Interstate 35E MnPASS Managed Lanes Extension: Little Canada Road to County Road 96 Pre-Implementation Study

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This report summarizes work to study the feasibility of extending MnPASS Express Lanes on I-35E between Little Canada Road and County Road 96 in the northeastern part of the Twin Cities metropolitan area. During peak rush hour periods, MnPASS Express Lanes provide a congestion-free option to transit vehicles, carpools and motorcycles, as well as single-occupant vehicles for a fee. The work was funded by a Value Pricing Pilot Program grant from the Federal Highway Administration.

This was a pre-implementation planning study designed to develop and evaluate conceptual alternatives for extending MnPASS Express Lanes between Little Canada Road and County Road 96 on I-35E and to identify and evaluate methods for improving bus transit and carpool use in the MnPASS lanes on I-35E.

The study sought to explore and analyze a number of scenarios to provide a higher level of service for all I-35E corridor users: those using the general purpose traffic lanes, those using the MnPASS Express Lanes, and those using transit. The goal for the project was to achieve greater efficiency in the corridor through better use of existing infrastructure and to optimize highway system performance and customer service through supportive land-use planning for transit and bike/pedestrian traffic. The study engaged community stakeholders and corridor users to analyze the design, operations, benefits, costs, and public acceptability of each conceptual alternative. The study also engaged community stakeholders in identifying and evaluating additional transit enhancements that could increase transit and carpool use in the I-35E MnPASS Express Lanes.

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Interstate 35E MnPASS Managed Lanes Extension:  
Little Canada Road to County Road 96  
Pre-Implementation Study  

Final Report  

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June 2015  

This report represents the results of research conducted by the authors and does not necessarily reflect the official views or policies of the Center for Transportation Studies, the University of Minnesota, or the Minnesota Department of Transportation. This report does not contain a standard or specified technique.  

The authors, the Minnesota Department of Transportation, and the University of Minnesota do not endorse products or manufacturers. Any trade or manufacturers’ names that may appear herein do so solely because they are considered essential to this report.
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EXECUTIVE SUMMARY

Project Overview

In 2013, the Federal Highway Administration (FHWA) awarded the Minnesota Department of Transportation (MnDOT) a Value Pricing Pilot Program grant to study the feasibility of extending MnPASS Express Lanes on I-35E between Little Canada Road and County Road 96 in the northeastern part of the Twin Cities metropolitan area (TCMA). During peak rush hour periods, MnPASS Express Lanes provide a congestion-free option to transit vehicles, carpools and motorcycles, as well as single-occupant vehicles for a fee.

This was a pre-implementation planning study designed to develop and evaluate conceptual alternatives for extending MnPASS Express Lanes between Little Canada Road and County Road 96 on I-35E, and to identify and evaluate methods for improving bus transit and carpool use in the MnPASS lanes on I-35E.

This study was completed as MnPASS Express Lanes are being constructed on I-35E between downtown St. Paul and Little Canada Road. These MnPASS Express Lanes, due to open in late 2015, will be the first in the eastern part of the TCMA. Because the 2040 Regional Transportation Policy Plan envisions extending the MnPASS lanes farther north of Little Canada Road, MnDOT identified an opportunity for implementing such an extension during the Goose Lake Road Bridge and Pavement construction project between County Road E and County Road 96 in the 2015/16 timeframe.

The study sought to explore and analyze a number of MnPASS Express Lane extension scenarios to provide a higher level of service for all I-35E corridor users: those using the general purpose traffic lanes, those using the MnPASS Express Lanes, and those using transit. The goal for the project was to achieve greater efficiency in the corridor through better use of existing infrastructure and to optimize highway system performance and customer service through supportive land use planning for transit and bike/pedestrian traffic. To accomplish this goal, the study engaged community stakeholders and corridor users to analyze the design, operations, benefits, costs, and public acceptability of each conceptual alternative. The study also engaged
community stakeholders in identifying and evaluating additional transit enhancements that could increase transit and carpool use in the I-35E MnPASS Express Lanes.

Accordingly, the study was divided into three components: Concept Development, Outreach and Education, and Land Use and Transit Enhancement. The full report for each component is included in the appendices.

**Concept Development**

A core challenge to the extension of MnPASS Express Lanes in this corridor was the I-694 / I-35E interchange, which was reconstructed in 2008. While that reconstruction improved traffic operations through this section, congestion continued to occur immediately north and south of the interchange on I-35E. Further, while MnPASS lanes were being constructed south of Little Canada Road, and the Goose Lake Road Bridge and Pavement construction project allowed the addition of MnPASS lanes north of the interchange, the recent reconstruction of the interchange made adding a new lane for MnPASS users through the interchange impractical. Consequently, the focus of this portion of the study was to identify conceptual options that would make the best use of already built freeway capacity through the interchange commons area. Three options were developed for consideration:

- **Continuous:** This option, which later came to be described as “MnPASS without a Gap,” called for simply extending the MnPASS Express Lanes north through the I-694/I-35E interchange up to County Road 96. Implementation of this option meant that the inside general purpose lane in each direction would be converted to a MnPASS Express Lane through the interchange commons area during peak periods. The inside lane would remain a general purpose lane during non-peak periods. North of the interchange commons area, an inside lane in each direction would be added on I-35E up to County Road 96, which would also operate as a MnPASS lane during peak periods and as a general purpose lane during non-peak periods.

- **Discontinuous:** This option, which came to be known as “MnPASS with a Gap,” eliminated the MnPASS designation through the I-694/I-35E interchange but still added the MnPASS lane in each direction north of the interchange commons area to County Road 96. This created a gap in the MnPASS lanes during peak periods with MnPASS lanes north and south of the interchange commons area but no MnPASS lanes through the commons area.

- **MnPASS on the Shoulder:** This option converted the inside shoulder in each direction through the I-694/I-35E interchange commons area to MnPASS lanes during peak periods. During non-peak periods, the lane would revert to being a shoulder. Once again, north of the interchange commons area, an inside lane in each direction would be added on I-35E to County Road 96, which would also operate as a MnPASS lane during peak periods and as a general purpose lane during non-peak periods.

During the course of the study, these three options were modeled and evaluated using a variety of criteria. One item that became clear through this effort was that, while each option had its strengths, none significantly outperformed the others, and the benefits of all options were
mitigated by the fact that the end of the northbound MnPASS lane at County Road 96 simply pushed existing congestion north from County Road E to County Road 96.

- **Hybrid Option**: Consequently, a “Hybrid” option was developed. This option matched the “Continuous” option in the southbound direction with the “Discontinuous” option in the northbound direction through the I-35E / I-694 commons area, and extended the northbound MnPASS lane to County Road J. The extension of the northbound MnPASS lane to County Road J resulted in significant improvements in the level of service for the afternoon (northbound) peak. Further, the Hybrid option also includes a longer-term recommendation to extend the MnPASS in both directions of I-35E to County Road 14.

**Outreach and Education**

The primary focus of this component was to introduce the MnPASS concept in the corridor and receive feedback regarding the proposed concept options. To do so, an infographic explaining MnPASS was developed, and Community Dialogues were held with three different groups: general users of the corridor, professional drivers and community leaders. Although these dialogues were held prior to the development of the hybrid option, they still provided useful feedback regarding the need to provide basic information about MnPASS in this part of the TCMA, and a preference among the participants toward the simplicity of the Continuous option.

The Outreach and Education component also included research into best practices and documentation of the 35E MnPASS Extension project. This effort resulted in two papers presented at the Transportation Research Board.

**Land Use and Transit Enhancement**

Although Park and Ride facilities exist along this section of the I-35E corridor, the communities have few continuous streets and low density development, with single occupant vehicles (SOVs) being the dominant mode of transportation as a result. Since the MnPASS Express Lanes are designed to create an advantage for transit and carpools, in addition to providing a congestion-free alternative for SOVs that pay a fee, this portion of the study looked to illustrate options that could facilitate and foster greater transit, carpool, and vanpool use in these communities.

To accomplish this goal, this component focused on four areas in the corridor: Little Canada (Little Canada Road), Vadnais Heights (County Road E), and
Hugo and Centerville (County Road 14). The study examined ways to create areas of concentrations of people and activities as sources of trip origins and trip destinations. The strategies presented include increasing density, increasing mixed-use land use, creating or using existing neighborhood spaces as gathering spaces for carpool and vanpool, and improving connectivity through bicycle and pedestrian pathways.

**Decision Making Process**

A Project Management Team (PMT) consisting of representatives from MnDOT, FHWA, the Metropolitan Council, and the University of Minnesota adopted a Project Management Plan that outlined the scope of the work and established the creation of four additional groups: three Technical Advisory Committees (one for each of the three study components) and a Steering Committee consisting of staff or elected officials from each of the cities and counties affected by developments on I-35E, in addition to the organizations represented on the PMT. The Project Management Plan and committee members are included in Appendix A.

The Steering Committee met four times throughout the course of this study, with the PMT meeting prior to each Steering Committee meeting, and on other occasions as needed. The Technical Advisory Committees also met on an ad hoc schedule, as appropriate for reviewing and guiding each component.

**Recommendations**

The research resulted in the following recommendations:

1) *Proceed toward implementation of the Hybrid concept option.* This concept option takes advantage of elements from the other concept options that had the best evaluation results and extends the project boundary to produce the best traffic operations outcomes for the corridor. The Hybrid option also produces the highest benefit/cost analysis results, with a result of 3.16. The option was presented to the PMT and Steering Committee in May 2014 and received favorable reaction. Based upon the technical analysis, feedback from the Steering Committee, and input received during the Community Dialogue sessions, MnDOT determined the Hybrid option’s short term recommendation warranted moving forward into the environmental/pre-design process.

2) *Education is key.* The effectiveness of the infographic and usefulness of discussing MnPASS in general before discussing the concept options at the Community Dialogues demonstrated that MnPASS is not well known in this part of the TCMA, so continued outreach and education efforts as MnPASS is implemented through the I-35E corridor will be beneficial.

3) *Move incrementally towards transit options.* Developing transit-supportive land uses in this area is a challenge due to the rural, small town history of the cities involved and the development pattern that resulted. However, opportunities for park and ride, park and pool, and “gather and go” sites can be created by using such facilities as centers for civic activities, encouraging mixed land uses in these areas, building better walking and biking connections, and taking advantage of 21st century technologies to connect potential users.
Chapter 1: Introduction

1.1 Project Overview

In 2013, the Federal Highway Administration (FHWA) awarded the Minnesota Department of Transportation (MnDOT) a Value Pricing Pilot Program grant to study the feasibility of extending MnPASS Express Lanes on I-35E between Little Canada Road and County Road 96 in the northeastern part of the Twin Cities Metropolitan Area (TCMA). During peak rush hour periods, MnPASS Express Lanes provide a congestion-free option to transit vehicles, carpools and motorcycles, as well as single-occupant vehicles for a fee.

This was a pre-implementation planning study designed to develop and evaluate conceptual alternatives for extending MnPASS Express Lanes between Little Canada Road and County Road 96 on I-35E, and to identify and evaluate methods for improving bus transit and carpool use in the MnPASS lanes on I-35E.

This study was completed as MnPASS Express Lanes are being constructed on I-35E between downtown St. Paul and Little Canada Road. These MnPASS Express Lanes, due to open in late 2015, will be the first in the eastern part of the TCMA. Because the 2040 Regional Transportation Policy Plan envisions extending the MnPASS lanes further north of Little Canada Road, MnDOT identified an opportunity for implementing such an extension during the Goose Lake Road Bridge and Pavement construction project between County Road E and County Road 96 in the 2015/16 timeframe.

The study sought to explore and analyze a number of MnPASS Express Lane extension scenarios to provide a higher level of service for all I-35E Corridor users: those using the general purpose traffic lanes, those using the MnPASS Express Lanes, and those using transit. The goal for the project was to achieve greater efficiency in the corridor through better use of existing infrastructure, and to optimize highway system performance and customer service through transit enhancements and supportive land use planning for transit and bike/pedestrian traffic.

Figure 1: I-35E Study Area
1.1.1 Physical Characteristics

The I-35E Corridor connecting downtown St. Paul to I-35W on the northeast side of the TCMA is a key link in the regional transportation network serving a broad range of trips: through-trips, local trips, and a significant number of truck and transit trips. The corridor has seen some changes in configuration and operations since 2008, including the reconstruction of the I-694 / I-35E interchange (known locally as “Unweave the Weave”). Other projects, shown in Figure 4, are currently underway or will take place in the near future. These include the Cayuga and Maryland Bridge replacement projects, which include overall reconstruction of the highway between University Avenue and Little Canada Road, as well as the construction of new MnPASS Express Lanes expected to open in late 2015. North of Little Canada Road, construction projects to improve the highway between County Road E and County Road 96 create the opportunity to consider extending the MnPASS Express Lanes north, which is the subject of this study. Finally, efforts to increase transit use include construction of new Park-and-Ride facilities at County Road E and County Road 14.

1.1.2 Key Issues

Implementation of MnPASS Express Lanes on I-35E north of Little Canada Road faced a couple of specific issues, along with a general one. First, implementation of MnPASS Express Lanes through the commons required an innovative solution. Second, the communities along this corridor had land use development patterns that are not conducive to transit use, creating a significant obstacle to meeting the goal of creating a transit advantage. Finally, MnPASS Express Lanes had not been implemented in this part of the TCMA, leading to questions about how much the public would accept the introduction of these facilities.

I-35E/I-694 Commons

The investment in the “Unweave the Weave” project through the I-35E / I-694 commons reduced congestion at that point, but bottlenecks north and south of the commons remain. In the AM peak period, the southbound direction of I-35E experiences moderate levels of congestion (1 – 2 hours of congestion) between County Road J and I-694, with more severe levels of congestion south of Little Canada Road, which the I-35E MnPASS and Cayuga projects are intended to help alleviate. In the PM peak period, the northbound direction experiences congestion at the County Road E bottleneck, which can back traffic back into the commons.
While this situation created an opportunity for providing a congestion-free trip on MnPASS north of Little Canada Road, it was impractical to construct these lanes through the commons due to the recent investment and construction. Consequently, a key challenge for this study was to develop a plan for implementing MnPASS Express Lanes through the commons without adding a new lane.

**Land Use and Transit**

While some transit investments such as Park-and-Ride facilities have been made in the corridor, single occupant vehicles (SOVs) are the dominant mode. The key reason is because these communities have histories as independent small towns and the land use patterns evolved in a low density, unconnected fashion. However, MnPASS Express Lanes have a goal of creating an advantage for transit and carpools, in addition to providing a congestion-free alternative for SOVs that pay a fee. The combination of these two factors meant that innovative options for promoting carpools and vanpools had to be developed.

**Public Acceptability**

The innovative nature of MnPASS Express Lanes in general, and the specific innovations related to transit and the changes to the I-35E / I-694 commons discussed above, mean that public support of implementing the lanes is not assured, if for no other reason than lack of familiarity.

While MnPASS Express Lanes have been in existence in the TCMA for several years, earlier implementation was on I-394 and I-35W, on the western side of the area. Many users of I-35E do not use those highways enough to make it worth subscribing to MnPASS, so MnPASS is a relatively new concept there. Opening of MnPASS Express Lanes south of Little Canada Road will help this issue by the time any MnPASS facilities are opened on the sections north of Little Canada Road (the subject of this study), but timing of the two projects resulted in this study taking place before the lanes opened south of Little Canada Road.

For these reasons, an outreach and education component was also a necessary element of this study.
1.2 Study Process

1.2.1 Concept Development

This component was developed to address the question of implementing MnPASS Express Lanes through the I-35E / I-694 commons, and was led by an engineering consultant. The work included reviewing existing congestion conditions in the corridor, developing and evaluating conceptual options for extending the MnPASS lanes on I-35E, conducting traffic forecasting and modeling, performing benefit-cost analysis of the options, and recommending a preferred option. The initial options evaluated were as follows:

- **Continuous**: This option, which later came to be described as “MnPASS without a Gap,” called for simply extending the MnPASS Express Lanes north through the I-694/I-35E interchange up to County Road 96. Implementation of this option meant that the inside general purpose lane in each direction would be converted to a MnPASS Express Lane through the interchange commons area during peak periods. The inside lane would remain a general purpose lane during non-peak periods. North of the interchange commons area, an inside lane in each direction would be added on I-35E up to County Road 96, which would also operate as a MnPASS lane during peak periods and as a general purpose lane during non-peak periods.

- **Discontinuous**: This option, which came to be known as “MnPASS with a Gap,” eliminated the MnPASS designation through the I-694/I-35E interchange, but still added the MnPASS lane in each direction north of the interchange commons area to County Road 96. This created a gap in the MnPASS lanes during peak periods with MnPASS lanes north and south of the interchange commons area, but no MnPASS lanes through the commons area.

- **MnPASS on the Shoulder**: This option converted the inside shoulder in each direction through the I-694/I-35E interchange commons area to MnPASS lanes during peak periods. During non-peak periods, the lane would revert to being a shoulder. Once again, north of the interchange commons area, an inside lane in each direction would be added on I-35E to County Road 96, which would also operate as a MnPASS lane during peak periods and as a general purpose lane during non-peak periods.

1.2.2 Outreach and Education

MnDOT contracted with a team from the Humphrey School of Public Affairs at the University of Minnesota to develop and conduct outreach and education in an effort to increase familiarity with MnPASS Express Lanes and gain insight into the public’s acceptance of the proposed options through the commons area.

This work included creating an infographic explaining MnPASS and conducting Community Dialogues with three different groups: general users of the corridor, professional drivers, and community leaders. The Outreach and Education component also included research into best practices and documentation of the I-35E MnPASS Extension project. This effort resulted in two papers presented at the Transportation Research Board. These papers are included in the Appendices. Finally, the Humphrey School team coordinated many of the meetings of the groups listed in the decision making structure below (see section 1.3).
1.2.3 Land Use and Transit

Researchers from the University of Minnesota’s Center for Changing Landscapes were retained to investigate and provide insight into the relationship between existing land uses and transportation mode use, and to discern opportunities for revising these land uses to create opportunities for greater carpool and transit use. Specifically, this component used community sites within the study area as case studies to demonstrate land uses that support, encourage, and enhance transit and carpool use in each communities. It also identified barriers to transforming auto-oriented communities into more transit-friendly and carpool-friendly communities.

1.3 Decision Making Structure

1.3.1 Project Management Team

Working with MnDOT, the Humphrey School team assembled a Project Management Team (PMT) that consisted of representatives from MnDOT (which also chaired the meetings), FHWA, Ramsey Council Regional Rail, the Metropolitan Council, and the University of Minnesota. The PMT met prior to each Steering Committee meeting and on other occasions as needed.

The PMT adopted a Project Management Plan that outlined the scope of the work and established the creation of four additional groups: a Steering Committee consisting of staff or elected officials from each of the cities and counties affected by developments on I-35E (in addition to the organizations represented on the PMT), and three Technical Advisory Committees (one for each of the three study components). The Project Management Plan, including a listing of PMT members, Steering Committee members, and Technical Advisory Committee members, is included in Appendix A.

1.3.2 Steering Committee

The Steering Committee met four times throughout the course of this study. Committee members were largely professional staff from the entities identified above, although elected officials were welcome to attend, and some did. Staff was the focus, as a key purpose of the meetings was to receive technical feedback on the work conducted and to ensure adequate coordination and communication between this work and other projects and studies occurring in the area. To the extent these other projects and studies were identified, they were listed in the Project Management Plan.

1.3.3 Technical Advisory Committees

The Technical Advisory Committees (TAC) consisted of relevant staff from the organizations represented on the PMT, as well as other stakeholders with a specific interest in that component. The TACs met on an ad hoc schedule, as appropriate for reviewing and guiding each component.
Chapter 2: Study Components

2.1 Concept Development

2.1.1 Issue Considered: Implementation through I-35E / I-694 Commons

I-35E is a congested corridor that experiences several hours of congestion daily, and projections of the future peak-hour highway conditions show increased congestion in the Corridor. Traffic already exceeds what the system can accommodate, resulting in traffic backups onto connecting freeways.

The corridor has seen some changes in configuration and operations since 2008, including the reconstruction of the I-694 / I-35E interchange (known locally as "Unweave the Weave"). However, congestion along I-35E exists during both the AM and PM peak periods due to demand exceeding capacity of the basic mainline section, heavy entering and exiting volumes, closely spaced ramps, and short acceleration/deceleration lengths at some locations. In general, minor queuing was observed on most of the freeway entrance and exit ramps and did not impact mainline or cross-street operations. Queuing occurred on most of the cross streets at the signalized intersections which resulted in motorist delay; however the queuing generally did not block lanes or extend to adjacent intersections.

The most challenging aspect of this extension involved planning for MnPASS Express Lanes through the I-35E / I-694 interchange commons area. This section constrains traffic movement despite the improvements yielded by the Unweave the Weave project. The investment in Unweave the Weave reduced congestion at the interchange commons, but bottlenecks north and south of the commons remained. In the AM peak period, the southbound direction of I-35E experiences moderate levels of congestion (1 – 2 hours of congestion) between County Road J and I-694, with more severe levels of congestion south of Little Canada Road, which the I-35E MnPASS and Cayuga projects are intended to help alleviate. In the PM peak period, the northbound direction experiences congestion at the County Road E bottleneck, which can back traffic back into the commons.

While this situation created an opportunity for providing a congestion-free trip on MnPASS north of Little Canada Road, it was impractical to construct these lanes through the commons due to the recent investment and construction. This component of the I-35E MnPASS Express Lanes Extension Pre-implementation Study considered a number of concepts for extending MnPASS Express Lanes north from Little Canada Road to County Road 96. These included:

1) **Continuous MnPASS Lane** involving the conversion of the left lane of I-35E to MnPASS between Little Canada Road and County Road E and connecting to a new MnPASS lane between County Road E and County Road 96;

2) **Discontinuous MnPASS Lane** with the MnPASS lane stopping at the current planned limits near Little Canada Road, and resuming with a new MnPASS lane added between County Road E and County Road 96; and

3) **Priced Dynamic Shoulder Lane (PDSL)** between Little Canada Road and County Road E with a new MnPASS lane north of the PDSL.
All three concepts include the same design for adding a new MnPASS lane between Country Road E and County Road 96. These are explained in detail, below.

2.1.2 Options Considered

2.1.2.1 Continuous ("MnPASS without a Gap")

The first option called for extending the MnPASS Express Lanes north from Little Canada Road through the I-694/I-35E interchange up to County Road 96.

![Continuous Option Lanes at Commons](image)

\textit{Figure 4: Continuous Option Lanes at Commons}

As shown in Figure 6, the inside general purpose lane in each direction would be converted to a MnPASS Express Lane through the interchange commons area during peak periods. The inside lane would remain a general purpose lane during non-peak periods. Outside of the interchange commons area, shown in Figure 7, an inside lane in each direction would be added on I-35E north to County Road 96. This lane would operate as a MnPASS lane during peak periods and as a general purpose lane during non-peak periods.

\textit{Figure 5: Continuous Option throughout Study Area}
2.1.2.2 Discontinuous ("MnPASS with a Gap")

As shown in Figure 8, this option eliminated the MnPASS designation through the I-694/I-35E interchange, but still added the MnPASS lane in each direction north of the interchange commons area to County Road 96. This configuration creates a gap in the MnPASS lanes during peak periods with MnPASS lanes north and south of the interchange commons area, but no MnPASS lanes through the commons area, as shown in Figure 9.

![Figure 6: Discontinuous Option throughout Study Area](image6.png)

![Figure 7: Discontinuous Option Lanes at Commons](image7.png)
2.1.2.3 Priced Dynamic Shoulder (PDSL), or Managed Lane

This option called for converting the inside shoulder in each direction through the I-694/I-35E interchange commons area to MnPASS lanes during peak periods, as shown in Figure 10, which also shows that the two middle lanes in each direction would be reduced from 12 feet to 11 feet wide. During non-peak periods, the lane would revert to being a shoulder.

![Figure 8: PDSL Option at Commons](image_url)

Figure 8: PDSL Option at Commons

Figure 11 shows how this configuration would work throughout the study area, including the addition of an inside lane in each direction on I-35E from the commons area north to County Road 96.

![Figure 9: PDSL Option throughout Study Area](image_url)
2.1.3 Modeling Results

Initial analysis into projected costs and performance of the three options found that the Continuous and Discontinuous options cost less and performed better than the PDSL option. Consequently, the Concept Development team dropped the PDSL option from consideration, and conducted CORSIM analysis on the Continuous and Discontinuous options, determining that the options performed similarly. However, neither option performed well due to dropping the northbound MnPASS lane at County Road 96, which pushed the bottleneck from County Road E to County Road 96 and potentially made congestion worse in the corridor.

2.1.4 Hybrid Recommendation

Based upon its findings from the CORSIM analysis, the Concept Development Team developed a “Hybrid” option that employed matching the Continuous alternative in the southbound direction of I-35E with the Discontinuous concept in the northbound direction through the 35E/694 commons area. More significantly, this option extended the northbound MnPASS lane to County Road J, which resulted in significant improvements in the level of service for the afternoon (northbound) peak period. The Hybrid option also includes a longer term recommendation to extend the MnPASS in both directions of I-35E north to County Road 14.

![Figure 10: Hybrid Configuration throughout Study Area](image-url)
The Hybrid option also produces the highest benefit/cost analysis results, with a result of 3.16, as shown in table 1 below:

Table 1: Benefit-Cost Analysis of the Concept Options Considered

<table>
<thead>
<tr>
<th>Concept</th>
<th>BCA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hybrid Concept</td>
<td>3.16</td>
</tr>
<tr>
<td>MnPASS with a Gap</td>
<td>2.32</td>
</tr>
<tr>
<td>MnPASS on Shoulder</td>
<td>1.35</td>
</tr>
<tr>
<td>MnPASS without a Gap</td>
<td>1.02</td>
</tr>
</tbody>
</table>

The Hybrid option’s short-term recommendation was also estimated to cost close to amount that was identified in the Statewide Transportation Improvement Program for a MnPASS improvement. The cost of the Hybrid option’s short-term recommendation was $17-18 million. The amount designated in the STIP for a MnPASS improvement was $14 million.

This Hybrid option was presented to the PMT and Steering Committee in May 2014 and received favorable reaction, based upon:

- The CORSIM modeling;
- Evaluation of twenty-three other quantitative and qualitative criteria covering traffic operations, legal issues, safety impacts, systems operations, transit impacts, and cost;
- Feedback from the Steering Committee; and
- Input received during the Community Dialogue Sessions (discussed below).

MnDOT determined that the Hybrid option’s short term recommendation warranted moving forward into the environmental/pre-design process. This decision was made with the understanding that additional analysis and feedback received through the environmental/pre-design process (discussed in Chapter 3) would ultimately determine whether a project would move forward into final design and construction.

2.2 Outreach and Education

2.2.1 Community Dialogues

The innovative nature of MnPASS Express Lanes in general, and the specific innovations related to transit and implementing through the I-35E / I-694 commons discussed above, meant that MnPASS Express Lanes would be a relatively new concept to people who live and work in communities along this corridor. Opening of MnPASS Express Lanes south of Little Canada Road will help this issue by the time any MnPASS facilities are opened on the sections north of Little Canada Road (the subject of this study), but timing of the two projects resulted in this study taking place before the lanes opened south of Little Canada Road. Consequently, a
component of this study was to reach out to community members to inform them about MnPASS in general, and receive their feedback regarding the concept options, in particular.

2.2.1.1 Objectives

In May 2014, a series of community dialogues and in-depth interviews were conducted with key stakeholders who live, work, and/or drive in the I-35E Corridor to gauge their feedback on the options for extending MnPASS on I-35E between Little Canada Road and County Road 96. The objectives of this effort were to communicate about the vision and plans for a MnPASS Express Lanes on the I-35E Corridor, help familiarize the participants with the concept options for extending MnPASS between Little Canada Road and County Road 96, and to learn their reactions and preferences on the concept options through conversation and a survey instrument.

2.2.1.2 Recruiting

Three categories of stakeholders were targeted:

1) *Community and Business Leaders*: community and business leaders who have a vested interest in the reliability and operations of the I-35E Corridor and who feel they can speak for the interests of their residents and/or employees;

2) *Professional Drivers*: employees and small business owners who rely on using the I-35E Corridor to conduct their regular business duties; and

3) *General Public Users*: members of the general public who are frequent users of the I-35E Corridor, especially those who travel regularly through the 694/35E crossing.

Multiple tactics were used to recruit participants for the community dialogues. Using both outreach lists created by the extension study team and the networks of individuals and organizations affiliated with the study, nearly 20,000 contacts were made over email and telephone to invite participants. The St. Paul Pioneer Press newspaper also ran a print and online announcement for the general public user dialogues. The date, time, and location of the dialogues were set based on what was identified as most convenient for each of the three categories of stakeholders. Participants were served lunch or refreshments and given a $25.00 gas gift card for their time and input.

2.2.1.3 Process and Materials

Using a focus group format, stakeholders participated in a community dialogue facilitated by a member of the I-35E MnPASS Extension Study team. Representatives from MnDOT and the design consultant, Parsons Brinkerhoff (PB), were present at each dialogue to answer any policy or technical-related questions that could not be answered by the facilitator. In-depth interviews were also conducted by the dialogue facilitator with two individuals who were interested in attending a community dialogue but were unable to make the available dates. The interviews covered the same information as the dialogues, but were limited to a conversation between the facilitator and the interviewee. No representatives from MnDOT or PB were present at the interviews.
The dialogues lasted seventy-five minutes and the groups were limited to a maximum of fifteen individuals. Table 2 provides a detailed description of the number of participants at each dialogue.

Table 2: Community Dialogue Participants

<table>
<thead>
<tr>
<th>Participant Count</th>
<th># Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Community &amp; Business Leaders</td>
<td>4 Dialogue</td>
</tr>
<tr>
<td>Professional Drivers</td>
<td>3 Dialogue</td>
</tr>
<tr>
<td></td>
<td>1 Interview</td>
</tr>
<tr>
<td>General Users</td>
<td>13 Dialogue</td>
</tr>
<tr>
<td></td>
<td>1 Interview</td>
</tr>
<tr>
<td>Total</td>
<td>22</td>
</tr>
</tbody>
</table>

To help ensure an informed discussion, participants were provided with a copy of the MnPASS Infographic (discussed in section 2.2.2.1 and included in Appendix E) and the “Arrow” schematics shown in Figures 7, 9 and 11 of this report. Also, the concept options were re-named “MnPASS without a Gap” for Continuous, “MnPASS with a Gap” for Discontinuous, and “Shoulder” for the PDSL option.

2.2.1.4 Results

Participants came to the dialogues and interviews with little to no knowledge or understanding of MnPASS. A significant portion of the seventy-five minute dialogue was spent describing and discussing the concept of managed lanes and the functionality of MnPASS in the I-35E Corridor. Being part of the dialogue process proved beneficial, as a survey administered at the end of the session showed a clear shift in participants feeling much more informed about MnPASS afterwards, with the concentration moving from “mostly uninformed/moderately informed” to “well informed.”

All participants acknowledged that congestion is an issue in this corridor and that a solution had to be found, especially with the prospect of a growing population. Most participants did not question the validity of MnPASS as the solution to congestion. Those who did raise concerns focused mostly on the equity issues of tolling, expressing concern that only the few who can pay would benefit. Others also expressed preference for either making the lanes only for High Occupancy users and better recruiting carpools to the system or simply building additional lane capacity without implementing tolling. The professional drivers group was most enthusiastic about MnPASS, noting many ways in which MnPASS could benefit their drivers (e.g., more...
reliable trip time) and one participant even pointed out that MnPASS could help drivers arrive to work on time.

As for the design options, participants overwhelmingly expressed support for the “Without a Gap” design option. Many participants explained that their reasoning was to ensure safety by limiting driver confusion by keeping continuity of MnPASS through the 35E/694 Commons. Participants’ preference for this option remained even when they were made aware of the lane conversion from general purpose to MnPASS through the 35E/694 Commons.

The “Shoulder” option raised safety concerns over losing a shoulder during peak traffic flow, but some participants liked this option as it allowed for the continuity of MnPASS through the Commons without losing a general purpose lane.

The “With a Gap” option raised safety concerns because participants felt that by dropping the MnPASS lane through the 35E/694 Commons, drivers would weave in and out of traffic, creating more congestion and opportunities for collisions. In the end, however, many participants offered some support for this option if it came down to a decision between this and the Shoulder option.

It is important to note that these dialogues took place before the Hybrid option was developed, so it was not presented.

The lessons from these Community Dialogues led to the following conclusions:

- *Education is key.* If people understand the principle behind and benefits of variable-priced tolling, there will likely be more willingness to purchase transponders.
- *The connection to transit options is critical.* It will be critical to communicate to the public how the introduction of MnPASS in this corridor is also accompanied by transit options.
- *Use the impact from MnPASS south of Little Canada Road to generate acceptance for MnPASS north of Little Canada Road.* The experience of using MnPASS south of Little Canada Road should be used to develop acceptance and buy-in from commuters on the greater impact MnPASS can have if implemented further north.

### 2.2.2 Other Efforts

#### 2.2.2.1 Infographic

While MnPASS Express Lanes have been in existence in the TCMA for several years, earlier implementation was on I-394 and I-35W, which are on the western side of the area. Many users of I-35E do not use those highways enough to make it worth subscribing to MnPASS, so MnPASS is a relatively new concept to them.

To help increase familiarity, the Outreach and Education team developed a 4-page infographic that explained the MnPASS Express Lanes, including how they work, their impacts on I-394 and I-35W, and the acceptance of users and residents along these corridors. This document is included in Appendix E.
A major challenge for the Outreach and Education team was recognition that - in spite of the significant potential benefits of congestion pricing and over twenty years of federal funding to encourage demonstrations of congestion pricing in the U.S. - public perceptions of congestion pricing remain mixed and present major challenges for implementing congestion pricing projects. This challenge was compounded in the I-35E Corridor as the concept options considered might create the perception that access to the road system is being taken away, which can make support for such investments difficult to generate.

The Outreach and Education Team sought to understand and identify best practices that could address public perception issues and facilitate the overall I-35E MnPASS Managed Lane Extension Study and future MnPASS projects. The team reviewed outreach and education efforts that were undertaken regarding development and implementation of MnPASS lanes on I-394 and I-35W, as well as national and international best practices. This research involved a broad and intensive literature search and follow-up interviews, resulting in the following papers, which were presented at the Transportation Research Board (TRB) Annual Meetings in 2014 and 2015. The full papers are included in the appendices.

**Public Perceptions of Congestion Pricing in Minnesota and Europe: Loss Aversion, Complexity and Framing** – Lee W. Munnich, Jr., Presented at 2014 TRB Annual Meeting

This paper presented the congestion pricing efforts in Minnesota over the past twenty years and, in combination from lessons learned from congestion pricing projects in the U.S. and Europe, examined what has been learned from the related outreach and education efforts. The paper also examined the challenges of communicating the benefits of congestion pricing to the public and presented possible explanations from psychology and behavioral economics.

**Addressing Public Perceptions of a Lane “Take-away” in Designing Minnesota’s I-35E MnPASS Managed Lane Extension** -- Lee W. Munnich, Jr., Mary Luedke Karlsson*, Michelle Fure†, Presented at 2015 TRB Annual Meeting

This case study presented a summary of the concept development and outreach and education efforts of this I-35E MnPASS Express Lane extension pre-implementation study, as well as a similar effort led by the Metropolitan Council for the update of the region’s long-range transportation plan. The focus of the paper was the potential for the MnPASS Express Lane options converting a general purpose lane to a priced lane. The study indicated that the public will accept a “take-away” if there are clear and understandable benefits, but pointed out that the Community Dialogues held with I-35E stakeholders and additional regional focus groups conducted by the Metropolitan Council indicated that the public is generally not very well informed about the rationale for MnPASS lanes. The public is also generally unaware that managed lanes are a priority in the regional transportation plan, suggesting that more outreach and education is needed and can help clarify the value of this approach.

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* Assistant Director of Route and System Planning, Metro Transit
† Outreach Manager, Metropolitan Council
2.3 Land Use and Transit

2.3.1 Project Approach

The communities along the I-35E Corridor have early histories as independent small towns. Over time the communities became suburbs, and their land use patterns evolved in a low density, unconnected fashion. While some transit investments have been made in the corridor, such as the Park-and-Ride facilities noted in section 1.1.1., single occupant vehicles (SOVs) are the dominant personal transportation mode. Since the MnPASS Express Lanes are designed to create an advantage for transit and carpoolers, in addition to providing a congestion-free alternative for SOVs that pay a fee, this portion of the study looked to illustrate options that could facilitate and foster greater transit, carpool, and vanpool use in these communities.

This study component reviewed land use patterns, community forms, and transportation systems in select communities along the proposed I-35 E MnPASS Corridor Extension route to identify land use and community design strategies that would support, enhance, and encourage transit, vanpool, and carpool use. Ways to strengthen community connectedness through bicycle and pedestrian pathways between existing and new developments in the corridor were also explored. The communities selected all had access to I-35 E and to regional Park-and-Ride facilities. They represent a variety of community types that presented diverse challenges and opportunities. The selected corridor communities and focus areas are Little Canada (Little Canada Road), Vadnais Heights (County Road E), and Hugo and Centerville (County Road 14).

The study focused on the question “What land use strategies are needed to create community form in developed and developing Twin City Metropolitan Area suburban communities that foster transit use and carpooling and strengthen communities?” The goal was to use community sites within the corridor as prototypes, demonstrating land use concepts that could support, encourage, and enhance transit and carpool use in each community and identify barriers to transforming auto-oriented communities into more transit-friendly and carpool-friendly communities.

Ultimately, this study component is intended to become a resource to help inform conversations in I-35E Corridor communities and other Metro Area communities about their futures, and to inspire incremental changes over time in land use patterns and in transit, car, bicycle, and pedestrian systems in keeping with each individual community’s identity, interests, resources, and aspirations.

2.3.2 Opportunities and Challenges

Because communities with few continuous streets and roads and many residential areas of low density are not able to sustain robust transit service, the study addressed how to create areas of concentrations of people and activities as sources of trip origins and trip destinations. The strategies presented include increasing density, increasing mixed-use land use, creating or using existing neighborhood spaces as gathering spaces for carpool and vanpool pickups that draw residents to them, and improving community connectivity through bicycle and pedestrian pathways.
2.3.2.1 Community Character

There is an opportunity for land use design to support and enhance each community’s distinctive character. Most corridor cities possess a unique character based upon their rural heritage, community history, and natural amenities. Community residents see themselves as non-urban, even as the communities continue to grow and change over time. This identity is expressed in city logos and names of residential subdivisions that emphasize a connection to nature, rather than an urban identity.

Corridor cities’ parks and preserved natural areas are valued as important community assets with important recreational and ecological roles.

Figure 11: Cities identify strongly with their historic landmarks, such as this church in Little Canada. Similarly, city logos, often seen on water towers, are an example of community desire to retain the connection to nature and rural history

Because building I-35E divided some communities, and because many existing residential subdivisions were designed as separate entities with street systems providing few connections and limited access for non-residents, it is currently a challenge to move from one subdivision neighborhood to another. Most cities value connections that include inter-district transit, pedestrian, and bicycle systems, and most have plans for making their existing systems more connected. There is an opportunity to build on shared-use, city-maintained pathways and trails, although conventional sidewalks that require individual property owners’ maintenance are less popular.

Figure 12: Shared-use, city-maintained pathways and trails, could enhance connections within communities.
Improving connections between separate residential developments and connecting them to the communities’ historic cores could further enhance community identity and provide additional opportunities for pedestrian and cyclist use in support of car pool and van pool use.

2.3.2.2 Need to Scale Redevelopment Projects to Community Capacity

Redevelopment strategies must respond to local conditions. The communities are well versed in their development/redevelopment opportunities and challenges and the culture of their neighborhoods. To be credible, the redevelopment strategies must respond to local conditions - to their immediate context and their larger development/redevelopment/neighborhood context.

Inner Ring and Second Ring Suburbs

Since many of these communities began as separate farming communities and were transformed over time into suburbs, they retain some elements, remnants, and culture of their former separate status. Some challenges they face are that they are mostly fully developed and have limited developable land, and some sites available for potential redevelopment may need mitigation due to previous uses or may have significant environmental constraints. Existing infrastructure for sewer and water services give them a potential competitive advantage and could lower development and redevelopment costs, but in some cases services may need to be expanded, replaced, or upgraded.

Figure 13: Neighborhoods of small single family homes limit opportunities for increasing density, although all communities do have dense mobile home parks

Adapting the existing transportation system to improve access to transit is constrained by a number of existing conditions:

- Some busy I-35E access roads were built prior to the freeway when the community was a freestanding community, and have many older, small houses with individual driveways that limit road reconfigurations;
- The existing small lot sizes of single-family housing pose challenges for assembling enough land for multi-family housing redevelopments that could increase community density;
- Existing multi-family housing units built in the ‘50s-‘80s need extensive retrofitting or redevelopment;
- Other streets and roads have been widened over time to accommodate increased traffic, making them less friendly to pedestrians and cyclists; and
• Although some communities have some sidewalks, they are absent along many streets, particularly in neighborhoods built after World War II.

There is a market for transit however, as all the communities have areas of dense housing and mobile home parks that house many residents. In addition, a significant portion of the suburban population is aging and needs services and senior housing to remain in their community. The challenge is creating residential, commercial, and industrial development/redevelopment that enhances their tax base while not requiring substantial community investments.

Emerging Suburban Edge Communities

The emerging Suburban Edge communities offer development/redevelopment opportunities and challenges because they offer large undeveloped tracts of land, which have potential to include transit, pedestrian, and bicycle network facilities as part of the new development requirements. However, long-time residents of these former “stand-alone” communities wish to retain the community’s historic rural character and identity and potentially developable land often is not served by existing infrastructure.

2.3.3 Prevailing Development Patterns, and Selected Sites

2.3.3.1 Little Canada

Little Canada has a history as an old, freestanding community. First settled in 1844, it was a farming community and much community activity centered on Saint John the Evangelist Church and the civic buildings and spaces in the eastern part of the city. Lake Gervais originally had many seasonal cottages along its shore, which were later replaced with year-around housing. As Rice Street developed, commercial activities that served local railroad workers and attracted visitors from Saint Paul became concentrated along the street.

As access and automobile use grew, this freestanding farming community changed over time into a suburb of suburban-style, single-family and multi-family neighborhoods north and south of Little Canada Road. Housing dominates the city, consisting mostly of single-family detached housing, but there are areas of concentrated multi-family housing. Areas of suburban industrial and commercial development are located on or close to major roads.
Little Canada has an extensive, well-developed system of streets, roads, and highways. Although the system is not a continuous, uniform grid, unlike many suburbs, the city has a modified grid system. Most streets, roads, and highways are straight and have either an east-west or a north-south orientation. Lakes, wetlands, and freeways interrupt the grid pattern and create discontinuity in the circulation systems. Highways have an extensive city presence and impact. I-35E divides the City into east and west sections, I-694 and State Highway 36 slice from east to west through the City near its northern and southern borders and State Highway 49, i.e., Rice Street, forms the City’s western edge.

Like many suburbs, the City’s main thoroughfares are county, state, or federal roads, not city streets. Rice Street is the main north-south route in the City’s western section, and Edgerton, i.e., County Road 58, is the City’s main north/south route in the east. Following an historic trail, Little Canada Road, i.e., County Road 21, is the City’s main east-west spine.

The grid–like character of some parts of the street/road system facilitates transit service. Transit routes follow along Rice Street, Little Canada Road, Centerville Road, County Road D, and Edgerton with loops on County Road B2/Demont Avenue and Labore Road. There also is a Park-and-Ride lot at the City’s edge at Rice Street and Highway 36, and a small Park-and-Ride in an important city space at the Little Canada Road and McMenemy Street intersection.

Bicycle and pedestrian facilities are limited, however. Although there are sidewalks in some areas, the City, like many other suburbs, does not have a consistent and pervasive sidewalk system, and the trail system’s role as a part of a citywide transportation system is not emphasized. The City’s comprehensive plan emphasizes the recreational nature of its many trails and their access to parks. In some parts of the city, the City trail system does relate well to its parks and some lakes and when the proposed trails are built out, the system will link the city more closely together.

![Figure 16: Mixed use and pedestrian friendly changes to existing strip malls could further enhance Little Canada’s commercial center](image)

The city’s existing commercial center at its western edge is physically separated from its civic heart in the eastern section of the community. This commercial center has been substantially redeveloped. Pedestrian-friendly and transit-friendly improvements include:

- New sidewalk design, pedestrian scale lighting, bus stops, and street furniture that make Little Canada Road;
- The land and building design of the Little Canada Village, the Lodge, and multi-family housing are scaled and sited to support the pedestrian-friendly street;
The acquisition of additional public park land along Round Lake; and
Areas of impermeable surfaces have been reduced and new storm water ponds created.

However, there are still challenges north and east of the new developments that include:

- Two underutilized strip malls; and
- The scattering of buildings, parking lots, and storm water ponds contribute to the area’s lack of clear circulation and definition.

### 2.3.3.2 Vadnais Heights

Vadnais Heights was a freestanding, farm-based community before it emerged as a suburb in the mid-20th century. Originally it had subsistence farms. Vadnais Heights’ farmers later became truck farmers who sold their produce at the Saint Paul Market in downtown Saint Paul. Over time, farmlands were developed as fine-grained suburban neighborhoods. After World War II many veterans and their families built modest single-family houses in Vadnais Heights, an opportunity provided by the GI bill. The 1980s were another period of substantial growth in Vadnais Heights; many neighborhoods of multi-family and single-family housing developments were built. Today, most of the buildable land has been developed; only one truck farm remains.

Clusters of fine-grained residential neighborhoods with winding streets are separated by lakes and wetlands. Very few have a grid pattern. Housing, the predominant land use, is concentrated west of I-35E in neighborhoods in the northern and southern parts of the city. The housing stock is diverse, with neighborhoods of modest and up-scale single-family housing and concentrated areas with multi-family housing. The percentage of multi-family units exceeds that found in many other suburbs, but fifty-four percent of the City’s housing is single-family detached housing.

Larger commercial, industrial, and institutional buildings are clustered to relate to north-south or east-west major roads and streets. Retail and office activity are concentrated in a central district at the intersection of County Road E and I-35E and along County Road E, Highway 61, and Highway 96. A small commercial area is located on Centerville Road just east of Edgerton, an area that is the city’s original downtown. Industrial uses are scattered east of I-35E in close proximity to the freeway and along the rail line south of Highway 96 while institutional uses are scattered throughout the City.

There are transit use challenges for local residents because many city streets do not have sidewalks or bikeways and many residential streets have winding and irregular patterns. The
community’s lack of sidewalks and trails, its street configurations, and its numerous wetlands make access difficult for non-driving residents.

With the opening of the Park-and-Ride facility in the southwestern quadrant of the I-35E and County Road E intersection, and the completion of the MnPASS lane, Vadnais Heights residents and their neighbors will have improved opportunities for access to downtown Saint Paul by more efficient transit service in the I-35E Corridor and by carpools using the MnPASS lane. However, the areas of dense worker housing are at a distance from the new Park-and-Ride transit facility, and although Vadnais Heights is a car-dominated environment, not everyone has a car, is able to drive a car, or has a car available to get to the new facility, and transit service that permits residents to reach the new facility does not currently exist.

For the many Vadnais Heights residents that do have cars, drive to work, and do not wish to use transit, the new facilities will offer an opportunity to use carpools to get to work taking advantage of the uncongested MnPASS lane by using the ramp closest to their homes, either the County Road E or the Highway 96 ramp. Neighborhood-based carpools could also potentially increase I-35E transit use if interested residents could organize carpools to the Park-and-Ride facility at County Road E.

2.3.3.3 Centerville

French Canadians founded Centerville as a township in 1857. Located by Centerville Lake and Centerville Road, the community’s original fine-grained grid pattern and its downtown were centered on Main Street, i.e., County Road 14, and Centerville Road, i.e., County Road 21. Lot sizes were small. Although the community has grown considerably since the 19th century and has been transformed into a suburb, it still retains the grid pattern of its historic core, its unique small town identity, and the landmark Church of Saint Genevieve of Paris, which has been an important part of the community throughout its history.

Single-family detached housing dominates the City’s building types. Areas of single-family housing along the lakeshores and those furthest from the downtown core have the least density. Multi–family and senior housing are located between Centerville Road and Dupre south of Sorel Street. Dense multi-family housing is located north of Main between 20th Avenue North, i.e., County Road 54, and the city limits. The historic landmark Saint Genevieve of Paris Church occupies that high ground between Centerville Lake and Centerville Road just south of Main Street on Goiffon Road, and a small core of detached commercial buildings is located in the historic downtown. Some commercial pad buildings and strip malls are strung along Main Street toward I-35E.

Figure 18: The Church of Saint Genevieve of Paris is a Centerville landmark.
The City’s lakes, wetlands, and creeks impact the alignment and the continuity of the City’s east-west, north-south, winding roads and streets. While Centerville’s heart is a tight grid of 4-6 blocks of county roads and local streets, many residential streets wind parallel to the lakes and Clearwater Creek or are interrupted by the wetlands and storm water ponds dotting the neighborhoods roads and local streets. Centerville Road, Main Street, and 20th Avenue, all county roads, are the City’s through streets. Old Mill Road, Dupre Road, La Mound Trail, Brian Drive, Shad Avenue, and Peterson Trail provide connections between many of the City’s residential neighborhoods and Main Street. Transit runs on both Centerville Road, i.e., County Road 21, and Main Street, i.e., County Road 14.

Although many parts of the City do not have sidewalks, the City has a network of bituminous trails and concrete sidewalks along streets that connect to Main Street. A bituminous trail provides a bicycle and pedestrian connection to the downtown and the school from the north.

2.3.3.4 Hugo

Although it has a long history, Hugo’s status as a city is comparatively recent. The area was established as Oneka Township in 1870, but Hugo did not become a city until 1972. In 1869, the Lake Superior and Mississippi Railroad established the Centerville Station in Hugo, and many local farming families cut, hauled, and sold wood to the railroad in the winter to use as railroad engine fuel. Hugo experienced commercial growth in the early 1900s along Highway 61, and the Hugo Feed Mill was built along the rail line in 1917. Commercial buildings developed along the highway and parallel to the rail line, and although the rail line is no longer active, nearby residential and commercial development still relate to the historic rail right-of-way and Highway 61.

Highway 61 and County Road 8 are Hugo’s main roads. The older sections of the City retain its original north-south, east-west gridded street pattern, but the newer, dispersed developments have curvilinear streets that wind among natural and man-made wetlands. Although there are few pedestrian paths in the City’s older areas, newer developments have pedestrian paths and bike trails, some of which connect to the Hardwood Regional Trail and the regional trail along Frenchman Road. A citywide trail system has been planned and partially built. When these and proposed county trails are built out, there will be strong connections between the disparate areas of the City.

Constrained on the east by Egg Lake, residential neighborhoods grew west of the rail line and northeast of the downtown between Egg Lake and Oneka Lake. Undeveloped areas, large agricultural tracts, and residential areas dominate current land uses in the area of Hugo within the Metropolitan Utilities Service Area. Commercial areas are sited on small parcels along the City’s main roads, Highway 61 and County Road 8, and industrial use is concentrated along Highway 61. Open spaces are designated throughout the area and many are associated with environmental amenities.

Figure 19: Hugo has worked to incorporate pedestrian friendly and livable community concepts in new developments
Hugo has embraced livable city design principals in planning for its future growth and development. It is using planning strategies that are designed to encourage concentration of commercial uses, density in close proximity to commercial areas, and a pedestrian-friendly connected network of sidewalks, streets, and trails.

The City has adopted a series of plans including Multi Family Development Guidelines (2005), Commercial and Industrial Design Guidelines (2011), and plans for a Rush Line Transit Station Area that support its livable city goals. Hugo also offers opportunities to implement smaller scale strategies that support carpooling, vanpooling, and transit use.

2.3.4 Design Strategies

To facilitate increased transit and MnPASS use, the strategies recommended here are designed to both overcome the challenges inherent in current auto-centric land use patterns and respond to the opportunities that already exist, are being developed, and/or must be developed to increase and enhance access by pedestrian and cyclists though land use changes and modifications. The strategies:

- Support the integration of transit/car/bicycle/pedestrian networks and systems into the physical and social fabric of each community, demonstrating ways to move from auto-centric communities to more multi-modal land use patterns that include increasing density and mixed-use land uses.
- Cite ways to overcome the distances and the circuitous, non-continuous travel ways created in communities by development patterns and environmental constraints such as wetlands.
- Demonstrate incremental changes of proper scale and capacity.
- Respond to and support increased interest in cycling and walking as part of one’s lifestyle.

The strategies are not listed in a particular order because each community is unique. They are presented in an illustrative laundry list from which individual communities could select an array of potential strategies that respond to its own specific opportunities, challenges, and aspirations.

Respond to Each Community’s Historic Character and Development Pattern to Support and Encourage MnPASS, Carpool, and Transit Use

Little Canada, Vadnais Heights, Centerville, and Hugo have unique identities, forms, and histories that can inform their future growth. They were communities before becoming “reluctant suburbs,” sociologist William H. Dobriner’s name for freestanding communities that became part of the greater suburban landscape when development surrounded them. Historic forms supported pedestrian and bicycle access and created dense town centers. Strategies for strengthening identity, historic patterns, and form include:

- Extending the existing grid/linear form into new neighborhoods;
- Reviving old civic and commercial centers with redeveloped and new mixed-use development that enhances and honors existing landmarks and creates new ones;
- Creating or strengthening public connections to important landscape features such as lakes and wetlands; and
Strengthening community identity by creating or enhancing civic gathering places and protecting cultural features that express the community’s roots and its uniqueness.

**Use Large Park-and-Ride Facilities as Civic Places to Support and Encourage MnPASS, Carpool, and Transit Use**

Typically, large Park-and-Ride lots are used heavily during the week and used lightly during weekends. Locating a Saturday farmers’ market in one area of large Park-and-Ride facilities could be one potential use that draws locals and familiarizes them with the facility while extending its value to the community beyond its single use. County Road E and County Road 14 Park-and-Ride sites could be examples within the corridor.

**Make a Network of Pedestrian-Friendly and Bicycle-Friendly Streets and Trails to Support and Encourage MnPASS, Carpool, and Transit Use**

Trails are popular in corridor communities and are seen as a part of their integrated transportation system that offers opportunities to knit separate neighborhoods together and provide access to important community destinations. To realize their potential as important parts of the city’s transportation system, trails should be seen as vital transportation corridors and not just recreational facilities: Trails can be enhanced by:

- Connecting residential areas to schools;
- Maintaining the trails for year-round use;
- Extending trails to areas not served by sidewalks; and
- Connecting them to commercial districts, job sites, recreational assets, Park-and-Ride facilities, and civic areas.

Busy roads offer challenges to pedestrian and cyclist use. Because many of the current bike routes are on busy county roads with no separation between cars and bikes, bicycle use is intimidating for all but mature, skilled cyclists, and many of these same roads have poor accommodations for pedestrians, even though some have bus stops.

Creating bicycle facilities and pedestrian pathways on less busy streets could encourage greater use. Roads and streets that provide bike lanes and pedestrian paths that separate cyclists and pedestrians from cars are preferred, but when this is not possible, other traffic calming devices could be employed to make them more pedestrian and cyclist friendly. Some of these strategies include:

- Adding street trees and pedestrian-scaled lighting that separate pedestrians from vehicular traffic;
- Shortening pedestrian crossings at intersections;
- Striping and signing pedestrian crosswalks at intersections;
- Installing pedestrian-activated signals at busy, uncontrolled intersections; and
- Ensuring that pedestrian facilities are fully accessible (compliant with ADA requirements).
Promote Denser Housing and Mixed-Use Development/Redevelopment to Support and Encourage MnPASS, Carpool, and Transit Use

Land use patterns in corridor communities are predominantly residential, and although mobile home parks and medium density housing can be found in each community, single-family houses on individual lots are the most common land use. Denser housing and mixed-use development have been found to promote transit use. Because there is very little easily-developable land left in some areas, redeveloping land with multi-unit housing or mixed-use developments that include housing can increase density, provide for commercial and retail spaces, enhance the tax base, create spaces of community activity, and strengthen community identity. Successful mixed-use redevelopments respond to the community context, are scaled to the community, and reflect community needs. The types of places within corridor communities that could have denser housing or mixed-uses include:

- Former farms that are being converted into developable sites;
- Areas of small, older houses and houses on large lots that are strategically located;
- Older city cores and older commercial areas that are candidates for redevelopment; and
- Areas located in proximity to valued environmental amenities that are appropriate candidates for environmentally sensitive dense housing.

Recycle Existing Underutilized Retail Properties to Support and Encourage MnPASS, Carpool, and Transit Use

The corridor’s underutilized retail properties provide opportunities to create denser, mixed-use developments and create or strengthen the pedestrian character of the street by locating new buildings closer to the street and providing sidewalks and pedestrian-scaled lighting. As the shift to online and big box retail continues, these under-used sites are candidates for denser, mixed-use redevelopment that could include live/work units, and their proximity to activities, connections to utilities, and transportation corridor locations would make them desirable. Candidate properties for redevelopment include:

- Empty stand-alone retail stores that are set back from the road or street on a much larger lot;
- Strip malls with vacancies that are located on busy streets or roads, at busy intersections, and/or on an existing bus line;
- Large parcels of land with a relatively small building footprint; and
- Linear or L-shaped one-story buildings set back a distance from the street or road with large parking lots located between the street and the buildings.

Develop/Redevelop with Ecological Sensitivity and Use Environmental Attributes as Amenities to Create Value Support and Encourage MnPASS, Carpool, and Transit Use

Many corridor communities have water features. Some are historic; some were altered over time, and many others were created to deal with the storm water runoff from impervious surfaces of roads and developments. Because early concentrated development patterns in these corridor communities were often centered upon roads or railroads, access to the community’s lakes was privatized and many houses line the lakeshores. Many of these water features are potentially
under-used amenities and represent opportunities to create value. Redevelopment offers opportunities to create public access to lakes and create higher-value, denser uses. Storm water retention areas often function as leftover spaces that could be redesigned as special site features by improving them and siting pedestrian and bicycle paths, creating an enhanced community or neighborhood asset.

**Address Unintended Consequences of Large Environmental Interventions**

Identify opportunities to respond to unintended consequences of large environmental interventions, such as a freeway dividing a community into parts, filling wetlands, etc. For example, Vadnais Heights responded to the building of I-35E that separated the city into east and west sections by making a new center of community activity at the intersection of County Road E and I-35E. Specifically, Vadnais Heights:

- Relocated the city hall and a fire station west of the freeway on County Road E;
- Concentrated new commercial development along County Road E on both sides of the I-35E intersection;
- Approved the development of the large Park-and–Ride facility in the southwest quadrant of the intersection; and
- Supported the creation of a transit corridor along an existing rail line, if and when it becomes available for repurposing.

**Respond to Opportunities that 21st Century Technology Presents**

Connecting people to form carpools is now much easier with the Internet; individuals could find each other, or communities and regional agencies could sponsor events and/or websites. Similarly, cell phones provide opportunities to stay in touch with one’s fellow carpool members to make pickups more efficient. Because over 50% of the region’s jobs are now located in the suburbs, this has implications for forming more carpools for MnPASS use, transit use, and suburb-to-suburb commuting.

The Internet has transformed what people do and where and how many people work; many telecommute to their jobs, others have home businesses. This change creates opportunities for (re)developing live/work units within the corridor, particularly on sites near existing commercial areas and transit stops.

**Create Park & Pool and Gather & Go: Multi- Neighborhood and Neighborhood-Scaled Places to Support and Encourage MnPASS, Carpool, and Transit Use**

Although the two new large Park-and-Ride lots at County Road 14 and County Road E serve the longer distance user, the car owner, and those who live nearby, smaller-scaled places could serve local neighborhood residents and help to cultivate a habit of carpooling. Pedestrian- and bicycle-friendly neighborhood places that are accessible to neighborhood residents who live at a distance from the large lots and to those who may not have a car would help promote informal neighbor-to-neighbor carpooling.
Park & Pool: Designated Sections in Existing Parking Lots

The Park & Pool (P + P) concept is for smaller, multi-neighborhood scale dispersed Park-and-Ride facilities that use designated portions of existing parking lots. After parking their car in a Park & Pool, users could join each other in one car to either use the I-35E MnPASS lane or to ride together to a new, large Park-and-Ride lot and ride the bus.

Park & Pool sections could be created by partnering with local landowners to designate P + Ps in portions of existing parking lots that are not used to capacity during the standard business day, such as a church or big box parking lot or at a large community-scale park (e.g., Kohler Park). While such sites may be used informally for ride sharing, a map or other designation for facilities could enhance recognition of these opportunities and enhance their use. Where a system is being delineated, designated P + P stalls should be clearly marked and accessible by drivers, cyclists, and pedestrians and have a bike storage facility and simple shelter with a bench to provide protection from rain, snow, and sun and a place for users to sit as they wait for their carpool or vanpool to arrive.

Gather & Go: Multi-Use Neighborhood Spaces

Like Park & Pool users, Gather & Go (G + G) carpoolers would be able to use I-35E’s MnPASS lane at no cost, or gather to drive to one of the new Park-and-Ride lots and ride the bus. G + G sites are a concept for neighborhood places that not only support increased transit use and MnPASS use; they also support increased carpooling to destinations not served by I-35E.

Currently within corridor communities there are single-use and under-used public, semi-public, and common spaces within residential neighborhoods and planned unit developments. These include small parks, mini playgrounds, areas with banks of mailboxes, storm water ponds, gardens, etc. Many such locations could serve as informal gathering sites for carpoolers. A Gather & Go neighborhood space, whether retrofitted or newly constructed, would best be located along a street that is accessible to immediate neighbors by foot and/or bicycle paths. Where frequent G + G use is anticipated, sites could include secure bicycle racks, a bench, a simple shelter, and a designated stopping area for carpools and school buses.

Besides supporting carpooling, these multi-purpose areas can become important neighborhood spaces for informal community-building that increases social capital and creates neighborhood cohesiveness while residents are waiting at them. In the future these spaces could possibly be used for bus stops for local transit service.

Gather & Go (G+G) types include.

- Neighborhood Gather & Go: The Neighborhood G + G concept is an area with a shelter, benches, a secure bicycle storage facility, and a safe pickup area. They could be in a number of neighborhood parks or other public spaces dispersed throughout the city.
- Planned Unit Development Gather & Go: G + G’s could be designed into new planned unit developments or retrofitted into existing developments. Some small-scale G+Gs that are easily accessible by foot and serve very concentrated areas would not need bicycle storage facilities. In addition to the shelter with benches, the G+Gs in planned unit developments...
could have additional uses such as the development’s banks of mailboxes, a playground area, a storm water pond, a garden, or a simple gathering area.

- New Civic Amenity Gather & Go: G+Gs could also be new civic amenities. Besides having a shelter with benches and bicycle storage facilities, they could include new community assets such as a community garden and/or be sited in places where the city’s history and extensive natural resources could be experienced and interpreted, such as in an existing neighborhood park or another public space.

Gather & Go markers could delineate where G + G groups are to gather, create visibility for the G + G program, and provide for the personal safety of G + G users with a safety camera. The prototype shown in Figure 22 uses a limestone detail, but concrete could also be used in its place. Adding a simple canopy and benches to the basic marker would provide seating and protection from rain, snow, and sun for G + G users waiting to be picked up by their carpool or vanpool. The marker’s design could reflect the City’s identity or the neighborhood’s character.

Figure 20: Gather & Go Marker Design Concept
Chapter 3: Results and Next Steps

3.1 Adoption of Hybrid Model and Implementation Steps

As indicated in section 2.1.4., the Hybrid option was developed and recommended to address:

1) The problem created by dropping the northbound MnPASS lane at County Road 96;

2) The issues raised through the I-35E/I-694 commons area; and

3) The limited funding available in 2016.

Based upon the technical analysis, feedback from the Steering Committee and input received during the Community Dialogue Sessions, MnDOT determined that the Hybrid option warranted moving forward into the environmental/pre-design process.

The environmental/pre-design process is currently underway. A draft Environmental Assessment (EA) document will be available for review by fall 2015, and a public comment period will be held from August - September 2015. During this period, there will be public open houses held to receive comments on the document. The document will also be available online for comment. Final approval of the EA document is anticipated by December 2015.

Upon final approval, MnDOT will proceed with final design, project letting, and construction in 2016. Project completion and opening is anticipated in winter 2016.

Pursuant to Minnesota Statutes sections 161.162-167, MnDOT also sought and obtained Municipal Consent for the project from the cities of Little Canada, Vadnais Height, White Bear Lake and Lino Lakes.

As indicated earlier in the report, the pre-design work for the I-35E MnPASS Extension project is being coordinated with the Goose Lake Bridge and Pavement project, as well as the tied County Road 96 Bridge re-deck project. Construction on these projects will be taking place during the 2015/16 timeframe. Coordination of these projects is resulting in cost savings and reducing impacts to I-35E Corridor users.

3.2 Outreach Regarding Study Results

The primary strategy for communicating the results of the study involves the project website and social media. Steering Committee members were also asked to inform their communities and organizations about the results of the study. MnDOT staff is also available to present on the study’s results upon request.

This outreach will be coordinated with other MnPASS communications efforts, particularly the implementation of the I-35E MnPASS marketing and communications plan, which has started and will continue through the full opening of MnPASS lanes on I-35E at the end of 2016.

The website, which will be linked from the MnPASS.org website, will focus on the results of this study and discuss the findings in plain language. This should be the primary resource for all
information about the study and connect with the overall MnPASS Express Lane information provided on the MnPASS.org website.

### 3.3 Future Evaluation of 35E / 694 Commons

Once the I-35E MnPASS Extension Project is complete and the MnPASS lanes on I-35E are fully open and operating, MnDOT will begin evaluating traffic operations and performance through the I-35E/I-694 commons area – specifically the northbound (MnPASS “With a Gap”) and southbound (MnPASS “Without a Gap”) approaches recommended by the Hybrid option. Evaluation criteria will include traffic flow metrics in the general purpose lanes and MnPASS lanes through the Commons using road sensor data and traffic analysis software. MnDOT will also use crash data and metrics to evaluate any impacts on safety in the corridor. It will also seek corridor user feedback through the use of surveys and/or focus groups to assess levels of understanding/confusion with the different approaches and determine whether there are other concerns or issues with the approaches that need to be addressed. Maintenance and enforcement criteria will also likely be evaluated.

MnDOT will be particularly examining the extent to which volumes increase in the southbound general purpose lanes on I-35E through the Commons and south of the Commons during the AM peak period, as well as in the northbound general purpose lanes in the vicinity of County Road E during the PM peak period. It will also be closely examining whether there is confusion among corridor users about when and how certain lanes can be used, and whether any safety issues arise.

MnDOT will continue the evaluation for a one- to two-year period. After sufficient information is received and analysis conducted, MnDOT will follow prescribed processes for input and guidance to determine whether any modifications need to be made to the MnPASS “With a Gap” and “Without a Gap” approaches through the Commons. Modifications could include switching the “With a Gap” approach to a “Without a Gap” approach or vice versa. Modifications may also include physical improvements in the Commons, such as signing, striping, or capacity improvements. If modifications are made, MnDOT will continue to monitor and evaluate the impacts of these modifications on corridor users and traffic flow through the Commons.
Purpose & Scope

Goals & Objectives
The goal for the Interstate 35E MnPASS Managed Lanes Extension Project is to achieve greater efficiency and performance in the corridor through better utilization of existing infrastructure, and to optimize highway system performance and customer service through transit enhancements and transit and bike/pedestrian supportive land use planning.

This project is supported by the MnPASS System Study 2, by the Region’s Transportation Policy Plan, and by MnDOT’s Metro District Highway Investment Plan. The objective is to help identify a cost effective near-term approach for I-35E MnPASS managed lanes implementation to achieve the following benefits:

- Reducing local and regional congestion and delays
- Reducing greenhouse gases
- Enhancing system performance for transit, carpoolers and toll customers
- Generating revenue for operations and development, and
- Supporting equity, livability and sustainability objectives

Project Scope
The I-35E MnPASS Extension Study is being conducted under a grant from the Federal Value Pricing Pilot Program. The project is a pre-implementation planning study that seeks to explore and test a number of managed lane scenarios to provide a higher level of service for all users.

The study will develop and evaluate conceptual alternatives for extending MnPASS Express Lanes between Little Canada Rd. and CR 96 on I-35E. A key component is evaluation of additional transit enhancements that can increase transit and carpool use in the I-35E MnPASS Express Lanes.

The study results will be used by MnDOT and the Met Council to assist in project planning and development, and to place this corridor in position to take advantage of future funding and construction opportunities.

Other Commitments
Preliminary results from the study will be needed by April/May 2014 to inform MnDOT’s decision on environmental review and coordinate with planned bridge and pavement improvements scheduled for 2015/16 on the corridor.
Coordination with other projects, studies and initiatives along the corridor will also be essential. Key projects, studies and initiatives include:

- **I-35E MnPASS and Cayuga Bridge construction projects**, particularly the MnPASS communications and marketing efforts related to these projects. It will be very important to minimize stakeholder and public confusion between this study and the construction and opening of MnPASS Express Lanes on I-35E between Little Canada Road and Cayuga Street in 2015. It will also be very important to ensure nothing in this study jeopardizes the timely completion of these projects and a successful opening of MnPASS between Little Canada Road and Cayuga Street.

- **New Park and Ride construction** at CR 14 and CR E in 2014

- **Rush Line Pre-Project Development Study**, which is studying Bus Rapid Transit on the I-35E corridor. It will be very important to work with Ramsey County Regional Railroad staff and the Rush Line Corridor Task Force to minimize stakeholder and public confusion and work task redundancy.

- **Highway Transitway Corridor Study**, which is also studying BRT along the corridor

- **Met Council’s Transportation Policy Plan Update**

- **Overall MnPASS System communication/marketing strategies and messages**

**SCHEDULE**

**Major Milestones**

- May 23, 2013 – I-35E MnPASS Extension Community Outreach & Education Study begins
- May 31, 2013 – 1st Project Management Team (PMT) meeting
- August 2013 – Concept Development Study Consultant named
- August 2013 – Land Use & Transit Enhancement Study begins
- September 2013 – 1st Steering Committee meeting
- April/ May 2014 – preliminary study results due, to inform MnDOT’s decision on environmental review for planned bridge and pavement improvements scheduled for 2015.
- Sept 2014 - Concept Development Study work complete
- March 31, 2015 - Community Outreach & Education Study and Land Use & Transit Enhancement Study complete
TEAM

Project Delivery Approach

This study will be delivered using the following three contractual components:

- **I-35E MnPASS Extension Concept Development Study Consultant Contract – Parsons Brinckerhoff (PB)**
  - **Scope** - Develop and evaluate conceptual alternatives for extending MnPASS express Lanes on I-35E between Little Canada Rd. and CR 96. Work will include concept and layout development, traffic forecasting and modeling, operations and benefit/cost analysis, cost estimating and reporting.
  - **Budget** - $462,500 ($370,000 Federal; $92,500 MnDOT match)

- **I-35E MnPASS Extension Community Outreach & Education Study University of Minnesota Master Contract Work Order – Humphrey School (HHH)**
  - **Scope** – Provide project management, outreach and education for the overall I-35E MnPASS Managed Lane Extension Study, as well as to evaluate the public acceptability of the various conceptual alternatives for extending MnPASS on I-35E between Little Canada Rd. and CR 96.
  - **Budget** - $218,750 ($175,000 Federal; $43,750 MnDOT match)

- **I-35E MnPASS Extension Land Use & Transit Enhancement Study University of Minnesota Master Contract Work Order – Center for Changing Landscapes (CCL)**
  - **Scope** – Identify and create land use/community design strategies that will promote greater transit use and van/carpooling in the I-35E MnPASS Express Lanes.
  - **Budget** - $75,000 ($60,000 Federal; $15,000 MnDOT match)
Project Management Structure
(see Appendix A for membership)

Project Management Team
Lead: Brad Larsen, MnDOT
Staff: HHH School, U of M

35E MnPASS Extension Study Steering Committee
Lead: Brad Larsen, MnDOT
Staff: HHH School, U of M

- Concept Development Study
  Technical Advisory Committee
  Lead: Jennie Read, MnDOT
  Staff: Parsons Brinckerhoff

- Community Outreach & Education Study
  Technical Advisory Committee
  Lead: Brad Larsen, MnDOT
  Staff: HHH School, U of M

- Land Use & Transit Enhancement Study
  Technical Advisory Committee
  Lead: Lynne Bly, MnDOT
  Staff: CCL, U of M
Key Team Roles & Responsibilities

a. MnDOT
   i. Brad Larsen, Overall Study Project Manager & Community Outreach & Education Project Manager
   ii. Jennie Read, Concept Development Study Project Manager
   iii. Lynne Bly, Transit Enhancement Study Project Manager
b. University of Minnesota
   i. Lee Munnich, Community Outreach & Education Study Principal Investigator
   ii. Frank Douma Community Outreach & Education Study Co-Principal Investigator
   iii. Mary Vogel, Land Use & Transit Enhancement Study Principal Investigator
c. Concept Development Study Consultant: (Parsons Brinckerhoff)
   i. Peter Muehlbach, Project Manager
d. Federal Highway Administration
   i. Susan Moe, Value Pricing Pilot Program Coordinator
e. See Appendix A for Project Management Team, Steering Committee and Technical Advisory Committee membership

COMMUNICATIONS

There will be several critical communications elements within this study:

- Stakeholder involvement on the Project Management Team, Steering Committee and Technical Advisories Committees will be key strategy for gathering input and feedback during the study. Professional staff from all cities and counties adjacent to the I-35E corridor from St. Paul to North Branch will be invited to participate on the Steering Committee. See Appendix A for PMT, Steering Comm. and TAC membership.
- The Public Acceptability Research task under the Community Outreach & Education study will also involve key communications with corridor stakeholders and users. These communications will likely take the form of community dialogues and stakeholder interviews. See the Public Acceptability Research Plan for more details.
- Later in the study as more information and analysis becomes available, several outreach and education strategies will be used to gather feedback from a broader public audience about the study’s preliminary findings. Although the outreach and education strategies will depend upon the preliminary findings, several of the following strategies, tools and tactics are likely to be used:
1. BRIEFING MATERIALS. Summaries, graphics, presentations, website content and other materials as necessary to communicate the overall I-35E MnPASS Managed Lane Extension Study purpose, process and findings to a wide variety of audiences. Materials will also include:
   a. Summary of MnPASS benefits and public support from other corridors
   b. Frequently Asked Questions document

2. ROUNDTABLE BRIEFING EVENTS. Rethinking Transportation Roundtables or similar events held in I-35E corridor. The target audience would be corridor leaders and stakeholders, and the program would feature:
   a. I-35E-specific study purpose, process and findings; and
   b. Documented benefits and public support from other MnPASS corridors

3. INDIVIDUAL BRIEFINGS. One-on-one and/or small group briefings with key state and local officials along the I-35E corridor who couldn’t make it to the roundtable briefing events.

4. EXPLANATORY COMMENTARIES
   a. Commentary for Pioneer Press explaining the I-35E study purpose, process, findings, as well as benefits and public support from other MnPASS corridors; and
   b. Similar commentary for weekly papers in the corridor.

5. OPEN HOUSE EVENT. I-35E MnPASS Extension Study Open House in the corridor May 2014 HHH will invite the public via weekly papers, set-up a display, distribute materials, and have experts available to explain the project, solicit feedback and answer questions one-on-one over a several-hour period.

MnDOT will also develop and maintain a project website.

Communication coordination with other projects and studies as outlined earlier will also be critical to reducing confusion, redundancy and risk.

RISK AND ISSUE MANAGEMENT
Potential project risks and issues include:
- Developing preliminary results by April/May 2014 sufficient to put MnDOT in position to add the MnPASS improvements to construction work planned for the corridor in the 2015/16 timeframe;
- Opposition to MnPASS in the corridor. This study must in no way jeopardize the success of the I-35E MnPASS project.
- Communication coordination with other projects and studies related to the corridor.
## Appendix A: Project Management Team, Steering Committee and Technical Advisory Committee Membership

### 35E MnPASS Extension Study PMT Members

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<thead>
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### 35E MnPASS Extension Study Steering Committee Members

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<tr>
<td>Management Team</td>
<td>City/Position</td>
<td>Contact Information</td>
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**University of Minnesota**

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<td>Others TBD</td>
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Concept Options Development Study TAC Members

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Community Outreach & Education Study  TAC Members

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### Land Use & Transit Enhancement Study TAC Members

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<td>Josh Olson</td>
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**I-35E MnPASS Managed Lanes Extension: Little Canada Road to County Road 96**

**Pre-Implementation Study**

**DRAFT Project Management Plan June 10, 2015**

**A-13**
I-35E MnPASS Extension Study

CONCEPT ANALYSIS

FINAL REPORT

PREPARED FOR:

MINNESOTA DEPARTMENT OF TRANSPORTATION

PREPARED BY:

PARSONS BRINCKERHOFF

520 NICOLLET MALL, SUITE 800
MINNEAPOLIS, MN 55402

September 2014
Background

MnPASS is a key regional strategy for improving highway and transit performance in the Twin Cities area. The I-35E corridor north of St. Paul through County Road 96 has been identified as a Managed Lane MnPASS corridor in the 2030 Regional Transportation Policy Plan.

In 2013, MnDOT started construction of new MnPASS Express Lanes on I-35E north of St. Paul as part of the I-35E MnPASS and Cayuga construction projects. When these improvements are complete near the end of 2015, there will be an additional MnPASS Express Lane on the inside of both southbound and northbound I-35E between Cayuga Street and Little Canada Road.

The new I-35E MnPASS Express Lanes will operate like the MnPASS lanes on I-394 and I-35W providing a congestion-free option for commuters during peak rush hour periods. During peak periods, buses, carpools (two or more passengers) and motorcycles will be able to use the lanes for free, while single occupant vehicles will be able to use the lanes for a fee. The new lanes will give commuters better highway and transit options to avert congestion on I-35E, however there will still be a bottleneck remaining on I-35E north of I-694.

In anticipation of the opening of the new I-35E MnPASS lane, MnDOT undertook this concept analysis to determine the best concept for extending the MnPASS lane further north along the I-35E corridor as is called for in the regional policy plan.

This report briefly documents the outcome and recommendation of this study and demonstrates the need for expanding MnPASS on the corridor. The full technical analysis and documentation of study results are found in supporting documents from the study.

Concepts Considered

The study originally considered three concepts and a no build concept. After developing and analyzing the three concepts, a fourth hybrid concept was created by the project management team to overcome shortcomings in the original three concepts. The four concepts include:

1. **MnPASS With a Gap Concept.** This concept added a MnPASS lane from County Road E to County Road 96. The section I-35E between County Road E and Little Canada Road would not have a MnPASS lane and thus a gap in operations between two MnPASS concepts.

2. **MnPASS without a Gap Concept.** This alternative also added a MnPASS lane from County Road E to County Road 96 and converted the existing inside general purpose lane of I-35E to MnPASS during peak periods so that there was a continuous MnPASS lane from County Road 96 to University Avenue. In off peak times the inside lane would convert back to being a general purpose lane.

3. **MnPASS on Shoulder Concept.** This concept also added a MnPASS lane from County Road E to County Road 96 but converted the existing inside shoulder of I-35E between County Road E and Little Canada Road to MnPASS during peak periods so that there was a continuous MnPASS lane from County Road 96 to University Avenue. In off peak times the shoulder would convert back to being a shoulder.
4. **Hybrid MnPASS Concept.** The hybrid concept was the same as the MnPASS without a Gap concept in the southbound direction of I-35E. This concept matched MnPASS with a Gap concept in the northbound direction, but in addition it extended the northbound MnPASS lane to just past County Road J. The extension of the MnPASS lane further north resulted in a significantly better level of service for the PM peak and overcame the limitation of the MnPASS with a Gap concept.

**Recommendation**

Through this study, the recommendation is that **the Hybrid Concept** is the preferred concept to address transportation needs of I-35E in the near and long term (2030).

This recommendation was made after development and evaluation of the original three concepts. The evaluation considered twenty three quantitative and qualitative criteria covering traffic operations, legal issues, safety impacts, systems operations, transit impacts, and cost. The Hybrid Concept was developed by the project stakeholders in response to the original analysis of the three concepts to take advantage of the parts of the concepts which had the best criteria results and to extend the project boundary to produce the best traffic operations outcomes for the corridor.

Planning level benefit cost results also support the hybrid recommendation as the preferred concept as indicated in the table below:

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<td>MnPASS without a Gap</td>
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**Supporting Studies**

Several studies and current project support the expansion of MnPASS on the I-35E Corridor. These include:

**MnPASS System Study – Phase 2.** The purpose of this 2010 study was to analyze and make recommendations for the next generation of MnPASS managed lane projects in the Twin Cities metropolitan region. The study was a follow up to a 2005 MnPASS study. This study recommended the I-35E corridor as the highest priority corridor (Tier 1) for expansion of MnPASS. The corridor was the highest priority because of the opportunities to coordinate with the planned Cayuga Bridge
reconstruction project, an existing congestion problem, moderately strong transit service, and an opportunity to extend MnPASS to the northern and eastern sections of the metro region. The study analyzed I-35E in two segments. The first from I-94 to TH 36 was programmed for construction and is scheduled to open in 2015. The second segment was from TH 36 to County Road E and is further analyzed in this I-35E Extension Study.

**Metropolitan Highway System Investment Study (MHSIS).** This 2010 study identified methods to achieve the greatest efficiency out of the Twin Cities’ highway system and manage congestion from a system-wide perspective. It was a joint effort between the Metropolitan Council and the Minnesota Department of Transportation (MnDOT). The strategy identified in the study was reflected in proposed amendments to the Met Council’s 2030 Transportation Policy Plan adopted in 2009. The study proposed a future transportation investment strategy that optimizes the highway capacity in the region by using multimodal-oriented managed lanes and comprehensive system management strategies. This strategy enables travelers to opt their way out of congestion.

2030 Transportation Policy Plan. The Metropolitan Council is required by federal regulation to develop a Transportation Policy Plan that is a master plan to improvement of the metropolitan area’s transportation system by developing action policies and specific strategies that would implement policy. The most recent plan is the “2030 Transportation Policy Plan” (TPP) which was adopted by the Metropolitan Council November 10, 2010. Chapter 1 of the TPP recognizes financial constraints for many of the expansion projects proposed in the past, and the need to reassess them more in line with projected revenues and MnDOT’s ability to implement these expansion projects. In an effort to address growing mobility needs and limited revenues, Chapter 6 of the TPP established policies and strategies that includes the use of MnPASS lanes. Policy 11-Highway System Management and Improvements, on page 72, has six strategies. Strategy 11F Roadway Pricing is one of the identified approaches to managing and improving mobility on the highway system. As stated “including High Occupancy Toll (HOT) lanes and priced dynamic lanes, to provide an alternative to congestion and will consider implementing pricing on any expansion project”. Recommendation from the MnPASS 2 Study has been incorporated into the current TPP. Table 6-37: 2015- 2020 Fiscally Constrained Congestion Mitigation/Mobility Investments in the TPP identified $15-50 M to help fund I-35E/Cayuga managed lane and the MnPASS Tier I recommendation.

The TPP also has public involvement requirements that require it to comply with the proactive public involvement requirements of title 23 Code of Federal Regulations section 450.316, which are outline in the Public Participation Plan. Public open houses and town hall meetings were held throughout the metropolitan area prior to the council adoption of the plan. These meetings were to gather comments and provide the public information on the new plan. In addition, the Metropolitan Council has a Transportation Board that includes representation from the metropolitan area cities, counties, MnDOT and FHWA. The Board helps to develop the policies and strategies established in the TPP.

**I-35E Cayuga Bridge and MnPASS projects.** MnDOT’s I35E Cayuga Bridge project includes reconstruction of the freeway from Maryland Avenue to University Avenue, approximately 1.3 miles. The project
includes sufficient pavement width for implementation of the planned MnPASS lane in each direction for the length of the project. The new lanes on the Cayuga Bridge connect to the MnPASS project that extends to Little Canada Road. Both projects had environmental documents which are supporting studies to this project. The projects are expected to be completed in late 2015 or early 2016.

**Supporting Documents for Study Recommendation:**

The technical analysis and study findings are further documented in the following documents generated in the study process:

- I-35E CORSIM Modeling Tech Report
- I-35E MnPASS Extension Pros and Cons
- I-35E Forecasting Results
- Needs Assessment for I-35E Final Report
- Concept of Operations for I35E Extension Final Report
- 35E Extension PMT Meeting Minutes
- 35E Extension Steering Committee Meeting Minutes
I-35E Needs Assessment

Introduction & Background
The I-35E corridor connecting downtown St. Paul to I-35W on the north side of the Twin Cities Metropolitan Area is a key link in the regional transportation network serving a broad range of trip purposes, through trips and local trips, and a significant number of truck and transit trips. Starting in Duluth, Minnesota and ending in Laredo, Texas, the I-35 corridor is the third longest north-south interstate highway, and provides a critical connection across North America. Since 2008, the corridor has seen some changes in configuration and operations, including the reconstruction of the I-694 / I-35E interchange (known locally as “Unweave the Weave”). Furthermore, the Cayuga Bridge replacement project, currently underway, will yield significant changes to the operations of I-35E north of downtown St. Paul, including relocation of existing ramps at Pennsylvania Avenue and a new interchange at Cayuga Street. Other improvements underway on I-35E include the construction of new priced managed lanes (known locally as “MnPASS Express Lanes”) between Cayuga Street and Little Canada Road, the limits of which are shown in yellow on the adjacent map. The MnPASS lanes are expected to open in late 2015.

This study, hereafter referred to as the I-35E MnPASS Extension Study, follows from adopted regional transportation plans that identify priced managed lanes as a potential approach for improving highway and transit performance on the I-35E corridor north of St. Paul. With the implementation of priced managed lanes south of Little Canada Road underway, this study will identify and evaluate potential concepts for extending the lanes further north to County Road 96, shown in orange on the adjacent map.
FHWA Value Pricing Pilot Program Grant

The I-35E MnPASS Extension Study is being performed pursuant to a Federal Value Pricing Pilot Program (VPPP) grant. The awarded VPPP application set forth the following Goals & Objectives for the study (VPPP grant award pre-implementation proposal, pages 4 and 5):

The goal for the Interstate 35E MnPASS Managed Lanes Extension Project is to achieve greater efficiency and performance in the corridor through better utilization of existing infrastructure, and to optimize highway system performance and customer service through transit enhancements and transit and bike/pedestrian supportive land use planning. This project proposal, which is supported by the MnPASS System Study 2, by the Region’s Transportation Policy Plan, and by MnDOT’s Metro District Highway Investment Plan, aims to help identify a cost effective near-term approach for I-35E MnPASS managed lanes implementation to achieve the following benefits:

- Reducing local and regional congestion and delays
- Reducing greenhouse gases
- Enhancing system performance for transit, carpoolers and toll customers
- Generating revenue for operations and development, and
- Supporting equity, livability and sustainability objectives

The study will use the following three contractual components to satisfy the terms of the FHWA VPPP grant award:

- **I-35E MnPASS Extension Concept Development** (Lead – Parsons Brinckerhoff). This component will develop and evaluate conceptual alternatives for extending MnPASS Express Lanes on I-35E between Little Canada Rd. and CR 96. Work will include concept and layout development, traffic forecasting and modeling, operations and benefit/cost analysis, cost estimating and reporting.
- **I-35E MnPASS Extension Community Outreach & Education** (Lead – University of Minnesota Humphrey School of Public Affairs). This component will provide project management, outreach and education for the overall I-35E MnPASS Extension Study, as well as evaluate stakeholder feedback on the various conceptual alternatives for extending MnPASS on I-35E.
- **I-35E MnPASS Extension Land Use & Transit Enhancement** (Lead – University of Minnesota Center for Changing Landscapes). This component will identify and create land use/community design strategies that will promote greater transit use and van/carpooling in the I-35E MnPASS Express Lanes.
Regional Context for the I-35E Corridor

The I-35E corridor within the study area plays a critical role in regional mobility and connectivity. It is the most direct connection between the central business district and center of state governance found in St. Paul, a connection to the Minneapolis / St. Paul International Airport, and a key freight connection with the Twin Ports of Duluth (Minnesota) and Superior (Wisconsin). Additionally, I-35E serves a critical interstate and international commerce role, as it spans from Canada to Mexico. As demonstrated by the I-35W bridge collapse, the corridor is more than a serviceable and logical alternative route to I-35W, and this vital interstate commerce continued without much complication using I-35E.

The Twin Cities region is continuing to grow and serve as a meta-regional attractor of residents and employees. The region’s population will grow by 893,000 by 2040, yielding a regional population of 3.74 million residents and 2.12 million workers. (Population, Household, and Employment Forecasts to 2040, Metropolitan Council, April 2012, page 1) Absent structural changes to transportation energy and infrastructure, daily vehicle miles traveled (VMT) are expected to increase from 2005 to 2030 by 23.8 million, or 35 percent.

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**Figure 1: 2040 Forecasts, Metropolitan Council, April 2012.**

In the scope of work for the I-35E MnPASS Extension Study, the impacts of population and employment growth directly upon the I-35E corridor will be evaluated through refined travel demand forecasts and operations modeling.
Congestion Relief

The needs assessment for the I-35E MnPASS extension begins with an examination of congestion conditions within the corridor. This congestion analysis incorporates many of the findings from the Congestion Management and Safety Plan, 2012 Metropolitan Freeway Congestion Report, and 2013 outputs from the Minnesota Department of Transportation PeMS database. For the purposes of this assessment, “congestion” is defined as sustained traffic flow at speeds less than 45 miles per hour, measured by in-field sensors present within the corridor right-of-way.

Existing Corridor Congestion

Regionally, the Twin Cities has experienced an increase in system-wide congestion in 2012 over 2011, continuing a linear trend that has been present since the early 1990s. The sources of congestion are various, and within corridors, cannot be relieved with only one action. On the I-35E corridor, the downstream constraint caused by the I-94 / I-35E commons within the vicinity of downtown St. Paul creates a large amount of weaving traffic that cascades upstream. Similarly, the I-694 / I-35E commons also constrains traffic movement, despite the improvements yielded by the Unweave the Weave project. Corridor constraints have a multiplicative effect upon traffic flow during peak periods, but have little to no effect during off-peak periods.

As an initial investigation into congestion on I-35E, outputs from the 2012 Metropolitan Freeway Congestion Report are shown in Figure 2, Figure 3, and Figure 4. In these reports, in the AM peak period, the southbound direction of I-35E experiences moderate levels of congestion (1 – 2 hours of congestion) between County Road J and I-694, with even more severe levels of congestion south of Little Canada Road, for which the I-35E MnPASS Phase 1 project is intended to help alleviate. In the PM peak period, the northbound direction experiences congestion at the County Road E bottleneck, which can back traffic back into the I-694 commons.

Whereas the congestion is moderate in this segment, on average, the variability in travel time is large. As a result, travel time reliability is quite poor in this segment, even if levels of traffic volumes and delay are moderate on average. This is demonstrated in Figure 5, Figure 6, Figure 7, and Figure 8. These figures illustrate levels of service on I-35E for two days – June 26, 2013 and September 18, 2013 – and at two time periods (7:00 am and 5:00 pm). As can be seen, traffic delays can vary significantly from one day to the next, requiring travelers in the corridor to extend their “planning time” for travel time delay (whether realized delay or not).
FIGURE 2: AM PEAK PERIOD CONGESTION, METROPOLITAN FREEWAY SYSTEM 2012 CONGESTION REPORT, JANUARY 2013, PAGE 7.
FIGURE 3: PM PEAK PERIOD CONGESTION, METROPOLITAN FREEWAY SYSTEM 2012 CONGESTION REPORT, JANUARY 2013, PAGE 10.
FIGURE 4: DAILY HOURS OF CONGESTION, METROPOLITAN FREEWAY SYSTEM 2012 CONGESTION REPORT, JANUARY 2013, PAGE 14.
Figure 5: PEMS Traffic Map, AM Peak Period, September 18, 2013 (7:00 AM), Minnesota Department of Transportation
FIGURE 6: PEMS TRAFFIC MAP, AM PEAK PERIOD, JUNE 26, 2013 (7:00 AM), MINNESOTA DEPARTMENT OF TRANSPORTATION
FIGURE 7: PEMS TRAFFIC MAP, PM PEAK PERIOD, SEPTEMBER 18, 2013 (5:00 PM), MINNESOTA DEPARTMENT OF TRANSPORTATION
For the purposes of this analysis, the MnDOT PeMS system created an average daily volume matrix for each sensor location. This sample was comprised of 12 Tuesdays, Wednesdays, and Thursdays representing average weekday travel for the months of October and November 2013. As can be seen in the following charts, current traffic mirrors the trends witnessed in the 2012 Congestion report and in the 2012 / 2013 PeMS outputs shown above.

- **CSAH 96 to CR E.** In the southbound direction, congestion (as defined as average conditions meeting Level of Service E or F) is present between 6:00 am and 8:00 am. As shown in Figure 9, these conditions are present in the vicinity of Goose Lake Road overpass, extending upstream to CSAH 96. In the northbound direction, congestion is present between 3:00 pm and 6:00 pm (Figure 10). Again, congestion is present in the vicinity of Goose Lake Road overpass to CSAH 96.

- **CR E to Little Canada Road.** Again consistent with the PeMS findings in 2012 and 2013, congestion is not a recurring problem between Little Canada Road and County Road E. In the southbound direction, downstream congestion in the segment between downtown St. Paul and TH-36 dissipates by Little Canada Road (Figure 11). Likewise, in the northbound direction, constraints between CR E and CSAH 96 do not create a problem within the commons of I-694 and I-35E (Figure 12).
Figure 9: Average Southbound I-35E Volume/Capacity North of CR E, October / November 2013
FIGURE 10: AVERAGE NORTHBOUND I-35E VOLUME/CAPACITY NORTH OF CR E, OCTOBER / NOVEMBER 2013
Figure 11: Average Southbound Volume/Capacity South of CR E, October / November 2013
**Figure 12: Average Northbound Volume/Capacity South of CR E, October / November 2013**
Causes of Congestion
Starting with the north end of the corridor at CSAH 96 and working south to Little Canada Road, the following causes of congestion have been identified (Figure 15):

- Goose Lake Road bridge (Figure 13). The vertical sight distance limitations of the geometric design and narrowed footprint of the bridge structure constrain traffic operations at this location. This effect is witnessed both in the AM and PM peak periods.

- Reduction from 3 lanes to 2 lanes north of County Road E (Figure 14). North of the I-35E / I-694 commons, and south of County Road E bridge over I-35E, the mainline reduces from 3 through lanes to 2 through lanes. In the PM peak direction, this can yield congested conditions north of County Road E.
**Figure 15:** Average Daily Hours of Congestion, CR E to CSAH 96
Future Corridor Congestion

Results from travel demand forecasts for this segment are not yet available, but will be conducted as a part of the I-35E MnPASS Extension Study. However, the I-35E MnPASS Phase 1 project also conducted travel demand forecasts for 2015 and 2030 to identify the benefit of provision of managed lanes. In those forecasts, travel conditions on I-35E south of Little Canada Road were provided. In Figure 16 below, the results of the forecast analysis upon travel speeds and level of service indicates that by 2030, significant segments of I-35E will fall under LOS E and F conditions, increasing to 3 or more hours of congestion for each peak period.

![Figure 16: No Build Level of Service Traffic Conditions, I-35E MnPass Project Environmental Assessment, Page 16, December 2012.](image-url)
Crash Locations and Rates
Concerns regarding crash rates for the I-35E corridor were identified in the Congestion Mitigation and Safety Program (CMSP) Phase I report. The AM peak period featured 5 – 10 crashes per mile between CSAH 96 and Centreville Road, and 15 – 20 crashes per mile between Centreville Road and County Road E (Figure 17). Additionally, the CMSP shows an average AM peak period rate of 5 – 10 crashes per mile between County Road E and Little Canada Road; however, this section has been reconstructed since the compilation of data. The PM Peak Period reflects 10 – 20 crashes per mile between County Road E and Centreville Road (Figure 18).

![Diagram of Crash Locations and Rates]

**Figure 17: AM Peak Period Crash Rate, Minnesota Department of Transportation**
The Corridor Investment Management Strategy (CIMS) shows high priority intersections and curves identified in MnDOT’s District Safety Plans for remediation, in addition to recent crash data and Toward Zero Deaths (TZD) coordination efforts. For the collective I-35 corridor, the 2012 CIMS indicates an opportunity to address fatal and serious injury crashes in the vicinity of County Road E to CSAH 96. Additional crash data was obtained from MnDOT’s Office of Traffic, Safety, and Operations for I-35E between Little Canada Road and CSAH 14 for the period 2008 – 2012, augmenting the data identified in the CMSP. For this period, the following issues were identified (Figure 19):
Crash Severity | Number | Percent of Total
--- | --- | ---
Fatal | 6 | 1%
Incapacitating Injury | 5 | 1%
Non-Incapacitating Injury | 64 | 7%
Possible Injury | 219 | 22%
Property Damage Only | 678 | 70%

Crash Location | Number | Percent of Total
--- | --- | ---
Rear End | 388 | 40%
Sideswipe Same Direction | 140 | 14%
Left Turn | 4 | 1%
Ran Off Road Left | 154 | 16%
Right Angle | 26 | 3%
Right Turn | 1 | 0%
Ran Off Road Right | 128 | 13%
Head On | 13 | 1%
Unknown | 118 | 12%

Road Condition | Number | Percent of Total
--- | --- | ---
Dry | 579 | 60%
Wet | 161 | 16%
Snow, Slush, Ice | 221 | 23%
Unknown | 11 | 1%

**Figure 19: I-35E Crash Statistics, 2008-2012, Minnesota Department of Transportation**

Understandably, the location of crashes correlates with the locations of congestion. Each of the segment’s five interchanges were examined using the Minnesota Department of Transportation’s Top 200 Statewide Interchanges analysis. When ranked by total crash cost, an averaged value comprised of fatal, injury and non-injury crashes, four of the five interchanges rate within the top 200, and the highest ranked locations were within the areas of congestion identified above (Figure 20):

- **West-end junction with I-694.** Ranking: 123. Total crash cost: $1,120,500. Between Little Canada Road and the eastern diverge with I-694, southbound sight distances are substandard, indicating a potential reduction in posted speed limit through the curve.
- **East-end junction with I-694.** Ranking: 93. Total crash cost: $1,342,833. Like the southbound direction, the northbound direction through the curve at the diverge between northbound I-35E and eastbound I-694 involves sight distance concerns, again suggesting a potential reduction in posted speed limit through the curve.
I-35E MnPASS Extension Study: Final Report

- County Road E. Ranking: 97. Total crash cost: $1,314,800. The lane drop at County Road E requires merging due to the combined bottleneck and ingress ramp onto I-35E from CR-E.
- CSAH 96. Ranking: 28. Total crash cost: $2,273,300. Higher volumes per lane at CSAH 96 coupled with the bridge piers location relative to the main travel lanes yields a crash concern. Often, queuing in the AM peak period will begin in the vicinity of CSAH 96. Slowdown in speeds due to downstream congestion introduces additional risk of rear-end collisions.

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<td>E JCT I-694</td>
<td>141,010</td>
<td>93</td>
<td>1,342,833</td>
<td>1</td>
<td>0</td>
<td>8</td>
<td>19</td>
<td>45</td>
<td>73</td>
<td>0.47</td>
<td>0.72</td>
<td>Full Directional</td>
</tr>
<tr>
<td>CR E</td>
<td>94,993</td>
<td>97</td>
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<td>1</td>
<td>0</td>
<td>8</td>
<td>17</td>
<td>68</td>
<td>94</td>
<td>0.90</td>
<td>1.26</td>
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</tr>
<tr>
<td>CSAH 96</td>
<td>94,876</td>
<td>28</td>
<td>2,273,300</td>
<td>1</td>
<td>2</td>
<td>9</td>
<td>36</td>
<td>103</td>
<td>151</td>
<td>1.45</td>
<td>2.07</td>
<td>Diamond</td>
</tr>
</tbody>
</table>

Figure 20: I-35E Corridor Interchanges in MnDOT Top 200 Crash Report 2012
Infrastructure Considerations

Bridge Structures
All bridge structures are rated as Good or Satisfactory by the CIMS within the study area. No bridge is identified for required reconstruction.

Pavement Conditions
Minimal pavement reconstruction is required between Centreville Road and County Road E, according to the CIMS. Otherwise, pavement condition is rated as Fair for 2011 RQI, according to the CIMS, between County Road E and CSAH 96, and, Good between Little Canada Road and County Road E.
I-35E MnPASS Extension Study: Final Report

Transit Schedule Degradation
Multiple Metro Transit bus routes operate along the I-35E corridor, including two express routes to downtown St. Paul – the 275 Express and the 285 Express. These buses will be consolidated into one route starting in 2014, with Metro Transit’s intention to increase service in accordance with the Rush Line vision. Additionally, the Route 860 uses the commons portion with I-694. In the AM peak period, 14 buses run in the segment north of Little Canada Road and 12 buses run in the PM peak period in this segment. In the current freeway configuration, bus passengers face the same delays and unreliable schedules that other motorists face due to the lack of Bus Only Shoulders in the segment, as seen by degradation in travel times from schedule (Figure 21).

<table>
<thead>
<tr>
<th>Route</th>
<th>Daily Ridership</th>
<th>Daily Buses</th>
<th>Variation in Travel Time from Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td>275 Express</td>
<td>200</td>
<td>6</td>
<td>-7.8 minutes (SB) to +2.4 minutes (NB)</td>
</tr>
<tr>
<td>285 Express</td>
<td>203</td>
<td>6</td>
<td>-10.3 minutes (NB) to -7.2 minutes (SB)</td>
</tr>
<tr>
<td>860 Local</td>
<td>560</td>
<td>13</td>
<td>-11.9 minutes (NB) to -1.4 minutes (SB)</td>
</tr>
</tbody>
</table>

Figure 21: Observed Boardings and Travel Time, October / November 2013, Metro Transit.

Metro Transit operates the following park-and-rides in the corridor: St. Genevieve in Centreville, White Bear Theatre near Lino Lakes, Cub Foods at CSAH 96, and Maplewood Mall. Additionally, three park-and-rides have been identified for significant improvement in the CIMS. A $16 million investment will be made in the existing Maplewood Mall park-and-ride, a $2 million investment will be made in a park-and-ride at CSAH 14 and I-35E, and a $2 million investment will be made at a park-and-ride at County Road E and I-35E.
Appendix C
I-35E MnPASS Extension Study
Needs Assessment
I-35E MnPASS Extension Study

NEEDS ASSESSMENT

DRAFT 3.0

PREPARED FOR:

PREPARED BY:

520 NICOLLET MALL, SUITE 800
MINNEAPOLIS, MN 55402
26 November 2013

<table>
<thead>
<tr>
<th>Revision</th>
<th>Initials</th>
<th>Date</th>
</tr>
</thead>
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<td>D.U.</td>
<td>09-28-2013</td>
</tr>
<tr>
<td>Version 3.0 Draft</td>
<td>D.U.</td>
<td>11-26-2013</td>
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<td>Verifier</td>
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</tbody>
</table>
Introduction & Background
The I-35E corridor connecting downtown St. Paul to I-35W on the north side of the Twin Cities Metropolitan Area is a key link in the regional transportation network serving a broad range of trip purposes, through trips and local trips, and a significant number of truck and transit trips. Starting in Duluth, Minnesota and ending in Laredo, Texas, the I-35 corridor is the third longest north-south interstate highway, and provides a critical connection across North America. Since 2008, the corridor has seen some changes in configuration and operations, including the reconstruction of the I-694 / I-35E interchange (known locally as “Unweave the Weave”). Furthermore, the Cayuga Bridge replacement project, currently underway, will yield significant changes to the operations of I-35E north of downtown St. Paul, including relocation of existing ramps at Pennsylvania Avenue and a new interchange at Cayuga Street. Other improvements underway on I-35E include the construction of new priced managed lanes (known locally as “MnPASS Express Lanes”) between Cayuga Street and Little Canada Road, the limits of which are shown in yellow on the adjacent map. The MnPASS lanes are expected to open in late 2015.

This study, hereafter referred to as the I-35E MnPASS Extension Study, follows from adopted regional transportation plans that identify priced managed lanes as a potential approach for improving highway and transit performance on the I-35E corridor north of St. Paul. With the implementation of priced managed lanes south of Little Canada Road underway, this study will identify and evaluate potential concepts for extending the lanes further north to County Road 96, shown in orange on the adjacent map.
The I-35E MnPASS Extension Study is being performed pursuant to a Federal Value Pricing Pilot Program (VPPP) grant. The awarded VPPP application set forth the following Goals & Objectives for the study (VPPP grant award pre-implementation proposal, pages 4 and 5):

The goal for the Interstate 35E MnPASS Managed Lanes Extension Project is to achieve greater efficiency and performance in the corridor through better utilization of existing infrastructure, and to optimize highway system performance and customer service through transit enhancements and transit and bike/pedestrian supportive land use planning. This project proposal, which is supported by the MnPASS System Study 2, by the Region’s Transportation Policy Plan, and by MnDOT’s Metro District Highway Investment Plan, aims to help identify a cost effective near-term approach for I-35E MnPASS managed lanes implementation to achieve the following benefits:

- Reducing local and regional congestion and delays
- Reducing green house gases
- Enhancing system performance for transit, carpoolers and toll customers
- Generating revenue for operations and development, and
- Supporting equity, livability and sustainability objectives

The study will use the following three contractual components to satisfy the terms of the FHWA VPPP grant award:

- **I-35E MnPASS Extension Concept Development** (Lead – Parsons Brinckerhoff). This component will develop and evaluate conceptual alternatives for extending MnPASS Express Lanes on I-35E between Little Canada Rd. and CR 96. Work will include concept and layout development, traffic forecasting and modeling, operations and benefit/cost analysis, cost estimating and reporting.
- **I-35E MnPASS Extension Community Outreach & Education** (Lead – University of Minnesota Humphrey School of Public Affairs). This component will provide project management, outreach and education for the overall I-35E MnPASS Extension Study, as well as evaluate stakeholder feedback on the various conceptual alternatives for extending MnPASS on I-35E.
- **I-35E MnPASS Extension Land Use & Transit Enhancement** (Lead – University of Minnesota Center for Changing Landscapes). This component will identify and create land use/community design strategies that will promote greater transit use and van/carpooling in the I-35E MnPASS Express Lanes.
Regional Context for the I-35E Corridor

The I-35E corridor within the study area plays a critical role in regional mobility and connectivity. It is the most direct connection between the central business district and center of state governance found in St. Paul, a connection to the Minneapolis / St. Paul International Airport, and a key freight connection with the the Twin Ports of Duluth (Minnesota) and Superior (Wisconsin). Additionally, I-35E serves a critical interstate and international commerce role, as it spans from Canada to Mexico. As demonstrated by the I-35W bridge collapse, the corridor is more than a serviceable and logical alternative route to I-35W, and this vital interstate commerce continued without much complication using I-35E.

The Twin Cities region is continuing to grow and serve as a meta-regional attractor of residents and employees. The region’s population will grow by 893,000 by 2040, yielding a regional population of 3.74 million residents and 2.12 million workers. (Population, Household, and Employment Forecasts to 2040, Metropolitan Council, April 2012, page 1) Absent structural changes to transportation energy and infrastructure, daily vehicle miles traveled (VMT) are expected to increase from 2005 to 2030 by 23.8 million, or 35 percent.

<table>
<thead>
<tr>
<th></th>
<th>2010</th>
<th>2020</th>
<th>2030</th>
<th>2040</th>
</tr>
</thead>
<tbody>
<tr>
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<td>2,850,000</td>
<td>3,144,000</td>
<td>3,447,000</td>
<td>3,743,000</td>
</tr>
<tr>
<td>Households</td>
<td>1,118,000</td>
<td>1,293,000</td>
<td>1,464,000</td>
<td>1,576,000</td>
</tr>
<tr>
<td>Employment</td>
<td>1,548,000</td>
<td>1,743,000</td>
<td>1,943,000</td>
<td>2,118,000</td>
</tr>
</tbody>
</table>

**FIGURE 1: 2040 FORECASTS, METROPOLITAN COUNCIL, APRIL 2012.**

In the scope of work for the I-35E MnPASS Extension Study, the impacts of population and employment growth directly upon the I-35E corridor will be evaluated through refined travel demand forecasts and operations modeling.
Congestion Relief

The needs assessment for the I-35E MnPASS extension begins with an examination of congestion conditions within the corridor. This congestion analysis incorporates many of the findings from the Congestion Management and Safety Plan, 2012 Metropolitan Freeway Congestion Report, and 2013 outputs from the Minnesota Department of Transportation PeMS database. For the purposes of this assessment, “congestion” is defined as sustained traffic flow at speeds less than 45 miles per hour, measured by in-field sensors present within the corridor right-of-way.

Existing Corridor Congestion

Regionally, the Twin Cities has experienced an increase in system-wide congestion in 2012 over 2011, continuing a linear trend that has been present since the early 1990s. The sources of congestion are various, and within corridors, cannot be relieved with only one action. On the I-35E corridor, the downstream constraint caused by the I-94 / I-35E commons within the vicinity of downtown St. Paul creates a large amount of weaving traffic that cascades upstream. Similarly, the I-694 / I-35E commons also constrains traffic movement, despite the improvements yielded by the Unweave the Weave project. Corridor constraints have a multiplicative effect upon traffic flow during peak periods, but have little to no effect during off-peak periods.

As an initial investigation into congestion on I-35E, outputs from the 2012 Metropolitan Freeway Congestion Report are shown in Figure 2, Figure 3, and Figure 4. In these reports, in the AM peak period, the southbound direction of I-35E experiences moderate levels of congestion (1 – 2 hours of congestion) between County Road J and I-694, with even more severe levels of congestion south of Little Canada Road, for which the I-35E MnPASS Phase 1 project is intended to help alleviate. In the PM peak period, the northbound direction experiences congestion at the County Road E bottleneck, which can back traffic back into the I-694 commons.

Whereas the congestion is moderate in this segment, on average, the variability in travel time is large. As a result, travel time reliability is quite poor in this segment, even if levels of traffic volumes and delay are moderate on average. This is demonstrated in Figure 5, Figure 6, Figure 7, and Figure 8. These figures illustrate levels of service on I-35E for two days – June 26, 2013 and September 18, 2013 – and at two time periods (7:00 am and 5:00 pm). As can be seen, traffic delays can vary significantly from one day to the next, requiring travelers in the corridor to extend their “planning time” for travel time delay (whether realized delay or not).
FIGURE 2: AM PEAK PERIOD CONGESTION, METROPOLITAN FREEWAY SYSTEM 2012 CONGESTION REPORT, JANUARY 2013, PAGE 7.
FIGURE 3: PM PEAK PERIOD CONGESTION, METROPOLITAN FREEWAY SYSTEM 2012 CONGESTION REPORT, JANUARY 2013, PAGE 10.

2012 Metro Freeway Congestion

Legend
- NO RECURRING CONGESTION
- UNDER 1 HOUR
- 1-2 HOURS
- 2-3 HOURS
- 3-4 HOURS
- 4-5 HOURS
- 5-6 HOURS
- 6-7 HOURS
- MORE THAN 7 HOURS

WHERE ESTIMATED SPEEDS ARE < 45 MPH

Data collected during October 2012.
FIGURE 4: DAILY HOURS OF CONGESTION, METROPOLITAN FREEWAY SYSTEM 2012 CONGESTION REPORT, JANUARY 2013, PAGE 14.

FIGURE 5: PeMS TRAFFIC MAP, AM PEAK PERIOD, SEPTEMBER 18, 2013 (7:00 AM), MINNESOTA DEPARTMENT OF TRANSPORTATION
Figure 6: PeMS Traffic Map, AM Peak Period, June 26, 2013 (7:00 AM), Minnesota Department of Transportation
Figure 7: PeMS Traffic Map, PM Peak Period, September 18, 2013 (5:00 PM), Minnesota Department of Transportation
For the purposes of this analysis, the MnDOT PeMS system created an average daily volume matrix for each sensor location. This sample was comprised of 12 Tuesdays, Wednesdays, and Thursdays representing average weekday travel for the months of October and November 2013. As can be seen in the following charts, current traffic mirrors the trends witnessed in the 2012 Congestion report and in the 2012 / 2013 PeMS outputs shown above.

- **CSAH 96 to CR E.** In the southbound direction, congestion (as defined as average conditions meeting Level of Service E or F) is present between 6:00 am and 8:00 am. As shown in Figure 9, these conditions are present in the vicinity of Goose Lake Road overpass, extending upstream to CSAH 96. In the northbound direction, congestion is present between 3:00 pm and 6:00 pm (Figure 10). Again, congestion is present in the vicinity of Goose Lake Road overpass to CSAH 96.

- **CR E to Little Canada Road.** Again consistent with the PeMS findings in 2012 and 2013, congestion is not a recurring problem between Little Canada Road and County Road E. In the southbound direction, downstream congestion in the segment between downtown St. Paul and TH-36 dissipates by Little Canada Road (Figure 11). Likewise, in the northbound direction, constraints between CR E and CSAH 96 do not create a problem within the commons of I-694 and I-35E (Figure 12).
FIGURE 9: AVERAGE SOUTHBOUND I-35E VOLUME/CAPACITY NORTH OF CR E, OCTOBER / NOVEMBER 2013
Figure 10: Average Northbound I-35E Daily Volume/Capacity by Time of Day

Figure 10: Average Northbound I-35E Volume/Capacity North of CR E, October / November 2013
Average Southbound I-35E Daily Volume / Capacity by Time of Day

Figure 11: Average Southbound Volume/Capacity South of CR E, October / November 2013
FIGURE 12: AVERAGE NORTHBOUND VOLUME/CAPACITY SOUTH OF CR E, OCTOBER / NOVEMBER 2013
Causes of Congestion
Starting with the north end of the corridor at CSAH 96 and working south to Little Canada Road, the following causes of congestion have been identified (Figure 15):

- Goose Lake Road bridge (Figure 13). The vertical sight distance limitations of the geometric design and narrowed footprint of the bridge structure constrain traffic operations at this location. This effect is witnessed both in the AM and PM peak periods.

- Reduction from 3 lanes to 2 lanes north of County Road E (Figure 14). North of the I-35E / I-694 commons, and south of County Road E bridge over I-35E, the mainline reduces from 3 through lanes to 2 through lanes. In the PM peak direction, this can yield congested conditions north of County Road E.
FIGURE 15: AVERAGE DAILY HOURS / CAUSES OF CONGESTION, CR E TO CSAH 96
**Future Corridor Congestion**

Results from travel demand forecasts for this segment are not yet available, but will be conducted as a part of the I-35E MnPASS Extension Study. However, the I-35E MnPASS Phase 1 project also conducted travel demand forecasts for 2015 and 2030 to identify the benefit of provision of managed lanes. In those forecasts, travel conditions on I-35E south of Little Canada Road were provided. In Figure 16 below, the results of the forecast analysis upon travel speeds and level of service indicates that by 2030, significant segments of I-35E will fall under LOS E and F conditions, increasing to 3 or more hours of congestion for each peak period.

![Figure 16: No Build Level of Service Traffic Conditions, I-35E MnPass Project Environmental Assessment, Page 16, December 2012.](image)

<table>
<thead>
<tr>
<th>Segments</th>
<th>2010 Existing Base Model</th>
<th>2015 No-Build*</th>
<th>2030 No-Build*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AM Peak</td>
<td>PM Peak</td>
<td>AM Peak</td>
</tr>
<tr>
<td>From</td>
<td>To</td>
<td></td>
<td>AM Peak</td>
</tr>
<tr>
<td>Little Canada Road</td>
<td>TH 36</td>
<td>F-1</td>
<td>B to C</td>
</tr>
<tr>
<td>TH 36</td>
<td>Roselawn Entry</td>
<td>F-2</td>
<td>C</td>
</tr>
<tr>
<td>Roselawn Entry</td>
<td>Larpenteur Exit</td>
<td>F-2</td>
<td>C</td>
</tr>
<tr>
<td>Larpenteur Exit</td>
<td>Wheelock Entry</td>
<td>F-3</td>
<td>C</td>
</tr>
<tr>
<td>Wheelock Entry</td>
<td>Maryland Ave Exit</td>
<td>F-2</td>
<td>C to D</td>
</tr>
<tr>
<td>Maryland Ave Exit</td>
<td>Maryland Ave Entry</td>
<td>F-3</td>
<td>C</td>
</tr>
<tr>
<td>Maryland Ave Exit</td>
<td>Pennsylvania Exit / Cayuga Entry</td>
<td>D / F-2</td>
<td>D</td>
</tr>
<tr>
<td>Pennsylvania Exit / Cayuga Exit</td>
<td>University Ave Exit</td>
<td>D</td>
<td>C</td>
</tr>
</tbody>
</table>

* Notes: The forecast for 2015 and 2030 assumes that the Maryland Avenue Bridge and Cayuga Bridge projects are built. The Cayuga Bridge project changes the existing roadway by removing Pennsylvania Avenue ramps and adds a new interchange at Cayuga Street. It also adds an auxiliary lane on I-35E between Maryland Avenue and the I-94 access ramps.

**Figure 16: No Build Level of Service Traffic Conditions, I-35E MnPass Project Environmental Assessment, Page 16, December 2012.**
Crash Locations and Rates
Concerns regarding crash rates for the I-35E corridor were identified in the Congestion Mitigation and Safety Program (CMSP) Phase I report. The AM peak period featured 5 – 10 crashes per mile between CSAH 96 and Centreville Road, and 15 – 20 crashes per mile between Centreville Road and County Road E (Figure 17). Additionally, the CMSP shows an average AM peak period rate of 5 – 10 crashes per mile between County Road E and Little Canada Road; however, this section has been reconstructed since the compilation of data. The PM Peak Period reflects 10 – 20 crashes per mile between County Road E and Centreville Road (Figure 18).

2005-2007 METRO DISTRICT
FREEWAY AND MAJOR EXPRESSWAY CRASHES

<table>
<thead>
<tr>
<th>AM Peak</th>
<th>6:00 AM to 9:00 AM</th>
<th>Crashes Per Mile</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0 - 5.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.1 - 10.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.1 - 15.0</td>
<td></td>
<td></td>
</tr>
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<td></td>
<td></td>
</tr>
<tr>
<td>20.1 - 25.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25.1 - 29.0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 17: AM Peak Period Crash Rate, Minnesota Department of Transportation
The Corridor Investment Management Strategy (CIMS) shows high priority intersections and curves identified in MnDOT’s District Safety Plans for remediation, in addition to recent crash data and Toward Zero Deaths (TZD) coordination efforts. For the collective I-35 corridor, the 2012 CIMS indicates an opportunity to address fatal and serious injury crashes in the vicinity of County Road E to CSAH 96. Additional crash data was obtained from MnDOT’s Office of Traffic, Safety, and Operations for I-35E between Little Canada Road and CSAH 14 for the period 2008 – 2012, augmenting the data identified in the CMSP. For this period, the following issues were identified (Figure 19):
Table: Crash Severity Statistics

<table>
<thead>
<tr>
<th>Crash Severity</th>
<th>Number</th>
<th>Percent of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fatal</td>
<td>6</td>
<td>1%</td>
</tr>
<tr>
<td>Incapacitating Injury</td>
<td>5</td>
<td>1%</td>
</tr>
<tr>
<td>Non-Incapacitating Injury</td>
<td>64</td>
<td>7%</td>
</tr>
<tr>
<td>Possible Injury</td>
<td>219</td>
<td>22%</td>
</tr>
<tr>
<td>Property Damage Only</td>
<td>678</td>
<td>70%</td>
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Table: Crash Location Statistics

<table>
<thead>
<tr>
<th>Crash Location</th>
<th>Number</th>
<th>Percent of Total</th>
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<tr>
<td>Rear End</td>
<td>388</td>
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<tr>
<td>Sideswipe Same Direction</td>
<td>140</td>
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</tr>
<tr>
<td>Left Turn</td>
<td>4</td>
<td>1%</td>
</tr>
<tr>
<td>Ran Off Road Left</td>
<td>154</td>
<td>16%</td>
</tr>
<tr>
<td>Right Angle</td>
<td>26</td>
<td>3%</td>
</tr>
<tr>
<td>Right Turn</td>
<td>1</td>
<td>0%</td>
</tr>
<tr>
<td>Ran Off Road Right</td>
<td>128</td>
<td>13%</td>
</tr>
<tr>
<td>Head On</td>
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<td>1%</td>
</tr>
<tr>
<td>Unknown</td>
<td>118</td>
<td>12%</td>
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</table>

Table: Road Condition Statistics

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<tr>
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<th>Number</th>
<th>Percent of Total</th>
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</thead>
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<tr>
<td>Dry</td>
<td>579</td>
<td>60%</td>
</tr>
<tr>
<td>Wet</td>
<td>161</td>
<td>16%</td>
</tr>
<tr>
<td>Snow, Slush, Ice</td>
<td>221</td>
<td>23%</td>
</tr>
<tr>
<td>Unknown</td>
<td>11</td>
<td>1%</td>
</tr>
</tbody>
</table>

**Figure 19: I-35E Crash Statistics, 2008-2012, Minnesota Department of Transportation**

Understandably, the location of crashes correlates with the locations of congestion. Each of the segment’s five interchanges were examined using the Minnesota Department of Transportation’s Top 200 Statewide Interchanges analysis. When ranked by total crash cost, an averaged value comprised of fatal, injury and non-injury crashes, four of the five interchanges rate within the top 200, and the highest ranked locations were within the areas of congestion identified above (Figure 20):

- **West-end junction with I-694.** Ranking: 123. Total crash cost: $1,120,500. Between Little Canada Road and the eastern diverge with I-694, southbound sight distances are substandard, indicating a potential reduction in posted speed limit through the curve.
- **East-end junction with I-694.** Ranking: 93. Total crash cost: $1,342,833. Like the southbound direction, the northbound direction through the curve at the diverge between northbound I-35E and eastbound I-694 involves sight distance concerns, again suggesting a potential reduction in posted speed limit through the curve.

C-22
- County Road E. Ranking: 97. Total crash cost: $1,314,800. The lane drop at County Road E requires merging due to the combined bottleneck and ingress ramp onto I-35E from CR-E.
- CSAH 96. Ranking: 28. Total crash cost: $2,273,300. Higher volumes per lane at CSAH 96 coupled with the bridge piers location relative to the main travel lanes yields a crash concern. Often, queuing in the AM peak period will begin in the vicinity of CSAH 96. Slowdown in speeds due to downstream congestion introduces additional risk of rear-end collisions.

<table>
<thead>
<tr>
<th>Interchange Description</th>
<th>Entering Volume</th>
<th>Rank</th>
<th>Crash Cost</th>
<th>K</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>PD</th>
<th>Total Crash Rate</th>
<th>Severity Rate</th>
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<tbody>
<tr>
<td>LITTLE CANADA</td>
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<td>0</td>
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<td>71</td>
<td>93</td>
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<td>0.85</td>
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<td>8</td>
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<td>55</td>
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<td>1,342,833</td>
<td>1</td>
<td>0</td>
<td>8</td>
<td>19</td>
<td>45</td>
<td>73</td>
<td>0.47</td>
<td>0.72</td>
</tr>
<tr>
<td>CR E</td>
<td>94,993</td>
<td>97</td>
<td>1,314,800</td>
<td>1</td>
<td>0</td>
<td>8</td>
<td>17</td>
<td>68</td>
<td>94</td>
<td>0.90</td>
<td>1.26</td>
</tr>
<tr>
<td>CSAH 96</td>
<td>94,876</td>
<td>28</td>
<td>2,273,300</td>
<td>1</td>
<td>2</td>
<td>9</td>
<td>36</td>
<td>103</td>
<td>151</td>
<td>1.45</td>
<td>2.07</td>
</tr>
</tbody>
</table>

**Figure 20: I-35E Corridor Interchanges in MnDOT Top 200 Crash Report 2012**
Infrastructure Considerations

Bridge Structures
All bridge structures are rated as Good or Satisfactory by the CIMS within the study area. No bridge is identified for required reconstruction.

Pavement Conditions
Minimal pavement reconstruction is required between Centreville Road and County Road E, according to the CIMS. Otherwise, pavement condition is rated as Fair for 2011 RQI, according to the CIMS, between County Road E and CSAH 96, and, Good between Little Canada Road and County Road E.
Transit Schedule Degradation
Multiple Metro Transit bus routes operate along the I-35E corridor, including two express routes to downtown St. Paul – the 275 Express and the 285 Express. These buses will be consolidated into one route starting in 2014, with MetroTransit’s intention to increase service in accordance with the Rush Line vision. Additionally, the Route 860 uses the commons portion with I-694. In the AM peak period, 14 buses run in the segment north of Little Canada Road and 12 buses run in the PM peak period in this segment. In the current freeway configuration, bus passengers face the same delays and unreliable schedules that other motorists face due to the lack of Bus Only Shoulders in the segment, as seen by degradation in travel times from schedule (Figure 21).

<table>
<thead>
<tr>
<th>Route</th>
<th>Daily Ridership</th>
<th>Daily Buses</th>
<th>Variation in Travel Time from Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td>275 Express</td>
<td>200</td>
<td>6</td>
<td>-7.8 minutes (SB) to +2.4 minutes (NB)</td>
</tr>
<tr>
<td>285 Express</td>
<td>203</td>
<td>6</td>
<td>-10.3 minutes (NB) to -7.2 minutes (SB)</td>
</tr>
<tr>
<td>860 Local</td>
<td>560</td>
<td>13</td>
<td>-11.9 minutes (NB) to -1.4 minutes (SB)</td>
</tr>
</tbody>
</table>

Figure 21: Observed Boardings and Travel Time, October / November 2013, MetroTransit.

Metro Transit operates the following park-and-rides in the corridor: St. Genevieve in Centreville, White Bear Theatre near Lino Lakes, Cub Foods at CSAH 96, and Maplewood Mall. Additionally, three park-and-rides have been identified for significant improvement in the CIMS. A $16 million investment will be made in the existing Maplewood Mall park-and-ride, a $2 million investment will be made in a park-and-ride at CSAH 14 and I-35E, and a $2 million investment will be made at a park-and-ride at County Road E and I-35E.
I-35E MnPASS Express Lanes Extension Project
Concept of Operations

Prepared by

PARSONS BRINCKERHOFF

February 18, 2014
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1. PURPOSE OF THE DOCUMENT

The purpose of this Concept of Operations is to describe the characteristics of the I-35E MnPASS Express Lanes system from the perspective of the operator – the Minnesota Department of Transportation (MnDOT) – and the users.

MnDOT and the Metropolitan Council have identified a plan for expanding the I-35E MnPASS Express Lanes that are scheduled to open in 2015 south of Little Canada Road north to County Road 96 or beyond. These MnPASS Lanes incorporate congestion pricing, also referred to as High Occupancy Toll (HOT) lanes or priced managed lanes, in order to improve efficiency and preserve the free-flow operations of the lanes, while maintaining priority use for carpools and transit buses. The I-35E MnPASS Express Lanes will operate as part of the growing regional system of MnPASS lanes that include facilities on I-394 and I-35W.

This document describes the concept of operation for the I-35E MnPASS Express Lanes under three separate concepts being studied to extend the MnPASS lanes north to County Road 96.
1.1. Glossary

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATM</td>
<td>Active Traffic Management</td>
</tr>
<tr>
<td>ATR</td>
<td>Automatic Traffic Recorder</td>
</tr>
<tr>
<td>AVI</td>
<td>Automatic Vehicle Identification</td>
</tr>
<tr>
<td>CCTV</td>
<td>Closed Circuit Television</td>
</tr>
<tr>
<td>CSC</td>
<td>Customer Service Center</td>
</tr>
<tr>
<td>CSR</td>
<td>Customer Service Representative</td>
</tr>
<tr>
<td>DMS</td>
<td>Dynamic Message Sign</td>
</tr>
<tr>
<td>DSRC</td>
<td>Dedicated Short Range Communications</td>
</tr>
<tr>
<td>ELOM</td>
<td>Express Lanes Operations Manager</td>
</tr>
<tr>
<td>ETC</td>
<td>Electronic Toll Collection</td>
</tr>
<tr>
<td>FHWA</td>
<td>Federal Highway Administration</td>
</tr>
<tr>
<td>FIRST</td>
<td>Freeway Incident Response Safety Team</td>
</tr>
<tr>
<td>HOT</td>
<td>High Occupancy Toll</td>
</tr>
<tr>
<td>HOV</td>
<td>High Occupancy Vehicle</td>
</tr>
<tr>
<td>HOV-2</td>
<td>Two-person carpool</td>
</tr>
<tr>
<td>HOV-2+</td>
<td>Two-or-more person carpool</td>
</tr>
<tr>
<td>ITS</td>
<td>Intelligent Transportation Systems</td>
</tr>
<tr>
<td>LOS</td>
<td>Level of Service</td>
</tr>
<tr>
<td>MnDOT</td>
<td>Minnesota Department of Transportation</td>
</tr>
<tr>
<td>MPH</td>
<td>Miles Per Hour</td>
</tr>
<tr>
<td>MUTCD</td>
<td>Manual on Uniform Traffic Control Devices</td>
</tr>
<tr>
<td>MVRD</td>
<td>Microwave Vehicle Radar Detectors</td>
</tr>
<tr>
<td>ORT</td>
<td>Open Road Tolling</td>
</tr>
<tr>
<td>RAMS</td>
<td>Revenue and Account Management System</td>
</tr>
<tr>
<td>RMS</td>
<td>Ramp Meter Signal</td>
</tr>
<tr>
<td>RTC</td>
<td>Roadside Toll Collection</td>
</tr>
<tr>
<td>RTMC</td>
<td>Regional Transportation Management Center</td>
</tr>
<tr>
<td>SOV</td>
<td>Single Occupant Vehicle</td>
</tr>
<tr>
<td>TP</td>
<td>Transaction Processor</td>
</tr>
<tr>
<td>VMS</td>
<td>Variable Message Sign</td>
</tr>
</tbody>
</table>
2. SCOPE OF THE PROJECT

The project limits of the I-35E MnPASS Express Lanes that will open in 2015 are generally described as I-35E between Cayuga Street and Little Canada Road. The design includes one buffer-separated express lane in each direction along I-35E, with access controlled through double white line striping. The MnPASS Lanes are accompanied by Active Traffic Management (ATM) over the MnPASS lane as well as traffic management systems with ramp meters, CCTV, and DMS as a safety and operations enhancement. MnDOT is responsible for the design and construction of the facility as well as maintenance and operations of the roadway, ATM, and ITS infrastructure. The MnPASS Operations will be supported by a toll services team under contract with MnDOT. Transit service on the corridor is provided by Metro Transit.

This document considers a Concept of Operation for I-35E that combines both the planned operation between Cayuga Street and Little Canada Road, and a potential extension of MnPASS further north to County Road 96. There are three concepts being considered for the MnPASS extension, including:
1) Priced Dynamic Shoulder Lane (PDSL) between Little Canada Road and County Road E with a new MnPASS lane north of the PDSL, 2) Discontinuous MnPASS Lane with the MnPASS lane stopping at the current planned limits near Little Canada Road, and resuming with a new MnPASS lane added between County Road E and County Road 96, and 3) Continuous MnPASS Lane involving the conversion of the left lane of I-35E to MnPASS between Little Canada Road and County Road E and connecting to a new MnPASS lane between County Road E and County Road 96. All three concepts include the same design for adding a new MnPASS lane between County Road E and County Road 96. This document will highlight operations considerations that require different approaches under each concept and note operations concepts are the same for each of the three concepts.

The following outlines the basic concept for how the I-35E MnPASS Express Lanes will be operated:

- The I-35E MnPASS Express Lanes will be operated in accordance with prevailing Federal law for interstate-based priced express lanes.
- Throughout the course of its operation, the MnPASS Express Lanes will utilize variable toll rates generated by prevailing levels of traffic and demand (“dynamic pricing”).
- As a goal, the MnPASS Express Lanes will be managed to maintain a minimum free flow speed of 45 mph or better (corresponding with a level of service “C”) 90% of the time for the weekday AM and PM peak periods in each direction.
- Toll rates will vary with traffic conditions so as to maintain the performance standards.
- The MnPASS Express Lanes will be monitored by MnDOT staff, with automated systems operated by the MnPASS Toll Services Provider.
- The MnPASS Express Lanes will be open to all eligible vehicles.
- Tolls will be collected electronically using existing MnPASS transponders. (By Federal law, national interoperable toll collection system(s) must be utilized by December 2016. At the time of this writing MnDOT is planning a new procurement of toll operations, and the transponder currently used on I-35W and I-394 MnPASS is subject to change.)
- Toll-exempt vehicles are not required to carry a transponder.
- Toll transactions will be conducted southbound in the AM peak and northbound in the PM peak.
- When not tolled the lanes will operate as general purpose lanes open to all traffic except for the PDSL segment which is closed to traffic when not in use.
- MnPASS Express Lanes signage will be in accordance with the 2009 Manual on Uniform Traffic Control Devices (MUTCD) Chapters 2F and 2G.
With the addition of new MnPASS lanes that add capacity to the corridor and expanded transit service, I-35E is undergoing a transformation. The projects will provide meaningful relief for a key congested corridor in the Twin Cities metro area, currently traveled by 120,000 vehicles per day. Implementation of the MnPASS Express Lanes will result in a more efficient use of available roadway capacity and improve traffic flow and reduce travel times in the corridor. In addition, the MnPASS Express Lanes will provide more consistent transit travel times for the many express transit routes that currently serve the corridor. MnPASS will provide commuters with a choice to avoid congestion or take high quality transit service. Through the tolling strategy, it is also an investment that sustains benefits in the long term.

Under the MnPASS Express Lane configuration, all eligible users (including high occupancy vehicles [HOV] with two or more occupants, motorcycles, buses and toll-paying single occupant vehicles [SOV]) will be able to access the MnPASS Express Lane at designated ingress/egress points.

The following identifies the design and operational parameters that inform this concept of operations.

- **Location.** The I-35E MnPASS Express Lanes will be located on the inside of each direction of the I-35E general purpose lanes between the median barrier and the left most general purpose lane.

- **Separation.** The Express Lanes will be separated from the general purpose lanes by a 2-foot buffer. The buffer will be delineated with a double white skip stripe in areas where access and egress into the lane is permitted or by a double solid white line where access is not permitted. For the PDSL concept, the PDSL lane would be separated from the general purpose lane by a solid yellow stripe.

- **Hours of Operation.** The MnPASS Express Lanes will operate as HOT lanes during peak weekday periods and as general purpose lanes at all other times. Closures will be conducted for periodic maintenance. Minnesota State Patrol (MSP) may either close the MnPASS Express Lanes or open them to all traffic for incident management purposes as to be defined in incident management protocol and policy.

- **Performance Objective.** Performance for the MnPASS Express Lanes will be oriented towards minimum speeds, in accordance with Federal Law. No operational guarantee will be offered to customers. The Express Lanes will be managed to maintain a minimum free flow speed of 45 mph and an average free flow (corresponding with a Level of Service [LOS] C).

- **Use of Express Lanes.**
  - Single-occupant passenger vehicles may utilize the Express Lanes in exchange for payment of a variable toll.
  - No tolls will be charged for buses, carpools or vanpools, motorcycles, and emergency responders.

- **MnPASS Express Lanes Closure.** The Express Lanes will close, from time to time, during which time no vehicles may access the Express Lanes.
  - For non-critical maintenance (including equipment servicing, equipment replacement, pavement repair, striping and signage, and other routine maintenance), the MnPASS Express Lanes may be closed in off-peak periods only.
  - For time-critical maintenance (such as pavement damage or debris blocking the Express Lanes), the MnPASS Express Lanes may be closed by MnDOT.
- For incidents (including crashes, obstructions, and other such events), the MnPASS Express Lanes may be closed to assist in incident management procedures as required by the responding agency.

- **MnPASS Express Lanes Open to all Traffic (no toll).** The MnPASS Express Lanes will open, from time to time, for incidents or emergency maintenance during which all traffic will have access to the lanes without tolls applied. In all cases, the request to open to all traffic must derive from emergency responders and MnDOT managers.
3. MnPASS GOALS AND OBJECTIVES

MnPASS Express lanes are a key multimodal strategy for addressing Twin Cities’ congestion and improving the region’s economy, environment and quality of life. They are a cost-effective solution that’s sustainable over a long period of time. They provide reliable congestion-free options for commuters, improve highway and bus transit performance, and better utilize available freeway capacity. The system has several key goals:

- **Provide more and better choices for commuters.** MnPASS lanes provide bus transit riders, van/carpoolers, motorcycles and solo drivers with an option to avoid congestion and enjoy a faster, safer, more reliable commute during rush hour periods.
- **Improve bus transit performance.** During congested rush hour periods, MnPASS lanes enable buses to operate at higher speeds and under safer conditions than they can on bus-only shoulders. MnPASS lanes also provide buses with more predictable trips which improves on-time performance. This improved service and the free use of the MnPASS lanes result in increased ridership and fare-box recovery.
- **Increase van/carpooling and Park & Ride use.** MnPASS lanes promote higher vehicle occupancies resulting in fewer vehicle miles traveled, improved system efficiency and many other regional benefits.
- **Improve overall corridor throughput.** MnPASS lanes increase the number of people that can be moved through a corridor during congested rush hour periods improving highway efficiency and decreasing the demand for additional highway capacity.
- **Encourage regional and corridor economic growth.** Because MnPASS lanes improve system efficiency and provide a reliable, congestion-free option, they enhance economic productivity and attractiveness for development.
- **Improve safety by reducing crashes.** Because MnPASS lanes help reduce congestion, they reduce vehicle collisions that result from recurring congestion.

The concepts being considered in this study will perpetuate these goals to additional system users and surrounding communities further north of I-694.
4. REFERENCE DOCUMENTS

The following are reference documents upon which this document is based:

- Concept of Operations for the I-35E Managed Lane from Little Canada Road to I-94
- Priced Managed Lane Guide, FHWA 2012
5. EXISTING CONDITIONS and EXPANSION CONCEPTS

I-35E is a key transportation facility for St. Paul and surrounding communities, the Twin Cities Region, and the state. I-35E not only connects the northern suburbs with St. Paul’s downtown and Capital area employment areas, but it also serves a vital interstate and commerce corridor and a key link to the MSP International airport. There are significant employment centers along this facility which draw residents from all over the Twin Cities Metro area. This congested corridor experiences several hours of congestion daily, and projections of the future peak-hour highway conditions show increased congestion in the corridor. Traffic already exceeds what the system can accommodate, resulting in traffic backups onto connecting freeways.

The following sections describe in more detail the planned operations of I-35E south of Little Canada Road after the MnPASS Express Lanes are open. Within each section this concept of operations will reflect how an extension of MnPASS to County Road 96 would integrate operations in conjunction with the planned operations for each of the three concepts (PDSL, Discontinuous, and Continuous). In many instances there is no difference in operation between the three concepts. Areas where the concepts diverge are in enforcement, toll zones, ITS infrastructure needs, maintenance, and access control.

5.1. Planned MnPASS Toll Technology

Under the MnPASS concept, the targeted LOS with MnPASS would be sustained at “C” with the implementation of the following proposed technology solutions.

- Dynamic pricing will control the toll rate based on the level of congestion in the MnPASS lanes. Rates will increase as the traffic in the MnPASS lane increases and are guided by business rules governing toll rates. Tolls would be assessed using electronic transponders;
- The number of access points to and from the MnPASS lane will be limited to pre-designated locations;
- I-35E loop detectors will continually monitor total traffic volumes and speed in the MnPASS lanes;
- The technology configuration will include Dynamic Message Signs (DMS) that display the current toll rate;
- A fiber-optic network of Roadside Toll Collection (RTC) sites read the transponders. The Roadside Collector Unit (RCU) is the primary computer that manages the communications. The Transaction Processor (TP) merges individual transactions into trips;
- The Revenue and Account Management System (RAMS) will handle payment processing, security/access and other financial issues.
- Mobile transponder readers will be added to State Patrol vehicles to allow officers enhanced enforcements of the I-35E MnPASS lane.
- The tolling technology will allow for the necessary monitoring of the HOV lanes to provide performance reports to FHWA including speed performance and lane usage.

It is anticipated that the I-35E tolling technology will comply with federal tolling interoperability requirements. The exact strategy to comply with these requirements will be determined prior to the implementation of the I-35E MnPASS lanes as part of the MnPASS Operations Contract with the Toll Services provider. Transponders on I-35E will be interoperable with I-394 and I-35W MnPASS systems.

5.2. Enforcement
General traffic enforcement along I-35E is currently carried out by the Minnesota State Patrol (MSP). Law enforcement stops are done generally on the paved right-hand shoulder.

The MnPASS Express Lanes will enforce HOV occupancy via the MSP under a contract with MnDOT for the service. Officers will enforce the facility daily during the morning and evening peak hours (6:00 a.m. to 10:00 a.m. and 3:00 p.m. to 6:00 p.m.). These shifts are in addition to the regular patrols, and are therefore considered overtime. Personnel are scheduled by MSP. Officers patrolling the MnPASS Express Lanes can respond to incidents on I-35E in order to maintain safety and improved incident clearance times so corridor operations can be restored quickly.

The toll system technology used on I-35W and I-394 MnPASS lanes comes equipped with multiple mobile enforcement tools, one being an enforcement transponder. The enforcement transponders are regular tolling transponders that are specially programmed to identify them as enforcement transponders. This enforcement tool operates at highway speeds as long as it is properly installed on the patrol vehicle’s windshield. The enforcement transponder beeps after passing under a toll reader if the vehicle in front of the trooper (in the MnPASS lane) had a transponder and it was identified by the toll system.

The second mobile enforcement tool provided with the toll system is the Mobile Enforcement Reader. The Mobile Enforcement Reader permits MnPASS enforcement activities by police officers while traveling at highway speeds. The Mobile Reader is permanently installed in a patrol vehicle. The Mobile Reader consists of a Reader Unit, Control/Display unit and two antennas. The Reader Unit is a transceiver which operates at 915 MHz frequency.

The Mobile Enforcement Reader (MER) permits the officer to safely and easily detect the presence and access the memory of a transponder within an adjacent vehicle traveling in the MnPASS lane.

The MSP will be contracted to provide increased enforcement on the I-35E MnPASS lanes during hours of tolling. Enforcement of the MnPASS lanes requires additional training as well as the MER technology installed in the vehicle. For this reason, MnDOT has contracted solely with the MSP on the existing I-394 and I-35W corridors. This agreement will continue on I-35E. Like I-394, the I-35E corridor will have one dedicated trooper on duty during tolling hours to provide extra enforcement of the MnPASS lane.

The typical enforcement method for MSP is to drive in the general purpose lane adjacent to the MnPASS lane. By using the MER technology, the state trooper is able to monitor the vehicles passing in the adjacent MnPASS lane. The MER device in the squad provides an audible tone that signals if the user of the MnPASS lane has a valid or invalid transponder. If no tone is heard, the state trooper must visually confirm the number of people in the vehicle before making a traffic stop.

From Maryland Ave to Hwy 36, the inside shoulder of the I-35E corridor will be limited to only 4 feet in width which will prohibit State Patrol from being able to pull a vehicle over to the left shoulder. This is similar in design to the I-35W corridor south of I-494. To stop a violator of the MnPASS lanes, the state trooper will either have to follow the vehicle either north of Hwy 36 or south of Maryland to make the traffic stop on the left shoulder or direct the violator to the right shoulder.

The tolling enforcement technology was developed by the current team providing toll services to MnDOT. This technology is subject to change when the MnPASS operations contract is renewed in 2014. For purposes of this plan, it is assumed though, that a mobile enforcement strategy similar to the existing strategy will be applied to I-35E. Video and license plate reader technology strategies for enforcement, or tolling, are not currently used in Minnesota.
Enforcement on PDSL Concept
Under the MnPASS Extension north of Little Canada Road the enforcement strategy is impacted by the ultimate design that is constructed. For the PDSL concept, the inside shoulder would be converted to a toll lane during peak periods. Like the section between Maryland Ave and Highway 36, this would leave no inside shoulder suitable for enforcement vehicles to monitor lanes, nor to pull over vehicles that are violating the HOV requirements. For southbound enforcement operations MSP would only have the left shoulder available for stops between Little Canada Road and Highway 36. In the PDSL concept for northbound 35E there would be no inside shoulder between Little Canada Road the end of the MnPASS lane at County Road 96. When no left shoulder exists, enforcement must pull the violator over to the right shoulder, weaving them across all general purpose lanes to the shoulder. While conducting enforcement without a left shoulder is difficult it has accomplished on I-35W.

Under the PDSL concept there is also a discontinuous section of MnPASS Express lane for both northbound and southbound operations. Southbound this segment is between the end of the PDSL and the start of the MnPASS lane south of Little Canada Road, and northbound between the end of the MnPASS lane at Little Canada Road and the beginning of the PDSL north of Little Canada Road. These segments will technically be a short general purpose lane segment. All traffic is allowed within this segment. Operationally there is no HOV violation to enforce within this short discontinuous segment.

Enforcement in Discontinuous MnPASS Concept
In the discontinuous concept, a full left shoulder remains between Little Canada Road and County Road E. This should will be an effective and safe location to stop vehicles that violated the HOV requirements southbound between County Road 96 and County Road E or Northbound between Maryland Avenue and Little Canada Road. In the discontinuous concept the left lane acts as a general purpose lane between County Road E and Little Canada Road, for enforcement the MSP officer would need to see the HOV violation occur within areas where MnPASS occurs then follow the driver into the discontinuous area and make the enforcement stop on the left shoulder. Like the PDSL concept, the enforcement stop can occur on the right shoulder if the violator weaves across all general purpose lanes to the shoulder.

It would be expected that the discontinuous concept would be less understood by drivers and could lead to a higher rate of HOV violations in areas downstream of the discontinuous section. Effective signing indicating tolling status (tolled/not tolled) at the end of the discontinuous segment will be important to minimize confusion.

Enforcement in the Continuous Concept
Like in the discontinuous concept, a full left shoulder remains between Little Canada Road and County Road E. This shoulder will be an effective and safe location to stop vehicles that violated the HOV requirements southbound between County Road 96 and County Road E or Northbound between Maryland Avenue and Little Canada Road. However, for this concept because the left lane is a MnPASS lane in the peak period, MSP can enforce HOV violations within this area. In addition, this concept is the only option to be able to use a left shoulder to allow MSP officers to stage for enforcement adjacent to the MnPASS lane or pull over violators on the left shoulder. This is a distinct benefit over the other concepts.

5.3. Tolling Infrastructure
Along with the future I-35E MnPASS Express Lanes, there are two other MnPASS facilities in the Twin Cities Metro Area on I-394 west of Downtown Minneapolis and I-35W south of Downtown Minneapolis. It is important that all of the facilities are interoperable with the MnPASS toll transponder. The toll services provider issues the transponders and manages all of the customer accounts for toll
facilities. The following describes the electronic toll collection technologies and policies that are currently in place for each facility:

- **I-394 MnPASS Express Lanes:** This 11 mile system was the first MnPASS corridor and has both a two-lane reversible segment and a single lane, non-barrier separated segment. Access to the reversible segment is controlled by automatic gates located at junctions with Downtown Minneapolis, I-94, Dunwoody Blvd, and TH 100. Access on the single lane MnPASS is managed through striping and signing, with double white lines restricting access, and skip striping in entry/exit points. Dynamic Message Signs (DMS) display the toll price prior to each entry point in the corridor. The facility is divided into two toll zones in each direction. In the AM peak, the MnPASS lane is tolled in the eastbound direction, in the PM peak it is tolled in the westbound direction. The tolling is from 6 to 10 AM and 2 to 7 PM. The exception to these hours is in the reversible section of the highway. For the reversible segment, it is always tolled when open.

- **I-35W MnPASS Express Lanes:** This 18 mile system is divided into three toll zones in the northbound direction and two toll zones in the southbound section. In the northbound section zone three is a priced dynamic shoulder. In the peak period this third northbound zone becomes part of the second zone for tolling purposes, but in off peak times, the PDSL is tolled whenever it is open to traffic. Like I-394, the 35W tolling hours are set to operate in peak periods and peak direction of travel. South of 494, tolling is northbound in the AM peak and southbound in the PM peak. North of I-494, tolling occurs in both peak periods in both directions due to higher traffic demand.

- **I-35E MnPASS hours:** For I-35E, tolling will occur southbound in the AM peak (6 to 10 AM) and northbound in the PM peak (3 to 6 PM). The segments between Maryland Avenue and Little Canada Road will operate as a single toll zone in each direction. It is assumed under all three concepts that where would be a single toll zone both northbound and southbound directions encompassing both the area of the concept and the new MnPASS Express Lanes south of Little Canada Road. Splitting I-35E into two zones in each direction should be considered if the MnPASS system is extended further north from County Road 96.

5.4. **ITS Infrastructure**

There are various ITS components utilized along this segment of the I-35E corridor. These include:

- **Closed Circuit Television (CCTV) Cameras:** There are a total of 10 existing CCTV in this segment of the I-35E between I-94 and Country Road 96 used by MnDOT. The CCTV cameras are used for monitoring travel conditions in the corridor, such as weather conditions, accidents, traffic congestion, and other events (reversible gate closure/opening). The video images are also shared with the public via the internet (www.511mn.org) and direct feeds to television news agencies.

- **Communications Backbone:** The existing communication network along the I-35E corridor consists of a fiber-optic backbone. Data is sent to and from field devices to MnDOT’s RTMC and to the MnPASS Customer Service Center facility in Golden Valley.

- **Ramp Meter Signals (RMS):** The I-35E corridor is managed by ramp meters through the entire segment from County Road J to I-94 and further south.

- **ITS Software:** There are several existing software programs used to assist with ITS infrastructure maintenance and operations.
• MnDOT’s Intelligent Roadway Information System Software (IRIS): IRIS software was developed by MnDOT to integrate and manage various ITS devices into a single program. The software resides at the RTMC and is used to post messages to the various DMS, collected detector information, control ramp meters, manage CCTV and perform various system administration and operation functions. The program is also used to collect and assemble data and disseminate this information to the travelling public or private vendors who repackage the information.

• MnPASS System Software (Various): The software that is central to toll lane operations, customer service management, and financial operations is provided by the toll services vendor team. This software sets toll rates, manages customer accounts, processes transactions, administers the system, and collects and stores data for reporting, billing and other standard functions. The toll systems interface with MnDOT’s systems in order to get real time traffic data to calculate toll rates from the loop detectors that are managed by MnDOT.

Dynamic Message Signs (DMS): There are a total of five existing DMS in this segment of the I-35E corridor used by MnDOT. The DMS not dedicated to the I-35E MnPASS Express Lanes are used for a wide range of other purposes, including providing driver information regarding weather advisories, travel times, amber alerts, and construction and incident notifications. MnDOT is planning the use of full color matrix dynamic messages signs for the I-35E MnPASS pricing sign. This type of sign provides greater flexible in the types of messages displayed over the MnPASS Express Lanes. Current practice on I-394 and I-35W is to use a static sign with dynamic inserts that display the price of the MnPASS lanes. The dynamic inserts only allow for nine alpha-numeric characters, which limit the amount of messaging displayed on the sign. During non-tolling hours the signs read “OPEN”, which has created confusion to some motorist, as it is not clear what open implies.

The proposed full color matrix DMS would allow for more flexibility in the messaging allowing operations staff to display either “OPEN TO ALL TRAFFIC” when the lane is not currently being restricted, or “CRASH, LEFT LANE CLOSED” when an incident or roadwork has closed the lane.

This proposed DMS is a walk-in device similar to the standard freeway overhead DMS. The sign is 18 ft. wide rather than the standard 30 ft. wide. As a walk-in DMS, the sign will be easier to maintain than the standard pricing signs on I-394 and I-35W as it does not require a lane closure to work on the DMS mounted to the front of the static sign.

To accommodate both the pricing sign and the standard overhead message sign, the DMS on southbound I-35E at Roselawn Ave will be a 40 ft. DMS capable of displaying both the pricing sign messages on the far left over the MnPASS Lanes while allowing incident messages and travel times to be displayed on the right most side of the DMS over the general purpose lanes.

The three figures below display examples of typical messages on DMS.
Figure 5.1 Example of MnPASS Express lane Sign with Two toll Zones on NB 35E.

Figure 5.2. Example of MnPASS Express Lane Sign Message during Off Peak /Non Tolling Time.
Additional pricing dynamic message signs will be required under each of the three concepts.

5.4.1. **Priced Dynamic Shoulder Lane Striping and Signing**

The PDSL concept will extend MnPASS an additional 5 miles from current start/end point near Little Canada Road. Dynamic signing will be needed to both provide toll rate information and to notify drivers if the shoulder is open or closed. The location of toll rate signs should be at logical places where users would want to enter the MnPASS lane. In the southbound direction, these locations would be at the beginning of the system near County Road 96 and west of Edgerton Road. For northbound the locations would be at the beginning of the PDSL and south of County Road E.

The PDSL design developed on I-35W has the dynamic shoulder lane separated from the general purpose lanes by a single solid yellow stripe. An additional yellow stripe can be placed along the center median barrier to improve lane visibility. This dual yellow line design concept would be the design of I-35E. Skip striping design for a mid-point access to encourage access in an out of the PDSL at a location near Edgerton Road should be explored.
Figure 5.4 Striping and Signing with PDSL open

Figure 5.5 Striping and Signing with PDSL closed
Lane widths for the dynamic shoulder will be at 13 ft with the adjacent general purpose lane being 11 ft wide. Between the dynamic shoulder lane and the general purpose lanes is a 2 ft buffer. Reaction distance from the dynamic shoulder lane to the center median barrier is 2.9 ft. Static signing as shown in Figure 5.6 together with intelligent lane control signals will designate when the shoulder lane is open to traffic.

The message signs used to tell drivers if the PDSL is open or closed would be placed at approximately ½ mile intervals over the PDSL with placement based on a goal of having a minimum of two changeable message signs indicating lane status visible to drivers at all times.

5.4.2. Priced Dynamic Shoulder Lane Transitions (Closing and Opening Lanes)

When the priced dynamic shoulder lane becomes blocked for any reason, either due to an incident or normal hours of operations, the RTMC operators shall implement a red ‘X’ in the overhead lane closure to indicate that the lane is closed. Advance signing will warn motorists the lane is closed up to 1 mile in advance of the closure point.

The overhead red ‘X’ will advise travelers that the lane is blocked or not passable, however nothing will physically prevent vehicles from using the lane, nor should the lane be presented to travelers as being a safe location to stop (as would be the case with dedicated shoulders).

Before removing the red ‘X’ from the overhead sign, and returning the overhead lane management sign to either blank or an arrow, the entire dynamic lane shall be observed by camera views within the RTMC and driven by a FIRST vehicle to verify that all debris or vehicles have been removed.

![Figure 5.6 Static/Dynamic sign for Dynamic Shoulder Lane](image)

5.4.3. MnPASS Operations in the Priced Dynamic Shoulder Lane

During periods of the day when the dynamic shoulder lane is ‘Priced’, the operations of the lane shall be in accordance with the MnPASS operations along the other stretches of I-35E, with the following exceptions:

- The priced dynamic shoulder lane will have a solid, single yellow line (as opposed to a double white line); therefore legally vehicles may move in and out of the lane at any time. Therefore, the
placement of the MnPASS readers determined during the design process must account for the increased flexibility in accessing the lane.

5.4.4. Pricing Sign Locations, Access Management and Readers

Tables 5 through 8 lay out the location of planned pricing signs, toll readers and access control through double white lines or open skip stripes between Little Canada Road and I-94. It is assumed that these locations will remain as planned for any of the three concepts. Tables 9 through 12 show proposed general sign and toll reader locations and access treatments for the three concepts.

5.4.5. Table 5: Southbound Pricing Signs and Readers

<table>
<thead>
<tr>
<th>Station</th>
<th>Location</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>636+14</td>
<td>South of Little Canada Rd</td>
<td>18 foot Price Sign</td>
</tr>
<tr>
<td>622+20</td>
<td>North of TH 36</td>
<td>Tolling Reader</td>
</tr>
<tr>
<td>589+25</td>
<td>Roselawn Ave</td>
<td>40 foot DMS sign/Price Sign</td>
</tr>
<tr>
<td>516+80</td>
<td>Arlington Ave</td>
<td>Tolling Reader</td>
</tr>
</tbody>
</table>

5.4.6. Table 6: Southbound Access

<table>
<thead>
<tr>
<th>From</th>
<th>To</th>
<th>Access</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>North of T.H. 36</td>
<td>Continue MnPASS Lane</td>
</tr>
<tr>
<td>North of T.H. 36</td>
<td>Roselawn Ave</td>
<td>Closed (double white line)</td>
</tr>
<tr>
<td>Roselawn Ave</td>
<td>South of Wheelock Pkwy</td>
<td>Open</td>
</tr>
<tr>
<td>South of Wheelock Pkwy</td>
<td>North of Maryland Ave</td>
<td>Closed (double white line)</td>
</tr>
<tr>
<td>North of Cayuga St</td>
<td></td>
<td>End Lane Restriction</td>
</tr>
</tbody>
</table>
5.4.7. Table 7: Northbound Pricing Signs and Readers

<table>
<thead>
<tr>
<th>Station</th>
<th>Location</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>428+43</td>
<td>Pennsylvania Ave</td>
<td>18 foot Price Sign</td>
</tr>
<tr>
<td>457+00</td>
<td>North of Cayuga St</td>
<td>Tolling Reader</td>
</tr>
<tr>
<td>510+00</td>
<td>South of Arlington Ave</td>
<td>18 foot price sign</td>
</tr>
<tr>
<td>569+00</td>
<td>Roselawn Ave</td>
<td>Tolling Reader</td>
</tr>
</tbody>
</table>

5.4.8. Table 8: Northbound Access

<table>
<thead>
<tr>
<th>From</th>
<th>To</th>
<th>Access</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cayuga St</td>
<td>Begin MnPASS Lane</td>
</tr>
<tr>
<td>Cayuga St</td>
<td>North of Arlington Ave</td>
<td>Closed (double white line)</td>
</tr>
<tr>
<td>North of Arlington Ave</td>
<td>Roselawn Ave</td>
<td>Open</td>
</tr>
<tr>
<td>Roselawn Ave</td>
<td>South of Little Canada Rd</td>
<td>Closed (double white line)</td>
</tr>
<tr>
<td>South of Little Canada Rd</td>
<td></td>
<td>End Lane Restriction for Discontinuous Access/Continue</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Land restriction for PDSL and Continuous</td>
</tr>
</tbody>
</table>
5.4.9. **Table 9: Proposed Southbound Pricing Signs and Toll Readers for Concepts**

<table>
<thead>
<tr>
<th>Location</th>
<th>Concept: PDSL</th>
<th>Concept: Discontinuous</th>
<th>Concept: Continuous</th>
</tr>
</thead>
<tbody>
<tr>
<td>North of County Road 96</td>
<td>18 foot Price Sign</td>
<td>18 foot Price Sign</td>
<td>18 foot Price Sign</td>
</tr>
<tr>
<td>South of Country Road 96</td>
<td>Toll Reader</td>
<td>Toll Reader</td>
<td>Toll Reader</td>
</tr>
<tr>
<td>North of County Road E</td>
<td>18 foot Price Sign</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>South of County Road E</td>
<td>None</td>
<td>None</td>
<td>18 foot Price Sign</td>
</tr>
<tr>
<td>West of Edgerton Road</td>
<td>Toll Reader / 18 foot Price Sign</td>
<td>None</td>
<td>Toll Reader / 18 foot Price Sign (place on separate structures)</td>
</tr>
</tbody>
</table>

5.4.10. **Table 10: Proposed Southbound Access for Concepts**

<table>
<thead>
<tr>
<th>From</th>
<th>To</th>
<th>Concept: PDSL</th>
<th>Concept: Discontinuous</th>
<th>Concept: Continuous</th>
</tr>
</thead>
<tbody>
<tr>
<td>County Road 96</td>
<td>County Road E</td>
<td>Open</td>
<td>Open</td>
<td>Open</td>
</tr>
<tr>
<td>County Road E</td>
<td>Little Canada Rd</td>
<td>Solid Yellow Line</td>
<td>Open Access</td>
<td>Open</td>
</tr>
</tbody>
</table>
### 5.4.11. Table 11: Proposed Northbound Pricing Signs and Toll Readers for Concepts

<table>
<thead>
<tr>
<th>Location</th>
<th>Concept: PDSL</th>
<th>Concept: Discontinuous</th>
<th>Concept: Continuous</th>
</tr>
</thead>
<tbody>
<tr>
<td>North of Little Canada Road</td>
<td>18 foot Price Sign</td>
<td>None</td>
<td>18 foot Price Sign</td>
</tr>
<tr>
<td>East of Edgerton</td>
<td>Toll Reader</td>
<td>None</td>
<td>Toll Reader</td>
</tr>
<tr>
<td>South of County Road E</td>
<td>18 foot Price Sign</td>
<td>18 foot Price Sign</td>
<td>18 foot Price Sign</td>
</tr>
<tr>
<td>South of County Road 96</td>
<td>Toll Reader</td>
<td>Toll Reader</td>
<td>Toll Reader</td>
</tr>
</tbody>
</table>

### 5.4.12. Table 12: Proposed Northbound Access for Concepts

<table>
<thead>
<tr>
<th>From</th>
<th>To</th>
<th>Concept: PDSL</th>
<th>Concept: Discontinuous</th>
<th>Concept: Continuous</th>
</tr>
</thead>
<tbody>
<tr>
<td>Little Canada Road</td>
<td>County Road E</td>
<td>Solid Yellow line/Open Access</td>
<td>Open</td>
<td>Open/Partial Closed Double White</td>
</tr>
<tr>
<td>South of County Road E</td>
<td>County Road 96</td>
<td>Open Access</td>
<td>Open Access</td>
<td>Open Access</td>
</tr>
</tbody>
</table>

### 5.5. Roles and Responsibilities

There are several key groups that will have a role in the operation of the proposed MnPASS Express Lanes facility. These groups, along with their responsibilities relating to ITS and tolling, are discussed below:

- **Toll Services Provider**: Managed by MnDOT, the provider has the responsibility for managing, maintaining and operating the MnPASS lane and its customers.
- **MnDOT Metro District RTMC**: The RTMC staff would operate and maintain the existing and proposed ITS infrastructure. This includes the ITS elements discussed previously, including toll rate signs, but would not include the tolling equipment. RTMC staff would be responsible for managing the Toll Services Provider contract.
- **Metropolitan Council**: The Council will be involved as the Metropolitan Planning Organization (MPO) for the project.
- **Metro Transit**: Metro Transit operates the buses that will utilize the MnPASS facility and serve the planned new park and rides at County Road E and County Road 14.
- Federal Highway Administration (FHWA): Since I-35E is part of the United States Interstate System, FHWA will have input into the final design of the facility and ongoing oversight of performance requirements under Federal Law for Express Lanes (generally codified under 23 USC 129 and 23 USC 166).

- Law Enforcement Agencies: The Minnesota State Patrol (MSP) will have a critical role of providing enforcement along the facility to ensure safe operations and also enforcing compliance with HOV occupancy requirements.
6. PROJECT NEEDS

In order to achieve the goals, the primary needs of the MnPASS Express Lane system are as follows:

- Maximize reliability;
- Maximize person throughput
- Minimize burden on users;
- Minimize revenue loss;
- Match driver expectancy;
- Maintain consistency with existing MnPASS facilities; and
- Maximize enforcement efficiency,

6.1. Operational Needs

Efficient operation of the system is critical in order to achieve one of the primary goals of the project, to improve the efficiency of the corridor as a whole and improve travel times for all users. As a result, the system will need to incorporate the following operational needs:

- Provide service during designated weekday peak periods, with periodic closures to perform maintenance being conducted outside of peak periods
- Provide effective ingress and egress points
- Provide a means to effectively accommodate the following user classes:
  - Transit vehicles
  - Eligible HOV users
  - Toll-paying users
  - Motorcycles
  - Emergency response vehicles
- Allow for efficient equipment maintenance
- Allow for efficient snow removal
- Effectively manage incidents in the general purpose lanes
- Effectively manage incidents in the MnPASS Express Lane
- Perform effective HOV violation enforcement

6.2. Enforcement Needs

Effective enforcement is a key component of the MnPASS system. Law enforcement personnel will need to have the ability to properly enforce the facility by having safe, effective locations to identify violators and issue citations. Potential enforcement strategies and technologies that demonstrate this will need to be provided.

6.3. Technological Needs

The MnPASS system must satisfy several technological needs. These include:

- Tolled users must be identified by the system in order to assess tolls through a transponder
- Toll tag readers must be able to read transponders that work on any part of the MnPASS network.
- The technology needs to allow customers to be able to pay a toll if driving solo, or not be charged if they are in a carpool.
- The system will need effective ITS subsystems to support tolling and traffic operations
7. TOLL and ATM Concepts

This section articulates the various use alternatives as they affect travellers on the I-35E MnPASS Express Lanes.

7.1. Toll Concepts

The toll system to be deployed on the I-35E MnPASS Express Lanes is envisioned to follow the same concept as I-35W and I-394 MnPASS. The foundation of this concept is that only solo drivers are required to have a transponder/account. Carpools, transit, and motor cycles are free to use the lane and are not required to have a transponder.

7.1.1. General Principles

7.1.1.1. Transponder Use

The primary means of electronic tolling involves the use of electronic toll tag readers that read data from transponders mounted on vehicles. There are two main types of toll tag transponders in the industry today - a hard plastic form factor transponder and a sticker transponder, both of which are typically installed on the vehicle windshield. Both types of transponders are used by agencies throughout the United States and internationally. The MnPASS system uses the plastic form factor and has the ability for the system to read data from and write data to the transponder. The transponder market has changed since the inception of MnPASS, particularly in toll systems where HOV are required to have a transponder but can pay a discounted rate compared to an SOV. This transponder, called a “switchable transponder” due to a manual pull-down or switch mechanism to engage an HOV declaration is used in systems in California, Colorado, Georgia and Washington.

7.1.1.2. Concept Consistency

There are no differences in transponder or toll technology for any of the three concept alternatives being considered for the MnPASS extension.

7.1.2. Legacy Toll Tag

7.1.2.1. Form Factors

Hard case transponders are the more prevalent type of transponder, given that they have been in circulation longer and because some of the new tolling schemes being implemented necessitate their use. These transponders are small hard plastic cases that typically attach to the inside of the windshield via Velcro and contain the necessary electronic components to be read by roadside toll tag readers to identify the user and record the transaction. Each transponder is set with a unique independent electronic signature that is linked to a specific user account. The transponders currently used in Minnesota are plastic cases with batteries that are placed in clips mounted on the windshield. The battery has an expected life of 5 years.

The type of transponder that is rapidly gaining in popularity is a sticker-type transponder. As the name implies, this type of transponder is not manufactured with a large hard case form factor, but instead is a sticker or thin plastic strip containing the electronic toll tag. These sticker-type transponders have certain advantages over hard case transponders. They are smaller, less expensive (generally cost only $1 - $2 as compared to $28 per unit for the MnPASS hard case transponders), and are passive tags that do not require a battery. Generally, sticker-type transponders are placed on a vehicle’s windshield; however, there are variations that can be mounted outside on the vehicle’s bumper or headlamp. Sticker transponders on the market use an open
protocol tag known as ISO 18000-6C (often referred to simply as “6C”). It is assumed for purpose of this document that the sticker tag will not be used on I-35E.

7.1.2.2. Use of Facility
SOVs that wish to use the I-35E MnPASS Express Lanes and are equipped with hard case transponder and have an active MnPASS account may use the MnPASS Express Lanes. These users will be charged the toll rate displayed (regardless of the number of occupants in the vehicle).

7.2. Active Traffic Management Concepts
This section addresses the role of Active Traffic Management (ATM) within the operation of the I-35E MnPASS Express Lanes corridor.

ATM is a traffic management strategy primarily aimed at reducing collisions and the negative effects that result from collisions. Collision rates have a direct relationship to congestion. The greater the congestion levels the more likely collisions are to occur. The primary purpose of ATM is to reduce collisions that occur on congested urban freeways and secondarily to address the congested conditions, themselves. ATM can be defined as a system that dynamically manages and controls traffic based on prevailing conditions in order to improve safety.

MnDOT has deployed the concept for the ATM on I-94 and I-35W, with the I-35W system including a MnPASS lane in addition to the ATM. ATM in Minnesota includes two major component subsystems: lane use control, speed advisory/queue warning. On the two existing ATM corridors, the lane use control subsystem is implemented through the use of overhead lane use signs spaced at half mile intervals, over each lane. The I-35E ATM system will be deployed only over the MnPASS lane and will be used for lane use control but not speed advisory or queue warning.

PDSL Concept ATM
There are significant differences between the three concepts in ATM design between Little Canada Road and County Road E. For a PDSL operation, ATM infrastructure is needed to indicate if the shoulder is open or closed to traffic and to indicate the starting and ending points of the PDSL. Based on the design of the PDSL on 35W, a dynamic message sign will be needed at the transition point to the shoulder lane.

The DMS would display a Green downward arrow when the PDSL is open and a Red X when the PDSL is closed. The arrow is used in conjunction with a static regulatory sign that as shown in figure 7.1.

The ATM DMS can be embedded within the static sign or a separate sign located below the static sign.

DMS located over the PDSL will need to be repeated every ½ mile or less along the entire distance of the PDSL to convey to the motorists that current status (open or closed) of the shoulder. To minimize infrastructure costs sign structures should be designed and located to hold both northbound and southbound PDSL DMS.

ATM with Discontinuous and Continuous Concepts.
There are no additional ATM signing required for the Discontinuous and Continuous Concepts.
8. PROPOSED PROCEDURES

8.1. MnPASS Express Lanes Policies

8.1.1. Hours of Operation
During the operational hours for the I-35E MnPASS Express Lanes, eligible users will be permitted access to the Express Lanes. The hours of operation will 6 to 10 AM in the southbound direction and 3 to 6 PM in the northbound direction. There is no difference in hours of operation of tolling for any of the three concepts. The PDSL could be opened to all traffic (non-tolled) in off peak hours if needed for managing traffic due to an incident or construction/maintenance activity.

8.1.2. Vehicle Eligibility
Federal law regarding Express Lanes (generally codified under 23 USC 129 and 23 USC 166) allows for the consideration of transit, para-transit, motorcycles, toll-paying single-occupant vehicles, and designated hybrids on HOV lanes operated on roadways constructed with federal funds. Furthermore, performance requirements under the law requires MnDOT, in consultation with partnering agencies, to change the operation policy for any express lane on the state roadway system, including minimum occupancy, hours of operation, pricing, and exceptions to these policies, if the express lanes degrade beyond defined performance minimums. It is under the performance requirements that vehicle eligibility may be altered.

During tolling hours, the MnPASS Express Lanes operated on I-35E will be restricted to the following vehicles:

- Single Occupant Vehicles. Single-occupant vehicles will pay the applicable toll rate by toll transponder.
- High-occupancy vehicles. Carpool customers meeting the requisite occupancy requirement of two or more persons will not be charged a toll for use.
- Motorcycles will not be charged a toll.
- Buses and vanpools will not be charged a toll at any time.
- Emergency and enforcement vehicles will not be charged a toll, provided they are responding to a dispatched event, and will not require a transponder.

8.2. Operational Requirements
The I-35E MnPASS Express Lanes operation will be managed by toll services provider staff on behalf of MnDOT. Transit operations will be maintained by Metro Transit. Enforcement will be managed and conducted by the MSP.

MnDOT’s RTMC oversees all system operations, incident management, and maintenance activities. The MSP will provide an enforcement supervisor, who is responsible for overseeing all MSP assigned to enforcing the occupancy and access provisions of the lane.

Whenever it is deemed necessary by the MSP or MnDOT, the operation of the MnPASS Express Lanes may be suspended. Suspension may be due to the presence of a corridor-wide incident, an incident within the MnPASS Lanes, severe weather, debris that impedes traffic, and other unsafe conditions. All suspension decisions will be coordinated with MnDOT. MnDOT and the toll services provider will ensure that changes in toll collection, including transaction nullification, are in keeping with the process identified in the business rules.
8.2.1. MnPASS Express Lanes Operations Manager
The toll services provider is located in the MnPASS Customer Service Center in Golden Valley, and manages all MnPASS operations, including:

- Coordinate work between MNDOT and the MSP with a responsibility for MnPASS Express Lanes and corridor operations for delivery and operations
- Toll system maintenance and capital equipment installation (Except Pricing Signs)
- Monitor MnPASS Express Lanes level of service and conduct speed and travel time studies as requested by MnDOT to meet Federal standards
- Provide recommendations to MnDOT to improve the MnPASS performance
- Monitor operations
- Log all information pertaining to incidents or requirements for toll nullification
- Relay information to traffic service entities and transportation agencies
- Manage maintenance of the toll collection system
- Manage customer service functions

8.2.2. Enforcement
The MSP supervisors are responsible for the direct supervision of the state troopers patrolling the MnPASS Express Lanes. The troopers will patrol the MnPASS Express Lanes and monitor the operation of each Express Lane from positions as directed by the supervisor. Troopers in the field will assist in the opening and closing operations of the Express Lanes, as necessary.

Troopers will facilitate the movement of the vehicles using the Express Lanes, enforce the rules and regulations, and enforce traffic laws under Minnesota law.

8.3. Enforcement Parameters
This section addresses the role of MSP relative to the movement of vehicles upon the I-35E MnPASS Express Lanes. This section complements existing policies concerning crash investigation, traffic law enforcement, and staffing.

8.3.1. Jurisdiction
The MSP, operating under the authority of Minnesota state statutes, possess the full authority for enforcing the policies and use of the MnPASS Express Lanes.

8.3.2. Vehicle Eligibility Enforcement
In order to maintain a high person-throughput, quality level of service, and long-term return on investment, the I-35E MnPASS Express Lanes must endeavor to minimize violations and improve enforcement of the facility's restrictions and requirements. Vehicle occupancy enforcement will be undertaken utilizing the current state of the practice for the safe and efficient enforcement of vehicle occupancy. As occupancy technology is continuing to evolve, the specific methodologies approved by MnDOT in occupancy enforcement will change over time as required to reasonably maintain state of the practice status.

8.3.3. Observation by Field Personnel
MnDOT, its contractors, and others with prior approval by MnDOT may observe traffic in the MnPASS Express Lanes for the purpose of understanding and reporting on Express Lane operation. This can include congestion levels, general observation of flow and operating conditions, as well as observation of vehicular occupancy. However, only officers from the MSP or local law enforcement agencies are authorized to issue traffic citations on the MnPASS Express Lanes.
8.4. Tolling Operations

The following functional descriptions are the basis for detailed tolling systems and technology requirements for implementation of the I-35E MnPASS Express Lanes. Key overarching requirements for the project are:

- The technologies required for the I-35E MnPASS Express Lanes enable “open road tolling” – A method of electronic toll collection where vehicles enter and exit a toll zone at main-line speeds without traversing a toll plaza or engaging infrastructure that causes the vehicle operator to alter or modify his speed or direction (IBTTA definition).
- The systems and technologies require interoperability with the entire MnPASS network. In addition, the systems should be able to comply with future US-wide interoperability requirements, by the 2016 deadline set forth in the Federal MAP-21 act. At this time, MnDOT has not determined how the system will be configured and operated to meet the future national interoperability requirement.

There is no difference in toll operations between the three concepts.

8.4.1. Toll Collection

The appropriate combination of technology and operational procedures is needed to meet the functional requirements of pricing in the MnPASS Express Lanes. The toll collection system consists of the following four primary components:

- Collecting the toll. Toll collection involves a transfer of data via electronic technology with actual money changing hands through other means (i.e. there will be no toll booths for cash payments). It is necessary to ensure the correct toll is collected, and that toll avoidance and user fraud is discouraged.
- Setting the toll rate. The toll rate must be determined, and the fees clearly conveyed to the user. Toll rates will vary based on the level of congestion and the number of vehicles which is critical to the use of variable pricing as a congestion management tool. The dynamic tolling algorithm used on I-35E will be the same as used on I-35W and I-394.
- Enforcement against violations. Identify, quantify, and mitigate potential losses due to HOV and toll violations, including the use of fair and consistent enforcement to ensure that there is an acceptable level of compliance.
- Management and accounting. Toll collection, audit, accounting, maintenance, security, customer service, and enforcement must be managed, with a full accounting of all revenue and costs associated with the operation.

8.4.2. Mechanisms

Toll collection will be performed using Electronic Toll Collection (ETC). The development of ETC has evolved into Open Road Tolling (ORT) which provides the most appropriate method for collecting tolls on Express Lane facilities. The use of ORT eliminates the need for Express Lane users to stop and pay a toll at a toll booth.

ORT depends on the ability to uniquely identify every vehicle that passes a tolling point. The primary means is through the use of automatic vehicle identification technology (AVI). AVI involves the transmission of an identification code between an in-vehicle device and a roadside reader. The in-vehicle device, called a transponder, is a Radio Frequency Identification (RFID) unit that transmits a radio signal to the roadside reader. The identification code is linked to the customer’s account, which is automatically debited for the amount of the toll.
The proposed tolling concept for the MnPASS Express Lanes includes the following components and characteristics:

- **All Cashless Tolling:** Tolls shall be collected electronically from vehicles equipped with a transponder traveling at freeway speeds. There will be no tollbooths or other stop-and-pay mechanisms.
- **All Toll-free Vehicles do not need a transponder:** All eligible vehicles wishing to use the MnPASS Express Lanes toll-free (e.g., HOV, motorcycles, transit) will not be required to have transponders.
- **Dynamic Pricing:** The amount charged to MnPASS Express Lanes toll payers will vary based upon a rates calculated through a dynamic pricing algorithm. The rate can vary every three minutes and at each toll read point. In general the rate is set based on the worst level of service downstream from the toll point. Rates vary from $0.25 to $8.00 and the customer only pays the rate displayed on the toll signs at the toll point where there transponder is detected.

**8.4.3. Toll Rate Setting**

The toll rate will be set based on current traffic conditions in the MnPASS lane, as is currently done on the on I-35W and I-394. The amount charged to MnPASS Express Lanes toll payers will vary based upon a rates calculated through a dynamic pricing algorithm. The rate can vary every three minutes and at each toll read point. In general the rate is set based on the worst level of service (in the MnPASS Express Lane) downstream from the toll point. Rates vary from $0.25 to $8.00 and the customer only pays the rate displayed on the toll signs at the toll point where there transponder is detected. Speed requirements will be based both on minimum standards set by the Federal Highway Administration (FHWA) to avoid lane degradation (currently 45 mph or greater than 90% of the time during peak hours).

For I-35E, under all concepts there would be a single toll zone in each direction. The initial operation northbound and southbound envisions single-price point tolling, which means that a single price is charged regardless of how far a customer travels within the I-35E MnPASS Express Lanes between Cayuga Street and County Road 96. The total distance of nearly 9 miles for 35E is within the range of the length of toll zones on I-35W and I-394. For the Discontinuous option, two toll zones could be established (per direction), one in the section between Cayuga Street and Little Canada Road, and one in the segment between County Road E and County Road 96. However, the County Road E to CR 96 segment would be very short and may discourage users to pay for use of such a short tolling segment. Operationally, experience on existing corridors has shown that performance can be maintained on a segment of this length. By having a single zone, the pricing message is simpler to communicate and customers are more likely to utilize the lane for a longer length which will benefit overall corridor operations.

**8.5. Toll Collection Enforcement**

**8.5.1. Leakage / Lost Revenue**

Procedures and mechanisms already developed by MnDOT and the toll services provider to minimize leakage and lost revenue will also be used for the I-35E MnPASS Express Lanes. These shall include mechanisms for vehicle identification and toll collection, field enforcement, collection of past due accounts, and auditing procedures to effectively report the status of all transactions and revenues.

**8.5.2. Penalties and Fines**

Penalties, fees, and fines already adopted by MnDOT for MnPASS accounts and fines set in state statute will be enforced for I-35E MnPASS Express Lane use.
8.5.3. Technology-Assisted Techniques for Occupancy and Toll Verification

Technological countermeasures are designed to assist manual occupancy verification efforts by confirming payment status of vehicles. For the MnPASS Express Lanes projects, the first tier of technology-assisted enforcement will be the use of mobile toll readers mounted in MSP vehicles. The technology allows the trooper to interrogate a vehicle to determine if they have a valid account and have paid a toll in the last three minutes. All vehicles without transponders need to be visually verified by troopers to determine if they are a carpool.

8.5.3.1. Automated Technology for Occupancy Verification

Vehicle occupancy verification is a principal impediment to more efficient HOV lane enforcement. Several semi- and fully-automated techniques for determining the number of persons in a moving vehicle have undergone limited field testing, including operator-monitored video cameras and infrared composite imaging. However, no automated solution has yet been developed for permanent field implementation, and no system has been found foolproof enough to satisfy traffic courts in upholding citations issued. As a result, HOV facility operators have traditionally relied on visual field enforcement to manage occupancy violations, and this is expected to continue into the near future for MnPASS.

8.6. Management

8.6.1. Accounting

Automated data transfers have been established to allow for electronic toll accounting information (revenues, etc.) to be transferred to the operating agency’s accounting system.

The following are high-level operations requirements that are part of the MnPASS system:

- **Account Options**: Electronic toll collection systems require drivers to establish toll accounts that are linked to individual transponders. Drivers are charged as their transponders are read at the tolling points.
- **Payment Options**: Toll collection accounts are automatically linked to credit cards for the automatic payment of tolls and fees and replenishment of account balances. Payment by cash or check is not accepted.
- **Transponder Account Management**: Transponder account management includes all aspects of MnPASS account management, including account openings and closures; transponder order fulfillment; maintaining transponder inventory; assessing of fees and credits; processing customer statements; and notifying customers of account irregularities (such as if their transponder is not reading or if their automatic replenishment payment method is expiring).
- **Customer Service Experience**: The customer service experience includes providing excellent service to all customer contacts. This may include service in-person, by phone or by email.
- **Financial Accounting**: Financial accounting will include the processing and reconciliation of all customer payments, fees and credits and reconciliation of fees and revenues against system transaction records for each toll facility under the suspense fund.

8.6.2. Auditing

At a minimum the auditing system should achieve the following goals:

- Minimize toll revenue variance
- Maximize transponder transaction posting
- Maximize the ability to audit both transponder transactions
- Minimize leakage (uncollected tolls)
- Identify the needed issues and items for periodic audits as well as defining the process for those audits
- Define the process for the audit of customer service center deposits
- Ensure the chain of custody of monies
- Reconcile the toll collection system to journal entries
- Identify potential system issues in a proactive manner
- Ensure the accuracy of transactions and revenues exchanged with interoperable toll agencies.

As part of the auditing process, the toll services provider provides robust and configurable tolling operations and system reports to monitor and document the performance of the customer services, toll system and interfaces to other systems.
9. SYSTEM OVERVIEW

9.1. Incident Management

Effective and responsive incident management protocols are critical for the successful operation of the I-35E MnPASS Express Lanes. One of the main objectives of the MnPASS Express Lanes is to provide reliable, time-saving travel for users. To do so, not only must MnPASS Express Lanes maintain enhanced operating conditions during recurring congested periods, but they must also be managed effectively during non-recurring events or incidents to ensure that users are not adversely affected. And since many of these users will be toll-paying customers, it is important that the value of the MnPASS Express Lanes be maintained so customers can receive the benefits for which they paid. Without incident management protocols, the integrity and reputation of the MnPASS Express Lanes can be compromised leading to low public acceptance and reduced revenue potential.

The FHWA Priced Managed Lanes Guide provides general guidance for incident management within Express Lane facilities and strongly recommends that Express Lanes be equipped with incident surveillance and detection equipment, monitored by observant (and preferably dedicated) staff at least during periods of peak demand. If construction is anticipated in the proximity of Express Lanes, the Guide further recommends service patrols, temporary collision investigation sites, immediate-tow rules and procedures, and agreements with construction contractors to assist in clearance of debris. MnDOT has a robust incident management practices that fully meet these requirements.

9.1.1. Facility Disruption

The MSP and local police and fire offers have primary responsibility for coordinating incident response strategies, in consultation with the MnDOT.

9.1.1.1. Weather

Severe weather in the Twin Cities area can cause system malfunctions, with specific implications to each corridor. MnDOT staff will make a determination of action needed on a case by case basis with regard to MnPASS Express Lanes operation during periods of severe weather. If a decision is made to physically close the Express Lanes, standard closing procedures will be followed and signage will be altered accordingly. If the PDSL concept is built, an effective snow and ice operations plan will be needed. Within the segment between Little Canada Road and County Road E with concrete barrier, the left shoulder is currently used to store snow, at least until it can be hauled out. The number of existing lanes in the 35E/694 commons section makes it unlikely that MnDOT maintenance could pull the snow from the left shoulder to the right shoulder in a multi-plow (aka gang plow) operation. Because of this, it is possible that the PDSL would not be available during a significant snow event. The left shoulder remains available for snow storage for the Discontinuous and Continuous concepts.

Based on the experience from I-35W dynamic shoulder, the shoulder lane should be left open 24/7 during snow and ice events so that vehicles can help spread salt materials on the shoulder and maintain a safe surface.

9.1.1.2. Equipment Malfunction

MnPASS Express Lanes equipment includes toll rate signs, toll collection systems, computer hardware, software, and related items. Any malfunction in equipment that adversely affects safety or traffic flow is reported immediately to the toll service provider so that a determination can be made on the action to be taken.

- Signs and signals should be legible, oriented toward oncoming traffic, and in good repair.
- Vehicle detection, toll collection, and other computer hardware and software shall be properly checked and determined to be fully operational daily.

The toll system operator and MnDOT will need to coordinate maintenance and repairs. Some tasks may be conducted while the MnPASS Express Lane is in operation. Other tasks may need to be done when the MnPASS Express Lane is closed. The toll rate and ATM signs are designed to allow maintenance of the DMS without closing a lane for traffic.

For the PDSL concept, if the green arrow is blank due to a malfunction for the in the “Shoulder Use Permitted on Green Arrow” sign then the shoulder lane is effectively closed to through traffic. However, the sign is repeated at half mile spacing, so the impact of a single sign malfunction would likely be minimal.

9.1.2. Vehicle Breakdowns

A vehicle breakdown will impact the operation of the MnPASS Express Lanes either as a partial lane blockage or complete lane blockage and must be addressed as soon as possible. The MSP and the MnDOT FIRST units in the area can coordinate their activities in providing traffic control and having the vehicle(s) removed from the lane. All activities are generally coordinated through RTMC.

9.1.2.1. Partial Lane Blockage

Once a partial lane blockage is identified:

- MnDOT or the MSP dispatch directs a trooper or FIRST unit to the scene to provide traffic control and assistance.

If the vehicle breakdown is a bus, it may be necessary to off-load passengers. In this case:

- RTMC MnDOT or the MSP dispatch works with Metro Transit to manage the incident.
- An empty bus is dispatched by Metro Transit to the scene.
- The bus approaches the scene from the upstream direction (operating direction) and stops in the center of the lane in front of the disabled bus.
- Under the direction of the MSP or FIRST, passengers are then safely transferred from bus to bus.
- The wrecker operator then removes the disabled bus from the lane to an off-site location as determined by Metro Transit.

9.1.2.2. Complete Lane Blockage

If a complete lane blockage is identified:

- Dispatch should direct the most currently available trooper or FIRST unit to proceed to the scene and temporarily close the lane
- MnDOT RTMC staff will coordinate sign messages to communicate a lane closure to motorists. For the PDSL option, RTMC staff can use the lane ATM signs to close the PDSL and work with the toll system operator to override tolling.
- The MSP dispatches a tow truck to the scene.
- When it has been determined that traffic has cleared the lane the RTMC operators can change DMS messages and remove toll system overrides to resume normal operations.
9.1.3. Emergency Management
Several types of incidents may call for emergency actions. Whenever the safety of the MnPASS Express Lanes users is reduced to the point that non-routine and expeditious actions are required to safeguard property and life, emergency actions may be required. All emergency actions will be coordinated through MSP and MnDOT Dispatch.

The responding FIRST responder will investigate, assess, and begin the process of clearance. If MnDOT maintenance is required to assist in the removal of the incident, the MSP will inform MnDOT Maintenance Dispatch of the request, who in turn queues MnDOT personnel and resources for response.

9.1.3.1. Diversion into MnPASS Express Lanes
There are multiple possible uses of the MnPASS Express Lane:

- **Operating as Designed.** Law enforcement and/or MnDOT determine that the incident does not impact the MnPASS Express Lane, nor would the clearance of the incident be aided by use of the MnPASS Lane.
- **Open to All Traffic.** Law enforcement and/or MnDOT may direct traffic into the MnPASS Express Lane, either by flagging or using DMSs to notify drivers. In this condition, the MnPASS Express Lane is necessary to assist in the removal of the incident. RTMC staff can override tolling and use DMS to help direct traffic into the lane.
- **Closed to All Traffic.** Law enforcement and/or MnDOT determines the MnPASS Express Lane is directly impacted by the incident, either as a blockage or need to use the Express Lanes for emergency responders.

In the event a major incident occurs on the freeway general purpose causing prolonged closure of the general purpose lanes, the MnPASS Express Lanes may be activated to serve as a freeway lane during operating or non-operating hours. In this case, tolls on the MnPASS Express Lanes must be nullified if drivers were directed into the lane. No tolls will be collected in the MnPASS Express Lane affected by the diversion during the period of diversion.

All actions taken will be coordinated through the MSP Dispatch and RTMC. MnDOT will ensure that toll collection activities and traffic control devices are coordinated correctly with these actions. Once emergency use is completed, the MnDOT and the toll systems vendor will ensure that the MnPASS Express Lanes resume normal operation or is secured.

9.2. Toll Systems

9.2.1. In Vehicle equipment
MnPASS Express Lane customers will be provided with a windshield-mounted transponder that will be coded with a unique identification number. This number is linked to a pre-paid account which is debited for the toll amount due when the transponder is read at a tolling point. All solo drivers using the MnPASS Express Lanes during tolled hours will be required to have a transponder.

9.2.2. Roadside equipment
This section describes the roadside equipment concept that supports electronic toll collection in the MnPASS Express Lanes. The roadside equipment components include the toll collection system, Intelligent Transportation Systems (ITS), and communications infrastructure.
9.2.2.1. Point of entry
Tolling points would be installed downstream of Toll Rate signs in the MnPASS lanes. A tolling point is the location on the roadway where the toll is registered electronically. Each tolling point would have a set of equipment to read transponder tags, collect data, activate enforcement equipment, capture images as needed, and transmit information to the central toll system. Each toll point requires power and communications to a local control cabinet.

Toll rate signs are placed at decision points prior to each MnPASS Express Lanes access points to notify motorists of the current toll rate. Toll rate signs are comprised of both static and dynamic components. The static portion of the sign indicates it is the MnPASS lane. The dynamic portion will be an LED display(s) indicating the current toll rate for destination(s) to support a “segment” pricing approach. The initial design will have one toll zone and destination but the signing is designed to accommodate multiple locations should the MnPASS lane be extend future north to a point where two segments are the preferred operation. The lane controller will communicate to the signs to provide information about rates and open/close status. The placement of the signs must provide motorists with adequate time to maneuver into the MnPASS Express Lane, within the limits of the striped ingress/egress zones.

9.2.2.2. Point of exit
A final tolling point may be placed at the point of exit to verify that all vehicles using the tolling segment have been identified. Other elements may or may not be present.

9.2.2.3. Power
Electrical power will be provided to a control cabinet for each tolling point and each DMS as well as other components that may require electrical power. Where practical, control cabinets may be shared by multiple devices if such sharing will not degrade overall system operation.

Protection against power surges, including, but not limited to lightning strikes will be provided as appropriate.

9.2.2.4. Communications
Each tolling point, dynamic toll rate sign, and all supporting ITS will require be supported by MnDOT’s communications network.

9.3. Tolling Subsystems

9.3.1. MnPASS Express Lanes Signs
Two types of signs will be required in the MnPASS Express Lanes: static and toll rate message signs.

9.3.1.1. Static Signs
Static signs are required throughout the length of the corridor to display entry/exit information, hours of operation, HOV requirements, and fines. The MnPASS Express Lane signs will adhere to the Manual on Uniform Traffic Control Devices (MUTCD). The MUTCD provides extensive guidance on how express lanes should be signed and marked to effectively and consistently communicate various lane management strategies to motorists.

Examples of the Static signs are found below:

9.3.2. Figure 9.1 – MnPASS Restriction Signs
9.3.3. Figure 9.2 – MnPASS Restriction Signs
9.3.4. Figure 9.3 – Additional MnPASS Signage

9.3.4.1. Toll Rate Signs
Toll rate signs will be installed in advance of the MnPASS Express Lane toll points. The toll rate signs are designed in accordance with MUTCD specifications for express lanes and shall be capable of displaying alphanumeric characters. The MnPASS Express Lane toll rate signs are part of a composite sign comprised of a traditional static sign and the dynamic sign portion. The static portion will display general information about the Express Lanes and provide context for the DMS messages.

A subsystem to manage the toll rate signs that post the tolls will also be required. This subsystem will receive inputs from the Toll Variable Pricing Subsystem. It may also be integrated with the Incident Management systems, to support the changing of the posted pricing messages indicating open or closed when incidents warrant these actions. Even if the system is not directly integrated with the Incident Management systems, the ability to override the pricing message must be part of the Toll Rate Signs Subsystem.

The Toll Rate Signs Subsystem must also integrate with the Toll Processing Subsystem to provide information on the current price, and when CLOSED or FREE is posted on the toll rate signs. The Toll Processing Subsystem should be instructed to remove tolls for a specified period before the CLOSED or FREE messages are posted. This accounts for the lag in time from when an incident occurs to the time when a message is posted, when customers may be slowed or stopped in traffic in the MnPASS Express Lane due to incidents.
9.3.5. Automatic Vehicle Identification
As a vehicle passes below the gantry, an overhead transponder reader consisting of a radio frequency (RF) antenna broadcasts a signal downward to the transponder within the vehicle. The transponder then transmits its unique identification number to the reader. The transponder read is then logged in the Toll Zone Reader for transmission to the central system.

9.3.5.1. In-Vehicle Enforcement System
The MSP vehicles are outfitted with a mobile reader to aid in conducting MnPASS Express Lane enforcements.

The units are designed to include:

- A means to read transponders in the field.
- Transponder account data, which can be updated daily to ensure the data is up-to-date accurate.

The troopers will be able to read transponders using mobile unit to match the transponder ID number to an active account number to determine whether or not the account is in good standing and determine if they have paid a toll within the last 3 minutes.

9.3.6. Traffic Monitoring
The existing MnDOT field systems already in place will be used for:

- Traffic detection: Traffic data collection (occupancy and traffic volumes)
- CCTV: Incident management and overall visual facility monitoring
- DMS: Posting incident information related to the corridor or MnPASS Express Lanes

9.3.7. Toll Zone Readers
The toll zone reader is positioned near the tolling zone. It operates with the radio frequency antenna to detect transponders and record trip data. The reader houses the network equipment that connects to the traffic management system and manages all of the data transfer and equipment health status updates.

9.3.8. Central Processing System
A central processing system (CPS) will be needed to support pricing and toll collection on the corridors. The primary function of the CPS would be to use the real-time traffic data collected by roadside RTMC detectors to inform the tolling rate.

- Interface to Vehicle Detection Data: The ITS vehicle detection data is provided in 30 second increments, 24 hours per day. The vehicle detection data includes volume, and lane occupancy, equipment status, and detection ID for all lanes on all segments of the facility.
- Rate Display: The rate display function will control the variable toll rate signs by sending commands to display the current toll rates for each segment.

The price displayed upon entry to the motorist will remain constant for the duration of their trip, and trips will be "assembled" by the toll system to create a single trip charge based upon the transponder reads collected at the various tolling points. In addition to setting the toll rate, the toll system is responsible for assembling the transponder read data gathered at the tolling points into complete trip transactions and monitoring device status.

9.4. Back Office
9.4.1. Business Rules
The Business Rules describe the operational policies surrounding the tolling program, including payment methods, account types, hours of operation, fees, etc.

- Toll free travel for vehicles that meet minimum vehicle occupancy requirement, including motorcycles and buses; all existing carpools would continue to be able to access the lanes without charge and need for a transponder (until such a time when performance is degraded and policies need to be revisited).
- Emergency vehicles may use the MnPASS Express Lanes when responding to incidents.

9.4.2. Standard Operating Procedures
The toll system operator develops and maintains standard operating procedure (SOP) documentation for all services provided. The standard operating procedures shall describe the steps required to complete all customer service operations and activities.

SOPs will exist for all roadway functions, customer service functions, and for all financial related activities. SOPs will incorporate scripts for common customer service functions, automated phone services and pre-recorded phone information. The SOPs will specifically address staff segregation of duties, proper authorization, physical control over assets and software access and adequate documentation and reports.

SOPs will include procedures to prevent revenue loss due to errors, irregularities and improper actions. Financial SOPs will address the accounting and reconciliation activities to be undertaken on a daily, monthly and annual basis.

9.5. Dynamic Tolling

9.5.1. General Requirements
As an SOV motorist enters the MnPASS Express Lane, the rate observed on the DMS shall be the maximum rate paid regardless of any rate changes while using the lane. Rates shall increase as traffic increases in the MnPASS lane until it reaches a point of discouraging enough users from entering. Conversely, the rate shall decrease with decreasing congestion in the MnPASS lane to allow more SOV motorists. The level of congestion in the MnPASS lane shall be determined by examination of the accumulated traffic data from within the MnPASS lanes.

The Revenue and Account Management System (RAMS) shall use traffic speed and volume statistics in order to determine if a toll rate change is necessary to discourage or encourage additional SOV traffic.

9.5.2. Level of Service (LOS) Calculations
The Level of Service (LOS) shall be determined by a parameter called Traffic Density (TD). The TD calculation shall be based upon information for traffic volume and speed (as determined by occupancy) supplied by the RTMC interface collected based on a user defined interval (e.g. 1-15 minutes). The TD (vehicles/mile/lane) shall be computed as follows:

\[
TD = \frac{((C/P) \times 3600)}{S \times N}
\]

Where

- \( C \) = the total vehicle count over the period
- \( P \) = length of the measurement period in seconds
S = Calculated average vehicle speed over the period in MPH

N = the number of lanes in operation at this tolling zone in the traffic direction.

The TD shall be correlated to level of service using the following table.

<table>
<thead>
<tr>
<th>LOS</th>
<th>TD</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0-11</td>
</tr>
<tr>
<td>B</td>
<td>&gt;11-18</td>
</tr>
<tr>
<td>C</td>
<td>&gt;18-26</td>
</tr>
<tr>
<td>D</td>
<td>&gt;26-35</td>
</tr>
<tr>
<td>E</td>
<td>&gt;35-45</td>
</tr>
<tr>
<td>F</td>
<td>&gt;45</td>
</tr>
</tbody>
</table>

The RAMS shall be able to assign a worst-case congestion level. Worst-case congestion level shall be selected using a user-configurable TD threshold. Upon exceeding this threshold, MnPASS Lane operational status shall be set to maximum toll price. At this toll point, SOV’s are discouraged from using the MnPASS Lanes.

9.5.3. Toll Rate Assessment and Calculation

The RAMS shall be capable of calculating toll rates in two ways. The RAMS shall be able to calculate toll rates based on the use of lookup tables for rising and falling traffic density conditions using the largest calculated traffic density within the influence area of a DMS location with a specific toll rate. The RAMS shall also be able to utilize look up tables for toll rates based on time of day and day of week conditions. During the period for which the lane status is set to open or closed to all traffic (i.e. no tolling), the RAMS shall automatically set the toll rate to zero (free) in that lane’s direction and section. During the period for which a lane status is set to open to toll traffic (i.e. tolling in effect), the RAMS shall set the toll rate according to the dynamic rating policy.

Congestion Management

The RAMS shall be capable of determining the rate of change of traffic density at each lane detector over time at each detector station. The RAMS shall adjust the toll rate up or down to reflect the rate of change in traffic density by an amount that will manage congestion reflected by the rate of change.

Largest Traffic Density (LTD) Calculation

The RAMS shall determine toll rates using the largest traffic density (LTD) for those detection zones downstream of each entry point. The RAMS shall compute the Largest Traffic Density (LTD) corresponding to each DMS location. The LTD calculation shall include the application of weighting
coefficients for each detection zone. The weighting coefficients shall be user-configurable based on geometrics, distance from entry point, and entry and exit configuration.

The calculation of LTD shall be as follows:

\[
LTD = \text{MAX} \left( A_{n,1} \times TD_1, A_{n,2} \times TD_2, \ldots, A_{n,j} \times TD_j \right)
\]

Where

\[\text{Max()} = \text{largest entry from the list of values}\]

\[n = \text{entry points}\]

\[j = \text{tolling zones}\]

Where \(A_{n,j}\) represent a set of definable coefficients, there being one set for each entrance; each member of the set being used to multiply the traffic density in its tolling zone in a manner that reflects the characteristics of that zone. The arrangement presumes that there are 'n' entry points and 'j' tolling zones in the direction of travel.

The table of weighting coefficients shall contain one row for each traffic detection station and one column for each tolling zone. The lookup tables shall include toll rates corresponding to specific ranges of LTD. The RAMS shall compute a new charging rate for the entry point based on the computed LTD calculation discussed above. Toll rates and specific ranges of LTD shall be user configurable. Different tables can be used during different weather conditions to reflect the differences in the correlation of TD and Level of Service. The time and duration of MnDOT overrides of the System shall be recorded by the RAMS to assure the toll rate tables are not used during these periods.

9.6. Customer Services

MnPASS Customer accounts are set up using customer applications. Customer applications are generated either through manual data entry at Customer Service Center (CSC) based on a walk-up counter or mail-in customer submission, or through a web-based application form submitted from the MnPASS website. Account applications are processed at the CSC. Customer applications may provide the following information:

- Vehicle(s) make, model, and license plate number
- Vehicle owner information
  - Last Name
  - First Name
  - Middle Initial
  - Complete Mailing Address
  - Phone Number(s)
  - Email Address
- Credit card number and expiration date
- Initial highway designation (I-394, I-35W or I-35E)
- Monthly statement option (email notification, mailed (fee charged))
- Initial account deposit to establish initial balance/replenishment information.

The Customer Service Representative establishes the initial account balance using either credit card or a debit card once the payment method has been authorized and verified.
9.6.1. Customer Trips

The RAMS builds trips from transactions collected for a particular transponder ID number that are recorded within a configurable time period between transactions. The RAMS builds a new trip when the configurable time period between transactions is exceeded i.e. 30 minutes. However, this time period will not apply to transactions between I-394, I-35W and I-35E. Trips on different roads are to be completely separate with the maximum toll that can be charged being $8.00 for each road.

9.6.2. Account Replenishment

The RAMS automatically replenishes customer accounts through a credit and debit card clearinghouse interface when the account balance reaches a configurable threshold (based on business rules). The RAMS is capable to scan and flag account(s) to be replenished on a daily basis when the balance in an account equals or is less than a configurable low balance threshold.

The RAMS processes automated account replenishments using the designated method (i.e., credit card, debit card) for all previously flagged accounts on a daily basis. The RAMS immediately posts a credit to the replenished account after the credit or debit card transaction has been authorized by the credit or debit card/bank clearinghouse.

The RAMS generates a notice to account holders with replenishment credit cards that are one month or less away from their expiration dates. The RAMS generates a notice to account holders whose balance falls below a defined threshold.

9.6.3. Customer Service

The toll systems provider shall be responsible for the Customer Service Center and back office operations including account establishment and management, transponder distribution, transponder transaction processing, payment and violations processing, interfaces with other toll operators, and all related financial services. Specifically, the toll systems provider is responsible for fulfilling the following responsibilities:

- The toll systems provider will conduct all services to support management and maintenance of customer accounts and responses to customer inquiries. Customers will be able to request the account maintenance services by email, phone, fax, or mail. Customers will also be able to make some changes themselves online via the MnPASS website.
- Toll Operations and Services: The toll systems provider will provide management and staff required to undertake the day-to-day toll operation and services. Services will consist of, but not be limited to, account establishment, account management, transponder management, transaction processing, violation processing, mail processing, payment processing, financial accounting, reconciliation, audit support, internal controls, training, security, reporting, performance monitoring, storefront operations, customer phone services, and marketing support.
- Toll Operations and Services Facilities: Establish, furnish, and maintain physical facilities including walk-in customer service storefronts, toll operations call center, and data center.
- Toll Service Web Site: Provide services to implement, manage and monitor the 24 hours, seven days a week toll service website. The website shall provide customers with an industry standard online service for remote access to general tolling information and account services.
- System Maintenance and Operations: Monitor, operate, and maintain roadside toll points, communications, toll collection system, and facilities.
9.7. Communications
The existing communications network is comprised of a fiber optic backbone an Ethernet-based Coarse Wavelength-Division Multiplexing (CWDM) optical carrier network. The communications network will carry all data and video for the ITS, ATM, and Tolling equipment.

9.8. Active Traffic Management
As discussed in Section 8, an active traffic management system will be included with the PDSL option of the MnPASS Express Lanes extension. This section describes the ATM system and its components.

9.8.1. Integration with Current ITS Infrastructure and Programs
The tolling and ATM techniques discussed in this document are consistent with the MnDOT traffic management philosophy. They provide MnDOT with another set of tools to help them actively manage traffic conditions.

Further, the hardware required for these elements described fits in well with the existing MnDOT ITS infrastructure. Communication will be needed to the controller equipment on the roadside. There is existing fiber optic communication cable throughout the corridor.

Current traffic management systems require detectors and the same technology can be used for the variable speed advisory system.

It is desirable to implement a camera system that allows the operators to see the signs.

The variable message signs used to support these techniques are similar to signs used elsewhere by MnDOT. The new signs should be specified to be NTCIP™ compliant.

Finally, ATM software needs to be integrated with existing MNDOT IRIS software.
10. SYSTEM EFFECTIVENESS

The success of the I-35E MnPASS Express Lanes will rely heavily on the ability to monitor operations in real time, efficiently disseminate critical information, and execute appropriate responses. This section seeks to develop a framework by which each of these functions can be streamlined to ensure that the Express Lanes provide reliable operational benefits and maintain financial integrity. Remote monitoring of traffic conditions, automated multi-faceted toll collection, and manual enforcement activities are essential to achieving these goals and the processes by which they are executed should be clearly defined to ensure consistency of practice. The goal is to develop standardized processes that are ideally suited for the corridor.

10.1. Traffic Management Requirements

The efficiency of the I-35E MnPASS Express Lanes system will be dependent upon maintaining a high level of reliability for free-flow travel times while not adversely impacting adjacent general purpose lanes. Without adequate prevention and response measures, degradation on the MnPASS Express Lanes will adversely affect customer demand, taking system revenue with it. The ability to manage MnPASS Express Lanes and overall corridor traffic and operations rests not only with the toll algorithms that help regulate demand, but also depends on the ability to monitor system performance and quickly detect and respond to changing traffic conditions throughout the network. Examples of situations that necessitate a need for intervention in a traffic management protocol include:

- Increasing volumes and densities in the adjacent general purpose lanes and/or in the MnPASS Express Lanes beyond algorithm limits;
- Non-recurring events, such as minor incidents and crashes on the Express Lanes, which can slow or shut down Express Lane operations in a particular location due to design constraints;
- Non-recurring events on the general purpose lanes, which will influence speeds and headways and may create shock demand for the MnPASS Express Lanes’ limited capacity; and
- Events of any kind on nearby corridors that likewise shift demand in unpredictable ways.

A clearly defined set of operational goals will be established for the MnPASS Express Lanes which will form the basis for a performance monitoring program. The attainment of these goals should be consistent with measures used on I-35W and I-394 quantified using various performance measures. The establishment of performance measures ensures that MnPASS Express Lane operations are ideally managed in response to varying traffic conditions. The performance measures also drive the monitoring and associated data collection needs that are necessary to ensure adherence to goals. Possible goals and performance measures that may be applied for Express Lane operations include:

- Goal: Improve mobility in the corridor
  - Measures: Average speeds, vehicular and person throughput, average travel times, and rates of violation
- Goal: Increase reliability
  - Measures: Average speed variation, travel time variation, and transit “on time” performance
- Goal: Improve safety
  - Measures: Number of incidents, incident response times, and nature of incidents

10.2. Monitoring Equipment and Data Collection

Monitoring equipment must include sufficient systems to collect and process the necessary data for evaluation of the MnPASS Express Lanes’ performance. At a minimum, roadway detection devices
must be capable of frequently and reliably collecting speed, volume, and video imagery throughout 
the network. Speed and volume characteristics will be used to evaluate whether operating conditions 
on the MnPASS Express Lanes are within desirable ranges and inform operators whether toll or other 
operating policies need to be modified to ensure optimal performance. For dynamically priced 
systems, speed and volume data are used as direct inputs for the toll-setting algorithm implemented 
in real-time.

Traffic monitoring equipment can also alert the MnPASS operator to the presence of traffic 
disruptions. Non-recurring traffic disruptions (i.e., debris on the roadway or traffic accidents) may 
 warrant an immediate response via a change in toll rates (for dynamically priced systems) or the 
displaying of relevant information on dynamic message signs, and in the extreme may require 
temporary lane closure. Traffic cameras will also be used to remotely monitor MnPASS Express Lane 
operations and confirm the presence of these types of disruptions. These cameras can also confirm 
that appropriate toll rates and other informational messages are correctly functioning and displayed 
on dynamic message signs. Monitoring equipment may also alert operators to the existence of 
recurring traffic disruptions (i.e., significant slowing at access points), which may warrant a different 
type of response.

The level of roadway detection and monitoring capability on MnPASS Express Lanes must be 
maintained at a high level of functional reliability. Functional requirements for the detection and 
monitoring system need to be defined and implemented as part of the intelligent transportation 
systems (ITS) and tolling integration systems that support the operations of the Express Lanes. The 
functionality and accuracy of monitoring equipment should be ensured so that for variable pricing 
algorithms can rely on accurate traffic data to properly set the toll rates.

10.3. Responsible Parties
Data collected by monitoring equipment will provide operational characteristics for discrete points 
along the I-35E MnPASS Express Lanes. This point detection data is aggregated to obtain a 
perspective of corridor and network performance. Compiling, reporting and archiving functions can be 
conducted by either the MnPASS operator, or, through the MnDOT. However, there will also be a 
need for dedicated personnel to oversee and coordinate MnPASS Express Lanes and I-35E corridor 
monitoring operations. In addition to incident detection, manual monitoring efforts will be required to 
sure data quality, oversee the management of monitoring systems and evaluate trends in MnPASS 
Express Lane operations.

MnDOT has sophisticated systems in the freeway network to enable operations monitoring and 
incident response including external sensors and closed circuit television cameras (CCTV).

The I-35E MnPASS Express Lanes will require both MnDOT and the Toll Services provider to monitor 
operations. The MnPASS functions will be managed by a MnDOT staff at the Metro District.

The constrained design of the I-35E MnPASS Express Lanes will dictate that responses are executed 
in a timely and efficient manner to avoid degradation of MnPASS Express Lane operating conditions.

10.4. Performance Measurement
MnPASS Express Lanes are implemented to improve the operation of the overall corridor and 
provider choices for commuters. To determine if this goal is being met, measurement of the 
operational characteristics of the MnPASS Express Lanes and the general-purpose lanes is required. 
Performance measurement of for corridors with MnPASS facilities have been clearly established and 
will extend to I-35E.
10.4.1. Federal Requirements for Performance

Title 23, Section 166 of the United States Code outlines the federal requirements for conversion of HOV lanes to Express Lanes. MnDOT will be required to submit a certification to the US Secretary of Transportation that the facility is not in a degraded condition. Further, MnDOT will be required to continually monitor the facility to ensure that the facility is not degraded based on federal standards. These standards require that a minimum operating speed of 45 mph be maintained during peak periods 90% of the time. If this standard is not met over a continuous 180 day period, the facility is considered degraded and the degradation must be cured within 180 days.

10.4.2. Performance Validation

Data collected from the field systems can be used to evaluate on an ongoing basis whether any of the facilities have degraded. Analysis can also be made of crashes in the corridors. This analysis can determine the number of crashes on each facility, the number of crashes per lane mile, and the number of crashes per vehicle miles of travel. This analysis will be compared with the general purpose lanes on each facility to determine any differences in overall safety of operation. The I-35E corridor will also have reporting annually on congestion levels.

10.5. Performance Adaptation

10.5.1. Degradation Definition

The I-35E MnPASS Express Lanes will be considered to be operating in a degraded state when operating speeds fall below 45 mph more than 10% of the time in peak travel periods during a continuous 180 day period.

An analysis will be performed quarterly to determine whether the I-35E MnPASS Express Lanes are operating within targets of performance. Results of this analysis shall be reported by FHWA and interested stakeholders.

Should a degraded condition occur on the I-35E MnPASS Express Lanes, one or more of the following actions could be undertaken:

- Increase the occupancy requirement for HOV vehicles in the MnPASS Express Lane.
- Increase the toll charged to non-HOV vehicles to reduce demand. This can be done as adjustments to the dynamic pricing system.
- No longer allow non-HOV vehicles to use the MnPASS Express Lanes.
- Increase the available capacity of the MnPASS Express Lanes.
- Work with other stakeholders to employ other transportation demand management strategies (TDM) to reduce peak period demand. These could include mechanisms to encourage carpooling or transit use, ITS strategies, or operational strategies such as enhanced ramp metering.
11. SYSTEM MAINTENANCE

Maintenance is essential for proper operations of the facility, including the roadway and tolling equipment. Considerations for maintenance include:

- **Infrastructure Location:** Equipment should be located where maintenance personnel can safely access it by setting up traffic control for a shoulder closure. An exception is any overhead signs or gantries which are required to be placed directly above travel lane(s). If possible the dynamic message sign structures should be designed for maintenance to occur under traffic. Infrastructure should also be installed at locations that minimize exposure to traffic and the possibility of being struck by an errant vehicle or debris. This includes mounting position on structures, placing equipment out of the travelled way, and installing equipment inside the barrier.

- **Maintenance Planning:** Special consideration will have to be given to the impact of maintenance on the MnPASS Express Lanes and coordination will need to take place to schedule activities and any special closures. This exercise will assure that routine maintenance procedures can be accomplished effectively without impacting MnPASS Express Lanes operations. For example, if a closure is needed in the MnPASS Express Lanes, the public needs to be notified and proper traffic control needs to be put in place to prevent drivers from using the MnPASS Express Lanes and being tolled for a portion of the facility that may be closed for repair. Such activities would be planned for non-peak periods.

- **Roadway Maintenance:** Roadway maintenance includes removing debris from the roadway, snow plowing, roadway repair, sign repair, and street sweeping. MnDOT will handle all roadway maintenance duties within the MnPASS Express Lanes.

11.1. Infrastructure Maintenance

11.1.1. Tolling Systems Maintenance

The toll system provider under contract with MnDOT is responsible for maintenance of all portions of the toll collection system that have been installed, integrated, tested, and are in active revenue collection service, with the exception of toll price signs, detection and communications which are maintained by MnDOT. The toll system provider shall also be responsible for maintenance, tracking, and secure storage of any spares or inactive equipment. The provider provides 24 hour, seven days a week coverage for all maintenance related activities for the toll collection system.

The toll systems provider is responsible for hardware, equipment, software, and firmware maintenance for the toll points, and connections from MnDOT’s fiber optic network hub to the central toll collection system, toll collection system applications software, system servers, system administration, and related peripheral equipment required for the provision of systems and services.

The toll systems provider is not be responsible for the maintenance of lane pavement, roadway structures, or other infrastructure and equipment installed by MnDOT.

11.1.2. Lane Pavement

MnDOT will provide for maintenance of lane pavement.

11.1.3. Structures

MnDOT will provide for maintenance of roadway structures including bridges, guard rail, median barriers and similar type equipment.
11.1.4. Signage
MnDOT will provide for maintenance of roadway signage.

11.1.5. Markings
MnDOT will provide for maintenance and refurbishment of roadway markings.
Appendix E
MnPASS AT-A-GLANCE
MnPASS Basics
MnPASS Basics

SOLO DRIVERS HAVE OPTION OF PAYING TO USE THE UNCONGESTED LANE

NO STOPPING AT TOLL BOOTHS

TOLLS COLLECTED ELECTRONICALLY AT HIGHWAY SPEEDS

PRE-PAID ACCOUNTS

TRANSIT, CARPOOLS AND MOTORCYCLES ALWAYS USE MnPASS FOR FREE

*M during non-rush hour periods, the express lanes are open to all users for free.

MnPASS is a tool for giving consumers more choices, and making more efficient use of roadways.
MnPASS Now

West metro area
- I-394, since 2005
- I-35W, since 2009
  » Extended further south in 2011
MnPASS Next
East metro area

- **I-35E northern improvements**
  (Little Canada Road to Hwy 96).
  » Planning and public input in progress.

- **I-35E southern improvements**
  (downtown to Little Canada Road).

And how well has MnPass worked where it is in use?
MnPASS Research Findings

ROAD TESTED
• Over 11 million MnPASS trips over 8 years. No major technical problems.
• 80% of users satisfied.

ALL USERS BENEFIT
• During peak hour, MnPASS lane can move 50% more people.
• When more people are moved through the area faster, all users benefit, even those who don’t choose MnPASS.

TRANSIT AND CARPOOLING REWARDED
• Free-flowing speeds – about 60 mph – maintained in MnPASS lane even during peak hour.
• Transit and carpools outnumber solo drivers by a 7-to-1 margin.

SOLO DRIVERS HAVE “GRIDLOCK INSURANCE”
• Solo drivers have option of using less congested MnPASS lane when they are in a pinch.
  » Average cost is about $1.61 per trip.

PUBLIC APPROVAL
• By 2-to-1 margin, area citizens approve of MnPASS (I394 survey, 2006).
Appendix F
Report on Activities and Findings from the I-35E Extension Study
Community Dialogues
Report on Activities and Findings from the I-35E Extension Study Community Dialogues
Prepared by Emily Saunoi-Sandgren, Humphrey School of Public Affairs
July 2014

Introduction
In May 2014, a series of community dialogues and in-depth interviews were conducted with key stakeholders who live, work and/or drive in the I-35E corridor to gauge their feedback on the options for extending MnPASS on I-35E between Little Canada Road and CR 96. Engaging these stakeholders provided an opportunity to communicate about the vision and plans for a MnPASS managed lane system on the I-35E corridor and to assess stakeholder reactions to the extension options as one method of informing future planning and decision making by MnDOT and the Metropolitan Council regarding the potential MnPASS extension. The following report describes the development of and findings from these outreach activities.

Methods
Sample. Three categories of stakeholders were targeted:
1) Community and Business Leaders: community and business leaders who have a vested interest in the reliability and operations of the I-35E corridor and who feel they can speak for the interests of their residents and/or employees;
2) Professional Drivers: employees and small business owners who rely on using the I-35E corridor to conduct their regular business duties; and
3) General Public users: members of the general public who are frequent users of the I-35E corridor, especially those who travel regularly through the 694/35E crossing.

Multiple tactics were used to recruit participants for the community dialogues. Utilizing both outreach lists created by the extension study team and the networks of individuals and organizations affiliated with the study, nearly 20,000 contacts were made over email and telephone to invite participants. The Pioneer Press also ran a print and online announcement for the general user dialogues. The date, time, and location of the dialogues were set based on what was identified as most convenient for each of the three categories of stakeholders. Participants were served lunch or refreshments and given a $25.00 gas gift card for their time and input.

Format. Using a focus group format, stakeholders participated in a community dialogue facilitated by a member of the I-35E MnPASS Extension Study team. Representatives from the Minnesota Department of Transportation (MnDOT) and the design consultant, Parsons Brinkerhoff (PB) were present at each dialogue to answer any policy or technical-related questions that could not be answered by the facilitator. In-depth interviews were also conducted by the dialogue facilitator with two individuals who were interested in attending a community dialogue, but were unable to make the available dates. The interviews covered the same information as the dialogues but were limited to a conversation between the facilitator and the interviewee. No representatives from MnDOT or PB were present at the interviews.

The dialogues lasted seventy-five minutes and the groups were limited to a maximum of fifteen individuals. Table 1 provides a detailed description of the number of participants at each dialogue. A major goal of the dialogues was to provide participants the opportunity to learn about the vision and plans for MnPASS in the I-35E corridor; help familiarize them with the concept options for extending...
MnPASS between Little Canada Road and CR 96; and to learn their reactions and preferences on the concept options through conversation and a survey instrument. Appendix A provides a detailed description of the dialogue agenda.

Data Collected. The focus groups were recorded and at the conclusion of the dialogues and interviews, participants filled out a survey asking for their feedback on each of the design options. Appendix B contains a copy of the survey form.

Findings
There were a total of twenty-two individuals who participated in a community dialogue or interview. All participants traveled the corridor with twenty who traveled the corridor more than once per week, of which eleven traveled the corridor more than once per day.

Table 1 – Participant Count

<table>
<thead>
<tr>
<th>Category</th>
<th># Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Community &amp; Business</td>
<td>4 Dialogue</td>
</tr>
<tr>
<td>Business Leaders</td>
<td>3 Dialogue</td>
</tr>
<tr>
<td>Professional Drivers</td>
<td>1 Interview</td>
</tr>
<tr>
<td>General Users</td>
<td>13 Dialogue</td>
</tr>
<tr>
<td></td>
<td>1 Interview</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>22</strong></td>
</tr>
</tbody>
</table>

Knowledge of MnPASS. Participants came to the dialogues and interviews with little to no knowledge or understanding of MnPASS. A significant portion of the seventy-five minute dialogue was spent describing and discussing the concept of managed lanes and the functionality of MnPASS in the I-35E corridor. Figure 1 shows the level at which participants felt they were knowledgeable about MnPASS before and after the dialogues/interviews. There is a clear shift in participants feeling much more informed about MnPASS after the dialogues/interviews, with the concentration moving from ‘mostly uninformed/moderately informed’ to ‘well informed.’

Figure 1: Before/After results for participant level of knowledge of MnPASS

How well informed do you consider yourself to be about MnPASS?

<table>
<thead>
<tr>
<th>Participant count</th>
<th>Before</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>Completely uninformed</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Mostly uninformed</td>
<td>9</td>
<td>0</td>
</tr>
<tr>
<td>Moderately informed</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>Well informed</td>
<td>2</td>
<td>12</td>
</tr>
<tr>
<td>Extremely well informed</td>
<td>0</td>
<td>4</td>
</tr>
</tbody>
</table>
Acceptance of MnPASS. While the purpose of the community dialogues was not to gauge whether people are willing to have MnPASS come to the I-35E corridor, participants still shared their thoughts and questions about the utility of a managed lane system. As a whole, the professional drivers group was most enthusiastic about MnPASS. This group vocalized the many ways in which MnPASS could benefit their drivers (e.g. more reliable trip time) and one participant was interested in providing MnPASS to its drivers as a benefit to ensure they arrived on time to work. It is important to note that this was the only group that included passenger transportation providers, who would be able to use the MnPASS lane without paying tolls since their occupancy status would qualify them as either transit or carpool.

All participants acknowledged that congestion is an issue in this corridor and that a solution needed to be found, especially with the prospect of a growing population. Most participants did not question the validity of MnPASS as the solution to congestion. Those who did raise concerns focused mostly on the equity issues of tolling, expressing concern that only the few who can pay would benefit. Others also expressed preference for either making the lanes only for High Occupancy users and better recruiting carpoolers to the system or simply building additional lane capacity without implementing tolling.

Design Options. Figure 2 summarizes the survey responses given by participants for each of the three design options. Participants overwhelmingly expressed support for the ‘Without a Gap’ design option. Many participants explained that their reasoning was to ensure safety by limiting driver confusion by keeping continuity of MnPASS through the 35E/694 Commons. Participants’ preference for this option remained even when they were made aware of the lane conversion from general purpose to MnPASS through the 35E/694 Commons.

The ‘Shoulder’ option raised safety concerns over losing a shoulder during peak traffic flow, but some participants liked this option as it allowed for the continuity of MnPASS through the Commons without losing a general purpose lane.

Figure 2: Level of Support for MnPASS Design Options

The ‘With a Gap’ option raised safety concerns because participants felt that by dropping the MnPASS lane through the 35E/694 Commons drivers would weave in and out of traffic creating more congestion.
and opportunities for collisions. In the end, many participants offered some support for this option if it came down to a decision between this and the Shoulder option.

Limitations to Findings
When developing the community dialogues, the initial objective was to conduct six total dialogues, two in each category. Once recruitment began for the dialogues, it became evident that there was very little interest or motivation to participate by the stakeholders who were targeted. Five dialogues were scheduled, but only three were held due to lack of participants at the other two. Lack of knowledge of MnPASS and perhaps the lack of an immediate impact contributed to the low participation turnout. Low turnout means there are potentially many perspectives that were not accounted for in this study. Additionally, there may be biases in the findings from those who did participate that would make their opinions substantially different from the views of those we did not hear from. These limitations must be considered when reviewing and interpreting the findings from this study.

Recommendations for future outreach and communications in the I-35E corridor

• **Education is key.** As the above Figure 1 shows, participants had very little knowledge of MnPASS prior to attending the dialogues. This area of the Metro will likely need a lot of education and outreach simply to raise awareness and education about the concept of managed lanes. If people understand the principle behind and benefits of variable priced tolling, there will likely be more willingness to purchase transponders.

• **The connection to transit options.** Part of creating a successful managed lane system is to provide viable travel alternatives to driving solo. It will be critical to communicate to the public how the introduction of MnPASS in this corridor is also accompanied by transit options.

• **Use the impact from MnPASS south of Little Canada Road to generate acceptance for MnPASS north of Little Canada Road.** Since MnPASS will be opening south of Little Canada Road, commuters who travel from the north into St. Paul will have an opportunity to experience the benefits of MnPASS. These benefits should be used to develop acceptance and buy-in from commuters on the greater impact MnPASS can have if implemented further north.
Appendix A – Community Dialogue Agenda

I-35E MNPass Extension Study
Community Dialogue on Design Options

Date, Location

Sign In, Complete Consent Forms, and Enjoy Refreshments

10mn. Welcome & Introductions
(Introductions by participants, Humphrey School, MN Department of Transportation, Parsons Brinckerhoff)

7mn. MnPASS Overview (Presentation)
- What is MnPASS?
- How does MnPASS work?
- Where is MnPASS operating?
- Why is MnPASS coming to I-35E?
- How well has MnPASS been working?

13mn. Extending MnPASS Design Options (Presentation)
Construction of an additional MnPASS lane in each direction is underway on I-35E between downtown St. Paul and Little Canada Road. These MnPASS lanes will open in late 2015.

MnPASS will eventually continue north of Little Canada Road on I-35E. We are currently studying options for extending MnPASS lanes on I-35E between Little Canada Road and Highway 96. There is more than one way that we can accomplish this extension and we need your input and insights in weighing the following three options:

- MnPASS Lane Without A Gap
- MnPASS Lane With A Gap
- MnPASS on Shoulder

30mn. Options-Focused Dialogue
- Questions?
- Preferences?
- Changes?

10mn. Take-Aways (Brief statement from each participant)
Very briefly, what 1-2 points do you want to be sure to emphasize to those who will be making the decision on the design of the I-35E MnPASS extension?

5mn. Close (Complete survey)
Appendix B – Participant Survey

Please complete this brief survey. Your responses are confidential.

1. On average, how frequently do you travel the I-35E corridor between Little Canada Road and CR 96 (the yellow portion of the map below)? (Please circle one)

2. Before today’s dialogue, how well informed did you consider yourself to be about MnPASS? (Please circle one)

3. After today’s dialogue, how well informed do you consider yourself to be now about MnPASS? (Please circle one)

Please turn over and complete side 2.
4. We have discussed three design options (Gap, No Gap, and Shoulder) for extending the I-35E MnPASS between Little Canada Road and Highway 96.

What is your level of support for each option? (Please check one for each option)

<table>
<thead>
<tr>
<th></th>
<th>I am strongly opposed</th>
<th>I am somewhat opposed</th>
<th>I am neutral</th>
<th>I support it somewhat.</th>
<th>I support it strongly.</th>
<th>I don’t have enough information</th>
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<tbody>
<tr>
<td>MnPASS Lane With A Gap</td>
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<td>MnPASS on Shoulder</td>
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</table>

5. Briefly describe below any additional comments you may have about each of the options.

<table>
<thead>
<tr>
<th>Option</th>
<th>Comments</th>
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<tbody>
<tr>
<td>MnPASS Lane With A Gap</td>
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<tr>
<td>MnPASS Lane Without A Gap</td>
<td></td>
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<tr>
<td>MnPASS on Shoulder</td>
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</tr>
</tbody>
</table>

Please turn over and complete side 3.
The following questions are OPTIONAL. Your responses help the research team better understand the characteristics of the participants, but will not be used to identify you in any reporting.

1. In what city or township do you live? ____________________________________________

2. What is your gender? (Please circle one)  Male  Female

3. What is your age? (Please circle the appropriate category)  
   20-29  30-39  40-49  50-59  60-69  70+

4. How do you describe yourself? (Please circle the one option that best describes you)
   American Indian or Alaska Native  Asian or Asian American  Black or African American  Hawaiian or Other Pacific Islander  Hispanic or Latino  Non-Hispanic White

5. What is the highest grade or year of school you completed (Please circle one)
   Some high school  High school graduate  Some college or technical school  College graduate  Graduate School/Advanced degree

6. What is your current employment status? (Please circle one)
   • Employed for wages  • Student
   • Self-employed  • Military
   • Out of work and looking for work  • Retired
   • Out of work, not looking  • Homemaker
   • Unable to work
Appendix G1
Public Perceptions of Congestion Pricing in Minnesota and Europe:
Loss Aversion, Complexity and Framing
Public Perceptions of Congestion Pricing in Minnesota and Europe: Loss Aversion, Complexity and Framing

Submitted to the Transportation Research Board
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ABSTRACT

In spite of the significant potential benefits of congestion pricing and over twenty years of federal funding to encourage demonstrations of congestion pricing in the U.S., public perceptions of congestion pricing remain mixed and present major challenges for implementing congestion pricing projects. This paper presents the congestion pricing efforts in Minnesota over the past twenty years and what has been learned from outreach and education related to congestion pricing. The paper also examines why it is so difficult to communicate the benefits of congestion pricing to the public and possible explanations from psychology and behavioral economics.

Congestion pricing has long been advocated by economists as the most efficient way to manage congestion on urban roads. Charging a market-based toll for using a road during peak periods can reduce traffic and result in time savings for all drivers as well as generating revenue that can be reinvested in the transportation system. With electronic tolling there is no need for delays to stop at a toll booth, making congestion pricing technically a very viable option for managing urban congestion.

MINNESOTA’S EXPERIENCE WITH CONGESTION PRICING

For the past twenty years, Minnesota transportation, academic and policy leaders have worked to apply congestion pricing as a tool in managing congestion. Minnesota has no traditional toll roads to fund road and bridge projects, and the Minnesota Legislature has prohibited toll roads as a funding mechanism in the past. However, the state has adopted high-occupancy toll (HOT) lanes on two major interstate corridors, I-394 west of Minneapolis and I-35W south of Minneapolis. These two projects involved conversion of existing high-occupancy vehicle (HOV) lanes for 2-person carpools and buses to HOT lanes, allowing single-occupant vehicles to use the lanes if they paid a toll. The lanes have been branded as MnPASS lanes. The I-35W project included an expansion of the previous HOV lanes to the north by creating new dynamic shoulder lanes on the inside lane, and the lanes have also been expanded to the south. The Minnesota Department of Transportation (MnDOT) and the Metropolitan Council, the metropolitan planning organization (MPO) for the region, have now adopted MnPASS lanes as part of the regional transportation plan to manage congestion and promote transit usage (Figure 1).

Over the years Minnesota has conducted extensive education and outreach activities related to congestion pricing and MnPASS lanes. Minnesota’s experience with education and outreach with both the public and policy leaders has been documented in a series of TRB articles (cite). Many of these activities were conducted by the University of Minnesota’s Humphrey School of Public Affairs (previously the Humphrey Institute) in conjunction with MnDOT, the Metropolitan Council and transportation consultants. The following is a brief summary of the education and outreach activities over the past 20 years.
Citizens Jury

In 1995, the Humphrey School conducted a week-long Citizens Jury with 24-randomly selected citizens from the Twin Cities area. Although the Citizens Jury voted 17-7 against congestion pricing as a way to manage congestion and fund transportation, the exit survey offered further explanations of the jury members’ attitudes and concerns about congestion pricing. One of the exit survey questions was whether Minnesota should consider congestion pricing in the future. While 6 of the 24 jurors were still opposed, 8 were in favor, and 10 were neutral, neither in favor or opposed, to considering congestion pricing as a solution in the future. The primary concerns of those who had not made up their mind were:

- Congestion not bad enough yet,
- Congestion pricing not fair – Lexus Lane concern,
• Congestion pricing costs too much – raise gas tax instead; and
• Congestion pricing won’t work.

The issues raised by the Citizens Jury helped frame the future outreach and education work on congestion pricing by MnDOT, the Metro Council and the Humphrey.

Regional Case Studies

In 1995 and 1996, the Humphrey School conducted regional case studies in urban regions throughout the U.S. to better understand the political and institutional issues that must be addressed to implement congestion pricing (1). The report concluded that there are six components of an implementation strategy for congestion pricing: the leadership coalition, elected officials leadership and support, attention to equity impacts, citizen understanding and involvement, marketing and media strategy, and a technology plan. This study provided a roadmap for the Minnesota efforts that followed, though the road was frequently bumpy.

Failed Attempts to Implement Tolling and Congestion Pricing in Minnesota

In 1996 MnDOT attempted to implement tolling to finance construction of Minnesota Highway 212 in the southwest suburbs of Minneapolis (2). The legislation authorizing the project required support of all of the cities in the corridor and was blocked by a vote against the project by one of the cities. In 1997 MnDOT sought to convert the HOV lane to a HOT lane in the I-394 corridor but the Governor withdrew the effort after a newspaper ad generated significant negative public response before the Metro Council was to take a required vote on the project. MnDOT continued to support research, education and outreach on congestion pricing to keep the option open for the future, but the agency did not actively pursue congestion pricing projects.

Buying Time Video

In 1998 the Humphrey School engaged a professional video firm to develop a video explaining the benefits of congestion relief tolls. This 13-minute Buying Time video included a “flying car” and comments by users of the SR 91 express lanes in Orange County, California, about the benefits of the these lanes (3). The video was used widely in Minnesota as well as other states to introduce the idea of congestion pricing in a way that personalized the benefits by focusing on the time savings for different types of users.

Grasstops Approach.

In 2001 as part of its outreach and education activities, the Humphrey School engaged a communications consultant to address the unique communications challenges related to congestion pricing. The consultant, who specialized in public policy communication, recommended using a “grasstops approach,” focusing on policy and political leaders in outreach and education (4). The idea was that state and regional leaders need to understand the benefits of congestion pricing before they could support and explain the benefits to the citizens they
represent. This approach focused on assuring that the Governor was onboard, engaging legislative champions, keeping the issue bipartisan, showing successful examples of road pricing, looking for media opportunities, and developing answers to all questions and concerns.

**Value Pricing Advisory Task Force**

In 2001 the Humphrey School convened a 30-member Value Pricing Advisory Task Force of state legislators, mayors, city council and county board members, and business, environmental, and transportation association leaders to explore appropriate and feasible value pricing options for Minnesota (2). The task force was chaired by the former chair of the Senate Transportation Committee, who had also served as a member of the Metropolitan Council. The task force concluded that Minnesota should proceed with a demonstration project and led to legislation and the Governor’s support for conversion of the I-394 HOV lane to a HOT lane, the project that had been rejected in 1997. Since 1997, legislators in the I-394 corridor had become increasingly concerned about the underutilization of the I-394 HOV lanes by carpools and saw charging a toll for single-occupant vehicles as a good way to make more efficient use of the dedicated lanes.

**I-394 Express Lane Community Task Force**

Once the legislature had approved the I-394 project, MnDOT established a 22-member I-394 Express Lane Community Task Force to assist in the development of what was now branded “MnPASS lanes” (5). The task force was made up of legislators, council members and citizens from the corridor, the American Automobile Association (AAA), the Minnesota Trucking Association, the Downtown Traffic Management Organization (TMO), and Transit for Livable Communities. The task force chair was a former legislator selected by the Governor. The purpose of the task force was to assist the MnDOT commissioner with advice and guidance on public involvement, communications, community outreach and education, and to address other policy issues including operations, pricing, access, violations and enforcement. The task force helped assure public concerns were addressed and increased the likelihood of project success.

**MnPASS System Studies**

In 2005 after the successful implementation of the I-394 MnPASS project, MnDOT established an advisory group and contracted with Cambridge Systematics and URS to identify corridors for future expansion of the MnPASS system (6). This study has become the basis for development of further expansion of the MnPASS system and the adoption of the MnPASS approach by MnDOT and the Metropolitan Council for managing congestion and creating opportunities for transit enhancement. The system study was updated for MnDOT and the Metro Council by Cambridge Systematics in 2010 (7). The purpose of this study was to analyze and make recommendations for the next generation of MnPASS managed lane projects in the Twin Cities metropolitan region.
I-394 MnPASS Phase II Corridor Study

With a Value Pricing Pilot Grant, MnDOT and the Metro Council explored the potential for a phase 2 MnPASS project with an advisory committee made up of community planning staff, regional planners, transit staff, transportation advocacy groups, and transportation and community design consultants (8). The purpose was to identify infrastructure enhancements, transit opportunities, and land use synergies within the I-394 corridor. The study generated cost estimates for creating an extra lane in the reversible section of I-394 MnPASS lanes. While the new infrastructure enhancements have not been funded, the study provided input to enhanced transit planning and land use strategies in the corridor.

I-35W Urban Partnership Agreement

In 2007 Minnesota successfully competed for a $134 federal Urban Partnership Agreement (UPA) grant to implement tolling, transit, technology and telecommuting enhancements in the I-35W corridor from downtown Minneapolis through southern suburbs (9). Stakeholder roundtables helped to identify potential projects and build support for federal grant application and the proposed I-35W MnPASS lanes. I-35W Corridor Coalition made up of mayors, city council members, county commissioners and legislators, endorsed and advocated for the I-35W UPA application to bring transit enhancements to the corridor and downtown Minneapolis. The project is now operational and has provided significant benefits in terms of transit and congestion relief. While public outreach and education were key elements of the I-35W UPA project, communications efforts during the project were largely overshadowed by the I-35W bridge collapse and rebuilding, which occurred at the same time that the UPA project began.

Metropolitan Highway System Investment Study

Concurrent with the MnPASS System Study Phase 2 in 2010, the Metropolitan Council, the Transportation Management Organization (TMO) for the Minneapolis-St. Paul region, conducted a Metropolitan Highway Investment Study (MHSIS) with Parsons Brinckerhoff that examined the use of management strategies as a possible alternative for costly general purpose capacity expansion in the region’s Transportation Policy Plan (TPP) (10). The MHSIS concentrated upon how active traffic management (ATM) and managed lane components could be combined and implemented in the Twin Cities. The purpose of these strategies was not to fix congestion, but rather to provide residents, employees, and visitors with a consistently congestion-free alternative throughout the regional highway system.

2030 Transportation Policy Plan

The Metropolitan Council has worked closely with MnDOT on congestion management and transit enhancement strategies involving MnPASS. The Metropolitan Council formally identified pricing as a highway system management strategy in its 2030 Transportation Policy Plan (TPP), adopted in 2010, with the following statement: “The Council supports roadway
pricing, including HOT lanes and priced dynamic shoulder lanes, to provide an alternative to congestion and will consider implementing pricing on any expansion project. Pricing of highway facilities offers a very effective tool to manage traffic, provide choices, and raise some revenues. Priced alternatives are one of the few highway ‘designs’ that can provide long-term congestion relief. “ (11)

PUBLIC PERCEPTIONS OF CONGESTION PRICING AND LOSS AVERSION

While Minnesota has successfully integrated congestion pricing as a transportation management strategy in its regional plan, it has come with significant challenges in explaining the benefits of these strategies to the public. Why is it so difficult to communicate the benefits of congestion pricing to the public and to implement congestion pricing strategies? Psychologists and behavioral economists may have some explanations for why this is the case. A better understanding of how human beings think about problems and arrive at decisions may help transportation planners in re-framing the issue of congestion pricing when designing and implementing projects.

A European study in 2008 may shed some light on the peculiar problem of public perceptions toward congestion pricing (12). Focusing on European cities that either implemented or attempted to implement congestion pricing during the 2000s, the study found that the public tends to be open or mildly opposed to congestion pricing when discussed generally but becomes more opposed to congestion pricing as projects move closer to implementation. However, after congestion pricing has been implemented, the public shifts from opposition to support (Figure 1).

Figure 2. Public Support for Pricing Projects (CURACAO Study)
Projects that were implemented in London and Stockholm in spite of significant public opposition beforehand resulted in high levels of public support after implementation and are still in operation. However, referenda on congestion pricing before implementation have failed miserably – 75 percent against in Edinburgh, Scotland, and 78 percent against in Manchester, England.

While the European study does not attempt to explain the phenomenon, an explanation may lie in the fields of psychology and behavioral economics. In psychology and behavioral economics loss aversion refers to people's tendency to strongly prefer avoiding losses to acquiring gains. Behavioral studies suggest that losses are twice as powerful, psychologically, as gains (Figure 2). (13)

Figure 3. Loss Aversion Affects Public Perceptions More the Potential Gains

![Graph showing the relationship between losses and gains.](source)

Source: Amos Tversky and Daniel Kahneman.

When a specific congestion pricing project is proposed in an area or corridor, the public focus is on the potential tolls (loss), triggering the loss aversion reaction among citizens. At the same time, the complexity of congestion pricing results in confusion or doubts about the primary benefit of congestion pricing, time savings (gain), as well as who will benefit from those gains. Media coverage will magnify these negative concerns about potential losses, and positive coverage will be overshadowed.

After a congestion pricing project is implemented, it becomes clear that congestion has been reduced, and the loss aversion affect switches in favor of congestion pricing – the public does not want to lose the time savings benefit, and the congestion tolls are clearly understood and of less concern.
FRAMING THE COMPLEX ISSUE OF CONGESTION PRICING

Minnesota has introduced congestion pricing through its MnPASS system through extensive outreach and education and learning from trial and error. The first foray into congestion pricing with the week-long Citizens Jury provided insights into public perceptions of congestion pricing that informed future activities. The framing of the question for the Citizens Jury ‘Is congestion pricing a good way to manage congestion and fund transportation?’ led the jury members to focus on the equity of tolls and cost of implementing congestion pricing. The complex relationship between pricing and congestion was harder to grasp than the revenue potential of tolling, resulting in suspicion about whether congestion pricing would work. The concerns about loss in new tolls and costs of collection were much stronger than the perception of gain in terms of time savings, demonstrating the power of the loss aversion effect.

In contrast to the open-ended question asked the guest jury, a panel survey conducted in 2004, 2005 and 2006 before and after the I-394 MnPASS project was implemented asked the question about pricing in a different way: “What do you think of allowing single drivers to use the carpool lanes by paying a toll?” (14) The survey respondents answered this question positively, 62-72 percent, for all income levels. People focused on the benefits of time saved and choice to pay toll, the gain over the cost. The simple choice of whether a trip is worth the time saving vs. paying the toll for different types of trips did not require an understanding of the complex concept of congestion pricing.

Figure 4. What do you think of allowing single drivers to use the carpool lanes by paying a toll?

Source: I-394 MnPASS Panel Survey
Psychologists and behavioral economists explain the challenge of presenting complex problems to the public in terms of the way the brain works. Human thinking works through two systems: System 1 operates automatically and quickly, with little or no sense of voluntary control; System 2 allocates attention to the effortful mental activities that demand it, including complex computations (15). System 1 is often associated with emotions and impulse, though it ends up influencing most of our conscious and unconscious decisions. System 2 requires much more effort and concentration, and the human brain’s capacity to manage these more complex logical calculations is much more limited. The two systems working together influence all of our routine human activities but also lead to amazing human accomplishments and innovations.

Transportation economists can present a compelling argument for congestion pricing using the logic and calculations of their System 2 thinking, but the general public is hearing the message with much simpler perceptions from their System 1 thinking. Thaler and Sunstein describe the issue in terms of Humans (responding quickly and impulsively with System 1) and Econ (responding slowly and logically with System 2) and suggests reframing problems to nudge people to better solutions (16).

LESSONS LEARNED

The following are some lessons learned from Minnesota’s experience with congestion pricing and possible insights from the fields of psychology and behavioral economics.

Political leadership is necessary

Political leaders in order to get elected and remain in office must learn to simplify complex issues and present policies to the public in a manner that is quickly understandable. Health care policy remains controversial at least in part because people don’t understand it. It is difficult to explain congestion pricing to the public unless it can be put in simpler more understandable terms, and elected officials understand how to do this. That means engaging political leaders in explaining congestion pricing and developing understandable messages that can be used in discussing pricing projects with constituents or in explaining legislation that advances congestion pricing. Minnesota’s grasstops approach to outreach and education is a good example of how to engage political leaders on congestion pricing.

Public will support projects if they can see benefits

Experience in Europe and the U.S. show that the public will support congestion pricing if they see it work and can see clear benefits in terms of time savings, less hassle with congestion, more reliability or better transit service. Showing people how pricing works and hearing testimony from people who benefit are important as in the case of Minnesota’s Buying Time video. Showing policy and opinion leaders successful congestion pricing projects and the people who benefit can be critical in nudging support from System 1 thinking.
Pricing projects must work from day one

Minnesota combined extensive outreach and education with innovative transportation and technology solutions such as dynamic shoulder lanes on I-35W. On both the I-394 and I-35W MnPASS projects, MnDOT paid close attention to successful implementation and responded quickly when problems occurred. Any failures will quickly sour public perceptions of congestion pricing and make future projects much more difficult, while successful projects will reinforce public support and lay the groundwork for future pricing projects.

Effective outreach, education and marketing are critical for success

Given the complexity of congestion pricing in terms of public perception, there must be effective outreach, education and marketing before, during and after congestion pricing projects are implemented. The messages to the public about congestion pricing must be clear and understandable, and all questions must be answered as projects are proposed and developed. The public’s loss aversion bias will dominate the discussion before projects are implemented and proven successful. Marketing and communications with users is essential to make sure they know how to use the system and understand the benefits as the congestion pricing project is implemented.

Pricing projects are more likely to generate support if linked to transit improvements

The I-35W project combined new MnPASS lanes with major investments through the federal UPA grant in transit. This approach makes the most effective use of the MnPASS lanes as transit lanes as well as for carpools and a paid option for SOVs. London, Stockholm and Singapore have also made significant improvements in transit at the same time congestion pricing was implemented. In addition to making the most efficient of scarce and costly urban road space, this approach has helped to make a much stronger case to political leaders and the public for congestion pricing as a tool for managing congestion.

CONCLUSION

A lot can be learned from the extensive congestion pricing outreach and education efforts in Minnesota over the past twenty years as well as the experience with congestion pricing projects in Europe and other U.S. cities. A lot more could be learned about why people think the way they do about congestion pricing and how to address these perceptions with more research on congestion pricing using insights and research approaches from the fields of psychology and behavioral economics.
REFERENCES


14. Munnich, L. W., Jr., and K. R. Buckeye. I-394 MnPASS High-Occupancy Toll Lanes: Planning and Operational Issues and Outcomes (Lessons Learned in Year 1). In *Transportation

Appendix G2
Addressing Public Perceptions of a Lane “Take-away” in Designing Minnesota’s I-35E MnPASS Managed Lane Extension
Addressing Public Perceptions of a Lane “Take-away” in Designing Minnesota’s I-35E MnPASS Managed Lane Extension

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ABSTRACT
A major challenge in implementing congestion pricing is the public perception that access to the road system is being taken away. Regardless of whether the road is paid for with taxes, tolls, or operational and congestion costs, a perceived “take-away” can make support for such investments difficult to generate. The greater Minneapolis-St. Paul region has implemented two MnPASS managed lane projects on I-394 and I-35W in Minneapolis and surrounding suburbs, and will open a third on I-35E north of St. Paul in 2015. This case study presents the results of a design alternatives study by the Minnesota Department of Transportation (MnDOT) for a proposed extension of the I-35E MnPASS managed lane, including results from MnDOT’s outreach and education effort and a similar effort led by the Metropolitan Council for the update of the region’s long-range transportation plan. The MnPASS design alternatives included converting a general purpose lane to a priced lane. The study indicates the public will accept a “take-away” if there are clear and understandable benefits. Community dialogues held with I-35E stakeholders and additional regional focus groups conducted by the Metropolitan Council indicate that the public is generally not very well informed about the rationale for MnPASS lanes or that managed lanes are a priority in the regional transportation plan, suggesting that more outreach and education is needed and can help clarify the value of this approach.
INTRODUCTION
The Minnesota Department of Transportation (MnDOT) and the Metropolitan Council, the metropolitan planning organization (MPO) for the greater Minneapolis-St. Paul region (Twin Cities region), have adopted a managed lane policy to offer options to avoid traffic congestion, promote transit usage, and make more efficient use of urban highways. This policy, incorporated in the state and regional transportation plans, requires that congestion management strategies, especially high-occupancy toll (HOT) MnPASS lanes, be considered when planning new highway investments in the region. This policy – along with the demonstrated success of MnPASS lanes on two urban interstates, I-394 west of downtown Minneapolis and I-35W south of downtown Minneapolis – have encouraged transportation policy leaders to incorporate MnPASS into future transportation projects.

The first two MnPASS projects broke new ground in a state that had no traditional toll roads. Interstate 394 and I-35W were both high-occupancy vehicle (HOV) lanes before conversion to HOT lanes. In the case of I-394, legislators supported the HOT lanes as a way to make more efficient use of an underutilized HOV lane that was limited to two-person carpools, buses and motorcycles (1). The I-394 MnPASS lanes were the first HOT lanes in the nation to use double-striped lines rather than physical barriers, proving that this approach could be used safely. The implementation of I-35W MnPASS lanes were accelerated with a $133 million Urban Partnership Agreement (UPA) grant from the U.S. Department of Transportation (USDOT) (2). The UPA grant included significant funding for transit improvements that were initiated simultaneously with the MnPASS lanes. A new feature of the I-35W project was a dynamic shoulder lane that could be used as a MnPASS lane during peak-periods, then returned to an shoulder at other times.

While transportation planners now see the advantages of MnPASS lanes, the implementation of MnPASS lanes on additional projects has not been a clear or simple effort. There are no other HOV lanes in the region beyond I-394 and I-35W that can be converted to MnPASS lanes, so any new projects must work with existing capacity or adding lanes. MnPASS is being added using new lanes on I-35E north of downtown St. Paul in conjunction with the reconstruction of I-35E. Construction is expected to be complete in 2015. The new section of MnPASS lanes is slightly more than four miles in each direction, and MnDOT planners have recognized the need to extend the lanes further north to make them more effective. The problem is that this extension north will require converting a 3-mile section of one southbound existing, general purpose freeway lane to MnPASS where I-35E shares common road space with I-694. This would mean taking away an existing general purpose lane and converting it to a HOT lane, creating problems of public perception and raising concerns about future freeway operations for some engineers.

THE “TAKE-AWAY” PROBLEM
A major challenges in implementing congestion pricing is dealing with the problem of public perceptions that access to the road system is being taken away. If a road is considered paid for by the public through taxes or past tolls – whether it has been paid for or not and whether it is still imposing costs in terms of operations and congestion – it can be extremely difficult to generate support and overcome opposition to what is perceived as a “take-away.” Even if there are significant public benefits in terms of congestion reduction, loss aversion effects can exaggerate the negative concerns about giving up something the public believes they are entitled to (3). Efforts to implement major congestion pricing in U.S. cities such as New York City and San
Francisco have been stymied because of concerns about taking away access to free roads (4) (5). While mitigating solutions may exist, it is difficult to convince the public *ex ante* that they will be better off, even though experience in such cities as London, Stockholm, and Singapore have demonstrated that the public will support congestion pricing when they see it working.

Many U.S. cities have found that the public will accept HOT lanes if they offer a choice to avoid congestion but do not take away existing general-purpose lanes. This can be achieved if there is excess capacity available in HOV lanes, or if there is an expansion of capacity in the highway corridor. However, capacity expansion may then reduce the need for the HOT lanes in the short term and, if implemented without careful and sometimes costly attention to transitions between MnPASS and general purpose capacity, may exacerbate existing traffic bottlenecks. Extensive outreach and education is required in any case, and public officials and transportation professionals may have little taste for the amount of public engagement that is required to move pricing projects forward.

General-purpose lane conversion to MnPASS operations during peak-periods had not been attempted before the I-35E extension because the public and many policymakers would oppose it on the grounds that it is a “take-away” of existing capacity. However, if a conversion of a general purpose to a MnPASS lane could be shown to be operationally sound, could the public be convinced to support or at least not oppose such a project?

Minnesota had experience with a variation on the “take-away” problem when it launched the I-394 MnPASS project in May 2005. The HOV lanes on I-394 west of Highway 100 were limited to two-person carpools, buses, and motorcycles only during the peak-periods eastbound in the morning and westbound in the evening. With support from a corridor advisory task force, MnDOT decided to operate the MnPASS lanes 24/7 rather than only during peak periods in the peak directions. Initially, there was a significant increase in congestion in the westbound morning peak as those who had previously used the HOV lane as solo drivers were shifted into the general purpose lanes. There weren’t enough MnPASS users and HOVs in the MnPASS lane to offset this shift.

While the MnPASS lanes were working well in all other respects, the increased westbound congestion in the morning generated considerable media attention and resulted in the state legislature introducing legislation to address the problem. After examining various options, MnDOT reversed its 24/7 operations and went back to the peak period in the peak direction approach under the previous HOV system (6). The additional congestion in the westbound lanes during the morning peak subsided, and the MnPASS lanes have worked well ever since without significant problems and with generally positive results and enthusiastic support by MnPASS users.

Seattle, Washington, faced the “take-away” problem when the region proposed to charge tolls on the SR 520 bridge to reduce congestion, as well as to generate revenue to replace the existing floating bridge with a new bridge over Lake Washington. Seattle received an $87 million UPA grant from the USDOT for transportation enhancements, including implementing variable tolling on the bridge. While drivers and transit would benefit from converting general purpose lanes to variably priced lanes through reduced congestion on the bridge, Washington state transportation leaders conducted considerable public outreach to explain the benefits. A major selling point was the need to replace the existing bridge and the use of the tolls as “an early down payment” on the new bridge (7).

Atlanta, Georgia, converted an HOV-2+ lane (two or more occupants) to a HOT-3+ lane (three or more occupants) on I-85 in 2011. Single-occupant could now use the I-85 Express
Lanes by paying a variable toll using a Peach Pass. Two-occupant vehicles, which previously used the HOV lane without charge, now needed to get a Peach Pass and pay a toll to use the lanes. Vehicles with 3 or more occupants could travel in the lanes for free, though they also needed a Peach Pass.

The Georgia project team conducted extensive outreach and education, hosting more than 100 public meetings to explain how the new I-85 Express Lanes would save time and money and get drivers home sooner. While this could be considered a “take-away,” since two-occupant vehicles were now being charged for the privilege they had previously enjoyed in the HOV lane, there was not much opposition to this change before the Express Lanes opened (8).

In spite of the extensive outreach, the project experienced very low usage of the Express Lanes on the first day and for the first few weeks. The problem was the sticker shock of moving from $0 to $5 for the trip. The governor instructed the project team to find ways to increase usage of the express lane by lowering the toll. When rates were reduced, Peach Pass sales and Express Lane use increased.

Los Angeles faced a similar issue in 2008 when it proposed to begin converting its network of HOV lanes to HOT lanes as a condition for funding through the USDOT’s Congestion Reduction Demonstration (CRD) program (9). (The USDOT renamed the Urban Partnership Agreement program the Congestion Reduction Demonstration program.) The long-term goal of the Los Angeles region is to implement a broad network of congestion-priced lanes.

The Metro ExpressLanes demonstration program, overseen by Los Angeles Metro, Caltrans and several other mobility partners, was created to develop multi-modal solutions to improve traffic flow and provide enhanced travel options on the I-110 and I-10 freeways in Los Angeles County. The program includes HOV lanes to HOT lane conversions, improving transit service and other alternatives to driving, updating transit facilities, and providing demand-based parking pricing in downtown Los Angeles (10).

However, the initial CRD proposal was more ambitious in increasing the minimum occupancy requirement for the HOV to HOT lanes conversions planned. Several HOV lanes were at capacity and unable to provide better service than general purpose lanes, thus making HOT 2+ lanes unrealistic. The solution proposed was to convert HOV 2+ lanes that were at capacity to HOT 3+ lanes, where both two-occupant and single-occupant vehicles would be tolled. Los Angeles originally identified SR-210 and I-10 as the corridors, with I-110 identified for conversion if funds were available. This would improve the performance of the ExpressLanes for all users. However, the number of Los Angeles residents who were using the lanes as two-person carpools turned out to be formidable opposition so that SR-210 was eliminated from consideration (11, 12). Though I-110 was added to the priority pilot, state law authorizing tolling also prohibited increasing the minimum occupancy requirement during the pilot. Therefore, I-110 operates as HOT 2+ today.

The I-10 operates as HOT3+ during the peak period and HOT 2+ during off-peak periods because that is how it operated as an HOV lane. The FastTrak transponders used on the ExpressLanes include a switch that allows the drive to choose a single driver, two-person carpool, or three-person carpool option. Some of the sting for the HOV-2s has been taken away through a rewards program for carpools and vanpools that use the ExpressLanes.
MANAGED LANE POLICY AND PUBLIC PERCEPTIONS IN MINNESOTA

Transportation Policy

MnPASS-style priced managed lanes have been a foundational piece of the highway congestion management approach for the Twin Cities region since 2010. The 2040 Transportation Policy Plan, scheduled for adoption in January 2015, emphasizes the importance of strategic, system-wide approaches for managing congestion that assure the best use of capacity within existing highway right-of-way. The MnPASS managed lane system planned is an essential component of this approach.

The plan acknowledges that the Twin Cities region has a well-developed and managed freeway system. During the 60 years of the freeway system’s development, the region’s approach to improving highway performance has changed to one that accepts congestion as a reality and focuses on ways to manage and optimize the performance of the entire highway system. Projects must be strategic to provide a high return on investment, recognizing the limited highway funding available.

In addition, highway costs are expected to outpace revenues over the long-term, creating challenges to operate, maintain, and rebuild the existing system. The plan also anticipates travel growth in the region by 2040: 28 percent more vehicle trips and 23 percent more miles traveled. To that end, the transportation plan focuses investments on affordable, multimodal, and flexible solutions that address problems from a transportation system-wide perspective and achieve multiple outcomes.

MnPASS system investments achieve multiple goals and objectives, including improving overall safety, managing highway travel demand, minimizing travel time, increasing reliability, enhancing travel options, and integrating with land use and other regional systems. Specifically, MnPASS system investments allow the region to apply multiple congestion management strategies in a corridor, and provide congestion-free reliable options for transit users, carpoolers, and drivers of single-occupant vehicles willing to pay. Small trucks can also buy their way into the managed lanes during rush hour times as long as the target travel conditions are maintained in the lane. Any motorist can freely use the MnPASS lanes outside of rush hour times. In addition, new or extended MnPASS lanes improve the flow of traffic in adjacent general purpose lanes.

The new regional transportation policy plan estimates the MnPASS lanes on the freeway system envisioned for 2040 will cost between $1.8 billion and $2.4 billion in 2014 dollars. This estimate assumes projects can be built in conjunction with major pavement and bridge reconstruction or rehabilitation projects, and with little or no new right-of-way to promote cost-effectiveness.

Public Perceptions

Though MnPASS has been a part of the Twin Cities highway system for nearly a decade, many motorists do not travel in the those corridors I-35W or I-394 corridors in the western and southern parts of the metro area, and therefore have no first-hand experience with MnPASS lanes. And while these corridors move thousands of transit passengers a day with reliable travel times, the public generally does not notice it.

Even motorists who regularly travel through those corridors may not understand how MnPASS works or its specific benefits. Motorists – both in corridors with MnPASS and other sections of the region – express frustration with MnPASS for various reasons that add up to a lack of understanding about the value of MnPASS as a tool to manage congestion. They don’t
understand that MnPASS lanes improve congestion in general purpose lanes. And a pervasive perception is that MnPASS lanes are only for people willing to pay tolls and therefore provide no benefit to other motorists or transit customers.

Therefore, the idea of converting existing general traffic lanes to a HOT lane is widely viewed in the Twin Cities region as an unfair “take-away.” Though performance information shows the critical role MnPASS lanes play in on-time performance for transit reliability, the general lack of understanding about MnPASS continues to feed these misperceptions about MnPASS’s valuable role in system-wide congestion management and commuter choices.

However, in settings where residents of the region have an opportunity to ask questions and gain a better understanding of how MnPASS lanes are planned and used, the perception is generally positive. The Metropolitan Council recently held a series of focused public discussions on long-term transportation policy in the Twin Cities region. Participants were recruited from across the Twin Cities metropolitan area. They represented a range of interests, including people with disabilities, people of color, people of a wide variety of ages, and were drivers, transit users, bikers, and walkers.

Participants were asked their perceptions of highway congestion management strategies, including MnPASS, and reported the following:

- Attendees recognized the value of a more reliable travel option, including related benefits on travel experience and driver behavior. They noted potential benefits to a broad range of customers, including motorists, commercial drivers, and transit riders. They also noted general support for greener options that reward transit commuters and carpoolers.
- Attendees were happy to learn MnPASS revenues are reinvested in the corridor. The common perception was MnPASS is simply a tactic to make more money for roads and transit, rather than to improve travel conditions and options in the corridor.
- Attendees perceived MnPASS lanes as providing benefit to a small market of motorists who can afford it, and that the benefits may not be broadly available to lower-income drivers who potentially cannot take transit. This perception reflects a gap in understanding that MnPASS lanes improve conditions in the adjacent general purpose lanes and benefit all motorists.
- But the most common feedback was that basic information about how MnPASS lanes work is not widely available or understood, and the process to acquire a transponder and plan ahead is complicated, and may create a barrier to participation and understanding.
- There are also enforcement and usage rules that can be difficult to understand and intimidating to a new user. For example, transponders need to be turned off when carpooling, and customers need to ensure the account contains funds for use. (14)

I-35E MNPASS EXTENSION DESIGN OPTIONS AND COMMUNITY DIALOGUES
Minnesota received a Value Pricing Pilot Program (VPPP) grant from the Federal Highway Administration (FHWA) in 2012 to conduct a pre-implementation study of innovative managed lane concepts for the development of I-35E on the eastern side of the Twin Cities metropolitan area. At the time MnDOT was designing a MnPASS facility in the I-35E corridor between downtown St. Paul and Little Canada Road, which would be the state’s first use of MnPASS where no pre-existing HOV lane could be converted to a HOT lane. This initial four-mile project is currently under construction and will open to traffic in 2015. The study examined alternative
approaches to continue the I-35E MnPASS lanes further north through the I-694/I-35E interchange and commons section, approximately four additional miles, in order to optimize the benefits that MnPASS can provide in the entire corridor. The purpose of the study was to determine (1) whether an existing general purpose lane in each direction could be converted to peak-period MnPASS operations through the I-694/I-35E interchange area, (2) how other alternatives such as a discontinuous MnPASS lane design would perform, and/or (3) whether shoulder operations are feasible and cost effective as a means to provide lane continuity.

The MnDOT proposal to FHWA identified three design options for the I-35E MnPASS extension (13) (Figure 2):

1. **General-purpose lane conversion** to MnPASS operations during peak-periods; This approach for creating HOT lanes has not been attempted previously because the public and many policymakers oppose it on the grounds that it is a “take-away” of existing capacity.

2. **Discontinuous MnPASS lane** configurations between the south and north sections; This alternative presents potential issues related to operations, lane continuity, and driver compliance and enforcement.

3. **Shoulder lane conversions during peak periods**; This alternative avoids a general-purpose lane capacity net take-away. This approach is a capacity-neutral option since the general-purpose lane conversion to a MnPASS lane is replaced by the use of the right shoulder (reconstructed) as a general-purpose lane.

Due to the controversial nature of the general purpose lane conversion alternative, the study included an outreach and education effort to gather stakeholder input on the design options. This included working with a steering committee from the communities in the I-35E corridor and community dialogues and interviews with representative stakeholders, including people who drive the corridor. An engineering design consultant conducted a technical analysis of the three options, which was used in the outreach and education activities.

**Knowledge of MnPASS in the I-35E Corridor**

Residents of St. Paul and eastern suburbs are not as likely to be familiar with MnPASS lanes operational in other parts of the region. For the community dialogues MnPASS and the region’s managed lanes policy had to be explained to the stakeholders before considering design options. An infographic was used to quickly explain MnPASS.

The community dialogues and interviews were designed to achieve three goals: opportunity for stakeholders to learn about the MnPASS system vision and plans for MnPASS in the I-35E corridor; familiarize users with the MnPASS concept options for extending MnPASS further north in the corridor; and gather reactions and preferences on the concept options. Representatives from MnDOT and the design consultant were present at each dialogue to answer policy or technical questions that could not be answered by the facilitator.

Three community dialogue sessions with a total of 20 participants and two stakeholder interviews were conducted during April and May 2014. Community dialogues were held with three different stakeholder groups – community and business leaders, professional drivers, and general users.

Participants came to the dialogues and interviews with little to no knowledge or understanding of MnPASS. A significant portion of the 75-minute dialogue was spent describing and discussing the concept of managed lanes and the functionality of MnPASS in the I-35E corridor. When leaving the dialogues/interviews, participants clearly felt much more informed.
about MnPASS, with most participants moving from ‘mostly uninformed/moderately informed’ to ‘well informed’ (Figure 3).

Participants shared their thoughts and questions about the utility of a MnPASS system. As a whole, the professional transit drivers group was most enthusiastic about MnPASS. The group voiced many ways MnPASS could benefit them (e.g. more reliable trip time). One participant was interested in providing MnPASS as a benefit to its drivers to ensure they arrive to work on time. It is important to note that the professional drivers group is the only one where all participants would benefit from the MnPASS lane without paying tolls since their occupancy status would qualify them as either transit or carpool.

All participants acknowledged congestion is an issue in this corridor and a solution needs to be found, with a growing population and job base. Most participants did not question the validity of MnPASS as an alternative to congestion. Those who did raise concerns focused mostly on tolling equity, expressing concern that only the few who can pay would benefit. Others expressed preference for either keeping it HOV and better recruiting carpoolers, or simply building more highway lanes without implementing tolling.

**Design Options**
Participants were presented with three design options and were shown maps to explain each option.
- MnPASS Lane *Without A Gap* (continuous or general-purpose lane conversion during peak periods)
- MnPASS Lane *With A Gap* (discontinuous MnPASS lane)
- MnPASS on Shoulder (shoulder lane conversions during peak periods)

Participants overwhelmingly expressed support for the “without a gap” option (Figure 4). Many participants explained they thought lane continuity would promote safety by limiting driver confusion through the I-35E/I-694 commons. Participants’ preference for this option remained even when they were made aware of the general purpose-to-MnPASS lane conversion through the I-35E/I-694 commons.

The “shoulder” option raised safety concerns over loss of the shoulder during peak traffic flow, but some participants liked the option because it allowed for MnPASS lane continuity through the I-35E/I-694 commons without losing a general purpose lane. The “with a gap” option raised safety concerns because participants felt that drivers would create more congestion and raise crash risks by weaving in and out of traffic lanes when MnPASS lane designation disappeared through the I-35E/I-694 commons. In the end, many participants offered some support for this option if the decision was between “with a gap” or “shoulder” options.

The evaluation and analysis determined that none of the three options would perform well in the northbound direction due to dropping the MnPASS lane at County Road 96, which would merely push the bottleneck from further north and could make PM congestion worse. As a result, the design consultant also developed and explored a fourth “hybrid” option in response to MnDOT and other stakeholder thoughts and concerns shared during steering committee meetings.

During the morning rush hours the “hybrid” option converts the inside southbound I-35E general purpose lane to a MnPASS lane without a gap through the I-35E/I-694 commons area, and results in a continuous MnPASS lane into downtown St. Paul (Figure 5). For afternoon rush hours in the northbound direction, there would be no change to the 2015 highway configuration because the “hybrid” option would include a gap in the MnPASS lane from Little Canada Road.
to County Road E through the I-35E/I-694 commons area. However, the option would add a new five-mile MnPASS lane north of I-694. The northbound extension adds little cost to the option and addresses an emerging traffic bottleneck.

The four options and no-build option through the commons were evaluated using more than 20 criteria and a variety of metrics. The analysis and evaluation determined ‘no gap” and “gap” options performed best and very similarly. The “no gap” performed slightly better in terms of lane continuity and user comprehension. The “gap” performed slightly better in terms of traffic volume and throughput in the adjacent general purpose lanes. However, it was also determined the “gap” would not operate well in the southbound direction because it would create a very short segment of MnPASS lane, and congestion south of the commons could back into the commons, creating congestion in the left-hand lane and eliminating the reliable congestion-free trip for transit riders, car/van poolers, and other MnPASS users.

Because the evaluation demonstrated the “gap” and “no gap” options performed similarly, MnDOT decided it would be best to test the “gap” option northbound in the PM peak and the “no gap” option southbound in the AM peak for a pilot/evaluation period of 1-2 years.

Based on the results of this evaluation, changes could be made to the “gap” and “no gap” approaches through the commons. This decision was also based on the fact that this will be one of the first times general purpose lane capacity is re-purposed to priced managed lane capacity during a peak rush hour period, and as a result, the pilot test approach will be more transparent, acceptable and responsive to corridor users.

The “hybrid” option was presented to the community steering committee and was well received, particularly with the northern extension to County Road J. The alternatives were presented to MnDOT decision-makers in May 2014, and the “hybrid” option was recommended to move forward into the environmental process with potential completion of the I-35E MnPASS managed lane extension in 2016.

Evaluating the Performance of “Gap” and “No Gap” Conditions through the I-35E/I-694 Commons

Once the MnPASS lanes are in full operation on I-35E, MnDOT will evaluate the performance of the northbound “gap” and southbound “no gap” conditions through the commons. Evaluation criteria will include traffic flow metrics in the general purpose lanes and MnPASS lanes through the commons area and the broader I-35E and I-694 corridors using road sensor data and analysis from MnDOT’s traffic analysis software. MnDOT will also use crash data and metrics to evaluate any safety impacts in the corridor. MnDOT will also gather user feedback to assess understanding and concerns with the different approaches. Maintenance and enforcement results will also be evaluated.

In particular, MnDOT will examine the extent to which traffic volumes increase in the southbound general purpose lanes on I-35E through the commons and south of the commons during the AM peak period, as well as in the northbound general purpose lanes in the vicinity of County Road E during the PM peak period. It will also closely examine whether there is confusion among corridor users about when and how certain lanes can be used, and whether any safety issues arise.

MnDOT will continue the evaluation for a 1-2 year period and will determine whether modifications need to be made to the “gap” and “no gap” conditions through the commons. Modifications could include switching a “gap” condition to a “no gap” condition or vice versa. Modifications may also include physical improvements in the commons, such as signing,
striping, or capacity improvements. If modifications are made, MnDOT will continue to monitor and evaluate the impacts of these modifications on corridor users and traffic flow through the commons and broader I-35E and I-694 corridors.

LESSONS LEARNED
The study teams identified several lessons from the I-35E MnPASS extension community dialogues and Metropolitan Council’s focus groups on the 2040 Transportation Policy Plan:

- Develop a communications strategy that recognizes and speaks to questions, conceptions, and concerns of different audiences and highlights basic understandings necessary for long-term success of priced managed lanes. Ensure that the communications strategy appeals to technical audiences (engineers and planners), business interests, policymakers, and the public. All the groups are potential clients and need to understand the purpose of the lanes, the full range of alternatives analyzed (including comparing return-on-investment), and the benefits of using these strategies.
- Develop and present the information in ways that are easily accessible to each audience and recognize priced managed lanes like MnPASS are new approaches many people do not have experience with.
- Create opportunities for all groups to play with the concept and develop an understanding and appreciation for all opportunities it presents. Recognize there is not necessarily one way to implement or operate a managed lane – slightly different options may be appropriate for different corridors. Allowing constituencies to play with these options may help alleviate anxiety or perceived risks, and supports a more deliberative process for choosing a managed lane solution.
- Education is key. Focus group and interview participants had very little knowledge of MnPASS prior to attending the community dialogues. In a part of the region where MnPASS has not yet been implemented, people need a lot of education and outreach to raise awareness and understanding of managed lanes like MnPASS.
- Emphasize people can continue to choose from among a range of travel options – managed lanes do not limit those choices.
- People should understand MnPASS provides transit and carpooling options. Part of creating a successful managed lane system is to provide viable travel alternatives to driving alone. It is critical to communicate to policymakers and the public how MnPASS directly supports efficient and effective transit and ridesharing.
- Discussion must illustrate the benefit of growing a MnPASS system of managed lanes. In the I-35E example, building on benefit from MnPASS south of Little Canada Road could generate acceptance for MnPASS north of Little Canada Road. Since MnPASS will be opening south of Little Canada Road first in 2015, I-35E commuters who travel into St. Paul from the north will have an opportunity to experience the benefits of MnPASS.

CONCLUSIONS
Converting general purpose lanes to priced managed lanes is possible if the public understands the benefits and there are not significant adverse congestion impacts on other users in the short-term. The experiences in Seattle, Atlanta, Los Angeles, and the Twin Cities demonstrate that outreach and education combined with careful operational design and prompt response to problems when they occur can lead to successful projects involving “take-aways” of general purpose lanes for priced managed lanes.
In addition to education and outreach related to priced managed lanes like MnPASS, communities should employ engagement strategies that encourage shared problem-solving with community stakeholders so motorists, transit customers, businesses, and policymakers can understand these strategies as effective congestion management techniques, among other options, and weigh the pros and cons along with technical staff. Effective engagement strategies will dispel perceptions that managed lane strategies are gimmicks and lend confidence to the decision-making process.

The I-35E MnPASS managed lane extension project and focus groups conducted for development of the 2040 Transportation Policy Plan provide a useful case study on how to engage a community in helping to shape managed lane policy and projects, and deal with sensitive issues such as general purpose to priced lane conversion in managed lane design.

REFERENCES

8. Interview with Malika Reed Wilkins, Director of Marketing and Communications, Georgia State Road and Tollway Authority, on June 6, 2014


13. Public workshops, outreach and engagement activities to support the creation of the 2040 Transportation Policy Plan, Metropolitan Council of the Twin Cities, 2014.

LIST OF FIGURES

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FIGURE 2  I-35E Extension Lane Options.

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FIGURE 5  I-35E MnPASS Extension “Hybrid Solution.”
FIGURE 1 MnPASS / Managed Lane System and I-35E Extension
**FIGURE 2** I-35E Extension Lane Options

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<th><strong>DISCONTINUOUS</strong></th>
<th><strong>PDSL</strong></th>
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<td><strong>CONVERT INSIDE GENERAL PURPOSE LANE TO MNPASS LANE DURING PEAK PERIODS</strong></td>
<td></td>
<td><strong>NO MNPASS LANE BETWEEN LITTLE CANADA ROAD AND COUNTY ROAD E</strong></td>
<td><strong>CONVERT INSIDE SHOULDER LANE TO MNPASS LANE DURING PEAK PERIODS</strong></td>
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- **CONTINUOUS**: COST: $11.3 M
- **DISCONTINUOUS**: COST: $10.7 M
- **PDSL**: COST: $24.0 M

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[Image of MnPASS and Parsons Brinckerhoff logos]

G2-16
FIGURE 3: Before and after results for community dialogue participant level of knowledge of MnPASS

How well informed do you consider yourself to be about MnPASS?

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<td>Extremely well informed</td>
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</table>
FIGURE 4: Level of Support for MnPASS Design Options in Community Dialogues

- not enough info: 1
- support strongly: 5, 9
- support somewhat: 3, 6
- neutral: 1, 2, 4
- somewhat opposed: 2, 5, 8
- strongly opposed: 3, 4, 5

Legend:
- Shoulder
- Without a Gap
- With a Gap
FIGURE 5  I-35E MnPASS Extension “Hybrid Solution”

Northbound

Future Phase: Extend MnPASS Managed Lane from County Rd J to County Rd 14
Length: 3 miles

Add New MnPASS Managed Lane from County Road E to County Road J
Length of expansion: 5.1 Miles

No Changes from Current Conditions-
Gap in MnPASS lane from Little Canada Road to County Road E-
Length of MnPASS Gap: 2.9 Miles

Southbound

Future phase: Add MnPASS Managed Lane from County Rd 14 to Goose Lake
Total length: 7.1 Miles

Add New MnPASS Managed Lane from Goose Lake Rd Bridges to County Rd E
Length of Expansion: 1.3 Miles

Convert Inside Southbound Lane of I-35E to MnPASS in AM Peak – 2.9 miles
(Without a Gap option)