, ITS, and more traditional traffic engineering treatments. This resulting Regional

Concept of Management and Operations makes system's operations and management itself another land use strategy for implementing smart growth, which reduces congestion and improves safety for all modes and users throughout the corridor (Hamilton, 2004).

Ridesharing/Vanpools

Rideshare and vanpool incentives promote and assist state, regional, and local efforts aimed at encouraging commuters to use alternatives to SOVs in traveling to work and encourage employers to provide in-house programs that promote ridesharing, transit, bicycling, and walking among employees.

The benefits of employer-based travel demand management (TDM) have generally been modest although not negligible. The most effective commuter choice strategies are those that provide financial incentives for alternative modes (e.g., subsidized or free transit passes) or disincentives (e.g., parking charges) for driving. Single-occupant vehicle (SOV) use typically declines by up to 20 percent at worksites where a transit benefits program is implemented—supporting significant reductions in local, peak-period congestion. (ICF, 2006)

Impacts will vary significantly, however, depending upon the availability of travel alternatives for the site or region. Central business districts (CBD) in metro areas with high levels of transit service and significant traffic congestion will see the greatest benefit. Studies suggest that telecommuting and alternative work schedules have small but still measurable effects on VMT (ICF, 2006).

Cambridge Systematics found a number of factors responsible for the limited implementation of ridesharing programs:

- Fiscal incentives are primarily limited by the cost to employers or public agencies of providing these incentives, as well as lack of quality transit service (and therefore employee interest) in many locations.
- Fiscal disincentives (parking charges) are limited by the expectation that parking will be provided free to employees as a benefit, and by the fact that parking supply is not constrained, and therefore a market for parking does not exist in most suburban areas.
- Use of alternative modes is limited by employee desires for flexibility (ridesharing, vanpooling, and transit) and/or convenience (bicycling, walking). Employers usually have no particular interest in promoting alternative travel options, especially if they are not perceived as desirable to employees.
- Regional agency leadership is required to conduct outreach to encourage businesses to offer benefits to their employees. Such leadership has been stronger in some areas than others (Cambridge Systematics, 2008).

Parking Management

The EPA Office of Mobile Sources reports that cities that already have a comprehensive parking plan for downtown or suburban areas may already have the necessary experience, personnel, and resources to effectively implement a parking supply program.

A transit-sensitive parking model has not replaced traditional predictive or decision models in many cities, and zoning requirements often reflect more traditional approaches to parking. The City of Charlotte, North Carolina, responded to their operator's 2025 Transit Corridor Systems Plan with transit-oriented development zoning standards that discourage excessive parking. Charlotte's uptown parking supply is 95 percent privately owned, located in decks designed and built to support the employment base, but are not considered visitor-friendly. The Charlotte Parking Collaborative is a marketing, branding, and standards model designed to overcome disadvantages of multiple ownerships, varied signage, and no common branding (Kimbler, 2005).

Many cities view parking as an economic development tool that can accelerate development and growth of a downtown area. Most lending institutions also believe an ample parking supply is necessary to ensure return on investment. Kimbler notes there is a philosophical approach among many cities across the United States to leverage their parking resources to support economic development. The common goal of these cities is to ensure that the right amount of parking is available to users, that all visitors can find parking, and that the public and private sectors work together for this mutual benefit.

The Tri-County RPC (TCRPC) in Lansing stated in its 2004 CMP that "future investments in parking facilities should be analyzed in the context of a balance between supply and demand for parking and the relationship between use of transit, roadway congestion, and other regional needs. Parking supply should not be based solely on the desire to provide a parking space for each and every trip-maker."

TCRPC advises that "local officials should consider the ability to finance construction of additional long-term parking facilities or expansion of existing facilities in the context of overall transportation system needs…Decisions to bond or finance construction of additional commuter parking facilities may come at the expense of the public's willingness to finance other transportation system improvements for airports, roadways, or transit services."

TCRPC staff's perspective is that "no transportation plan or congestion management system can be complete without consideration of parking location, design, and related issues" (TCRPC, 2004).

Diversified Development Patterns

Very little research has been performed on the impacts on congestion through implementing diversified development patterns in the last two decades. Diversified development pattern is a planning approach to mixed-use development that focuses on creating greater heterogeneity of land uses in a specified area. It is closely related to increased density and New Urbanism design. Higher densities, richly mixed land uses, and pedestrian-friendly designs are believed to lower the rates of vehicular travel. The concept also presupposes that diversity, density, and design are positively associated with the choices of shared-ride, transit, and non-motorized modes (Cervero and Kockelman, 1997).

Smart Growth

Smart growth is a land use planning and development strategy that enables other more specific congestion mitigation strategies to occur. Smart growth measures involve urban design and transportation measures, guidelines, and regulations designed to reduce automobile trips and to promote non automobile travel associated with the use of a cohesive nexus of activity such as office parks, shopping centers, mixed-use developments, and other areas of vehicle activity.

According to the EPA, the basic principles of smart growth, based on community experiences with the concept, are:

- Mix land uses.
- Take advantage of compact building design.
- Create a range of housing opportunities and choices.
- Create walkable neighborhoods.
- Foster distinctive, attractive communities with a strong sense of place.
- Preserve open space, farmland, natural beauty, and critical environmental areas.
- Strengthen and direct development toward existing communities.
- Provide a variety of transportation choices.
- Make development decisions predictable, fair, and cost effective.
- Encourage community and stakeholder collaboration in development decisions (EPA, 2001).

In Michigan's Land, Michigan's Future: Final Report of the Michigan Land Use Leadership Council, the report recommends as a state goal:

> Supporting efforts to make Michigan cities more livable by *expediting the reuse of abandoned properties*, controlling blight, encouraging private investment, *encouraging mixed-use development*, improving transportation options, *supporting a full range of housing options*, and attracting and retaining residents who can contribute to the viability of our urban core areas (italics added).

Compact Development

Compact metropolitan development generally means the space needs of a population can be satisfied with less land area. Compact development can take various forms. From a regional perspective, metropolitan areas may limit the extent of development so that it does not extend too far into rural areas. New development can be targeted to specific areas, such as redevelopment areas within established communities. It is primarily a planning tool to promote increased density of development.

A Michigan State University study found that, in the 18 communities studied, land consumption and costs for infrastructure and municipal services were far less expensive when Smart Growth principles replaced sprawling patterns of development (Najafi et al., 2006).

The Michigan Land Use Leadership Council final report recommended that the state provide "new tools to local government to encourage better land use decisions that allow more compact, mixed-use development." Regarding density and land use, the Council report states:

"The state should reduce overall land consumption by fostering more dense residential development through activities such as:

a. Encouraging minimum allowable housing densities of four units per acre for single-family housing and ten units per acre for multifamily or attached housing commensurate with available water, sewer, and road infrastructure.
b. Encouraging counties and local governments to use local zoning ordinances to provide for a range of cluster development options in appropriate residential and mixed-use zones, and encouraging developers to use these cluster development options by providing appropriate incentives such as allowing higher density and/or a streamlined development review process.
c. Promoting development of accessory dwelling units such as carriage houses or accessory apartments.
d. Providing incentives favoring the development of housing above existing retail in downtown and suburban areas.
e. Encouraging residential mixed-use and mixed-use zoning."

Redevelopment and Infill

A redevelopment and infill strategy includes actions such as reclamation and reuse of abandoned or contaminated property for employment and residential use, maintenance and improvement of the transportation system, financial assistance for infrastructure targeted to support redevelopment and infill projects, improved transportation between existing housing and job centers, and attainment of high levels of educational quality and public safety.

Infill can be effective through a comprehensive plan that contains goals, objectives, and policies that address the location and intensity to guide future development and direction. To encourage infill development projects, local governments should have strategies to make sites attractive for developers through public infrastructure investment including road improvements and improved site access (EPA, 2007).

The goal of redevelopment and infill strategies is to create the most efficient pattern of regional land development possible. Redevelopment and infill strategies produce:

- Cost savings through use of existing infrastructure and avoiding costly new infrastructure improvements.
- Travel savings by taking advantage of compact and mixed use development patterns instead of the more inefficient patterns of new development seen on the fringes of metropolitan areas.

EPA noted in a review of several infill studies that actively supporting infill development can be a highly effective regional transportation policy. These strategies have shown that positive impacts result from redevelopment and infill activities in terms of increased transit ridership, reduced VMT because of shorter trips, and increased walking and bicycling. If done well, redevelopment creates neighborhoods where residents can accomplish their daily activities with less driving. Site level studies noted by the agency suggest that shifting development to more accessible locations reduces vehicle travel per person by 30–60 percent (EPA, 2007).

Mixed Use Development

Many terms can be used to describe mixed use such as New Urbanism, transit-oriented development, sustainable development, and cluster development. All generally require greater density requirements, smaller lots, less segregation of land use with a mix of housing, business, recreation, and retail industries. Mixed-use development is intended to provide site amenities encouraging ridesharing or transit use, thus decreasing reliance on single occupancy vehicle (SOV) use (EPA, 2007).

The advantage of mixed use development is the ability to shift and shorten some trips that would otherwise end up on regional roads, and to encourage walking and bicycling to destinations. An EPA study showed that commercial centers with even a narrow range of mixed uses can eliminate 25 percent of trips consumers would have made going to separate destinations. At business parks, on-site services and shopping can eliminate 20 percent of the VMT by office workers.

Jobs-Housing Balance

Jobs-housing balance is a planning tool, rather than a regulatory tool that local governments can use to achieve a roughly equal number of jobs and housing units (or households) in a jurisdiction. Ideally, the jobs available in a community should match the labor force skills, and housing should be available at prices, sizes, and locations suited to workers who wish to live in the area. The spatial mismatch between the locations of jobs and housing is considered one important reason for the longer commute trips and deteriorating traffic conditions in many metropolitan regions. When numerous employees live far from their work places and have to drive to work, the result is often longer commutes and greater vehicle miles traveled. Traffic congestion and reduced quality of life can also occur as a result of such imbalances.

MDOT has noted local jobs/housing balance concerns in the 2005 long-range transportation plan. Tightening of the labor force and relocation of employers to remain in proximity to localized labor pools may cause a change in the jobs-housing balance. This spatial reorganization will need careful analysis by transportation and local governments regarding the impact on their tax base and how these longer-distance commuters are served.

A ratio of jobs to housing is most commonly used to express the concept of jobs-housing balance. Generally stated, the jobs-housing ratio is a ratio between a measure of employment and a measure of housing in a given area of analysis. The most basic measure is the ratio of the number of jobs to the number of housing units in an area (Weitz, 2003).

Transit-Oriented Development

The Transit-Oriented Development (TOD) strategy promotes land development patterns that maximize public transportation systems and help achieve cost-effective land use patterns at the same time. TOD promotes urban design features such as mixed land uses (residential, retail, offices), a centrally located commercial core with compact development patterns, a well-connected grid street network, and ease of pedestrian and bicycle access.

Transit-oriented development requires four primary strategies. These include:

- Create high-density, mixed-use development around a transit station. High densities are necessary because they lead to increased transit ridership. Mixed-use development helps create an environment conducive to pedestrian activity. TOD's development area is usually a radius ranging from a quarter-mile to a half-mile around a transit station. This radius represents the maximum distance people are generally willing to walk to a transit station. Depending on the type of transit used in the development, density requirements range from 3.5 to 15 dwelling units per acre adjacent to the site.
- Design or improve a neighborhood conducive to bicycle/pedestrian activity. Walking and bicycling complement transit because they are ideal methods for people to get to a train from their home or to a destination from the train station.
- Traffic calming and increased connectivity. Traffic calming reduces the speeds of vehicles on the street as well as the number of automobiles, because most drivers will move to a street that does not employ traffic calming. Promoting connectivity ensures that pedestrians can walk from one place to another on a fairly direct path, often connecting to roads via pathways that cars cannot drive on.
- Parking management is also crucial to TOD. Parking spaces in urban environments take valuable land away from productive use and spread destinations farther apart. Reducing the amount of available and/or free parking promotes higher density land uses. Transit use is indirectly promoted by making driving slightly more difficult and/or expensive (Niles and Nelson, 1999).

TCRP Report 128 researchers found that TOD-housing resulted in fewer trips generated in the 17 surveyed TOD-housing projects that were studied. Over a typical weekday period, the TOD-housing projects averaged 44 percent fewer vehicle trips than estimated by the ITE manual (3.754 trips versus 6.715). To the degree that impact fees are based on peak travel conditions, one can infer that traffic impact studies might overstate the potential congestion-inducing effects of TOD-housing in large rail-served metropolitan areas by up to 50 percent (Arrington and Cervero, 2008).

No examples were found of transit-oriented development in Michigan. There is discussion and proposal for incorporation of TOD in the planned Woodward Avenue light rail project in Detroit. Researchers at the University of Michigan planned from a TOD perspective three separate stations and their surrounding areas along the proposed line (De Silva, 2010).

Corridor Land Use and Transportation Coordination

Corridor land use and transportation coordination is a tool designed to promote cooperation among local governments in coordinating transportation and land use solutions aimed at congestion management goals. This tool allows for joint planning among corridor-wide communities for land use and transportation and for the assessment of cumulative impacts resulting from corridor-wide growth. Such coordination is achieved when local governments in a transportation corridor enter into formal intergovernmental agreements specifying a planning process for program implementation.

This strategy is implemented through intergovernmental agreements as authorized under Article 3, Section 5 of the Michigan State Constitution. The Land Bank Fast Track Act of 2003 also provides for the State of Michigan to enter into intergovernmental agreements with townships for land use redevelopment purposes. The Michigan Land Use Leadership Council supported "creating incentives to encourage interagency and intergovernmental cooperation in addressing land use issues and public investments of more than local concern."

The TCRPC in Lansing exemplifies the benefits of regional coordination of transportation. At plan build-out, their Smart Growth approach estimates savings between $1.8 and $5.4 billion in transportation costs by eliminating half the congested lane miles anticipated if current trends continue. This approach also preserves three townships of agricultural land/open space and reduces pollutants by greater than 10,000 kilograms per day.

The RPC established strong linkages among its townships between regional land use and transportation goals, objectives, investment strategies, performance measures, project selection criteria, and smart growth, along with auxiliary land use strategies such as access management and traffic impact studies (Hamilton, 2004).

According to the TCRPC, "the Regional Concept of Management and Operations for congested corridors which is emerging from this approach is being applied to all modes 'from building façade to building façade,' is performance based and considers safety, wide nodes, narrow roads, road diets, traffic calming, ITS and more traditional traffic engineering treatments. This resulting Regional Concept of Management and Operations makes system's operations and management itself another land use strategy for implementing smart growth, which reduces congestion and improves safety for all modes and users throughout the corridor" (Hamilton, 2004).

Car Sharing

Carsharing allows people to rent cars on a short-term (hourly or daily), as-needed basis, paying only for the time they use the car and the mileage they drive. The operators of the carsharing program provide vehicle maintenance, repair, and insurance.

The term "shared-use vehicle" is a broader concept that encompasses both carsharing and station car programs. Station car programs are designed to facilitate transit access in the cases where the final destination of a person who uses public transportation is located too far away from the endpoint of the transit route; people can drive station cars to complete the final leg of their trip.

Shared-use vehicles allow individuals to gain the benefits of using a private car without the costs and responsibilities of owning a car. Members of a shared-use vehicle or carsharing program pick up and return vehicles at shared use lots that are scattered throughout a particular region or concentrated at a transit station, activity, or employment center. Typically, a member makes a reservation in advance, lets him or herself into the vehicle with a personal card or key, and drives away. When the person is finished using the car, he or she returns the car to its home parking space, locks it, and leaves it for the next car sharer (Millard-Ball et al., 2008).

The start-up of a carsharing program typically requires public subsidy, often using CMAQ funding. In San Francisco, the 2003 budget for the City Carshare program had commitments of more than $300,000 in funding from various public agencies. Minnesota estimated the cost of two years of seed funding to enable Twin Cities *hOur Car* to establish a financially sustainable employer program would be $100,000 for each year.

The benefits of carsharing can include:

- More careful consideration of the necessity, duration, and distance of automobile trips, resulting in decreased vehicle use and ownership.
- Greater consideration given to alternative modes, resulting in increased transit ridership, biking, and walking.
- Cost savings to individuals and employers.
- Reduced parking demand at participating transit stations, member employer sites, and residential locations.

The estimated impact of the Minneapolis program was shown to be 570, or 3 percent, of the 19,000 daily SOV commuters to downtown Minneapolis switched to bus, bike, or carpool/vanpool, the impact would equal 285 fewer SOV trips each year. This would result in a cost savings of $351 per year for each SOV trip avoided ($100,000 seed funding/285) (InnovativeMobilty.org, 2011).

Zipcar operates a carsharing program at the University of Michigan and Michigan State University. Students, faculty, and staff can join Zipcar for only $50/year. The service is available 24 hours/day, 7 days/week. Hourly rates range from $8–9. This fee covers gas, insurance, and an allocation of free miles (Zipcar, 2011).

Trip Reduction Ordinances

Trip-reduction ordinances (TROs) consist of regulations or similar measures requiring implementation of other congestion mitigation strategies. TROs may specify specific mitigation strategies or simply require a set reduction in VMT, trips, or other measure of reduced travel. TROs are applied in a variety of ways, depending upon the needs of a particular locality. The focus of these ordinances has been to encourage socially beneficial travel choices rather than controlling traveler behavior. Most TROs, therefore, offer a range of travel options, but the individual traveler's choice is voluntary.

TROs require developers, employers, or building managers to provide incentives for occupants or employees to use alternative modes. Programs and ordinances can be implemented state/region wide or by local jurisdictions, and take many different forms. These include:

- Special use permits – Government entities can require permitting for certain uses of land which, by their location, nature or size, and density tend to cause traffic and related impacts which are contrary to the public health, safety and general welfare in that they lead to, generate, or exacerbate danger and congestion in travel and transportation upon the public streets and/or parking problems
- Negotiated agreements – Trip-reduction requirements can be used as a bargaining element in negotiations over rezonings and/or as part of a public-private development agreement. Negotiated agreements allow the trip-reduction program to be formulated to mitigate the emission impacts of the specific project under consideration, but may also lead to considerable variation among the requirements imposed on similar projects.

- Trip reduction goal programs – Requires employers of specific-size companies to reduce the number of commute trips made by employees by a certain amount. Program goals can be mandatory or voluntary for employers. The program encourages use of alternative modes of travel including ridesharing, transit, walking/bicycling, and telecommuting among employees.
- Conditions of approval for new construction – These policies require that adequate public facilities be in place (or at least programmed and funded) before additional development can be approved. They may call for developers to implement specific types of facilities and services (e.g., park-and-ride lots at all major housing developments, sidewalks and bike paths, on-site transit pass sales, and rideshare matching) and/or may establish performance standards with the means of achieving those standards subject to negotiation.
- Mandated Programs – Requires employers who employ more than a certain number of employees to implement ridesharing and/or related alternative commute programs. The reduction goals can vary according to the reduction needs of the locality. Program goals can be measured in various ways including improvement in employee average vehicle ridership or a decrease in employee home-based work trips.
- Transportation Management Districts – Provide concentrated services to encourage the use of transit and other commuting options in major business districts (Pogue, 1997).

TOOLBOX STRATEGIES

The final list of strategies provided in the Toolbox is listed below.

1. Supply/System Management.
    a. Traffic Operations.
        i. Increasing number of lanes without widening.
        ii. Increase number of lanes by widening/lane additions.
        iii. Highway ramp closures/reconfigurations.
            1. Diverging diamonds.
            2. Loop ramps eliminating left turns.
            3. Deceleration/acceleration auxiliary lanes.
            4. Configurations to increase queuing capacity.
        iv. Bottleneck removal.
        v. Geometric design improvements.
            1. Intersection improvements.
            2. Auxiliary lanes for merging and diverging.
            3. Acceleration/deceleration lanes.
            4. Intersection channelization.
            5. Commercial vehicles accommodations.
            6. One-way streets.
        vi. Super street arterials (grade-separated intersections).
        vii. Complete streets.
        viii. Improving street continuity.
        ix. Vehicle use restrictions.
        x. Access management.

xi. Active traffic management.
1. Speed harmonization.
2. Temporary shoulder use.
3. Queue warning.
4. Dynamic merge control.
5. Construction site management.
6. Dynamic truck restrictions.
7. Dynamic traveler information and rerouting.

xii. Intelligent Transportation Systems.
1. Advanced traveler information systems.
2. Performance measurement.

xiii. Traffic signals.

xiv. Reversible traffic lanes/changeable lane assignments.

xv. Exclusive lanes.

xvi. Incident management.
1. Service/courtesy patrols.
2. Detection, response, and clearance.
3. Information/routing and interagency cooperation.

xvii. Special event management.

xviii. Road weather management.

b. Transit.
i. Park-and-ride lots.

c. Multimodal transportation centers.

d. Freight rail improvements.

e. Bicycle and pedestrian.

f. Reducing construction/maintenance interference.

2. Demand Management.
a. Work schedule changes.
b. Land use development.
c. Ridesharing/vanpools.
d. Parking management.
e. Diversified development patterns.
f. New community design (smart growth).
i. Compact development.
ii. Redevelopment and Infill.
iii. Mixed use development.
iv. Jobs housing balance.
v. Transit-oriented development.
vi. Corridor land use and transportation coordination.

g. Car sharing.
h. Trip reduction ordinances.

SURVEY OF METROPOLITAN PLANNING ORGANIZATIONS

Survey Responses and Observations

Fifty-three (14%) MPOs responded to the survey with 22 (6%) MPOs completing all questions of the survey. The respondents represented a range of populations and were primarily represented in the Midwest and Northeast regions of the United States. Figure 2 displays the respondent distribution by population. Figure 3 displays the geographic distribution of the respondents.

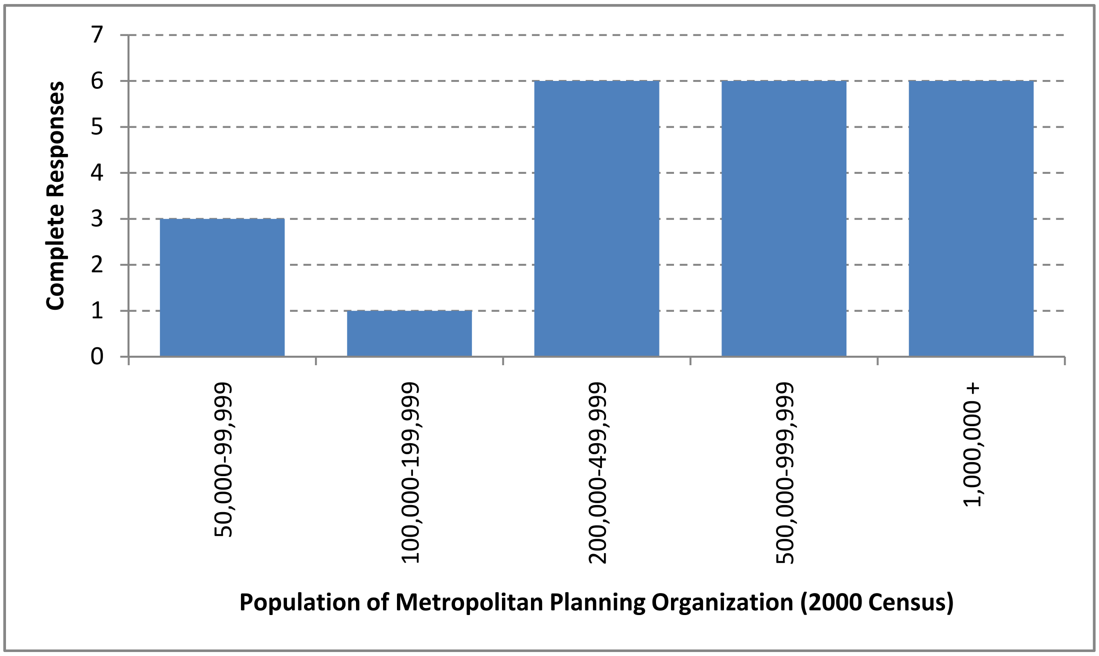

Figure 2. Distribution of complete respondents by metropolitan planning organization population.

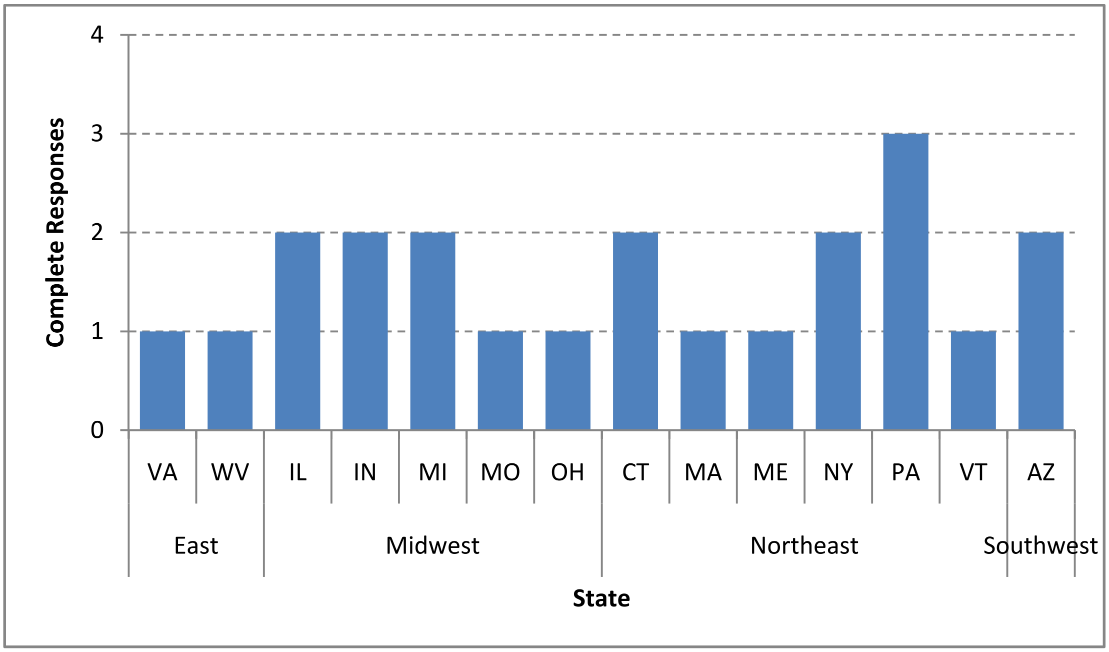

Figure 3. Distribution of complete respondents by metropolitan planning organization location.

Appendix C provides the complete survey responses. Personal information is redacted to ensure confidentiality of the respondents. The research team reviewed and processed the survey responses to produce one-page summaries. Appendix D provides these summaries. The one-page summaries contain a data table of the number of respondents, the number and percentage of respondents noting strategies were implemented or are planned, success of the strategy on a 1 to 5 scale (1 is not successful and 5 is very successful), and the ease of implementation on a 1 to 5 scale (1 is very difficult and 5 is very easy). The success and ease of implementation ratings were adjusted to show strength from the mid-point response. These values are plotted together to display relative relationships between strategies in a group. Finally, the free-form text responses to identified barriers to implementation, solutions to those barriers, costs, and benefit/cost information are summarized under key observations.

General Findings

The most implemented or planned congestion mitigation strategies were identified from the responses. Table 5 displays the top 20 strategies. All respondents indicated they have implemented or plan to implement traffic signal coordination and bike racks on transit vehicles. Nine of ten respondents indicated additional turn lanes at intersections, traffic signal retiming, traffic signal equipment upgrades, transit vehicle replacement/upgrade, improvement of bicycle/pedestrian facilities, new sidewalks, bike racks at transit stations, and bike racks at destinations. With the exception of the transit vehicle replacement/upgrade strategy, these strategies can be considered low-cost improvements. The more moderate to higher cost strategies within the list in Table 5 are the incident management strategies of camera monitoring and variable message signs, and park-and-ride lots to support transit facilities.

Table 5. Top 20 Most Implemented or Planned Congestion Mitigation Strategies among Respondents.

Group	Action	% of Respondents
Geometric Design Improvements	Additional turn lanes at intersections	96%
	Lengthened turn lanes at intersections for queuing	88%
Access Management	Two-way-left-turn-lanes	88%
	Raised median installation	83%
	Left-turn restrictions	83%
Traffic Signal Strategies	Retiming	95%
	Coordination	100%
	Equipment upgrade	95%
	Adaptive signal controls/demand responsive	82%
Incident Management Strategies	Camera monitoring	82%
	Variable message signs	86%
Transit Capital Improvements	Vehicle replacement/upgrade	91%
Transit Support Facilities	Park-and-ride lots	82%
	Paratransit	82%
Bicycle/Pedestrian Improvements	Improved facilities (lighting, signing, etc.)	95%
	New sidewalks	91%
	Rails to trails developments	86%
Bicycle/Pedestrian Support Services	Bike racks at transit stations	91%
	Bike racks on transit vehicles	100%
	Bike racks at destinations	91%
	Route maps	82%
	Promotional campaigns	82%
	Educational outreach	86%
Work Zone Strategies	Work zone management	82%
Work Schedule Changes	Telecommuting	82%
Land Use Strategies	Mixed-use developments	82%
	Infill and densification	82%
Ridesharing/Vanpool Strategies	Marketing and promotions	86%
	Ridematching services	82%
	Guaranteed ride home	82%

The research team examined the highest and lowest rated strategies for success in mitigating congestion. The results for the most successful strategies are shown in Table 6. The least successful strategies are shown in Table 7.

The strength from average score in Table 6 shows that respondents rated the listed strategies as being somewhat to very successful mitigating congestion. The highest rated strategy is shoulder use for part-time travel lane; however the number of respondents is very low. Caution should be used in identifying this as a highly successful strategy because of the small number of respondents. The next most successful strategies are street-rail grade separations, traffic signal coordination, and traffic signal retiming. Grade separations can be moderate to high cost project where the traffic signal coordination and retiming projects are considered low cost.
The least successful strategies have very low responses and are generally slightly under average success. Lockers at transit stations and destinations have the highest number of respondents.

Table 6. Ten Most Successful Congestion Mitigation Strategies Identified by Respondents.

		Success		
Group	**Action**	**Rating (1-5, 3=avg)**	**Strength From Average**	**n**
Lanes without Widening	Shoulder used for part-time travel lane	4.50	1.50	2
Geometric Design Improvements	Grade separations (street-rail)	4.40	1.40	10
	Grade separations (street-street)	4.20	1.20	10
Traffic Signal Strategies	Retiming	4.30	1.30	20
	Coordination	4.35	1.35	20
	Equipment upgrade	4.15	1.15	20
	Adaptive signal controls/demand responsive	4.23	1.23	13
Incident Management Strategies	Traffic/courtesy patrols	4.25	1.25	12
	Response teams	4.14	1.14	14
Contracting Strategies	Allowable working days and working hours	4.14	1.14	7

Table 7. Eight Least Successful Congestion Mitigation Strategies Identified by Respondents.

Group	Action	Success: Rating (1-5, 3=avg)	Success: Strength from Average	n
Time-of-Day Policies	Truck peak period bans on arterials	2.67	-0.33	3
Ramp Metering Systems	Ramp metering - HOV bypass	2.50	-0.50	2
Freeway HOV	Contraflow - barrier separated	2.50	-0.50	2
Bicycle/Pedestrian Support Services	Lockers at transit stations	2.9	-0.10	10
	Lockers at destinations	2.75	-0.25	8
	Shower facilities at transit stations	2.6	-0.40	5
New Community Design	Transit oriented development design requirements	2.83	-0.17	6
Trip Reduction Ordinances	Trip reduction goal programs	2.8	-0.20	5

Table 8 and Table 9, respectively, display the easiest and most difficult congestion mitigation strategies to implement as identified by the respondents. Traffic signal timing was the only strategy that was between somewhat and very easy to implement. Most other listed strategies tended toward somewhat easy to implement. Most of the Table 8 strategies may be characterized as low-cost projects with the exception of the reversible lanes. Reversible lanes, depending on the design, may be more moderately priced projects if dynamic lane assignments are used and the controls are connected back to a traffic management center.

Nine of the ten most difficult strategies are somewhat to very difficult to implement. The exception is transit oriented developments, which are close to somewhat difficult to implement. Grade separations are indicated to be the most difficult to implement. This may be due to the capital investment and right-of-way costs required to modify existing at-grade intersections to grade separation. Freeway ramp removals are also difficult due to strong public reaction to the perception or reality of lost accessibility to customer or residents. Surprisingly, mandated trip reduction programs were not indicated to be the most difficult strategy to implement. The rating of this strategy may be influenced more by the small number of respondents. Mandated trip reduction programs received a strong negative response when they were more widely introduced as a required measure for some areas under the Clean Air Act Amendments of 1990. This section was later removed.

Table 8. Ten Easiest Congestion Mitigation Strategies to Implement Identified by Respondents.

Group	Action	Ease of Implementation: Rating (3=neutral)	Strength from Neutral	n
Traffic Signal Strategies	Retiming	4.05	1.05	20
	Coordination	3.70	0.70	20
Reversible Lanes	Reversible Lanes	3.71	0.71	7
Bicycle/Pedestrian Support Services	Bike racks at transit stations	3.94	0.94	18
	Bike racks on transit vehicles	3.75	0.75	20
	Route maps	3.89	0.89	18
	Promotional campaigns	3.88	0.88	16
	Educational outreach	3.71	0.71	17
Work Zone Strategies	Advance information	3.83	0.83	12
	Trailblazing/detours	3.7	0.70	10
Work Schedule Changes	Flextime	3.71	0.71	14

Table 9. Ten Most Difficult Congestion Mitigation Strategies to Implement Identified by Respondents.

Group	Action	Ease of Implementation: Rating (3=neutral)	Strength from Neutral	n
Ramp Removal/Reconfiguration	Freeway ramp removals	1.71	-1.29	7
Geometric Design Improvements	Diverging diamond intersections	1.83	-1.17	6
	Grade separations (street-rail)	1.70	-1.3	10
	Grade separations (street-street)	1.73	-1.27	11
Active Traffic Management	Interchange modifications	1.91	-1.09	11
	Dynamic truck restrictions	2.00	-1.00	2
Land Use Strategies	Shower facilities at transit stations	2.00	-1.00	7
	Transit-oriented developments	2.23	-0.77	13
Trip Reduction Ordinances	Mandated programs	2.00	-1.00	4
	Transportation management districts	2.00	-1.00	5

Two recurring comments were received as barriers to implementation. The first barrier noted was lack of funding. Noted many times by respondents, they indicated that more projects would be implemented if the funding was available. This is important because there is a willingness among the respondents to further mitigate congestion, which is supported by their policy committees. The second barrier grouped together was public perception and personal choice. These present a strong barrier to entice travelers to voluntarily make different choices. Perhaps through more refined, focused, and engaged outreach methods, negative public perceptions might be moved positive. Of course, perception cannot be moved positive if undesirable environments do indeed exist. Personal choice is also a strong force to travelers. Attractiveness of congestion mitigation strategies must be highly perceived or valued to greatly influence personal choice. Only mandated programs can effect certain change, however these programs are typically viewed negatively by the public.

SURVEY OF MICHIGAN TRANSPORTATION MANAGEMENT AREAS

Congestion Management Process Development

Several approaches to developing congestion mitigation strategies were identified by respondents. The approaches varied between the agencies. Genesee County MPC developed a list of congestion mitigation measures that included a variety of strategies that could be used. The strategy list was arranged in a hierarchy of priorities so that the measures on top take precedence over those on the bottom. These measures are:

- Strategy 1: Reduce Person Trips or Vehicle Miles Traveled (VMT).
- Strategy 2: Shift Automobile Trips to Other Modes.
- Strategy 3: Shift Trips from SOV to HOV Auto/Van.
- Strategy 4: Improve Roadway Operations (signal timing, turning lanes, etc.).
- Strategy 5: Adding Thru-Lane Capacity.

In another TMA, land use is the primary strategy. Use of this strategy pivots off the previously developed regional vision based on a land use strategy identified as the Wise Growth option. It was developed by the region through a consensus-based process over several years in the 1990s. Regional agencies try to conduct transportation planning within the assumptions and goals of this land use strategy. Development of CMPs also fell into broader categories of demand reduction, management and operations, and alternate modes. Other factors taken into account in developing their CMPs included access management and road diets.

All four TMAs noted good working relationships in this process with MDOT both at the local office and state levels.

Strategy Evaluation

All of the respondents referred to their CMPs for strategy evaluation methods and tools. The research team review of those documents along with the interview responses provided a detailed overview of their methods.

Much of the mitigation strategy analysis is performed at a “very high level.” At GVMC, the MPO uses its travel demand model to identify capacity deficiencies and provides the information to local road agencies. The local road agencies are asked to submit projects that will address identified capacity deficiencies for the Long Range Transportation Plan (LRTP). As part of their application, the local road agency has to complete a CMP checklist that runs them though various strategies in the GVMC toolbox. The CMP checklist provides guidance to local units, and the application requires them to review several alternatives. Local agencies evaluate the options and submit a project and a proposed implementation year. MPO staff evaluates the proposed project and completes an alternative analysis using the travel demand model to determine the best projects. (One agency noted that they are not able to analyze some alternatives such as transit and carpooling due to limitations of their travel demand model.)

SEMCOG's evaluation process is listed below:

- Identify congested corridors for the entire regional network using the travel demand model's estimated average speed.
- Compare the estimated average speed against the free flow speed (posted), and compute the percentage difference.
- Based on the percentage difference of the above speeds, assign mitigation strategies to the corridor. Consider the following major prioritized mitigation strategies:
  1. Transportation System Management (transportation system management, i.e., signal improvements, synchronization, etc.).
  2. Access management.
  3. Intelligent Transportation Systems (ITS).
  4. Travel Demand Management (includes improved transit service, ride share modes etc.).
  5. Capacity widening.

SEMCOG noted that the travel demand forecast model is the only tool available to forecast future congestion on corridors; however, they keep in mind that the tool is meant to provide more accurate analysis at the regional level. As they focus closer to the road level the model output is less accurate, especially in identifying where congestion begins. The travel demand forecast model is also limited regarding analyzing traffic operations mitigation strategies (ITS, progressive signal retiming, etc.). This is why SEMCOG then applies meso/micro-simulation models. However, these types of models do require more resources and effort to make them run but result in a better analysis. The agency also performs post processing of data using GIS, database, and spreadsheet analyses.

Various tools were identified by the TMAs in order to develop and evaluate strategies. They are listed below:

- Travel demand forecast model.
- Post processing model data using GIS.
- Meso/micro-simulation models.
- Regional Concept for Transportation Operations (RCTO).
- ITS Architecture (IDAS, and post processing).
- Asset Manager NT (capacity vs. operations comparison).
- Field data/studies (MDOT road sensors, NAVTEQ sensors, floating car speed surveys).
- Speed studies.
- Requirement for traffic impact studies for projects.
- Travel surveys.

For evaluation of strategies post-implementation, several of the respondents noted the lack of this type of analysis although they did remark that they were in the initial stages of planning for post-implementation studies. SEMCOG performs an annual survey of the projects implemented by the local road agencies. The local road agencies supply the MPO with a variety of information related to the projects completed from the TIP, including: completion date, actual costs, etc. With this information along with other data the agency collects prior to the mitigating strategy being implemented, i.e., travel time studies, crash data, traffic volume counts, etc., SEMCOG then performs a before/after analysis to determine the benefits of the strategies. One problem noted by SEMCOG is that there may be multiple strategies implemented, and their analysis may not be able to differentiate effects between the strategies.

External Factors and Barriers

Some factors affecting development and implementation of congestion mitigation strategies noted by agencies include:

- Lack of data across the entire network. "For example, we may spend $80,000 on collecting travel time data on 600 miles of roads in our network. However, our entire federal aid eligible road network totals approximately 8,700 miles. We focus on the roads that we feel are congested but it would be nice to have information across the entire network. To remedy this we are researching the use/cost of probe data. I would also like to see a statewide coalition developed for sharing the costs of this data since it is of value to all of us."
- Lack of stakeholder input regarding the validation of identified congested corridors. "Much of the time we don't hear back from our local road agencies regarding what we identify as being congested. And when we do they may add a large number of additional roads but provide us with no data to verify this."
- All stakeholders could do a much better job at collaborating on projects focusing individual efforts in areas of greatest need, thus providing a greater benefit. It might be done when MDOT calls for CMAQ projects. Road agencies submitting projects could meet collectively to review the deficiencies and develop a combined strategy for mitigating them.

Another agency noted inadequate federal and state transportation funding as an issue, but acknowledged they have little control over it.

Keys to Success

The keys to the success of the implementation of the full CMP, as noted by one respondent, are the federal mandate [23 CFR 450.320(a) and (b)] and the shift in mindset that we do not have to widen our way out of congestion. Others noted that the CMP is comprehensive, kept up-to-date, and provides regional cities with options that they might not consider.

Consensus among the communities in the region was also noted. One area developed consensus in the 1990s in developing a regional vision. Consensus was accomplished through town zoning hearings and workshops that focused on the regional plan. It laid the groundwork for maintaining consensus in the last decade of funding issues and other economic problems. The regional plan and process had specific recommendations and specific responsibilities for communities within it. The specificity helped local governments focus on their roles and implementation needs in that plan, and the mindset created more receptivity and cooperation in developing the congestion mitigation plans.

Educating local road agencies on the benefits of the CMP process contributed to success. In one region specifically the CMP process education has resulted in "…a lot of communities participating in signal optimization projects and a good number of 4-to-3 lane conversions [road diets]. We have also had success in working with local road agencies to improve project applications. One example is working with the road commission and the public to evaluate a proposed 2-to-5 lane conversion. In the end, the project ended up as a 2-to-3 lane conversion, and the public and the road agency were both satisfied."

Effectiveness

All the TMAs remarked that overall the CMP seemed to work fine for the type of projects that are relevant to their areas. All three levels of government (federal, state, local) cooperated in the process and have been positive about the results. As with any federally mandated process, one respondent noted, "it takes time for the member agencies to fully buy into it. It took a few years but now our members don't jump to a conclusion on how to deal with a certain congested condition." However, another respondent noted that "congestion in the region is not growing mostly due to the downturn in our economy. Our focus needs to be in incident management and bottleneck elimination."

One agency respondent provided a useful perspective to the CMP process. They remarked that "the reality of our region is that we have a relatively small amount of congestion (as compared to other areas) and we have very little amount of money to deal with the congestion that we do have ($930,000 a year for expansion-related projects). The projects that we focus on are signal optimization (we get $1.6 million a year to use for signal timing, carpool, and transit congestion related projects) and small expansion projects (less than a mile) once every couple of years. Model evaluation of projects during alternative analysis seems to support projects originally submitted by the local unit. This can probably be credited to the level of congestion that we have (basically intersections and small segments for the most part), limited federal funds related to congestion mitigation and type of funding (CMAQ geared to signal timing at 100% federal), and limitations on local match (locals do not have money to match big projects.)"

Lack of Effectiveness

Respondents noted the lack of adequate funding, time, and resources as perennial issues in developing and implementing these plans and strategies. Two respondents noted that traffic data collection technology should be improved in their areas both for evaluation and monitoring the road networks. Lack of evaluation of the strategies was noted by two respondents, specifically the lack of follow-up documentation of strategies. Another one observed that there is still "an inherent modal bias towards cars and roads in the process." Finally, one agency noted that in terms of mitigating strategies, there is a need to generate more discussion on what works and what does not in developing and implementing CMPs. A peer exchange was given as an example of disseminating ideas and techniques.

TMA Recommendations

All of the TMAs were asked for recommendations for developing congestion mitigation plans and strategies that could be used by other areas.

In terms of strategy development, it was noted that traffic operations strategies achieve the most benefit over costs. These include signal retiming, access management, minor geometric changes – right/left-turn lanes, ITS, message signs, integrated corridor management, etc. It was also stated that “the more (strategy) options you offer (local raid agencies and the public) the better.” At the same time, eliminate options that have no chance of being implemented (i.e., carpool lanes in area with no freeway congestion). Another suggested keeping the CMP current. “As new strategies are identified that may have use in the region, incorporate them into the CMP.”

Two of the agencies recommended that planners communicate, coordinate, collaborate, and gain the commitment of stakeholders for the betterment of the process and outcomes. Develop the CMP with their policy and technical committees and make sure everyone is a part of the development of the policies, strategies, application, and project prioritization process. “It is hard for local road agencies to complain about a process that they helped to create.”

REVIEW OF BENEFIT-COST ANALYSES

Benefit-cost analysis (BCA) attempts to capture all benefits and costs accruing to society from a project or course of action, regardless of which particular party realizes the benefits or costs, or the form these benefits and costs take. When used properly, BCA reveals the economically efficient investment alternative, i.e., the one that maximizes the net benefits to the public from an allocation of resources.

The FHWA Office of Asset Management *Economic Analysis Primer provides* an excellent source of information on benefit-cost analysis for the transportation practitioner (FHWA, 2003). In highway decision-making, BCA may be used to help determine the following:

- Project Feasibility – whether the project life-cycle benefits will exceed its costs
- Project Timing – BCA may reveal that the project does not pass economic muster now, but would be worth pursuing 10 years from now due to projected regional traffic growth. If so, it would be prudent to take steps now to preserve the future project right-of-way.
- Project Selection – BCA can be used to select from among design alternatives that yield different benefits (e.g., reconstruct a roadway with additional lanes versus no additional lanes); unrelated highway projects (a widened road versus an interchange on another road); and unrelated transportation projects in different transportation modes.

In BCA, the analyst applies a discount rate (interest rate) to the benefits and costs incurred in each year of the project’s life cycle. This exercise yields one or more alternative measures of a project’s economic merit (FHWA, 2003).

The BCA process begins with the establishment of objectives for an improvement to a highway facility, such as reducing traffic congestion or improving safety. A clear statement of the objectives is essential to reduce the number of alternatives considered. The next step is to identify constraints (policy, legal, natural, or other) on potential agency options and specify assumptions about the future, such as expected regional traffic growth and vehicle mixes over the projected lifespan of the improvement (FHWA, 2003).

Having identified objectives and assumptions, the analyst (or analytical team) then develops a full set of reasonable improvement alternatives to meet the objectives. This process begins with the development of a “do minimal” option, known as the base case. The base case represents the continued operation of the current facility under good management practices but without major investments. Under these “do minimal” conditions, the condition and performance of the base case would be expected to decline over time. Reasonable improvement alternatives to the base case can include a range of options, from major rehabilitation of the existing facility to full-depth reconstruction to replacement by a higher volume facility. Such alternatives will often involve construction, but alternatives that improve highway operations (such as the use of intelligent transportation systems) or manage travel demand (such as incentives for off-peak travel) are suitable for consideration (FHWA, 2003).

To ensure that the alternatives can be compared fairly, the analyst specifies a multiyear analysis period over which the life-cycle costs and benefits of all alternatives will be measured. The analysis period is selected to be long enough to include at least one major rehabilitation activity, if appropriate, for each alternative.

Project benefits and costs varied. Costs are attributed to the implementing agency and to users. User costs may also be seen as benefits if the changes are favorable to the user. External factors are also included. Table 10 lists the benefit and cost categories and elements that are generally included in BCA (FHWA, 2003).

Table 10. Benefits and Costs Typically Considered in Benefit-Cost Analysis.

Agency Costs	User Costs/Benefits Associated with Work Zones	User Costs/Benefits Associated with Facility Operations	Externalities (non-user impacts, if applicable)
Design and Engineering	Delay	Travel Time and Delay	Emissions
Land Acquisition	Crashes	Crashes	Noise
Construction	Vehicle Operations Costs	Vehicle Operating Costs	Other Impacts
Reconstruction/Rehabilitation			
Preservation/Routine Maintenance			
Mitigation (e.g., noise barriers)			

Reference: FHWA, 2003

Once the analyst has calculated all benefits and costs of the project alternatives and discounted them, there are several measures to compare benefits to costs in BCA. The two most widely used measures are:

- *Net present value (NPV)* – NPV is perhaps the most straightforward BCA measure. All benefits and costs over an alternative’s life cycle are discounted to the present, and the costs are subtracted from the benefits to yield a NPV. If benefits exceed costs, the NPV is positive, and the project is worth pursuing. Where two or more alternatives for a project exist, the one with the highest NPV over an equivalent analysis period should usually be pursued. Policy issues, perceived risk, and funding availability, however, may lead to the selection of an alternative with a lower, positive NPV.

- *Benefit-cost ratio (BCR)* – BCR is frequently used to select among projects when funding restrictions apply. In this measure, the present value of benefits (including negative benefits) is placed in the numerator of the ratio, and the present value of the initial agency investment cost is placed in the denominator. The ratio is usually expressed as a quotient (e.g., \$2.0 million/\$1.0 million = 2.0). For any given budget, the projects with the highest BCRs can be selected to form a package of projects that yields the greatest multiple of benefits to costs. (FHWA, 2003)

FHWA recommends the use of either the NPV or BCR measures for most economic evaluations. Other BCA measures are available and may be used depending on agency preference.

Congestion Mitigation Strategy Benefit-Cost Ratios

The literature review produced benefit-cost ratios for six of the congestion mitigation strategies in the toolbox. Several sources in the literature review identified congestion mitigation strategies as cost-effective but did not provide actual numbers. Table 11 summarizes the ratios found in the review.

Table 11. Summary of Benefit-Cost Ratios Found.

Strategy	Estimated Benefit-Cost Ratio (*x*:1)
Increasing Number of Lanes without Widening	3.8–13.9
Configurations to Increase Queuing Capacity	5.1
Vehicle Use Restrictions	Favorable
Service/Courtesy Patrols (*Michigan*)	15.2
Incident Management – Detection, Response, and Clearance	4.5–12.33
Bicycle and Pedestrian	11.73
Trip Reduction Ordinances	3.1

Benefit-Cost Ratios Found

Increasing Number of Lanes without Widening

Quantification of expected benefits and costs from deployment of temporary shoulder lanes along the I-65 corridor in Birmingham was performed to estimate economic impacts from possible deployment and determine the most economically efficient investment alternative. The cost-benefit analysis considered life-cycle costs and life-cycle benefits of the project alternatives under study. The life-cycle costs include engineering, construction, and maintenance. Life-cycle benefits include savings in vehicle operation and travel time, safety, and emission reduction. Following the analysis, the costs and benefits were discounted on year-to-year basis and projected for the analysis period 2010 to 2020.

From the CORSIM outputs for different scenarios, the fuel consumption, vehicle miles of travel, travel time, and emissions outputs were obtained and used to calculate VOC, VOT, accident costs, and emission costs. These costs were utilized to calculate and compare the benefit-cost ratios for different scenarios on an annual basis. Based on these components the benefit-cost ratios for different scenarios were calculated. For four planning scenarios for shoulder lane use, the BCRs ranged from 3.8 to 13.9:1. The results showed that VOC, VOT, accident costs, and emission costs are lower when shoulder lane use is permitted (Sisiopiku et al., 2009).

Configurations to Increase Queuing Capacity

As part of an evaluation of freeway ramp metering in the Minneapolis-St. Paul area, Cambridge Systematics derived a BCR for the project type of 5.1:1 (Cambridge Systematics, 2001).

Comparison of Annual Costs and Benefits

Measure	Value
Annual ramp metering benefits	$40,028,008
Annual ramp metering costs	$7,877,275
Annual net benefit (benefits–costs)	$32,150,734
Benefit/cost ratio	5.1:1

Analysis of field data indicated that ramp metering is a cost-effective investment of public funds for the Twin Cities area. This analysis was based on a conservative analysis of both costs and benefits in the following ways:

- The baseline cost analysis includes the costs of the entire regional congestion management system, even though many of these costs are unrelated to ramp metering.
- The benefit calculation is based on the following assumptions:
  - The value of time lost in unexpected delay (i.e., reliability of travel time) is valued the same as routine travel time, even though the literature suggests it could be valued three times higher.
  - The impact of delays on long trips originating beyond the test corridors is not captured.
  - The impact of more erratic acceleration/deceleration on freeways resulting from slower speeds, more congestion, and less predictable traffic conditions is not captured in the analysis of fuel consumption and emissions (Cambridge Systematics, 2001).

A summary of the annual benefits of ramp metering was provided as follows:

- Traffic Volumes and Throughput: After the meters were turned off, there was an average 9 percent traffic volume reduction on freeways and no significant traffic volume change on parallel arterials included in the study. Also, during peak traffic conditions, freeway mainline throughput declined by an average of 14 percent in the “without meters” condition.
- Travel Time: Without meters, the decline in travel speeds on freeway facilities more than offsets the elimination of ramp delays. This results in annual system wide savings of 25,121 hours of travel time with meters.

- Travel Time Reliability: Without ramp metering, freeway travel time is almost twice as unpredictable as with ramp metering. The ramp metering system produces an annual reduction of 2.6 million hours of unexpected delay.
- Safety: In the absence of metering and after accounting for seasonal variations, peak period crashes on previously metered freeways and ramps increased by 26 percent. Ramp metering results in annual savings of 1,041 crashes or approximately four crashes per day.
- Emissions: Ramp metering results in a net annual savings of 1,160 tons of emissions.
- Fuel Consumption: Ramp metering results in an annual increase of 5.5 million gallons of fuel consumed. This was the only criteria category made worse by ramp metering.
- Benefit/Cost Analysis: Ramp metering results in annual savings of approximately $40 million to the Twin Cities traveling public. The benefits of ramp metering outweigh the costs by a significant margin and result in a net benefit of $32 to $37 million per year. The benefit/cost ratio indicates that benefits are approximately five times greater than the cost of the entire congestion management system and over 15 times greater than the cost of the ramp metering system alone (Cambridge Systematics, 2001).

Vehicle Use Restrictions

Booz Allen Hamilton provides a general statement on area pricing projects.

> "To date, there have been no attempts to introduce a comprehensive area road-use charging scheme in any Australian city. However, in 2006, the New Zealand Government completed and published a feasibility study for a comprehensive road pricing scheme for Auckland, a city of some 1.3M people and with similar characteristics to Australian cities. *This study found that the benefit: cost ratio for the more promising of the area charging schemes investigated were favorable*" (Booz, 2006).

Service/Courtesy Patrols

A cost-benefit analysis of the Michigan Department of Transportation's Freeway Courtesy Patrol in 2008 indicated that for every dollar spent on the program, a $15.20 benefit was realized, a 15.2:1 ratio (SEMCOG, 2008).

Research conducted in 1998 indicated benefit-cost ratios for metropolitan freeway courtesy patrol programs. The B/C ratios discovered from this research by metropolitan region is presented in Table 12.

Table 12. Benefit-Cost Ratios for Service Patrol Programs.

Location	Patrol Name	Year Performed	B/C Ratings
Charlotte, NC	Incident Management Assistance Patrol	1993	3:1 to 7:1
Chicago, IL	Emergency Traffic Patrol	1990	17:1
Dallas, TX	Courtesy Patrol	1995	3.3:1 to 36.2:1
Denver, CA	Mile High Courtesy Patrol	1996	20:1 to 23:1
Detroit, MI	Freeway Courtesy Patrol	1995	14:1
Fresno, CA	Freeway Service Patrol	1995	12.5:1
Houston, TX	Motorist Assistance Program	1994	6.6:1 to 23.3:1
Los Angeles, CA	Metro Freeway Service Patrol	1993	11.1
Minneapolis, MN	Highway Helper	1995	5:1
New York & Westchester County, NY	Highway Emergency Local Patrol	1995	23.5:1
Norfolk, VA	Safety Service Patrol	1995	2:1 to 2.5:1
Oakland, CA	Freeway Service Patrol	1991	3.5:1
Orange County, CA	Freeway Service Patrol	1995	3:1
Riverside County, CA	Freeway Service Patrol	1995	3:1
Sacramento, CA	Freeway Service Patrol	1995	5.5:1

Reference: Fenno, 1998

The benefit-cost ratios range from 2:1 to 36.2:1. (Fenno, 1998)

Incident Management – Detection, Response, and Clearance

Researchers developed an analysis methodology for congestion mitigation strategies for the Indiana state highway network. For each roadway type, the input data include mileage, geometric characteristics, current average daily traffic (ADT), and land use information for individual links. The algorithm primarily examines whether the section (or link) is congested or when it will be congested. The peak volume factor and peak directional factor for roadways were developed on the basis of facility type and area type by using historical data from traffic counting stations in Indiana. Applying these factors with ADT data, the directional peak-period volumes can be obtained. The ratio between peak-period volume and capacity was used as a performance standard to indicate the level of use of the highway system, and a set of standards was developed through a consensus among all MPOs and Indiana DOT for various road classes and land use types. By comparing the peak-period volume-to-capacity (V/C) ratio with the benchmark V/C ratio, all links whose V/C ratios exceed the established benchmark values can be identified as congested links. When the congested links are known, a list of potential projects is considered. The methodology estimates, for each project, expected benefits from travel time savings, vehicle operating cost savings, crash cost savings, and emission reductions. The analysis is performed on a yearly basis. Two categories of costs, nonrecurring and recurring, are involved over the project life cycle (Choocharukul, 2002).

The research team concluded that most of the benefit from the incident management program could be derived mainly from crash cost savings. Vehicle operating cost (VOC) savings for incident management were negative because of the expected increase in speed after improvement, which causes increased fuel and oil consumption. The results indicated that the benefit-cost ratio for incident management programs would 12.33:1. The project therefore could be considered economically viable (Choocharukul, 2002).

The I-65 Corridor analysis in Birmingham, Alabama, noted earlier also looked at incident management program scenarios. The estimated BCR from IM planning scenarios ranged from 4.5 to 11.3:1 (Sisiopiku et al., 2009).

Bicycle and Pedestrian

The Mid-America Regional Council submitted a federal grant proposal to help construct a 101-mile bicycle lane program. Project analysts computed a benefit-cost ratio of 11.73 for the entire program along with a 0.4 percent reduction in vehicle trips over 20 years. Analysts estimated a $10,473 annual benefit for congestion reduction for both bicycle and pedestrian modes (Mid-America Regional Council, 2009).

Trip Reduction Ordinances

In the course of evaluating a new TDM Assessment Procedure (TDMAP) model, University of Central Florida researchers focused on employee-based transit pass subsidies and derived a BCR of 3.1:1 for that project type (Winter et al., 2010). The summary from the analysis is below:

VALUE OF TRIP REMOVED

	Peak	Off-Peak
Per Trip--Annual Benefits	$ 1,256	$ 375
Per Trip--Annualized Cost	$ 410	$ 1,229
Per Trip--Net Value	$ 846	$ (854)
Per Trip--Benefit to Cost Ratio	3.1	0.3

DEVELOPMENT OF TOOLBOX

The Toolbox is organized into two sections:

1. Introduction – includes background information, survey responses, the Toolbox organization, and information on how to use the Toolbox.
2. Congestion Mitigation Strategies – describes each strategy, its application, costs, benefits, and Michigan experiences, if any.

Forty-seven strategies are discussed in the Toolbox. Strategies are organized around transportation supply/system management and travel demand management categories. Within supply/system management, strategies are organized within topic areas of:

- Traffic Operations.
- Transit.
- Multimodal Transportation Centers.
- Freight Rail Improvements.
- Bicycle and Pedestrian.
- Reducing Construction/Maintenance Interference.

Within demand management, the strategies are organized within topic areas of:

- Work Schedule Changes.
- Land Use Development.
- Ridesharing/Vanpools.
- Parking Management.
- Diversified Development Patterns.
- New Community Design (Smart Growth).
- Car Sharing.
- Trip Reduction Ordinances.

Each mitigation strategy summary is two to four pages. Typically, the following items are included in the body of the discussion for each strategy:

- Introduction.
- Techniques.
- Data.
- Application Principles.
- Costs.
- Benefits and Impacts.
- Michigan Plans and Policy.
- For More Information.

Each strategy also includes a call-out box that highlights the following:

- Cost – 1–5 black dots are given to indicate relative cost level, lowest to highest.
- Time – Identified as “long,” “moderate,” or “short” for implementation timeframe.
- Impact – The spatial context of the strategy identified as “spot,” “corridor,” or “regional.”
- Project Life – Specifies in years (rounded to 5 years), the typical life of the project.
- Sponsors – Indicates the implementing agency level (e.g., city, state).

The information in the call-out box allows for “at-a-glance” comparison of strategies, particularly as it relates to cost elements and the time it takes to implement the mitigation strategy. These call-out boxes appear in the margins of the strategies.

6.0 CONCLUSIONS

CONGESTION MITIGATION

Previous congestion management or mitigation toolboxes provide good basic and background information, but the fault of those toolboxes is that they do not include newly developed or innovative strategies and techniques. A majority of the toolbox techniques identified since 1985 still remain viable strategies to mitigation congestion problems. However, there have been advancements in technology such as adaptive traffic signal control that are not addressed. Certainly the toolbox created from this project is current at its publication date; however without planned review and update, this toolbox has the potential to become stale and less of a resource for practitioners in Michigan.

MPOs are implementing on the whole low-cost congestion mitigation strategies that return a high degree of success. For example, traffic signal timing and coordination were identified by survey respondents as a popular project that was highly successful and easy to implement. Though some critics may question the effectiveness of traffic signal improvements given their short-term project life they remain a popular technique to improve mobility in urban areas.

BENEFIT-COST ANALYSIS

Researchers found few benefit-cost ratios available in the academic and professional literature for the 47 strategies in the Toolbox. Several sources in the review identified congestion mitigation strategies as cost-effective but did not provide actual numbers. This may be due to the limits of planning documents and the intended audiences. Benefit-cost analysis is complicated to the average citizen, but in an environment of low funding and rising congestion, policy boards and planning professionals need to know what strategies will truly help in mitigating congestion in their areas.

MICHIGAN CONGESTION MANAGEMENT PROCESS

In surveying MPO staff in Michigan TMAs, researchers found a desire for more coordination, education, and collaboration in the congestion mitigation process within their areas. Despite perennial underfunding and the recent economic downturn, they noted that knowledge of the congestion mitigation process has worked its way into the planning process. Traditional methods of building their way out of congestion remain, but it seems tempered by an awareness of alternative strategies.

In terms of strategy development, it was noted that traffic operations strategies achieve the most benefit over costs. These include signal retiming, access management, minor geometric changes—right/left turn lanes, ITS, message signs, integrated corridor management, etc. This opinion is in line with what the research team found from surveying other states and their strategy experiences.

Michigan MPO staff suggested that the role of planners in mitigating congestion is to communicate, coordinate, collaborate, and gain the commitment of stakeholders for the betterment of the process and outcomes. Develop the CMP with their policy and technical committees and make sure everyone is a part of the development of the policies, strategies, application, and project prioritization process. It is hoped that the Toolbox will provide a bridge to those roles and discussion for stakeholders in Michigan.

7.0 RECOMMENDATIONS FOR FURTHER RESEARCH

TOOLBOX UPDATE

The research team recommends that MDOT create and implement a Toolbox update process. A departmental guidebook that maintains an "up-to-date" status maintains its effectiveness as a tool for the department, Michigan MPOs, elected and appointed officials, and the citizens of the state.

A Toolbox update process could be conducted in-house or by outside researchers. The research team recommends revisiting the Toolbox every three years repeating some of the same tasks conducted for the current research process. This would include:

1. Review of the state of the practice, national and international – This step would require a review of the professional and academic literature addressing congestion mitigation in the three previous years. The time and effort required to review three years of sources would be much less than a full historical review of congestion mitigation strategies.
2. Survey of Michigan TMAs with CMPs – Discussions with key personnel involved with congestion mitigation at the MPOs and other metropolitan or regional agencies in Michigan can be done through survey, oral interviews, or roundtable discussion. Based on comments with staff at the current four TMAs that have CMPs, MDOT already maintains good communication with these agencies. This task would simply provide a more formal structure to addressing the issue. The survey should also cover use of the Toolbox and potential improvements to its design and format for user-friendliness.
3. Survey of MDOT staff involved with congestion mitigation – These discussions can be done concurrently with the survey of Michigan TMAs and cover the same topics.
4. Updates to the Toolbox – Upon completion of the first three tasks, the Toolbox should be updated with new information and design changes.

COLLECTION OF BENEFIT-COST ANALYSES

The research team sought documented benefit-cost analyses for the various congestion mitigation strategies. A more thorough and focused research project is recommended to collect and synthesize this information from various available sources. The highest quality source will be individual technical project documentation. This documentation is not recorded in transportation literature databases. It must be discovered through individual contact with implementing agencies.

8.0 RECOMMENDATIONS FOR IMPLEMENTATION

The implementation plan recommends developing a one-day workshop for technology transfer that will promote the 1) research findings, and 2) the Toolbox to be delivered at four locations in Michigan. The targeted audience is MDOT and its partnering agency staff. Products of the implementation plan beyond the required technical report are:

- Adult-learning, Centered Lesson Plan.
- Instructor's notebook: Printed slides in 3-ring binder form complete with instructor's notes.
- Participant's notebook: Printed slides in 3-ringe binder without instructor's notes.
- Visual aids: All PowerPoint® slides.
- Marketing materials: Flyer for marketing of workshop.

IMPLEMENTATION PLAN

The TTI implementation team proposes four (4), one-day workshops with two instructors. Instructors will perform the technology transfer workshops to MDOT and its partnering agencies that will promote the 1) research findings and 2) the Toolbox. The target audience of the workshops is MDOT Region staff, MDOT TSC staff, and the staff of interested partnering agencies (MPOs, RPCs, cities, villages, counties). Based on prior experience, the TTI implementation team anticipates that the maximum class size to achieve the learning objectives of the workshop is 40 participants.

The objective of the workshop is to introduce participants to the Toolbox, helping participants understand the organization and contents so they can take full advantage of implementing the strategies when opportunities are available. The TTI implementation team will use their extensive experiences in adult-learning instruction to ensure an engaging and successful environment for understanding and technology transfer.

TTI proposes six (6) tasks, described below, to successfully introduce the Toolbox to users in Michigan.

Task 1: Develop Lesson Plans

The first task is to develop the lesson plans. The TTI implementation team will develop a lesson plan that will include these key elements:

- Course organization and agenda.
- Target audience and class size.
- Workshop equipment and classroom requirements.
- Workshop learning objectives.
- Individual lessons plans for each module containing lesson title, learning objectives, instructional method(s) used, evaluation plan to ensure lessons are learned, and time allocation.

After creating a draft full lesson plan, the TTI implementation team will solicit feedback on the draft full lesson plan from the Implementation Director (ID) and other MDOT advisors. After changes are made to the lesson plans based upon MDOT feedback, the TTI implementation team will update the lesson plans and begin development of the draft workshop materials.

Task 2: Development of Draft Workshop Materials

Drawing upon the lesson plans developed in Task 1, the TTI implementation team will develop drafts of all necessary workshop materials. The project team will develop the final organization of the workshop and all PowerPoint® presentations for each session of the workshop.

The workshop will be one day (from approximately 9:30 a.m. to 3:30 p.m.). These times are tentative, but the intent is to allow some time in the morning and afternoon for those participants traveling to the workshop. In the final participant notebooks, the PowerPoint® slides will be inserted into 3-ring binders with tabs for each lesson. To keep the workshop interactive and engaging, the project team will develop interactive exercises appropriate for each module. The exercises will assist in reinforcing the learning objectives identified in the lesson plans for each module.

Task 3: Develop Workshop Marketing Materials

The TTI implementation team will develop workshop marketing materials as part of this task. A color PDF flyer will be developed for distribution to target potential participants. The flyer will include key learning objectives and identify what attendees will know when they leave the workshop. It will include contact information of MDOT and the TTI implementation team. Based on prior experiences and successes, TTI recommends the flyer be distributed from MDOT personnel to increase interest and response.

Task 4: Perform Workshop Pilot and Walkthrough

The TTI implementation team will perform a pilot of the workshop to the ID, MDOT advisors, and others, as deemed appropriate. Two instructors will travel to Michigan to perform the pilot workshop. The project team will refine the workshop materials based upon the feedback received from pilot participants.

Task 5: Arrange and Conduct Regional Workshops

The project team proposes four (4), one-day workshops with two instructors. The workshop materials developed in Task 2, and refined in Task 4, will be used at the workshops. The workshops will be conducted at a local transportation agency (e.g., city, metropolitan planning organization [MPO]) or perhaps at an MDOT Region office considering geographical representation and needs (e.g., Detroit, Lansing, Grand Rapids, Marquette). The implementation team will work with the MDOT ID, MDOT Region, TSC staff, and MPO (if present) to identify appropriate agencies and specific invitees that should attend.

After assistance from MDOT and/or the local MPO to make initial contacts with local agency personnel, the implementation team will obtain potential participant lists from MDOT in each Region office, and associated TSCs. The marketing materials developed in Task 3 will be used to solicit interest in the workshops.

The implementation team recommends scheduling two workshops per week over two weeks to cost-effectively use travel funds. This will allow the TTI implementation team to implement the following instruction schedule for a given week. The following provides a tentative weekly schedule for two instructors:

- Monday: Fly to Michigan; meet with key agency contacts regarding workshop the following day; set up the room for instruction the following day.
- Tuesday: Perform the workshop in location #1.
- Wednesday: Travel to next workshop location; meet with key agency contacts regarding workshop the following day; set up the room for instruction the following day.
- Thursday: Perform the workshop in location #2.
- Friday: Meet with MDOT ID, MDTO advisors/others; discuss workshop feedback, etc. while available. Fly back to Texas.

Of course this schedule is flexible and could be "shifted" depending upon the geographical proximity of the workshop locations, the need for (and location of) any necessary meetings with MDOT ORBP or others.

Task 6: Prepare Project Deliverables

The project team will finalize all project deliverables in this task including:

- Technical report: 10 pages or less documenting the scope of the workshops, agencies contacted, number of individuals trained, general feedback from the workshops, etc.
- Adult-learning, Centered Lesson Plan: Finalized in Task 1.
- Instructor's notebook: Printed slides in 3-ring binder form complete with instructor's notes.
- Participant's notebook: Printed slides in 3-ring binder without instructor's notes.
- Visual aids: All PowerPoint® slides.
- Marketing materials: Flyer for marketing of workshop.

The TTI implementation team will transmit the technical report, lesson plan, visual aids, and marketing materials in electronic form. The TTI implementation team will transmit the instructor's notebook and participant's notebook to MDOT in both electronic and hard-copy form.

Assistance or Involvement by MDOT

T o be successful, the implementation project will require assistance and involvement by MDOT. TTI prides itself on effective and timely communication with sponsors. This is particularly important when the goal is performing workshops in an adult-learning environment. The TTI implementation team has identified the following as key assistance/involvement needed by MDOT to make the workshops successful.

Each workshop participant will get a copy of the toolbox, provided by MDOT. The ID, as well as other MDOT staff deemed appropriate, will play an active role in reviewing and commenting on the lesson plans and workshop materials developed by the TTI implementation team. MDOT Region/TSC staff will assist in providing initial contacts of what agencies should be represented at the workshops, and what staff from those agencies should participate. Per Task 3, MDOT will assist in soliciting interest and participants to attend the workshops. Finally, selected MDOT Region/TSC staff will participate in the workshops.

9.0 LIST OF ACRONYMS, ABBREVIATIONS, AND SYMBOLS

AASHTO	American Association of State Highway and Transportation Officials
APA	American Planning Association
ATIS	Advanced traveler information systems
ATM	Advanced traffic management
ATMS	Advanced traffic management systems
AVO	Average vehicle occupancy
BBS	Bus bypass shoulder
BCR	Benefit-cost ratio
BOS	Bus on shoulder
CATS	Chicago Area Transportation Study
CBD	Central business district
CCTV	Closed circuit television
CMAQ	Congestion Mitigation and Air Quality
CMP	Congestion management process
CTR	Commuter trip reduction
DDI	Diverging diamond interchange
DIFT	Detroit Intermodal Freight Terminal
DMS	Dynamic message sign
DOT	Department of Transportation
EIS	Environmental impact statement
EPA	Environmental Protection Agency
ESS	Environmental sensor stations
FHWA	Federal Highway Administration
GRH	Guaranteed Ride Home
HAR	Highway advisory radio
HERS	Highway economic requirements system
HGV	Heavy goods vehicles
HOV	High occupancy vehicle
HSR	Hard shoulder running
ICS	Incident command system
ITE	Institute of Transportation Engineers
ITS	Intelligent transportation systems
JIT	Just in time
LOS	Level of service
MDOT	Michigan Department of Transportation
MITS	Michigan Intelligent Transportation System
MPO	Metropolitan Planning Organization
MUTIT	Median U-turn intersection treatment
NCHRP	National Cooperative Highway Research Program
NCTR	National Center for Transit Research
NIMS	National Incident Management System
NIPC	National Infrastructure Protection Center
ORBP	MDOT’s Office of Research and Best Practices
PDSL	Priced dynamic shoulder lanes

PIP	Public information plan
ROW	Right-of-way
RPC	Regional Planning Council/Commission
SOV	Single occupant vehicle
STC	State Transportation Commission
TAZ	Traffic analysis zone
TCRP	Transit Cooperative Research Program
TCRPC	Tri-County Regional Planning Commission
TDM	Travel demand management
TDMAP	Transportation demand management assessment procedure
TEA-21	Transportation Equity Act for the 21st Century
TIM	Traffic incident management
TIP	Transportation Improvement Program
TMA	Transportation management association
TMC	Traffic management center
TMP	Transportation management plan
TOD	Transit-oriented development
TOP	Transportation operations plan
TOT	Truck-only toll
TRB	Transportation Research Board
TRO	Trip reduction ordinances
TSC	Transportation service center
TTCP	Temporary traffic control plan
TTI	Texas Transportation Institute
VHT	Vehicle hours traveled
VMT	Vehicle miles of travel
VSL	Variable speed limit

10.0 REFERENCES

A Policy on Geometric Design of Highways and Streets, American Association of State Highway and Transportation Officials, Washington, D.C., 2004.

A Toolbox for Alleviating Traffic Congestion and Enhancing Mobility. Institute of Transportation Engineers. Washington, D.C., 1997.

Access Management Manual. Transportation Research Board. Washington, D.C., 2003.

Active Traffic Management Feasibility Study. Report to Washington State Department of Transportation, Urban Corridors Office. Seattle, WA: PB Americas, Carter + Burgess, EarthTech, Inc., and Telvent Farradyne, 2007.

Aftabuzzaman, Md, et al., *Understanding Congestion Relief Impacts of Public Transport in Monetary Terms – Evidence from Australasia, Europe and the US*, 2008.

Agent, K.R., N. Stamatiadis, and S. Jones. *Development of Accident Reduction Factors*. Kentucky Transportation Center Report No. KTC-96-13, Kentucky Transportation Cabinet, 1996.

Arrington, G.B. and R. Cervero. *TCRP Report 128: Effects of TOD on Housing, Parking, and Travel.* Federal Transit Administration, Transportation Research Board, Washington, D.C., 2008.

Bared, J.G., et al., *Design and Operational Performance of Double Crossover Intersection and Diverging Diamond Interchange*. Transportation Research Record 1912, Transportation Research Board, Washington, D.C., 2005, p. 31–38.

Bartholomew, K. *Integrating Land Use Issues into Transportation Planning: Scenario Planning: Summary Report.* FHWA, 2005.

Bonneson, J. et al., *Development of Ramp Design Procedures for Facilities without Frontage Roads.* Report 0-4538-2, Texas Transportation Institute, September 2004.

Booz, A.H. *Study of Successful Congestion Management Approaches and the Role of Charging, Taxes, Levies and Infrastructure and Service Pricing in Travel Demand Management.* Consultancy Report Prepared for Council of Australian Governments, November 2006.

Cambridge Systematics, Inc., *Effective Practices for Congestion Management: Final Report.* American Association of State Highway and Transportation Officials (AASHTO), November 2008.

Cambridge Systematics, Inc., *NCHRP Project 8-32(2), Multimodal Transportation: Development of a Performance-Based Planning Process.* December 1999.

Cambridge Systematics, Inc., *Traffic Congestion and Reliability Trends and Advanced Strategies for Congestion Mitigation*, September 1, 2005.

Cambridge Systematics, Inc., *Twin Cities Ramp Meter Evaluation: Final Report.* February 1, 2001.

Cervero, R. and K. Kockelman *Travel Demand and the 3Ds: Density, Diversity, and Design.* Transportation Research D, Vol. 2, No. 3, 1997.

Chlewicki, G. *New Interchange and Intersection Designs: The Synchronized Split-Phasing Intersection and the Diverging Diamond Interchange.* 2nd Urban Street Symposium (Anaheim, California), April 2003.

Choocharukul, K. et al., *Development of a Congestion Management System Methodology for the Indiana State Highway Network.* Transportation Research Record 1781, 2002, p. 40–48.

City of Troy, Michigan website, http://troymi.gov/TransitCenter/BusGrant.pdf, accessed April 2011.

City of West Melbourne, Florida, *Horizon 2030 Comprehensive Plan, Volume II: Data and Analysis.* October 2010.

Cohen, A. et al. *Carsharing: A Guide for Local Planners*. PAS Memo, American Planning Association, May/June 2008.

Coleman, J., J. Paniati, R. Cotton, R. Covey, D. Graham, J. McCauley, G. Mortford, J. Paniati, M. Parker, H. Pena, M. Robinson, and W. Taylor. *FHWA Study Tour for Speed Management and Enforcement Technology.* Report No. FHWA-PL-96-006. Alexandria, VA: American Trade Initiatives for Federal Highway Administration. 1995.

Deeter, D. *NCHRP Synthesis 399: Real-Time Traveler Information Systems: A Synthesis of Highway Practice*, Transportation Research Board, Washington, D.C., 2009.

De Silva, L.et al. *Transit-Oriented Development in Detroit*, University of Michigan, May 2010.

Delaware Valley Regional Planning Commission Philadelphia Metropolitan Region Planning for Congestion Management and Tracking Progress, April 2009.

Desktop Reference for Crash Reduction Factors. U.S. Department of Transportation, Federal Highway Administration, Report No. FHWA-SA-07-015. Washington, D.C., September 2007.

Douglas, J.G. *Handbook for Planning Truck Facilities on Urban Highways,* Parsons Brinckerhoff Monograph. August 2004.

Douma, F. and F. Cleaveland. *The Impact of Bicycling Facilities on Commute Mode Share: Final Report.* Hubert H. Humphrey Institute of Public Affairs, University of Minnesota, August 2008.

Eisele, W.L. and W.E. Frawley. *Michigan Access Management Program Evaluation.* Prepared by the Texas Transportation Institute for Michigan Department of Transportation. May 2010.

Ewing, R. et al. *Growing Cooler: The Evidence on Urban Development and Climate Change.* Urban Land Institute, October 2007.

Fenno, D.W. and M.A. Ogden. *Freeway Services Patrols: A State of the Practice.* Paper presented at the 77th Annual Transportation Research Board Meeting, Washington, D.C., January 1998.

Federal Highway Administration (FHWA), *2010 Traffic Incident Management Handbook Update.*

Federal Highway Administration (FHWA), *Freeway Management and Operations Handbook.* September 2003.

Federal Highway Administration (FHWA), *Managing Travel for Planned Special Events.* September 2003.

Federal Highway Administration (FHWA), *Ramp Management and Control Handbook.* January 2006.

Federal Highway Administration (FHWA), *Recurring Traffic Bottlenecks: A Primer Focus on Low-Cost Operational Improvements.* June 2009.

Federal Highway Administration (FHWA), *Service Patrol Handbook.* July 2008.

Federal Highway Administration (FHWA), *Signalized Intersections: Informational Guide.* August 2004.

Federal Highway Administration (FHWA), *TechBrief: Synthesis of the Median U-Turn Intersection Treatment, Safety, and Operational Benefits.* 2007.

Federal Highway Administration (FHWA) Office of Asset Management, *Economic Analysis Primer.* August 2003.

Federal Highway Administration (FHWA) Office of Operations, *Developing and Implementing Transportation Management Plans for Work Zones.* December 2005.

Federal Highway Administration (FHWA), Office of Operations, *Traffic Control Systems Handbook.* October 2005.

Federal Highway Administration (FHWA), Office of Safety, *Guidance on 23 U.S.C. § 130 Annual Reporting Requirements for Railway-Highway Crossings.* May 2006.

Federal Highway Administration (FHWA), Real-Time Traveler Information Program website, http://www.ops.fhwa.dot.gov/travelinfo/index.htm, accessed June 2011.

Federal Highway Administration (FHWA), Research and Innovative Technology Administration ITS Joint Program Office website, http://www.its.dot.gov/its_jpo.htm, accessed May 2011.

Federal Highway Administration (FHWA), Road Weather Management website, http://ops.fhwa.dot.gov/weather/index.asp, accessed June 2011.

Flanigan, Erin. *White Paper: The Congestion Management Process for State and Metropolitan Transportation Planning*, Cambridge Systematics, Inc., November 2008

Gan, A., J. Shen, and A. Rodriguez. *Update of Florida Crash Reduction Factors and Countermeasures to Improve the Development of District Safety Improvement Projects.* Florida Department of Transportation, 2005.

GEO-650-D: Flares and Intersection Details. Michigan Department of Transportation. September 2011.

Good Traffic Management Techniques Know No Bounds. In TranScan, No. 3. Washington, D.C.: National Cooperative Highway Research Program, TRB. 2001.

Hamilton, P.T. *Implementing a Smart Growth Land Use Pattern to Manage Congestion & Safety by Integrating Regional Transportation Futures Alternatives Analysis with a Regional Concept of Management and Operations (RCMO): A Case Study in Performance Based Planning.* Tri-County RPC, Lansing, MI, 2004.

Highway Capacity Manual. Transportation Research Board, Washington, D.C., 2010.

Highway Congestion: Intelligent Transportation Systems' Promise for Managing Congestion Falls Short, and DOT Could Better Facilitate Their Strategic Use. GAO-05-943, September 2005.

Holguin-Veras, J. et al., *Overall Impacts of Off-Hour Delivery Programs in the New York City Metropolitan Area.* TRB 90th Annual Meeting Compendium of Papers DVD, 2011.

Houston-Galveston Area Council, *Congestion Mitigation Analysis State Highway 99 (Grand Parkway, Segments E, F-1, F-2, and G.* December 2005.

Hummer, J.E. *An Update on Superstreet Implementation and Research.* Submitted to Eighth National Conference on Access Management, Transportation Research Board, Baltimore, MD, July 2008.

InnovativeMobilty.org, http://www.innovativemobility.org/carsharing/index.shtml, accessed June 2011.

International Technology Scanning Program: Freeway Geometric Design for Active Traffic Management in Europe. American Association of State Highway and Transportation Officials and National Cooperative Highway Research Program, October 2010.

Jarema, F., C. Dahlin, R. Gillmann, M. Hallenbeck, D. Huft, R. Reel, and R. Tweedie. *FHWA Study Tour for European Traffic-Monitoring Programs and Technologies*. Alexandria, VA: American Trade Initiatives for Federal Highway Administration, 1997.

Jones, E.et al. A Collaborative Plan for Curbside Freight Delivery in Washington, D.C., USA. *ITE Journal*, May 2009.

Kimbler, J.D. *Parking Strategies in Transit Oriented Development.* The Charlotte Parking Collaborative, 2005.

Kreis, D.et al. *Statewide Planning Scenario Synthesis: Transportation Congestion Measurement and Management.* Kentucky Transportation Center, September 2005.

Kuhn, B. *Efficient Use of Highway Capacity Summary.* Report No. FHWA-HOP-10-023. College Station, TX: Texas Transportation Institute, The Texas A&M University System, 2010.

Kuhn, B. *PCM International Scan Tour – Denmark.* Copenhagen, Denmark: Unpublished Personal Notes, June 2006.

Kuhn, B. *PCM International Scan Tour – England.* London, England: Unpublished Personal Notes, June 2006.

Kuhn, B. *PCM International Scan Tour – Germany.* Frankfurt, Germany: Unpublished Personal Notes, June 2006.

Kuhn, B. *PCM International Scan Tour – Netherlands.* Rotterdam, Netherlands: Unpublished Personal Notes, June 2006.

Lassacher, S. et al., *Traffic Management of Special Events in Small Communities*, TRR 2099, 2009.

Litman, T.et al., *Pedestrian and Bicycle Planning Guide to Best Practices.* Victoria Transport Policy Institute, April 2009.

M25 Controlled Motorways Summary Report, Issue 1. London, England: Highways Agency, Department for Transport, 2004.

M5 Junctions 19 to 20 Pilot Scheme – Advisory Restrictions for Towing Vehicles. London, England: Highways Agency, Department for Transport, 2005.

Machemehl, R.B. et al. *Freeway Operational Flexibility Concept.* Research Report Number 1844-1, Center for Transportation Research, University of Texas at Austin, March 2001.

McCann, B. Complete the Streets. *Planning*, May 18-23, 2005.

Mehran, B. and H. Nakamura. *Implementing Travel Time Reliability for Evaluation of Congestion Relief Schemes on Expressways.* TRR 2124, TRB, Washington, D.C., 2009.

Meyer, M.D. *A Toolbox for Alleviating Traffic Congestion and Enhancing Mobility.* Institute of Transportation Engineers, Washington D.C., 1997.

Michigan Complete Streets Coalition website, http://www.micompletestreets.org/, accessed June 2011.

Michigan Department of Transportation, *State Long Range Transportation Plan, 2005-2030: Socioeconomics Technical Report.* August 2006.

Michigan Department of Transportation (MDOT) Michigan Intelligent Transportation Systems Center.

Michigan Department of Transportation (MDOT) *Road Design Manual.*

Michigan Department of Transportation (MDOT) Road Weather Information System.

Michigan Department of Transportation (MDOT) website, *US-12 Improvement Study near Saline*, www.michigan.gov/mdot, accessed June 2011.

Michigan Department of Transportation (MDOT), *Work Zone Safety and Mobility Manual*, January 2010.

Michigan Department of Transportation (MDOT), *Access Management Program*. Michigan Department of Transportation.

Michigan Department of Transportation, *Michigan Intersection Guide.* July 2008.

Michigan's Land, Michigan's Future: Final Report of the Michigan Land Use Leadership Council. August 15, 2003.

Michigan Department of Transportation, *Detroit Intermodal Freight Terminal: Final Environmental Impact Statement and Final Section 4(f) Evaluation.* December 2009.

MiCommute.com, accessed June 2011.

Mid-America Regional Council, *Kansas City Regional Tiger Application, Appendix D: KC Bicycle/Pedestrian Project.* September 2009.

Mid-America Regional Council, Kansas City Regional Tiger Application, Appendix D: KC Bicycle/Pedestrian Project, September 2009

Middelham, F. *Dynamic Traffic Management*. Presentation to Planning for Congestion Management Scan Team, Rotterdam, The Netherlands: Ministry of Transport, Public Works, and Water Management, Directorate-General of Public Works and Water Management, AVV Transport Research Centre, June 2006.

Middleton, D.R. *Summary Report on Truck Accommodation Design Guidance*. Research Report Number 0-4364-S. Texas Transportation Institute, College Station, TX, June 2004.

MiDrive.com, accessed June 2011.

Millard-Ball, A. et al., *Car-Sharing: Where and How It Succeeds*, TCRP Report 108, Transportation Research Board, Washington, D.C., 2005.

Mirshahi, M., J. Obenberger, C. Fuhs, C. Howard, R. Krammes, B. Kuhn, R. Mayhew, M. Moore, K. Sahebjam, C. Stone, and J. Yung. *Active Traffic Management: The Next Step in Congestion Management*. Report No. FHWA-PL-07-012. Alexandria, VA: American Trade Initiatives for Federal Highways Administration, 2007.

Missouri Department of Transportation, *Missouri's Experience with a Diverging Diamond Interchange - Lessons Learned.* May 2010.

Mortensen, S. *ITS Transit Technologies and Strategies in Integrated Corridor Management.* Mitretek Systems, 2008.

Najafi, M. et al. *The Fiscal Impacts of Alternative Single Family Housing Densities: Infrastructure Costs.* MSU Land Policy Institute Report No. 2006-2, May 2006.

National Center for Transit Research (NCTR) National TDM and Telework Clearinghouse, http://www.nctr.usf.edu/clearinghouse/tro.htm, accessed May 2011.

National Cooperative Research Program (NCHRP) Report 369, *Use of Shoulders and Narrow Lanes to Increase Freeway Capacity.* 1995.

Niles, J. *JALA International: Home-based Telecommuting Cost-Benefit Analysis* (web site, http://www.jalahq.com/), 2010.

Niles, J. and D. Nelson, Measuring the Success of Transit-Oriented Development: Retail Market Dynamics and Other Key Determinants, *Proceedings of the American Planning Association National Planning Conference.* Seattle, Washington, April 24–28, 1999.

Parsons Brinckerhoff , *SJTPO Congestion Management System: Phase II Update.* Final Report and Technical Memorandum, July 2003.

Pedestrian and Bicycle Information Center, bicyclinginfo.org, accessed May 2011.

Pogue, T.D. *The Transportation Management District: A Tool to Engage Private Sector Support in Meeting Energy, Environmental, and Transportation Goals*. *Energy Policy*, Volume 25, 14-15, December 1997.

Rämä, P. *Effects of Weather-Controlled Variable Message Signing on Driver Behavior.* VTT Publications No. 447. Helsinki, Finland: Technical Research Centre of Finland, VTT Building and Transport, 2001.

Ray, B.L., J. Schoen, P. Jenior, J. Knudsen, R.J. Porter, J.P. Leisch, J. Mason, and R. Roess. *Guidelines for Ramp and Interchange Spacing.* National Cooperative Highway Research Program (NCHRP) Report 687, Transportation Research Board, Washington, D.C., 2011.

SAFETEA-LU 1808: Congestion Mitigation and Air Quality Improvement Program: Evaluation and Assessment - Phase 1 Final Report. FHWA, October 2008.

Separation of Vehicles—CMV-Only Lanes. Joint Report NCHRP Report 649/NCFRP Report 3. Transportation Research Board, Washington, D.C., 2010.

Shaw, T. *NCHRP Synthesis 311: Performance Measures of Operational Effectiveness for Highway Segments and Systems: A Synthesis of Highway Practice.* Transportation Research Board, Washington, D.C., 2003.

Shimazu, T. and Y. Yoshida. *Issues with Signal Control Operation and Its Improvement Effects.* 12th World Congress on ITS, San Francisco, 6-10 November 2005.

Short, J. *Survey of Motor Carrier Opinions on Potential Optional Truck Only Toll (TOT) Lanes on Atlanta Interstate Highways.* TRRB Conference, 2007.

Sight Distance Guidelines. Michigan Department of Transportation, February 2008.

Signal Technology Applications to Address Traffic Congestion on US 301 in Starke, Florida, Final Report. USF-UCITSS-II, Center for Urban Transportation Research (CUTR), University of South Florida, October 31, 2008.

Signalized Intersections: Informational Guide. U.S. Department of Transportation, Federal Highway Administration, Publication No. FHWA-HRT-04-091. August 2004.

Sisiopiku, V. et al. *Implementing Active Traffic Management Strategies in the U.S.* University Transportation Center for Alabama, UTCA Report Number 08206, October 2009.

SMWM/Arup and Associated Consultants, *Sacramento Intermodal Transportation Facility: Final Conceptual Transit and Joint Development Programs.* September 2004.

Southeast Michigan Council of Governments (SEMCOG), *MDOT Freeway Courtesy Patrol in Southeast Michigan: FY 2008 Evaluation Report.*

Steinke, D., L. Sanderson, J. Byrnes, J. Conrad, R. Forrestel, K. Harrington-Hughes, K. Kobetsky, S. Lanford, K. Snyder-Petty, D. Testa, and J. Wilkerson. *Methods and Procedures to Reduce Motorist Delays in European Work Zones*. Report No. FHWA-PL-00-001. Alexandria, VA: American Trade Initiatives for Federal Highway Administration, 2000.

Texas Department of Transportation (TxDOT), *Texas Guide to Accepted Mobile Source Emission Reduction Strategies.* 2007.

Texas Transportation Institute, *Houston's Travel Rate Improvement Program: "Toolbox" Of Improvement Strategies.* Prepared for Greater Houston Partnership, April 2001.

Tignor, S., L. Brown, J. Butner, R. Cunard, S. Davis, G. Hawkins, E. Fischer, M. Kehril, P. Rusch, and S. Wainwright. *Innovative Traffic Control – Technology and Practice in Europe*. Report No. FHWA-PL-00-021. Alexandria, VA: American Trade Initiatives for Federal Highway Administration, 1999.

The Congestion Mitigation and Air Quality Improvement Program: Assessing 10 Years of Experience -- Special Report 264. Transportation Research Board, National Academy Press, Washington, D.C., 2002.

Traffic and Safety Note 604A: Traffic Volume Guidelines for Right-turn Lanes and Tapers. Michigan Department of Transportation, Traffic and Safety Division, August 2004.

Traffic and Safety Note 605A: Traffic Volume Guidelines for Left-turn Lanes and Passing Flares at Unsignalized Intersections. Michigan Department of Transportation, Traffic and Safety Division, August 2004.

Transit Cooperative Research Program. *TCRP 107: Analyzing the Effectiveness of Commuter Benefits Programs.* ICF and Center for Urban Transportation Research, 2006.

Tri-County Regional Planning Commission, *Congestion Management System for the Tri-County Region.* March 2004.

Trueblood, M. et al. *Managing Congestion Levels through Improved Signal Timing.* 2009.

U.S. Environmental Protection Agency (EPA), *Measuring the Air Quality and Transportation Impacts of Infill Development.* EPA 231-R-07-001, November 2007.

U.S. Environmental Protection Agency (EPA), *Our Built and Natural Environments.* January 2001.

U.S. Environmental Protection Agency (EPA), *Transportation Control Measure Information*. March 1992.

U.S. Environmental Protection Agency (EPA), *What Is Smart Growth? A Smart Growth Fact Sheet.* EPA 231-F-01-001A, 2001.

U.S. Environmental Protection Agency (EPA), Office of Air and Radiation, *Benefits Estimates for Selected TCM Programs.* March 1999.

U.S. Environmental Protection Agency (EPA), Office of Air and Radiation, *Transportation Control Measure Information Documents.* Washington, D.C., March 1992.

U.S. EPA Office of Mobile Sources TRAQ Technical Overview, *Transportation Control Measures: Bicycle and Pedestrian Programs.* July 1998.

Weitz, J. *Jobs-Housing Balance*, APA Planning Advisory Service Report No. 516, 2003.

Wilbur Smith and Associates, *MDOT State Long-Range Transportation Plan Goals, Objectives, and Performance Measures Report.* November 2006.

Williams, K. and K. Seggerman. *Model Regulations and Plan Amendments For Multimodal Transportation Districts.* National Center for Transit Research, University of South Florida, March 2004.

Winter, P.L.et al., *Developing a Technique That Predicts the Impacts of TDM on a Transportation System*, National Center for Transit Research, University of South Florida, March 2010.

Wycoff, M.A. and M. Manning. *Reducing Traffic Congestion and Improving Traffic Safety in Michigan Communities: The Access Management Guidebook*. Developed by Planning & Zoning Center, Inc. for Michigan Department of Transportation, October 2001.

Xiang, F.et al. *A Fuzzy-Based System for Freeway Bottleneck Severity Diagnosis in a Sensor Network.* TRB Conference, 2009.

Xiao, Q.et al. Real-Time Traveler Information Performance Measures for Work Zone Congestion Management. *Journal of the Transportation Research Forum*, Vol. 49, No. 2, 2010, p. 49–63.

Zipcar website, http://www.zipcar.com/msu/, accessed June 2011.

11.0 APPENDIX A – EXPANDED LIST OF POTENTIAL STRATEGIES

POTENTIAL CONGESTION MITIGATION STRATEGIES

Developing a Congestion Mitigation Toolbox
MDOT
478230-00001

1. Supply/System Management
    a. Traffic Operations
        i. Increasing number of lanes without widening
            1. Lane width reduction
            2. Pave medians
            3. Shoulder conversion
            4. Shoulders used for part-time travel lane
        ii. Increase number of lanes by widening/lane additions
        iii. Highway ramp closures
        iv. Bottleneck removal
        v. Geometric design improvements
            1. Lane widening
            2. Widen for shoulders
            3. Intersection improvements
                a. Additional turn lanes at intersections
                b. Improved sight distances
                c. Diverging diamonds
                d. Jughandles
                e. Median U-turn crossovers
                f. Continuous flow intersections
            4. Auxiliary lanes for merging and diverging
            5. Acceleration/deceleration lanes
            6. Channelization
            7. Bus turnouts
            8. Commercial vehicles accommodations
            9. Grade separation
                a. Street-rail
                b. Street-street
            10. One-way streets
                a. Couplets
        vi. Super street arterials (grade-separated intersections)
        vii. Complete streets
        viii. Traffic calming
        ix. Improving street continuity
        x. Improved international border crossings
        xi. Vehicle use restrictions
            1. Auto
                a. Time-of-Day Restrictions
                    i. Turning
                    ii. Parking

        b. Pedestrian malls
        c. Auto free zones
    2. Truck
        a. Time of Day Restrictions
            i. Scheduling of shipping/deliveries
            ii. Peak period bans on arterials
        b. Designated truck routes
        c. Truck management strategies
        d. Freight and delivery consolidation
xii. Access management
    1. Driveway management
        a. Policies and standards
        b. Sidestreet/alley access
        c. Shared access/common driveways
    2. Median management
        a. Policies and standards
        b. Bi-directional turn lanes
        c. Establishing medians
    3. Frontage roads
    4. Left turn restrictions
    5. Curb cut and driveway restrictions
    6. Interchange modifications
        a. Full clover-leaf to partial clover-leaf
    7. Frontage roads
    8. Collector-distributor roads
    9. Minimum intersection/interchange spacing
    10. Turn lanes and new/relocated driveways and exit ramps
xiii. Active traffic management
    1. Speed harmonization
    2. Temporary shoulder use
    3. Queue warning
    4. Dynamic merge control
    5. Construction site management
    6. Truck restrictions
    7. Dynamic rerouting and traveler information
    8. Dynamic lane markings
    9. Automated enforcement
xiv. Improved traffic control devices
xv. ITS
    1. Ramp metering
        a. Localized
        b. Demand responsive
        c. Coordinated
        d. HOV bypass

    2. Incident management
        a. Highway
        b. Arterial
    3. Service/courtesy patrols
    4. Advanced traveler information systems
        a. Real-time speed via web/smartphone
        b. Transit vehicle schedule progress
        c. Highway information systems
        d. 511 traveler information systems
        e. Travel time messages for travelers
        f. Freight shipper congestion information
        g. National traffic and road closure information
    5. Electronic toll collection
xvi. Traffic signals
    1. Retiming
    2. Coordination
    3. Equipment upgrade
    4. Adaptive signal controls/demand responsive
xvii. Reversible traffic lanes/changeable lane assignments
xviii. Exclusive lanes
    1. HOV/ML
        a. Design
            i. Freeway
                1. Separate ROW
                2. Barrier or buffer separated
                3. Concurrent flow
                4. Contraflow
            ii. Arterial
                1. Concurrent flow
                2. Contraflow
                3. Reversible
                4. Median lane
        b. Integration of park-and-ride lots
        c. Rideshare matching services
        d. Ramps
        e. Ramp bypass
        f. Publicity/outreach
        g. Support services
            i. Park-and-ride facilities
            ii. Casual carpool facilities
            iii. HOV toll discounts
    2. Bus
    3. Truck

xix. Incident management
1. Detection
a. Traffic/courtesy patrols
b. Monitoring
c. Roadway detectors/surveillance
2. Response
a. Communication systems/protocol
b. Traffic/courtesy patrols
c. Responder vehicle priority
3. Clearance
a. Service patrols
b. Response teams
4. Information/Routing
a. Alternative route planning
b. Variable message signs
c. Advisory radio
xx. Event management
1. Reversible lanes/lane assignments
xxi. Road weather management
b. Transit
i. Capital
1. Fleet Improvements
a. Expansion
b. Vehicle replacement/upgrade
c. Change vehicle types
d. Vehicle management systems
2. Support facilities
a. Park-and-ride lots
b. Transit centers
c. Improved station amenities
3. Exclusive ROW
a. Implement rail transit
i. Heavy rail
ii. Commuter rail
iii. Light rail
b. Bus rapid transit/busways
c. Bus lanes
d. Bus bypass ramps
ii. Operations
1. Service Improvements
a. Increased frequency
b. Additional stops
c. Modify operating hours
d. Schedule coordination
e. Improved transfers
f. Route modification

g. Route expansion
h. Express routes
i. Activity center circulator buses
j. Paratransit
2. Neighborhood circulator buses
3. Marketing/Information
a. Marketing
b. Agency coordination
c. Real-time traveler information systems
4. Incentives
a. Fare reductions
b. Fare packages
c. Employer-paid transit passes
5. Street Operations
a. Signal priority
b. Signal coordination
c. Bus turnouts
d. Rail crossing coordination
e. HOV signal priority
6. Passenger amenities
7. Vehicle tracking (AVL)
c. Multimodal transportation centers
d. Freight rail improvements
e. Bicycle and pedestrian
i. Infrastructure
1. Planning
a. Design guidelines for pedestrian-oriented developments
i. Maximum block length
ii. Building setback restrictions
iii. Streetscape enhancements
iv. Sidewalk widths
2. Designated bicycle lanes
a. Restriping existing roadways (safety, efficiency)
b. Paths
3. Improved facilities
a. Lighting
b. Signage
c. Route marking
d. Striping
e. Pavement quality
f. Curb cuts
g. Curb extensions
h. Median refuges
i. Raised crosswalks
4. New sidewalks
5. Wider sidewalks

6. Exclusive non-motorized ROW
a. Rails-to-trails
b. Pedestrian malls
ii. Support Services
1. Bicycle facility support at transit stations and trip destinations
a. Amenities
i. Racks/lockers
ii. Bike carriers on transit
iii. Showers
iv. Route maps
v. Promotional campaigns
b. Incentives
2. Bike sharing
3. Coordinators
4. Ordinances
5. Education
6. Media and promotion
f. Reducing construction/maintenance interference
i. Contracting strategies and accelerated construction
1. Allowable working day and working hours
2. Financial incentives/disincentives for high-priority projects
3. A+B Bidding
4. Lane rentals
ii. Work zone management strategies
iii. Warranty contracting
iv. Advance information
v. Trailblazing/detours
vi. Management plans
vii. Design-build strategies
viii. Job order contracting (on-call contracting)
2. Demand Management
a. Work Schedule Changes
i. Flextime
ii. Compressed work week
iii. Staggered work hours
iv. Telecommuting
b. Land use development
i. Mixed-use development
ii. Infill and densification
iii. Transit-oriented development
c. Ridesharing/Vanpools
i. Incentives
1. HOV parking discounts
2. Subsidized service
ii. Marketing and promotion
iii. Ride matching services

        iv. Guaranteed ride home
d. Parking management
    i. On-street parking and standing restrictions
        1. Peak-period prohibitions to free lane capacity
    ii. Employer/landlord parking agreements
    iii. Increased parking fees
    iv. HOV/carpool/vanpool
        1. Preferential
        2. Discounts
    v. Location-specific parking ordinances
e. Truck use restrictions
f. Diversified development patterns
g. New community design (smart growth)
    i. Compact development
        1. Density standards
    ii. Redevelopment and infill development
        1. Side reclamation and reuse
        2. Incentives to develop in areas with existing infrastructure
    iii. Mixed use development
        1. Zoning regulations
    iv. Jobs/housing development
        1. Zoning regulations
    v. Transit-oriented development
        1. Density standards
        2. Design requirements
        3. Bicycle/pedestrian access
    vi. Corridor land use and transportation coordination
        1. Intergovernmental agreements
h. Car sharing
i. Transit
    i. Land-use policies
    ii. Site design criteria
    iii. Employer incentives
    iv. Employer-paid transit passes
    v. TOD parking management
j. Trip reduction ordinances
    i. Special use permits
    ii. Negotiated agreements
    iii. Trip reduction goal programs
    iv. Conditions of approval for new construction
    v. Mandated programs
    vi. Transportation management districts

Works Reviewed for Task

FHWA Congestion Reduction Toolbox (Accessed January 4, 2011)
http://www.fhwa.dot.gov/congestion/toolbox/index.htm

Richmond Area MPO CMS Toolbox (July 2008), *Cambridge Systematics*
Analytical methods, implementation timeframe, costs and other impacts, congestion/mobility benefits

Active Traffic Management: The Next Step in Congestion Management (July 2007), *American Trade Initiatives*

Mountainland Association of Governments CMP (March 2007) *Cambridge Systematics*
Analytical methods, implementation timeframe, costs and other impacts, congestion/mobility benefits

Traffic Congestion and Reliability: Trends and Advanced Strategies for Congestion Mitigation (September 2005), *Cambridge Systematics*

Travel Rate Improvement Program — 2005 Update (September 2004), *Texas Transportation Institute*

South Jersey Transportation Planning Organization CMS: Phase II Update (June 2003), *PB*
Application area, benefit rating

MARC Enhanced CMS Toolbox (December 2001), *Cambridge Systematics*
Analytical methods, implementation timeframe, costs and other impacts, congestion/mobility benefits

Handbook of Selected Congestion Mitigation Techniques in the United States (October 1998), *Texas Transportation Institute*

CATS Congestion Mitigation Handbook (September 1998), *Metro Transportation Group, TransCore, WSA*

Use and Evaluation of Transportation Control Measures (September 1994), *Texas Transportation Institute*

A Toolbox for Alleviating Traffic Congestion (1989), *Institute of Transportation Engineers*

12.0 APPENDIX B – SURVEY INSTRUMENT FOR METROPOLITAN PLANNING ORGANIZATIONS

MDOT Congestion Management Survey

1. Introduction

Introduction
The purpose of this introduction is to provide you (as a prospective research project participant) information that may affect your decision to participate in this research.

You have been asked to participate in a research project being performed by the Texas Transportation Institute at Texas A&M University to create a congestion mitigation toolbox for the Michigan Department of Transportation. You were selected to be a possible participant because (1) your previous/current involvement with the development and/or implementation of congestion mitigation strategies, plans, and toolboxes or (2) you have special knowledge/experiences with the development and/or implementation of congestion mitigation strategies, plans, and toolboxes. This study is being sponsored by the Michigan Department of Transportation.

What will I be asked to do?
If you agree to participate in this project, you will be asked to answer questions about your knowledge and experiences related to congestion mitigation. This survey will take approximately 60 minutes to complete, depending on your answers to questions and follow-up questions that may result.

What are the risks involved in this study?
The risks associated with this study are minimal, and are not greater than risks ordinarily encountered in filling out other paper forms in daily life.

What are the possible benefits of this study?
You will receive no direct benefit from participating in this study; however, your responses will assist the research team in developing a congestion mitigation toolbox for transportation planners and engineers in the State of Michigan.

Do I have to participate?
No. Your participation is voluntary. You may decide to not participate or to withdraw at any time without your current or future relations with the Texas Transportation Institute or Texas A&M University being affected.

Who will know about my participation in this research study?
Your responses may be cited in summaries or reports produced for this study. Your information will be kept confidential by not identifying you personally as the source of information. Your response may be attributed to your agency.

Whom do I contact with questions about the research?
If you have questions regarding this study, you may contact the Principal Investigator Jason Crawford at (817) 462-0534 or jcrawford@tamu.edu.

Whom do I contact about my rights as a research participant?
This research study has been reviewed by the Human Subjects' Protection Program and/or the Institutional Review Board at Texas A&M University. For research-related problems or questions regarding your rights as a research participant, you can contact these offices at (979) 458-4067 or irb@tamu.edu.

Participation
Please be sure you have read the above information, asked questions and received answers to your satisfaction. If you would like to be in the project, please participate by responding to our web-based survey questions.

* 1. Please enter your contact information (Agency information is required).

Name:

Agency:

State:

Email Address:

Phone Number:

*** 2. May a researcher contact you to ask any follow-up question(s) and/or request permission to publish a specific response?**

- ◯ Yes
- ◯ No

2. Introduction

You will be asked a series of similar questions for several broad congestion mitigation strategies. These questions pertain to use, success, barriers and solutions, and general costs and benefit/cost ratios.

Generally there are three required questions for each group of congestion mitigation strategies.

This survey must be completed at one sitting. The survey does not have the ability for the respondent to save their place and return to complete.

3. Added Capacity without Facility Widening

*** 1. Which of the following techniques have been used in your metropolitan area to increase the number of lanes without widening?**

	Not Implemented in My Region	Implemented in My Region	Not Implemented, but Planned	Implemented Previously & Future Plans	Technical Documents Are Available
Lane width reduction	☐	☐	☐	☐	☐
Conversion of median to travel lane(s)	☐	☐	☐	☐	☐
Shoulder conversion	☐	☐	☐	☐	☐
Shoulder used for part-time travel lane	☐	☐	☐	☐	☐

Other (please specify)

*** 2. Please rate the success of these strategies at mitigating congestion in your region.**

	Very Unsuccessful	Somewhat Unsuccessful	Average	Somewhat Successful	Very Successful	N/A
Lane width reduction	○	○	○	○	○	○
Conversion of median to travel lane(s)	○	○	○	○	○	○
Shoulder conversion	○	○	○	○	○	○
Shoulder used for part-time travel lane	○	○	○	○	○	○

Other (please specify)

*** 3. Please rate the ease of implementation for these strategies.**

	Very Difficult	Somewhat Difficult	Neutral	Somewhat Easy	Very Easy	N/A
Lane width reduction	○	○	○	○	○	○
Conversion of median to travel lane(s)	○	○	○	○	○	○
Shoulder conversion	○	○	○	○	○	○
Shoulder used for part-time travel lane	○	○	○	○	○	○

Other (please specify)

4. Please identify barriers encountered for these strategies.

Lane width reduction

Conversion of median to travel lane(s)

Shoulder conversion

Shoulder used for part-time travel lane

5. Please identify the solutions to the barriers encountered for these strategies.

Lane width reduction

Conversion of median to travel lane(s)

Shoulder conversion

Shoulder used for part-time travel lane

6. Please identify the costs ($) for these strategies and note which year these represent (e.g., $100,000 $2008).

Lane width reduction

Conversion of median to travel lane(s)

Shoulder conversion

Shoulder used for part-time travel lane

7. Please identify the calculated or documented benefit/cost ratio or a range for these strategies.

Lane width reduction

Conversion of median to travel lane(s)

Shoulder conversion

Shoulder used for part-time travel lane

4. Highway Ramp Removal and Reconfiguration

*** 1. Have any freeway ramps been closed or reconfigured to improve traffic operations?**

	Not Implemented in My Region	Implemented in My Region	Not Implemented, but Planned	Implemented Previously & Future Plans	Technical Documents Are Available
Freeway ramp closure	☐	☐	☐	☐	☐
Freeway ramp configuration	☐	☐	☐	☐	☐

*** 2. Please rate the success of these strategies at mitigating congestion in your region.**

	Very Unsuccessful	Somewhat Unsuccessful	Average	Somewhat Successful	Very Successful	N/A
Freeway ramp removals	○	○	○	○	○	○
Freeway ramp reconfiguration	○	○	○	○	○	○

*** 3. Please rate the ease of implementation for these strategies.**

	Very Difficult	Somewhat Difficult	Neutral	Somewhat Easy	Very Easy	N/A
Freeway ramp removals	○	○	○	○	○	○
Freeway ramp reconfiguration	○	○	○	○	○	○

4. Please identify barriers encountered for these strategies.

5. Please identify the solutions to the barriers encountered for these strategies.

6. Please identify the costs ($) for these strategies and note which year these represent (e.g., $100,000 $2008).

7. Please identify the calculated or documented benefit/cost ratio or a range for these strategies.

5. Roadway Bottleneck Removal

*** 1. Have any agencies in your metropolitan area removed raodway bottlenecks?**

	Not Implemented in My Region	Implemented in My Region	Not Implemented, but Planned	Implemented Previously & Future Plans	Technical Documents Are Available
Freeway bottleneck removal	☐	☐	☐	☐	☐
Arterial bottleneck removal	☐	☐	☐	☐	☐

*** 2. Please rate the success of these strategies at mitigating congestion in your region.**

	Very Unsuccessful	Somewhat Unsuccessful	Average	Somewhat Successful	Very Successful	N/A
Freeway bottleneck removal	○	○	○	○	○	○
Arterial bottleneck removal	○	○	○	○	○	○

*** 3. Please rate the ease of implementation for these strategies.**

	Very Difficult	Somewhat Difficult	Neutral	Somewhat Easy	Very Easy	N/A
Freeway bottleneck removal	○	○	○	○	○	○
Arterial bottleneck removal	○	○	○	○	○	○

4. Please identify barriers encountered for these strategies.

5. Please identify the solutions to the barriers encountered for these strategies.

6. Please identify the costs ($) for these strategies and note which year these represent (e.g., $100,000 $2008).

7. Please identify the calculated or documented benefit/cost ratio or a range for these strategies.

MDOT Congestion Management Survey

6. Geometric Design Improvements

*** 1. Please indicate which of the following geometric design improvements have been implemented in your metropolitan area to mitigate congestion.**

	Not Implemented in My Region	Implemented in My Region	Not Implemented, but Planned	Implemented Previously & Future Plans	Technical Documents Are Available
Widen road to accomodate shoulders	☐	☐	☐	☐	☐
Additional turn lanes at intersections	☐	☐	☐	☐	☐
Lengthened turn lanes at intersection for queueing	☐	☐	☐	☐	☐
Improved sight distances at intersections	☐	☐	☐	☐	☐
Diverging diamond intersections	☐	☐	☐	☐	☐
Jughandles at intersections	☐	☐	☐	☐	☐
Median U-turn crossovers	☐	☐	☐	☐	☐
Continuous flow intersections	☐	☐	☐	☐	☐
Auxiliary lanes for merging and diverging	☐	☐	☐	☐	☐
Intersection channelization	☐	☐	☐	☐	☐
Bus turnouts	☐	☐	☐	☐	☐
Commercial vehicle accommodations	☐	☐	☐	☐	☐
Grade separations (street-rail)	☐	☐	☐	☐	☐
Grade separations (street-street)	☐	☐	☐	☐	☐

Other (please specify)

MDOT Congestion Management Survey

*** 2. Please rate the success of these strategies at mitigating congestion in your region.**

	Very Unsuccessful	Somewhat Unsuccessful	Average	Somewhat Successful	Very Successful	N/A
Widen road to accomodate shoulders	◯	◯	◯	◯	◯	◯
Additional turn lanes at intersections	◯	◯	◯	◯	◯	◯
Lengthened turn lanes at intersection for queueing	◯	◯	◯	◯	◯	◯
Improved sight distances at intersections	◯	◯	◯	◯	◯	◯
Diverging diamond intersections	◯	◯	◯	◯	◯	◯
Jughandles at intersections	◯	◯	◯	◯	◯	◯
Median U-turn crossovers	◯	◯	◯	◯	◯	◯
Continuous flow intersections	◯	◯	◯	◯	◯	◯
Auxiliary lanes for merging and diverging	◯	◯	◯	◯	◯	◯
Intersection channelization	◯	◯	◯	◯	◯	◯
Bus turnouts	◯	◯	◯	◯	◯	◯
Commercial vehicle accommodations	◯	◯	◯	◯	◯	◯
Grade separations (street-rail)	◯	◯	◯	◯	◯	◯
Grade separations (street-street)	◯	◯	◯	◯	◯	◯

Other (please specify)

* 3. Please rate the ease of implementation for these strategies.

	Very Difficult	Somewhat Difficult	Neutral	Somewhat Easy	Very Easy	N/A
Widen road to accomodate shoulders	◯	◯	◯	◯	◯	◯
Additional turn lanes at intersections	◯	◯	◯	◯	◯	◯
Lengthened turn lanes at intersection for queueing	◯	◯	◯	◯	◯	◯
Improved sight distances at intersections	◯	◯	◯	◯	◯	◯
Diverging diamond intersections	◯	◯	◯	◯	◯	◯
Jughandles at intersections	◯	◯	◯	◯	◯	◯
Median U-turn crossovers	◯	◯	◯	◯	◯	◯
Continuous flow intersections	◯	◯	◯	◯	◯	◯
Auxiliary lanes for merging and diverging	◯	◯	◯	◯	◯	◯
Intersection channelization	◯	◯	◯	◯	◯	◯
Bus turnouts	◯	◯	◯	◯	◯	◯
Commercial vehicle accommodations	◯	◯	◯	◯	◯	◯
Grade separations (street-rail)	◯	◯	◯	◯	◯	◯
Grade separations (street-street)	◯	◯	◯	◯	◯	◯

Other (please specify)

4. Please identify the solutions to the barriers encountered for these strategies.

Widen road to accomodate shoulders	
Additional turn lanes at intersections	
Lengthened turn lanes at intersection for queueing	
Improved sight distances at intersections	
Diverging diamond intersections	
Jughandles at intersections	
Median U-turn crossovers	
Continuous flow intersections	
Auxiliary lanes for merging and diverging	
Intersection channelization	
Bus turnouts	
Commercial vehicle accommodations	
Grade separations (street-rail)	
Grade separations (street-street)	

5. Please identify the costs ($) for these strategies and note which year these represent (e.g., $100,000 $2008).

Widen road to accomodate shoulders	
Additional turn lanes at intersections	
Lengthened turn lanes at intersection for queueing	
Improved sight distances at intersections	
Diverging diamond intersections	
Jughandles at intersections	
Median U-turn crossovers	
Continuous flow intersections	
Auxiliary lanes for merging and diverging	
Intersection channelization	
Bus turnouts	
Commercial vehicle accommodations	
Grade separations (street-rail)	
Grade separations (street-street)	

6. Please identify the calculated or documented benefit/cost ratio or a range for these strategies.

Widen road to accomodate shoulders	
Additional turn lanes at intersections	
Lengthened turn lanes at intersection for queueing	
Improved sight distances at intersections	
Diverging diamond intersections	
Jughandles at intersections	
Median U-turn crossovers	
Continuous flow intersections	
Auxiliary lanes for merging and diverging	
Intersection channelization	
Bus turnouts	
Commercial vehicle accommodations	
Grade separations (street-rail)	
Grade separations (street-street)	

7. Overall Street Improvements

*** 1. Which of the following overall street improvements have been implemented in your metropolitan area.**

	Not Implemented in My Region	Implemented in My Region	Not Implemented, but Planned	Implemented Previously & Future Plans	Technical Documents Are Available
Superstreets (series of non-freeway grade separations)	☐	☐	☐	☐	☐
Complete streets	☐	☐	☐	☐	☐
Improving street continuity	☐	☐	☐	☐	☐
Two-way to One-way conversion	☐	☐	☐	☐	☐
One-way to Two-way conversion	☐	☐	☐	☐	☐

Other (please specify)

*** 2. Please rate the success of these strategies at mitigating congestion in your region.**

	Very Unsuccessful	Somewhat Unsuccessful	Average	Somewhat Successful	Very Successful	N/A
Superstreets (series of non-freeway grade separations)	○	○	○	○	○	○
Complete streets	○	○	○	○	○	○
Improving street continuity	○	○	○	○	○	○
Two-way to One-way conversion	○	○	○	○	○	○
One-way to Two-way conversion	○	○	○	○	○	○

Other (please specify)

*** 3. Please rate the ease of implementation for these strategies.**

	Very Difficult	Somewhat Difficult	Neutral	Somewhat Easy	Very Easy	N/A
Superstreets (series of non-freeway grade separations)	○	○	○	○	○	○
Complete streets	○	○	○	○	○	○
Improving street continuity	○	○	○	○	○	○
Two-way to One-way conversion	○	○	○	○	○	○
One-way to Two-way conversion	○	○	○	○	○	○

Other (please specify)

4. Please identify barriers encountered for these strategies.

Superstreets (series of non-freeway grade separations)

Complete streets

Improving street continuity

Two-way to One-way conversion

One-way to Two-way conversion

5. Please identify the solutions to the barriers encountered for these strategies.

Superstreets (series of non-freeway grade separations)

Complete streets

Improving street continuity

Two-way to One-way conversion

One-way to Two-way conversion

6. Please identify the costs ($) for these strategies and note which year these represent (e.g., $100,000 $2008).

Superstreets (series of non-freeway grade separations)

Complete streets

Improving street continuity

Two-way to One-way conversion

One-way to Two-way conversion

7. Please identify the calculated or documented benefit/cost ratio or a range for these strategies.

Superstreets (series of non-freeway grade separations)

Complete streets

Improving street continuity

Two-way to One-way conversion

One-way to Two-way conversion

8. Vehicle Use Restrictions

*** 1. Have any of the following time-of-day policies been implemented in your metropolitan area to mitigate congestion?**

	Not Implemented in My Region	Implemented in My Region	Not Implemented, but Planned	Implemented Previously & Future Plans	Technical Documents Are Available
Auto turning restrictions on streets	☐	☐	☐	☐	☐
Auto parking restrictions on streets	☐	☐	☐	☐	☐
Truck shipping/delivery schedules	☐	☐	☐	☐	☐
Truck peak period bans on arterials	☐	☐	☐	☐	☐
Truck management strategies	☐	☐	☐	☐	☐
Truck freight and delivery consolidation	☐	☐	☐	☐	☐
Designated truck routes	☐	☐	☐	☐	☐

Other (please specify)

*** 2. Please rate the success of these strategies at mitigating congestion in your region.**

	Very Unsuccessful	Somewhat Unsuccessful	Average	Somewhat Successful	Very Successful	N/A
Auto turning restrictions on streets	○	○	○	○	○	○
Auto parking restrictions on streets	○	○	○	○	○	○
Truck shipping/delivery schedules	○	○	○	○	○	○
Truck peak period bans on arterials	○	○	○	○	○	○
Truck management strategies	○	○	○	○	○	○
Truck freight and delivery consolidation	○	○	○	○	○	○
Designated truck routes	○	○	○	○	○	○

Other (please specify)

* 3. Please rate the ease of implementation for these strategies.

	Very Difficult	Somewhat Difficult	Neutral	Somewhat Easy	Very Easy	N/A
Auto turning restrictions on streets	◯	◯	◯	◯	◯	◯
Auto parking restrictions on streets	◯	◯	◯	◯	◯	◯
Truck shipping/delivery schedules	◯	◯	◯	◯	◯	◯
Truck peak period bans on arterials	◯	◯	◯	◯	◯	◯
Truck management strategies	◯	◯	◯	◯	◯	◯
Truck freight and delivery consolidation	◯	◯	◯	◯	◯	◯
Designated truck routes	◯	◯	◯	◯	◯	◯

Other (please specify)

4. Please identify barriers encountered for these strategies.

Auto turning restrictions on streets

Auto parking restrictions on streets

Truck shipping/delivery schedules

Truck peak period bans on arterials

Truck management strategies

Truck freight and delivery consolidation

Designated truck routes

5. Please identify the solutions to the barriers encountered for these strategies.

Auto turning restrictions on streets

Auto parking restrictions on streets

Truck shipping/delivery schedules

Truck peak period bans on arterials

Truck management strategies

Truck freight and delivery consolidation

Designated truck routes

6. Please identify the costs ($) for these strategies and note which year these represent (e.g., $100,000 $2008).

Auto turning restrictions on streets

Auto parking restrictions on streets

Truck shipping/delivery schedules

Truck peak period bans on arterials

Truck management strategies

Truck freight and delivery consolidation

Designated truck routes

7. Please identify the calculated or documented benefit/cost ratio or a range for these strategies.

Auto turning restrictions on streets

Auto parking restrictions on streets

Truck shipping/delivery schedules

Truck peak period bans on arterials

Truck management strategies

Truck freight and delivery consolidation

Designated truck routes

9. Access Management

*** 1. Which of the following access management strategies have been implemented in your metropolitan area?**

	Not Implemented in My Region	Implemented in My Region	Not Implemented, but Planned	Implemented Previously & Future Plans	Technical Documents Are Available
Driveway spacing standards	◯	◯	◯	◯	◯
Driveway consolidation	◯	◯	◯	◯	◯
Driveway sharing and cross-access	◯	◯	◯	◯	◯
Sidestreet/alley/backage road access	◯	◯	◯	◯	◯
Raised median policies and standards	◯	◯	◯	◯	◯
Two-way-left-turn-lanes	◯	◯	◯	◯	◯
Raised median installation	◯	◯	◯	◯	◯
Frontage roads on arterial streets	◯	◯	◯	◯	◯
Left-turn restrictions	◯	◯	◯	◯	◯
Interchange modifications (such as full clover leaf to partial clover leaf)	◯	◯	◯	◯	◯
Minimum street intersection spacing	◯	◯	◯	◯	◯
Minimum freeway interchange spacing	◯	◯	◯	◯	◯

Other (please specify)

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*** 2. Please rate the success of these strategies at mitigating congestion in your region?**

	Very Unsuccessful	Somewhat Unsuccessful	Average	Somewhat Successful	Very Successful	N/A
Driveway spacing standards	◯	◯	◯	◯	◯	◯
Driveway consolidation	◯	◯	◯	◯	◯	◯
Driveway sharing and cross-access	◯	◯	◯	◯	◯	◯
Sidestreet/alley/backage road access	◯	◯	◯	◯	◯	◯
Raised median policies and standards	◯	◯	◯	◯	◯	◯
Two-way-left-turn-lanes	◯	◯	◯	◯	◯	◯
Raised median installation	◯	◯	◯	◯	◯	◯
Frontage roads on arterial streets	◯	◯	◯	◯	◯	◯
Left-turn restrictions	◯	◯	◯	◯	◯	◯
Interchange modifications (such as full clover leaf to partial clover leaf)	◯	◯	◯	◯	◯	◯
Minimum street intersection spacing	◯	◯	◯	◯	◯	◯
Minimum freeway interchange spacing	◯	◯	◯	◯	◯	◯

Other (please specify)

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* 3. Please rate the east of implementation for these strategies.

	Very Difficult	Somewhat Difficult	Neutral	Somewhat Easy	Very Easy	N/A
Driveway spacing standards						
Driveway consolidation						
Driveway sharing and cross-access						
Sidestreet/alley/backage road access						
Raised median policies and standards						
Two-way-left-turn-lanes						
Raised median installation						
Frontage roads on arterial streets						
Left-turn restrictions						
Interchange modifications (such as full clover leaf to partial clover leaf)						
Minimum street intersection spacing						
Minimum freeway interchange spacing						

Other (please specify)

4. Please identify barriers encountered for these strategies.

Driveway spacing standards

Driveway consolidation

Driveway sharing and cross-access

Sidestreet/alley/backage road access

Raised median policies and standards

Two-way-left-turn-lanes

Raised median installation

Frontage roads on arterial streets

Left-turn restrictions

Interchange modifications (such as full clover leaf to partial clover leaf)

Minimum street intersection spacing

Minimum freeway interchange spacing

5. Please identify the solutions to the barriers encountered for these strategies.

Driveway spacing standards

Driveway consolidation

Driveway sharing and cross-access

Sidestreet/alley/backage road access

Raised median policies and standards

Two-way-left-turn-lanes

Raised median installation

Frontage roads on arterial streets

Left-turn restrictions

Interchange modifications (such as full clover leaf to partial clover leaf)

Minimum street intersection spacing

Minimum freeway interchange spacing

6. Please identify the costs ($) for these strategies and note which year these represent (e.g., $100,000 $2008).

Driveway spacing standards

Driveway consolidation

Driveway sharing and cross-access

Sidestreet/alley/backage road access

Raised median policies and standards

Two-way-left-turn-lanes

Raised median installation

Frontage roads on arterial streets

Left-turn restrictions

Interchange modifications (such as full clover leaf to partial clover leaf)

Minimum street intersection spacing

Minimum freeway interchange spacing

7. Please identify the calculated or documented benefit/cost ratio or a ranger for these strategies.

Driveway spacing standards

Driveway consolidation

Driveway sharing and cross-access

Sidestreet/alley/backage road access

Raised median policies and standards

Two-way-left-turn-lanes

Raised median installation

Frontage roads on arterial streets

Left-turn restrictions

Interchange modifications (such as full clover leaf to partial clover leaf)

Minimum street intersection spacing

Minimum freeway interchange spacing

10. Ramp Metering

* 1. Which of the following ramp metering systems have been implemented in your metropolitan area?

	Not Implemented in My Region	Implemented in My Region	Not Implemented, but Planned	Implemented Previously & Future Plans	Technical Documents Are Available
Ramp metering - localized	☐	☐	☐	☐	☐
Ramp metering - demand responsive	☐	☐	☐	☐	☐
Ramp metering - coordinated	☐	☐	☐	☐	☐
Ramp metering - HOV bypass	☐	☐	☐	☐	☐

* 2. Please rate the success of these strategies at mitigating congestion in your region.

	Very Unsuccessful	Somewhat Unsuccessful	Average	Somewhat Successful	Very Successful	N/A
Ramp metering - localized	○	○	○	○	○	○
Ramp metering - demand responsive	○	○	○	○	○	○
Ramp metering - coordinated	○	○	○	○	○	○
Ramp metering - HOV bypass	○	○	○	○	○	○

* 3. Please rate the ease of implementation for these strategies.

	Very Difficult	Somewhat Difficult	Neutral	Somewhat Easy	Very Easy	N/A
Ramp metering - localized	○	○	○	○	○	○
Ramp metering - demand responsive	○	○	○	○	○	○
Ramp metering - coordinated	○	○	○	○	○	○
Ramp metering - HOV bypass	○	○	○	○	○	○

4. Please identify barriers encountered for these strategies.

Ramp metering - localized

Ramp metering - demand responsive

Ramp metering - coordinated

Ramp metering - HOV bypass

5. Please identify the solutions to the barriers encountered for these strategies.

Ramp metering - localized

Ramp metering - demand responsive

Ramp metering - coordinated

Ramp metering - HOV bypass

6. Please identify the costs ($) for these strategies and note which year these represent (e.g., $100,000 $2008).

Ramp metering - localized

Ramp metering - demand responsive

Ramp metering - coordinated

Ramp metering - HOV bypass

7. Please identify the calculated or documented benefit/cost ratio or a range for these strategies.

Ramp metering - localized

Ramp metering - demand responsive

Ramp metering - coordinated

Ramp metering - HOV bypass

11. Advanced Traveler Information Systems

*** 1. Which of the following advanced traveler information systems have been implemented in your metropolitan area?**

	Not Implemented in My Region	Implemented in My Region	Not Implemented, but Planned	Implemented Previously & Future Plans	Technical Documents Are Available
Real-time speed via web/smartphone	☐	☐	☐	☐	☐
Transit vehicle schedule progress	☐	☐	☐	☐	☐
Highway information systems	☐	☐	☐	☐	☐
511 traveler information systems	☐	☐	☐	☐	☐
Website traveler information systems	☐	☐	☐	☐	☐
Travel time message for travelers	☐	☐	☐	☐	☐
Freight shipper congestion information	☐	☐	☐	☐	☐
National traffic and road closure information	☐	☐	☐	☐	☐

Other (please specify)

*** 2. Please rate the success of these strategies at mitigating congestion in your region.**

	Very Unsuccessful	Somewhat Unsuccessful	Average	Somewhat Successful	Very Successful	N/A
Real-time speed via web/smartphone	○	○	○	○	○	○
Transit vehicle schedule progress	○	○	○	○	○	○
Highway information systems	○	○	○	○	○	○
511 traveler information systems	○	○	○	○	○	○
Website traveler information systems	○	○	○	○	○	○
Travel time message for travelers	○	○	○	○	○	○
Freight shipper congestion information	○	○	○	○	○	○
National traffic and road closure information	○	○	○	○	○	○

Other (please specify)

* 3. Please rate the ease of implementation for these strategies.

	Very Difficult	Somewhat Difficult	Neutral	Somewhat Easy	Very Easy	N/A
Real-time speed via web/smartphone	◯	◯	◯	◯	◯	◯
Transit vehicle schedule progress	◯	◯	◯	◯	◯	◯
Highway information systems	◯	◯	◯	◯	◯	◯
511 traveler information systems	◯	◯	◯	◯	◯	◯
Website traveler information systems	◯	◯	◯	◯	◯	◯
Travel time message for travelers	◯	◯	◯	◯	◯	◯
Freight shipper congestion information	◯	◯	◯	◯	◯	◯
National traffic and road closure information	◯	◯	◯	◯	◯	◯

Other (please specify)

4. Please identify barriers encountered for these strategies.

Real-time speed via web/smartphone

Transit vehicle schedule progress

Highway information systems

511 traveler information systems

Website traveler information systems

Travel time message for travelers

Freight shipper congestion information

National traffic and road closure information

5. Please identify the solutions to the barriers encountered for these strategies.

Real-time speed via web/smartphone

Transit vehicle schedule progress

Highway information systems

511 traveler information systems

Website traveler information systems

Travel time message for travelers

Freight shipper congestion information

National traffic and road closure information

6. Please identify the costs ($) for these strategies and note which year these represent (e.g., $100,000 $2008).

Real-time speed via web/smartphone

Transit vehicle schedule progress

Highway information systems

511 traveler information systems

Website traveler information systems

Travel time message for travelers

Freight shipper congestion information

National traffic and road closure information

7. Please identify the calculated or documented benefit/cost ratio or a range for these strategies.

Real-time speed via web/smartphone	
Transit vehicle schedule progress	
Highway information systems	
511 traveler information systems	
Website traveler information systems	
Travel time message for travelers	
Freight shipper congestion information	
National traffic and road closure information	

12. Electronic Toll Collection

*** 1. Has electronic toll collection been implemented in your metropolitan area?**

- ◯ Yes - all toll roads
- ◯ Yes - some toll roads
- ◯ No - not on any toll roads
- ◯ There are no toll roads in my area

13. Active Traffic Management Strategies

*** 1. Which of the following active traffic management strategies have been implemented in your metropolitan area?**

	Not Implemented in My Region	Implemented in My Region	Not Implemented, but Planned	Implemented Previously & Future Plans	Technical Documents Are Available
Speed harmonization	☐	☐	☐	☐	☐
Temporary shoulder use	☐	☐	☐	☐	☐
Queue warning	☐	☐	☐	☐	☐
Dynamic merge control	☐	☐	☐	☐	☐
Construction site management	☐	☐	☐	☐	☐
Dynamic truck restrictions	☐	☐	☐	☐	☐
Dynamic traveler information and rerouting	☐	☐	☐	☐	☐
Automated enforcement	☐	☐	☐	☐	☐

Other (please specify)

*** 2. Please rate the success of these strategies at mitigating congestion in your region.**

	Very Unsuccessful	Somewhat Unsuccessful	Average	Somewhat Successful	Very Successful	N/A
Speed harmonization	○	○	○	○	○	○
Temporary shoulder use	○	○	○	○	○	○
Queue warning	○	○	○	○	○	○
Dynamic merge control	○	○	○	○	○	○
Construction site management	○	○	○	○	○	○
Dynamic truck restrictions	○	○	○	○	○	○
Dynamic traveler information and rerouting	○	○	○	○	○	○
Automated enforcement	○	○	○	○	○	○

Other (please specify)

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*** 3. Please rate the ease of implementation for these strategies.**

	Very Difficult	Somewhat Difficult	Neutral	Somewhat Easy	Very Easy	N/A
Speed harmonization	○	○	○	○	○	○
Temporary shoulder use	○	○	○	○	○	○
Queue warning	○	○	○	○	○	○
Dynamic merge control	○	○	○	○	○	○
Construction site management	○	○	○	○	○	○
Dynamic truck restrictions	○	○	○	○	○	○
Dynamic traveler information and rerouting	○	○	○	○	○	○
Automated enforcement	○	○	○	○	○	○

Other (please specify)

4. Please identify barriers encountered for these strategies.

Speed harmonization

Temporary shoulder use

Queue warning

Dynamic merge control

Construction site management

Dynamic truck restrictions

Dynamic traveler information and rerouting

Automated enforcement

5. Please identify the solutions to the barriers encountered for these strategies.

Speed harmonization

Temporary shoulder use

Queue warning

Dynamic merge control

Construction site management

Dynamic truck restrictions

Dynamic traveler information and rerouting

Automated enforcement

6. Please identify the costs ($) for these strategies and note which year these represent (e.g., $100,000 $2008).

Speed harmonization	
Temporary shoulder use	
Queue warning	
Dynamic merge control	
Construction site management	
Dynamic truck restrictions	
Dynamic traveler information and rerouting	
Automated enforcement	

7. Please identify the calculated or documented benefit/cost ratio or a range for these strategies.

Speed harmonization	
Temporary shoulder use	
Queue warning	
Dynamic merge control	
Construction site management	
Dynamic truck restrictions	
Dynamic traveler information and rerouting	
Automated enforcement	

14. Traffic Signals

*** 1. Which of the following traffic signal strategies have been implemented in your metropolitan area?**

	Not Implemented in My Region	Implemented in My Region	Not Implemented, but Planned	Implemented Previously & Future Plans	Technical Documents Are Available
Retiming	☐	☐	☐	☐	☐
Coordination	☐	☐	☐	☐	☐
Equipment upgrade	☐	☐	☐	☐	☐
Adaptive signal controls/demand responsive	☐	☐	☐	☐	☐

Other (please specify)

*** 2. Please rate the success of these strategies at mitigating congestion in your region.**

	Very Unsuccessful	Somewhat Unsuccessful	Average	Somewhat Successful	Very Successful	N/A
Retiming	○	○	○	○	○	○
Coordination	○	○	○	○	○	○
Equipment upgrade	○	○	○	○	○	○
Adaptive signal controls/demand responsive	○	○	○	○	○	○

Other (please specify)

*** 3. Please rate the ease of implementation for these strategies.**

	Very Difficult	Somewhat Difficult	Neutral	Somewhat Easy	Very Easy	N/A
Retiming	○	○	○	○	○	○
Coordination	○	○	○	○	○	○
Equipment upgrade	○	○	○	○	○	○
Adaptive signal controls/demand responsive	○	○	○	○	○	○

Other (please specify)

4. Please identify barriers encountered for these strategies.

Retiming

Coordination

Equipment upgrade

Adaptive signal controls/demand responsive

5. Please identify the solutions to the barriers encountered for these strategies.

Retiming

Coordination

Equipment upgrade

Adaptive signal controls/demand responsive

6. Please identify the costs ($) for these strategies and note which year these represent (e.g., $100,000 $2008).

Retiming

Coordination

Equipment upgrade

Adaptive signal controls/demand responsive

7. Please identify the calculated or documented benefit/cost ratio or a range for these strategies.

Retiming

Coordination

Equipment upgrade

Adaptive signal controls/demand responsive

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15. Dynamic Lanes

*** 1. Has any agency in your metropolitan area implemented reversible lanes/changeable lane assignments on a routine basis?**

- Yes
- No

*** 2. Are reversible lanes/changeable lane assignments used for special events in your metropolitan area?**

- Yes
- No

*** 3. Please rate the success of these strategies at mitigating congestion in your region.**

	Very Unsuccessful	Somewhat Unsuccessful	Average	Somewhat Successful	Very Successful	N/A
Reversible lanes/changeable lane assignments						

*** 4. Please rate the ease of implementation for these strategies.**

	Very Unsuccessful	Somewhat Unsuccessful	Average	Somewhat Successful	Very Successful	N/A
Reversible lanes/changeable lane assignments						

5. Please identify barriers encountered for these strategies.

6. Please identify the solutions to the barriers encountered for these strategies.

7. Please identify the costs ($) for these strategies and note which year these represent (e.g., $100,000 $2008).

8. Please identify the calculated or documented benefit/cost ratio or a range for these strategies.

16. Road Weather Management Systems

1. What is your region's experience with road weather management systems?

	Not Implemented in My Region	Implemented in My Region	Not Implemented, but Planned	Implemented Previously & Future Plans	Technical Documents Are Available
Road weather management systems	☐	☐	☐	☐	☐

* **2. Please rate the success of these strategies at mitigating congestion in your region.**

	Very Unsuccessful	Somewhat Unsuccessful	Average	Somewhat Successful	Very Successful	N/A
Road weather management systems	○	○	○	○	○	○

* **3. Please rate the ease of implementation for these strategies.**

	Very Difficult	Somewhat Difficult	Neutral	Somewhat Easy	Very Easy	N/A
Road weather management systems	○	○	○	○	○	○

4. Please identify barriers encountered for these strategies.

5. Please identify the solutions to the barriers encountered for these strategies.

6. Please identify the costs ($) for these strategies and note which year these represent (e.g., $100,000 $2008).

7. Please identify the calculated or documented benefit/cost ratio or a range for these strategies.

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17. HOV Lanes - Part 1

*** 1. Which of the following high occupancy vehicle (HOV) lane strategies have been implemented on FREEWAYS in your metropolitan area?**

- [ ] Separate right-of-way
- [ ] Concurrent flow - Barrier separated
- [ ] Concurrent flow - Buffer separated
- [ ] Contraflow - Barrier separated
- [ ] Contraflow - Buffer separated
- [ ] None of the above

*** 2. Please rate the success of these strategies at mitigating congestion in your region.**

	Very Unsuccessful	Somewhat Unsuccessful	Average	Somewhat Successful	Very Successful	N/A
Separate right-of-way	○	○	○	○	○	○
Concurrent flow - Barrier separated	○	○	○	○	○	○
Concurrent flow - Buffer separated	○	○	○	○	○	○
Contraflow - Barrier separated	○	○	○	○	○	○
Contraflow - Buffer separated	○	○	○	○	○	○

*** 3. Please rate the ease of implementation for these strategies.**

	Very Difficult	Somewhat Difficult	Neutral	Somewhat Easy	Very Easy	N/A
Separate right-of-way	○	○	○	○	○	○
Concurrent flow - Barrier separated	○	○	○	○	○	○
Concurrent flow - Buffer separated	○	○	○	○	○	○
Contraflow - Barrier separated	○	○	○	○	○	○
Contraflow - Buffer separated	○	○	○	○	○	○

4. Please identify barriers encountered for these strategies.

5. Please identify the solutions to the barriers encountered for these strategies.

6. Please identify the costs ($) for these strategies and note which year these represent (e.g., $100,000 $2008).

7. Please identify the calculated or documented benefit/cost ratio or a range for these strategies.

18. HOV Lanes - Part 2

*** 1. Which of the following HOV lane strategies have been implemented on ARTERIAL streets in your metropolitan area?**

- ☐ Concurrent flow
- ☐ Contraflow
- ☐ Reversible
- ☐ Median lane
- ☐ None of the above

*** 2. Please rate the success of these strategies at mitigating congestion in your region.**

	Very Unsuccessful	Somewhat Unsuccessful	Average	Somewhat Successful	Very Successful	N/A
Concurrent flow	○	○	○	○	○	○
Contraflow	○	○	○	○	○	○
Reversible	○	○	○	○	○	○
Median lane	○	○	○	○	○	○

*** 3. Please rate the ease of implementation for these strategies.**

	Very Difficult	Somewhat Difficult	Neutral	Somewhat Easy	Very Easy	N/A
Concurrent flow	○	○	○	○	○	○
Contraflow	○	○	○	○	○	○
Reversible	○	○	○	○	○	○
Median lane	○	○	○	○	○	○

4. Please identify barriers encountered for these strategies.

5
6

5. Please identify the solutions to the barriers encountered for these strategies.

5
6

6. Please identify the costs ($) for these strategies and note which year these represent (e.g., $100,000 $2008).

7. Please identify the calculated or documented benefit/cost ratio or a range for these strategies.

19. HOV Lanes - Part 3

*** 1. Which of the following HOV-related improvements have been implemented in your metropolitan area?**

	Not Implemented in My Region	Implemented in My Region	Not Implemented, but Planned	Implemented Previously & Future Plans	Technical Documents Are Available
Park and ride lot integration	☐	☐	☐	☐	☐
Rideshare matching services	☐	☐	☐	☐	☐
Ramps	☐	☐	☐	☐	☐
Ramp by-pass	☐	☐	☐	☐	☐
Publicity/outreach	☐	☐	☐	☐	☐
Park and ride facilities	☐	☐	☐	☐	☐
Casual carpool facilities	☐	☐	☐	☐	☐
HOV toll discounts	☐	☐	☐	☐	☐

Other (please specify)

*** 2. Please rate the success of these strategies at mitigating congestion in your region.**

	Very Unsuccessful	Somewhat Unsuccessful	Average	Somewhat Successful	Very Successful	N/A
Park and ride lot integration	○	○	○	○	○	○
Rideshare matching services	○	○	○	○	○	○
Ramps	○	○	○	○	○	○
Ramp by-pass	○	○	○	○	○	○
Publicity/outreach	○	○	○	○	○	○
Park and ride facilities	○	○	○	○	○	○
Casual carpool facilities	○	○	○	○	○	○
HOV toll discounts	○	○	○	○	○	○

*** 3. Please rate the ease of implementation for these strategies.**

	Very Difficult	Somewhat Difficult	Neutral	Somewhat Easy	Very Easy	N/A
Park and ride lot integration	○	○	○	○	○	○
Rideshare matching services	○	○	○	○	○	○
Ramps	○	○	○	○	○	○
Ramp by-pass	○	○	○	○	○	○
Publicity/outreach	○	○	○	○	○	○
Park and ride facilities	○	○	○	○	○	○
Casual carpool facilities	○	○	○	○	○	○
HOV toll discounts	○	○	○	○	○	○

4. Please identify barriers encountered for these strategies.

5. Please identify the solutions to the barriers encountered for these strategies.

6. Please identify the costs ($) for these strategies and note which year these represent (e.g., $100,000 $2008).

7. Please identify the calculated or documented benefit/cost ratio or a range for these strategies.

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20. Other Exclusive Lanes

* **1. Which of the following special lane designations exist in your metropolitan area?**

- ☐ Bus lanes
- ☐ Truck lanes
- ☐ None of the above

2. Please identify barriers encountered for these strategies.

3. Please identify the solutions to the barriers encountered for these strategies.

4. Please identify the costs ($) for these strategies and note which year these represent (e.g., $100,000 $2008).

5. Please identify the calculated or documented benefit/cost ratio or a range for these strategies.

21. Incident Management

* 1. My region applies incident management techniques to:

- ◯ Highways/freeways only
- ◯ Arterials only
- ◯ Highways/freeways and arterials
- ◯ None of the above

* 2. Which of the following incident management strategies have been implemented in your metropolitan area?

	Not Implemented in My Region	Implemented in My Region	Not Implemented, but Planned	Implemented Previously & Future Plans	Technical Documents Are Available
Camera monitoring	☐	☐	☐	☐	☐
Raodway detectors/surveillance	☐	☐	☐	☐	☐
Traffic/courtesy patrols	☐	☐	☐	☐	☐
Response teams	☐	☐	☐	☐	☐
Responder vehicle priority	☐	☐	☐	☐	☐
Alternative route planning	☐	☐	☐	☐	☐
Variable message signs	☐	☐	☐	☐	☐
Advisory radio	☐	☐	☐	☐	☐

Other (please specify)

* 3. Please rate the success of these strategies at mitigating congestion in your region.

	Very Unsuccessful	Somewhat Unsuccessful	Average	Somewhat Successful	Very Successful	N/A
Camera monitoring	◯	◯	◯	◯	◯	◯
Raodway detectors/surveillance	◯	◯	◯	◯	◯	◯
Traffic/courtesy patrols	◯	◯	◯	◯	◯	◯
Response teams	◯	◯	◯	◯	◯	◯
Responder vehicle priority	◯	◯	◯	◯	◯	◯
Alternative route planning	◯	◯	◯	◯	◯	◯
Variable message signs	◯	◯	◯	◯	◯	◯
Advisory radio	◯	◯	◯	◯	◯	◯

Other (please specify)

*** 4. Please rate the ease of implementation for these strategies.**

	Very Difficult	Somewhat Difficult	Neutral	Somewhat Easy	Very Easy	N/A
Camera monitoring	○	○	○	○	○	○
Raodway detectors/surveillance	○	○	○	○	○	○
Traffic/courtesy patrols	○	○	○	○	○	○
Response teams	○	○	○	○	○	○
Responder vehicle priority	○	○	○	○	○	○
Alternative route planning	○	○	○	○	○	○
Variable message signs	○	○	○	○	○	○
Advisory radio	○	○	○	○	○	○

Other (please specify)

5. Please identify barriers encountered for these strategies.

Camera monitoring

Raodway detectors/surveillance

Traffic/courtesy patrols

Response teams

Responder vehicle priority

Alternative route planning

Variable message signs

Advisory radio

6. Please identify the solutions to the barriers encountered for these strategies.

Camera monitoring

Raodway detectors/surveillance

Traffic/courtesy patrols

Response teams

Responder vehicle priority

Alternative route planning

Variable message signs

Advisory radio

7. Please identify the costs ($) for these strategies and note which year these represent (e.g., $100,000 $2008).

Camera monitoring

Raodway detectors/surveillance

Traffic/courtesy patrols

Response teams

Responder vehicle priority

Alternative route planning

Variable message signs

Advisory radio

8. Please identify the calculated or documented benefit/cost ratio or a range for these strategies.

Camera monitoring

Raodway detectors/surveillance

Traffic/courtesy patrols

Response teams

Responder vehicle priority

Alternative route planning

Variable message signs

Advisory radio

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22. Transit

* **1. Which of the following transit capital improvements have been made in your metropolitan area?**

- [ ] Fleet expansion
- [ ] Vehicle replacement/upgrade
- [ ] Change vehicle types
- [ ] Vehicle management systems
- [ ] None of the above

2. Please describe the barriers faced with implementation of these capital improvements and the solutions that overcame those barriers.

3. Please provide descriptions and related costs of the transit capital improvements noted in the previous question that were made in the past five years.

* **4. Which of the following transit support facilities have been built in your metropolitan area?**

- [ ] Park and ride lots
- [ ] Transit centers
- [ ] Improved station amenities
- [ ] None of the above

5. Please describe the barriers faced with implementation of these support facilities and the solutions that overcame those barriers.

6. Please provide descriptions and related costs of the transit support facilities noted in the previous question that were made in the past five years.

* **7. Which of the following transit exclusive right-of-way improvements/acquistions have been made in your metropolitan area?**

- ☐ Heavy rail
- ☐ Commuter rail
- ☐ Light rail
- ☐ Bus rapid transit/busway
- ☐ Bus lanes
- ☐ Bus bypass ramps
- ☐ None of the above

8. Please describe the barriers faced with implementation of these exclusive right-of-way facilities and the solutions that overcame those barriers.

9. Please provide descriptions and related costs of these exclusive right-of-way facilities noted in the previous question that were made in the past five years.

*** 10. Which of the following transit operational improvements have been implemented in your metropolitan area?**

- [ ] Increased frequency (decreased headways)
- [ ] Additional stops
- [ ] Modify operating hours
- [ ] Schedule coordination
- [ ] Improved transfers
- [ ] Route modifications
- [ ] Route expansions
- [ ] Express routes
- [ ] Activity center circulator buses
- [ ] Paratransit
- [ ] Neighborhood circulator buses
- [ ] Signal priorities for transit vehicles
- [ ] Signal coordination for transit vehicles
- [ ] Bus turnouts
- [ ] Rail crossing coordination
- [ ] HOV signal priority
- [ ] None of the above

11. Please describe the barriers faced with implementation of these transit operational improvements and the solutions that overcame those barriers.

12. Please provide descriptions and related costs of these transit operational improvements noted in the previous question that were made in the past five years.

* 13. **Which of the following transit policy strategies have been implemented in your metropolitan area?**

- [ ] Marketing
- [ ] Agency coordination
- [ ] Real-time traveler information systems
- [ ] Fare reduction incentives
- [ ] Fare package incentives
- [ ] Employer-paid transit passes
- [ ] None of the above

14. Please describe the barriers faced with implementation of these transit policy strategies and the solutions that overcame those barriers.

5
6

15. Please provide descriptions and related costs of these transit policy strategies noted in the previous question that were made in the past five years.

5
6

* **16. Please list and describe any multimodal transportation centers that have been built in your metropolitan area.**

5
6

* **17. Please list and describe any freight rail improvements that have been implemented in your metropolitan area.**

5
6

*** 18. Which of the following design guidelines have been implemented in your metropolitan area?**

- [ ] Maximum block lengths
- [ ] Building setbacks
- [ ] Streetscape enhancements
- [ ] Sidewalk widths
- [ ] There are others (please list in the following question)
- [ ] None of the above

Other (please specify)

23. Bicycle/Pedestrian

*** 1. Which of the following bicycle/pedestrian improvements have been implemented in your metropolitan area?**

	Not Implemented in My Region	Implemented in My Region	Not Implemented, but Planned	Implemented Previously & Future Plans	Technical Documents Are Available
Designated bike lanes by restriping existing roadways	☐	☐	☐	☐	☐
Designated bike lanes using separate paths	☐	☐	☐	☐	☐
Improved facilities (e.g. lighting, signing, etc)	☐	☐	☐	☐	☐
New sidewalks	☐	☐	☐	☐	☐
Wider sidewalks	☐	☐	☐	☐	☐
Rails to trails developments	☐	☐	☐	☐	☐

*** 2. Please rate the success of these strategies at mitigating congestion in your region.**

	Very Unsuccessful	Somewhat Unsuccessful	Average	Somewhat Successful	Very Successful	N/A
Designated bike lanes by restriping existing roadways	○	○	○	○	○	○
Designated bike lanes using separate paths	○	○	○	○	○	○
Improved facilities (e.g. lighting, signing, etc)	○	○	○	○	○	○
New sidewalks	○	○	○	○	○	○
Wider sidewalks	○	○	○	○	○	○
Rails to trails developments	○	○	○	○	○	○

*** 3. Please rate the ease of implementation for these strategies.**

	Very Difficult	Somewhat Difficult	Neutral	Somewhat Easy	Very Easy	N/A
Designated bike lanes by restriping existing roadways	○	○	○	○	○	○
Designated bike lanes using separate paths	○	○	○	○	○	○
Improved facilities (e.g. lighting, signing, etc)	○	○	○	○	○	○
New sidewalks	○	○	○	○	○	○
Wider sidewalks	○	○	○	○	○	○
Rails to trails developments	○	○	○	○	○	○

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4. Please identify barriers encountered for these strategies.

Designated bike lanes by restriping existing roadways

Designated bike lanes using separate paths

Improved facilities (e.g. lighting, signing, etc)

New sidewalks

Wider sidewalks

Rails to trails developments

5. Please identify the solutions to the barriers encountered for these strategies.

Designated bike lanes by restriping existing roadways

Designated bike lanes using separate paths

Improved facilities (e.g. lighting, signing, etc)

New sidewalks

Wider sidewalks

Rails to trails developments

6. Please identify the costs ($) for these strategies and note which year these represent (e.g., $100,000 $2008).

Designated bike lanes by restriping existing roadways

Designated bike lanes using separate paths

Improved facilities (e.g. lighting, signing, etc)

New sidewalks

Wider sidewalks

Rails to trails developments

7. Please identify the calculated or documented benefit/cost ratio or a range for these strategies.

Designated bike lanes by restriping existing roadways

Designated bike lanes using separate paths

Improved facilities (e.g. lighting, signing, etc)

New sidewalks

Wider sidewalks

Rails to trails developments

*** 8. Which of the following bicycle/pedestrian support services have been implemented in your metropolitan area?**

	Not Implemented in My Region	Implemented in My Region	Not Implemented, but Planned	Implemented Previously & Future Plans	Technical Documents Are Available
Bike racks at transit stations	☐	☐	☐	☐	☐
Bike racks on transit vehicles	☐	☐	☐	☐	☐
Bike racks at destinations	☐	☐	☐	☐	☐
Lockers at transit stations	☐	☐	☐	☐	☐
Lockers at destinations	☐	☐	☐	☐	☐
Shower facilities at transit stations	☐	☐	☐	☐	☐
Shower facilities at destinations	☐	☐	☐	☐	☐
Route maps	☐	☐	☐	☐	☐
Bike sharing	☐	☐	☐	☐	☐
Coordinators	☐	☐	☐	☐	☐
Supporting ordinances	☐	☐	☐	☐	☐
Promotional campaigns	☐	☐	☐	☐	☐
Promotional campaigns via media	☐	☐	☐	☐	☐
Educational outreach	☐	☐	☐	☐	☐

* 9. Please rate the success of these strategies at mitigating congestion in your region.

	Very Unsuccessful	Somewhat Unsuccessful	Average	Somewhat Successful	Very Successful	N/A
Bike racks at transit stations	◯	◯	◯	◯	◯	◯
Bike racks on transit vehicles	◯	◯	◯	◯	◯	◯
Bike racks at destinations	◯	◯	◯	◯	◯	◯
Lockers at transit stations	◯	◯	◯	◯	◯	◯
Lockers at destinations	◯	◯	◯	◯	◯	◯
Shower facilities at transit stations	◯	◯	◯	◯	◯	◯
Shower facilities at destinations	◯	◯	◯	◯	◯	◯
Route maps	◯	◯	◯	◯	◯	◯
Bike sharing	◯	◯	◯	◯	◯	◯
Coordinators	◯	◯	◯	◯	◯	◯
Supporting ordinances	◯	◯	◯	◯	◯	◯
Promotional campaigns	◯	◯	◯	◯	◯	◯
Promotional campaigns via media	◯	◯	◯	◯	◯	◯
Educational outreach	◯	◯	◯	◯	◯	◯

* 10. Please rate the ease of implementation for these strategies.

	Very Difficult	Somewhat Difficult	Neutral	Somewhat Easy	Very Easy	N/A
Bike racks at transit stations	◯	◯	◯	◯	◯	◯
Bike racks on transit vehicles	◯	◯	◯	◯	◯	◯
Bike racks at destinations	◯	◯	◯	◯	◯	◯
Lockers at transit stations	◯	◯	◯	◯	◯	◯
Lockers at destinations	◯	◯	◯	◯	◯	◯
Shower facilities at transit stations	◯	◯	◯	◯	◯	◯
Shower facilities at destinations	◯	◯	◯	◯	◯	◯
Route maps	◯	◯	◯	◯	◯	◯
Bike sharing	◯	◯	◯	◯	◯	◯
Coordinators	◯	◯	◯	◯	◯	◯
Supporting ordinances	◯	◯	◯	◯	◯	◯
Promotional campaigns	◯	◯	◯	◯	◯	◯
Promotional campaigns via media	◯	◯	◯	◯	◯	◯
Educational outreach	◯	◯	◯	◯	◯	◯

11. Please identify barriers encountered for these strategies.

Bike racks at transit stations

Bike racks on transit vehicles

Bike racks at destinations

Lockers at transit stations

Lockers at destinations

Shower facilities at transit stations

Shower facilities at destinations

Route maps

Bike sharing

Coordinators

Supporting ordinances

Promotional campaigns

Promotional campaigns via media

Educational outreach

12. Please identify the solutions to the barriers encountered for these strategies.

Bike racks at transit stations

Bike racks on transit vehicles

Bike racks at destinations

Lockers at transit stations

Lockers at destinations

Shower facilities at transit stations

Shower facilities at destinations

Route maps

Bike sharing

Coordinators

Supporting ordinances

Promotional campaigns

Promotional campaigns via media

Educational outreach

13. Please identify the costs ($) for these strategies and note which year these represent (e.g., $100,000 $2008).

Bike racks at transit stations	
Bike racks on transit vehicles	
Bike racks at destinations	
Lockers at transit stations	
Lockers at destinations	
Shower facilities at transit stations	
Shower facilities at destinations	
Route maps	
Bike sharing	
Coordinators	
Supporting ordinances	
Promotional campaigns	
Promotional campaigns via media	
Educational outreach	

14. Please identify the calculated or documented benefit/cost ratio or a range for these strategies.

Bike racks at transit stations	
Bike racks on transit vehicles	
Bike racks at destinations	
Lockers at transit stations	
Lockers at destinations	
Shower facilities at transit stations	
Shower facilities at destinations	
Route maps	
Bike sharing	
Coordinators	
Supporting ordinances	
Promotional campaigns	
Promotional campaigns via media	
Educational outreach	

24. Construction and Maintenance Interference Reductions

*** 1. Which of the following contracting strategies have been utilized in your metropolitan area?**

	Not Implemented in My Region	Implemented in My Region	Not Implemented, but Planned	Implemented Previously & Future Plans
Allowable working days and working hours	☐	☐	☐	☐
Financial incentives/disincentives for high-priority projects	☐	☐	☐	☐
A+B bidding	☐	☐	☐	☐
Lane rentals	☐	☐	☐	☐

Other (please specify)

*** 2. Please rate the success of these strategies at mitigating congestion in your region.**

	Very Unsuccessful	Somewhat Unsuccessful	Average	Somewhat Successful	Very Successful	N/A
Allowable working days and working hours	○	○	○	○	○	○
Financial incentives/disincentives for high-priority projects	○	○	○	○	○	○
A+B bidding	○	○	○	○	○	○
Lane rentals	○	○	○	○	○	○

Other (please specify)

*** 3. Please rate the ease of implementation for these strategies.**

	Very Difficult	Somewhat Difficult	Neutral	Somewhat Easy	Very Easy	N/A
Allowable working days and working hours	○	○	○	○	○	○
Financial incentives/disincentives for high-priority projects	○	○	○	○	○	○
A+B bidding	○	○	○	○	○	○
Lane rentals	○	○	○	○	○	○

Other (please specify)

4. Please identify barriers encountered for these strategies.

Allowable working days and working hours	
Financial incentives/disincentives for high-priority projects	
A+B bidding	
Lane rentals	

5. Please identify the solutions to the barriers encountered for these strategies.

Allowable working days and working hours	
Financial incentives/disincentives for high-priority projects	
A+B bidding	
Lane rentals	

* 6. Which of the following strategies have been utilitzed in your metropolitan area?

	Not Implemented in My Region	Implemented in My Region	Not Implemented, but Planned	Implemented Previously & Future Plans
Work zone management				
Warranty contracting				
Advance information				
Trailblazing/detours				
Management plans				
Design-build				
Job order (on-call) contracting				

* 7. Please rate the success of these strategies at mitigating congestion in your region.

	Very Unsuccessful	Somewhat Unsuccessful	Average	Somewhat Successful	Very Successful	N/A
Work zone management						
Warranty contracting						
Advance information						
Trailblazing/detours						
Management plans						
Design-build						
Job order (on-call) contracting						

*** 8. Please rate the ease of implementation for these strategies.**

	Very Difficult	Somewhat Difficult	Neutral	Somewhat Easy	Very Easy	N/A
Work zone management						
Warranty contracting						
Advance information						
Trailblazing/detours						
Management plans						
Design-build						
Job order (on-call) contracting						

9. Please identify barriers encountered for these strategies.

Work zone management

Warranty contracting

Advance information

Trailblazing/detours

Management plans

Design-build

Job order (on-call) contracting

10. Please identify the solutions to the barriers encountered for these strategies.

Work zone management

Warranty contracting

Advance information

Trailblazing/detours

Management plans

Design-build

Job order (on-call) contracting

25. Work Schedule Changes

*** 1. Which of the following work schedule changes have been implemented in your metropolitan area?**

	Not Implemented in My Region	Implemented in My Region	Not Implemented, but Planned	Implemented Previously & Future Plans	Technical Documents Are Available
Flextime	☐	☐	☐	☐	☐
Compressed work week	☐	☐	☐	☐	☐
Staggered work hours	☐	☐	☐	☐	☐
Telecommuting	☐	☐	☐	☐	☐

Other (please specify)

*** 2. Please rate the success of these strategies at mitigating congestion in your region.**

	Very Unsuccessful	Somewhat Unsuccessful	Average	Somewhat Successful	Very Successful	N/A
Flextime	○	○	○	○	○	○
Compressed work week	○	○	○	○	○	○
Staggered work hours	○	○	○	○	○	○
Telecommuting	○	○	○	○	○	○

Other (please specify)

*** 3. Please rate the ease of implementation for these strategies.**

	Very Difficult	Somewhat Difficult	Neutral	Somewhat Easy	Very Easy	N/A
Flextime	○	○	○	○	○	○
Compressed work week	○	○	○	○	○	○
Staggered work hours	○	○	○	○	○	○
Telecommuting	○	○	○	○	○	○

Other (please specify)

4. Please identify barriers encountered for these strategies.

Flextime

Compressed work week

Staggered work hours

Telecommuting

5. Please identify the solutions to the barriers encountered for these strategies.

Flextime

Compressed work week

Staggered work hours

Telecommuting

6. Please identify the costs ($) for these strategies and note which year these represent (e.g., $100,000 $2008).

Flextime

Compressed work week

Staggered work hours

Telecommuting

7. Please identify the calculated or documented benefit/cost ratio or a range for these strategies.

Flextime

Compressed work week

Staggered work hours

Telecommuting

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26. Land-use Development

*** 1. Which of the following land use development strategies have been implemented in your metropolitan area?**

	Not Implemented in My Region	Implemented in My Region	Not Implemented, but Planned	Implemented Previously & Future Plans	Technical Documents Are Available
Mixed-use developments	☐	☐	☐	☐	☐
Infill and densification	☐	☐	☐	☐	☐
Transit-oriented developments	☐	☐	☐	☐	☐

Other (please specify)

*** 2. Please rate the success of these strategies at mitigating congestion in your region.**

	Very Unsuccessful	Somewhat Unsuccessful	Average	Somewhat Successful	Very Successful	N/A
Mixed-use developments	○	○	○	○	○	○
Infill and densification	○	○	○	○	○	○
Transit-oriented developments	○	○	○	○	○	○

Other (please specify)

*** 3. Please rate the ease of implementation for these strategies.**

	Very Difficult	Somewhat Difficult	Neutral	Somewhat Easy	Very Easy	N/A
Mixed-use developments	○	○	○	○	○	○
Infill and densification	○	○	○	○	○	○
Transit-oriented developments	○	○	○	○	○	○

Other (please specify)

4. Please identify barriers encountered for these strategies.

Mixed-use developments

Infill and densification

Transit-oriented developments

5. Please identify the solutions to the barriers encountered for these strategies.

Mixed-use developments

Infill and densification

Transit-oriented developments

6. Please identify the costs ($) for these strategies and note which year these represent (e.g., $100,000 $2008).

Mixed-use developments

Infill and densification

Transit-oriented developments

7. Please identify the calculated or documented benefit/cost ratio or a range for these strategies.

Mixed-use developments

Infill and densification

Transit-oriented developments

27. Ridesharing and Vanpools

*** 1. Which of the following ridesharing/vanpool strategies have been implemented in your metropolitan area?**

	Not Implemented in My Region	Implemented in My Region	Not Implemented, but Planned	Implemented Previously & Future Plans	Technical Documents Are Available
HOV parking discount incentives	☐	☐	☐	☐	☐
Subsidized service incentives	☐	☐	☐	☐	☐
Marketing and promotions	☐	☐	☐	☐	☐
Ridematching services	☐	☐	☐	☐	☐
Guaranteed ride home	☐	☐	☐	☐	☐

Other (please specify)

*** 2. Please rate the success of these strategies at mitigating congestion in your region.**

	Very Unsuccessful	Somewhat Unsuccessful	Average	Somewhat Successful	Very Successful	N/A
HOV parking discount incentives	○	○	○	○	○	○
Subsidized service incentives	○	○	○	○	○	○
Marketing and promotions	○	○	○	○	○	○
Ridematching services	○	○	○	○	○	○
Guaranteed ride home	○	○	○	○	○	○

Other (please specify)

*** 3. Please rate the ease of implementation for these strategies.**

	Very Difficult	Somewhat Difficult	Neutral	Somewhat Easy	Very Easy	N/A
HOV parking discount incentives	○	○	○	○	○	○
Subsidized service incentives	○	○	○	○	○	○
Marketing and promotions	○	○	○	○	○	○
Ridematching services	○	○	○	○	○	○
Guaranteed ride home	○	○	○	○	○	○

Other (please specify)

4. Please identify barriers encountered for these strategies.

HOV parking discount incentives

Subsidized service incentives

Marketing and promotions

Ridematching services

Guaranteed ride home

5. Please identify the solutions to the barriers encountered for these strategies.

HOV parking discount incentives

Subsidized service incentives

Marketing and promotions

Ridematching services

Guaranteed ride home

6. Please identify the costs ($) for these strategies and note which year these represent (e.g., $100,000 $2008).

HOV parking discount incentives

Subsidized service incentives

Marketing and promotions

Ridematching services

Guaranteed ride home

7. Please identify the calculated or documented benefit/cost ratio or a range for these strategies.

HOV parking discount incentives

Subsidized service incentives

Marketing and promotions

Ridematching services

Guaranteed ride home

28. Parking Management

*** 1. Which of the following parking management strategies have been implemented in your metropolitan area?**

	Not Implemented in My Region	Implemented in My Region	Not Implemented, but Planned	Implemented Previously & Future Plans	Technical Documents Are Available
On-street parking and standing restrictions	☐	☐	☐	☐	☐
Peak-period prohibitions to free lane capacity	☐	☐	☐	☐	☐
Employer/landlord parking agreements	☐	☐	☐	☐	☐
Increased parking fees	☐	☐	☐	☐	☐
Preferential HOV/carpool/vanpool parking	☐	☐	☐	☐	☐
Discounted HOV/carpool/vanpool parking	☐	☐	☐	☐	☐
Location specific parking ordinances	☐	☐	☐	☐	☐

Other (please specify)

*** 2. Please rate the success of these strategies at mitigating congestion in your region.**

	Very Unsuccessful	Somewhat Unsuccessful	Average	Somewhat Successful	Very Successful	N/A
On-street parking and standing restrictions	○	○	○	○	○	○
Peak-period prohibitions to free lane capacity	○	○	○	○	○	○
Employer/landlord parking agreements	○	○	○	○	○	○
Increased parking fees	○	○	○	○	○	○
Preferential HOV/carpool/vanpool parking	○	○	○	○	○	○
Discounted HOV/carpool/vanpool parking	○	○	○	○	○	○
Location specific parking ordinances	○	○	○	○	○	○

Other (please specify)

* 3. Please rate the ease of implementation for these strategies.

	Very Difficult	Somewhat Difficult	Neutral	Somewhat Easy	Very Easy	N/A
On-street parking and standing restrictions	◯	◯	◯	◯	◯	◯
Peak-period prohibitions to free lane capacity	◯	◯	◯	◯	◯	◯
Employer/landlord parking agreements	◯	◯	◯	◯	◯	◯
Increased parking fees	◯	◯	◯	◯	◯	◯
Preferential HOV/carpool/vanpool parking	◯	◯	◯	◯	◯	◯
Discounted HOV/carpool/vanpool parking	◯	◯	◯	◯	◯	◯
Location specific parking ordinances	◯	◯	◯	◯	◯	◯

Other (please specify)

4. Please identify barriers encountered for these strategies.

On-street parking and standing restrictions

Peak-period prohibitions to free lane capacity

Employer/landlord parking agreements

Increased parking fees

Preferential HOV/carpool/vanpool parking

Discounted HOV/carpool/vanpool parking

Location specific parking ordinances

5. Please identify the solutions to the barriers encountered for these strategies.

On-street parking and standing restrictions

Peak-period prohibitions to free lane capacity

Employer/landlord parking agreements

Increased parking fees

Preferential HOV/carpool/vanpool parking

Discounted HOV/carpool/vanpool parking

Location specific parking ordinances

6. Please identify the costs ($) for these strategies and note which year these represent (e.g., $100,000 $2008).

On-street parking and standing restrictions

Peak-period prohibitions to free lane capacity

Employer/landlord parking agreements

Increased parking fees

Preferential HOV/carpool/vanpool parking

Discounted HOV/carpool/vanpool parking

Location specific parking ordinances

7. Please identify the calculated or documented benefit/cost ratio or a range for these strategies.

On-street parking and standing restrictions

Peak-period prohibitions to free lane capacity

Employer/landlord parking agreements

Increased parking fees

Preferential HOV/carpool/vanpool parking

Discounted HOV/carpool/vanpool parking

Location specific parking ordinances

29. Diversified Development Patterns and Community Design

*** 1. Which of the following new community design (smart growth) strategies have been implemented in your metropolitan area?**

	Not Implemented in My Region	Implemented in My Region	Not Implemented, but Planned	Implemented Previously & Future Plans	Technical Documents Are Available
Density standards	☐	☐	☐	☐	☐
Site reclamation and reuse	☐	☐	☐	☐	☐
Incentives to develop in areas with existing infrastructure	☐	☐	☐	☐	☐
Mixed use zoning regulations	☐	☐	☐	☐	☐
Jobs/housing development zoning requlations	☐	☐	☐	☐	☐
Transit oriented development density standards	☐	☐	☐	☐	☐
Transit oriented development design requirements	☐	☐	☐	☐	☐
Transit oriented development bicycle/pedestrian access	☐	☐	☐	☐	☐
Intergovernmental agreements for corridor land use and transportation coordination	☐	☐	☐	☐	☐

Other (please specify)

*** 2. Please rate the success of these strategies at mitigating congestion in your region.**

	Very Unsuccessful	Somewhat Unsuccessful	Average	Somewhat Successful	Very Successful	N/A
Density standards	○	○	○	○	○	○
Site reclamation and reuse	○	○	○	○	○	○
Incentives to develop in areas with existing infrastructure	○	○	○	○	○	○
Mixed use zoning regulations	○	○	○	○	○	○
Jobs/housing development zoning requlations	○	○	○	○	○	○
Transit oriented development density standards	○	○	○	○	○	○
Transit oriented development design requirements	○	○	○	○	○	○
Transit oriented development bicycle/pedestrian access	○	○	○	○	○	○
Intergovernmental agreements for corridor land use and transportation coordination	○	○	○	○	○	○

Other (please specify)

MDOT Congestion Management Survey

*** 3. Please rate the ease of implementation for these strategies.**

	Very Difficult	Somewhat Difficult	Neutral	Somewhat Easy	Very Easy	N/A
Density standards	◯	◯	◯	◯	◯	◯
Site reclamation and reuse	◯	◯	◯	◯	◯	◯
Incentives to develop in areas with existing infrastructure	◯	◯	◯	◯	◯	◯
Mixed use zoning regulations	◯	◯	◯	◯	◯	◯
Jobs/housing development zoning requlations	◯	◯	◯	◯	◯	◯
Transit oriented development density standards	◯	◯	◯	◯	◯	◯
Transit oriented development design requirements	◯	◯	◯	◯	◯	◯
Transit oriented development bicycle/pedestrian access	◯	◯	◯	◯	◯	◯
Intergovernmental agreements for corridor land use and transportation coordination	◯	◯	◯	◯	◯	◯

Other (please specify)

4. Please identify barriers encountered for these strategies.

Density standards

Site reclamation and reuse

Incentives to develop in areas with existing infrastructure

Mixed use zoning regulations

Jobs/housing development zoning requlations

Transit oriented development density standards

Transit oriented development design requirements

Transit oriented development bicycle/pedestrian access

Intergovernmental agreements for corridor land use and transportation coordination

5. Please identify the solutions to the barriers encountered for these strategies.

Density standards

Site reclamation and reuse

Incentives to develop in areas with existing infrastructure

Mixed use zoning regulations

Jobs/housing development zoning requlations

Transit oriented development density standards

Transit oriented development design requirements

Transit oriented development bicycle/pedestrian access

Intergovernmental agreements for corridor land use and transportation coordination

6. Please identify the costs ($) for these strategies and note which year these represent (e.g., $100,000 $2008).

Density standards

Site reclamation and reuse

Incentives to develop in areas with existing infrastructure

Mixed use zoning regulations

Jobs/housing development zoning requlations

Transit oriented development density standards

Transit oriented development design requirements

Transit oriented development bicycle/pedestrian access

Intergovernmental agreements for corridor land use and transportation coordination

7. Please identify the calculated or documented benefit/cost ratio or a range for these strategies.

Density standards

Site reclamation and reuse

Incentives to develop in areas with existing infrastructure

Mixed use zoning regulations

Jobs/housing development zoning requlations

Transit oriented development density standards

Transit oriented development design requirements

Transit oriented development bicycle/pedestrian access

Intergovernmental agreements for corridor land use and transportation coordination

30. Car Sharing

*** 1. Have any car sharing programs been implemented in your metropolitan area?**

	Not Implemented in My Region	Implemented in My Region	Not Implemented, but Planned	Implemented Previously & Future Plans	Technical Documents Are Available
Car Sharing	☐	☐	☐	☐	☐

*** 2. Please rate the success of this strategy at mitigating congestion in your region.**

	Very Unsuccessful	Somewhat Unsuccessful	Average	Somewhat Successful	Very Successful	N/A
Car Sharing	○	○	○	○	○	○

*** 3. Please rate the ease of implementation for this strategy.**

	Very Difficult	Somewhat Difficult	Neutral	Somewhat Easy	Very Easy	N/A
Car Sharing	○	○	○	○	○	○

4. Please identify barriers encountered for this strategy.

5. Please identify the solutions to the barriers encountered for these strategies.

6. Please identify the costs ($) for these strategies and note which year these represent (e.g., $100,000 $2008).

7. Please identify the calculated or documented benefit/cost ratio or a range for these strategies.

31. Trip Reduction Ordinances

*** 1. Have any of the following trip reduction strategies or ordinances been implemented in your metropolitan area?**

	Not Implemented in My Region	Implemented in My Region	Not Implemented, but Planned	Implemented Previously & Future Plans	Technical Documents Are Available
Special use permits	☐	☐	☐	☐	☐
Negotiated agreements	☐	☐	☐	☐	☐
Trip reduction goal programs	☐	☐	☐	☐	☐
Conditions of approval for new construction	☐	☐	☐	☐	☐
Mandated programs	☐	☐	☐	☐	☐
Transportation management districts	☐	☐	☐	☐	☐

Other (please specify)

*** 2. Please rate the success of these strategies at mitigating congestion in your region.**

	Very Unsuccessful	Somewhat Unsuccessful	Average	Somewhat Successful	Very Successful	N/A
Special use permits	○	○	○	○	○	○
Negotiated agreements	○	○	○	○	○	○
Trip reduction goal programs	○	○	○	○	○	○
Conditions of approval for new construction	○	○	○	○	○	○
Mandated programs	○	○	○	○	○	○
Transportation management districts	○	○	○	○	○	○

Other (please specify)

* 3. Please rate the ease of implementation for these strategies.

	Very Difficult	Somewhat Difficult	Neutral	Somewhat Easy	Very Easy	N/A
Special use permits	○	○	○	○	○	○
Negotiated agreements	○	○	○	○	○	○
Trip reduction goal programs	○	○	○	○	○	○
Conditions of approval for new construction	○	○	○	○	○	○
Mandated programs	○	○	○	○	○	○
Transportation management districts	○	○	○	○	○	○

Other (please specify)

4. Please identify barriers encountered for these strategies.

Special use permits

Negotiated agreements

Trip reduction goal programs

Conditions of approval for new construction

Mandated programs

Transportation management districts

5. Please identify the solutions to the barriers encountered for these strategies.

Special use permits

Negotiated agreements

Trip reduction goal programs

Conditions of approval for new construction

Mandated programs

Transportation management districts

6. Please identify the costs ($) for these strategies and note which year these represent (e.g., $100,000 $2008).

Special use permits

Negotiated agreements

Trip reduction goal programs

Conditions of approval for new construction

Mandated programs

Transportation management districts

7. Please identify the calculated or documented benefit/cost raio or a range for these strategies.

Special use permits

Negotiated agreements

Trip reduction goal programs

Conditions of approval for new construction

Mandated programs

Transportation management districts

32. Conclusion

Thank you very much for your time and patience required to complete this survey. Your responses are very valued.

13.0 APPENDIX C – SURVEY RESULTS FROM METROPOLITAN PLANNING ORGANIZATIONS

MDOT Congestion Management Survey

SurveyMonkey

1. Please enter your contact information (Agency information is required).

	Response Percent	Response Count
Name:	**100.0%**	**53**
Agency:	**100.0%**	**53**
State:	**100.0%**	**53**
Email Address:	**100.0%**	**53**
Phone Number:	96.2%	51
	answered question	**53**
	skipped question	**0**

2. May a researcher contact you to ask any follow-up question(s) and/or request permission to publish a specific response?

	Response Percent	Response Count
Yes	**92.5%**	**49**
No	7.5%	4
	answered question	**53**
	skipped question	**0**

3. Which of the following techniques have been used in your metropolitan area to increase the number of lanes without widening?

	Not Implemented in My Region	Implemented in My Region	Not Implemented, but Planned	Implemented Previously & Future Plans	Technical Documents Are Available	Response Count
Lane width reduction	**50.0% (17)**	29.4% (10)	14.7% (5)	8.8% (3)	2.9% (1)	34
Conversion of median to travel lane(s)	**67.6% (23)**	17.6% (6)	2.9% (1)	14.7% (5)	2.9% (1)	34
Shoulder conversion	**67.6% (23)**	20.6% (7)	2.9% (1)	11.8% (4)	2.9% (1)	34
Shoulder used for part-time travel lane	**88.2% (30)**	2.9% (1)	11.8% (4)	2.9% (1)	2.9% (1)	34
					Other (please specify)	2
					answered question	**34**
					skipped question	**19**

4. Please rate the success of these strategies at mitigating congestion in your region.

	Very Unsuccessful	Somewhat Unsuccessful	Average	Somewhat Successful	Very Successful	N/A	Rating Average	Response Count
Lane width reduction	0.0% (0)	0.0% (0)	11.8% (4)	14.7% (5)	11.8% (4)	**61.8% (21)**	4.00	34
Conversion of median to travel lane(s)	0.0% (0)	2.9% (1)	11.8% (4)	5.9% (2)	11.8% (4)	**67.6% (23)**	3.82	34
Shoulder conversion	0.0% (0)	2.9% (1)	11.8% (4)	5.9% (2)	8.8% (3)	**70.6% (24)**	3.70	34
Shoulder used for part-time travel lane	0.0% (0)	0.0% (0)	0.0% (0)	2.9% (1)	2.9% (1)	**94.1% (32)**	4.50	34
							Other (please specify)	0
							answered question	**34**
							skipped question	**19**

5. Please rate the ease of implementation for these strategies.

	Very Difficult	Somewhat Difficult	Neutral	Somewhat Easy	Very Easy	N/A	Rating Average	Response Count
Lane width reduction	0.0% (0)	14.7% (5)	5.9% (2)	23.5% (8)	2.9% (1)	**52.9% (18)**	3.31	34
Conversion of median to travel lane(s)	2.9% (1)	14.7% (5)	11.8% (4)	8.8% (3)	2.9% (1)	**58.8% (20)**	2.86	34
Shoulder conversion	5.9% (2)	8.8% (3)	11.8% (4)	5.9% (2)	5.9% (2)	**61.8% (21)**	2.92	34
Shoulder used for part-time travel lane	5.9% (2)	2.9% (1)	8.8% (3)	2.9% (1)	0.0% (0)	**79.4% (27)**	2.43	34
							Other (please specify)	0
							answered question	**34**
							skipped question	**19**

6. Please identify barriers encountered for these strategies.

	Response Percent	Response Count
Lane width reduction	**100.0%**	**15**
Conversion of median to travel lane(s)	80.0%	12
Shoulder conversion	80.0%	12
Shoulder used for part-time travel lane	73.3%	11
answered question		**15**
skipped question		**38**

7. Please identify the solutions to the barriers encountered for these strategies.

	Response Percent	Response Count
Lane width reduction	**92.9%**	**13**
Conversion of median to travel lane(s)	71.4%	10
Shoulder conversion	78.6%	11
Shoulder used for part-time travel lane	64.3%	9
answered question		**14**
skipped question		**39**

8. Please identify the costs ($) for these strategies and note which year these represent (e.g., $100,000 $2008).

	Response Percent	Response Count
Lane width reduction	**91.7%**	**11**
Conversion of median to travel lane(s)	75.0%	9
Shoulder conversion	58.3%	7
Shoulder used for part-time travel lane	58.3%	7
	answered question	**12**
	skipped question	**41**

9. Please identify the calculated or documented benefit/cost ratio or a range for these strategies.

	Response Percent	Response Count
Lane width reduction	**100.0%**	**10**
Conversion of median to travel lane(s)	80.0%	8
Shoulder conversion	70.0%	7
Shoulder used for part-time travel lane	70.0%	7
	answered question	**10**
	skipped question	**43**

10. Have any freeway ramps been closed or reconfigured to improve traffic operations?

	Not Implemented in My Region	Implemented in My Region	Not Implemented, but Planned	Implemented Previously & Future Plans	Technical Documents Are Available	Response Count
Freeway ramp closure	**75.0% (24)**	6.3% (2)	12.5% (4)	6.3% (2)	3.1% (1)	32
Freeway ramp configuration	**34.4% (11)**	**34.4% (11)**	12.5% (4)	21.9% (7)	3.1% (1)	32
					answered question	**32**
					skipped question	**21**

11. Please rate the success of these strategies at mitigating congestion in your region.

	Very Unsuccessful	Somewhat Unsuccessful	Average	Somewhat Successful	Very Successful	N/A	Rating Average	Response Count
Freeway ramp removals	0.0% (0)	0.0% (0)	3.1% (1)	6.3% (2)	0.0% (0)	**90.6% (29)**	3.67	32
Freeway ramp reconfiguration	0.0% (0)	3.1% (1)	12.5% (4)	15.6% (5)	18.8% (6)	**50.0% (16)**	4.00	32
							answered question	**32**
							skipped question	**21**

12. Please rate the ease of implementation for these strategies.

	Very Difficult	Somewhat Difficult	Neutral	Somewhat Easy	Very Easy	N/A	Rating Average	Response Count
Freeway ramp removals	9.4% (3)	9.4% (3)	3.1% (1)	0.0% (0)	0.0% (0)	**78.1% (25)**	1.71	32
Freeway ramp reconfiguration	15.6% (5)	12.5% (4)	12.5% (4)	21.9% (7)	0.0% (0)	**37.5% (12)**	2.65	32
							answered question	**32**
							skipped question	**21**

13. Please identify barriers encountered for these strategies.

	Response Count
	11
answered question	**11**
skipped question	**42**

14. Please identify the solutions to the barriers encountered for these strategies.

	Response Count
	10
answered question	**10**
skipped question	**43**

15. Please identify the costs ($) for these strategies and note which year these represent (e.g., $100,000 $2008).

	Response Count
	8
answered question	**8**
skipped question	**45**

16. Please identify the calculated or documented benefit/cost ratio or a range for these strategies.

	Response Count
	8
answered question	**8**
skipped question	**45**

17. Have any agencies in your metropolitan area removed raodway bottlenecks?

	Not Implemented in My Region	Implemented in My Region	Not Implemented, but Planned	Implemented Previously & Future Plans	Technical Documents Are Available	Response Count
Freeway bottleneck removal	**51.6% (16)**	29.0% (9)	9.7% (3)	19.4% (6)	0.0% (0)	31
Arterial bottleneck removal	**45.2% (14)**	32.3% (10)	3.2% (1)	25.8% (8)	0.0% (0)	31
					answered question	**31**
					skipped question	**22**

18. Please rate the success of these strategies at mitigating congestion in your region.

	Very Unsuccessful	Somewhat Unsuccessful	Average	Somewhat Successful	Very Successful	N/A	Rating Average	Response Count
Freeway bottleneck removal	6.5% (2)	3.2% (1)	6.5% (2)	12.9% (4)	19.4% (6)	**51.6% (16)**	3.73	31
Arterial bottleneck removal	3.2% (1)	3.2% (1)	12.9% (4)	16.1% (5)	19.4% (6)	**45.2% (14)**	3.82	31
							answered question	**31**
							skipped question	**22**

19. Please rate the ease of implementation for these strategies.

	Very Difficult	Somewhat Difficult	Neutral	Somewhat Easy	Very Easy	N/A	Rating Average	Response Count
Freeway bottleneck removal	12.9% (4)	25.8% (8)	3.2% (1)	9.7% (3)	3.2% (1)	**45.2% (14)**	2.35	31
Arterial bottleneck removal	12.9% (4)	22.6% (7)	6.5% (2)	9.7% (3)	0.0% (0)	**48.4% (15)**	2.25	31
							answered question	**31**
							skipped question	**22**

20. Please identify barriers encountered for these strategies.

		Response Count
		14
	answered question	**14**
	skipped question	**39**

21. Please identify the solutions to the barriers encountered for these strategies.

	Response Count
	10
answered question	10
skipped question	43

22. Please identify the costs ($) for these strategies and note which year these represent (e.g., $100,000 $2008).

	Response Count
	9
answered question	9
skipped question	44

23. Please identify the calculated or documented benefit/cost ratio or a range for these strategies.

	Response Count
	9
answered question	9
skipped question	44

24. Please indicate which of the following geometric design improvements have been implemented in your metropolitan area to mitigate congestion.

	Not Implemented in My Region	Implemented in My Region	Not Implemented, but Planned	Implemented Previously & Future Plans	Technical Documents Are Available	Response Count
Widen road to accomodate shoulders	26.9% (7)	**50.0% (13)**	7.7% (2)	19.2% (5)	0.0% (0)	26
Additional turn lanes at intersections	3.8% (1)	**76.9% (20)**	0.0% (0)	23.1% (6)	0.0% (0)	26
Lengthened turn lanes at intersection for queueing	11.5% (3)	**73.1% (19)**	0.0% (0)	19.2% (5)	0.0% (0)	26
Improved sight distances at intersections	19.2% (5)	**61.5% (16)**	0.0% (0)	23.1% (6)	0.0% (0)	26
Diverging diamond intersections	**68.0% (17)**	8.0% (2)	16.0% (4)	12.0% (3)	0.0% (0)	25
Jughandles at intersections	**68.0% (17)**	20.0% (5)	4.0% (1)	8.0% (2)	0.0% (0)	25
Median U-turn crossovers	**60.0% (15)**	20.0% (5)	12.0% (3)	8.0% (2)	0.0% (0)	25
Continuous flow intersections	**69.2% (18)**	15.4% (4)	7.7% (2)	7.7% (2)	0.0% (0)	26
Auxiliary lanes for merging and diverging	32.0% (8)	**44.0% (11)**	4.0% (1)	20.0% (5)	0.0% (0)	25
Intersection channelization	30.8% (8)	**50.0% (13)**	0.0% (0)	19.2% (5)	0.0% (0)	26
Bus turnouts	34.6% (9)	**42.3% (11)**	11.5% (3)	11.5% (3)	0.0% (0)	26
Commercial vehicle accommodations	**65.4% (17)**	19.2% (5)	3.8% (1)	11.5% (3)	0.0% (0)	26

Grade separations (street-rail)	**56.0% (14)**	32.0% (8)	0.0% (0)	12.0% (3)	0.0% (0)	25
Grade separations (street-street)	**54.2% (13)**	29.2% (7)	4.2% (1)	12.5% (3)	0.0% (0)	24
					Other (please specify)	0
					answered question	**26**
					skipped question	**27**

25. Please rate the success of these strategies at mitigating congestion in your region.

	Very Unsuccessful	Somewhat Unsuccessful	Average	Somewhat Successful	Very Successful	N/A	Rating Average	Response Count
Widen road to accomodate shoulders	3.8% (1)	15.4% (4)	**30.8% (8)**	15.4% (4)	3.8% (1)	**30.8% (8)**	3.00	26
Additional turn lanes at intersections	11.5% (3)	0.0% (0)	23.1% (6)	**42.3% (11)**	11.5% (3)	11.5% (3)	3.48	26
Lengthened turn lanes at intersection for queueing	7.7% (2)	0.0% (0)	30.8% (8)	**34.6% (9)**	7.7% (2)	19.2% (5)	3.43	26
Improved sight distances at intersections	3.8% (1)	7.7% (2)	**34.6% (9)**	26.9% (7)	7.7% (2)	19.2% (5)	3.33	26
Diverging diamond intersections	0.0% (0)	3.8% (1)	7.7% (2)	0.0% (0)	3.8% (1)	**84.6% (22)**	3.25	26
Jughandles at intersections	0.0% (0)	0.0% (0)	19.2% (5)	3.8% (1)	3.8% (1)	**73.1% (19)**	3.43	26
Median U-turn crossovers	0.0% (0)	0.0% (0)	15.4% (4)	15.4% (4)	0.0% (0)	**69.2% (18)**	3.50	26
Continuous flow intersections	0.0% (0)	3.8% (1)	7.7% (2)	0.0% (0)	11.5% (3)	**76.9% (20)**	3.83	26
Auxiliary lanes for merging and diverging	0.0% (0)	3.8% (1)	15.4% (4)	26.9% (7)	11.5% (3)	**42.3% (11)**	3.80	26
Intersection channelization	0.0% (0)	11.5% (3)	11.5% (3)	26.9% (7)	15.4% (4)	**34.6% (9)**	3.71	26
Bus turnouts	0.0% (0)	7.7% (2)	15.4% (4)	15.4% (4)	7.7% (2)	**53.8% (14)**	3.50	26
Commercial vehicle accommodations	0.0% (0)	0.0% (0)	11.5% (3)	11.5% (3)	0.0% (0)	**76.9% (20)**	3.50	26
Grade separations (street-rail)	0.0% (0)	0.0% (0)	7.7% (2)	7.7% (2)	23.1% (6)	**61.5% (16)**	4.40	26

Grade separations (street-street)	0.0% (0)	0.0% (0)	11.5% (3)	7.7% (2)	19.2% (5)	**61.5% (16)**	4.20	26
							Other (please specify)	0
							answered question	**26**
							skipped question	**27**

26. Please rate the ease of implementation for these strategies.

	Very Difficult	Somewhat Difficult	Neutral	Somewhat Easy	Very Easy	N/A	Rating Average	Response Count
Widen road to accomodate shoulders	3.8% (1)	23.1% (6)	19.2% (5)	23.1% (6)	0.0% (0)	**30.8% (8)**	2.89	26
Additional turn lanes at intersections	0.0% (0)	**34.6% (9)**	23.1% (6)	30.8% (8)	0.0% (0)	11.5% (3)	2.96	26
Lengthened turn lanes at intersection for queueing	0.0% (0)	23.1% (6)	**26.9% (7)**	**26.9% (7)**	3.8% (1)	19.2% (5)	3.14	26
Improved sight distances at intersections	0.0% (0)	15.4% (4)	**34.6% (9)**	23.1% (6)	7.7% (2)	19.2% (5)	3.29	26
Diverging diamond intersections	11.5% (3)	3.8% (1)	7.7% (2)	0.0% (0)	0.0% (0)	**76.9% (20)**	1.83	26
Jughandles at intersections	0.0% (0)	11.5% (3)	11.5% (3)	3.8% (1)	0.0% (0)	**73.1% (19)**	2.71	26
Median U-turn crossovers	0.0% (0)	3.8% (1)	15.4% (4)	11.5% (3)	3.8% (1)	**65.4% (17)**	3.44	26
Continuous flow intersections	3.8% (1)	3.8% (1)	7.7% (2)	7.7% (2)	0.0% (0)	**76.9% (20)**	2.83	26
Auxiliary lanes for merging and diverging	3.8% (1)	7.7% (2)	15.4% (4)	23.1% (6)	0.0% (0)	**50.0% (13)**	3.15	26
Intersection channelization	0.0% (0)	3.8% (1)	26.9% (7)	19.2% (5)	3.8% (1)	**46.2% (12)**	3.43	26

Bus turnouts	0.0% (0)	7.7% (2)	23.1% (6)	23.1% (6)	0.0% (0)	**46.2% (12)**	3.29	26
Commercial vehicle accommodations	0.0% (0)	3.8% (1)	19.2% (5)	0.0% (0)	0.0% (0)	**76.9% (20)**	2.83	26
Grade separations (street-rail)	19.2% (5)	11.5% (3)	7.7% (2)	0.0% (0)	0.0% (0)	**61.5% (16)**	1.70	26
Grade separations (street-street)	19.2% (5)	15.4% (4)	7.7% (2)	0.0% (0)	0.0% (0)	**57.7% (15)**	1.73	26
							Other (please specify)	0
							answered question	**26**
							skipped question	**27**

27. Please identify the solutions to the barriers encountered for these strategies.

	Response Percent	Response Count
Widen road to accomodate shoulders	**62.5%**	**5**
Additional turn lanes at intersections	**62.5%**	**5**
Lengthened turn lanes at intersection for queueing	**62.5%**	**5**
Improved sight distances at intersections	37.5%	3
Diverging diamond intersections	37.5%	3
Jughandles at intersections	37.5%	3
Median U-turn crossovers	37.5%	3
Continuous flow intersections	37.5%	3
Auxiliary lanes for merging and diverging	37.5%	3

Intersection channelization	37.5%	3
Bus turnouts	37.5%	3
Commercial vehicle accommodations	37.5%	3
Grade separations (street-rail)	**62.5%**	**5**
Grade separations (street-street)	**62.5%**	**5**
	answered question	**8**
	skipped question	**45**

28. Please identify the costs ($) for these strategies and note which year these represent (e.g., $100,000 $2008).

	Response Percent	Response Count
Widen road to accomodate shoulders	**80.0%**	**4**
Additional turn lanes at intersections	**80.0%**	**4**
Lengthened turn lanes at intersection for queueing	**80.0%**	**4**
Improved sight distances at intersections	60.0%	3
Diverging diamond intersections	60.0%	3
Jughandles at intersections	60.0%	3
Median U-turn crossovers	60.0%	3
Continuous flow intersections	60.0%	3
Auxiliary lanes for merging and diverging	60.0%	3

Intersection channelization	60.0%	3
Bus turnouts	60.0%	3
Commercial vehicle accommodations	60.0%	3
Grade separations (street-rail)	60.0%	3
Grade separations (street-street)	60.0%	3
	answered question	**5**
	skipped question	**48**

29. Please identify the calculated or documented benefit/cost ratio or a range for these strategies.

	Response Percent	Response Count
Widen road to accomodate shoulders	**100.0%**	**4**
Additional turn lanes at intersections	75.0%	3
Lengthened turn lanes at intersection for queueing	75.0%	3
Improved sight distances at intersections	75.0%	3
Diverging diamond intersections	75.0%	3
Jughandles at intersections	75.0%	3
Median U-turn crossovers	75.0%	3
Continuous flow intersections	75.0%	3
Auxiliary lanes for merging and diverging	75.0%	3

Intersection channelization	75.0%	3
Bus turnouts	75.0%	3
Commercial vehicle accommodations	75.0%	3
Grade separations (street-rail)	75.0%	3
Grade separations (street-street)	75.0%	3
	answered question	**4**
	skipped question	**49**

30. Which of the following overall street improvements have been implemented in your metropolitan area.

	Not Implemented in My Region	Implemented in My Region	Not Implemented, but Planned	Implemented Previously & Future Plans	Technical Documents Are Available	Response Count
Superstreets (series of non-freeway grade separations)	**84.6% (22)**	0.0% (0)	7.7% (2)	3.8% (1)	3.8% (1)	26
Complete streets	19.2% (5)	23.1% (6)	**34.6% (9)**	11.5% (3)	15.4% (4)	26
Improving street continuity	**42.3% (11)**	26.9% (7)	3.8% (1)	23.1% (6)	3.8% (1)	26
Two-way to One-way conversion	**57.7% (15)**	26.9% (7)	3.8% (1)	7.7% (2)	3.8% (1)	26
One-way to Two-way conversion	**57.7% (15)**	23.1% (6)	7.7% (2)	7.7% (2)	3.8% (1)	26
					Other (please specify)	2
					answered question	**26**
					skipped question	**27**

31. Please rate the success of these strategies at mitigating congestion in your region.

	Very Unsuccessful	Somewhat Unsuccessful	Average	Somewhat Successful	Very Successful	N/A	Rating Average	Response Count
Superstreets (series of non-freeway grade separations)	0.0% (0)	0.0% (0)	0.0% (0)	3.8% (1)	0.0% (0)	**96.2% (25)**	4.00	26
Complete streets	0.0% (0)	3.8% (1)	3.8% (1)	19.2% (5)	7.7% (2)	**65.4% (17)**	3.89	26
Improving street continuity	3.8% (1)	0.0% (0)	0.0% (0)	34.6% (9)	11.5% (3)	**50.0% (13)**	4.00	26
Two-way to One-way conversion	3.8% (1)	3.8% (1)	0.0% (0)	19.2% (5)	0.0% (0)	**73.1% (19)**	3.29	26
One-way to Two-way conversion	0.0% (0)	0.0% (0)	3.8% (1)	26.9% (7)	0.0% (0)	**69.2% (18)**	3.88	26
							Other (please specify)	0
							answered question	**26**
							skipped question	**27**

32. Please rate the ease of implementation for these strategies.

	Very Difficult	Somewhat Difficult	Neutral	Somewhat Easy	Very Easy	N/A	Rating Average	Response Count
Superstreets (series of non-freeway grade separations)	3.8% (1)	3.8% (1)	0.0% (0)	3.8% (1)	0.0% (0)	**88.5% (23)**	2.33	26
Complete streets	0.0% (0)	30.8% (8)	15.4% (4)	7.7% (2)	0.0% (0)	**46.2% (12)**	2.57	26
Improving street continuity	3.8% (1)	34.6% (9)	3.8% (1)	7.7% (2)	0.0% (0)	**50.0% (13)**	2.31	26
Two-way to One-way conversion	3.8% (1)	7.7% (2)	11.5% (3)	11.5% (3)	0.0% (0)	**65.4% (17)**	2.89	26
One-way to Two-way conversion	0.0% (0)	15.4% (4)	3.8% (1)	11.5% (3)	0.0% (0)	**69.2% (18)**	2.88	26
							Other (please specify)	0
							answered question	**26**
							skipped question	**27**

33. Please identify barriers encountered for these strategies.

	Response Percent	Response Count
Superstreets (series of non-freeway grade separations)	50.0%	4
Complete streets	**87.5%**	**7**
Improving street continuity	62.5%	5
Two-way to One-way conversion	62.5%	5
One-way to Two-way conversion	50.0%	4
answered question		**8**
skipped question		**45**

34. Please identify the solutions to the barriers encountered for these strategies.

	Response Percent	Response Count
Superstreets (series of non-freeway grade separations)	50.0%	3
Complete streets	**83.3%**	**5**
Improving street continuity	**83.3%**	**5**
Two-way to One-way conversion	50.0%	3
One-way to Two-way conversion	50.0%	3
	answered question	**6**
	skipped question	**47**

35. Please identify the costs ($) for these strategies and note which year these represent (e.g., $100,000 $2008).

	Response Percent	Response Count
Superstreets (series of non-freeway grade separations)	100.0%	3
Complete streets	100.0%	3
Improving street continuity	100.0%	3
Two-way to One-way conversion	100.0%	3
One-way to Two-way conversion	100.0%	3
answered question		3
skipped question		50

36. Please identify the calculated or documented benefit/cost ratio or a range for these strategies.

	Response Percent	Response Count
Superstreets (series of non-freeway grade separations)	100.0%	3
Complete streets	100.0%	3
Improving street continuity	100.0%	3
Two-way to One-way conversion	100.0%	3
One-way to Two-way conversion	100.0%	3
	answered question	3
	skipped question	50

37. Have any of the following time-of-day policies been implemented in your metropolitan area to mitigate congestion?

	Not Implemented in My Region	Implemented in My Region	Not Implemented, but Planned	Implemented Previously & Future Plans	Technical Documents Are Available	Response Count
Auto turning restrictions on streets	37.5% (9)	**50.0% (12)**	0.0% (0)	12.5% (3)	4.2% (1)	24
Auto parking restrictions on streets	41.7% (10)	**50.0% (12)**	0.0% (0)	4.2% (1)	4.2% (1)	24
Truck shipping/delivery schedules	**75.0% (18)**	8.3% (2)	4.2% (1)	4.2% (1)	8.3% (2)	24
Truck peak period bans on arterials	**83.3% (20)**	4.2% (1)	0.0% (0)	4.2% (1)	8.3% (2)	24
Truck management strategies	**75.0% (18)**	8.3% (2)	4.2% (1)	4.2% (1)	8.3% (2)	24
Truck freight and delivery consolidation	**79.2% (19)**	8.3% (2)	0.0% (0)	4.2% (1)	8.3% (2)	24
Designated truck routes	**62.5% (15)**	25.0% (6)	4.2% (1)	4.2% (1)	4.2% (1)	24
					Other (please specify)	1
					answered question	**24**
					skipped question	**29**

38. Please rate the success of these strategies at mitigating congestion in your region.

	Very Unsuccessful	Somewhat Unsuccessful	Average	Somewhat Successful	Very Successful	N/A	Rating Average	Response Count
Auto turning restrictions on streets	0.0% (0)	0.0% (0)	16.7% (4)	33.3% (8)	4.2% (1)	**45.8% (11)**	3.77	24
Auto parking restrictions on streets	0.0% (0)	4.2% (1)	16.7% (4)	29.2% (7)	0.0% (0)	**50.0% (12)**	3.50	24
Truck shipping/delivery schedules	0.0% (0)	0.0% (0)	8.3% (2)	8.3% (2)	0.0% (0)	**83.3% (20)**	3.50	24
Truck peak period bans on arterials	0.0% (0)	4.2% (1)	8.3% (2)	0.0% (0)	0.0% (0)	**87.5% (21)**	2.67	24
Truck management strategies	0.0% (0)	0.0% (0)	8.3% (2)	4.2% (1)	0.0% (0)	**87.5% (21)**	3.33	24
Truck freight and delivery consolidation	0.0% (0)	0.0% (0)	8.3% (2)	4.2% (1)	0.0% (0)	**87.5% (21)**	3.33	24
Designated truck routes	4.2% (1)	0.0% (0)	16.7% (4)	8.3% (2)	0.0% (0)	**70.8% (17)**	3.00	24
							Other (please specify)	0
							answered question	**24**
							skipped question	**29**

39. Please rate the ease of implementation for these strategies.

	Very Difficult	Somewhat Difficult	Neutral	Somewhat Easy	Very Easy	N/A	Rating Average	Response Count
Auto turning restrictions on streets	0.0% (0)	8.3% (2)	16.7% (4)	29.2% (7)	0.0% (0)	**45.8% (11)**	3.38	24
Auto parking restrictions on streets	4.2% (1)	8.3% (2)	16.7% (4)	16.7% (4)	4.2% (1)	**50.0% (12)**	3.17	24
Truck shipping/delivery schedules	0.0% (0)	8.3% (2)	12.5% (3)	0.0% (0)	0.0% (0)	**79.2% (19)**	2.60	24
Truck peak period bans on arterials	4.2% (1)	0.0% (0)	12.5% (3)	0.0% (0)	0.0% (0)	**83.3% (20)**	2.50	24
Truck management strategies	0.0% (0)	8.3% (2)	8.3% (2)	0.0% (0)	0.0% (0)	**83.3% (20)**	2.50	24
Truck freight and delivery consolidation	4.2% (1)	0.0% (0)	12.5% (3)	0.0% (0)	0.0% (0)	**83.3% (20)**	2.50	24
Designated truck routes	4.2% (1)	8.3% (2)	8.3% (2)	12.5% (3)	0.0% (0)	**66.7% (16)**	2.88	24
							Other (please specify)	0
							answered question	**24**
							skipped question	**29**

40. Please identify barriers encountered for these strategies.

	Response Percent	Response Count
Auto turning restrictions on streets	50.0%	2
Auto parking restrictions on streets	50.0%	2
Truck shipping/delivery schedules	50.0%	2
Truck peak period bans on arterials	**75.0%**	**3**
Truck management strategies	50.0%	2
Truck freight and delivery consolidation	50.0%	2
Designated truck routes	**75.0%**	**3**
	answered question	**4**
	skipped question	**49**

41. Please identify the solutions to the barriers encountered for these strategies.

	Response Percent	Response Count
Auto turning restrictions on streets	50.0%	1
Auto parking restrictions on streets	50.0%	1
Truck shipping/delivery schedules	50.0%	1
Truck peak period bans on arterials	50.0%	1
Truck management strategies	**100.0%**	**2**
Truck freight and delivery consolidation	50.0%	1
Designated truck routes	**100.0%**	**2**
	answered question	**2**
	skipped question	**51**

42. Please identify the costs ($) for these strategies and note which year these represent (e.g., $100,000 $2008).

	Response Percent	Response Count
Auto turning restrictions on streets	100.0%	1
Auto parking restrictions on streets	100.0%	1
Truck shipping/delivery schedules	100.0%	1
Truck peak period bans on arterials	100.0%	1
Truck management strategies	100.0%	1
Truck freight and delivery consolidation	100.0%	1
Designated truck routes	100.0%	1
	answered question	1
	skipped question	52

43. Please identify the calculated or documented benefit/cost ratio or a range for these strategies.

	Response Percent	Response Count
Auto turning restrictions on streets	100.0%	1
Auto parking restrictions on streets	100.0%	1
Truck shipping/delivery schedules	100.0%	1
Truck peak period bans on arterials	100.0%	1
Truck management strategies	100.0%	1
Truck freight and delivery consolidation	100.0%	1
Designated truck routes	100.0%	1
	answered question	1
	skipped question	52

44. Which of the following access management strategies have been implemented in your metropolitan area?

	Not Implemented in My Region	Implemented in My Region	Not Implemented, but Planned	Implemented Previously & Future Plans	Technical Documents Are Available	Response Count
Driveway spacing standards	30.4% (7)	**47.8% (11)**	0.0% (0)	13.0% (3)	8.7% (2)	23
Driveway consolidation	20.8% (5)	**45.8% (11)**	8.3% (2)	16.7% (4)	8.3% (2)	24
Driveway sharing and cross-access	21.7% (5)	**47.8% (11)**	8.7% (2)	13.0% (3)	8.7% (2)	23
Sidestreet/alley/backage road access	33.3% (8)	**37.5% (9)**	8.3% (2)	12.5% (3)	8.3% (2)	24
Raised median policies and standards	**41.7% (10)**	**41.7% (10)**	4.2% (1)	4.2% (1)	8.3% (2)	24
Two-way-left-turn-lanes	12.5% (3)	**79.2% (19)**	0.0% (0)	8.3% (2)	0.0% (0)	24
Raised median installation	13.0% (3)	**65.2% (15)**	8.7% (2)	8.7% (2)	4.3% (1)	23
Frontage roads on arterial streets	29.2% (7)	**54.2% (13)**	4.2% (1)	8.3% (2)	4.2% (1)	24
Left-turn restrictions	16.7% (4)	**66.7% (16)**	4.2% (1)	8.3% (2)	4.2% (1)	24
Interchange modifications (such as full clover leaf to partial clover leaf)	**50.0% (12)**	25.0% (6)	0.0% (0)	16.7% (4)	8.3% (2)	24
Minimum street intersection spacing	**54.2% (13)**	16.7% (4)	0.0% (0)	16.7% (4)	12.5% (3)	24
Minimum freeway interchange spacing	**52.2% (12)**	26.1% (6)	0.0% (0)	17.4% (4)	4.3% (1)	23
					Other (please specify)	1

answered question	**24**
skipped question	**29**

45. Please rate the success of these strategies at mitigating congestion in your region?

	Very Unsuccessful	Somewhat Unsuccessful	Average	Somewhat Successful	Very Successful	N/A	Rating Average	Response Count
Driveway spacing standards	0.0% (0)	4.2% (1)	29.2% (7)	20.8% (5)	8.3% (2)	**37.5% (9)**	3.53	24
Driveway consolidation	0.0% (0)	4.2% (1)	**33.3% (8)**	20.8% (5)	8.3% (2)	**33.3% (8)**	3.50	24
Driveway sharing and cross-access	0.0% (0)	4.2% (1)	25.0% (6)	25.0% (6)	8.3% (2)	**37.5% (9)**	3.60	24
Sidestreet/alley/backage road access	0.0% (0)	4.2% (1)	20.8% (5)	20.8% (5)	8.3% (2)	**45.8% (11)**	3.62	24
Raised median policies and standards	0.0% (0)	4.2% (1)	12.5% (3)	16.7% (4)	8.3% (2)	**58.3% (14)**	3.70	24
Two-way-left-turn-lanes	0.0% (0)	4.2% (1)	29.2% (7)	**41.7% (10)**	8.3% (2)	16.7% (4)	3.65	24
Raised median installation	0.0% (0)	4.2% (1)	20.8% (5)	**37.5% (9)**	12.5% (3)	25.0% (6)	3.78	24
Frontage roads on arterial streets	0.0% (0)	8.7% (2)	17.4% (4)	26.1% (6)	13.0% (3)	**34.8% (8)**	3.67	23
Left-turn restrictions	0.0% (0)	8.3% (2)	20.8% (5)	**29.2% (7)**	12.5% (3)	**29.2% (7)**	3.65	24
Interchange modifications (such as full clover leaf to partial clover leaf)	0.0% (0)	8.7% (2)	8.7% (2)	4.3% (1)	17.4% (4)	**60.9% (14)**	3.78	23
Minimum street intersection spacing	0.0% (0)	0.0% (0)	8.3% (2)	20.8% (5)	8.3% (2)	**62.5% (15)**	4.00	24

Minimum freeway interchange spacing	0.0% (0)	0.0% (0)	12.5% (3)	20.8% (5)	8.3% (2)	**58.3% (14)**	3.90	24
							Other (please specify)	0
							answered question	**24**
							skipped question	**29**

46. Please rate the east of implementation for these strategies.

	Very Difficult	Somewhat Difficult	Neutral	Somewhat Easy	Very Easy	N/A	Rating Average	Response Count
Driveway spacing standards	0.0% (0)	20.8% (5)	16.7% (4)	25.0% (6)	0.0% (0)	**37.5% (9)**	3.07	24
Driveway consolidation	4.2% (1)	**45.8% (11)**	16.7% (4)	8.3% (2)	0.0% (0)	25.0% (6)	2.39	24
Driveway sharing and cross-access	0.0% (0)	**41.7% (10)**	16.7% (4)	12.5% (3)	0.0% (0)	29.2% (7)	2.59	24
Sidestreet/alley/backage road access	0.0% (0)	20.8% (5)	25.0% (6)	16.7% (4)	0.0% (0)	**37.5% (9)**	2.93	24
Raised median policies and standards	0.0% (0)	8.7% (2)	21.7% (5)	21.7% (5)	0.0% (0)	**47.8% (11)**	3.25	23
Two-way-left-turn-lanes	0.0% (0)	20.8% (5)	**41.7% (10)**	20.8% (5)	0.0% (0)	16.7% (4)	3.00	24
Raised median installation	8.3% (2)	**25.0% (6)**	20.8% (5)	**25.0% (6)**	0.0% (0)	20.8% (5)	2.79	24
Frontage roads on arterial streets	4.3% (1)	**34.8% (8)**	13.0% (3)	17.4% (4)	0.0% (0)	30.4% (7)	2.63	23
Left-turn restrictions	0.0% (0)	12.5% (3)	**37.5% (9)**	20.8% (5)	4.2% (1)	25.0% (6)	3.22	24
Interchange modifications (such as full clover leaf to partial clover leaf)	12.5% (3)	25.0% (6)	8.3% (2)	0.0% (0)	0.0% (0)	**54.2% (13)**	1.91	24

Minimum street intersection spacing	0.0% (0)	12.5% (3)	12.5% (3)	12.5% (3)	0.0% (0)	**62.5% (15)**	3.00	24
Minimum freeway interchange spacing	0.0% (0)	16.7% (4)	16.7% (4)	12.5% (3)	0.0% (0)	**54.2% (13)**	2.91	24
							Other (please specify)	0
							answered question	**24**
							skipped question	**29**

47. Please identify barriers encountered for these strategies.

	Response Percent	Response Count
Driveway spacing standards	0.0%	0
Driveway consolidation	**75.0%**	**3**
Driveway sharing and cross-access	**75.0%**	**3**
Sidestreet/alley/backage road access	25.0%	1
Raised median policies and standards	0.0%	0
Two-way-left-turn-lanes	25.0%	1
Raised median installation	25.0%	1
Frontage roads on arterial streets	25.0%	1
Left-turn restrictions	50.0%	2
Interchange modifications (such as full clover leaf to partial clover leaf)	0.0%	0

Minimum street intersection spacing	0.0%	0
Minimum freeway interchange spacing	25.0%	1
	answered question	**4**
	skipped question	**49**

48. Please identify the solutions to the barriers encountered for these strategies.

	Response Percent	Response Count
Driveway spacing standards	0.0%	0
Driveway consolidation	**100.0%**	**1**
Driveway sharing and cross-access	**100.0%**	**1**
Sidestreet/alley/backage road access	**100.0%**	**1**
Raised median policies and standards	0.0%	0
Two-way-left-turn-lanes	**100.0%**	**1**
Raised median installation	**100.0%**	**1**
Frontage roads on arterial streets	**100.0%**	**1**
Left-turn restrictions	**100.0%**	**1**
Interchange modifications (such as full clover leaf to partial clover leaf)	0.0%	0

Minimum street intersection spacing		0.0%	0
Minimum freeway interchange spacing		0.0%	0
		answered question	**1**
		skipped question	**52**

49. Please identify the costs ($) for these strategies and note which year these represent (e.g., $100,000 $2008).

	Response Percent	Response Count
Driveway spacing standards	0.0%	0
Driveway consolidation	0.0%	0
Driveway sharing and cross-access	0.0%	0
Sidestreet/alley/backage road access	0.0%	0
Raised median policies and standards	0.0%	0
Two-way-left-turn-lanes	0.0%	0
Raised median installation	0.0%	0
Frontage roads on arterial streets	0.0%	0
Left-turn restrictions	0.0%	0
Interchange modifications (such as full clover leaf to partial clover leaf)	0.0%	0
Minimum street intersection spacing	0.0%	0
Minimum freeway interchange spacing	0.0%	0
	answered question	**0**
	skipped question	**53**

50. Please identify the calculated or documented benefit/cost ratio or a ranger for these strategies.

	Response Percent	Response Count
Driveway spacing standards	0.0%	0
Driveway consolidation	0.0%	0
Driveway sharing and cross-access	0.0%	0
Sidestreet/alley/backage road access	0.0%	0
Raised median policies and standards	0.0%	0
Two-way-left-turn-lanes	0.0%	0
Raised median installation	0.0%	0
Frontage roads on arterial streets	0.0%	0
Left-turn restrictions	0.0%	0
Interchange modifications (such as full clover leaf to partial clover leaf)	0.0%	0
Minimum street intersection spacing	0.0%	0
Minimum freeway interchange spacing	0.0%	0
	answered question	**0**

skipped question	53

51. Which of the following ramp metering systems have been implemented in your metropolitan area?

	Not Implemented in My Region	Implemented in My Region	Not Implemented, but Planned	Implemented Previously & Future Plans	Technical Documents Are Available	Response Count
Ramp metering - localized	**75.0% (18)**	16.7% (4)	0.0% (0)	4.2% (1)	8.3% (2)	24
Ramp metering - demand responsive	**83.3% (20)**	8.3% (2)	4.2% (1)	4.2% (1)	4.2% (1)	24
Ramp metering - coordinated	**83.3% (20)**	12.5% (3)	0.0% (0)	4.2% (1)	4.2% (1)	24
Ramp metering - HOV bypass	**95.8% (23)**	0.0% (0)	0.0% (0)	4.2% (1)	0.0% (0)	24
					answered question	**24**
					skipped question	**29**

52. Please rate the success of these strategies at mitigating congestion in your region.

	Very Unsuccessful	Somewhat Unsuccessful	Average	Somewhat Successful	Very Successful	N/A	Rating Average	Response Count
Ramp metering - localized	0.0% (0)	8.3% (2)	4.2% (1)	8.3% (2)	0.0% (0)	**79.2% (19)**	3.00	24
Ramp metering - demand responsive	0.0% (0)	0.0% (0)	4.2% (1)	4.2% (1)	4.2% (1)	**87.5% (21)**	4.00	24
Ramp metering - coordinated	0.0% (0)	0.0% (0)	8.3% (2)	4.2% (1)	4.2% (1)	**83.3% (20)**	3.75	24
Ramp metering - HOV bypass	0.0% (0)	4.2% (1)	4.2% (1)	0.0% (0)	0.0% (0)	**91.7% (22)**	2.50	24
							answered question	**24**
							skipped question	**29**

53. Please rate the ease of implementation for these strategies.

	Very Difficult	Somewhat Difficult	Neutral	Somewhat Easy	Very Easy	N/A	Rating Average	Response Count
Ramp metering - localized	4.2% (1)	0.0% (0)	8.3% (2)	4.2% (1)	0.0% (0)	**83.3% (20)**	2.75	24
Ramp metering - demand responsive	0.0% (0)	0.0% (0)	12.5% (3)	0.0% (0)	0.0% (0)	**87.5% (21)**	3.00	24
Ramp metering - coordinated	0.0% (0)	4.2% (1)	12.5% (3)	0.0% (0)	0.0% (0)	**83.3% (20)**	2.75	24
Ramp metering - HOV bypass	0.0% (0)	8.3% (2)	4.2% (1)	0.0% (0)	0.0% (0)	**87.5% (21)**	2.33	24
							answered question	**24**
							skipped question	**29**

54. Please identify barriers encountered for these strategies.

	Response Percent	Response Count
Ramp metering - localized	**50.0%**	**1**
Ramp metering - demand responsive	0.0%	0
Ramp metering - coordinated	0.0%	0
Ramp metering - HOV bypass	**50.0%**	**1**
	answered question	**2**
	skipped question	**51**

55. Please identify the solutions to the barriers encountered for these strategies.

	Response Percent	Response Count
Ramp metering - localized	**100.0%**	**1**
Ramp metering - demand responsive	0.0%	0
Ramp metering - coordinated	0.0%	0
Ramp metering - HOV bypass	0.0%	0
	answered question	**1**
	skipped question	**52**

56. Please identify the costs ($) for these strategies and note which year these represent (e.g., $100,000 $2008).

	Response Percent	Response Count
Ramp metering - localized	0.0%	0
Ramp metering - demand responsive	0.0%	0
Ramp metering - coordinated	0.0%	0
Ramp metering - HOV bypass	0.0%	0
	answered question	**0**
	skipped question	**53**

57. Please identify the calculated or documented benefit/cost ratio or a range for these strategies.

	Response Percent	Response Count
Ramp metering - localized	0.0%	0
Ramp metering - demand responsive	0.0%	0
Ramp metering - coordinated	0.0%	0
Ramp metering - HOV bypass	0.0%	0
	answered question	**0**
	skipped question	**53**

58. Which of the following advanced traveler information systems have been implemented in your metropolitan area?

	Not Implemented in My Region	Implemented in My Region	Not Implemented, but Planned	Implemented Previously & Future Plans	Technical Documents Are Available	Response Count
Real-time speed via web/smartphone	**60.9% (14)**	30.4% (7)	4.3% (1)	4.3% (1)	0.0% (0)	23
Transit vehicle schedule progress	30.4% (7)	**39.1% (9)**	21.7% (5)	8.7% (2)	0.0% (0)	23
Highway information systems	21.7% (5)	**65.2% (15)**	4.3% (1)	13.0% (3)	0.0% (0)	23
511 traveler information systems	30.4% (7)	**56.5% (13)**	8.7% (2)	4.3% (1)	0.0% (0)	23
Website traveler information systems	21.7% (5)	**65.2% (15)**	0.0% (0)	13.0% (3)	0.0% (0)	23
Travel time message for travelers	30.4% (7)	**47.8% (11)**	8.7% (2)	13.0% (3)	0.0% (0)	23
Freight shipper congestion information	**73.9% (17)**	13.0% (3)	0.0% (0)	13.0% (3)	0.0% (0)	23
National traffic and road closure information	**54.5% (12)**	40.9% (9)	0.0% (0)	4.5% (1)	0.0% (0)	22
					Other (please specify)	0
					answered question	**23**
					skipped question	**30**

59. Please rate the success of these strategies at mitigating congestion in your region.

	Very Unsuccessful	Somewhat Unsuccessful	Average	Somewhat Successful	Very Successful	N/A	Rating Average	Response Count
Real-time speed via web/smartphone	0.0% (0)	0.0% (0)	21.7% (5)	13.0% (3)	4.3% (1)	**60.9% (14)**	3.56	23
Transit vehicle schedule progress	0.0% (0)	0.0% (0)	34.8% (8)	4.3% (1)	4.3% (1)	**56.5% (13)**	3.30	23
Highway information systems	0.0% (0)	4.3% (1)	21.7% (5)	**34.8% (8)**	4.3% (1)	**34.8% (8)**	3.60	23
511 traveler information systems	0.0% (0)	4.3% (1)	21.7% (5)	26.1% (6)	4.3% (1)	**43.5% (10)**	3.54	23
Website traveler information systems	0.0% (0)	8.7% (2)	21.7% (5)	30.4% (7)	4.3% (1)	**34.8% (8)**	3.47	23
Travel time message for travelers	0.0% (0)	4.3% (1)	17.4% (4)	21.7% (5)	4.3% (1)	**52.2% (12)**	3.55	23
Freight shipper congestion information	0.0% (0)	0.0% (0)	4.3% (1)	13.0% (3)	4.3% (1)	**78.3% (18)**	4.00	23
National traffic and road closure information	0.0% (0)	0.0% (0)	17.4% (4)	21.7% (5)	0.0% (0)	**60.9% (14)**	3.56	23
							Other (please specify)	0
							answered question	**23**
							skipped question	**30**

60. Please rate the ease of implementation for these strategies.

	Very Difficult	Somewhat Difficult	Neutral	Somewhat Easy	Very Easy	N/A	Rating Average	Response Count
Real-time speed via web/smartphone	0.0% (0)	8.7% (2)	17.4% (4)	13.0% (3)	0.0% (0)	**60.9% (14)**	3.11	23
Transit vehicle schedule progress	0.0% (0)	13.0% (3)	13.0% (3)	21.7% (5)	0.0% (0)	**52.2% (12)**	3.18	23
Highway information systems	0.0% (0)	8.7% (2)	26.1% (6)	26.1% (6)	0.0% (0)	**39.1% (9)**	3.29	23
511 traveler information systems	0.0% (0)	13.0% (3)	26.1% (6)	17.4% (4)	0.0% (0)	**43.5% (10)**	3.08	23
Website traveler information systems	0.0% (0)	13.0% (3)	21.7% (5)	26.1% (6)	0.0% (0)	**39.1% (9)**	3.21	23
Travel time message for travelers	0.0% (0)	13.0% (3)	13.0% (3)	21.7% (5)	0.0% (0)	**52.2% (12)**	3.18	23
Freight shipper congestion information	0.0% (0)	8.7% (2)	4.3% (1)	13.0% (3)	0.0% (0)	**73.9% (17)**	3.17	23
National traffic and road closure information	0.0% (0)	4.3% (1)	8.7% (2)	21.7% (5)	4.3% (1)	**60.9% (14)**	3.67	23
							Other (please specify)	0
							answered question	**23**
							skipped question	**30**

61. Please identify barriers encountered for these strategies.

	Response Percent	Response Count
Real-time speed via web/smartphone	0.0%	0
Transit vehicle schedule progress	50.0%	1
Highway information systems	50.0%	1
511 traveler information systems	**100.0%**	**2**
Website traveler information systems	50.0%	1
Travel time message for travelers	0.0%	0
Freight shipper congestion information	0.0%	0
National traffic and road closure information	0.0%	0
	answered question	**2**
	skipped question	**51**

62. Please identify the solutions to the barriers encountered for these strategies.

	Response Percent	Response Count
Real-time speed via web/smartphone	0.0%	0
Transit vehicle schedule progress	**100.0%**	**1**
Highway information systems	0.0%	0
511 traveler information systems	**100.0%**	**1**
Website traveler information systems	0.0%	0
Travel time message for travelers	0.0%	0
Freight shipper congestion information	0.0%	0
National traffic and road closure information	0.0%	0
	answered question	**1**
	skipped question	**52**

63. Please identify the costs ($) for these strategies and note which year these represent (e.g., $100,000 $2008).

	Response Percent	Response Count
Real-time speed via web/smartphone	0.0%	0
Transit vehicle schedule progress	0.0%	0
Highway information systems	0.0%	0
511 traveler information systems	0.0%	0
Website traveler information systems	0.0%	0
Travel time message for travelers	0.0%	0
Freight shipper congestion information	0.0%	0
National traffic and road closure information	0.0%	0
	answered question	**0**
	skipped question	**53**

64. Please identify the calculated or documented benefit/cost ratio or a range for these strategies.

	Response Percent	Response Count
Real-time speed via web/smartphone	0.0%	0
Transit vehicle schedule progress	0.0%	0
Highway information systems	0.0%	0
511 traveler information systems	0.0%	0
Website traveler information systems	0.0%	0
Travel time message for travelers	0.0%	0
Freight shipper congestion information	0.0%	0
National traffic and road closure information	0.0%	0
	answered question	**0**
	skipped question	**53**

65. Has electronic toll collection been implemented in your metropolitan area?

	Response Percent	Response Count
Yes - all toll roads	**52.2%**	**12**
Yes - some toll roads	0.0%	0
No - not on any toll roads	8.7%	2
There are no toll roads in my area	39.1%	9
	answered question	**23**
	skipped question	**30**

66. Which of the following active traffic management strategies have been implemented in your metropolitan area?

	Not Implemented in My Region	Implemented in My Region	Not Implemented, but Planned	Implemented Previously & Future Plans	Technical Documents Are Available	Response Count
Speed harmonization	**86.4% (19)**	0.0% (0)	9.1% (2)	9.1% (2)	0.0% (0)	22
Temporary shoulder use	**72.7% (16)**	13.6% (3)	9.1% (2)	4.5% (1)	0.0% (0)	22
Queue warning	**86.4% (19)**	4.5% (1)	9.1% (2)	4.5% (1)	0.0% (0)	22
Dynamic merge control	**86.4% (19)**	4.5% (1)	9.1% (2)	4.5% (1)	0.0% (0)	22
Construction site management	**54.5% (12)**	36.4% (8)	0.0% (0)	9.1% (2)	0.0% (0)	22
Dynamic truck restrictions	**90.9% (20)**	0.0% (0)	4.5% (1)	4.5% (1)	0.0% (0)	22
Dynamic traveler information and rerouting	**81.8% (18)**	13.6% (3)	4.5% (1)	4.5% (1)	0.0% (0)	22
Automated enforcement	**63.6% (14)**	22.7% (5)	4.5% (1)	9.1% (2)	0.0% (0)	22
					Other (please specify)	0
					answered question	**22**
					skipped question	**31**

67. Please rate the success of these strategies at mitigating congestion in your region.

	Very Unsuccessful	Somewhat Unsuccessful	Average	Somewhat Successful	Very Successful	N/A	Rating Average	Response Count
Speed harmonization	0.0% (0)	0.0% (0)	4.5% (1)	9.1% (2)	0.0% (0)	**86.4% (19)**	3.67	22
Temporary shoulder use	0.0% (0)	0.0% (0)	9.1% (2)	9.1% (2)	0.0% (0)	**81.8% (18)**	3.50	22
Queue warning	0.0% (0)	0.0% (0)	4.5% (1)	4.5% (1)	0.0% (0)	**90.9% (20)**	3.50	22
Dynamic merge control	0.0% (0)	0.0% (0)	9.1% (2)	0.0% (0)	0.0% (0)	**90.9% (20)**	3.00	22
Construction site management	0.0% (0)	4.5% (1)	4.5% (1)	27.3% (6)	9.1% (2)	**54.5% (12)**	3.90	22
Dynamic truck restrictions	0.0% (0)	0.0% (0)	4.5% (1)	0.0% (0)	0.0% (0)	**95.5% (21)**	3.00	22
Dynamic traveler information and rerouting	0.0% (0)	0.0% (0)	13.6% (3)	4.5% (1)	0.0% (0)	**81.8% (18)**	3.25	22
Automated enforcement	0.0% (0)	4.5% (1)	9.1% (2)	9.1% (2)	4.5% (1)	**72.7% (16)**	3.50	22
							Other (please specify)	0
							answered question	**22**
							skipped question	**31**

68. Please rate the ease of implementation for these strategies.

	Very Difficult	Somewhat Difficult	Neutral	Somewhat Easy	Very Easy	N/A	Rating Average	Response Count
Speed harmonization	0.0% (0)	4.5% (1)	9.1% (2)	4.5% (1)	0.0% (0)	**81.8% (18)**	3.00	22
Temporary shoulder use	0.0% (0)	9.1% (2)	4.5% (1)	4.5% (1)	0.0% (0)	**81.8% (18)**	2.75	22
Queue warning	0.0% (0)	4.5% (1)	4.5% (1)	0.0% (0)	0.0% (0)	**90.9% (20)**	2.50	22
Dynamic merge control	0.0% (0)	4.5% (1)	9.1% (2)	4.5% (1)	0.0% (0)	**81.8% (18)**	3.00	22
Construction site management	4.5% (1)	9.1% (2)	13.6% (3)	18.2% (4)	0.0% (0)	**54.5% (12)**	3.00	22
Dynamic truck restrictions	4.5% (1)	0.0% (0)	4.5% (1)	0.0% (0)	0.0% (0)	**90.9% (20)**	2.00	22
Dynamic traveler information and rerouting	0.0% (0)	9.1% (2)	4.5% (1)	9.1% (2)	0.0% (0)	**77.3% (17)**	3.00	22
Automated enforcement	0.0% (0)	13.6% (3)	13.6% (3)	4.5% (1)	0.0% (0)	**68.2% (15)**	2.71	22
							Other (please specify)	0
							answered question	**22**
							skipped question	**31**

69. Please identify barriers encountered for these strategies.

	Response Percent	Response Count
Speed harmonization	0.0%	0
Temporary shoulder use	33.3%	1
Queue warning	0.0%	0
Dynamic merge control	0.0%	0
Construction site management	33.3%	1
Dynamic truck restrictions	0.0%	0
Dynamic traveler information and rerouting	33.3%	1
Automated enforcement	**66.7%**	**2**
	answered question	**3**
	skipped question	**50**

70. Please identify the solutions to the barriers encountered for these strategies.

	Response Percent	Response Count
Speed harmonization	0.0%	0
Temporary shoulder use	0.0%	0
Queue warning	0.0%	0
Dynamic merge control	0.0%	0
Construction site management	0.0%	0
Dynamic truck restrictions	0.0%	0
Dynamic traveler information and rerouting	0.0%	0
Automated enforcement	0.0%	0
	answered question	**0**
	skipped question	**53**

71. Please identify the costs ($) for these strategies and note which year these represent (e.g., $100,000 $2008).

	Response Percent	Response Count
Speed harmonization	0.0%	0
Temporary shoulder use	0.0%	0
Queue warning	0.0%	0
Dynamic merge control	0.0%	0
Construction site management	0.0%	0
Dynamic truck restrictions	0.0%	0
Dynamic traveler information and rerouting	0.0%	0
Automated enforcement	0.0%	0
	answered question	**0**
	skipped question	**53**

72. Please identify the calculated or documented benefit/cost ratio or a range for these strategies.

	Response Percent	Response Count
Speed harmonization	0.0%	0
Temporary shoulder use	0.0%	0
Queue warning	0.0%	0
Dynamic merge control	0.0%	0
Construction site management	0.0%	0
Dynamic truck restrictions	0.0%	0
Dynamic traveler information and rerouting	0.0%	0
Automated enforcement	0.0%	0
	answered question	**0**
	skipped question	**53**

73. Which of the following traffic signal strategies have been implemented in your metropolitan area?

	Not Implemented in My Region	Implemented in My Region	Not Implemented, but Planned	Implemented Previously & Future Plans	Technical Documents Are Available	Response Count
Retiming	4.5% (1)	**63.6% (14)**	4.5% (1)	27.3% (6)	4.5% (1)	22
Coordination	0.0% (0)	**68.2% (15)**	4.5% (1)	27.3% (6)	9.1% (2)	22
Equipment upgrade	4.5% (1)	**63.6% (14)**	4.5% (1)	27.3% (6)	9.1% (2)	22
Adaptive signal controls/demand responsive	18.2% (4)	**36.4% (8)**	13.6% (3)	31.8% (7)	4.5% (1)	22
					Other (please specify)	0
					answered question	**22**
					skipped question	**31**

74. Please rate the success of these strategies at mitigating congestion in your region.

	Very Unsuccessful	Somewhat Unsuccessful	Average	Somewhat Successful	Very Successful	N/A	Rating Average	Response Count
Retiming	0.0% (0)	0.0% (0)	9.1% (2)	**45.5% (10)**	36.4% (8)	9.1% (2)	4.30	22
Coordination	0.0% (0)	4.5% (1)	9.1% (2)	27.3% (6)	**50.0% (11)**	9.1% (2)	4.35	22
Equipment upgrade	0.0% (0)	0.0% (0)	18.2% (4)	**40.9% (9)**	31.8% (7)	9.1% (2)	4.15	22
Adaptive signal controls/demand responsive	0.0% (0)	0.0% (0)	9.1% (2)	27.3% (6)	22.7% (5)	**40.9% (9)**	4.23	22
							Other (please specify)	0
							answered question	**22**
							skipped question	**31**

75. Please rate the ease of implementation for these strategies.

	Very Difficult	Somewhat Difficult	Neutral	Somewhat Easy	Very Easy	N/A	Rating Average	Response Count
Retiming	0.0% (0)	4.5% (1)	18.2% (4)	**36.4% (8)**	31.8% (7)	9.1% (2)	4.05	22
Coordination	0.0% (0)	18.2% (4)	13.6% (3)	**36.4% (8)**	22.7% (5)	9.1% (2)	3.70	22
Equipment upgrade	0.0% (0)	18.2% (4)	**36.4% (8)**	13.6% (3)	22.7% (5)	9.1% (2)	3.45	22
Adaptive signal controls/demand responsive	0.0% (0)	18.2% (4)	13.6% (3)	18.2% (4)	18.2% (4)	**31.8% (7)**	3.53	22
							Other (please specify)	0
							answered question	**22**
							skipped question	**31**

76. Please identify barriers encountered for these strategies.

	Response Percent	Response Count
Retiming	75.0%	3
Coordination	50.0%	2
Equipment upgrade	**100.0%**	**4**
Adaptive signal controls/demand responsive	25.0%	1
answered question		**4**
skipped question		**49**

77. Please identify the solutions to the barriers encountered for these strategies.

	Response Percent	Response Count
Retiming	**75.0%**	**3**
Coordination	**75.0%**	**3**
Equipment upgrade	50.0%	2
Adaptive signal controls/demand responsive	25.0%	1
	answered question	**4**
	skipped question	**49**

78. Please identify the costs ($) for these strategies and note which year these represent (e.g., $100,000 $2008).

	Response Percent	Response Count
Retiming	**100.0%**	**1**
Coordination	**100.0%**	**1**
Equipment upgrade	**100.0%**	**1**
Adaptive signal controls/demand responsive	0.0%	0
answered question		**1**
skipped question		**52**

79. Please identify the calculated or documented benefit/cost ratio or a range for these strategies.

	Response Percent	Response Count
Retiming	**100.0%**	**1**
Coordination	0.0%	0
Equipment upgrade	0.0%	0
Adaptive signal controls/demand responsive	0.0%	0
	answered question	**1**
	skipped question	**52**

80. Has any agency in your metropolitan area implemented reversible lanes/changeable lane assignments on a routine basis?

	Response Percent	Response Count
Yes	18.2%	4
No	**81.8%**	**18**
	answered question	**22**
	skipped question	**31**

81. Are reversible lanes/changeable lane assignments used for special events in your metropolitan area?

	Response Percent	Response Count
Yes	22.7%	5
No	**77.3%**	**17**
	answered question	**22**
	skipped question	**31**

82. Please rate the success of these strategies at mitigating congestion in your region.

	Very Unsuccessful	Somewhat Unsuccessful	Average	Somewhat Successful	Very Successful	N/A	Rating Average	Response Count
Reversible lanes/changeable lane assignments	0.0% (0)	4.5% (1)	4.5% (1)	18.2% (4)	9.1% (2)	**63.6% (14)**	3.88	22
							answered question	**22**
							skipped question	**31**

83. Please rate the ease of implementation for these strategies.

	Very Unsuccessful	Somewhat Unsuccessful	Average	Somewhat Successful	Very Successful	N/A	Rating Average	Response Count
Reversible lanes/changeable lane assignments	0.0% (0)	4.5% (1)	9.1% (2)	9.1% (2)	9.1% (2)	**68.2% (15)**	3.71	22
							answered question	**22**
							skipped question	**31**

84. Please identify barriers encountered for these strategies.

	Response Count
	3
answered question	**3**
skipped question	**50**

85. Please identify the solutions to the barriers encountered for these strategies.

	Response Count
	2
answered question	**2**
skipped question	**51**

86. Please identify the costs ($) for these strategies and note which year these represent (e.g., $100,000 $2008).

	Response Count
	1
answered question	**1**
skipped question	**52**

87. Please identify the calculated or documented benefit/cost ratio or a range for these strategies.

	Response Count
	1
answered question	**1**
skipped question	**52**

88. What is your region's experience with road weather management systems?

	Not Implemented in My Region	Implemented in My Region	Not Implemented, but Planned	Implemented Previously & Future Plans	Technical Documents Are Available	Response Count
Road weather management systems	**50.0% (11)**	45.5% (10)	0.0% (0)	9.1% (2)	0.0% (0)	22
					answered question	**22**
					skipped question	**31**

89. Please rate the success of these strategies at mitigating congestion in your region.

	Very Unsuccessful	Somewhat Unsuccessful	Average	Somewhat Successful	Very Successful	N/A	Rating Average	Response Count
Road weather management systems	0.0% (0)	4.5% (1)	13.6% (3)	27.3% (6)	4.5% (1)	**50.0% (11)**	3.64	22
							answered question	**22**
							skipped question	**31**

90. Please rate the ease of implementation for these strategies.

	Very Difficult	Somewhat Difficult	Neutral	Somewhat Easy	Very Easy	N/A	Rating Average	Response Count
Road weather management systems	0.0% (0)	4.5% (1)	22.7% (5)	22.7% (5)	0.0% (0)	**50.0% (11)**	3.36	22
							answered question	**22**
							skipped question	**31**

91. Please identify barriers encountered for these strategies.

	Response Count
	1
answered question	**1**
skipped question	**52**

92. Please identify the solutions to the barriers encountered for these strategies.

	Response Count
	0
answered question	**0**
skipped question	**53**

93. Please identify the costs ($) for these strategies and note which year these represent (e.g., $100,000 $2008).

	Response Count
	0
answered question	0
skipped question	53

94. Please identify the calculated or documented benefit/cost ratio or a range for these strategies.

	Response Count
	0
answered question	0
skipped question	53

95. Which of the following high occupancy vehicle (HOV) lane strategies have been implemented on FREEWAYS in your metropolitan area?

	Response Percent	Response Count
Separate right-of-way	0.0%	0
Concurrent flow - Barrier separated	9.1%	2
Concurrent flow - Buffer separated	13.6%	3
Contraflow - Barrier separated	4.5%	1
Contraflow - Buffer separated	0.0%	0
None of the above	**81.8%**	**18**
	answered question	**22**
	skipped question	**31**

96. Please rate the success of these strategies at mitigating congestion in your region.

	Very Unsuccessful	Somewhat Unsuccessful	Average	Somewhat Successful	Very Successful	N/A	Rating Average	Response Count
Separate right-of-way	0.0% (0)	0.0% (0)	4.5% (1)	0.0% (0)	0.0% (0)	**95.5% (21)**	3.00	22
Concurrent flow - Barrier separated	0.0% (0)	0.0% (0)	4.5% (1)	4.5% (1)	0.0% (0)	**90.9% (20)**	3.50	22
Concurrent flow - Buffer separated	0.0% (0)	0.0% (0)	13.6% (3)	0.0% (0)	0.0% (0)	**86.4% (19)**	3.00	22
Contraflow - Barrier separated	0.0% (0)	4.5% (1)	4.5% (1)	0.0% (0)	0.0% (0)	**90.9% (20)**	2.50	22
Contraflow - Buffer separated	0.0% (0)	0.0% (0)	4.5% (1)	0.0% (0)	0.0% (0)	**95.5% (21)**	3.00	22
							answered question	**22**
							skipped question	**31**

97. Please rate the ease of implementation for these strategies.

	Very Difficult	Somewhat Difficult	Neutral	Somewhat Easy	Very Easy	N/A	Rating Average	Response Count
Separate right-of-way	0.0% (0)	0.0% (0)	4.5% (1)	0.0% (0)	0.0% (0)	**95.5% (21)**	3.00	22
Concurrent flow - Barrier separated	0.0% (0)	4.5% (1)	4.5% (1)	0.0% (0)	0.0% (0)	**90.9% (20)**	2.50	22
Concurrent flow - Buffer separated	0.0% (0)	0.0% (0)	9.1% (2)	4.5% (1)	0.0% (0)	**86.4% (19)**	3.33	22
Contraflow - Barrier separated	0.0% (0)	0.0% (0)	9.1% (2)	0.0% (0)	0.0% (0)	**90.9% (20)**	3.00	22
Contraflow - Buffer separated	0.0% (0)	0.0% (0)	4.5% (1)	0.0% (0)	0.0% (0)	**95.5% (21)**	3.00	22
							answered question	**22**
							skipped question	**31**

98. Please identify barriers encountered for these strategies.

	Response Count
	0
answered question	**0**
skipped question	**53**

99. Please identify the solutions to the barriers encountered for these strategies.

	Response Count
	0
answered question	0
skipped question	53

100. Please identify the costs ($) for these strategies and note which year these represent (e.g., $100,000 $2008).

	Response Count
	0
answered question	0
skipped question	53

101. Please identify the calculated or documented benefit/cost ratio or a range for these strategies.

	Response Count
	0
answered question	0
skipped question	53

102. Which of the following HOV lane strategies have been implemented on ARTERIAL streets in your metropolitan area?

	Response Percent	Response Count
Concurrent flow	4.5%	1
Contraflow	0.0%	0
Reversible	4.5%	1
Median lane	4.5%	1
None of the above	**90.9%**	**20**
	answered question	**22**
	skipped question	**31**

103. Please rate the success of these strategies at mitigating congestion in your region.

	Very Unsuccessful	Somewhat Unsuccessful	Average	Somewhat Successful	Very Successful	N/A	Rating Average	Response Count
Concurrent flow	0.0% (0)	0.0% (0)	4.5% (1)	4.5% (1)	0.0% (0)	**90.9% (20)**	3.50	22
Contraflow	0.0% (0)	0.0% (0)	4.5% (1)	0.0% (0)	0.0% (0)	**95.5% (21)**	3.00	22
Reversible	0.0% (0)	0.0% (0)	4.5% (1)	4.5% (1)	0.0% (0)	**90.9% (20)**	3.50	22
Median lane	0.0% (0)	0.0% (0)	4.5% (1)	4.5% (1)	0.0% (0)	**90.9% (20)**	3.50	22
							answered question	**22**
							skipped question	**31**

104. Please rate the ease of implementation for these strategies.

	Very Difficult	Somewhat Difficult	Neutral	Somewhat Easy	Very Easy	N/A	Rating Average	Response Count
Concurrent flow	0.0% (0)	0.0% (0)	4.5% (1)	4.5% (1)	0.0% (0)	**90.9% (20)**	3.50	22
Contraflow	0.0% (0)	0.0% (0)	4.5% (1)	0.0% (0)	0.0% (0)	**95.5% (21)**	3.00	22
Reversible	0.0% (0)	0.0% (0)	9.1% (2)	0.0% (0)	0.0% (0)	**90.9% (20)**	3.00	22
Median lane	0.0% (0)	0.0% (0)	4.5% (1)	4.5% (1)	0.0% (0)	**90.9% (20)**	3.50	22
							answered question	**22**
							skipped question	**31**

105. Please identify barriers encountered for these strategies.

	Response Count
	0
answered question	**0**
skipped question	**53**

106. Please identify the solutions to the barriers encountered for these strategies.

	Response Count
	0
answered question	**0**
skipped question	**53**

107. Please identify the costs ($) for these strategies and note which year these represent (e.g., $100,000 $2008).

	Response Count
	0
answered question	**0**
skipped question	**53**

108. Please identify the calculated or documented benefit/cost ratio or a range for these strategies.

	Response Count
	0
answered question	**0**
skipped question	**53**

109. Which of the following HOV-related improvements have been implemented in your metropolitan area?

	Not Implemented in My Region	Implemented in My Region	Not Implemented, but Planned	Implemented Previously & Future Plans	Technical Documents Are Available	Response Count
Park and ride lot integration	**59.1% (13)**	27.3% (6)	0.0% (0)	13.6% (3)	0.0% (0)	22
Rideshare matching services	36.4% (8)	**40.9% (9)**	4.5% (1)	18.2% (4)	0.0% (0)	22
Ramps	**86.4% (19)**	9.1% (2)	0.0% (0)	4.5% (1)	4.5% (1)	22
Ramp by-pass	**90.9% (20)**	4.5% (1)	0.0% (0)	4.5% (1)	4.5% (1)	22
Publicity/outreach	36.4% (8)	**45.5% (10)**	0.0% (0)	22.7% (5)	0.0% (0)	22
Park and ride facilities	27.3% (6)	**54.5% (12)**	0.0% (0)	18.2% (4)	0.0% (0)	22
Casual carpool facilities	**54.5% (12)**	36.4% (8)	0.0% (0)	13.6% (3)	0.0% (0)	22
HOV toll discounts	**90.9% (20)**	4.5% (1)	0.0% (0)	4.5% (1)	0.0% (0)	22
					Other (please specify)	0
					answered question	**22**
					skipped question	**31**

110. Please rate the success of these strategies at mitigating congestion in your region.

	Very Unsuccessful	Somewhat Unsuccessful	Average	Somewhat Successful	Very Successful	N/A	Rating Average	Response Count
Park and ride lot integration	0.0% (0)	0.0% (0)	27.3% (6)	13.6% (3)	4.5% (1)	**54.5% (12)**	3.50	22
Rideshare matching services	4.5% (1)	9.1% (2)	18.2% (4)	22.7% (5)	4.5% (1)	**40.9% (9)**	3.23	22
Ramps	0.0% (0)	0.0% (0)	18.2% (4)	0.0% (0)	0.0% (0)	**81.8% (18)**	3.00	22
Ramp by-pass	0.0% (0)	0.0% (0)	9.1% (2)	4.5% (1)	0.0% (0)	**86.4% (19)**	3.33	22
Publicity/outreach	0.0% (0)	9.1% (2)	27.3% (6)	22.7% (5)	4.5% (1)	**36.4% (8)**	3.36	22
Park and ride facilities	0.0% (0)	0.0% (0)	**31.8% (7)**	27.3% (6)	9.1% (2)	**31.8% (7)**	3.67	22
Casual carpool facilities	0.0% (0)	0.0% (0)	27.3% (6)	18.2% (4)	4.5% (1)	**50.0% (11)**	3.55	22
HOV toll discounts	4.5% (1)	0.0% (0)	9.1% (2)	4.5% (1)	4.5% (1)	**77.3% (17)**	3.20	22
							answered question	**22**
							skipped question	**31**

111. Please rate the ease of implementation for these strategies.

	Very Difficult	Somewhat Difficult	Neutral	Somewhat Easy	Very Easy	N/A	Rating Average	Response Count
Park and ride lot integration	0.0% (0)	9.1% (2)	22.7% (5)	13.6% (3)	0.0% (0)	**54.5% (12)**	3.10	22
Rideshare matching services	4.5% (1)	13.6% (3)	18.2% (4)	22.7% (5)	0.0% (0)	**40.9% (9)**	3.00	22
Ramps	4.5% (1)	4.5% (1)	13.6% (3)	0.0% (0)	0.0% (0)	**77.3% (17)**	2.40	22
Ramp by-pass	4.5% (1)	0.0% (0)	9.1% (2)	0.0% (0)	0.0% (0)	**86.4% (19)**	2.33	22
Publicity/outreach	0.0% (0)	4.5% (1)	27.3% (6)	18.2% (4)	13.6% (3)	**36.4% (8)**	3.64	22
Park and ride facilities	0.0% (0)	18.2% (4)	27.3% (6)	22.7% (5)	0.0% (0)	**31.8% (7)**	3.07	22
Casual carpool facilities	0.0% (0)	9.1% (2)	13.6% (3)	22.7% (5)	9.1% (2)	**45.5% (10)**	3.58	22
HOV toll discounts	0.0% (0)	0.0% (0)	9.1% (2)	9.1% (2)	0.0% (0)	**81.8% (18)**	3.50	22
							answered question	**22**
							skipped question	**31**

112. Please identify barriers encountered for these strategies.

	Response Count
	2
answered question	**2**
skipped question	**51**

113. Please identify the solutions to the barriers encountered for these strategies.

	Response Count
	2
answered question	2
skipped question	51

114. Please identify the costs ($) for these strategies and note which year these represent (e.g., $100,000 $2008).

	Response Count
	0
answered question	0
skipped question	53

115. Please identify the calculated or documented benefit/cost ratio or a range for these strategies.

	Response Count
	0
answered question	0
skipped question	53

116. Which of the following special lane designations exist in your metropolitan area?

	Response Percent	Response Count
Bus lanes	18.2%	4
Truck lanes	0.0%	0
None of the above	**81.8%**	**18**
	answered question	**22**
	skipped question	**31**

117. Please identify barriers encountered for these strategies.

	Response Count
	0
answered question	**0**
skipped question	**53**

118. Please identify the solutions to the barriers encountered for these strategies.

	Response Count
	0
answered question	0
skipped question	53

119. Please identify the costs ($) for these strategies and note which year these represent (e.g., $100,000 $2008).

	Response Count
	0
answered question	0
skipped question	53

120. Please identify the calculated or documented benefit/cost ratio or a range for these strategies.

	Response Count
	0
answered question	0
skipped question	53

121. My region applies incident management techniques to:

	Response Percent	Response Count
Highways/freeways only	**54.5%**	**12**
Arterials only	0.0%	0
Highways/freeways and arterials	31.8%	7
None of the above	13.6%	3
answered question		**22**
skipped question		**31**

122. Which of the following incident management strategies have been implemented in your metropolitan area?

	Not Implemented in My Region	Implemented in My Region	Not Implemented, but Planned	Implemented Previously & Future Plans	Technical Documents Are Available	Response Count
Camera monitoring	18.2% (4)	**63.6% (14)**	0.0% (0)	13.6% (3)	4.5% (1)	22
Raodway detectors/surveillance	22.7% (5)	**54.5% (12)**	4.5% (1)	13.6% (3)	4.5% (1)	22
Traffic/courtesy patrols	**36.4% (8)**	**36.4% (8)**	9.1% (2)	13.6% (3)	4.5% (1)	22
Response teams	27.3% (6)	**45.5% (10)**	9.1% (2)	13.6% (3)	4.5% (1)	22
Responder vehicle priority	31.8% (7)	**40.9% (9)**	9.1% (2)	13.6% (3)	4.5% (1)	22
Alternative route planning	**36.4% (8)**	**36.4% (8)**	13.6% (3)	9.1% (2)	4.5% (1)	22
Variable message signs	13.6% (3)	**63.6% (14)**	4.5% (1)	13.6% (3)	4.5% (1)	22
Advisory radio	**40.9% (9)**	**40.9% (9)**	4.5% (1)	9.1% (2)	4.5% (1)	22
					Other (please specify)	0
					answered question	**22**
					skipped question	**31**

123. Please rate the success of these strategies at mitigating congestion in your region.

	Very Unsuccessful	Somewhat Unsuccessful	Average	Somewhat Successful	Very Successful	N/A	Rating Average	Response Count
Camera monitoring	0.0% (0)	4.5% (1)	18.2% (4)	**27.3% (6)**	**27.3% (6)**	22.7% (5)	4.00	22
Raodway detectors/surveillance	0.0% (0)	4.5% (1)	18.2% (4)	18.2% (4)	27.3% (6)	**31.8% (7)**	4.00	22
Traffic/courtesy patrols	0.0% (0)	0.0% (0)	9.1% (2)	22.7% (5)	22.7% (5)	**45.5% (10)**	4.25	22
Response teams	0.0% (0)	0.0% (0)	18.2% (4)	18.2% (4)	27.3% (6)	**36.4% (8)**	4.14	22
Responder vehicle priority	0.0% (0)	0.0% (0)	13.6% (3)	27.3% (6)	13.6% (3)	**45.5% (10)**	4.00	22
Alternative route planning	0.0% (0)	0.0% (0)	13.6% (3)	9.1% (2)	18.2% (4)	**59.1% (13)**	4.11	22
Variable message signs	0.0% (0)	9.1% (2)	22.7% (5)	18.2% (4)	**27.3% (6)**	22.7% (5)	3.82	22
Advisory radio	0.0% (0)	0.0% (0)	18.2% (4)	18.2% (4)	18.2% (4)	**45.5% (10)**	4.00	22
							Other (please specify)	0
							answered question	**22**
							skipped question	**31**

124. Please rate the ease of implementation for these strategies.

	Very Difficult	Somewhat Difficult	Neutral	Somewhat Easy	Very Easy	N/A	Rating Average	Response Count
Camera monitoring	0.0% (0)	18.2% (4)	**31.8% (7)**	27.3% (6)	0.0% (0)	22.7% (5)	3.12	22
Raodway detectors/surveillance	0.0% (0)	18.2% (4)	**31.8% (7)**	22.7% (5)	0.0% (0)	27.3% (6)	3.06	22
Traffic/courtesy patrols	0.0% (0)	4.5% (1)	31.8% (7)	18.2% (4)	0.0% (0)	**45.5% (10)**	3.25	22
Response teams	0.0% (0)	4.5% (1)	**40.9% (9)**	18.2% (4)	0.0% (0)	36.4% (8)	3.21	22
Responder vehicle priority	0.0% (0)	4.5% (1)	22.7% (5)	27.3% (6)	0.0% (0)	**45.5% (10)**	3.42	22
Alternative route planning	0.0% (0)	13.6% (3)	18.2% (4)	13.6% (3)	0.0% (0)	**54.5% (12)**	3.00	22
Variable message signs	0.0% (0)	9.1% (2)	**40.9% (9)**	27.3% (6)	0.0% (0)	22.7% (5)	3.24	22
Advisory radio	0.0% (0)	9.1% (2)	22.7% (5)	18.2% (4)	0.0% (0)	**50.0% (11)**	3.18	22
							Other (please specify)	0
							answered question	**22**
							skipped question	**31**

125. Please identify barriers encountered for these strategies.

	Response Percent	Response Count
Camera monitoring	25.0%	1
Raodway detectors/surveillance	25.0%	1
Traffic/courtesy patrols	0.0%	0
Response teams	25.0%	1
Responder vehicle priority	25.0%	1
Alternative route planning	25.0%	1
Variable message signs	**75.0%**	**3**
Advisory radio	25.0%	1
	answered question	**4**
	skipped question	**49**

126. Please identify the solutions to the barriers encountered for these strategies.

	Response Percent	Response Count
Camera monitoring	0.0%	0
Raodway detectors/surveillance	0.0%	0
Traffic/courtesy patrols	0.0%	0
Response teams	0.0%	0
Responder vehicle priority	0.0%	0
Alternative route planning	**100.0%**	**1**
Variable message signs	0.0%	0
Advisory radio	0.0%	0
	answered question	**1**
	skipped question	**52**

127. Please identify the costs ($) for these strategies and note which year these represent (e.g., $100,000 $2008).

	Response Percent	Response Count
Camera monitoring	0.0%	0
Raodway detectors/surveillance	0.0%	0
Traffic/courtesy patrols	0.0%	0
Response teams	0.0%	0
Responder vehicle priority	0.0%	0
Alternative route planning	0.0%	0
Variable message signs	0.0%	0
Advisory radio	0.0%	0
	answered question	**0**
	skipped question	**53**

128. Please identify the calculated or documented benefit/cost ratio or a range for these strategies.

	Response Percent	Response Count
Camera monitoring	0.0%	0
Raodway detectors/surveillance	0.0%	0
Traffic/courtesy patrols	0.0%	0
Response teams	0.0%	0
Responder vehicle priority	0.0%	0
Alternative route planning	0.0%	0
Variable message signs	0.0%	0
Advisory radio	0.0%	0
	answered question	**0**
	skipped question	**53**

129. Which of the following transit capital improvements have been made in your metropolitan area?

	Response Percent	Response Count
Fleet expansion	63.6%	14
Vehicle replacement/upgrade	**90.9%**	**20**
Change vehicle types	40.9%	9
Vehicle management systems	54.5%	12
None of the above	9.1%	2
	answered question	**22**
	skipped question	**31**

130. Please describe the barriers faced with implementation of these capital improvements and the solutions that overcame those barriers.

	Response Count
	5
answered question	**5**
skipped question	**48**

131. Please provide descriptions and related costs of the transit capital improvements noted in the previous question that were made in the past five years.

	Response Count
	3
answered question	**3**
skipped question	**50**

132. Which of the following transit support facilities have been built in your metropolitan area?

	Response Percent	Response Count
Park and ride lots	**81.8%**	**18**
Transit centers	72.7%	16
Improved station amenities	50.0%	11
None of the above	9.1%	2
answered question		**22**
skipped question		**31**

133. Please describe the barriers faced with implementation of these support facilities and the solutions that overcame those barriers.

	Response Count
	3
answered question	3
skipped question	50

134. Please provide descriptions and related costs of the transit support facilities noted in the previous question that were made in the past five years.

	Response Count
	1
answered question	1
skipped question	52

135. Which of the following transit exclusive right-of-way improvements/acquistions have been made in your metropolitan area?

	Response Percent	Response Count
Heavy rail	4.5%	1
Commuter rail	9.1%	2
Light rail	9.1%	2
Bus rapid transit/busway	13.6%	3
Bus lanes	13.6%	3
Bus bypass ramps	0.0%	0
None of the above	**63.6%**	**14**
	answered question	**22**
	skipped question	**31**

136. Please describe the barriers faced with implementation of these exclusive right-of-way facilities and the solutions that overcame those barriers.

	Response Count
	4
answered question	4
skipped question	49

137. Please provide descriptions and related costs of these exclusive right-of-way facilities noted in the previous question that were made in the past five years.

	Response Count
	0
answered question	0
skipped question	53

138. Which of the following transit operational improvements have been implemented in your metropolitan area?

	Response Percent	Response Count
Increased frequency (decreased headways)	59.1%	13
Additional stops	40.9%	9
Modify operating hours	63.6%	14
Schedule coordination	54.5%	12
Improved transfers	59.1%	13
Route modifications	72.7%	16
Route expansions	68.2%	15
Express routes	77.3%	17
Activity center circulator buses	31.8%	7
Paratransit	**81.8%**	**18**
Neighborhood circulator buses	40.9%	9
Signal priorities for transit vehicles	22.7%	5
Signal coordination for transit vehicles	9.1%	2
Bus turnouts	45.5%	10
Rail crossing coordination	4.5%	1

HOV signal priority		0.0%	0
None of the above		9.1%	2
		answered question	**22**
		skipped question	**31**

139. Please describe the barriers faced with implementation of these transit operational improvements and the solutions that overcame those barriers.

	Response Count
	8
answered question	**8**
skipped question	**45**

140. Please provide descriptions and related costs of these transit operational improvements noted in the previous question that were made in the past five years.

	Response Count
	0
answered question	**0**
skipped question	**53**

141. Which of the following transit policy strategies have been implemented in your metropolitan area?

	Response Percent	Response Count
Marketing	**77.3%**	**17**
Agency coordination	68.2%	15
Real-time traveler information systems	31.8%	7
Fare reduction incentives	45.5%	10
Fare package incentives	59.1%	13
Employer-paid transit passes	59.1%	13
None of the above	9.1%	2
	answered question	**22**
	skipped question	**31**

142. Please describe the barriers faced with implementation of these transit policy strategies and the solutions that overcame those barriers.

	Response Count
	3
answered question	**3**
skipped question	**50**

143. Please provide descriptions and related costs of these transit policy strategies noted in the previous question that were made in the past five years.

	Response Count
	0
answered question	**0**
skipped question	**53**

144. Please list and describe any multimodal transportation centers that have been built in your metropolitan area.

	Response Count
	22
answered question	**22**
skipped question	**31**

145. Please list and describe any freight rail improvements that have been implemented in your metropolitan area.

	Response Count
	22
answered question	**22**
skipped question	**31**

146. Which of the following design guidelines have been implemented in your metropolitan area?

	Response Percent	Response Count
Maximum block lengths	22.7%	5
Building setbacks	40.9%	9
Streetscape enhancements	**54.5%**	**12**
Sidewalk widths	50.0%	11
There are others (please list in the following question)	4.5%	1
None of the above	27.3%	6
	Other (please specify)	2
	answered question	**22**
	skipped question	**31**

147. Which of the following bicycle/pedestrian improvements have been implemented in your metropolitan area?

	Not Implemented in My Region	Implemented in My Region	Not Implemented, but Planned	Implemented Previously & Future Plans	Technical Documents Are Available	Response Count
Designated bike lanes by restriping existing roadways	22.7% (5)	**50.0% (11)**	4.5% (1)	27.3% (6)	4.5% (1)	22
Designated bike lanes using separate paths	27.3% (6)	**59.1% (13)**	0.0% (0)	18.2% (4)	4.5% (1)	22
Improved facilities (e.g. lighting, signing, etc)	4.5% (1)	**68.2% (15)**	4.5% (1)	22.7% (5)	4.5% (1)	22
New sidewalks	9.1% (2)	**72.7% (16)**	0.0% (0)	18.2% (4)	4.5% (1)	22
Wider sidewalks	36.4% (8)	**45.5% (10)**	4.5% (1)	13.6% (3)	0.0% (0)	22
Rails to trails developments	13.6% (3)	**50.0% (11)**	18.2% (4)	22.7% (5)	0.0% (0)	22
					answered question	**22**
					skipped question	**31**

148. Please rate the success of these strategies at mitigating congestion in your region.

	Very Unsuccessful	Somewhat Unsuccessful	Average	Somewhat Successful	Very Successful	N/A	Rating Average	Response Count
Designated bike lanes by restriping existing roadways	0.0% (0)	4.5% (1)	27.3% (6)	18.2% (4)	18.2% (4)	**31.8% (7)**	3.73	22
Designated bike lanes using separate paths	0.0% (0)	9.1% (2)	18.2% (4)	13.6% (3)	22.7% (5)	**36.4% (8)**	3.79	22
Improved facilities (e.g. lighting, signing, etc)	0.0% (0)	9.1% (2)	**36.4% (8)**	27.3% (6)	13.6% (3)	13.6% (3)	3.53	22
New sidewalks	0.0% (0)	4.5% (1)	**50.0% (11)**	18.2% (4)	13.6% (3)	13.6% (3)	3.47	22
Wider sidewalks	0.0% (0)	9.1% (2)	**36.4% (8)**	9.1% (2)	9.1% (2)	**36.4% (8)**	3.29	22
Rails to trails developments	4.5% (1)	13.6% (3)	**27.3% (6)**	18.2% (4)	9.1% (2)	**27.3% (6)**	3.19	22
							answered question	**22**
							skipped question	**31**

149. Please rate the ease of implementation for these strategies.

	Very Difficult	Somewhat Difficult	Neutral	Somewhat Easy	Very Easy	N/A	Rating Average	Response Count
Designated bike lanes by restriping existing roadways	0.0% (0)	4.5% (1)	**36.4% (8)**	27.3% (6)	9.1% (2)	22.7% (5)	3.53	22
Designated bike lanes using separate paths	0.0% (0)	**36.4% (8)**	27.3% (6)	9.1% (2)	0.0% (0)	27.3% (6)	2.63	22
Improved facilities (e.g. lighting, signing, etc)	0.0% (0)	4.5% (1)	**54.5% (12)**	31.8% (7)	4.5% (1)	4.5% (1)	3.38	22
New sidewalks	0.0% (0)	18.2% (4)	**50.0% (11)**	22.7% (5)	0.0% (0)	9.1% (2)	3.05	22
Wider sidewalks	0.0% (0)	22.7% (5)	27.3% (6)	18.2% (4)	0.0% (0)	**31.8% (7)**	2.93	22
Rails to trails developments	0.0% (0)	**50.0% (11)**	18.2% (4)	13.6% (3)	0.0% (0)	18.2% (4)	2.56	22
							answered question	**22**
							skipped question	**31**

150. Please identify barriers encountered for these strategies.

	Response Percent	Response Count
Designated bike lanes by restriping existing roadways	**75.0%**	**3**
Designated bike lanes using separate paths	50.0%	2
Improved facilities (e.g. lighting, signing, etc)	50.0%	2
New sidewalks	50.0%	2
Wider sidewalks	0.0%	0
Rails to trails developments	**75.0%**	**3**
	answered question	**4**
	skipped question	**49**

151. Please identify the solutions to the barriers encountered for these strategies.

	Response Percent	Response Count
Designated bike lanes by restriping existing roadways	0.0%	0
Designated bike lanes using separate paths	0.0%	0
Improved facilities (e.g. lighting, signing, etc)	0.0%	0
New sidewalks	0.0%	0
Wider sidewalks	0.0%	0
Rails to trails developments	0.0%	0
	answered question	**0**
	skipped question	**53**

152. Please identify the costs ($) for these strategies and note which year these represent (e.g., $100,000 $2008).

		Response Percent	Response Count
Designated bike lanes by restriping existing roadways		0.0%	0
Designated bike lanes using separate paths		0.0%	0
Improved facilities (e.g. lighting, signing, etc)		0.0%	0
New sidewalks		0.0%	0
Wider sidewalks		0.0%	0
Rails to trails developments		0.0%	0
		answered question	**0**
		skipped question	**53**

153. Please identify the calculated or documented benefit/cost ratio or a range for these strategies.

	Response Percent	Response Count
Designated bike lanes by restriping existing roadways	0.0%	0
Designated bike lanes using separate paths	0.0%	0
Improved facilities (e.g. lighting, signing, etc)	0.0%	0
New sidewalks	0.0%	0
Wider sidewalks	0.0%	0
Rails to trails developments	0.0%	0
	answered question	**0**
	skipped question	**53**

154. Which of the following bicycle/pedestrian support services have been implemented in your metropolitan area?

	Not Implemented in My Region	Implemented in My Region	Not Implemented, but Planned	Implemented Previously & Future Plans	Technical Documents Are Available	Response Count
Bike racks at transit stations	9.1% (2)	**72.7% (16)**	4.5% (1)	13.6% (3)	4.5% (1)	22
Bike racks on transit vehicles	0.0% (0)	**86.4% (19)**	0.0% (0)	18.2% (4)	4.5% (1)	22
Bike racks at destinations	9.1% (2)	**63.6% (14)**	4.5% (1)	18.2% (4)	9.1% (2)	22
Lockers at transit stations	**59.1% (13)**	27.3% (6)	4.5% (1)	9.1% (2)	4.5% (1)	22
Lockers at destinations	**68.2% (15)**	18.2% (4)	0.0% (0)	9.1% (2)	9.1% (2)	22
Shower facilities at transit stations	**90.9% (20)**	0.0% (0)	0.0% (0)	4.5% (1)	9.1% (2)	22
Shower facilities at destinations	**77.3% (17)**	13.6% (3)	0.0% (0)	4.5% (1)	9.1% (2)	22
Route maps	18.2% (4)	**68.2% (15)**	0.0% (0)	13.6% (3)	4.5% (1)	22
Bike sharing	**77.3% (17)**	13.6% (3)	0.0% (0)	9.1% (2)	9.1% (2)	22
Coordinators	**59.1% (13)**	36.4% (8)	0.0% (0)	9.1% (2)	4.5% (1)	22
Supporting ordinances	40.9% (9)	**45.5% (10)**	0.0% (0)	9.1% (2)	9.1% (2)	22
Promotional campaigns	18.2% (4)	**59.1% (13)**	0.0% (0)	18.2% (4)	9.1% (2)	22
Promotional campaigns via media	**40.9% (9)**	36.4% (8)	0.0% (0)	18.2% (4)	9.1% (2)	22
Educational outreach	13.6% (3)	**68.2% (15)**	0.0% (0)	18.2% (4)	4.5% (1)	22
					answered question	**22**
					skipped question	**31**

155. Please rate the success of these strategies at mitigating congestion in your region.

	Very Unsuccessful	Somewhat Unsuccessful	Average	Somewhat Successful	Very Successful	N/A	Rating Average	Response Count
Bike racks at transit stations	0.0% (0)	18.2% (4)	**31.8% (7)**	13.6% (3)	13.6% (3)	22.7% (5)	3.29	22
Bike racks on transit vehicles	0.0% (0)	18.2% (4)	**40.9% (9)**	13.6% (3)	18.2% (4)	9.1% (2)	3.35	22
Bike racks at destinations	4.5% (1)	18.2% (4)	**27.3% (6)**	13.6% (3)	18.2% (4)	18.2% (4)	3.28	22
Lockers at transit stations	4.5% (1)	4.5% (1)	27.3% (6)	9.1% (2)	0.0% (0)	**54.5% (12)**	2.90	22
Lockers at destinations	4.5% (1)	4.5% (1)	22.7% (5)	4.5% (1)	0.0% (0)	**63.6% (14)**	2.75	22
Shower facilities at transit stations	4.5% (1)	0.0% (0)	18.2% (4)	0.0% (0)	0.0% (0)	**77.3% (17)**	2.60	22
Shower facilities at destinations	4.5% (1)	0.0% (0)	18.2% (4)	9.1% (2)	0.0% (0)	**68.2% (15)**	3.00	22
Route maps	4.5% (1)	9.1% (2)	**31.8% (7)**	9.1% (2)	22.7% (5)	22.7% (5)	3.47	22
Bike sharing	4.5% (1)	0.0% (0)	22.7% (5)	9.1% (2)	4.5% (1)	**59.1% (13)**	3.22	22
Coordinators	4.5% (1)	9.1% (2)	22.7% (5)	18.2% (4)	4.5% (1)	**40.9% (9)**	3.15	22
Supporting ordinances	4.5% (1)	9.1% (2)	22.7% (5)	18.2% (4)	4.5% (1)	**40.9% (9)**	3.15	22
Promotional campaigns	0.0% (0)	4.5% (1)	**36.4% (8)**	22.7% (5)	9.1% (2)	27.3% (6)	3.50	22
Promotional campaigns via media	4.5% (1)	4.5% (1)	27.3% (6)	9.1% (2)	9.1% (2)	**45.5% (10)**	3.25	22
Educational outreach	0.0% (0)	9.1% (2)	**36.4% (8)**	18.2% (4)	13.6% (3)	22.7% (5)	3.47	22
							answered question	**22**
							skipped question	**31**

156. Please rate the ease of implementation for these strategies.

	Very Difficult	Somewhat Difficult	Neutral	Somewhat Easy	Very Easy	N/A	Rating Average	Response Count
Bike racks at transit stations	0.0% (0)	4.5% (1)	18.2% (4)	**36.4% (8)**	22.7% (5)	18.2% (4)	3.94	22
Bike racks on transit vehicles	0.0% (0)	4.5% (1)	31.8% (7)	**36.4% (8)**	18.2% (4)	9.1% (2)	3.75	22
Bike racks at destinations	4.5% (1)	9.1% (2)	**27.3% (6)**	18.2% (4)	22.7% (5)	18.2% (4)	3.56	22
Lockers at transit stations	4.5% (1)	9.1% (2)	18.2% (4)	9.1% (2)	4.5% (1)	**54.5% (12)**	3.00	22
Lockers at destinations	4.5% (1)	4.5% (1)	22.7% (5)	9.1% (2)	4.5% (1)	**54.5% (12)**	3.10	22
Shower facilities at transit stations	9.1% (2)	13.6% (3)	9.1% (2)	0.0% (0)	0.0% (0)	**68.2% (15)**	2.00	22
Shower facilities at destinations	4.5% (1)	13.6% (3)	18.2% (4)	0.0% (0)	0.0% (0)	**63.6% (14)**	2.38	22
Route maps	4.5% (1)	4.5% (1)	13.6% (3)	**31.8% (7)**	27.3% (6)	18.2% (4)	3.89	22
Bike sharing	4.5% (1)	18.2% (4)	13.6% (3)	0.0% (0)	0.0% (0)	**63.6% (14)**	2.25	22
Coordinators	4.5% (1)	9.1% (2)	22.7% (5)	13.6% (3)	9.1% (2)	**40.9% (9)**	3.23	22
Supporting ordinances	4.5% (1)	9.1% (2)	22.7% (5)	18.2% (4)	4.5% (1)	**40.9% (9)**	3.15	22
Promotional campaigns	0.0% (0)	4.5% (1)	**27.3% (6)**	13.6% (3)	**27.3% (6)**	**27.3% (6)**	3.88	22
Promotional campaigns via media	4.5% (1)	9.1% (2)	18.2% (4)	4.5% (1)	18.2% (4)	**45.5% (10)**	3.42	22
Educational outreach	0.0% (0)	9.1% (2)	**31.8% (7)**	9.1% (2)	27.3% (6)	22.7% (5)	3.71	22
							answered question	**22**
							skipped question	**31**

157. Please identify barriers encountered for these strategies.

	Response Percent	Response Count
Bike racks at transit stations	**50.0%**	**1**
Bike racks on transit vehicles	**50.0%**	**1**
Bike racks at destinations	0.0%	0
Lockers at transit stations	0.0%	0
Lockers at destinations	0.0%	0
Shower facilities at transit stations	0.0%	0
Shower facilities at destinations	0.0%	0
Route maps	0.0%	0
Bike sharing	0.0%	0
Coordinators	0.0%	0
Supporting ordinances	0.0%	0
Promotional campaigns	0.0%	0
Promotional campaigns via media	0.0%	0
Educational outreach	0.0%	0
	answered question	**2**

	skipped question	51

158. Please identify the solutions to the barriers encountered for these strategies.

	Response Percent	Response Count
Bike racks at transit stations	0.0%	0
Bike racks on transit vehicles	0.0%	0
Bike racks at destinations	0.0%	0
Lockers at transit stations	0.0%	0
Lockers at destinations	0.0%	0
Shower facilities at transit stations	0.0%	0
Shower facilities at destinations	0.0%	0
Route maps	0.0%	0
Bike sharing	0.0%	0
Coordinators	0.0%	0
Supporting ordinances	0.0%	0
Promotional campaigns	0.0%	0
Promotional campaigns via media	0.0%	0
Educational outreach	0.0%	0
	answered question	**0**

	skipped question	**53**

159. Please identify the costs ($) for these strategies and note which year these represent (e.g., $100,000 $2008).

	Response Percent	Response Count
Bike racks at transit stations	0.0%	0
Bike racks on transit vehicles	0.0%	0
Bike racks at destinations	0.0%	0
Lockers at transit stations	0.0%	0
Lockers at destinations	0.0%	0
Shower facilities at transit stations	0.0%	0
Shower facilities at destinations	0.0%	0
Route maps	0.0%	0
Bike sharing	0.0%	0
Coordinators	0.0%	0
Supporting ordinances	0.0%	0
Promotional campaigns	0.0%	0
Promotional campaigns via media	0.0%	0
Educational outreach	0.0%	0
	answered question	**0**

	skipped question	53

160. Please identify the calculated or documented benefit/cost ratio or a range for these strategies.

	Response Percent	Response Count
Bike racks at transit stations	0.0%	0
Bike racks on transit vehicles	0.0%	0
Bike racks at destinations	0.0%	0
Lockers at transit stations	0.0%	0
Lockers at destinations	0.0%	0
Shower facilities at transit stations	0.0%	0
Shower facilities at destinations	0.0%	0
Route maps	0.0%	0
Bike sharing	0.0%	0
Coordinators	0.0%	0
Supporting ordinances	0.0%	0
Promotional campaigns	0.0%	0
Promotional campaigns via media	0.0%	0
Educational outreach	0.0%	0
	answered question	0

skipped question	53

161. Which of the following contracting strategies have been utilized in your metropolitan area?

	Not Implemented in My Region	Implemented in My Region	Not Implemented, but Planned	Implemented Previously & Future Plans	Response Count
Allowable working days and working hours	**63.6% (14)**	27.3% (6)	0.0% (0)	9.1% (2)	22
Financial incentives/disincentives for high-priority projects	**59.1% (13)**	31.8% (7)	0.0% (0)	9.1% (2)	22
A+B bidding	**86.4% (19)**	9.1% (2)	0.0% (0)	4.5% (1)	22
Lane rentals	**95.5% (21)**	0.0% (0)	0.0% (0)	4.5% (1)	22
				Other (please specify)	1
				answered question	**22**
				skipped question	**31**

162. Please rate the success of these strategies at mitigating congestion in your region.

	Very Unsuccessful	Somewhat Unsuccessful	Average	Somewhat Successful	Very Successful	N/A	Rating Average	Response Count
Allowable working days and working hours	0.0% (0)	0.0% (0)	13.6% (3)	0.0% (0)	18.2% (4)	**68.2% (15)**	4.14	22
Financial incentives/disincentives for high-priority projects	0.0% (0)	0.0% (0)	13.6% (3)	9.1% (2)	13.6% (3)	**63.6% (14)**	4.00	22
A+B bidding	0.0% (0)	0.0% (0)	9.1% (2)	0.0% (0)	0.0% (0)	**90.9% (20)**	3.00	22
Lane rentals	0.0% (0)	0.0% (0)	4.5% (1)	0.0% (0)	0.0% (0)	**95.5% (21)**	3.00	22
							Other (please specify)	0
							answered question	**22**
							skipped question	**31**

163. Please rate the ease of implementation for these strategies.

	Very Difficult	Somewhat Difficult	Neutral	Somewhat Easy	Very Easy	N/A	Rating Average	Response Count
Allowable working days and working hours	0.0% (0)	4.5% (1)	18.2% (4)	0.0% (0)	9.1% (2)	**68.2% (15)**	3.43	22
Financial incentives/disincentives for high-priority projects	0.0% (0)	9.1% (2)	22.7% (5)	0.0% (0)	4.5% (1)	**63.6% (14)**	3.00	22
A+B bidding	0.0% (0)	0.0% (0)	9.1% (2)	0.0% (0)	0.0% (0)	**90.9% (20)**	3.00	22
Lane rentals	0.0% (0)	0.0% (0)	4.5% (1)	0.0% (0)	0.0% (0)	**95.5% (21)**	3.00	22
							Other (please specify)	0
							answered question	**22**
							skipped question	**31**

164. Please identify barriers encountered for these strategies.

	Response Percent	Response Count
Allowable working days and working hours	0.0%	0
Financial incentives/disincentives for high-priority projects	0.0%	0
A+B bidding	0.0%	0
Lane rentals	0.0%	0
	answered question	**0**
	skipped question	**53**

165. Please identify the solutions to the barriers encountered for these strategies.

	Response Percent	Response Count
Allowable working days and working hours	0.0%	0
Financial incentives/disincentives for high-priority projects	0.0%	0
A+B bidding	0.0%	0
Lane rentals	0.0%	0
	answered question	**0**
	skipped question	**53**

166. Which of the following strategies have been utilitzed in your metropolitan area?

	Not Implemented in My Region	Implemented in My Region	Not Implemented, but Planned	Implemented Previously & Future Plans	Response Count
Work zone management	18.2% (4)	**72.7% (16)**	0.0% (0)	9.1% (2)	22
Warranty contracting	**54.5% (12)**	31.8% (7)	0.0% (0)	13.6% (3)	22
Advance information	27.3% (6)	**59.1% (13)**	0.0% (0)	13.6% (3)	22
Trailblazing/detours	40.9% (9)	**45.5% (10)**	0.0% (0)	13.6% (3)	22
Management plans	36.4% (8)	**50.0% (11)**	0.0% (0)	13.6% (3)	22
Design-build	31.8% (7)	**59.1% (13)**	0.0% (0)	9.1% (2)	22
Job order (on-call) contracting	**68.2% (15)**	18.2% (4)	0.0% (0)	13.6% (3)	22
				answered question	**22**
				skipped question	**31**

167. Please rate the success of these strategies at mitigating congestion in your region.

	Very Unsuccessful	Somewhat Unsuccessful	Average	Somewhat Successful	Very Successful	N/A	Rating Average	Response Count
Work zone management	0.0% (0)	4.5% (1)	22.7% (5)	**31.8% (7)**	13.6% (3)	27.3% (6)	3.75	22
Warranty contracting	0.0% (0)	0.0% (0)	13.6% (3)	18.2% (4)	4.5% (1)	**63.6% (14)**	3.75	22
Advance information	0.0% (0)	4.5% (1)	9.1% (2)	36.4% (8)	9.1% (2)	**40.9% (9)**	3.85	22
Trailblazing/detours	0.0% (0)	0.0% (0)	13.6% (3)	18.2% (4)	13.6% (3)	**54.5% (12)**	4.00	22
Management plans	0.0% (0)	0.0% (0)	13.6% (3)	22.7% (5)	13.6% (3)	**50.0% (11)**	4.00	22
Design-build	0.0% (0)	4.5% (1)	22.7% (5)	31.8% (7)	4.5% (1)	**36.4% (8)**	3.57	22
Job order (on-call) contracting	0.0% (0)	0.0% (0)	13.6% (3)	9.1% (2)	0.0% (0)	**77.3% (17)**	3.40	22
							answered question	**22**
							skipped question	**31**

168. Please rate the ease of implementation for these strategies.

	Very Difficult	Somewhat Difficult	Neutral	Somewhat Easy	Very Easy	N/A	Rating Average	Response Count
Work zone management	0.0% (0)	4.5% (1)	27.3% (6)	**36.4% (8)**	4.5% (1)	27.3% (6)	3.56	22
Warranty contracting	0.0% (0)	4.5% (1)	18.2% (4)	13.6% (3)	0.0% (0)	**63.6% (14)**	3.25	22
Advance information	0.0% (0)	4.5% (1)	9.1% (2)	31.8% (7)	9.1% (2)	**45.5% (10)**	3.83	22
Trailblazing/detours	0.0% (0)	4.5% (1)	13.6% (3)	18.2% (4)	9.1% (2)	**54.5% (12)**	3.70	22
Management plans	0.0% (0)	4.5% (1)	13.6% (3)	27.3% (6)	4.5% (1)	**50.0% (11)**	3.64	22
Design-build	4.5% (1)	4.5% (1)	22.7% (5)	22.7% (5)	0.0% (0)	**45.5% (10)**	3.17	22
Job order (on-call) contracting	0.0% (0)	4.5% (1)	9.1% (2)	9.1% (2)	0.0% (0)	**77.3% (17)**	3.20	22
							answered question	**22**
							skipped question	**31**

169. Please identify barriers encountered for these strategies.

	Response Percent	Response Count
Work zone management	0.0%	0
Warranty contracting	0.0%	0
Advance information	0.0%	0
Trailblazing/detours	0.0%	0
Management plans	0.0%	0
Design-build	0.0%	0
Job order (on-call) contracting	0.0%	0
	answered question	**0**
	skipped question	**53**

170. Please identify the solutions to the barriers encountered for these strategies.

	Response Percent	Response Count
Work zone management	0.0%	0
Warranty contracting	0.0%	0
Advance information	0.0%	0
Trailblazing/detours	0.0%	0
Management plans	0.0%	0
Design-build	0.0%	0
Job order (on-call) contracting	0.0%	0
	answered question	**0**
	skipped question	**53**

171. Which of the following work schedule changes have been implemented in your metropolitan area?

	Not Implemented in My Region	Implemented in My Region	Not Implemented, but Planned	Implemented Previously & Future Plans	Technical Documents Are Available	Response Count
Flextime	22.7% (5)	**59.1% (13)**	0.0% (0)	18.2% (4)	0.0% (0)	22
Compressed work week	27.3% (6)	**54.5% (12)**	0.0% (0)	18.2% (4)	0.0% (0)	22
Staggered work hours	36.4% (8)	**45.5% (10)**	4.5% (1)	18.2% (4)	0.0% (0)	22
Telecommuting	18.2% (4)	**63.6% (14)**	0.0% (0)	18.2% (4)	0.0% (0)	22
					Other (please specify)	1
					answered question	**22**
					skipped question	**31**

172. Please rate the success of these strategies at mitigating congestion in your region.

	Very Unsuccessful	Somewhat Unsuccessful	Average	Somewhat Successful	Very Successful	N/A	Rating Average	Response Count
Flextime	0.0% (0)	9.1% (2)	**31.8% (7)**	22.7% (5)	4.5% (1)	**31.8% (7)**	3.33	22
Compressed work week	0.0% (0)	9.1% (2)	**31.8% (7)**	18.2% (4)	9.1% (2)	**31.8% (7)**	3.40	22
Staggered work hours	0.0% (0)	9.1% (2)	22.7% (5)	27.3% (6)	4.5% (1)	**36.4% (8)**	3.43	22
Telecommuting	0.0% (0)	9.1% (2)	**31.8% (7)**	27.3% (6)	4.5% (1)	27.3% (6)	3.38	22
							Other (please specify)	0
							answered question	**22**
							skipped question	**31**

173. Please rate the ease of implementation for these strategies.

	Very Difficult	Somewhat Difficult	Neutral	Somewhat Easy	Very Easy	N/A	Rating Average	Response Count
Flextime	0.0% (0)	0.0% (0)	22.7% (5)	**36.4% (8)**	4.5% (1)	**36.4% (8)**	3.71	22
Compressed work week	0.0% (0)	4.5% (1)	18.2% (4)	**36.4% (8)**	4.5% (1)	**36.4% (8)**	3.64	22
Staggered work hours	0.0% (0)	4.5% (1)	18.2% (4)	31.8% (7)	4.5% (1)	**40.9% (9)**	3.62	22
Telecommuting	0.0% (0)	0.0% (0)	**31.8% (7)**	27.3% (6)	9.1% (2)	**31.8% (7)**	3.67	22
							Other (please specify)	1
							answered question	**22**
							skipped question	**31**

174. Please identify barriers encountered for these strategies.

	Response Percent	Response Count
Flextime	0.0%	0
Compressed work week	0.0%	0
Staggered work hours	0.0%	0
Telecommuting	0.0%	0
	answered question	**0**
	skipped question	**53**

175. Please identify the solutions to the barriers encountered for these strategies.

	Response Percent	Response Count
Flextime	0.0%	0
Compressed work week	0.0%	0
Staggered work hours	0.0%	0
Telecommuting	0.0%	0
	answered question	**0**
	skipped question	**53**

176. Please identify the costs ($) for these strategies and note which year these represent (e.g., $100,000 $2008).

	Response Percent	Response Count
Flextime	0.0%	0
Compressed work week	0.0%	0
Staggered work hours	0.0%	0
Telecommuting	0.0%	0
	answered question	**0**
	skipped question	**53**

177. Please identify the calculated or documented benefit/cost ratio or a range for these strategies.

	Response Percent	Response Count
Flextime	0.0%	0
Compressed work week	0.0%	0
Staggered work hours	0.0%	0
Telecommuting	0.0%	0
	answered question	**0**
	skipped question	**53**

178. Which of the following land use development strategies have been implemented in your metropolitan area?

	Not Implemented in My Region	Implemented in My Region	Not Implemented, but Planned	Implemented Previously & Future Plans	Technical Documents Are Available	Response Count
Mixed-use developments	18.2% (4)	**50.0% (11)**	4.5% (1)	27.3% (6)	0.0% (0)	22
Infill and densification	18.2% (4)	**50.0% (11)**	9.1% (2)	22.7% (5)	0.0% (0)	22
Transit-oriented developments	22.7% (5)	18.2% (4)	**40.9% (9)**	18.2% (4)	0.0% (0)	22
					Other (please specify)	0
					answered question	**22**
					skipped question	**31**

179. Please rate the success of these strategies at mitigating congestion in your region.

	Very Unsuccessful	Somewhat Unsuccessful	Average	Somewhat Successful	Very Successful	N/A	Rating Average	Response Count
Mixed-use developments	0.0% (0)	13.6% (3)	**27.3% (6)**	13.6% (3)	18.2% (4)	**27.3% (6)**	3.50	22
Infill and densification	0.0% (0)	4.5% (1)	**36.4% (8)**	13.6% (3)	13.6% (3)	31.8% (7)	3.53	22
Transit-oriented developments	0.0% (0)	9.1% (2)	18.2% (4)	9.1% (2)	13.6% (3)	**50.0% (11)**	3.55	22
							Other (please specify)	0
							answered question	**22**
							skipped question	**31**

180. Please rate the ease of implementation for these strategies.

	Very Difficult	Somewhat Difficult	Neutral	Somewhat Easy	Very Easy	N/A	Rating Average	Response Count
Mixed-use developments	9.1% (2)	**31.8% (7)**	22.7% (5)	13.6% (3)	0.0% (0)	22.7% (5)	2.53	22
Infill and densification	13.6% (3)	22.7% (5)	**31.8% (7)**	4.5% (1)	0.0% (0)	27.3% (6)	2.38	22
Transit-oriented developments	4.5% (1)	36.4% (8)	18.2% (4)	0.0% (0)	0.0% (0)	**40.9% (9)**	2.23	22
							Other (please specify)	0
							answered question	**22**
							skipped question	**31**

181. Please identify barriers encountered for these strategies.

	Response Percent	Response Count
Mixed-use developments	0.0%	0
Infill and densification	0.0%	0
Transit-oriented developments	0.0%	0
	answered question	**0**
	skipped question	**53**

182. Please identify the solutions to the barriers encountered for these strategies.

	Response Percent	Response Count
Mixed-use developments	0.0%	0
Infill and densification	0.0%	0
Transit-oriented developments	0.0%	0
	answered question	**0**
	skipped question	**53**

183. Please identify the costs ($) for these strategies and note which year these represent (e.g., $100,000 $2008).

	Response Percent	Response Count
Mixed-use developments	0.0%	0
Infill and densification	0.0%	0
Transit-oriented developments	0.0%	0
	answered question	**0**
	skipped question	**53**

184. Please identify the calculated or documented benefit/cost ratio or a range for these strategies.

	Response Percent	Response Count
Mixed-use developments	0.0%	0
Infill and densification	0.0%	0
Transit-oriented developments	0.0%	0
	answered question	**0**
	skipped question	**53**

185. Which of the following ridesharing/vanpool strategies have been implemented in your metropolitan area?

	Not Implemented in My Region	Implemented in My Region	Not Implemented, but Planned	Implemented Previously & Future Plans	Technical Documents Are Available	Response Count
HOV parking discount incentives	**86.4% (19)**	0.0% (0)	0.0% (0)	13.6% (3)	0.0% (0)	22
Subsidized service incentives	**72.7% (16)**	18.2% (4)	0.0% (0)	9.1% (2)	0.0% (0)	22
Marketing and promotions	13.6% (3)	**63.6% (14)**	4.5% (1)	18.2% (4)	0.0% (0)	22
Ridematching services	18.2% (4)	**59.1% (13)**	4.5% (1)	18.2% (4)	0.0% (0)	22
Guaranteed ride home	18.2% (4)	**63.6% (14)**	0.0% (0)	18.2% (4)	0.0% (0)	22
					Other (please specify)	0
					answered question	**22**
					skipped question	**31**

186. Please rate the success of these strategies at mitigating congestion in your region.

	Very Unsuccessful	Somewhat Unsuccessful	Average	Somewhat Successful	Very Successful	N/A	Rating Average	Response Count
HOV parking discount incentives	0.0% (0)	0.0% (0)	13.6% (3)	4.5% (1)	0.0% (0)	**81.8% (18)**	3.25	22
Subsidized service incentives	0.0% (0)	0.0% (0)	13.6% (3)	13.6% (3)	0.0% (0)	**72.7% (16)**	3.50	22
Marketing and promotions	0.0% (0)	13.6% (3)	**31.8% (7)**	27.3% (6)	4.5% (1)	22.7% (5)	3.29	22
Ridematching services	0.0% (0)	13.6% (3)	27.3% (6)	**36.4% (8)**	4.5% (1)	18.2% (4)	3.39	22
Guaranteed ride home	0.0% (0)	9.1% (2)	**36.4% (8)**	27.3% (6)	4.5% (1)	22.7% (5)	3.35	22
							Other (please specify)	0
							answered question	**22**
							skipped question	**31**

187. Please rate the ease of implementation for these strategies.

	Very Difficult	Somewhat Difficult	Neutral	Somewhat Easy	Very Easy	N/A	Rating Average	Response Count
HOV parking discount incentives	0.0% (0)	4.5% (1)	13.6% (3)	0.0% (0)	0.0% (0)	**81.8% (18)**	2.75	22
Subsidized service incentives	0.0% (0)	0.0% (0)	18.2% (4)	4.5% (1)	4.5% (1)	**72.7% (16)**	3.50	22
Marketing and promotions	4.5% (1)	4.5% (1)	**40.9% (9)**	18.2% (4)	13.6% (3)	18.2% (4)	3.39	22
Ridematching services	0.0% (0)	13.6% (3)	**36.4% (8)**	18.2% (4)	18.2% (4)	13.6% (3)	3.47	22
Guaranteed ride home	0.0% (0)	9.1% (2)	**31.8% (7)**	22.7% (5)	13.6% (3)	22.7% (5)	3.53	22
							Other (please specify)	0
							answered question	**22**
							skipped question	**31**

188. Please identify barriers encountered for these strategies.

	Response Percent	Response Count
HOV parking discount incentives	0.0%	0
Subsidized service incentives	0.0%	0
Marketing and promotions	**100.0%**	**1**
Ridematching services	**100.0%**	**1**
Guaranteed ride home	**100.0%**	**1**
	answered question	**1**
	skipped question	**52**

189. Please identify the solutions to the barriers encountered for these strategies.

	Response Percent	Response Count
HOV parking discount incentives	0.0%	0
Subsidized service incentives	0.0%	0
Marketing and promotions	0.0%	0
Ridematching services	0.0%	0
Guaranteed ride home	0.0%	0
	answered question	**0**
	skipped question	**53**

190. Please identify the costs ($) for these strategies and note which year these represent (e.g., $100,000 $2008).

	Response Percent	Response Count
HOV parking discount incentives	0.0%	0
Subsidized service incentives	0.0%	0
Marketing and promotions	0.0%	0
Ridematching services	0.0%	0
Guaranteed ride home	0.0%	0
	answered question	**0**
	skipped question	**53**

191. Please identify the calculated or documented benefit/cost ratio or a range for these strategies.

	Response Percent	Response Count
HOV parking discount incentives	0.0%	0
Subsidized service incentives	0.0%	0
Marketing and promotions	0.0%	0
Ridematching services	0.0%	0
Guaranteed ride home	0.0%	0
	answered question	**0**
	skipped question	**53**

192. Which of the following parking management strategies have been implemented in your metropolitan area?

	Not Implemented in My Region	Implemented in My Region	Not Implemented, but Planned	Implemented Previously & Future Plans	Technical Documents Are Available	Response Count
On-street parking and standing restrictions	22.7% (5)	**59.1% (13)**	0.0% (0)	13.6% (3)	4.5% (1)	22
Peak-period prohibitions to free lane capacity	**59.1% (13)**	27.3% (6)	0.0% (0)	9.1% (2)	4.5% (1)	22
Employer/landlord parking agreements	**59.1% (13)**	31.8% (7)	0.0% (0)	4.5% (1)	4.5% (1)	22
Increased parking fees	**63.6% (14)**	22.7% (5)	4.5% (1)	4.5% (1)	4.5% (1)	22
Preferential HOV/carpool/vanpool parking	**63.6% (14)**	31.8% (7)	0.0% (0)	4.5% (1)	0.0% (0)	22
Discounted HOV/carpool/vanpool parking	**77.3% (17)**	13.6% (3)	0.0% (0)	4.5% (1)	4.5% (1)	22
Location specific parking ordinances	**45.5% (10)**	**45.5% (10)**	0.0% (0)	4.5% (1)	4.5% (1)	22
					Other (please specify)	0
					answered question	**22**
					skipped question	**31**

193. Please rate the success of these strategies at mitigating congestion in your region.

	Very Unsuccessful	Somewhat Unsuccessful	Average	Somewhat Successful	Very Successful	N/A	Rating Average	Response Count
On-street parking and standing restrictions	0.0% (0)	0.0% (0)	27.3% (6)	18.2% (4)	9.1% (2)	**45.5% (10)**	3.67	22
Peak-period prohibitions to free lane capacity	0.0% (0)	4.5% (1)	18.2% (4)	0.0% (0)	4.5% (1)	**72.7% (16)**	3.17	22
Employer/landlord parking agreements	0.0% (0)	0.0% (0)	18.2% (4)	4.5% (1)	0.0% (0)	**77.3% (17)**	3.20	22
Increased parking fees	0.0% (0)	0.0% (0)	13.6% (3)	4.5% (1)	9.1% (2)	**72.7% (16)**	3.83	22
Preferential HOV/carpool/vanpool parking	0.0% (0)	4.5% (1)	18.2% (4)	4.5% (1)	0.0% (0)	**72.7% (16)**	3.00	22
Discounted HOV/carpool/vanpool parking	0.0% (0)	0.0% (0)	9.1% (2)	4.5% (1)	0.0% (0)	**86.4% (19)**	3.33	22
Location specific parking ordinances	0.0% (0)	9.1% (2)	18.2% (4)	9.1% (2)	4.5% (1)	**59.1% (13)**	3.22	22
							Other (please specify)	0
							answered question	**22**
							skipped question	**31**

194. Please rate the ease of implementation for these strategies.

	Very Difficult	Somewhat Difficult	Neutral	Somewhat Easy	Very Easy	N/A	Rating Average	Response Count
On-street parking and standing restrictions	4.5% (1)	9.1% (2)	27.3% (6)	9.1% (2)	9.1% (2)	**40.9% (9)**	3.15	22
Peak-period prohibitions to free lane capacity	0.0% (0)	4.5% (1)	22.7% (5)	4.5% (1)	4.5% (1)	**63.6% (14)**	3.25	22
Employer/landlord parking agreements	0.0% (0)	9.1% (2)	18.2% (4)	0.0% (0)	0.0% (0)	**72.7% (16)**	2.67	22
Increased parking fees	0.0% (0)	4.5% (1)	13.6% (3)	9.1% (2)	0.0% (0)	**72.7% (16)**	3.17	22
Preferential HOV/carpool/vanpool parking	0.0% (0)	0.0% (0)	18.2% (4)	9.1% (2)	4.5% (1)	**68.2% (15)**	3.57	22
Discounted HOV/carpool/vanpool parking	0.0% (0)	0.0% (0)	13.6% (3)	4.5% (1)	0.0% (0)	**81.8% (18)**	3.25	22
Location specific parking ordinances	0.0% (0)	13.6% (3)	22.7% (5)	4.5% (1)	9.1% (2)	**50.0% (11)**	3.18	22
							Other (please specify)	0
							answered question	**22**
							skipped question	**31**

195. Please identify barriers encountered for these strategies.

	Response Percent	Response Count
On-street parking and standing restrictions	0.0%	0
Peak-period prohibitions to free lane capacity	0.0%	0
Employer/landlord parking agreements	0.0%	0
Increased parking fees	0.0%	0
Preferential HOV/carpool/vanpool parking	**100.0%**	**1**
Discounted HOV/carpool/vanpool parking	0.0%	0
Location specific parking ordinances	0.0%	0
answered question		**1**
skipped question		**52**

196. Please identify the solutions to the barriers encountered for these strategies.

	Response Percent	Response Count
On-street parking and standing restrictions	0.0%	0
Peak-period prohibitions to free lane capacity	0.0%	0
Employer/landlord parking agreements	0.0%	0
Increased parking fees	0.0%	0
Preferential HOV/carpool/vanpool parking	0.0%	0
Discounted HOV/carpool/vanpool parking	0.0%	0
Location specific parking ordinances	0.0%	0
	answered question	**0**
	skipped question	**53**

197. Please identify the costs ($) for these strategies and note which year these represent (e.g., $100,000 $2008).

	Response Percent	Response Count
On-street parking and standing restrictions	0.0%	0
Peak-period prohibitions to free lane capacity	0.0%	0
Employer/landlord parking agreements	0.0%	0
Increased parking fees	0.0%	0
Preferential HOV/carpool/vanpool parking	0.0%	0
Discounted HOV/carpool/vanpool parking	0.0%	0
Location specific parking ordinances	0.0%	0
	answered question	**0**
	skipped question	**53**

198. Please identify the calculated or documented benefit/cost ratio or a range for these strategies.

	Response Percent	Response Count
On-street parking and standing restrictions	0.0%	0
Peak-period prohibitions to free lane capacity	0.0%	0
Employer/landlord parking agreements	0.0%	0
Increased parking fees	0.0%	0
Preferential HOV/carpool/vanpool parking	0.0%	0
Discounted HOV/carpool/vanpool parking	0.0%	0
Location specific parking ordinances	0.0%	0
	answered question	**0**
	skipped question	**53**

199. Which of the following new community design (smart growth) strategies have been implemented in your metropolitan area?

	Not Implemented in My Region	Implemented in My Region	Not Implemented, but Planned	Implemented Previously & Future Plans	Technical Documents Are Available	Response Count
Density standards	**59.1% (13)**	27.3% (6)	13.6% (3)	4.5% (1)	0.0% (0)	22
Site reclamation and reuse	**40.9% (9)**	**40.9% (9)**	18.2% (4)	4.5% (1)	0.0% (0)	22
Incentives to develop in areas with existing infrastructure	**45.5% (10)**	31.8% (7)	9.1% (2)	13.6% (3)	0.0% (0)	22
Mixed use zoning regulations	31.8% (7)	**50.0% (11)**	9.1% (2)	13.6% (3)	0.0% (0)	22
Jobs/housing development zoning regulations	**77.3% (17)**	18.2% (4)	0.0% (0)	4.5% (1)	0.0% (0)	22
Transit oriented development density standards	**59.1% (13)**	22.7% (5)	9.1% (2)	9.1% (2)	0.0% (0)	22
Transit oriented development design requirements	**68.2% (15)**	18.2% (4)	4.5% (1)	9.1% (2)	0.0% (0)	22
Transit oriented development bicycle/pedestrian access	**54.5% (12)**	31.8% (7)	4.5% (1)	9.1% (2)	0.0% (0)	22
Intergovernmental agreements for corridor land use and transportation coordination	**63.6% (14)**	22.7% (5)	9.1% (2)	4.5% (1)	0.0% (0)	22
					Other (please specify)	0
					answered question	**22**
					skipped question	**31**

200. Please rate the success of these strategies at mitigating congestion in your region.

	Very Unsuccessful	Somewhat Unsuccessful	Average	Somewhat Successful	Very Successful	N/A	Rating Average	Response Count
Density standards	0.0% (0)	9.1% (2)	18.2% (4)	9.1% (2)	0.0% (0)	**63.6% (14)**	3.00	22
Site reclamation and reuse	0.0% (0)	4.5% (1)	22.7% (5)	13.6% (3)	9.1% (2)	**50.0% (11)**	3.55	22
Incentives to develop in areas with existing infrastructure	0.0% (0)	9.1% (2)	18.2% (4)	9.1% (2)	9.1% (2)	**54.5% (12)**	3.40	22
Mixed use zoning regulations	0.0% (0)	4.5% (1)	27.3% (6)	18.2% (4)	4.5% (1)	**45.5% (10)**	3.42	22
Jobs/housing development zoning requlations	0.0% (0)	4.5% (1)	18.2% (4)	0.0% (0)	4.5% (1)	**72.7% (16)**	3.17	22
Transit oriented development density standards	0.0% (0)	9.1% (2)	13.6% (3)	4.5% (1)	4.5% (1)	**68.2% (15)**	3.14	22
Transit oriented development design requirements	0.0% (0)	9.1% (2)	13.6% (3)	4.5% (1)	0.0% (0)	**72.7% (16)**	2.83	22
Transit oriented development bicycle/pedestrian access	0.0% (0)	4.5% (1)	18.2% (4)	9.1% (2)	4.5% (1)	**63.6% (14)**	3.38	22
Intergovernmental agreements for corridor land use and transportation coordination	0.0% (0)	4.5% (1)	18.2% (4)	9.1% (2)	4.5% (1)	**63.6% (14)**	3.38	22
							Other (please specify)	0
							answered question	**22**
							skipped question	**31**

201. Please rate the ease of implementation for these strategies.

	Very Difficult	Somewhat Difficult	Neutral	Somewhat Easy	Very Easy	N/A	Rating Average	Response Count
Density standards	0.0% (0)	4.5% (1)	27.3% (6)	0.0% (0)	0.0% (0)	**68.2% (15)**	2.86	22
Site reclamation and reuse	9.1% (2)	4.5% (1)	31.8% (7)	4.5% (1)	0.0% (0)	**50.0% (11)**	2.64	22
Incentives to develop in areas with existing infrastructure	0.0% (0)	18.2% (4)	18.2% (4)	9.1% (2)	0.0% (0)	**54.5% (12)**	2.80	22
Mixed use zoning regulations	0.0% (0)	9.1% (2)	31.8% (7)	13.6% (3)	0.0% (0)	**45.5% (10)**	3.08	22
Jobs/housing development zoning requlations	0.0% (0)	18.2% (4)	18.2% (4)	0.0% (0)	0.0% (0)	**63.6% (14)**	2.50	22
Transit oriented development density standards	0.0% (0)	13.6% (3)	18.2% (4)	4.5% (1)	0.0% (0)	**63.6% (14)**	2.75	22
Transit oriented development design requirements	0.0% (0)	4.5% (1)	18.2% (4)	9.1% (2)	0.0% (0)	**68.2% (15)**	3.14	22
Transit oriented development bicycle/pedestrian access	0.0% (0)	0.0% (0)	31.8% (7)	9.1% (2)	0.0% (0)	**59.1% (13)**	3.22	22
Intergovernmental agreements for corridor land use and transportation coordination	0.0% (0)	13.6% (3)	18.2% (4)	9.1% (2)	0.0% (0)	**59.1% (13)**	2.89	22
							Other (please specify)	0
							answered question	**22**
							skipped question	**31**

202. Please identify barriers encountered for these strategies.

	Response Percent	Response Count
Density standards	0.0%	0
Site reclamation and reuse	0.0%	0
Incentives to develop in areas with existing infrastructure	0.0%	0
Mixed use zoning regulations	0.0%	0
Jobs/housing development zoning requlations	0.0%	0
Transit oriented development density standards	0.0%	0
Transit oriented development design requirements	0.0%	0
Transit oriented development bicycle/pedestrian access	0.0%	0
Intergovernmental agreements for corridor land use and transportation coordination	0.0%	0
	answered question	**0**
	skipped question	**53**

203. Please identify the solutions to the barriers encountered for these strategies.

	Response Percent	Response Count
Density standards	0.0%	0
Site reclamation and reuse	0.0%	0
Incentives to develop in areas with existing infrastructure	0.0%	0
Mixed use zoning regulations	0.0%	0
Jobs/housing development zoning requlations	0.0%	0
Transit oriented development density standards	0.0%	0
Transit oriented development design requirements	0.0%	0
Transit oriented development bicycle/pedestrian access	0.0%	0
Intergovernmental agreements for corridor land use and transportation coordination	0.0%	0
	answered question	**0**
	skipped question	**53**

204. Please identify the costs ($) for these strategies and note which year these represent (e.g., $100,000 $2008).

	Response Percent	Response Count
Density standards	0.0%	0
Site reclamation and reuse	0.0%	0
Incentives to develop in areas with existing infrastructure	0.0%	0
Mixed use zoning regulations	0.0%	0
Jobs/housing development zoning requlations	0.0%	0
Transit oriented development density standards	0.0%	0
Transit oriented development design requirements	0.0%	0
Transit oriented development bicycle/pedestrian access	0.0%	0
Intergovernmental agreements for corridor land use and transportation coordination	0.0%	0
	answered question	**0**
	skipped question	**53**

205. Please identify the calculated or documented benefit/cost ratio or a range for these strategies.

	Response Percent	Response Count
Density standards	0.0%	0
Site reclamation and reuse	0.0%	0
Incentives to develop in areas with existing infrastructure	0.0%	0
Mixed use zoning regulations	0.0%	0
Jobs/housing development zoning requlations	0.0%	0
Transit oriented development density standards	0.0%	0
Transit oriented development design requirements	0.0%	0
Transit oriented development bicycle/pedestrian access	0.0%	0
Intergovernmental agreements for corridor land use and transportation coordination	0.0%	0
	answered question	**0**
	skipped question	**53**

206. Have any car sharing programs been implemented in your metropolitan area?

	Not Implemented in My Region	Implemented in My Region	Not Implemented, but Planned	Implemented Previously & Future Plans	Technical Documents Are Available	Response Count
Car Sharing	**50.0% (11)**	31.8% (7)	13.6% (3)	4.5% (1)	0.0% (0)	22
					answered question	**22**
					skipped question	**31**

207. Please rate the success of this strategy at mitigating congestion in your region.

	Very Unsuccessful	Somewhat Unsuccessful	Average	Somewhat Successful	Very Successful	N/A	Rating Average	Response Count
Car Sharing	0.0% (0)	4.5% (1)	18.2% (4)	9.1% (2)	0.0% (0)	**68.2% (15)**	3.14	22
							answered question	**22**
							skipped question	**31**

208. Please rate the ease of implementation for this strategy.

	Very Difficult	Somewhat Difficult	Neutral	Somewhat Easy	Very Easy	N/A	Rating Average	Response Count
Car Sharing	0.0% (0)	9.1% (2)	13.6% (3)	9.1% (2)	0.0% (0)	**68.2% (15)**	3.00	22
							answered question	**22**
							skipped question	**31**

209. Please identify barriers encountered for this strategy.

	Response Count
	0
answered question	0
skipped question	53

210. Please identify the solutions to the barriers encountered for these strategies.

	Response Count
	0
answered question	0
skipped question	53

211. Please identify the costs ($) for these strategies and note which year these represent (e.g., $100,000 $2008).

	Response Count
	0
answered question	0
skipped question	53

212. Please identify the calculated or documented benefit/cost ratio or a range for these strategies.

	Response Count
	0
answered question	**0**
skipped question	**53**

213. Have any of the following trip reduction strategies or ordinances been implemented in your metropolitan area?

	Not Implemented in My Region	Implemented in My Region	Not Implemented, but Planned	Implemented Previously & Future Plans	Technical Documents Are Available	Response Count
Special use permits	**86.4% (19)**	9.1% (2)	0.0% (0)	4.5% (1)	0.0% (0)	22
Negotiated agreements	**90.9% (20)**	4.5% (1)	0.0% (0)	4.5% (1)	0.0% (0)	22
Trip reduction goal programs	**77.3% (17)**	13.6% (3)	0.0% (0)	9.1% (2)	0.0% (0)	22
Conditions of approval for new construction	**86.4% (19)**	4.5% (1)	0.0% (0)	9.1% (2)	0.0% (0)	22
Mandated programs	**90.9% (20)**	4.5% (1)	0.0% (0)	4.5% (1)	0.0% (0)	22
Transportation management districts	**86.4% (19)**	9.1% (2)	0.0% (0)	4.5% (1)	0.0% (0)	22
					Other (please specify)	1
					answered question	**22**
					skipped question	**31**

214. Please rate the success of these strategies at mitigating congestion in your region.

	Very Unsuccessful	Somewhat Unsuccessful	Average	Somewhat Successful	Very Successful	N/A	Rating Average	Response Count
Special use permits	0.0% (0)	0.0% (0)	9.1% (2)	4.5% (1)	0.0% (0)	**86.4% (19)**	3.33	22
Negotiated agreements	0.0% (0)	0.0% (0)	9.1% (2)	4.5% (1)	0.0% (0)	**86.4% (19)**	3.33	22
Trip reduction goal programs	0.0% (0)	9.1% (2)	9.1% (2)	4.5% (1)	0.0% (0)	**77.3% (17)**	2.80	22
Conditions of approval for new construction	0.0% (0)	0.0% (0)	13.6% (3)	4.5% (1)	0.0% (0)	**81.8% (18)**	3.25	22
Mandated programs	0.0% (0)	0.0% (0)	9.1% (2)	0.0% (0)	0.0% (0)	**90.9% (20)**	3.00	22
Transportation management districts	0.0% (0)	0.0% (0)	13.6% (3)	0.0% (0)	4.5% (1)	**81.8% (18)**	3.50	22
							Other (please specify)	0
							answered question	**22**
							skipped question	**31**

215. Please rate the ease of implementation for these strategies.

	Very Difficult	Somewhat Difficult	Neutral	Somewhat Easy	Very Easy	N/A	Rating Average	Response Count
Special use permits	4.5% (1)	0.0% (0)	13.6% (3)	4.5% (1)	0.0% (0)	**77.3% (17)**	2.80	22
Negotiated agreements	4.5% (1)	0.0% (0)	13.6% (3)	4.5% (1)	0.0% (0)	**77.3% (17)**	2.80	22
Trip reduction goal programs	4.5% (1)	0.0% (0)	22.7% (5)	4.5% (1)	0.0% (0)	**68.2% (15)**	2.86	22
Conditions of approval for new construction	4.5% (1)	4.5% (1)	18.2% (4)	0.0% (0)	0.0% (0)	**72.7% (16)**	2.50	22
Mandated programs	4.5% (1)	9.1% (2)	4.5% (1)	0.0% (0)	0.0% (0)	**81.8% (18)**	2.00	22
Transportation management districts	4.5% (1)	13.6% (3)	4.5% (1)	0.0% (0)	0.0% (0)	**77.3% (17)**	2.00	22
							Other (please specify)	0
							answered question	**22**
							skipped question	**31**

216. Please identify barriers encountered for these strategies.

	Response Percent	Response Count
Special use permits	0.0%	0
Negotiated agreements	0.0%	0
Trip reduction goal programs	0.0%	0
Conditions of approval for new construction	0.0%	0
Mandated programs	0.0%	0
Transportation management districts	0.0%	0
	answered question	**0**
	skipped question	**53**

217. Please identify the solutions to the barriers encountered for these strategies.

	Response Percent	Response Count
Special use permits	0.0%	0
Negotiated agreements	0.0%	0
Trip reduction goal programs	0.0%	0
Conditions of approval for new construction	0.0%	0
Mandated programs	0.0%	0
Transportation management districts	0.0%	0
	answered question	**0**
	skipped question	**53**

218. Please identify the costs ($) for these strategies and note which year these represent (e.g., $100,000 $2008).

	Response Percent	Response Count
Special use permits	0.0%	0
Negotiated agreements	0.0%	0
Trip reduction goal programs	0.0%	0
Conditions of approval for new construction	0.0%	0
Mandated programs	0.0%	0
Transportation management districts	0.0%	0
	answered question	**0**
	skipped question	**53**

219. Please identify the calculated or documented benefit/cost raio or a range for these strategies.

	Response Percent	Response Count
Special use permits	0.0%	0
Negotiated agreements	0.0%	0
Trip reduction goal programs	0.0%	0
Conditions of approval for new construction	0.0%	0
Mandated programs	0.0%	0
Transportation management districts	0.0%	0
	answered question	**0**
	skipped question	**53**

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1	Pima Association of Governments	Mar 23, 2011 4:28 PM
2	Greensboro MPO	Mar 22, 2011 7:53 AM
3	York County Planning Commission	Mar 22, 2011 5:40 AM
4	Hampton Roads Transportation Planning Organization	Mar 21, 2011 11:46 AM
5	Corridor MPO	Mar 21, 2011 9:18 AM
6	Reading MPO	Mar 18, 2011 10:27 AM
7	Ashland Area MPO/FIVCO ADD	Mar 18, 2011 8:50 AM
8	Tyler Area MPO	Mar 17, 2011 9:10 AM

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9	Tri County Regional Planning Commission	Mar 17, 2011 7:56 AM
10	semcog	Mar 16, 2011 4:46 PM
11	San Joaquin Council of Governments	Mar 16, 2011 4:30 PM
12	Mountainland Assoc. Of Governments	Mar 16, 2011 4:18 PM
13	San Joaquin Council of Governments	Mar 15, 2011 3:05 PM
14	Maricopa Association of Governments	Mar 15, 2011 3:02 PM
15	Indianapolis Metropolitan Planning Organization	Mar 15, 2011 11:28 AM
16	Southwestern PA Commission	Mar 15, 2011 10:15 AM
17	Chittenden County MPO	Mar 15, 2011 9:54 AM
18	Southern California Assn. of Governments	Mar 14, 2011 10:04 AM
19	Champaign County Regional Planning Commission	Mar 14, 2011 7:17 AM
20	Bi-State Regional Commission	Mar 11, 2011 9:55 AM
21	FBRMPO	Mar 11, 2011 8:15 AM
22	KYOVA IPC	Mar 10, 2011 12:48 PM
23	Morgantown Monongalia MPO	Mar 10, 2011 9:27 AM
24	Hillsborough County MPO	Mar 10, 2011 7:05 AM
25	CHICAGO METROPOLITAN AGENCY FOR PLANNING	Mar 9, 2011 8:38 PM
26	CRCOG	Mar 9, 2011 5:56 PM
27	Lafayette Consolidated Government	Mar 9, 2011 4:29 PM
28	Denver Regional Council of Govts.	Mar 9, 2011 12:44 PM
29	Liberty Consolidated Commission (MPO)	Mar 9, 2011 11:28 AM

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30	tri-County regional planning commission	Mar 9, 2011 11:02 AM
31	Reading Area Transportation Study	Mar 9, 2011 8:04 AM
32	Valley COG	Mar 9, 2011 7:27 AM
33	Waco MPO	Mar 9, 2011 7:21 AM
34	Rockford Metropolitan Agency for Planning	Mar 9, 2011 7:08 AM
35	ATRC	Mar 9, 2011 6:17 AM
36	Lane Council of Governments	Mar 8, 2011 5:14 PM
37	Brown County Planning Commission/Green Bay MPO	Mar 8, 2011 3:06 PM
38	MVRPC	Mar 8, 2011 12:54 PM
39	Lanc. County Planning Comm.	Mar 8, 2011 12:32 PM
40	Capitol Region Council of Governments	Mar 8, 2011 11:29 AM
41	Capital District Transportation Committee	Mar 8, 2011 10:36 AM
42	FMATS	Mar 8, 2011 10:36 AM
43	Carson Area MPO	Mar 8, 2011 10:01 AM
44	Sumter Area Transportation Study (SUATS)-MPO	Mar 8, 2011 9:24 AM
45	Altoona MPO	Mar 8, 2011 9:02 AM
46	MWVCoG / SKATS	Mar 8, 2011 8:58 AM
47	Genesee Transportation Council	Mar 8, 2011 8:53 AM
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49	North Jersey Transportation Planning Authority	Mar 8, 2011 8:05 AM
50	Victoria MPO / City of Victoria	Mar 8, 2011 7:14 AM

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51	Mid-America Regional Council	Mar 8, 2011 6:54 AM
52	Amarillo MPO	Mar 8, 2011 6:50 AM
53	Columbus Area MPO	Mar 8, 2011 5:50 AM
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7	KY	Mar 18, 2011 8:50 AM
8	TX	Mar 17, 2011 9:10 AM
9	IL	Mar 17, 2011 7:56 AM
10	MI	Mar 16, 2011 4:46 PM
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12	UT	Mar 16, 2011 4:18 PM
13	CA	Mar 15, 2011 3:05 PM
14	AZ	Mar 15, 2011 3:02 PM
15	IN	Mar 15, 2011 11:28 AM
16	PA	Mar 15, 2011 10:15 AM
17	VT	Mar 15, 2011 9:54 AM

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33	TX	Mar 9, 2011 7:21 AM
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35	ME	Mar 9, 2011 6:17 AM
36	OR	Mar 8, 2011 5:14 PM
37	WI	Mar 8, 2011 3:06 PM
38	OH	Mar 8, 2011 12:54 PM

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41	NY	Mar 8, 2011 10:36 AM
42	AK	Mar 8, 2011 10:36 AM
43	NV	Mar 8, 2011 10:01 AM
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21	[redacted]	Mar 11, 2011 8:15 AM
22	[redacted]	Mar 10, 2011 12:48 PM
23	[redacted]	Mar 10, 2011 9:27 AM
24	[redacted]	Mar 10, 2011 7:05 AM
25	[redacted]	Mar 9, 2011 8:38 PM
26	[redacted]	Mar 9, 2011 5:56 PM

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27	[redacted]	Mar 9, 2011 4:29 PM
28	[redacted]	Mar 9, 2011 12:44 PM
29	[redacted]	Mar 9, 2011 11:28 AM
30	[redacted]	Mar 9, 2011 11:02 AM
31	[redacted]	Mar 9, 2011 8:04 AM
32	[redacted]	Mar 9, 2011 7:27 AM
33	[redacted]	Mar 9, 2011 7:21 AM
34	[redacted]	Mar 9, 2011 7:08 AM
35	[redacted]	Mar 9, 2011 6:17 AM
36	[redacted]	Mar 8, 2011 5:14 PM
37	[redacted]	Mar 8, 2011 3:06 PM
38	[redacted]	Mar 8, 2011 12:54 PM
39	[redacted]	Mar 8, 2011 12:32 PM
40	[redacted]	Mar 8, 2011 11:29 AM
41	[redacted]	Mar 8, 2011 10:36 AM
42	[redacted]	Mar 8, 2011 10:36 AM
43	[redacted]	Mar 8, 2011 10:01 AM
44	[redacted]	Mar 8, 2011 9:24 AM
45	[redacted]	Mar 8, 2011 9:02 AM
46	[redacted]	Mar 8, 2011 8:58 AM
47	[redacted]	Mar 8, 2011 8:53 AM

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48	[redacted]	Mar 8, 2011 8:48 AM
49	[redacted]	Mar 8, 2011 8:05 AM
50	[redacted]	Mar 8, 2011 7:14 AM
51	[redacted]	Mar 8, 2011 6:54 AM
52	[redacted]	Mar 8, 2011 6:50 AM
53	[redacted]	Mar 8, 2011 5:50 AM
	Phone Number:	
1	[redacted]	Mar 23, 2011 4:28 PM
2	[redacted]	Mar 22, 2011 7:53 AM
3	[redacted]	Mar 22, 2011 5:40 AM
4	[redacted]	Mar 21, 2011 11:46 AM
5	[redacted]	Mar 21, 2011 9:18 AM
6	[redacted]	Mar 18, 2011 10:27 AM
7	[redacted]	Mar 18, 2011 8:50 AM
8	[redacted]	Mar 17, 2011 9:10 AM
9	[redacted]	Mar 17, 2011 7:56 AM
10	[redacted]	Mar 16, 2011 4:46 PM
11	[redacted]	Mar 16, 2011 4:30 PM
12	[redacted]	Mar 16, 2011 4:18 PM
13	[redacted]	Mar 15, 2011 3:05 PM
14	[redacted]	Mar 15, 2011 3:02 PM

Page 1, Q1. Please enter your contact information (Agency information is required).

15	[redacted]	Mar 15, 2011 11:28 AM
16	[redacted]	Mar 15, 2011 10:15 AM
17	[redacted]	Mar 15, 2011 9:54 AM
18	[redacted]	Mar 14, 2011 10:04 AM
19	[redacted]	Mar 14, 2011 7:17 AM
20	[redacted]	Mar 11, 2011 9:55 AM
21	[redacted]	Mar 11, 2011 8:15 AM
22	[redacted]	Mar 10, 2011 12:48 PM
24	[redacted]	Mar 10, 2011 7:05 AM
25	[redacted]	Mar 9, 2011 8:38 PM
26	[redacted]	Mar 9, 2011 5:56 PM
27	[redacted]	Mar 9, 2011 4:29 PM
28	[redacted]	Mar 9, 2011 12:44 PM
29	[redacted]	Mar 9, 2011 11:28 AM
30	[redacted]	Mar 9, 2011 11:02 AM
31	[redacted]	Mar 9, 2011 8:04 AM
32	[redacted]	Mar 9, 2011 7:27 AM
33	[redacted]	Mar 9, 2011 7:21 AM
34	[redacted]	Mar 9, 2011 7:08 AM
35	[redacted]	Mar 9, 2011 6:17 AM
36	[redacted]	Mar 8, 2011 5:14 PM

Page 1, Q1. Please enter your contact information (Agency information is required).		
37	[redacted]	Mar 8, 2011 3:06 PM
38	[redacted]	Mar 8, 2011 12:54 PM
39	[redacted]	Mar 8, 2011 12:32 PM
40	[redacted]	Mar 8, 2011 11:29 AM
41	[redacted]	Mar 8, 2011 10:36 AM
42	[redacted]	Mar 8, 2011 10:36 AM
44	[redacted]	Mar 8, 2011 9:24 AM
45	[redacted]	Mar 8, 2011 9:02 AM
46	[redacted]	Mar 8, 2011 8:58 AM
47	[redacted]	Mar 8, 2011 8:53 AM
48	[redacted]	Mar 8, 2011 8:48 AM
49	[redacted]	Mar 8, 2011 8:05 AM
50	[redacted]	Mar 8, 2011 7:14 AM
51	[redacted]	Mar 8, 2011 6:54 AM
52	[redacted]	Mar 8, 2011 6:50 AM
53	[redacted]	Mar 8, 2011 5:50 AM

Page 3, Q1. Which of the following techniques have been used in your metropolitan area to increase the number of lanes without widening?		
1	Reversible lane use	Mar 23, 2011 4:32 PM
2	Reversible Lanes	Mar 22, 2011 5:53 AM

Page 3, Q4. Please identify barriers encountered for these strategies.

	Lane width reduction	
1	Necessary ROW	Mar 23, 2011 4:32 PM
2	Financial support availability	Mar 22, 2011 5:53 AM
3	N/A	Mar 21, 2011 12:01 PM
4	Roadway geometry can be challenging. For example, a lane width reduction on Kessler Avenue was satisfactory for much of its length, but a winding portion of the roadway poses challenges for the reduced width.	Mar 15, 2011 11:37 AM
5	safety, trucks and transit vehicles	Mar 15, 2011 10:22 AM
6	Safety concerns, particularly for large vehicles	Mar 15, 2011 9:56 AM
7	Done on some arterials. Not fully implemented.	Mar 14, 2011 10:35 AM
8	lake of public support	Mar 11, 2011 1:56 PM
9	Constructablity while maintaining traffic operation.	Mar 10, 2011 9:30 AM
10	Hesitation by state DOT, some business concerns re. access (lots of citizen support)	Mar 10, 2011 7:13 AM
11	POLICY PREFERS 12' LANES	Mar 9, 2011 8:45 PM
12	additional cartway widening usually required	Mar 9, 2011 8:13 AM
13	Opposition by first responders (specifically Fire Departments)	Mar 9, 2011 7:37 AM
14	N/A	Mar 9, 2011 7:09 AM
15	Areas this was proposed also had heavy truck traffic	Mar 8, 2011 9:08 AM
	Conversion of median to travel lane(s)	
1	NA	Mar 23, 2011 4:32 PM
2	Financial support availability	Mar 22, 2011 5:53 AM
3	N/A	Mar 21, 2011 12:01 PM

Page 3, Q4. Please identify barriers encountered for these strategies.

4	I am thinking here of Fall Creek Blvd, where a median lane has been converted to a reversible travel lane. Some safety problems are associated (it is affectionately referred to as a "suicide lane").	Mar 15, 2011 11:37 AM
5	construction cost, potential for induced travel demand	Mar 15, 2011 10:22 AM
7	Freeway medians - bridge supports needed to be moved, road surface needed to be completely rebuilt.	Mar 14, 2011 10:35 AM
8	lake of public support	Mar 11, 2011 1:56 PM
11	ROW. STRUCTURES.	Mar 9, 2011 8:45 PM
12	median usually converted to turn lane	Mar 9, 2011 8:13 AM
13	Not yet considered by our region	Mar 9, 2011 7:37 AM
14	N/A	Mar 9, 2011 7:09 AM
15	Loss of greenery and median drainage	Mar 8, 2011 9:08 AM
	Shoulder conversion	
1	NA	Mar 23, 2011 4:32 PM
2	Financial support availability	Mar 22, 2011 5:53 AM
3	N/A	Mar 21, 2011 12:01 PM
4	Has been done for portions of interstate system. Accidents can pose a risk of snarling traffic.	Mar 15, 2011 11:37 AM
5	safety, administrative approval	Mar 15, 2011 10:22 AM
7	n/a	Mar 14, 2011 10:35 AM
8	lake of public support	Mar 11, 2011 1:56 PM
11	ROW. STRUCTURES. INTERCHANGE TRAFFIC.	Mar 9, 2011 8:45 PM
12	cost, shoulder not wide enough, not enough right-of-way	Mar 9, 2011 8:13 AM
13	Some reluctance by TxDOT district. Only applies to FM road system, shoulders elsewhere are not able to carry heavy loads.	Mar 9, 2011 7:37 AM

Page 3, Q4. Please identify barriers encountered for these strategies.

14	N/A	Mar 9, 2011 7:09 AM
15	Loss of parking and perceived tight fit	Mar 8, 2011 9:08 AM
	Shoulder used for part-time travel lane	
1	NA	Mar 23, 2011 4:32 PM
2	Financial support availability	Mar 22, 2011 5:53 AM
3	Geometric deficiencies	Mar 21, 2011 12:01 PM
5	safety, unfamiliarity with drivers	Mar 15, 2011 10:22 AM
7	n/a	Mar 14, 2011 10:35 AM
8	lake of public support	Mar 11, 2011 1:56 PM
11	POLICY PREFERS FULL AVAILABILITY OF SHOULDER.	Mar 9, 2011 8:45 PM
12	cost, shoulder not wide enough, reconstruction necessary, not enough right-of-way	Mar 9, 2011 8:13 AM
13	Same issues as shoulder conversion	Mar 9, 2011 7:37 AM
14	N/A	Mar 9, 2011 7:09 AM
15	Not used or considered as yet	Mar 8, 2011 9:08 AM

Page 3, Q5. Please identify the solutions to the barriers encountered for these strategies.

	Lane width reduction	
1	Implement where possible, ROW purchase when necessary	Mar 23, 2011 4:32 PM
2	N/A	Mar 21, 2011 12:01 PM
3	Not implemented.	Mar 15, 2011 11:37 AM
5	Reduced speeds, in some cases going back to wider lanes with narrowed center turn lane	Mar 15, 2011 9:56 AM
6	Wider outside lane for buses than on inside lanes.	Mar 14, 2011 10:35 AM
7	lake of public support	Mar 11, 2011 1:56 PM
8	no median, a few refuge islands, public outreach	Mar 10, 2011 7:13 AM
9	NA	Mar 9, 2011 8:45 PM
10	some cartway widening along with lane width reduction	Mar 9, 2011 8:13 AM
11	Fire trucks are 8 feet wide, lanes as narrow as 9 feet (combined with reduced speed limits) should still be acceptable width.	Mar 9, 2011 7:37 AM
12	N/A	Mar 9, 2011 7:09 AM
13	Change from normal experience for motorists	Mar 8, 2011 10:03 AM
14	Went with shoulder conversion	Mar 8, 2011 9:08 AM
	Conversion of median to travel lane(s)	
1	NA	Mar 23, 2011 4:32 PM
2	N/A	Mar 21, 2011 12:01 PM
3	Signalization, overhead lane directional signs.	Mar 15, 2011 11:37 AM
6	Moved bridge supports and rebuilt median to accomodate vehicle weights.	Mar 14, 2011 10:35 AM
7	lake of public support	Mar 11, 2011 1:56 PM

Page 3, Q5. Please identify the solutions to the barriers encountered for these strategies.

9	MONEY	Mar 9, 2011 8:45 PM
10	consistent width of median over long distance	Mar 9, 2011 8:13 AM
11	n/a	Mar 9, 2011 7:37 AM
12	N/A	Mar 9, 2011 7:09 AM
14	Traffic needs overruled aesthetics; drainage was redirected	Mar 8, 2011 9:08 AM
	Shoulder conversion	
1	NA	Mar 23, 2011 4:32 PM
2	N/A	Mar 21, 2011 12:01 PM
3	Special pull-over areas for accidents are identified.	Mar 15, 2011 11:37 AM
4	illustrate examples of successful applications	Mar 15, 2011 10:22 AM
6	n/a	Mar 14, 2011 10:35 AM
7	lake of public support	Mar 11, 2011 1:56 PM
9	MONEY	Mar 9, 2011 8:45 PM
10	$$	Mar 9, 2011 8:13 AM
11	Outside of FM road system, additional pavement depth would be required to handle heavy loads.	Mar 9, 2011 7:37 AM
12	N/A	Mar 9, 2011 7:09 AM
14	Parking was relocated (underused driveways). Perception changed with use.	Mar 8, 2011 9:08 AM
	Shoulder used for part-time travel lane	
1	NA	Mar 23, 2011 4:32 PM
2	Emergency pull-off areas were added, ramps were redesigned, and static and changeable signage was added.	Mar 21, 2011 12:01 PM
6	n/a	Mar 14, 2011 10:35 AM

Page 3, Q5. Please identify the solutions to the barriers encountered for these strategies.

7	lake of public support	Mar 11, 2011 1:56 PM
9	NA	Mar 9, 2011 8:45 PM
10	$$	Mar 9, 2011 8:13 AM
11	Same issues as shoulder conversion	Mar 9, 2011 7:37 AM
12	N/A	Mar 9, 2011 7:09 AM
14	Not used or considered yet	Mar 8, 2011 9:08 AM

Page 3, Q6. Please identify the costs ($) for these strategies and note which year these represent (e.g., $100,000 $2008).

	Lane width reduction	
1	Not sure	Mar 23, 2011 4:32 PM
2	N/A	Mar 21, 2011 12:01 PM
4	Don't know	Mar 15, 2011 11:37 AM
5	minimal striping costs - $10,000-$50,000/mile	Mar 14, 2011 10:35 AM
6	$5 million	Mar 10, 2011 9:30 AM
7	done in conjunction w/resurfacing ~$11million for 3 miles	Mar 10, 2011 7:13 AM
8	NA	Mar 9, 2011 8:45 PM
9	unknown	Mar 9, 2011 8:13 AM
10	$10,000 to $15,000 per linear mile in 2010 (depends upon inclusion of bicycle and/or transit lanes)	Mar 9, 2011 7:37 AM
11	N/A	Mar 9, 2011 7:09 AM
12	cost saving compared to widening road further	Mar 8, 2011 10:03 AM
	Conversion of median to travel lane(s)	
1	NA	Mar 23, 2011 4:32 PM
2	N/A	Mar 21, 2011 12:01 PM
3	About $3.0 million per centerline mile - adds a lane in each direction and closes median.	Mar 15, 2011 3:04 PM
4	Don't know	Mar 15, 2011 11:37 AM
5	full project costs were over $100million/mile on existing freeways in urban areas.	Mar 14, 2011 10:35 AM
8	?	Mar 9, 2011 8:45 PM
9	unknown	Mar 9, 2011 8:13 AM
10	n/a	Mar 9, 2011 7:37 AM

Page 3, Q6. Please identify the costs ($) for these strategies and note which year these represent (e.g., $100,000 $2008).		
11	N/A	Mar 9, 2011 7:09 AM
	Shoulder conversion	
1	NA	Mar 23, 2011 4:32 PM
2	N/A	Mar 21, 2011 12:01 PM
4	Don't know	Mar 15, 2011 11:37 AM
8	?	Mar 9, 2011 8:45 PM
9	unknown	Mar 9, 2011 8:13 AM
10	For FM road system: ~$10,000 per mile. Other roads - up to $500,000 for each shoulder per mile ($1,000,000 per mile for both directions). Both in 2010	Mar 9, 2011 7:37 AM
11	N/A	Mar 9, 2011 7:09 AM
	Shoulder used for part-time travel lane	
1	NA	Mar 23, 2011 4:32 PM
2	Not sure, VDOT implemented the project.	Mar 21, 2011 12:01 PM
4	Don't know	Mar 15, 2011 11:37 AM
8	NA	Mar 9, 2011 8:45 PM
9	unknown	Mar 9, 2011 8:13 AM
10	See shoulder conversion	Mar 9, 2011 7:37 AM
11	N/A	Mar 9, 2011 7:09 AM

Page 3, Q7. Please identify the calculated or documented benefit/cost ratio or a range for these strategies.

	Lane width reduction	
1	Unavailable	Mar 23, 2011 4:32 PM
2	N/A	Mar 21, 2011 12:01 PM
3	Don't know	Mar 15, 2011 11:37 AM
4	??	Mar 14, 2011 10:35 AM
5	NA	Mar 10, 2011 9:30 AM
6	not yet calculated, awaiting report from FDOT, but crash reduction ~40%	Mar 10, 2011 7:13 AM
7	NA	Mar 9, 2011 8:45 PM
8	unknown	Mar 9, 2011 8:13 AM
9	None performed	Mar 9, 2011 7:37 AM
10	N/A	Mar 9, 2011 7:09 AM
	Conversion of median to travel lane(s)	
1	NA	Mar 23, 2011 4:32 PM
2	N/A	Mar 21, 2011 12:01 PM
3	Don't know	Mar 15, 2011 11:37 AM
4	as an HOV lane 10:1 http://www.hovworld.com/publications_assets/MTAHOVexecsum.pdf	Mar 14, 2011 10:35 AM
7	NOT AVAILABLE	Mar 9, 2011 8:45 PM
8	unknown	Mar 9, 2011 8:13 AM
9	n/a	Mar 9, 2011 7:37 AM
10	N/A	Mar 9, 2011 7:09 AM
	Shoulder conversion	

Page 3, Q7. Please identify the calculated or documented benefit/cost ratio or a range for these strategies.

1	NA	Mar 23, 2011 4:32 PM
2	N/A	Mar 21, 2011 12:01 PM
3	Don't know	Mar 15, 2011 11:37 AM
7	NOT AVAILABLE.	Mar 9, 2011 8:45 PM
8	unknown	Mar 9, 2011 8:13 AM
9	None Performed	Mar 9, 2011 7:37 AM
10	N/A	Mar 9, 2011 7:09 AM
	Shoulder used for part-time travel lane	
1	NA	Mar 23, 2011 4:32 PM
2	Not sure. We are not aware of any study that was done at the time.	Mar 21, 2011 12:01 PM
3	Don't know	Mar 15, 2011 11:37 AM
7	NA	Mar 9, 2011 8:45 PM
8	unknown	Mar 9, 2011 8:13 AM
9	None Performed	Mar 9, 2011 7:37 AM
10	N/A	Mar 9, 2011 7:09 AM

Page 4, Q4. Please identify barriers encountered for these strategies.		
1	Ramp removal - business interests can be in opposition Reconfiguration can be costly	Mar 23, 2011 4:34 PM
2	Funding for Interstate construction projects has been difficult to obtain in recent years, and ramps have been reconfigured as part of major roadway improvement projects.	Mar 21, 2011 12:07 PM
3	political	Mar 16, 2011 4:54 PM
4	ROW acquisition and cost. A planned reconfiguration will require reworking of local street system.	Mar 15, 2011 11:39 AM
5	public backlash, right-of-way and construction costs (for reconfigurations)	Mar 15, 2011 10:24 AM
6	LOCAL COMMERCIAL CONCERNS ABOUT LOSS OF FREEWAY ACCESS.	Mar 9, 2011 8:47 PM
7	Cost, funding, design challenges	Mar 9, 2011 8:18 AM
8	Ramp removals generally opposed by businesses in immediate vicinity of the ramp to be removed. Perceived reduction of access to/from main lanes is projected to harm business. Reconfigurations are generally viewed to help access.	Mar 9, 2011 7:47 AM
9	N/A	Mar 9, 2011 7:10 AM
10	Public opinion against ramp removal or closure	Mar 8, 2011 6:54 AM
11	Funding was the primary issue with getting this accomplished.	Mar 8, 2011 5:59 AM

Page 4, Q5. Please identify the solutions to the barriers encountered for these strategies.

1	Outreach and education early in process.	Mar 23, 2011 4:34 PM
2	N/A	Mar 21, 2011 12:07 PM
3	education	Mar 16, 2011 4:54 PM
4	Folding local street system reconfiguration into project.	Mar 15, 2011 11:39 AM
5	simulation models showing expected results	Mar 15, 2011 10:24 AM
6	COMPROMISE	Mar 9, 2011 8:47 PM
7	mix of funding strategies, working with adjacent property owners, finding design solutions	Mar 9, 2011 8:18 AM
8	For ramp removals, better or improved signage, multi-laned ramps help, continuous frontage roads are also needed.	Mar 9, 2011 7:47 AM
9	N/A	Mar 9, 2011 7:10 AM
10	The Governor leased the I-70 Tollway and we got this and one other project (very big) funded in our area.	Mar 8, 2011 5:59 AM

Page 4, Q6. Please identify the costs ($) for these strategies and note which year these represent (e.g., $100,000 $2008).

1	Not sure about removal costs. Reconfiguration can run into the tens of millions if ramps and bridges need to be rebuilt.	Mar 23, 2011 4:34 PM
2	Not sure.	Mar 21, 2011 12:07 PM
3	Don't know.	Mar 15, 2011 11:39 AM
4	?	Mar 9, 2011 8:47 PM
5	unknown	Mar 9, 2011 8:18 AM
6	$10,000 per 1000 feet of ramp to be removed. Ramp reconfigurations: $30,000,000 to reconfigure a diamond interchange to a multi-level interchange. $10,000,000 for vice-versa. All costs in year 2010.	Mar 9, 2011 7:47 AM
7	N/A	Mar 9, 2011 7:10 AM

Page 4, Q6. Please identify the costs ($) for these strategies and note which year these represent (e.g., $100,000 $2008).		
8	FFY 2010 at 6.633 million dollars	Mar 8, 2011 5:59 AM

Page 4, Q7. Please identify the calculated or documented benefit/cost ratio or a range for these strategies.		
1	Unavailable	Mar 23, 2011 4:34 PM
2	Not sure.	Mar 21, 2011 12:07 PM
3	Don't know.	Mar 15, 2011 11:39 AM
4	?	Mar 9, 2011 8:47 PM
5	unknown	Mar 9, 2011 8:18 AM
6	None calculated	Mar 9, 2011 7:47 AM
7	N/A	Mar 9, 2011 7:10 AM
8	This project was selected at the INDOT Central Office using their IPOC scoring process. This selection process scores projects on a number of factors to include economic impact. This project is the interchange for major Indiana industry park and thus scored well.	Mar 8, 2011 5:59 AM

Page 5, Q4. Please identify barriers encountered for these strategies.

1	Funding is often the main barrier	Mar 23, 2011 4:38 PM
2	Obtaining funding for roadway projects is an issue. Other issues related to construction are also an issue such as obtaining right-of-way, environmental permits, etc. Another barrier is that most of our bottlenecks are bridges and tunnels in our region, so construction costs to alleviate these bottlenecks are much higher than other roadway projects.	Mar 21, 2011 12:20 PM
3	Physical barriers (bridge carrying multiple overhead railroad tracks) Cost (adding capacity to end-of-freeway bottleneck) NEPA issues (preserved ag. parcels, historical and environmental concerns)	Mar 18, 2011 10:33 AM
4	funding	Mar 16, 2011 4:54 PM
5	Primary strategy I am thinking of here is roundabouts, which have been implemented in a variety of suburban communities to replace four-way stops, and even traffic signals in limited circumstances. It takes time for people to get used to them.	Mar 15, 2011 11:43 AM
6	right-of-way, construction costs, utilities, railroad coordination, maintenance & protection of traffic during construction	Mar 15, 2011 10:25 AM
7	Right of way issues with businesses located along arterials. Stormwater permitting.	Mar 15, 2011 9:59 AM
8	Costs. In an urban built out environment, the costs for ROW . Technical Documents for both freeway and arterial can be found at http://www.scag.ca.gov/corridor/	Mar 14, 2011 10:35 AM
9	COST. COMMUNITY OPPOSITION	Mar 9, 2011 8:49 PM
10	Certain intersections were bottleneck due to lane merge and complex geometric road configuration. Lane addition and safety improvements done by CT DOT has highly improved traffic mobility and congestion along the corridor.	Mar 9, 2011 6:06 PM
11	n/a	Mar 9, 2011 8:19 AM
12	No barriers identified for freeways. Generally few, if any, bottlenecks on the arterial system in our region.	Mar 9, 2011 7:51 AM
13	The only barrier was cost. We had a substandard freeway to freeway connection which backed up traffic for miles.	Mar 9, 2011 7:13 AM
14	Minor ROW	Mar 8, 2011 8:51 AM

Page 5, Q5. Please identify the solutions to the barriers encountered for these strategies.		
1	N/A.	Mar 21, 2011 12:20 PM
2	Clear signage and lane markings indicating through- vs. turn lanes, priority vehicles, signaling when exiting the roundabout.	Mar 15, 2011 11:43 AM
3	ITS	Mar 15, 2011 10:25 AM
4	Legal remedies sought for ROW. Increases costs for additional stormwater avoidance and mitigation.	Mar 15, 2011 9:59 AM
5	CONTEXT SENSITIVE SOLUTIONS	Mar 9, 2011 8:49 PM
6	NA	Mar 9, 2011 6:06 PM
7	n/a	Mar 9, 2011 8:19 AM
8	n/a	Mar 9, 2011 7:51 AM
9	The Illinois Tollway took the lead and raised tolls at the Illinois-Wisconsin State line to pay for the improvements.	Mar 9, 2011 7:13 AM
10	Lane drop followed by close lane addition was graded out to continuous 2 lanes on main interstate	Mar 8, 2011 8:51 AM

Page 5, Q6. Please identify the costs ($) for these strategies and note which year these represent (e.g., $100,000 $2008).		
1	Depending on the strategy implemented. I am aware of TI reconstructions and freeway widening as well as arterial lane reconfiguration and reconstruction	Mar 23, 2011 4:38 PM
2	Not sure.	Mar 21, 2011 12:20 PM
3	Costs vary widely depending on ROW requirements. A typical cost is about $100-500K.	Mar 15, 2011 11:43 AM
4	?	Mar 9, 2011 8:49 PM
5	NA	Mar 9, 2011 6:06 PM
6	n/a	Mar 9, 2011 8:19 AM
7	$1,500,000 to $20,000,000 to extend frontage roads. Varies depending upon distance and feature to be crossed (largest and most expensive bottleneck is IH-35 over Brazos River). All costs in year 2010.	Mar 9, 2011 7:51 AM
8	I do not know the exact amount, but the total project was roughly $75 million.	Mar 9, 2011 7:13 AM
9	NA	Mar 8, 2011 8:51 AM

Page 5, Q7. Please identify the calculated or documented benefit/cost ratio or a range for these strategies.		
1	Unknown	Mar 23, 2011 4:38 PM
2	Not sure.	Mar 21, 2011 12:20 PM
3	N/A	Mar 15, 2011 11:43 AM
4	?	Mar 9, 2011 8:49 PM
5	NA	Mar 9, 2011 6:06 PM
6	n/a	Mar 9, 2011 8:19 AM
7	None calculated	Mar 9, 2011 7:51 AM
8	I do not know.	Mar 9, 2011 7:13 AM

Page 5, Q7. Please identify the calculated or documented benefit/cost ratio or a range for these strategies.

9	NA	Mar 8, 2011 8:51 AM

Page 6, Q4. Please identify the solutions to the barriers encountered for these strategies.

	Widen road to accomodate shoulders	
1	ROW purchase	Mar 23, 2011 4:43 PM
4	N/A	Mar 15, 2011 11:47 AM
5	MONEY,	Mar 9, 2011 8:56 PM
6	More right of way	Mar 9, 2011 8:02 AM
7	i	Mar 9, 2011 7:30 AM
	Additional turn lanes at intersections	
2	Devoted funding pots such as CMAQ.	Mar 21, 2011 12:37 PM
4	N/A	Mar 15, 2011 11:47 AM
5	MONEY,	Mar 9, 2011 8:56 PM
6	More right of way	Mar 9, 2011 8:02 AM
8	Public Education	Mar 9, 2011 6:24 AM
	Lengthened turn lanes at intersection for queueing	
2	Devoted funding pots such as CMAQ.	Mar 21, 2011 12:37 PM
4	N/A	Mar 15, 2011 11:47 AM
5	MONEY	Mar 9, 2011 8:56 PM
6	More right of way	Mar 9, 2011 8:02 AM
8	Public Education	Mar 9, 2011 6:24 AM
	Improved sight distances at intersections	
4	N/A	Mar 15, 2011 11:47 AM
5	MONEY	Mar 9, 2011 8:56 PM

Page 6, Q4. Please identify the solutions to the barriers encountered for these strategies.

6	n/a	Mar 9, 2011 8:02 AM
	Diverging diamond intersections	
4	Signal timing; reconfiguration to single-point interchange	Mar 15, 2011 11:47 AM
5	MONEY, CONTEXT SENSITIVE SOLUTIONS	Mar 9, 2011 8:56 PM
6	n/a	Mar 9, 2011 8:02 AM
	Jughandles at intersections	
4	N/A	Mar 15, 2011 11:47 AM
5	MONEY, CONTEXT SENSITIVE SOLUTIONS	Mar 9, 2011 8:56 PM
6	n/a	Mar 9, 2011 8:02 AM
	Median U-turn crossovers	
4	N/A	Mar 15, 2011 11:47 AM
5	MONEY, CONTEXT SENSITIVE SOLUTIONS	Mar 9, 2011 8:56 PM
6	Generally incorporated in grade separated interchange design by TxDOT	Mar 9, 2011 8:02 AM
	Continuous flow intersections	
4	N/A	Mar 15, 2011 11:47 AM
5	MONEY, CONTEXT SENSITIVE SOLUTIONS	Mar 9, 2011 8:56 PM
6	n/a	Mar 9, 2011 8:02 AM
	Auxiliary lanes for merging and diverging	
4	N/A	Mar 15, 2011 11:47 AM
5	MONEY	Mar 9, 2011 8:56 PM
6	n/a	Mar 9, 2011 8:02 AM

Page 6, Q4. Please identify the solutions to the barriers encountered for these strategies.

	Intersection channelization	
4	N/A	Mar 15, 2011 11:47 AM
5	MONEY	Mar 9, 2011 8:56 PM
6	n/a	Mar 9, 2011 8:02 AM
	Bus turnouts	
4	N/A	Mar 15, 2011 11:47 AM
5	MONEY	Mar 9, 2011 8:56 PM
6	More right of way	Mar 9, 2011 8:02 AM
	Commercial vehicle accommodations	
4	N/A	Mar 15, 2011 11:47 AM
5	MONEY, CONTEXT SENSITIVE SOLUTIONS	Mar 9, 2011 8:56 PM
6	n/a	Mar 9, 2011 8:02 AM
	Grade separations (street-rail)	
2	Obtaining funding for this type of high-cost project.	Mar 21, 2011 12:37 PM
3	funding	Mar 16, 2011 4:58 PM
4	N/A	Mar 15, 2011 11:47 AM
5	MONEY, CONTEXT SENSITIVE SOLUTIONS	Mar 9, 2011 8:56 PM
6	More accomodation by railroads	Mar 9, 2011 8:02 AM
	Grade separations (street-street)	
2	Obtaining funding for this type of high-cost project.	Mar 21, 2011 12:37 PM
3	funding	Mar 16, 2011 4:58 PM

Page 6, Q4. Please identify the solutions to the barriers encountered for these strategies.		
4	N/A	Mar 15, 2011 11:47 AM
5	MONEY, CONTEXT SENSITIVE SOLUTIONS	Mar 9, 2011 8:56 PM
6	More consideration of other design concepts by TxDOT (e.g. roundabouts)	Mar 9, 2011 8:02 AM

Page 6, Q5. Please identify the costs ($) for these strategies and note which year these represent (e.g., $100,000 $2008).

	Widen road to accomodate shoulders	
1	Not sure	Mar 21, 2011 12:37 PM
2	N/A	Mar 15, 2011 11:47 AM
3	$500,000 per mile (2010)	Mar 9, 2011 8:02 AM
4	i	Mar 9, 2011 7:30 AM
	Additional turn lanes at intersections	
1	Not sure	Mar 21, 2011 12:37 PM
2	N/A	Mar 15, 2011 11:47 AM
3	$250,000 per intersection (all 4 approaches)(2010)	Mar 9, 2011 8:02 AM
5	$100,000 $2009	Mar 9, 2011 6:24 AM
	Lengthened turn lanes at intersection for queueing	
1	Not sure	Mar 21, 2011 12:37 PM
2	N/A	Mar 15, 2011 11:47 AM
3	$100,000 per approach (2010)	Mar 9, 2011 8:02 AM
5	$100,000 $2008	Mar 9, 2011 6:24 AM
	Improved sight distances at intersections	
1	Not sure	Mar 21, 2011 12:37 PM
2	N/A	Mar 15, 2011 11:47 AM
3	Varies considerably	Mar 9, 2011 8:02 AM
	Diverging diamond intersections	
1	Not sure	Mar 21, 2011 12:37 PM

Page 6, Q5. Please identify the costs ($) for these strategies and note which year these represent (e.g., $100,000 $2008).		
2	N/A	Mar 15, 2011 11:47 AM
3	n/a	Mar 9, 2011 8:02 AM
	Jughandles at intersections	
1	Not sure	Mar 21, 2011 12:37 PM
2	N/A	Mar 15, 2011 11:47 AM
3	n/a	Mar 9, 2011 8:02 AM
	Median U-turn crossovers	
1	Not sure	Mar 21, 2011 12:37 PM
2	N/A	Mar 15, 2011 11:47 AM
3	Generally incorporated in grade separated interchange design by TxDOT	Mar 9, 2011 8:02 AM
	Continuous flow intersections	
1	Not sure	Mar 21, 2011 12:37 PM
2	N/A	Mar 15, 2011 11:47 AM
3	n/a	Mar 9, 2011 8:02 AM
	Auxiliary lanes for merging and diverging	
1	Not sure	Mar 21, 2011 12:37 PM
2	N/A	Mar 15, 2011 11:47 AM
3	n/a	Mar 9, 2011 8:02 AM
	Intersection channelization	
1	Not sure	Mar 21, 2011 12:37 PM
2	N/A	Mar 15, 2011 11:47 AM

Page 6, Q5. Please identify the costs ($) for these strategies and note which year these represent (e.g., $100,000 $2008).

3	n/a	Mar 9, 2011 8:02 AM
	Bus turnouts	
1	Not sure	Mar 21, 2011 12:37 PM
2	N/A	Mar 15, 2011 11:47 AM
3	$100,000 per turnout (2010)	Mar 9, 2011 8:02 AM
	Commercial vehicle accommodations	
1	Not sure	Mar 21, 2011 12:37 PM
2	N/A	Mar 15, 2011 11:47 AM
3	n/a	Mar 9, 2011 8:02 AM
	Grade separations (street-rail)	
1	Not sure	Mar 21, 2011 12:37 PM
2	N/A	Mar 15, 2011 11:47 AM
3	$5,000,000 per grade separation (2010)	Mar 9, 2011 8:02 AM
	Grade separations (street-street)	
1	Not sure	Mar 21, 2011 12:37 PM
2	N/A	Mar 15, 2011 11:47 AM
3	$10,000,000 per interchange (includes on & off-ramps) (2010)	Mar 9, 2011 8:02 AM

Page 6, Q6. Please identify the calculated or documented benefit/cost ratio or a range for these strategies.

	Widen road to accomodate shoulders	
1	Not sure	Mar 21, 2011 12:37 PM
2	N/A	Mar 15, 2011 11:47 AM
3	None performed	Mar 9, 2011 8:02 AM
4	i	Mar 9, 2011 7:30 AM
	Additional turn lanes at intersections	
1	Not sure	Mar 21, 2011 12:37 PM
2	N/A	Mar 15, 2011 11:47 AM
3	None performed	Mar 9, 2011 8:02 AM
	Lengthened turn lanes at intersection for queueing	
1	Not sure	Mar 21, 2011 12:37 PM
2	N/A	Mar 15, 2011 11:47 AM
3	None performed	Mar 9, 2011 8:02 AM
	Improved sight distances at intersections	
1	Not sure	Mar 21, 2011 12:37 PM
2	N/A	Mar 15, 2011 11:47 AM
3	None performed	Mar 9, 2011 8:02 AM
	Diverging diamond intersections	
1	Not sure	Mar 21, 2011 12:37 PM
2	N/A	Mar 15, 2011 11:47 AM
3	None performed	Mar 9, 2011 8:02 AM

Page 6, Q6. Please identify the calculated or documented benefit/cost ratio or a range for these strategies.

	Jughandles at intersections	
1	Not sure	Mar 21, 2011 12:37 PM
2	N/A	Mar 15, 2011 11:47 AM
3	None performed	Mar 9, 2011 8:02 AM
	Median U-turn crossovers	
1	Not sure	Mar 21, 2011 12:37 PM
2	N/A	Mar 15, 2011 11:47 AM
3	None performed	Mar 9, 2011 8:02 AM
	Continuous flow intersections	
1	Not sure	Mar 21, 2011 12:37 PM
2	N/A	Mar 15, 2011 11:47 AM
3	None performed	Mar 9, 2011 8:02 AM
	Auxiliary lanes for merging and diverging	
1	Not sure	Mar 21, 2011 12:37 PM
2	N/A	Mar 15, 2011 11:47 AM
3	None performed	Mar 9, 2011 8:02 AM
	Intersection channelization	
1	Not sure	Mar 21, 2011 12:37 PM
2	N/A	Mar 15, 2011 11:47 AM
3	None performed	Mar 9, 2011 8:02 AM
	Bus turnouts	

Page 6, Q6. Please identify the calculated or documented benefit/cost ratio or a range for these strategies.		
1	Not sure	Mar 21, 2011 12:37 PM
2	N/A	Mar 15, 2011 11:47 AM
3	None performed	Mar 9, 2011 8:02 AM
	Commercial vehicle accommodations	
1	Not sure	Mar 21, 2011 12:37 PM
2	N/A	Mar 15, 2011 11:47 AM
3	None performed	Mar 9, 2011 8:02 AM
	Grade separations (street-rail)	
1	Not sure	Mar 21, 2011 12:37 PM
2	N/A	Mar 15, 2011 11:47 AM
3	None performed	Mar 9, 2011 8:02 AM
	Grade separations (street-street)	
1	Not sure	Mar 21, 2011 12:37 PM
2	N/A	Mar 15, 2011 11:47 AM
3	None performed	Mar 9, 2011 8:02 AM

Page 7, Q1. Which of the following overall street improvements have been implemented in your metropolitan area.		
1	Michigan turn intersections along specific corridor	Mar 23, 2011 4:46 PM
2	I have no knowledge of any of the above.	Mar 9, 2011 6:15 PM

Page 7, Q4. Please identify barriers encountered for these strategies.

	Superstreets (series of non-freeway grade separations)	
1	Costs and right-of-way acquisition.	Mar 21, 2011 12:46 PM
4	N/A	Mar 15, 2011 11:49 AM
5	?	Mar 9, 2011 9:01 PM
6	n/a	Mar 9, 2011 8:11 AM
	Complete streets	
1	Costs.	Mar 21, 2011 12:46 PM
2	Had to be done as a full reconstruction, including sidewalks, drainage, parking, bike/ped/transit accommodations	Mar 18, 2011 10:43 AM
4	N/A	Mar 15, 2011 11:49 AM
5	COST, ROW	Mar 9, 2011 9:01 PM
6	Opposition by some questioning need for bicycle / pedestrian facilities	Mar 9, 2011 8:11 AM
7	ROW, user education	Mar 8, 2011 8:55 AM
8	Lack of solid technical guidance (i.e. AASHTO Guide to Bike Facilities is disgracefully bad.)	Mar 8, 2011 6:06 AM
	Improving street continuity	
1	Costs.	Mar 21, 2011 12:46 PM
4	N/A	Mar 15, 2011 11:49 AM
5	COST, ROW	Mar 9, 2011 9:01 PM
6	n/a	Mar 9, 2011 8:11 AM
8	NIMBY	Mar 8, 2011 6:06 AM
	Two-way to One-way conversion	
1	Public and political acceptance.	Mar 21, 2011 12:46 PM

Page 7, Q4. Please identify barriers encountered for these strategies.		
3	parking	Mar 16, 2011 4:59 PM
4	Opposition from merchants	Mar 15, 2011 11:49 AM
5	LOSS OF ACCESS	Mar 9, 2011 9:01 PM
6	Opposed by property owners due to deterioration of access and increased speeds	Mar 9, 2011 8:11 AM
	One-way to Two-way conversion	
3	parking	Mar 16, 2011 4:59 PM
4	N/A	Mar 15, 2011 11:49 AM
5	NONE	Mar 9, 2011 9:01 PM
6	Opposed by property owners due to perceived reduction of capacity and traffic volumes	Mar 9, 2011 8:11 AM

Page 7, Q5. Please identify the solutions to the barriers encountered for these strategies.

	Superstreets (series of non-freeway grade separations)	
3	N/A	Mar 15, 2011 11:49 AM
4	NA	Mar 9, 2011 9:01 PM
5	n/a	Mar 9, 2011 8:11 AM
	Complete streets	
2	Complete them as new construction; reconstruction of existing is difficult, expensive and time consuming	Mar 18, 2011 10:43 AM
3	N/A	Mar 15, 2011 11:49 AM
4	PLANNING FOR WHOLE STREET	Mar 9, 2011 9:01 PM
5	Better education on benefits and needs	Mar 9, 2011 8:11 AM
6	Lots of research, benchmarking European approaches	Mar 8, 2011 6:06 AM
	Improving street continuity	
1	Obtaining funding for these type projects.	Mar 21, 2011 12:46 PM
3	N/A	Mar 15, 2011 11:49 AM
4	ACCESS MANAGMENT STRATEGY	Mar 9, 2011 9:01 PM
5	n/a	Mar 9, 2011 8:11 AM
6	Lots of public input and meetings.	Mar 8, 2011 6:06 AM
	Two-way to One-way conversion	
3	N/A	Mar 15, 2011 11:49 AM
4	NONE	Mar 9, 2011 9:01 PM
5	We generally no longer support these conversions	Mar 9, 2011 8:11 AM
	One-way to Two-way conversion	

Page 7, Q5. Please identify the solutions to the barriers encountered for these strategies.		
3	N/A	Mar 15, 2011 11:49 AM
4	N.A.	Mar 9, 2011 9:01 PM
5	Better education on benefits	Mar 9, 2011 8:11 AM

Page 7, Q6. Please identify the costs ($) for these strategies and note which year these represent (e.g., $100,000 $2008).

	Superstreets (series of non-freeway grade separations)	
1	Not sure	Mar 21, 2011 12:46 PM
2	N/A	Mar 15, 2011 11:49 AM
3	n/a	Mar 9, 2011 8:11 AM
	Complete streets	
1	Not sure	Mar 21, 2011 12:46 PM
2	N/A	Mar 15, 2011 11:49 AM
3	$10,000 to $200,000 per mile (depends upon need for bike / ped and/or transit lanes)(2010)	Mar 9, 2011 8:11 AM
	Improving street continuity	
1	Not sure	Mar 21, 2011 12:46 PM
2	N/A	Mar 15, 2011 11:49 AM
3	n/a	Mar 9, 2011 8:11 AM
	Two-way to One-way conversion	
1	Not sure	Mar 21, 2011 12:46 PM
2	N/A	Mar 15, 2011 11:49 AM
3	We generally no longer support these conversions	Mar 9, 2011 8:11 AM
	One-way to Two-way conversion	
1	Not sure	Mar 21, 2011 12:46 PM
2	N/A	Mar 15, 2011 11:49 AM
3	$150,000 to $250,000 per mile (depends upon number of signalized intersections)(2010)	Mar 9, 2011 8:11 AM

Page 7, Q7. Please identify the calculated or documented benefit/cost ratio or a range for these strategies.

	Superstreets (series of non-freeway grade separations)	
1	Not sure	Mar 21, 2011 12:46 PM
2	N/A	Mar 15, 2011 11:49 AM
3	None performed	Mar 9, 2011 8:11 AM
	Complete streets	
1	Not sure	Mar 21, 2011 12:46 PM
2	N/A	Mar 15, 2011 11:49 AM
3	None performed	Mar 9, 2011 8:11 AM
	Improving street continuity	
1	Not sure	Mar 21, 2011 12:46 PM
2	N/A	Mar 15, 2011 11:49 AM
3	None performed	Mar 9, 2011 8:11 AM
	Two-way to One-way conversion	
1	Not sure	Mar 21, 2011 12:46 PM
2	N/A	Mar 15, 2011 11:49 AM
3	None performed	Mar 9, 2011 8:11 AM
	One-way to Two-way conversion	
1	Not sure	Mar 21, 2011 12:46 PM
2	N/A	Mar 15, 2011 11:49 AM
3	None performed	Mar 9, 2011 8:11 AM

Page 8, Q1. Have any of the following time-of-day policies been implemented in your metropolitan area to mitigate congestion?		
1	If it says not impleemented, I don't know, but am required to put a response.	Mar 28, 2011 2:17 PM

Page 8, Q4. Please identify barriers encountered for these strategies.

	Auto turning restrictions on streets	
1	Enforcement.	Mar 21, 2011 12:50 PM
3	N/A	Mar 15, 2011 11:50 AM
	Auto parking restrictions on streets	
3	One parked vehicle can mess up traffic flow	Mar 15, 2011 11:50 AM
4	LACK OF ENFORCEMENT; COMMERCIAL INTEREST AND COMMUNITY OPPOSITION	Mar 9, 2011 9:08 PM
	Truck shipping/delivery schedules	
3	N/A	Mar 15, 2011 11:50 AM
4	N.A.	Mar 9, 2011 9:08 PM
	Truck peak period bans on arterials	
1	Concerns from the freight community.	Mar 21, 2011 12:50 PM
3	N/A	Mar 15, 2011 11:50 AM
4	COMMERCIAL OPPOSITION. COMMERCIAL OPERATIONS WON'T FACILITATE THIS.	Mar 9, 2011 9:08 PM
	Truck management strategies	
3	N/A	Mar 15, 2011 11:50 AM
4	ATTAINING INDUSTRY COOPERATION	Mar 9, 2011 9:08 PM
	Truck freight and delivery consolidation	
3	N/A	Mar 15, 2011 11:50 AM
4	LOGISTICS	Mar 9, 2011 9:08 PM
	Designated truck routes	
2	political	Mar 16, 2011 5:00 PM

Page 8, Q4. Please identify barriers encountered for these strategies.		
3	N/A	Mar 15, 2011 11:50 AM
4	MAY ADD TO CONGESTION BY ADDING TRUCK VMT	Mar 9, 2011 9:08 PM

Page 8, Q5. Please identify the solutions to the barriers encountered for these strategies.		
	Auto turning restrictions on streets	
1	Enforcement	Mar 15, 2011 11:50 AM
	Auto parking restrictions on streets	
1	Increased enforcement	Mar 15, 2011 11:50 AM
	Truck shipping/delivery schedules	
1	N/A	Mar 15, 2011 11:50 AM
	Truck peak period bans on arterials	
1	N/A	Mar 15, 2011 11:50 AM
	Truck management strategies	
1	N/A	Mar 15, 2011 11:50 AM
2	FREIGHT COMMITTEE HAS BEEN ESTABLISHED TO WORK THROUGH THESE ISSUES	Mar 9, 2011 9:08 PM
	Truck freight and delivery consolidation	
1	N/A	Mar 15, 2011 11:50 AM
	Designated truck routes	
1	N/A	Mar 15, 2011 11:50 AM
2	COMMUNITY COOPERATION	Mar 9, 2011 9:08 PM

Page 8, Q6. Please identify the costs ($) for these strategies and note which year these represent (e.g., $100,000 $2008).

	Auto turning restrictions on streets	
1	N/A	Mar 15, 2011 11:50 AM
	Auto parking restrictions on streets	
1	N/A	Mar 15, 2011 11:50 AM
	Truck shipping/delivery schedules	
1	N/A	Mar 15, 2011 11:50 AM
	Truck peak period bans on arterials	
1	N/A	Mar 15, 2011 11:50 AM
	Truck management strategies	
1	N/A	Mar 15, 2011 11:50 AM
	Truck freight and delivery consolidation	
1	N/A	Mar 15, 2011 11:50 AM
	Designated truck routes	
1	N/A	Mar 15, 2011 11:50 AM

Page 8, Q7. Please identify the calculated or documented benefit/cost ratio or a range for these strategies.		
	Auto turning restrictions on streets	
1	N/A	Mar 15, 2011 11:50 AM
	Auto parking restrictions on streets	
1	N/A	Mar 15, 2011 11:50 AM
	Truck shipping/delivery schedules	
1	N/A	Mar 15, 2011 11:50 AM
	Truck peak period bans on arterials	
1	N/A	Mar 15, 2011 11:50 AM
	Truck management strategies	
1	N/A	Mar 15, 2011 11:50 AM
	Truck freight and delivery consolidation	
1	N/A	Mar 15, 2011 11:50 AM
	Designated truck routes	
1	N/A	Mar 15, 2011 11:50 AM

Page 9, Q1. Which of the following access management strategies have been implemented in your metropolitan area?		
1	SCAG does not implement. All these are local responsibility.	Mar 28, 2011 2:18 PM

Page 9, Q4. Please identify barriers encountered for these strategies.

	Driveway spacing standards	
	Driveway consolidation	
1	political	Mar 16, 2011 5:03 PM
3	Property owner perceived needs vs. benefit to the adjacent roadway	Mar 9, 2011 7:24 AM
4	Owner foresight/cooperation	Mar 8, 2011 9:02 AM
	Driveway sharing and cross-access	
1	business	Mar 16, 2011 5:03 PM
3	Property owner perceived needs vs. benefit to the adjacent roadway. Also cost sharing of future mailtenance.	Mar 9, 2011 7:24 AM
4	Owner foresight/cooperation	Mar 8, 2011 9:02 AM
	Sidestreet/alley/backage road access	
4	ROW/space	Mar 8, 2011 9:02 AM
	Raised median policies and standards	
	Two-way-left-turn-lanes	
4	Safety concerns	Mar 8, 2011 9:02 AM
	Raised median installation	
4	Business objections to reduced access / longer paths	Mar 8, 2011 9:02 AM
	Frontage roads on arterial streets	
4	ROW/space	Mar 8, 2011 9:02 AM
	Left-turn restrictions	
3	Citizen opposition, especially in residential areas	Mar 9, 2011 7:24 AM
4	Business and citizen objections to reduced access / longer paths	Mar 8, 2011 9:02 AM

Page 9, Q4. Please identify barriers encountered for these strategies.

	Interchange modifications (such as full clover leaf to partial clover leaf) Minimum street intersection spacing Minimum freeway interchange spacing	
2	Political pressure to increase number of interchanges in built-up areas	Mar 15, 2011 11:53 AM

Page 9, Q5. Please identify the solutions to the barriers encountered for these strategies.

	Driveway spacing standards Driveway consolidation	
1	Enlightened encouragement	Mar 8, 2011 9:02 AM
	Driveway sharing and cross-access	
1	Enlightened encouragement	Mar 8, 2011 9:02 AM
	Sidestreet/alley/backage road access	
1	Plan ahead	Mar 8, 2011 9:02 AM
	Raised median policies and standards Two-way-left-turn-lanes	
1	Keep them wide,long and marked	Mar 8, 2011 9:02 AM
	Raised median installation	
1	Enlightened encouragement, often accepted	Mar 8, 2011 9:02 AM
	Frontage roads on arterial streets	
1	Plan ahead	Mar 8, 2011 9:02 AM
	Left-turn restrictions	
1	Put in place amd monitor reaction/usage	Mar 8, 2011 9:02 AM
	Interchange modifications (such as full clover leaf to partial clover leaf) Minimum street intersection spacing Minimum freeway interchange spacing	

Page 10, Q4. Please identify barriers encountered for these strategies.

	Ramp metering - localized	
1	political	Mar 16, 2011 5:04 PM
	Ramp metering - demand responsive Ramp metering - coordinated Ramp metering - HOV bypass	
2	These were used then removed in favor of dual ramp meter lights. HOV bypass had major safety issues.	Mar 15, 2011 3:13 PM

Page 10, Q5. Please identify the solutions to the barriers encountered for these strategies.

	Ramp metering - localized	
1	political	Mar 16, 2011 5:04 PM
	Ramp metering - demand responsive Ramp metering - coordinated Ramp metering - HOV bypass	

Page 11, Q4. Please identify barriers encountered for these strategies.

	Real-time speed via web/smartphone	
	Transit vehicle schedule progress	
1	Technical coordination with transit AVL system, data quality and consistency	Mar 23, 2011 5:02 PM
	Highway information systems	
2	Availability needs to be known; access whiel traveling can be difficult/dangerous	Mar 8, 2011 9:04 AM
	511 traveler information systems	
1	Coordination between state and local agencies to provide comprehensive data for travelers	Mar 23, 2011 5:02 PM
2	Availability needs to be known; access whiel traveling can be difficult/dangerous	Mar 8, 2011 9:04 AM
	Website traveler information systems	
2	Availability needs to be known; access whiel traveling can be difficult/dangerous	Mar 8, 2011 9:04 AM
	Travel time message for travelers	
	Freight shipper congestion information	
	National traffic and road closure information	

Page 11, Q5. Please identify the solutions to the barriers encountered for these strategies.

	Real-time speed via web/smartphone Transit vehicle schedule progress	
1	Committment	Mar 23, 2011 5:02 PM
	Highway information systems 511 traveler information systems	
1	Getting state system to allow data input from local agencies	Mar 23, 2011 5:02 PM
	Website traveler information systems Travel time message for travelers Freight shipper congestion information National traffic and road closure information	

Page 13, Q4. Please identify barriers encountered for these strategies.

	Speed harmonization Temporary shoulder use	
1	These barriers were listed previously in the study.	Mar 21, 2011 12:58 PM
	Queue warning Dynamic merge control Construction site management	
3	Safety in setup	Mar 8, 2011 9:06 AM
	Dynamic truck restrictions Dynamic traveler information and rerouting	
3	Public trust; timeliness of information, before and after incident	Mar 8, 2011 9:06 AM
	Automated enforcement	
1	Political and public concerns.	Mar 21, 2011 12:58 PM
2	Photo speed enforcement on highways used, showed safety benefits but public/political issues caused removal.	Mar 15, 2011 3:16 PM

Page 14, Q4. Please identify barriers encountered for these strategies.

	Retiming	
1	Set up as regional program, run by MPO. Coordination among agencies is a barrier.	Mar 23, 2011 5:18 PM
3	Takes a lot a staff hours to collect data in the field	Mar 9, 2011 7:29 AM
4	Resources	Mar 8, 2011 9:07 AM
	Coordination	
3	Need a communications backbone	Mar 9, 2011 7:29 AM
4	Resources	Mar 8, 2011 9:07 AM
	Equipment upgrade	
1	Coordination among multiple agencies is a challenge. Funding.	Mar 23, 2011 5:18 PM
2	Obtaining funding.	Mar 21, 2011 1:00 PM
3	Cost	Mar 9, 2011 7:29 AM
4	Resources	Mar 8, 2011 9:07 AM
	Adaptive signal controls/demand responsive	
1	Limited benefits. Extensive detection requirements.	Mar 23, 2011 5:18 PM

Page 14, Q5. Please identify the solutions to the barriers encountered for these strategies.

	Retiming	
1	Coordination and buy-in	Mar 23, 2011 5:18 PM
2	Regional funding.	Mar 21, 2011 1:00 PM
4	Done when possible	Mar 8, 2011 9:07 AM
	Coordination	
2	Regional funding.	Mar 21, 2011 1:00 PM
3	Seek grants	Mar 9, 2011 7:29 AM
4	Done when possible	Mar 8, 2011 9:07 AM
	Equipment upgrade	
1	Grouped projects organized by MPO had better chance at getting TIP funding	Mar 23, 2011 5:18 PM
4	Done when possible	Mar 8, 2011 9:07 AM
	Adaptive signal controls/demand responsive	
1	TBD	Mar 23, 2011 5:18 PM

Page 14, Q6. Please identify the costs ($) for these strategies and note which year these represent (e.g., $100,000 $2008).

	Retiming	
1	$110,000 $2008	Mar 9, 2011 6:32 AM
	Coordination	
1	$365,000 $2010	Mar 9, 2011 6:32 AM
	Equipment upgrade	

Page 14, Q6. Please identify the costs ($) for these strategies and note which year these represent (e.g., $100,000 $2008).		
1	$100,000 $2009	Mar 9, 2011 6:32 AM
	Adaptive signal controls/demand responsive	

Page 14, Q7. Please identify the calculated or documented benefit/cost ratio or a range for these strategies.		
	Retiming	
1	avg 7% reduction in delays, 2-3% reduction in fuel use, 3-16% reduction in various emissions	Mar 23, 2011 5:18 PM
	Coordination	
	Equipment upgrade	
	Adaptive signal controls/demand responsive	

Page 15, Q5. Please identify barriers encountered for these strategies.		
1	Resistance from business and neighborhood groups. City council ultimately eliminated use of reversible lanes in Tucson. Education is a challenge. Properly informing winter visitors can be a challenge.	Mar 23, 2011 5:21 PM
2	Manpower needed to implement traffic management plans after special events.	Mar 21, 2011 1:01 PM
3	Accident-prone	Mar 15, 2011 11:57 AM

Page 15, Q6. Please identify the solutions to the barriers encountered for these strategies.		
1	Close work with business community and neighborhood groups. Treatments to reduce neighborhood cut throughs and ease access to businesses.	Mar 23, 2011 5:21 PM

Page 15, Q6. Please identify the solutions to the barriers encountered for these strategies.		
2	Proper signage and signals for informing on direction.	Mar 15, 2011 11:57 AM

Page 15, Q7. Please identify the costs ($) for these strategies and note which year these represent (e.g., $100,000 $2008).		
1	Not sure	Mar 23, 2011 5:21 PM

Page 15, Q8. Please identify the calculated or documented benefit/cost ratio or a range for these strategies.		
1	Don't have this on hand	Mar 23, 2011 5:21 PM

Page 16, Q4. Please identify barriers encountered for these strategies.		
1	State run program. Not sure of details.	Mar 23, 2011 5:22 PM

Page 19, Q4. Please identify barriers encountered for these strategies.		
1	Obtaining funding for TDM strategies.	Mar 21, 2011 1:07 PM
2	Resources, public education	Mar 8, 2011 9:10 AM

Page 19, Q5. Please identify the solutions to the barriers encountered for these strategies.		
1	The region allocates $1 million annually from CMAQ funds to Traffix, the regional TDM program.	Mar 21, 2011 1:07 PM

Page 19, Q5. Please identify the solutions to the barriers encountered for these strategies.

2	Outside firms doing some work (with advertiser support)	Mar 8, 2011 9:10 AM

Page 21, Q5. Please identify barriers encountered for these strategies.

	Camera monitoring	
2	Lack of operational staff to perform real-time monitoring	Mar 15, 2011 10:12 AM
	Raodway detectors/surveillance	
2	Failure of detection devices	Mar 15, 2011 10:12 AM
	Traffic/courtesy patrols	
	Response teams	
1	Keeping the safety service patrol program funded.	Mar 21, 2011 1:12 PM
	Responder vehicle priority	
4	Some counter-congestion increases	Mar 8, 2011 9:12 AM
	Alternative route planning	
3	Takes a lot of work, training and coordination with multiple agencies	Mar 9, 2011 7:33 AM
	Variable message signs	
1	Maintenance.	Mar 21, 2011 1:12 PM
2	Few alternate routes available for detours around incidents	Mar 15, 2011 10:12 AM
4	Acknowledment/use	Mar 8, 2011 9:12 AM
	Advisory radio	
1	Obtaining a signal that is strong enough to be heard over a large area.	Mar 21, 2011 1:12 PM

Page 21, Q6. Please identify the solutions to the barriers encountered for these strategies.		
	Camera monitoring Raodway detectors/surveillance Traffic/courtesy patrols Response teams Responder vehicle priority Alternative route planning	
1	State DOT make a priority and provide ITS funds	Mar 9, 2011 7:33 AM
	Variable message signs Advisory radio	

Page 22, Q2. Please describe the barriers faced with implementation of these capital improvements and the solutions that overcame those barriers.		
1	money	Mar 16, 2011 5:17 PM
2	Primarily funding.	Mar 15, 2011 12:03 PM
3	CT Transit does most of the transit related work.	Mar 9, 2011 6:44 PM
4	Lack of Funding	Mar 9, 2011 6:40 AM
5	Limited resources versus wish to upgrade with replacements	Mar 8, 2011 9:21 AM

Page 22, Q3. Please provide descriptions and related costs of the transit capital improvements noted in the previous question that were made in the past five years.		
1	Automatic Vehicle Locators have been implemented. Bus sizes, in general, are going down (to medium-size buses). Hybrid and electric buses have been experimented with, with unsatisfactory results.	Mar 15, 2011 12:03 PM
2	Purchase of 3 new buses	Mar 9, 2011 6:40 AM
3	Us replacements as possible, as many hybrid types as possible	Mar 8, 2011 9:21 AM

Page 22, Q5. Please describe the barriers faced with implementation of these support facilities and the solutions that overcame those barriers.		
1	money row for park and ride lots	Mar 16, 2011 5:17 PM
2	Primarily lack of funding. PNR's are not dedicated facilities, but rather shared parking lots with cooperative churches and shopping centers.	Mar 15, 2011 12:03 PM
3	Funding was the open point until ARRA solved that.	Mar 8, 2011 6:22 AM

Page 22, Q6. Please provide descriptions and related costs of the transit support facilities noted in the previous question that were made in the past five years.		
1	Transit transfer station to include inside waiting room, restrooms, and shelter for bus pull up. $888,815	Mar 8, 2011 6:22 AM

Page 22, Q8. Please describe the barriers faced with implementation of these exclusive right-of-way facilities and the solutions that overcame those barriers.		
1	Construction of the first leg of the regional light rail system has been plagued with cost overruns.	Mar 21, 2011 1:18 PM
2	CRCOG and CT DOT had to do a lots of public outreach and information sessions to educated general public and elected officials about the benefits of Busway and so on.	Mar 9, 2011 6:44 PM

Page 22, Q8. Please describe the barriers faced with implementation of these exclusive right-of-way facilities and the solutions that overcame those barriers.		
3	We have BRT without exclusive right of way. Funding has been a barrier. Yet we are opening the system in April.	Mar 8, 2011 11:08 AM
4	Commuter rail parking, timing/information, service dependability, sustained subsidization vs. consuder attitudes and expectations	Mar 8, 2011 9:21 AM

Page 22, Q11. Please describe the barriers faced with implementation of these transit operational improvements and the solutions that overcame those barriers.		
1	Funding has been difficult for our regional transit agencies to obtain, especially since a large portion of their funding is obtained from their member cities.	Mar 21, 2011 1:18 PM
2	dollars	Mar 16, 2011 5:17 PM
3	Many of the above strategies are in the planning phase, but a lack of funding is hindering implementation.	Mar 15, 2011 12:03 PM
4	CT Transit operates transit buses. Although we work together in many transit related areas, CT Transit would be better equipped to provide better response.	Mar 9, 2011 6:44 PM
5	Funding	Mar 9, 2011 6:40 AM
6	The transit riders have difficulty with route restructuring especially when ineffective routes are cut, yet the restructuring has been very successful and has increased ridership.	Mar 8, 2011 11:08 AM
7	Public expectations versus degree of subsidy; degree of demand for services (perceived versus actual); perceived possible improvements in operations versus reality of funding and direct operational considerations not obvious to general public. Operators always try to do their best with resources available anddeal with public as bset as possible.	Mar 8, 2011 9:21 AM
8	We are completing an ITS plan at the moment, next steps will be GPS tracking of busses and electronic fair cards in order to collect better data for route changes.	Mar 8, 2011 6:22 AM

Page 22, Q14. Please describe the barriers faced with implementation of these transit policy strategies and the solutions that overcame those barriers.

1	Price Chopper (food store chain) has implemented gasoline discounts with their advantage card, which has been expanded to transit pass discounts in coordination with CDTA (Capital District Transportation Authority).	Mar 8, 2011 11:08 AM
2	Resistance to abandoning personal space/vehicles; bus travel environment, perecived and actual; limited scope of transit system, as restrcited by demand and resources	Mar 8, 2011 9:21 AM
3	Despite our low fairs, fair discounts for bulk purchasing are very popular. Our ridership is captive and fairly dependent upon the service due to their socioeconomic status.	Mar 8, 2011 6:22 AM

Page 22, Q16. Please list and describe any multimodal transportation centers that have been built in your metropolitan area.

1	Ronstadt Transit Center etc	Mar 23, 2011 5:30 PM
2	--	Mar 22, 2011 6:21 AM
3	Williamsburg Transportation Center, with plans for a center in Norfolk.	Mar 21, 2011 1:18 PM
4	BARTA Transportation Center combines central transit facility, taxi waiting area and parking garage	Mar 18, 2011 11:11 AM
5	Rosa PArks	Mar 16, 2011 5:17 PM
6	Nono	Mar 15, 2011 3:23 PM
7	N/A	Mar 15, 2011 12:03 PM
8	n/a	Mar 15, 2011 10:14 AM
9	Huntington, WV Ironton, Ohio	Mar 11, 2011 2:03 PM
10	?	Mar 9, 2011 9:29 PM
11	Union Station in Hartford. There are plans for more such centers.	Mar 9, 2011 6:44 PM
12	Downtown and MSU GAroiund Trasnmportation Centers	Mar 9, 2011 11:25 AM
13	N/A but being planned	Mar 9, 2011 7:36 AM
14	i	Mar 9, 2011 7:35 AM
15	Fixed Route Bus Station also houses Intercity Bus	Mar 9, 2011 6:40 AM
16	A new downtown bus station is currently planned for completion in fall 2013.	Mar 8, 2011 2:23 PM
17	NA	Mar 8, 2011 1:08 PM
18	Queen Street bus station	Mar 8, 2011 12:59 PM
19	The Albany-Rensselaer Amtrak Station is operated by CDTA	Mar 8, 2011 11:08 AM
20	Rebuilt Union Staion has commuter rail/Amtrak/ Interstate bus	Mar 8, 2011 9:21 AM
21	There are numerous multimodal transportation centers for freight in the Kansas City metropolitan area.	Mar 8, 2011 7:31 AM

Page 22, Q16. Please list and describe any multimodal transportation centers that have been built in your metropolitan area.

22	See question six above.	Mar 8, 2011 6:22 AM

Page 22, Q17. Please list and describe any freight rail improvements that have been implemented in your metropolitan area.		
1	NA	Mar 23, 2011 5:30 PM
2	--	Mar 22, 2011 6:21 AM
3	Construction is underway on a rail overpass over Hampton Boulevard leading into Norfolk International Terminals.	Mar 21, 2011 1:18 PM
4	Clearance improvements to allow for double-stack containers	Mar 18, 2011 11:11 AM
5	West Detroit	Mar 16, 2011 5:17 PM
6	None	Mar 15, 2011 3:23 PM
7	N/A	Mar 15, 2011 12:03 PM
8	n/a	Mar 15, 2011 10:14 AM
9	None	Mar 11, 2011 2:03 PM
10	CREATE PROGRAM	Mar 9, 2011 9:29 PM
11	We do have rail lines that carries freight. I don't have any knowledge of recent improvements made. There are plans to upgrade rail lines in CT.	Mar 9, 2011 6:44 PM
12	none	Mar 9, 2011 11:25 AM
13	N/A	Mar 9, 2011 7:36 AM
14	i	Mar 9, 2011 7:35 AM
15	None	Mar 9, 2011 6:40 AM
16	N/A	Mar 8, 2011 2:23 PM
17	NA	Mar 8, 2011 1:08 PM
18	Dillerville Yard - Norfolk Southern - relocation & expansion	Mar 8, 2011 12:59 PM
19	Limited capital projects	Mar 8, 2011 11:08 AM
20	Workiing on furthering doublestack in Central MA	Mar 8, 2011 9:21 AM

Page 22, Q17. Please list and describe any freight rail improvements that have been implemented in your metropolitan area.		
21	There have been numerous freight rail improvements in the Kansas City metropolitan area.	Mar 8, 2011 7:31 AM
22	Only by the rail company itself.	Mar 8, 2011 6:22 AM

Page 22, Q18. Which of the following design guidelines have been implemented in your metropolitan area?		
1	None county-wide	Mar 22, 2011 6:21 AM
2	We are working on guidelines	Mar 9, 2011 7:36 AM

Page 23, Q4. Please identify barriers encountered for these strategies.

	Designated bike lanes by restriping existing roadways	
1	Done more for safety than congestion relief.	Mar 15, 2011 12:07 PM
2	Funding	Mar 9, 2011 6:44 AM
4	Good technical guidance on bike lanes is non-existant	Mar 8, 2011 6:28 AM
	Designated bike lanes using separate paths	
2	Funding	Mar 9, 2011 6:44 AM
4	The federal project development process is a nightmare of non-value adding paperwork.	Mar 8, 2011 6:28 AM
	Improved facilities (e.g. lighting, signing, etc)	
3	Resources	Mar 8, 2011 9:24 AM
4	Do it ourselves locally, pretty easy	Mar 8, 2011 6:28 AM
	New sidewalks	
3	Resources	Mar 8, 2011 9:24 AM
4	Our road crews do a decent amount of this for us, not too difficult.	Mar 8, 2011 6:28 AM
	Wider sidewalks	
	Rails to trails developments	
1	Trails are popular destinations; increase congestion at roadway crossing points and popular access points. ROW acquisition can be difficult.	Mar 15, 2011 12:07 PM
2	Public acceptance	Mar 9, 2011 6:44 AM
3	Resources. ROW	Mar 8, 2011 9:24 AM

Page 23, Q11. Please identify barriers encountered for these strategies.		
	Bike racks at transit stations	
2	All of the above mentioned were relatively easily implemented.	Mar 8, 2011 6:28 AM
	Bike racks on transit vehicles	
1	Racks only fit 2 bicyclists - many times need additional space	Mar 15, 2011 10:16 AM
	Bike racks at destinations	
	Lockers at transit stations	
	Lockers at destinations	
	Shower facilities at transit stations	
	Shower facilities at destinations	
	Route maps	
	Bike sharing	
	Coordinators	
	Supporting ordinances	
	Promotional campaigns	
	Promotional campaigns via media	
	Educational outreach	

Page 24, Q1. Which of the following contracting strategies have been utilized in your metropolitan area?		
1	I have no knowledge any of the above.	Mar 9, 2011 6:50 PM

Page 25, Q1. Which of the following work schedule changes have been implemented in your metropolitan area?		
1	Some agencies have flextime and telecommuting policies.	Mar 9, 2011 6:51 PM

Page 25, Q3. Please rate the ease of implementation for these strategies.		
1	THIS IS A PRIVATE ACTIVITY.	Mar 9, 2011 9:40 PM

Page 27, Q4. Please identify barriers encountered for these strategies.		
	HOV parking discount incentives Subsidized service incentives Marketing and promotions	
1	People want to use their individual vehicles	Mar 8, 2011 9:27 AM
	Ridematching services	
1	People want to use their individual vehicles	Mar 8, 2011 9:27 AM
	Guaranteed ride home	
1	People want to use their individual vehicles	Mar 8, 2011 9:27 AM

Page 28, Q4. Please identify barriers encountered for these strategies.		
	On-street parking and standing restrictions Peak-period prohibitions to free lane capacity Employer/landlord parking agreements Increased parking fees Preferential HOV/carpool/vanpool parking	
1	Voluntary, small-scale deployments limit impact.	Mar 8, 2011 7:42 AM

Page 28, Q4. Please identify barriers encountered for these strategies.

Discounted HOV/carpool/vanpool parking

Location specific parking ordinances

Page 31, Q1. Have any of the following trip reduction strategies or ordinances been implemented in your metropolitan area?

1	I have no knowledge of most of the above items.	Mar 9, 2011 6:58 PM

14.0 APPENDIX D – ANNOTATED SURVEY RESULTS FROM METROPOLITAN PLANNING ORGANIZATIONS

Lanes without Widening

Table D-1. Response Summary for Lanes without Widening.

Action	Response Count	Implemented/Planned n	Implemented/Planned % Of Respondents	Success Rating (1-5, 3=average)	Success Strength from Average[1]	Success n	Ease of Implementation Rating (3=neutral)	Ease of Implementation Strength from Neutral[2]	Ease of Implementation n
Lane width reduction	34	17	50%	4.00	1.00	13	3.31	0.31	16
Conversion of median to travel lane(s)	34	11	32%	3.82	0.82	11	2.86	-0.14	14
Shoulder conversion	34	11	32%	3.70	0.70	10	2.92	-0.08	13
Shoulder used for part-time travel lane	34	4	12%	4.50	1.50	2	2.43	-0.57	7

[1] Rating minus 3 = Strength from average
[2] Rating minus 3 = Strength from neutral

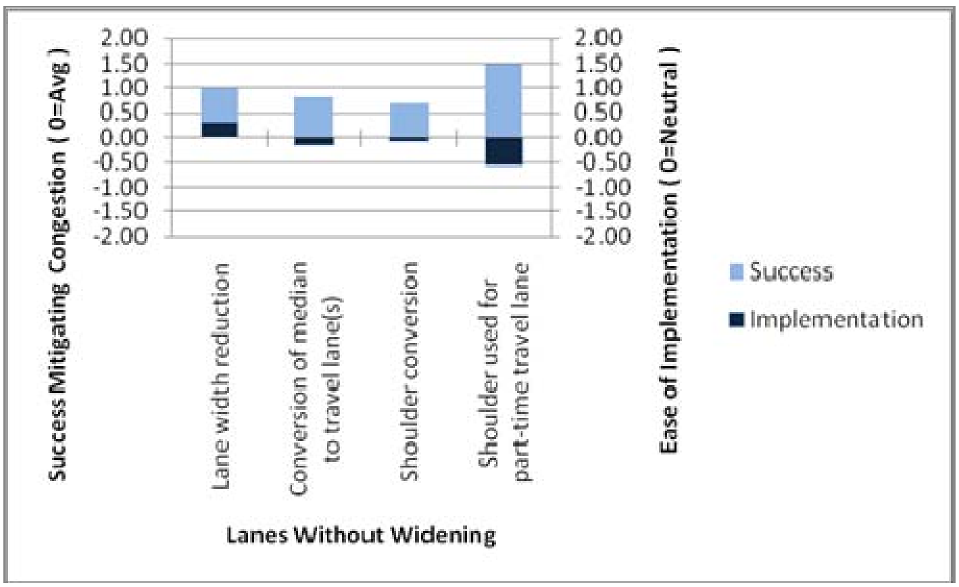

Figure D-1. Strength of success and ease of implementation for lanes without widening.

Key Observations

- Lane width reductions carry safety concerns of vehicle operating performance (e.g., turning) for large vehicles including trucks and transit vehicles. Costs for restriping range between $10,000–$50,000/mile.
- Converting medians or shoulders into travel lanes may require replacement/removal of existing pavement, structures, and drainage within the ROW. Cost range for median conversion is $3–$100 Million/mile and for shoulder approx $10,000/mile on FM roads and $1 Million/mile on other roads.
- The benefit/cost ratio of median conversion to HOV lanes is 10:1, respondents did not provide information regarding other modes.

Ramp Removal/Reconfiguration

Table D-2. Response Summary for Ramp Removal/Reconfiguration.

Action	Response Count	Implemented/Planned n	Implemented/Planned % of Respondents	Success Rating (1-5, 3=average)	Success Strength from Average[1]	Success n	Ease of Implementation Rating (3=neutral)	Ease of Implementation Strength from Neutral[2]	Ease of Implementation n
Freeway ramp removals	32	8	25%	3.67	0.67	3	1.71	-1.29	7
Freeway ramp reconfiguration	32	21	66%	4.00	1.00	16	2.65	-0.35	20

[1] Rating minus 3 = Strength from average

[2] Rating minus 3 = Strength from neutral

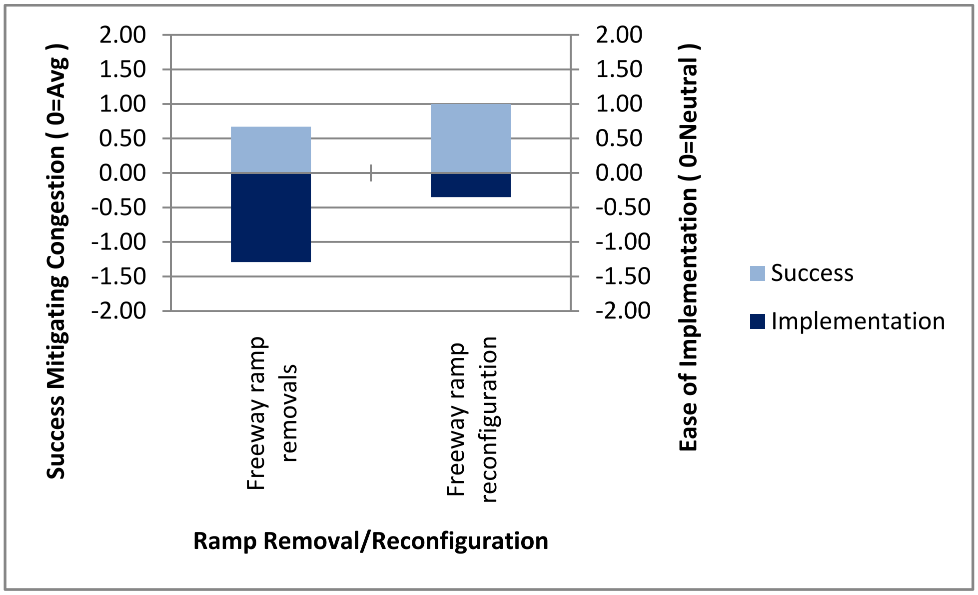

Figure D-2. Strength of success and ease of implementation for ramp removal/reconfiguration.

Key Observations

- With ramp removal there are immediate business concerns and a perceived reduction of access. Associated costs are approximately $10,000/1000 ft.
- Reconfiguration of ramps requires design, ROW acquisition, reworking local streets, and construction; all of which are costly. Estimated costs from respondents range from $6.63–$30 Million.
- Respondents did not provide benefit/cost ratio information.

Bottleneck Removal

Table D-3. Response Summary for Bottleneck Removal.

		Implemented/Planned		Success			Ease of Implementation		
Action	Response Count	n	% of Respondents	Rating (1-5, 3=average)	Strength from Average[1]	n	Rating (3=neutral)	Strength from Neutral[2]	n
Freeway bottleneck removal	31	19	61%	3.73	0.73	15	2.35	-0.65	17
Arterial bottleneck removal	31	25	81%	3.82	0.82	17	2.25	-0.75	16

[1] Rating minus 3 = Strength from average
[2] Rating minus 3 = Strength from neutral

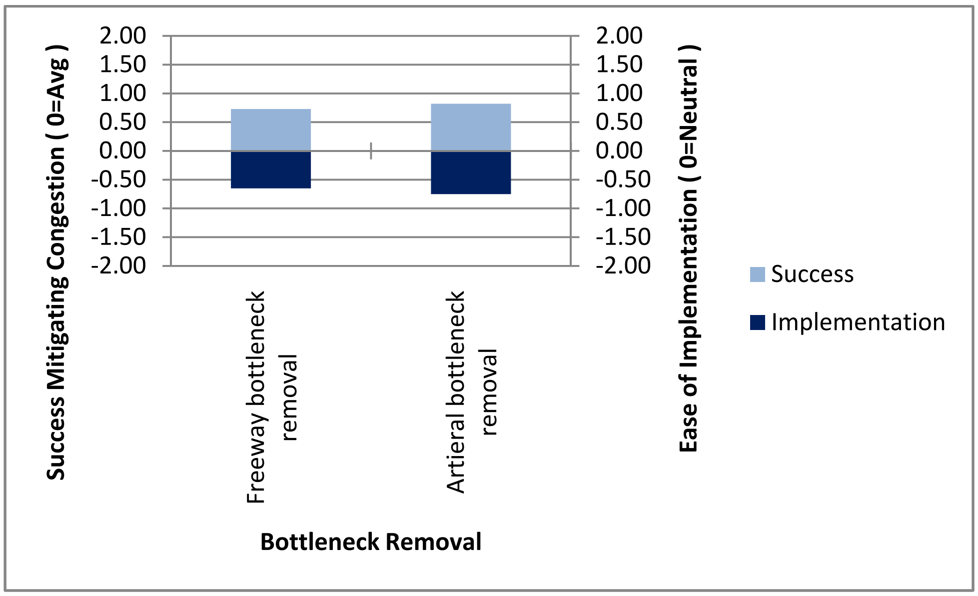

Figure D-3. Strength of success and ease of implementation for bottleneck removal.

Key Observations

- Freeway bottleneck removal is costly and difficult to receive funding for. Costs range widely from $100,000–$75 million and are dependent on location and solution.
- Barriers for arterial bottleneck removal include ROW acquisition, utilities, storm water permitting, and construction. Roundabouts and replacement of turn lanes into through lanes are some solutions to ROW issues.
- No information regarding benefit/cost ratio was given by respondents.

Geometric Design Improvements

Table D-4. Response Summary for Geometric Design Improvements.

		Implemented/Planned		Success			Ease of Implementation		
Action	Response Count	N	% of Respondents	Rating (1-5, 3=average)	Strength from Average[1]	n	Rating (3=neutral)	Strength from Neutral[2]	n
Widen road to accommodate shoulders	26	19	73%	3.00	0.00	18	2.89	-0.11	18
Additional turn lanes at intersections	26	25	96%	3.48	0.48	23	2.96	-0.04	23
Lengthened turn lanes at intersection for queuing	26	23	88%	3.43	0.43	21	3.14	0.14	21
Improved sight distances at intersections	26	21	81%	3.33	0.33	21	3.29	0.29	21
Diverging diamond intersections	26	8	31%	3.25	0.25	4	1.83	-1.17	6
Jughandles at intersections	26	8	31%	3.43	0.43	7	2.71	-0.29	7
Median U-turn crossovers	26	10	38%	3.50	0.50	8	3.44	0.44	9
Continuous flow intersections	26	8	31%	3.83	0.83	6	2.83	-0.17	6
Auxiliary lanes for merging and diverging	26	17	65%	3.80	0.80	15	3.15	0.15	13
Intersection channelization	26	18	69%	3.71	0.71	17	3.43	0.43	14
Bus turnouts	26	17	65%	3.50	0.50	12	3.29	0.29	14
Commercial vehicle accommodations	26	9	35%	3.50	0.50	6	2.83	-0.17	6
Grade separations (street-rail)	26	11	42%	4.40	1.40	10	1.70	-1.3	10
Grade separation (street-street)	26	11	42%	4.20	1.20	10	1.73	-1.27	11

[1] Rating minus 3 = Strength from average

[2] Rating minus 3 = Strength from neutral

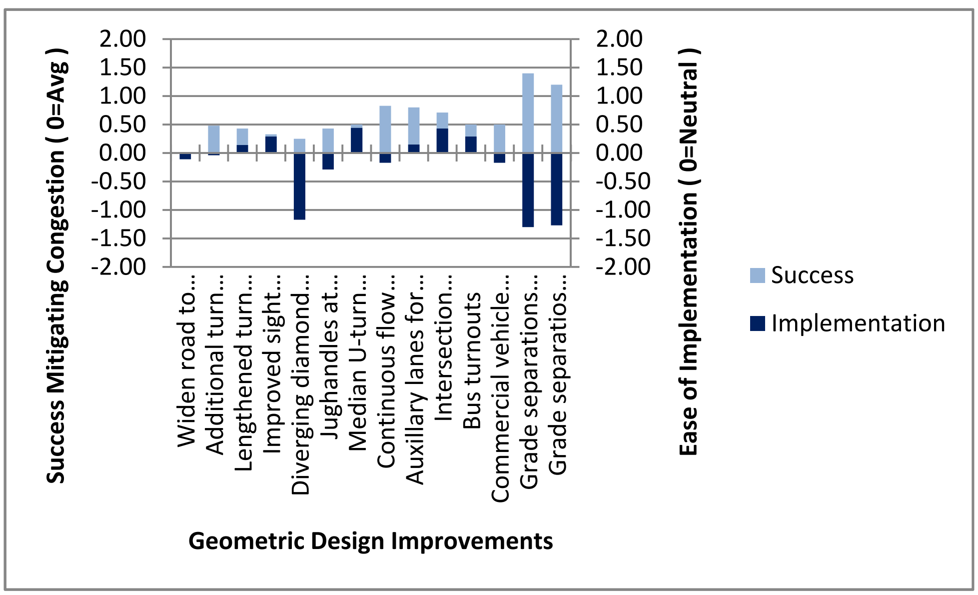

Figure D-4. Strength of success and ease of implementation for geometric design improvements.

Key Observations

- Geometric design improvements are difficult to implement due to their high costs and need for ROW acquisition. When grade separations are introduced, the costs increase significantly.
- Improvements without grade separation range in cost from \$100,000–\$500,000 and with grade separation the cost ranges from \$5–\$10 million.
- Respondents did not provide information regarding the cost/benefit ratio.

Overall Street Improvements

Table D-5. Response Summary for Overall Street Improvements.

		Implemented/Planned		Success			Ease of Implementation		
Action	Response Count	n	% of Respondents	Rating (1-5, 3=average)	Strength from Average[1]	n	Rating (3=neutral)	Strength from Neutral[2]	n
Superstreets	26	4	15%	4.00	1.00	1	2.33	-0.67	3
Complete streets	26	11	42%	3.89	0.89	9	2.57	-0.43	14
Improving street continuity	26	15	58%	4.00	1.00	13	2.31	-0.69	13
Two-way to one-way conversion	26	11	42%	3.29	0.29	7	2.89	-0.11	9
One-way to two-way conversion	26	11	42%	3.88	0.88	8	2.88	-0.12	8

[1] Rating minus 3 = Strength from average
[2] Rating minus 3 = Strength from neutral

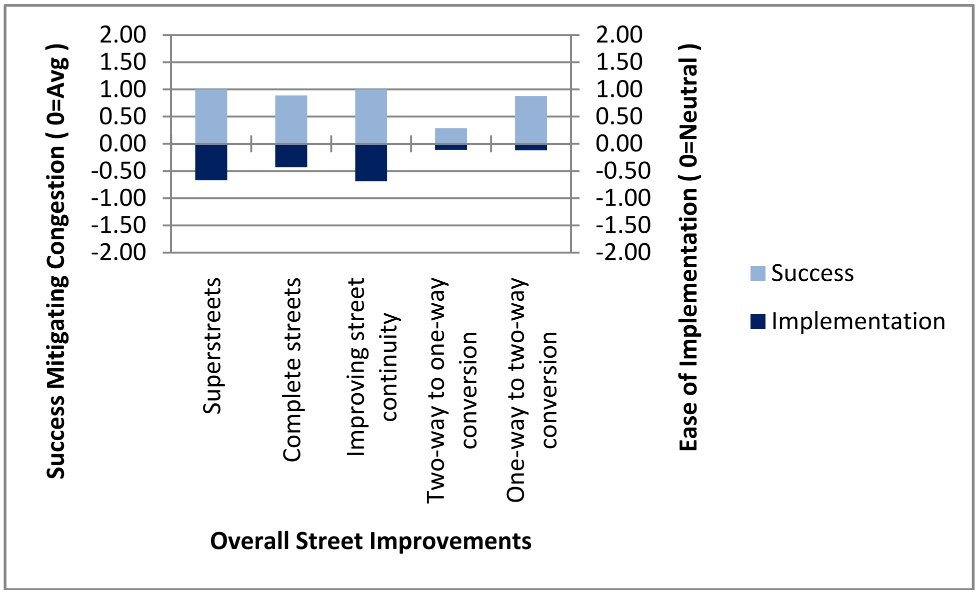

Figure D-5. Strength of success and ease of implementation for overall street improvements.

Key Observations

- Overall street improvements can be difficult to implement due to high cost, perceived reduction in capacity and volume by business owners, reduced amount of parking, and lack of public education.
- Input from the public and better education is good ways to gain acceptance. Planning new streets with these improvements is easier than reconstructing existing facilities.
- Implementing improvements can cost in a range of $10,000–$250,000/mile.
- Respondents gave no information regarding cost/benefits ratio.

Time-of-Day Policies

Table D-6. Response Summary for Time-of-Day Policies.

Action	Response Count	Implemented/Planned N	Implemented/Planned % of Respondents	Success Rating (1-5, 3=average)	Success Strength from Average[1]	Success n	Ease of Implementation Rating (3=neutral)	Ease of Implementation Strength from Neutral[2]	Ease of Implementation n
Auto turning restrictions on streets	24	15	63%	3.77	0.77	13	3.38	0.38	13
Auto parking restrictions on streets	24	14	58%	3.50	0.50	12	3.17	0.17	12
Truck shipping/delivery schedules	24	6	25%	3.50	0.50	4	2.6	-0.4	5
Truck peak period bans on arterials	24	4	17%	2.67	-0.33	3	2.5	-0.5	4
Truck management strategies	24	6	25%	3.33	0.33	3	2.5	-0.5	4
Truck freight and delivery consolidation	24	5	21%	3.33	0.33	3	2.5	-0.5	4
Designated truck routes	24	9	38%	3.00	0.00	7	2.88	-0.12	8

[1] Rating minus 3 = Strength from average
[2] Rating minus 3 = Strength from neutral

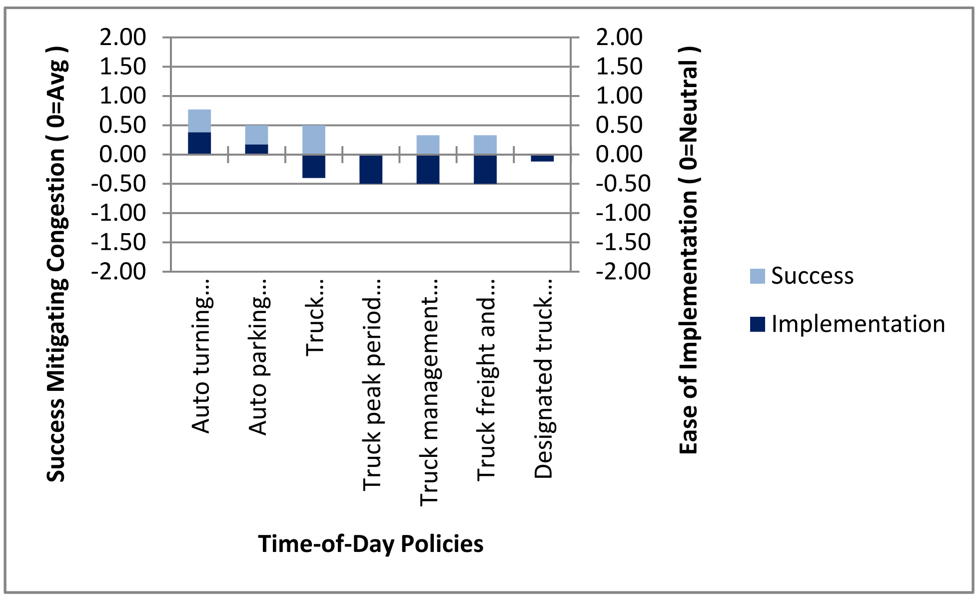

Figure D-6. Strength of success and ease of implementation for time-of-day policies.

Key Observations

- Time-of-day policies are prevented by lack of enforcement and commercial opposition.
- Respondents did not provide information regarding cost of implementation.
- Respondents did not provide information regarding cost/benefits ratio.

Access Management

Table D-7. Response Summary for Access Management.

Action	Response Count	Implemented/Planned n	Implemented/Planned % of Respondents	Success Rating (1-5, 3=average)	Success Strength from Average[1]	Success n	Ease of Implementation Rating (3=neutral)	Ease of Implementation Strength from Neutral[2]	Ease of Implementation n
Driveway spacing standards	24	16	67%	3.53	0.53	15	3.07	0.07	15
Driveway consolidation	24	19	79%	3.50	0.50	16	2.39	-0.61	18
Driveway sharing and cross-access	24	18	75%	3.60	0.60	15	2.59	-0.41	17
Sidestreet/alley/backage road access	24	16	67%	3.62	0.62	13	2.93	-0.07	15
Raised median policies and standards	24	14	58%	3.70	0.70	10	3.25	0.25	12
Two-way-left-turn-lanes	24	21	88%	3.65	0.65	20	3	0	20
Raised median installation	24	20	83%	3.78	0.78	18	2.79	-0.21	19
Frontage roads on arterial streets	24	17	71%	3.67	0.67	15	2.63	-0.37	16
Left-turn restrictions	24	20	83%	3.65	0.65	17	3.22	0.22	18
Interchange modifications	24	12	50%	3.78	0.78	9	1.91	-1.09	11
Minimum street intersection spacing	24	11	46%	4.00	1.00	9	3	0	9
Minimum freeway interchange spacing	24	11	46%	3.90	0.90	10	2.91	-0.09	11

[1] Rating minus 3 = Strength from average

[2] Rating minus 3 = Strength from neutral

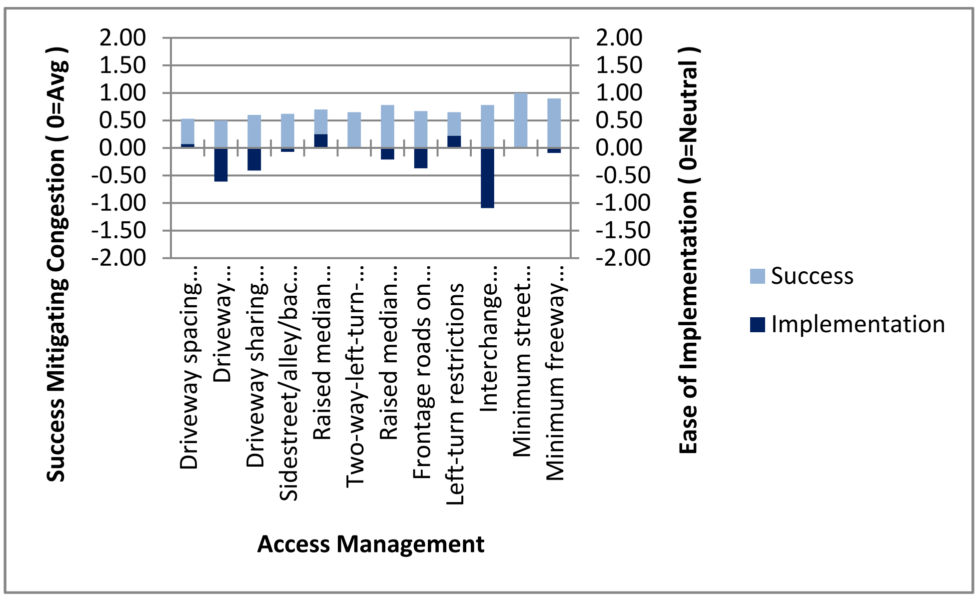

Figure D-7. Strength of success and ease of implementation for access management.

Key Observations

- Cooperation from property owners and businesses can be a barrier to implementing access management.
- Planning prior to construction and enlightened encouragement can ease implementation.

Ramp Metering Systems

Table D-8. Response Summary for Ramp Metering Systems.

Action	Response Count	Implemented/Planned n	Implemented/Planned % of Respondents	Success Rating (1-5, 3=average)	Success Strength from Average[1]	Success n	Ease of Implementation Rating (3=neutral)	Ease of Implementation Strength from Neutral[2]	Ease of Implementation n
Ramp metering - localized	24	6	25%	3.00	0.00	5	2.75	-0.25	4
Ramp metering - demand responsive	24	4	17%	4.00	1.00	3	3	0	3
Ramp metering - coordinated	24	4	17%	3.75	0.75	4	2.75	-0.25	4
Ramp metering - HOV bypass	24	1	4%	2.50	-0.50	2	2.33	-0.67	3

[1] Rating minus 3 = Strength from average

[2] Rating minus 3 = Strength from neutral

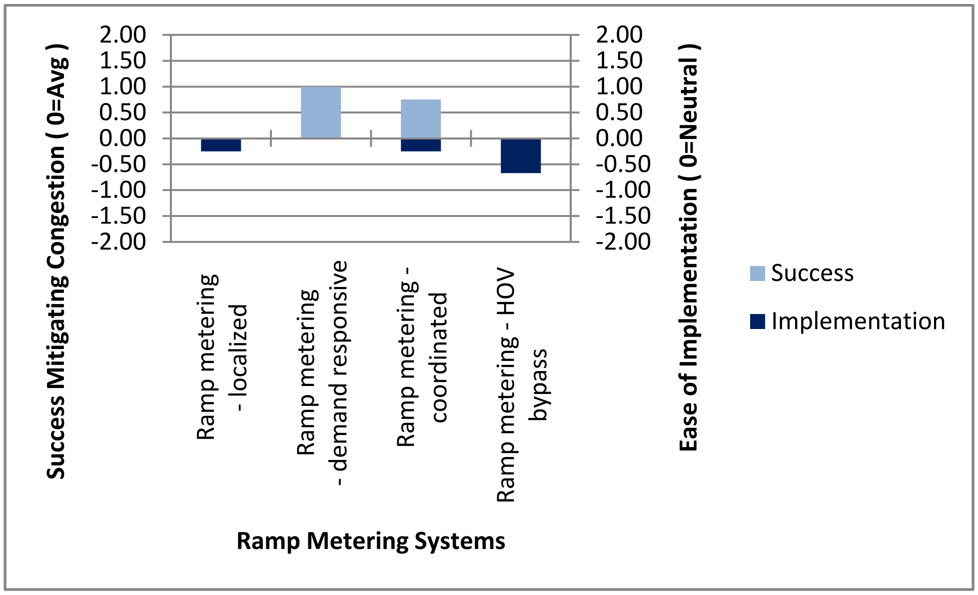

Figure D-8. Strength of success and ease of implementation for ramp metering systems.

Key Observations

- Ramp metering systems are politically unattractive.
- HOV bypass has major safety issues.

Advanced Traveler Information Systems

Table D-9. Response Summary for Advanced Traveler Information Systems.

		Implemented/Planned		Success			Ease of Implementation		
Action	Response Count	n	% of Respondents	Rating (1-5, 3=average)	Strength from Average[1]	n	Rating (3=neutral)	Strength from Neutral[2]	n
Real-time speed via web/smartphone	23	9	39%	3.56	0.56	9	3.11	0.11	9
Transit vehicle schedule progress	23	16	70%	3.30	0.30	10	3.18	0.18	11
Highway information systems	23	18	78%	3.60	0.60	15	3.29	0.29	14
911 traveler information systems	23	16	70%	3.54	0.54	13	3.08	0.08	13
Website traveler information systems	23	18	78%	3.47	0.47	15	3.21	0.21	14
Travel time message for travelers	23	16	70%	3.55	0.55	11	3.18	0.18	11
Freight shipper congestion information	23	6	26%	4.00	1.00	5	3.17	0.17	6
National traffic and road closure information	23	10	43%	3.56	0.56	9	3.67	0.67	9

[1] Rating minus 3 = Strength from average
[2] Rating minus 3 = Strength from neutral

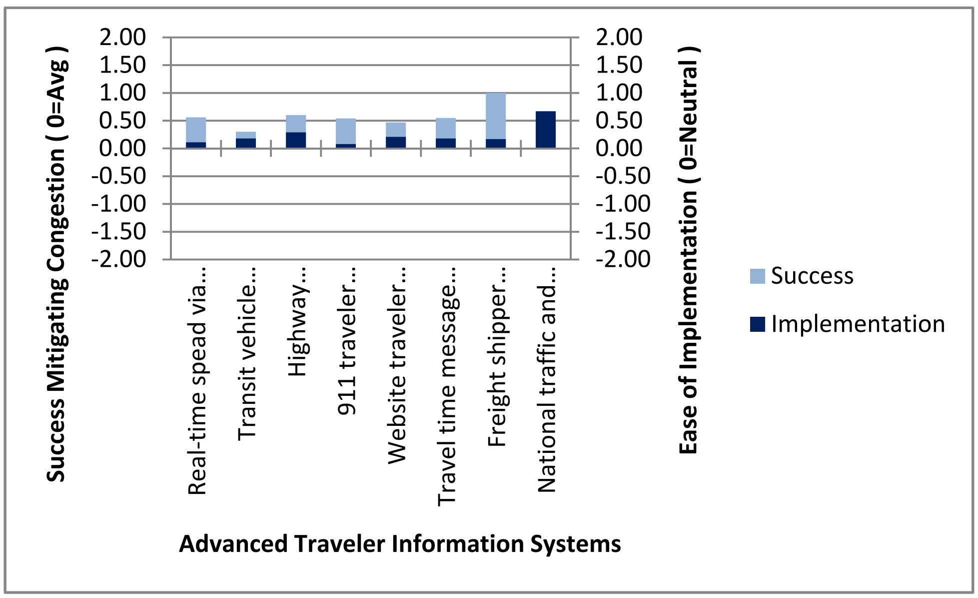

Figure D-9. Strength of success and ease of implementation for advanced traveler information systems.

Key Observations

- Real-time speed and transit vehicle schedule progress has trouble with consistency, quality, and coordination. Commitment and input from local agencies alleviate some trouble with the systems.
- Access to advanced traveler information systems can be difficult and/or dangerous while traveling.

Electronic Toll Collection

Table D-10. Response Summary for Electronic Toll Collection.

		Implemented/Planned		Success			Ease of Implementation		
Action	Response Count	n	% of Respondents	Rating (1-5, 3=average)	Strength from Average[1]	n	Rating (3=neutral)	Strength from Neutral[2]	n
Yes - all toll roads	23	12	52%	n/c	n/c	n/c	n/c	n/c	n/c
Yes - some toll roads	23	0	0%	n/c	n/c	n/c	n/c	n/c	n/c
No - not on any toll roads	23	2	9%	n/c	n/c	n/c	n/c	n/c	n/c
No toll roads in my area	23	9	39%	n/c	n/c	n/c	n/c	n/c	n/c

[1] Rating minus 3 = Strength from average
[2] Rating minus 3 = Strength from neutral
n/c – not collected

Key Observations

- Respondents provided no information on subject.

Active Traffic Management

Table D-11. Response Summary for Active Traffic Management.

		Implemented/Planned		Success			Ease of Implementation		
Action	Response Count	n	% of Respondents	Rating (1-5, 3=average)	Strength from Average[1]	n	Rating (3=neutral)	Strength from Neutral[2]	n
Speed harmonization	22	3	14%	3.67	0.67	3	3.00	0.00	4
Temporary shoulder use	22	6	27%	3.50	0.50	4	2.75	-0.25	4
Queue warning	22	3	14%	3.50	0.50	2	2.50	-0.50	2
Dynamic merge control	22	3	14%	3.00	0.00	2	3.00	0.00	4
Construction site management	22	10	45%	3.90	0.90	10	3.00	0.00	10
Dynamic truck restrictions	22	2	9%	3.00	0.00	1	2.00	-1.00	2
Dynamic traveler information and rerouting	22	4	18%	3.25	0.25	4	3.00	0.00	5
Automated enforcement	22	8	36%	3.50	0.50	6	2.71	-0.29	7

[1] Rating minus 3 = Strength from average
[2] Rating minus 3 = Strength from neutral

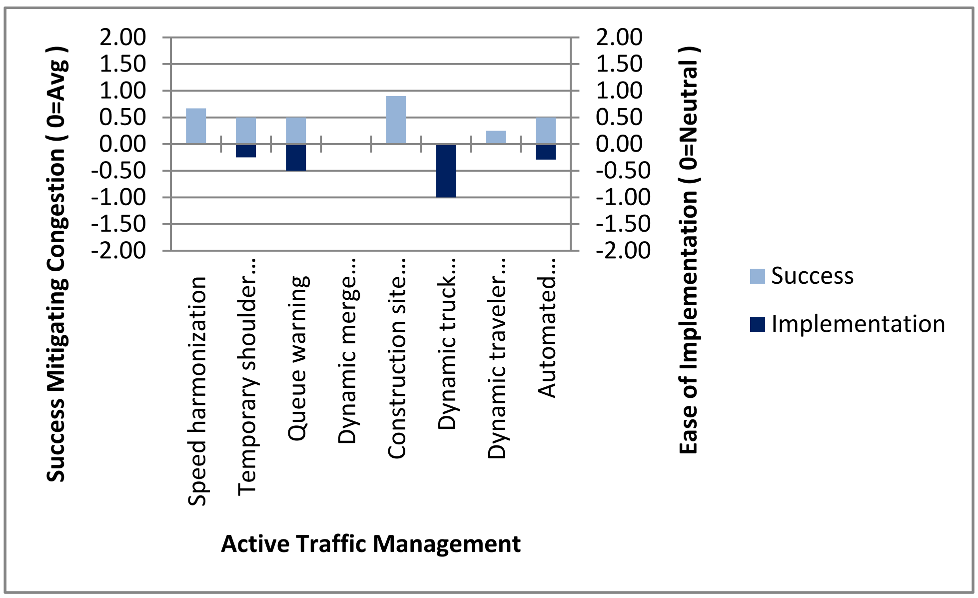

Figure D-10. Strength of success and ease of implementation for active traffic management.

Key Observations

- Active traffic management causes political and public concerns, which have caused removal of equipment in some situations.

Traffic Signal Strategies

Table D-12. Response Summary for Traffic Signal Strategies.

Action	Response Count	Implemented/Planned n	Implemented/Planned % of Respondents	Success Rating (1-5, 3=average)	Success Strength from Average[1]	Success n	Ease of Implementation Rating (3=neutral)	Ease of Implementation Strength from Neutral[2]	Ease of Implementation n
Retiming	22	21	95%	4.30	1.30	20	4.05	1.05	20
Coordination	22	22	100%	4.35	1.35	20	3.70	0.70	20
Equipment upgrade	22	21	95%	4.15	1.15	20	3.45	0.45	20
Adaptive signal controls/demand responsive	22	18	82%	4.23	1.23	13	3.53	0.53	15

[1] Rating minus 3 = Strength from average
[2] Rating minus 3 = Strength from neutral

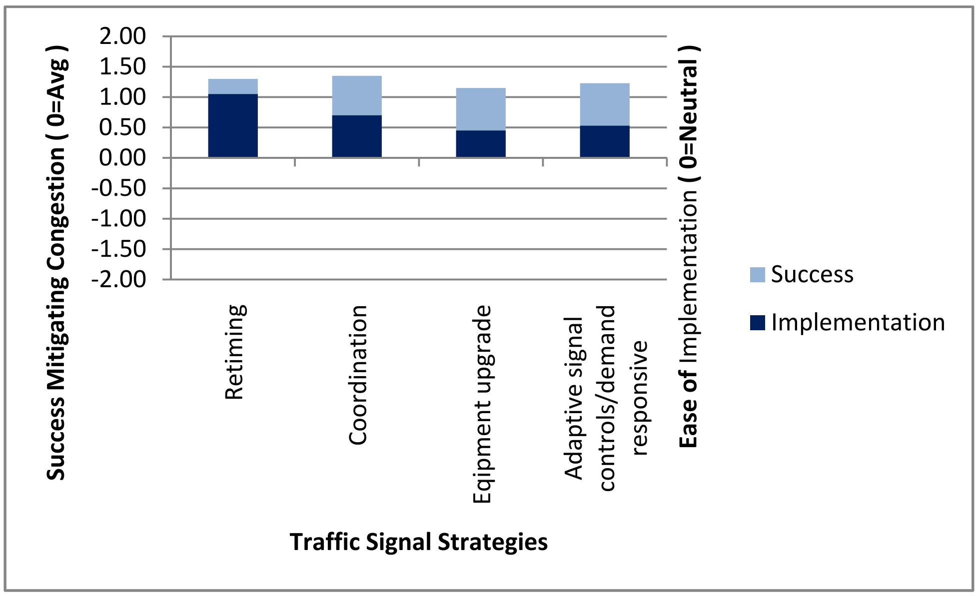

Figure D-11. Strength of success and ease of implementation for traffic signal strategies.

Key Observations

- Implementation of traffic signal strategies can be halted by a lack of resources (money, staff) and difficulty with coordination among agencies.
- Costs associated with traffic signal strategies range from $100,000–$365,000.
- Retiming traffic signals results in an average 7% reduction in delays, 2–3% reduction in fuel use, and 3–6% reduction in various emissions.

Reversible Lanes

Table D-13. Response Summary for Reversible Lanes.

Action	Response Count	Implemented/Planned n	Implemented/Planned % of Respondents	Success Rating (1-5, 3=average)	Success Strength from Average[1]	Success n	Ease of Implementation Rating (3=neutral)	Ease of Implementation Strength from Neutral[2]	Ease of Implementation n
Reversible Lanes	22	5	23%	3.88	0.88	8	3.71	0.71	7

[1] Rating minus 3 = Strength from average
[2] Rating minus 3 = Strength from neutral

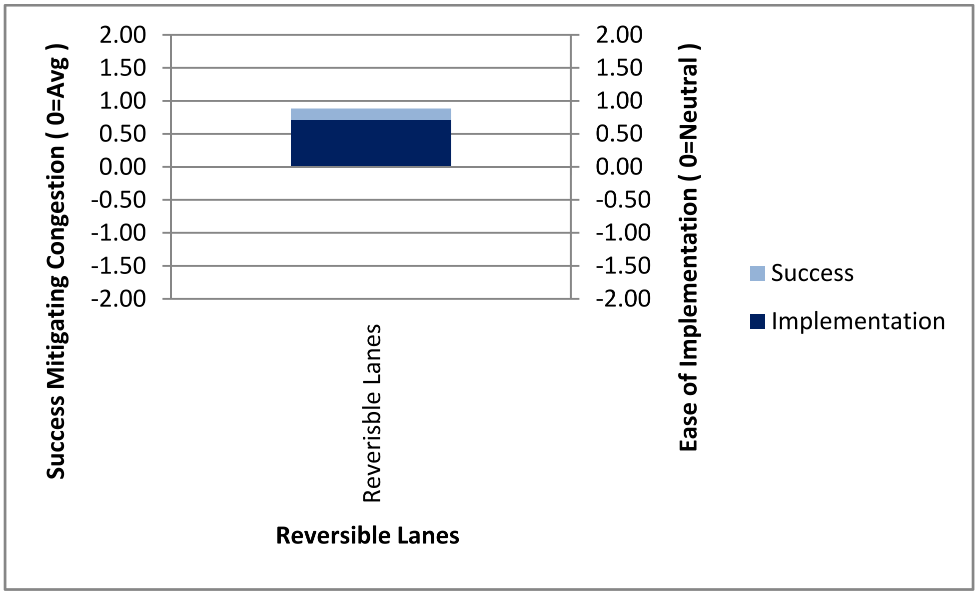

Figure D-12. Strength of success and ease of implementation for reversible lanes.

Key Observations

- Reversible lanes encounter resistance from business and neighborhood groups and are accident prone due to improper signage.
- Reduction in neighborhood cut through and close relations with the business community can help ease implementation.
- Respondents did not provide information on cost or cost/benefits ratio.

Road Weather Management Systems

Table D-14. Response Summary for Road Weather Management Systems.

Action	Response Count	Implemented/Planned n	Implemented/Planned % Of Respondents	Success Rating (1-5, 3=average)	Success Strength from Average[1]	Success n	Ease of Implementation Rating (3=neutral)	Ease of Implementation Strength from Neutral[2]	Ease of Implementation n
Road weather management systems	22	11	50%	3.64	0.64	11	3.36	0.36	11

[1] Rating minus 3 = Strength from average
[2] Rating minus 3 = Strength from neutral

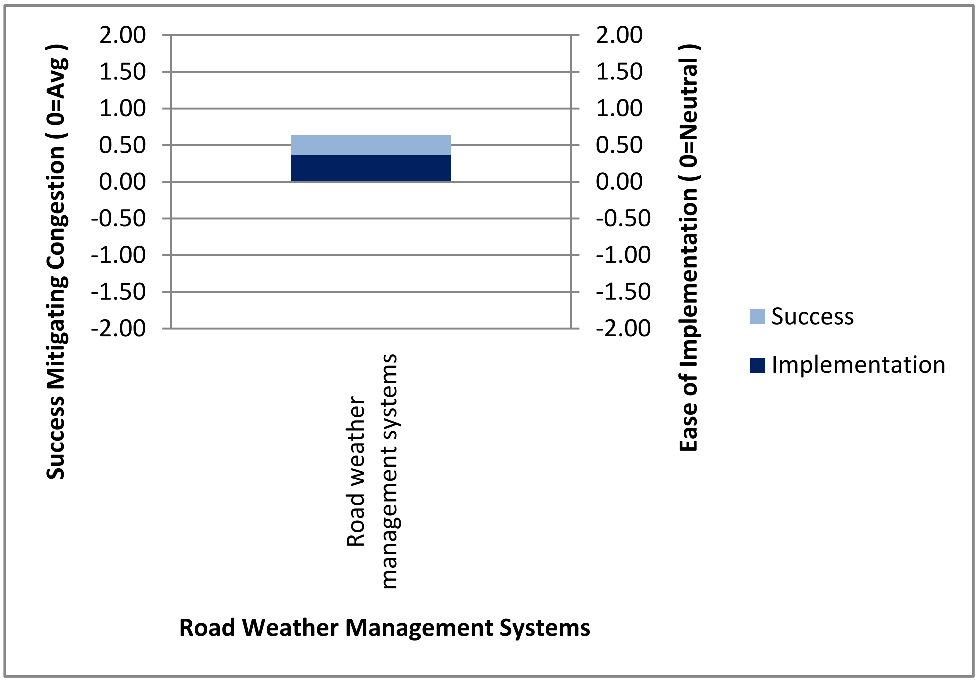

Figure D-13. Strength of success and ease of implementation for road weather management systems.

Key Observations

- Respondents provided no information on subject.

Freeway HOV

Table D-15. Response Summary for Freeway HOV.

Action	Response Count	Implemented/Planned n	Implemented/Planned % of Respondents	Success Rating (1-5, 3=average)	Success Strength from Average[1]	Success n	Ease of Implementation Rating (3=neutral)	Ease of Implementation Strength from Neutral[2]	Ease of Implementation n
Separate right-of-way	22	0	0%	3.00	0.00	1	3.00	0.00	1
Concurrent flow - barrier separated	22	2	9%	3.50	0.50	2	2.50	-0.50	2
Concurrent flow - buffer separated	22	3	14%	3.00	0.00	3	3.33	0.33	3
Contraflow - barrier separated	22	1	5%	2.50	-0.50	2	3.00	0.00	2
Contraflow - buffer separated	22	0	0%	3.00	0.00	1	3.00	0.00	1

[1] Rating minus 3 = Strength from average
[2] Rating minus 3 = Strength from neutral

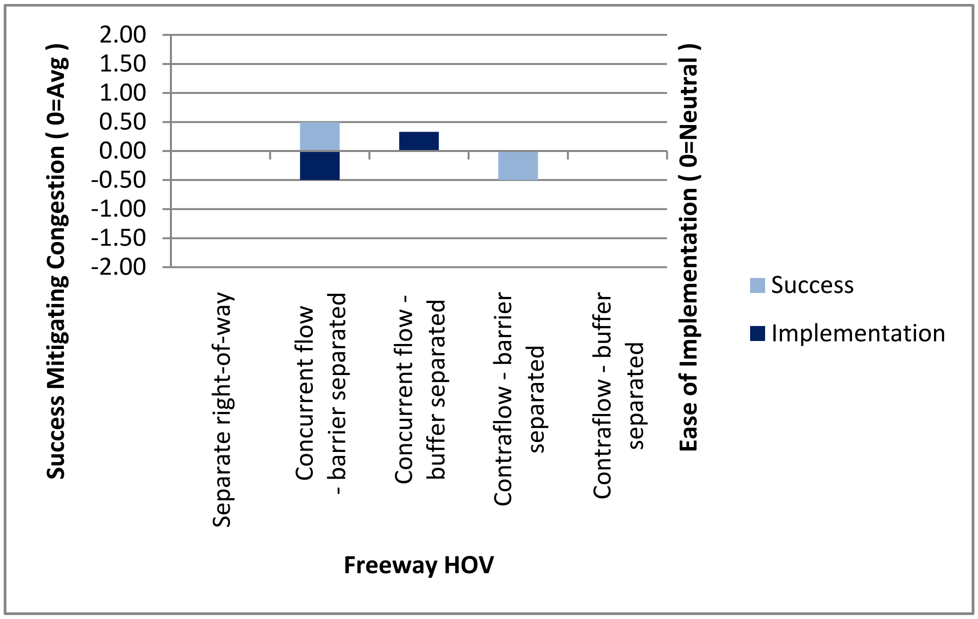

Figure D-14. Strength of success and ease of implementation for freeway HOV.

Key Observations

- Respondents provided no information on subject.

Arterial HOV

Table D-16. Response Summary for Arterial HOV.

Action	Response Count	Implemented/Planned n	% of Respondents	Success Rating (1-5, 3=average)	Strength from Average[1]	n	Ease of Implementation Rating (3=neutral)	Strength from Neutral[2]	n
Concurrent flow	22	1	5%	3.50	0.50	2	3.50	0.50	2
Contraflow	22	0	0%	3.00	0.00	1	3.00	0.00	1
Reversible	22	1	5%	3.50	0.50	2	3.00	0.00	2
Median lane	22	1	5%	3.50	0.50	3	3.50	0.50	2

1 Rating minus 3 = Strength from average
2 Rating minus 3 = Strength from neutral

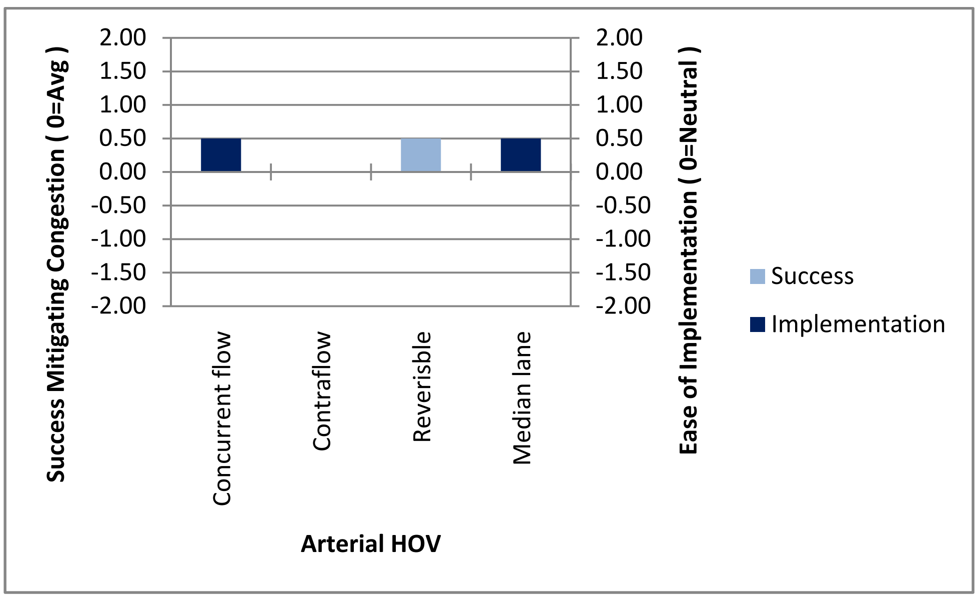

Figure D-15. Strength of success and ease of implementation for arterial HOV.

Key Observations

- Respondents provided no information on subject.

HOV-Related Improvements

Table D-17. Response Summary for HOV-related Improvements.

		Implemented/Planned		Success			Ease of Implementation		
Action	Response Count	n	% of Respondents	Rating (1-5, 3=average)	Strength from Average[1]	n	Rating (3=neutral)	Strength from Neutral[2]	n
Park-and-ride lot integration	22	8	36%	3.50	0.50	10	3.10	0.10	10
Rideshare matching services	22	14	64%	3.23	0.23	13	3.00	0.00	13
Ramps	22	3	14%	3.00	0.00	4	2.40	-0.60	5
Ramp by-pass	22	2	9%	3.33	0.33	3	2.33	-0.67	3
Publicity/outreach	22	14	64%	3.36	0.36	14	3.64	0.64	14
Park-and-ride facilities	22	16	73%	3.67	0.67	15	3.07	0.07	15
Casual carpool facilities	22	10	45%	3.55	0.55	11	3.58	0.58	12
HOV toll discounts	22	2	9%	3.20	0.20	5	3.50	0.50	4

[1] Rating minus 3 = Strength from average
[2] Rating minus 3 = Strength from neutral

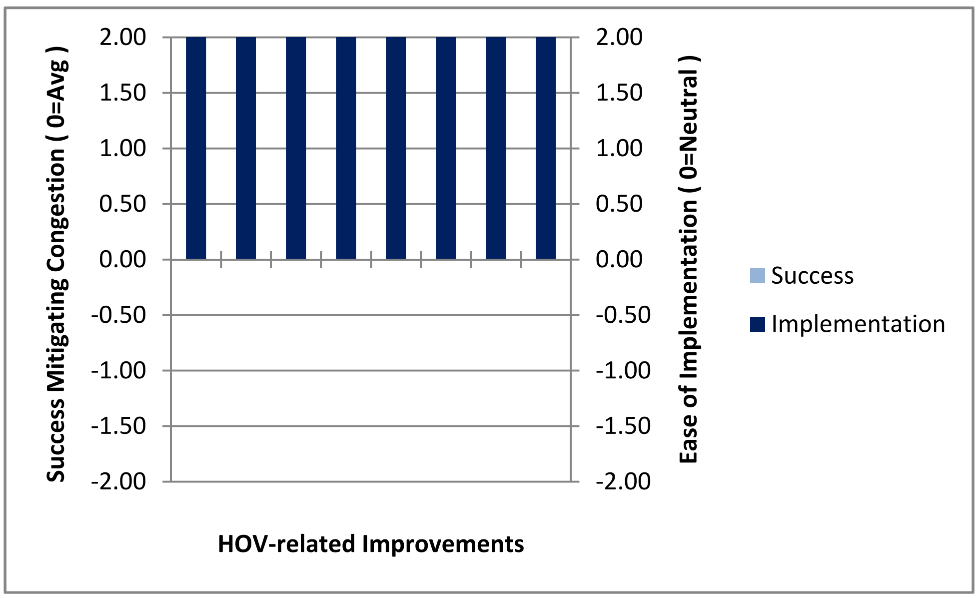

Figure D-16. Strength of success and ease of implementation for HOV-related improvements.

Key Observations

- HOV-related improvements are hard to implement due to lack of resources and difficulty in obtaining funding.

Special Lanes

Table D-18. Response Summary for Special Lanes.

		Implemented/Planned		Success			Ease of Implementation		
Action	Response Count	n	% of Respondents	Rating (1-5, 3=average)	Strength from Average[1]	n	Rating (3=neutral)	Strength from Neutral[2]	n
Bus lanes	22	4	18%	n/c	n/c	n/c	n/c	n/c	n/c
Truck lanes	22	0	0%	n/c	n/c	n/c	n/c	n/c	n/c

[1] Rating minus 3 = Strength from average
[2] Rating minus 3 = Strength from neutral
n/c – not collected

Key Observations

- Respondents provided no information on subject.

Incident Management

Table D-19. Response Summary for Incident Management.

Action	Response Count	Implemented/Planned n	Implemented/Planned % of Respondents	Success Rating (1-5, 3=average)	Success Strength from Average[1]	Success n	Ease of Implementation Rating (3=neutral)	Ease of Implementation Strength from Neutral[2]	Ease of Implementation n
Highways/freeways only	22	12	55%	n/c	n/c	n/c	n/c	n/c	n/c
Arterials only	22	0	0%	n/c	n/c	n/c	n/c	n/c	n/c
Highways/freeways and arterials	22	7	32%	n/c	n/c	n/c	n/c	n/c	n/c

[1] Rating minus 3 = Strength from average
[2] Rating minus 3 = Strength from neutral
n/c – not collected

Key Observations

- Respondents provided no information on subject.

Incident Management Strategies

Table D-20. Response Summary for Incident Management Strategies.

Action	Response Count	Implemented/Planned n	% Of Respondents	Success Rating (1-5, 3=average)	Strength from Average[1]	n	Ease of Implementation Rating (3=neutral)	Strength from Neutral[2]	n
Camera monitoring	22	18	82%	4.00	1.00	17	3.12	0.12	17
Roadway detectors/surveillance	22	17	77%	4.00	1.00	15	3.06	0.06	16
Traffic/courtesy patrols	22	14	64%	4.25	1.25	12	3.25	0.25	12
Response teams	22	16	73%	4.14	1.14	14	3.21	0.21	14
Responder vehicle priority	22	15	68%	4.00	1.00	12	3.42	0.42	12
Alternate route planning	22	14	64%	4.11	1.11	9	3.00	0.00	10
Variable message signs	22	19	86%	3.82	0.82	17	3.24	0.24	17
Advisory radio	22	13	59%	4.00	1.00	12	3.18	0.18	11

[1] Rating minus 3 = Strength from average
[2] Rating minus 3 = Strength from neutral

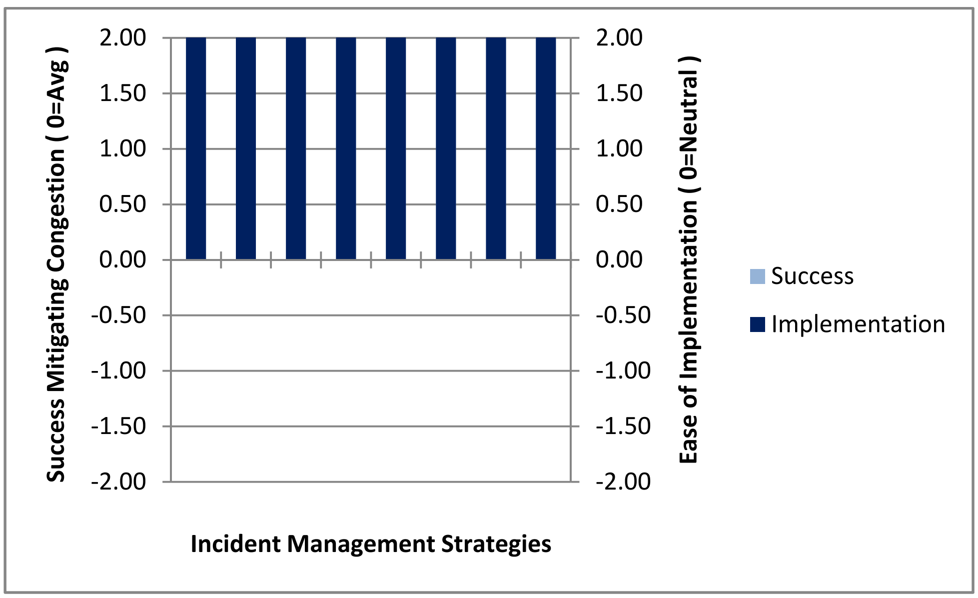

Figure D-17. Strength of success and ease of implementation for incident management strategies.

Key Observations

- Incident management strategies require more funding to operate, maintenance on equipment, and the acknowledgment of the public in order to be properly utilized.
- Alternative route planning takes a great amount of work, training, and coordination to implement.

Transit Capital Improvements

Table D-21. Response Summary for Transit Capital Improvements.

		Implemented/Planned		Success			Ease of Implementation		
Action	Response Count	n	% of Respondents	Rating (1-5, 3=average)	Strength from Average[1]	n	Rating (3=neutral)	Strength from Neutral[2]	n
Fleet expansion	22	14	64%	n/c	n/c	n/c	n/c	n/c	n/c
Vehicle replacement/upgrade	22	20	91%	n/c	n/c	n/c	n/c	n/c	n/c
Change vehicle types	22	9	41%	n/c	n/c	n/c	n/c	n/c	n/c
Vehicle management systems	22	12	55%	n/c	n/c	n/c	n/c	n/c	n/c

[1] Rating minus 3 = Strength from average
[2] Rating minus 3 = Strength from neutral
n/c – not collected

Key Observations

- Limited resources inhibit transit capital improvements.

Transit Support Facilities

Table D-22. Response Summary for Transit Support Facilities.

		Implemented/Planned		Success			Ease of Implementation		
Action	Response Count	n	% of Respondents	Rating (1-5, 3=average)	Strength from Average[1]	n	Rating (3=neutral)	Strength from Neutral[2]	n
Park-and-ride lots	22	18	82%	n/c	n/c	n/c	n/c	n/c	n/c
Transit centers	22	16	73%	n/c	n/c	n/c	n/c	n/c	n/c
Improved station amenities	22	11	50%	n/c	n/c	n/c	n/c	n/c	n/c

[1] Rating minus 3 = Strength from average
[2] Rating minus 3 = Strength from neutral
n/c – cot collected

Key Observations

- Transit support facilities are difficult to implement due to lack of funding.
- A transit transfer station including inside waiting room, restrooms, and shelter for bus pull up will cost $888,815.

Transit Exclusive Right-of-Way

Table D-23. Response Summary for Transit Exclusive Right-of-Way.

		Implemented/Planned		Success			Ease of Implementation		
Action	Response Count	n	% of Respondents	Rating (1-5, 3=average)	Strength from Average[1]	n	Rating (3=neutral)	Strength from Neutral[2]	n
Heavy rail	22	1	5%	n/c	n/c	n/c	n/c	n/c	n/c
Commuter rail	22	2	9%	n/c	n/c	n/c	n/c	n/c	n/c
Light rail	22	2	9%	n/c	n/c	n/c	n/c	n/c	n/c
Bus rapid transit/busway	22	3	14%	n/c	n/c	n/c	n/c	n/c	n/c
Bus lanes	22	3	14%	n/c	n/c	n/c	n/c	n/c	n/c
Bus bypass ramps	22	0	0%	n/c	n/c	n/c	n/c	n/c	n/c

[1] Rating minus 3 = Strength from average
[2] Rating minus 3 = Strength from neutral
n/c – not collected

Key Observations

- Public education and cost overruns impede implementation of transit exclusive right-of-way.
- Commuter rail parking, timing information, dependability and consumer attitude all play into the difficulty of implementation.

Transit Operational Improvements

Table D-24. Response Summary for Transit Operational Improvements.

		Implemented/Planned		Success			Ease of Implementation		
Action	Response Count	n	% of Respondents	Rating (1-5, 3=average)	Strength from Average[1]	n	Rating (3=neutral)	Strength from Neutral[2]	n
Increased frequency (decreased headways)	22	13	59%	n/c	n/c	n/c	n/c	n/c	n/c
Additional stops	22	9	41%	n/c	n/c	n/c	n/c	n/c	n/c
Modify operating hours	22	14	64%	n/c	n/c	n/c	n/c	n/c	n/c
Schedule coordination	22	12	55%	n/c	n/c	n/c	n/c	n/c	n/c
Improved transfers	22	13	59%	n/c	n/c	n/c	n/c	n/c	n/c
Route modifications	22	16	73%	n/c	n/c	n/c	n/c	n/c	n/c
Route expansions	22	15	68%	n/c	n/c	n/c	n/c	n/c	n/c
Express routes	22	17	77%	n/c	n/c	n/c	n/c	n/c	n/c
Activity center circulator buses	22	7	32%	n/c	n/c	n/c	n/c	n/c	n/c
Paratransit	22	18	82%	n/c	n/c	n/c	n/c	n/c	n/c
Neighborhood circulator buses	22	9	41%	n/c	n/c	n/c	n/c	n/c	n/c
Signal priorities for transit vehicles	22	5	23%	n/c	n/c	n/c	n/c	n/c	n/c
Signal coordination for transit vehicles	22	2	9%	n/c	n/c	n/c	n/c	n/c	n/c
Bus turnouts	22	10	45%	n/c	n/c	n/c	n/c	n/c	n/c
Rail crossing coordination	22	1	5%	n/c	n/c	n/c	n/c	n/c	n/c
HOV signal priority	22	0	0%	n/c	n/c	n/c	n/c	n/c	n/c

[1] Rating minus 3 = Strength from average
[2] Rating minus 3 = Strength from neutral
n/c – not collected

Key Observations

- Lack of adequate funding to implement improvements. This is challenge to meet the public's expectations and demand for services.
- Transit users have difficulty with route restructuring especially when ineffective routes are eliminated.

Transit Policy Strategies

Table D-25. Response Summary for Transit Policy Strategies.

		Implemented/Planned		Success			Ease of Implementation		
Action	Response Count	n	% of Respondents	Rating (1-5, 3=average)	Strength from Average[1]	n	Rating (3=neutral)	Strength from Neutral[2]	n
Marketing	22	17	77%	n/c	n/c	n/c	n/c	n/c	n/c
Agency coordination	22	15	68%	n/c	n/c	n/c	n/c	n/c	n/c
Real-time traveler information systems	22	7	32%	n/c	n/c	n/c	n/c	n/c	n/c
Fare collection incentives	22	10	45%	n/c	n/c	n/c	n/c	n/c	n/c
Fare package incentives	22	13	59%	n/c	n/c	n/c	n/c	n/c	n/c
Employer-transit passes	22	13	59%	n/c	n/c	n/c	n/c	n/c	n/c

[1] Rating minus 3 = Strength from average
[2] Rating minus 3 = Strength from neutral
n/c – not collected

Key Observations

- Fare discounts are popular through bulk discounts and retail partnerships.
- Perennial issues of (1) personal choice to abandon personal vehicles and space, (2) perception of the transit environment, and (3) transit system limitations.

Design Guidelines

Table D-26. Response Summary for Design Guidelines.

		Implemented/Planned		Success			Ease of Implementation		
Action	Response Count	n	% of Respondents	Rating (1-5, 3=average)	Strength from Average[1]	n	Rating (3=neutral)	Strength from Neutral[2]	n
Maximum block lengths	22	5	23%	n/c	n/c	n/c	n/c	n/c	n/c
Building setbacks	22	9	41%	n/c	n/c	n/c	n/c	n/c	n/c
Streetscape enhancements	22	12	55%	n/c	n/c	n/c	n/c	n/c	n/c
Sidewalk widths	22	11	50%	n/c	n/c	n/c	n/c	n/c	n/c

[1] Rating minus 3 = Strength from average
[2] Rating minus 3 = Strength from neutral
n/c – not collected

Key Observations

- Respondents provided no information on subject.

Pedestrian/Bicycle Improvements

Table D-27. Response Summary for Pedestrian/Bicycle Improvements.

		Implemented/Planned		Success			Ease of Implementation		
Action	Response Count	n	% of Respondents	Rating (1-5, 3=average)	Strength from Average[1]	n	Rating (3=neutral)	Strength from Neutral[2]	n
Designated bike lanes by restriping existing roadways	22	17	77%	3.73	0.73	15	3.53	0.53	17
Designated bike lanes using separate paths	22	16	73%	3.79	0.79	14	2.63	-0.37	16
Improved facilities (lighting, signing, etc.)	22	21	95%	3.53	0.53	19	3.38	0.38	21
New sidewalks	22	20	91%	3.47	0.47	19	3.05	0.05	20
Wider sidewalks	22	14	64%	3.29	0.29	14	2.93	-0.07	15
Rails to trails developments	22	19	86%	3.19	0.19	16	2.56	-0.44	18

[1] Rating minus 3 = Strength from average
[2] Rating minus 3 = Strength from neutral

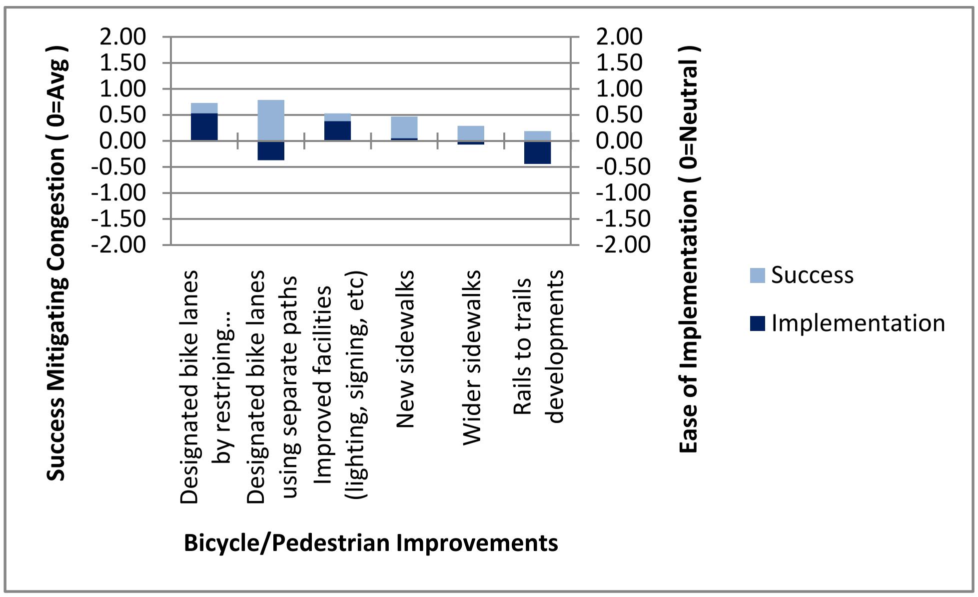

Figure D-18. Strength of success and ease of implementation for pedestrian/bicycle improvements.

Key Observations

- A lack of adequate funding was generally noted for all strategies.
- There is a lack of good technical guidance on designated bike lanes by restriping existing roadways.
- The right-of-way acquisition for rails to trails can be difficult. Vehicle congestion increases at roadway crossings and popular access points to the trails.

Pedestrian/Bicycle Support Services

Table D-28. Response Summary for Pedestrian/Bicycle Support Services.

		Implemented/Planned		Success			Ease of Implementation		
Action	Response Count	n	% of Respondents	Rating (1-5, 3=average)	Strength from Average[1]	n	Rating (3=neutral)	Strength from Neutral[2]	n
Bike racks at transit stations	22	20	91%	3.29	0.29	17	3.94	0.94	18
Bike racks on transit vehicles	22	22	100%	3.35	0.35	20	3.75	0.75	20
Bike racks at destinations	22	20	91%	3.28	0.28	18	3.56	0.56	18
Lockers at transit stations	22	9	41%	2.9	-0.10	10	3	0.00	10
Lockers at destinations	22	7	32%	2.75	-0.25	8	3.1	0.10	10
Shower facilities at transit stations	22	2	9%	2.6	-0.40	5	2	-1.00	7
Shower facilities at destinations	22	5	23%	3	0.00	7	2.38	-0.62	8
Route maps	22	18	82%	3.47	0.47	17	3.89	0.89	18
Bike sharing	22	5	23%	3.22	0.22	9	2.25	-0.75	8
Coordinators	22	9	41%	3.15	0.15	13	3.23	0.23	13
Supporting ordinances	22	13	59%	3.15	0.15	13	3.15	0.15	13
Promotional campaigns	22	18	82%	3.5	0.50	16	3.88	0.88	16
Promotional campaigns via media	22	13	59%	3.25	0.25	12	3.42	0.42	12
Educational outreach	22	19	86%	3.47	0.47	17	3.71	0.71	17

[1] Rating minus 3 = Strength from average
[2] Rating minus 3 = Strength from neutral

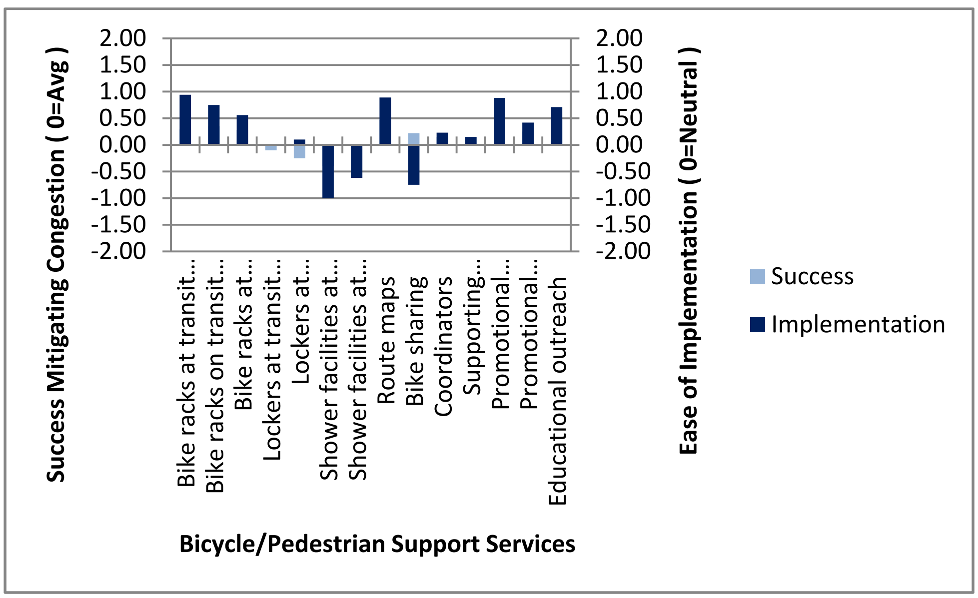

Figure D-19. Strength of success and ease of implementation for pedestrian/bicycle support services.

Key Observations

- Bike racks for buses are limited to fit two bicycles. In high bicycle use areas, this is inadequate to handle the demand.

Contracting Strategies

Table D-29. Response Summary for Contracting Strategies.

		Implemented/Planned		Success			Ease of Implementation		
Action	Response Count	n	% of Respondents	Rating (1-5, 3=average)	Strength from Average[1]	n	Rating (3=neutral)	Strength from Neutral[2]	n
Allowable working days and working hours	22	8	36%	4.14	1.14	7	3.43	0.43	7
Financial incentives/disincentives for high-priority projects	22	9	41%	4	1.00	8	3	0.00	8
A+B bidding	22	3	14%	3	0.00	2	3	0.00	2
Lane rentals	22	1	5%	3	0.00	1	3	0.00	1

[1] Rating minus 3 = Strength from average

[2] Rating minus 3 = Strength from neutral

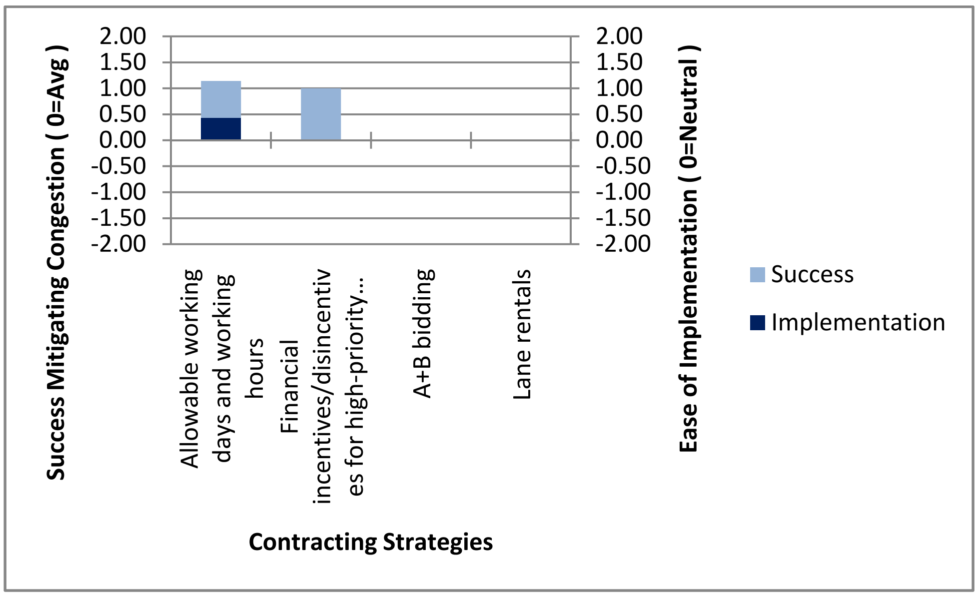

Figure D-20. Strength of success and ease of implementation for contracting strategies.

Key Observations

- Respondents provided no information on subject.

Work Zone Strategies

Table D-30. Response Summary for Work Zone Strategies.

		Implemented/Planned		Success			Ease of Implementation		
Action	Response Count	n	% of Respondents	Rating (1-5, 3=average)	Strength from Average[1]	n	Rating (3=neutral)	Strength from Neutral[2]	n
Work zone management	22	18	82%	3.75	0.75	16	3.56	0.56	16
Warranty contracting	22	10	45%	3.75	0.75	8	3.25	0.25	8
Advance information	22	16	73%	3.85	0.85	13	3.83	0.83	12
Trailblazing/detours	22	13	59%	4	1.00	10	3.7	0.70	10
Management plans	22	14	64%	4	1.00	11	3.64	0.64	11
Design-build	22	15	68%	3.57	0.57	14	3.17	0.17	12
Job order (on-call) contracting	22	7	32%	3.4	0.40	5	3.2	0.20	5

[1] Rating minus 3 = Strength from average
[2] Rating minus 3 = Strength from neutral

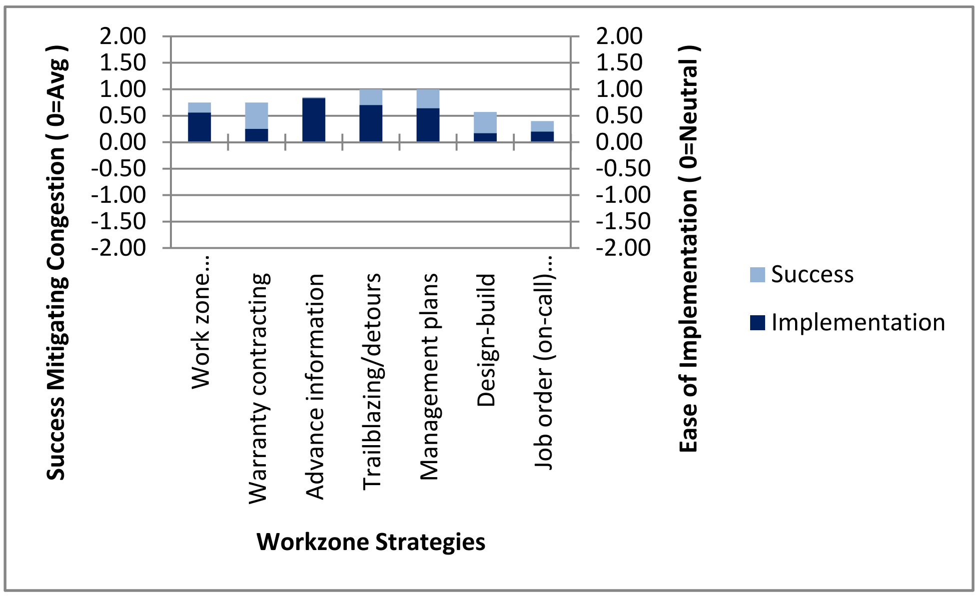

Figure D-21. Strength of success and ease of implementation for work zone strategies.

Key Observations

- Respondents provided no information on subject.

Work Schedule Changes

Table D-31. Response Summary for Work Schedule Changes.

Action	Response Count	Implemented/Planned n	Implemented/Planned % of Respondents	Success Rating (1-5, 3=average)	Success Strength from Average[1]	Success n	Ease of Implementation Rating (3=neutral)	Ease of Implementation Strength from Neutral[2]	Ease of Implementation n
Flextime	22	17	77%	3.33	0.33	15	3.71	0.71	14
Compressed work week	22	16	73%	3.4	0.40	15	3.64	0.64	14
Staggered work hours	22	14	64%	3.43	0.43	14	3.62	0.62	13
Telecommuting	22	18	82%	3.38	0.38	16	3.67	0.67	15

[1] Rating minus 3 = Strength from average

[2] Rating minus 3 = Strength from neutral

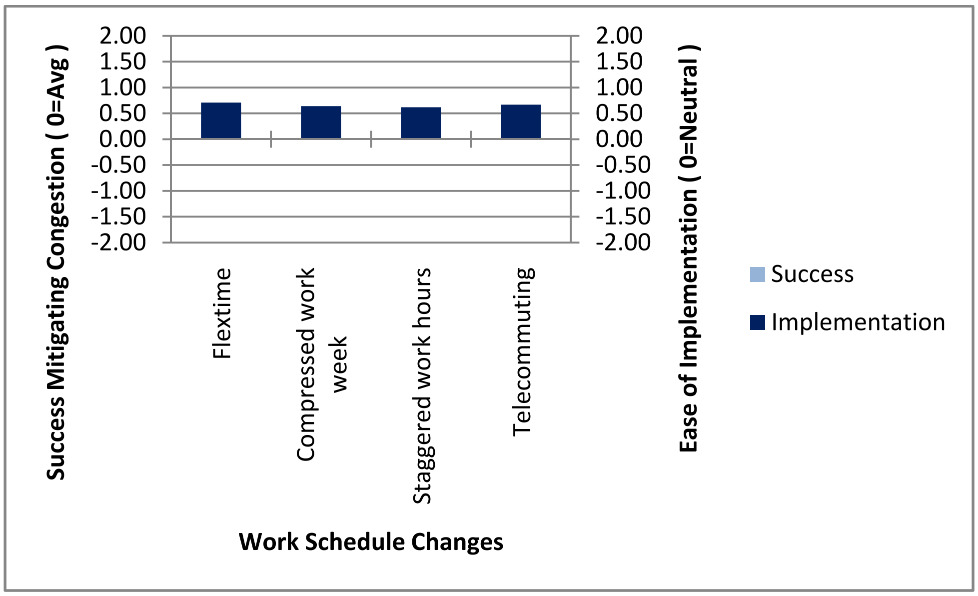

Figure D-22. Strength of success and ease of implementation for work schedule changes.

Key Observations

- Respondents provided no information on subject.

Land Use Strategies

Table D-32. Response Summary for Lane Use Strategies.

Action	Response Count	Implemented/Planned n	% of Respondents	Success Rating (1-5, 3=average)	Strength from Average[1]	n	Ease of Implementation Rating (3=neutral)	Strength from Neutral[2]	n
Mixed-use developments	22	18	82%	3.5	0.50	16	2.53	-0.47	17
Infill and densification	22	18	82%	3.53	0.53	15	2.38	-0.62	16
Transit-oriented developments	22	17	77%	3.55	0.55	11	2.23	-0.77	13

[1] Rating minus 3 = Strength from average

[2] Rating minus 3 = Strength from neutral

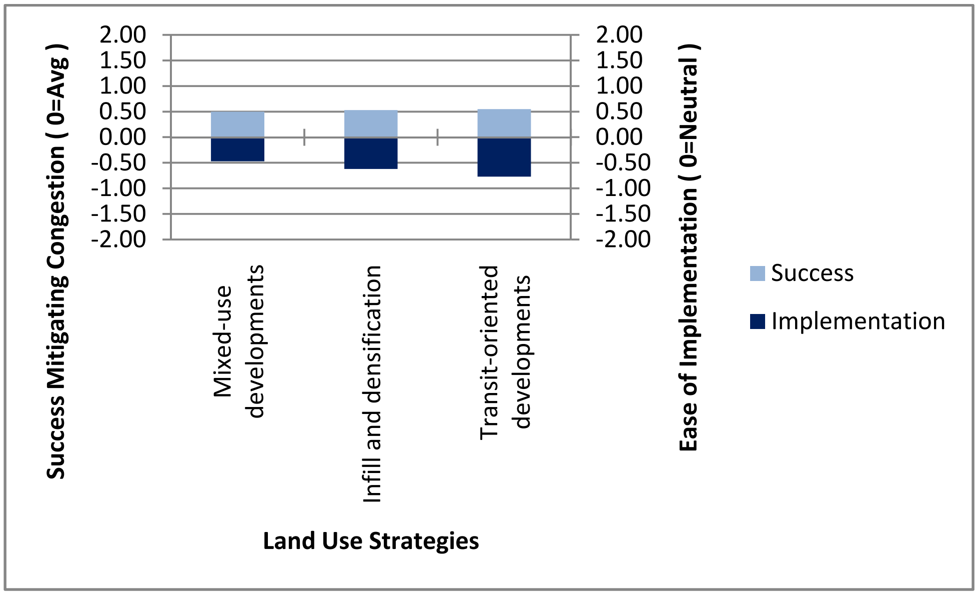

Figure D-23. Strength of success and ease of implementation for land use strategies.

Key Observations

- Respondents provided no information on subject.

Ridesharing/Vanpool Strategies

Table D-33. Response Summary for Ridesharing/Vanpool Strategies.

		Implemented/Planned		Success			Ease of Implementation		
Action	Response Count	n	% of Respondents	Rating (1-5, 3=average)	Strength from Average[1]	n	Rating (3=neutral)	Strength from Neutral[2]	n
HOV parking discount incentives	22	3	14%	3.25	0.25	4	2.75	-0.25	4
Subsidized service incentives	22	6	27%	3.5	0.50	6	3.5	0.50	6
Marketing and promotions	22	19	86%	3.29	0.29	17	3.39	0.39	18
Ridematching services	22	18	82%	3.39	0.39	18	3.47	0.47	19
Guaranteed ride home	22	18	82%	3.35	0.35	17	3.53	0.53	17

[1] Rating minus 3 = Strength from average

[2] Rating minus 3 = Strength from neutral

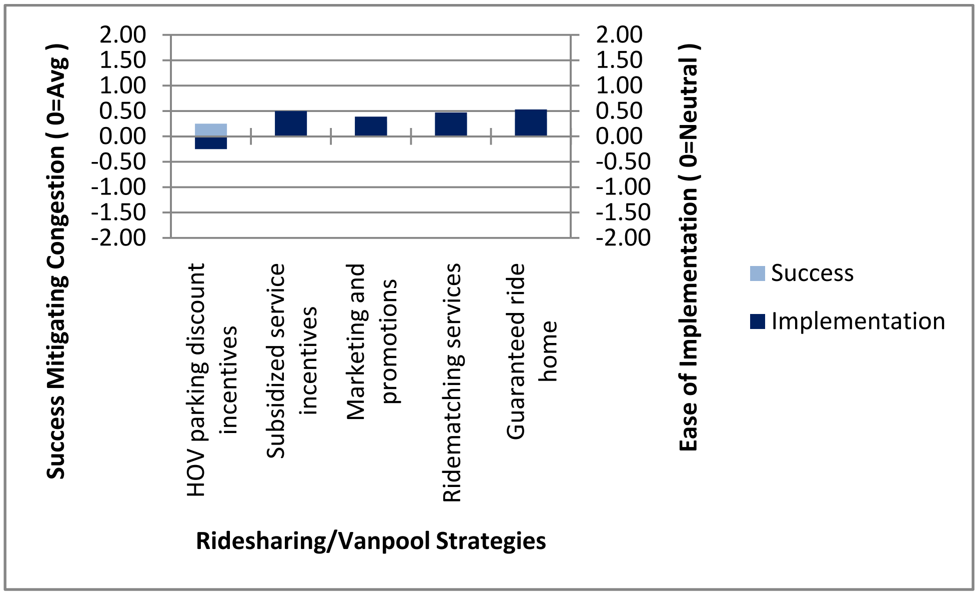

Figure D-24. Strength of success and ease of implementation for ridesharing/vanpool strategies.

Key Observations

- Personal preference to use one's individual vehicle is the greatest barrier.

Parking Management

Table D-34. Response Summary for Parking Management.

Action	Response Count	Implemented/Planned n	Implemented/Planned % of Respondents	Success Rating (1-5, 3=average)	Success Strength from Average[1]	Success n	Ease of Implementation Rating (3=neutral)	Ease of Implementation Strength from Neutral[2]	Ease of Implementation n
On-street parking and standing restrictions	22	17	77%	3.67	0.67	12	3.15	0.15	13
Peak-period prohibitions to free lane capacity	22	9	41%	3.17	0.17	6	3.25	0.25	8
Employer/landlord parking agreements	22	9	41%	3.2	0.20	5	2.67	-0.33	6
Increased parking fees	22	8	36%	3.83	0.83	6	3.17	0.17	6
Preferential HOV/carpool/vanpool parking	22	8	36%	3	0.00	6	3.57	0.57	7
Discounted HOV/carpool/vanpool parking	22	5	23%	3.33	0.33	3	3.25	0.25	4
Location specific parking ordinances	22	12	55%	3.22	0.22	9	3.18	0.18	11

[1] Rating minus 3 = Strength from average
[2] Rating minus 3 = Strength from neutral

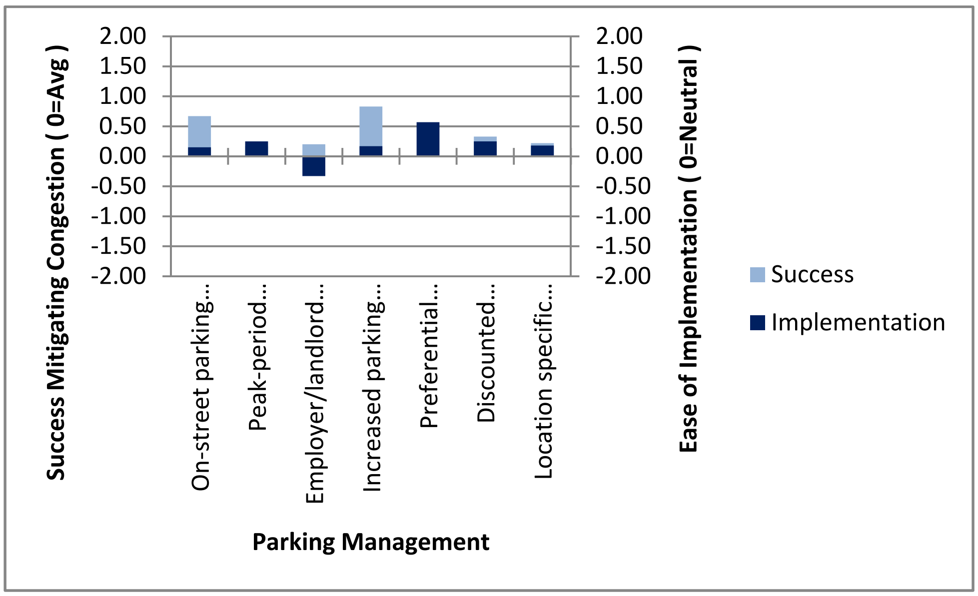

Figure D-25. Strength of success and ease of implementation for parking management.

Key Observations

- Respondents provided no information on subject.

New Community Design

Table D-35. Response Summary for New Community Design.

Action	Response Count	Implemented/Planned n	Implemented/Planned % of Respondents	Success Rating (1-5, 3=average)	Success Strength from Average[1]	Success n	Ease of Implementation Rating (3=neutral)	Ease of Implementation Strength from Neutral[2]	Ease of Implementation n
Density standards	22	9	41%	3	0.00	8	2.86	-0.14	7
Site reclamation and reuse	22	13	59%	3.55	0.55	11	2.64	-0.36	11
Incentives to develop in areas with existing infrastructure	22	12	55%	3.4	0.40	10	2.8	-0.20	10
Mixed use zoning regulations	22	15	68%	3.42	0.42	12	3.08	0.08	12
Jobs/housing development zoning regulations	22	5	23%	3.17	0.17	6	2.5	-0.50	8
Transit oriented development density standards	22	9	41%	3.14	0.14	7	2.75	-0.25	8
Transit oriented development design requirements	22	7	32%	2.83	-0.17	6	3.14	0.14	7
Transit oriented development bicycle/pedestrian access	22	10	45%	3.38	0.38	8	3.22	0.22	9
Intergovernmental agreements for corridor land use and transportation coordination	22	8	36%	3.38	0.38	8	2.89	-0.11	9

[1] Rating minus 3 = Strength from average
[2] Rating minus 3 = Strength from neutral

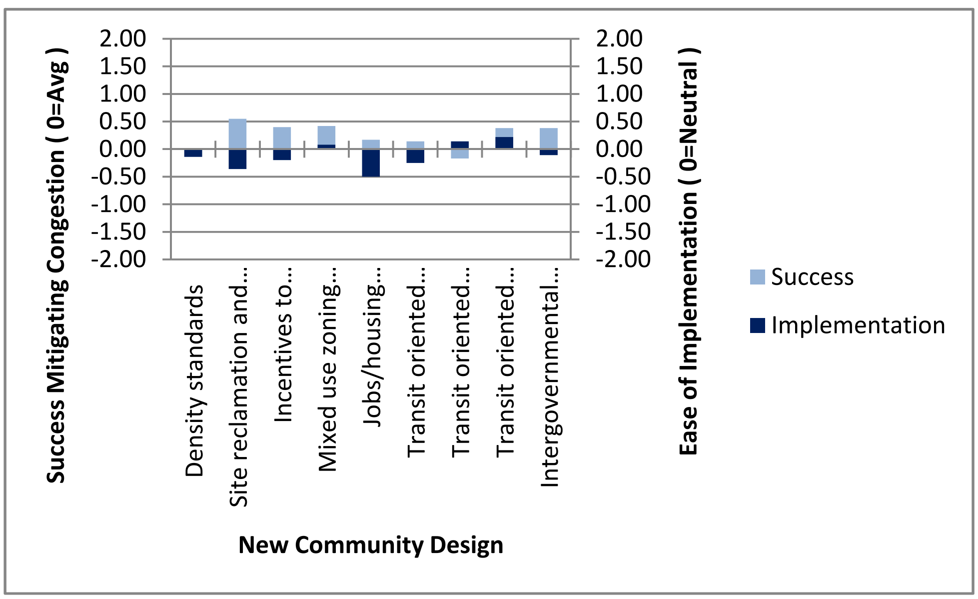

Figure D-26. Strength of success and ease of implementation for new community design.

Key Observations

- Respondents provided no information on subject.

Car Sharing

Table D-36. Response Summary for Car Sharing.

Action	Response Count	Implemented/Planned n	Implemented/Planned % of Respondents	Success Rating (1-5, 3=average)	Success Strength from Average[1]	Success n	Ease of Implementation Rating (3=neutral)	Ease of Implementation Strength from Neutral[2]	Ease of Implementation n
Car Sharing	22	11	50%	3.14	0.14	7	3	0.00	7

[1] Rating minus 3 = Strength from average
[2] Rating minus 3 = Strength from neutral

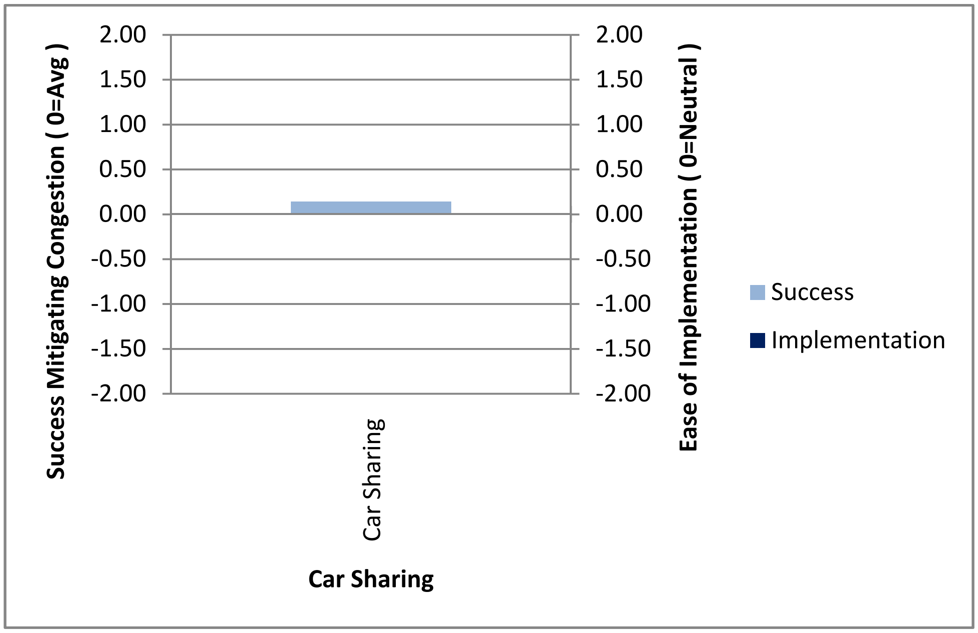

Figure D-27. Strength of success and ease of implementation for car sharing.

Key Observations

- Respondents provided no information on subject.

Trip Reduction Ordinances

Table D-37. Response Summary for Trip Reduction Ordinances.

Action	Response Count	Implemented/Planned n	Implemented/Planned % of Respondents	Success Rating (1-5, 3=average)	Success Strength from Average[1]	Success n	Ease of Implementation Rating (3=neutral)	Ease of Implementation Strength from Neutral[2]	Ease of Implementation n
Special use permits	22	3	14%	3.33	0.33	3	2.80	-0.20	5
Negotiated agreements	22	2	9%	3.33	0.33	3	2.80	-0.20	5
Trip reduction goal programs	22	5	23%	2.8	-0.20	5	2.86	-0.14	7
Conditions of approval for new construction	22	3	14%	3.25	0.25	4	2.50	-0.50	6
Mandated programs	22	2	9%	3	0.00	2	2.00	-1.00	4
Transportation management districts	22	3	14%	3.5	0.50	4	2.00	-1.00	5

[1] Rating minus 3 = Strength from average

[2] Rating minus 3 = Strength from neutral

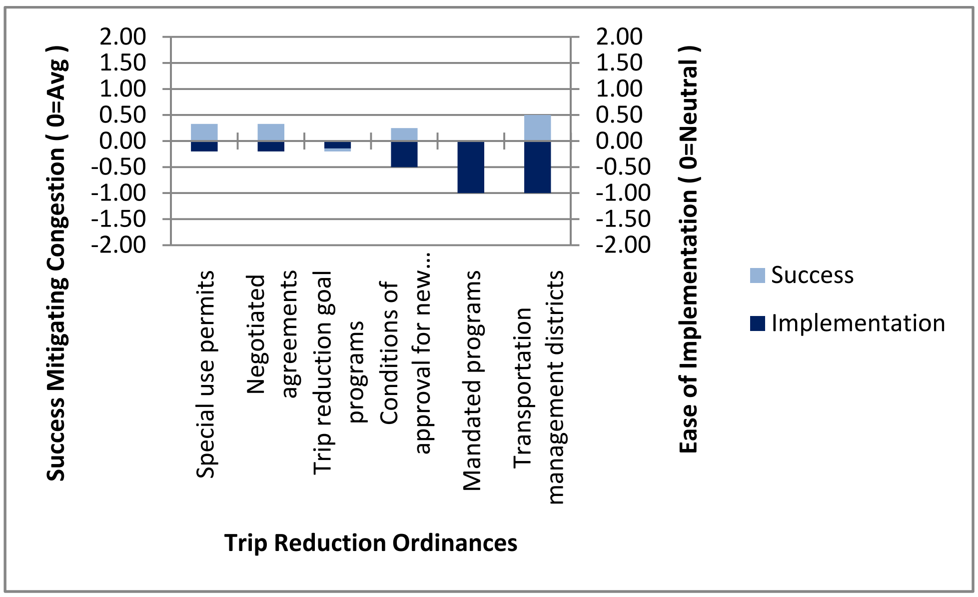

Figure D-28. Strength of success and ease of implementation for trip reduction ordinances.

Key Observations

- Respondents provided no information on subject.