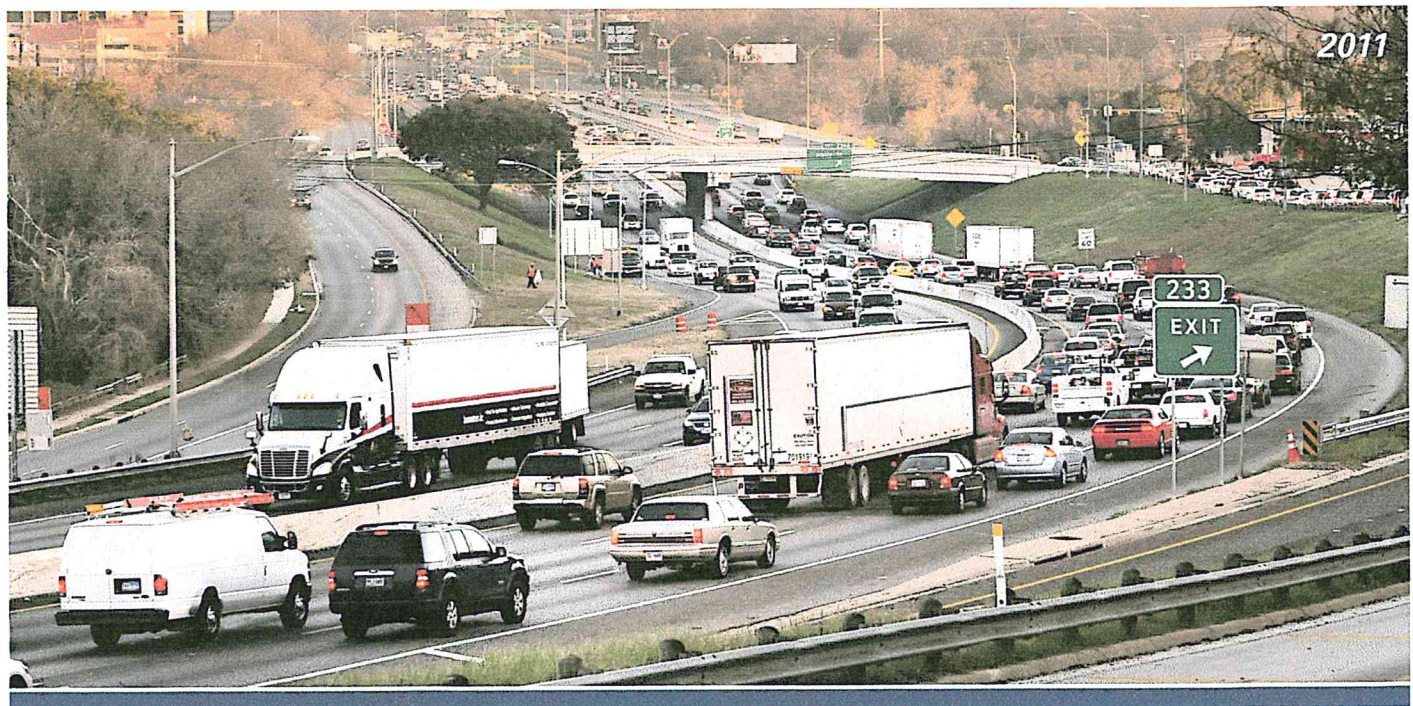


# Mobility Investment Priorities Project

## Long-Term Central Texas IH 35 Improvement Scenarios

### Executive Summary

August 2013



**Establishing Mobility Investment Priorities**

**Under TxDOT Rider 42:**

**Long-Term Central Texas  
IH 35 Improvement Scenarios**

**Prepared for  
Texas Transportation Commission  
And  
83<sup>rd</sup> Texas Legislature**

**Prepared by:  
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**Mobility Investment Priorities Project  
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## EXECUTIVE SUMMARY

This summary presents an overview of the purpose, findings, and recommendations resulting from a computer modeling effort to examine potential long-term solutions for IH 35 through Central Texas.

### Context

The City of Austin is among the fastest-growing cities in the U.S., with surrounding counties keeping a similar pace. Travel times from downtown Austin to Round Rock, where many commuters live, range from 45 to 60 minutes during the average afternoon rush hour. And yet, there is no agreement on what should be done to solve the travel time problem. The long-range transportation plan for the Austin Metropolitan Area, the 2035 CAMPO Metropolitan Transportation Plan (2035 CAMPO), shows no large-scale construction improvement strategies for IH 35 through Central Texas. On-going IH 35 initiatives by the Texas Department of Transportation (TxDOT) and the City of Austin are focused upon short- and mid-term improvement strategies that address existing and near-term congestion with potential high-return strategies (<http://www.mobility35.org/>). At the same time, decision-makers have expressed a need for examination of long-term solutions for IH 35, considering, for example, concepts which had been discussed under previous studies but not fully explored.

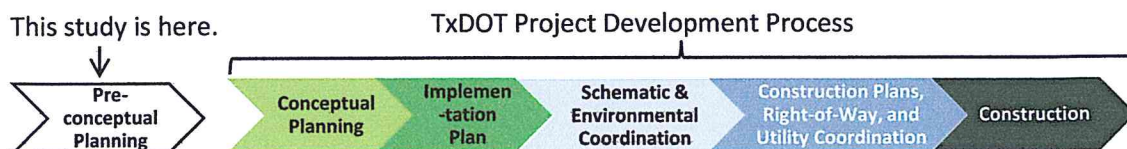


*IH 35 looking northbound, 2012*

The Mobility Investment Priorities project offers an opportunity to perform this initial examination. As referenced in the [Mobility Investment Priorities \(MIP\) First Year Report](#), the most congested metropolitan highways in Texas are becoming even more crowded, resulting in lost time and wasted fuel topping \$10 billion per year. Not only is congestion high, but traffic problems are also increasing faster in Texas than in similar U.S. areas: the areas of Houston, Dallas-Fort Worth, San Antonio, and Austin rank in the 15 fastest-growing congested urban areas in the country. Congested corridors cause problems for the movement of goods and services to areas throughout Texas. This study applies advanced traffic modeling techniques to assess long-term congestion reduction strategies for IH 35 through Central Texas.

The MIP modeling analysis is conducted at what is called a pre-conceptual level (Exhibit ES-1).

### Exhibit ES-1 Study Level Context



This modeling effort provides an opportunity for Central Texas stakeholders to explore roadway design scenarios unbounded by the consideration of today's financial constraints or federal restrictions on conversion of existing travel lanes to toll lanes. This exercise enables stakeholders to determine if any of the scenarios have benefits that are substantial enough to warrant the additional effort and investment necessary to further pursue a large-scale commitment for the complex IH 35 corridor, or even to seek an exception to the federal restrictions mentioned above. In short, this effort is a first step in addressing the question:

### ***What is the long-term solution for IH 35 congestion through the Austin Metropolitan Area?***

This study provides a framework for preliminary screening of long-term, large-scale options. The modeling analysis is intended to complement and support existing planning and development efforts underway in the region, and is **not a replacement for current local efforts**.

### **Common Perceptions about IH 35 through Central Texas**

The study team uncovered findings directly pertinent to beliefs common to many residents in Central Texas:

- Through traffic causes most of the congestion problems along IH 35 in Central Texas.
- Truck traffic along IH 35 is a major problem that can be addressed by diverting trucks to SH 130, a parallel route east of IH 35.
- Central Texas can build enough road and transit system capacity to eliminate IH 35 congestion.

Researching these perceptions was not a specific task of the research effort, although the analysis does provide insight into these common assumptions and offers insight into the underlying causes of the mobility challenges awaiting future Central Texans.

### **Study Approach**

As a pre-conceptual analysis, this study was oriented toward two broad tasks:

- 1) **Scenario Analysis:** examination of a base case and seven improvement scenarios.
- 2) **Supplemental Analysis:** addressing questions which arose as part of the initial scenario analysis.

Exhibit ES-2 summarizes the initial scenarios considered.

**Exhibit ES-2 Initial Scenarios Examined**

Scenario <b>0</b>	<b>Base Case</b>	The 2035 CAMPO plan–adopted roads and transit network. Scenario 0 includes no additional auto or truck vehicle capacity along IH 35 between SH 45 North and SH 45 South, which is consistent with the current CAMPO-adopted plan.
Scenario <b>1</b>	<b>HOV Lanes</b>	One express lane added to IH 35 in each direction, HOV 3+ and bus transit access only, configuration and access according to the current City of Austin study between 51st Street and William Cannon, concept extended to SH 45 North and South.
Scenario <b>2</b>	<b>Express Lanes</b>	Same as Scenario 1, but also allow HOV2 and SOV vehicles paying an auto toll rate and truck vehicles paying a truck toll rate. Congestion on these lanes is “managed” by allowing the toll rate to vary dynamically throughout the day in order to maintain vehicle flow.
Scenario <b>3</b>	<b>System-Wide Dynamic Pricing</b>	Same as Scenario 2, but allow toll rates to vary dynamically for IH 35 and other north-to-south tolled facilities in the CAMPO 2035–adopted plan system, specifically SH 130, SH 45 Southeast, US 183 South tolled mainlanes, and tolled express lanes along Loop 1 (MoPac).
Scenario <b>4</b>	<b>My35 Conversion Plus</b>	Based on a concept derived by local stakeholders as part of the My35 statewide study. Includes one express lane added to IH 35 in each direction (configuration and access according to the current City of Austin study between 51st Street and William Cannon) plus conversion of one existing IH 35 general purpose lane between SH 45 North and SH 45 South to an express lane.* The express lanes are tolled dynamically; HOV3+ and bus transit ride for free. Remove tolls from SH 130/SH 45 Southeast completely and move the Interstate designation to SH 130/SH 45 Southeast.
Scenario <b>5</b>	<b>My35 Swap</b>	Explores a concept derived by local stakeholders as part of the My35 statewide study. No added capacity. Toll all existing IH 35 mainlanes dynamically during morning and afternoon peak periods (6-9 am and 4-7 pm);* HOV3+ and bus transit ride for free. Remove tolls from SH 130/SH 45 Southeast completely and move the Interstate designation to SH 130/SH 45 Southeast.
Scenario <b>6</b>	<b>Capacity Addition through Core</b>	Explores a concept frequently discussed as an ultimate need to address future congestion. Concept was examined as three additional express lanes in each direction, depressed or tunneled, and dynamically tolled; HOV3+ and bus transit ride for free.
Scenario <b>7</b>	<b>Downtown Austin Alternative</b>	Same as Scenario 2, but with downtown Austin configuration providing alternative cross-street access and separation of through traffic and downtown traffic.

SOV = Single-Occupancy Vehicle; HOV2 = High-Occupancy Vehicle, 2 persons; HOV3+ = High-Occupancy Vehicle, 3 or more persons

\* Note that federal law currently prohibits the conversion of existing general purpose lanes on an Interstate facility to tolled lanes. This study explores such a scenario only to see if any benefits merit exploring an exception.

Scenario 0 is the base case against which the remaining scenarios were compared. This base case is the 2035 CAMPO–adopted road and transit network, which includes no additional capacity along IH 35 between SH 45 North and SH 45 South. Scenarios 1, 2, and 3 build upon Scenario 0 and each other in sequence, exploring different operational approaches to adding one express lane in each direction. Scenarios 4, 5, and 6 explore concepts discussed in previous stakeholder involvement activities. Scenario 7 is based upon Scenario 2, but with an alternative downtown Austin configuration based upon recent local input.

A key assumption for the initial scenario analysis is that transit vehicles and passenger cars with three or more occupants (HOV3+) may use any express lane on IH 35 without paying a toll, but two-person vehicles (HOV2), single-occupancy vehicles (SOV), and trucks pay a toll. Variations on this assumption were explored under a follow-up examination.

An additional important assumption concerns the transit system. The research team determined that the transit system as coded in the 2035 CAMPO model network represents an aggressive representation of current transit plans for Central Texas, but is still within realistic bounds of what is being planned. Therefore, according to this model representation, Central Texas users in 2035 will have many more transit opportunities than they do currently, and therefore the transit mode is well represented in the model being used for this exercise.

The research team applied the CAMPO regional travel model together with DynusT, a traffic analysis software offering several advantages relevant for this study, including the capability to:

- Perform dynamic traffic assignment (DTA) that models a more detailed level of roadway operations than a typical regional travel model, including traffic back-up as a result of extreme congestion.
- Examine the entire CAMPO regional study area (Travis, Bastrop, Caldwell, Hays, and Williamson County), instead of merely the IH 35 corridor. This showed the diversion of traffic to other roadways or attraction of traffic from other roadways in response to IH 35 improvements.
- Model driver behavior and choices in congested conditions closer to reality than typical regional travel models do.
- Model driver choices made with regard to dynamic tolling in response to congestion to maximize system efficiency.

At the same time that DynusT offers the above advantages, the application of a DTA software in a regional context and at this stage of pre-conceptual study is a research application of this approach. That is, while this and other studies are showing DTA as a very useful tool, the technology has been only recently developed, and further research in coming years will standardize DTA practice. In that context, caveats apply, as documented in this report.

## **Key Findings**

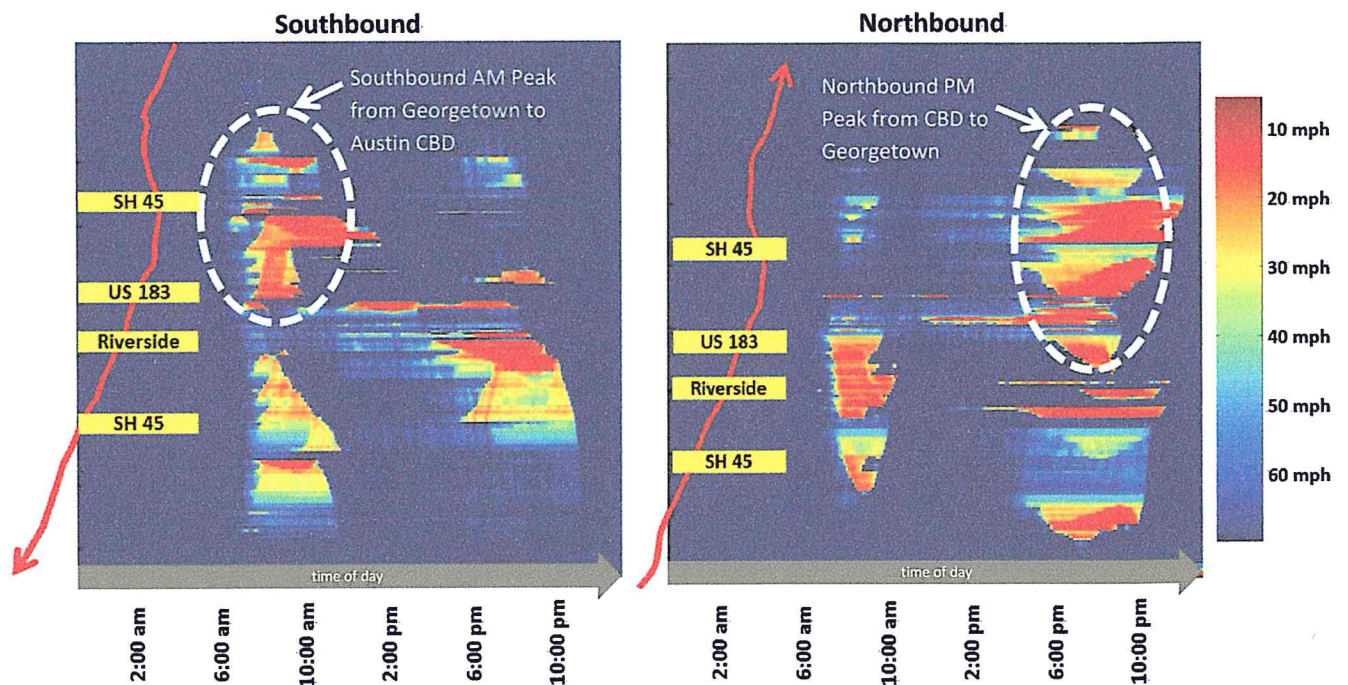
This study applied dynamic traffic assignment and dynamic tolling analysis to examine various long-term scenarios with potential to address growing congestion on the critical IH 35 corridor through

Central Texas. The findings were illuminating: if residential and employment growth each continue on their current pace through 2035, Central Texas faces a grim future of extreme traffic congestion on IH 35.

**Key Finding: The Problem is Huge**

The most dramatic finding is that IH 35 congestion will be severe even if a substantial amount of roadway capacity (typically as lanes) is added. This finding is best illustrated using a “heat” diagram such as depicted for the current CAMPO-adopted plan in Exhibit ES-3. The scale provided to the right of the diagram shows colors that represent freeway speeds: dark blue is speeds 60 mph and above, with yellow, orange, and red representing worsening conditions, down to 10 mph and below. The left side represents southbound IH 35 travel speeds in the general purpose lanes, from the northern Williamson County line to the southern Hays County line. The diagram on the right represents the same for northbound traffic. The entire day is shown in each, as indicated by the time of day shown along the bottom—moving from midnight on the left to noon in the middle and 11:59 pm on the right.

**Exhibit ES-3 “Heat” Diagram Summary of Base Case Congestion (2035)**



Unfortunately, due to the number of trips anticipated for the region and IH 35 in the year 2035, the heat diagrams for the seven improvement scenarios showed only minor changes from this base case (no IH 35 construction improvements) scenario. Other performance measures, including point-to-point travel times for typical commuters, also showed very little change among the initial scenarios examined. Basically, traffic “swamps” the IH 35 corridor and the Austin region in 2035. In addition, peak-period congestion is so severe that it extends into off-peak periods, for example as late as 10 pm as shown in Exhibit ES-3.



### **Key Finding: The Problem is Central Texas Travelers**

The research team identified an apparent contradiction between a common perception voiced in Central Texas regarding the cause of IH 35 congestion and reality: that is, Central Texans have a much greater impact than through travelers. The magnitude of commuter and other local traffic using IH 35 is substantial and increasing due to local projected population and employment growth. Based on the best available data, local traffic represents approximately 86% of traffic on IH 35 through Austin. Thus, through traffic (the traffic that many think should be bypassing Austin) is not the primary cause of Central Texas IH 35 congestion problems. Commuters or other trips with an origin or destination in the Austin area are the major factor influencing IH 35 congestion, not through travelers.

Attempts to re-route truck traffic from IH 35 to SH 130 will have limited impact on IH 35 congestion for two reasons. First, much of the truck traffic has an origin or destination or both near the corridor, making IH 35 a desirable or necessary route. Second, the analysis indicates that truck trips that are traveling through the Austin metropolitan area without stopping generally find the path afforded by IH 35 to be most efficient to allow them to meet their delivery schedule. The effect of congestion on business planning and development (for example, the need for additional manufacturing plants, distribution centers, trucks or staffing to serve customers and suppliers) was not part of this study.

### **Key Finding: The Long-Term Solution Likely Cannot Be Capacity-Addition Alone**

This modeling research demonstrates that Central Texas cannot simply “build its way out of congestion” on IH 35. Of the build-alone options tested, the only one found to have a substantial congestion-reducing effect was Scenario 6, which assumes the addition of six tolled express lanes (three each direction) between SH 45 North and SH 45 South and eight intermediate access points. Although no cost estimate was developed, Scenario 6 will be costly to build and likely to have community and environmental concerns.

Nonetheless, the over-arching and positive message of this examination is that Central Texas does have options to address IH 35 congestion—using a combined “everything including the kitchen sink” approach. Any substantial improvement must come from adding capacity together with operating the system efficiently, new development patterns, and travel behavior changes. Examination of the initial set of scenarios demonstrates that, as capacity is added to IH 35, Central Texas drivers move from other severely congested streets and roads to IH 35, in essence “re-filling” the highway. Therefore, additional capacity provides little relief to peak-hour IH 35 general purpose lane congestion. And, because population and jobs are projected to grow so much in the corridor, any open road space created by new lanes is quickly filled by new trips. As the regional performance measures demonstrate, adding capacity to IH 35 improves system-wide measures because these additional trips are better served on IH 35. Additional capacity for buses, carpoolers, or toll-payers provides users a mobility option that is not present under the base scenario. However, the travel experience along IH 35 general purpose lanes does not substantially improve as a result of any of the scenarios that only add roadway capacity.

### **What Does This Mean?**

The MIP Working Group concluded that the arrangement of land uses and transportation capacity that was modeled, which was based on the 2035 CAMPO plan, is unlikely to occur. That is, the levels of congestion the model predicts for IH 35 and the Central Texas region—as seen in a 3-hour commute

between Round Rock and downtown Austin in 2035—will be unacceptable for local residents and businesses and is not likely to occur. This means that behavior changes would probably occur: jobs and homes would likely relocate to shorten commute times, travelers would avoid making peak-period trips, and severe congestion would likely dampen the area’s population and employment growth. Therefore, with impacts to quality of life and economic health predicted to be this substantial, there may be sufficient motivation to approach IH 35 congestion solutions differently.

## **What Would It Take? A Hybrid Strategy**

Considering the findings from the initial scenario analysis, the logical question is “if a lot of capacity by itself will not solve the problem, what will?” Key to formulating a solution is understanding the underlying issues causing the levels of congestion in the 2035 model. Three primary factors are in play:

- Population and employment growth anticipated for 2035 are substantial. How can these be accommodated?
- The standard analysis approach assumes that people will exhibit the same travel behaviors in the future as they do today. How reasonable is it to assume that Central Texans will change their patterns to avoid severe congestion? And by how much?
- A hybrid approach involving capacity increases and demand pattern changes will almost certainly be required. The demand appears too large for any single congestion strategy.

To address these issues, the hybrid approach assumed the following aggressive strategies:

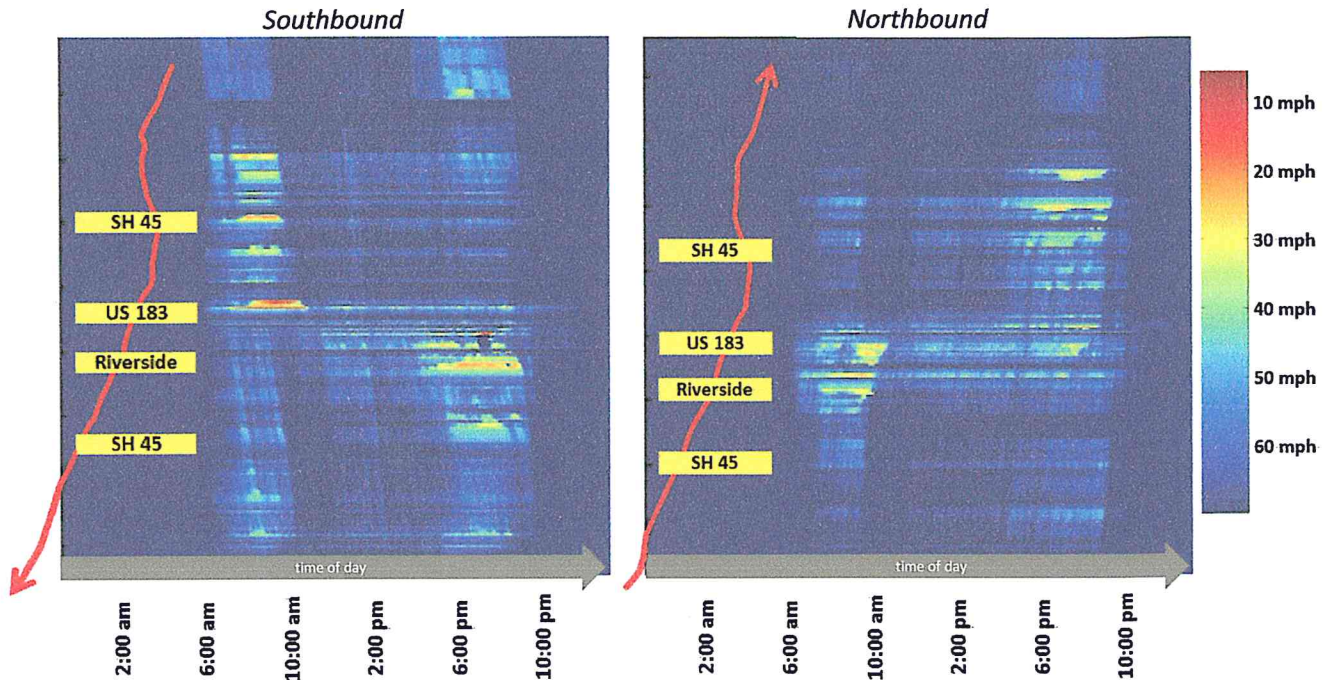
- Adding and managing capacity similar to Scenario 2.
- Shifting 40% of region-wide work commuter trips to work-at-home jobs.
- Reducing university commuter trips by 30% region-wide, assuming, for instance, technology options replace the in-class experience.
- Reducing retail shopping trips by 10% region-wide, for example being replaced by online shopping.
- Shifting trips to off-peak periods.
- Increasing HOV, transit, and non-motorized usage each by 25%, decreasing auto vehicle usage.

As shown in the resulting heat diagram (Exhibit ES-4), the hybrid strategy demonstrates that IH 35 traffic congestion can be substantially addressed by those significant changes: the red areas representing the lowest speeds have essentially disappeared, and the remaining red areas appear to represent localized bottlenecks which could be addressed individually through operational improvements. And yet, the changes to travel behavior necessary to effect such an improvement are significant.

Additional scenario aspects are detailed in the full report: different express lane tolling policies for HOV2+ and HOV3+ and a technology-based strategy facilitated by personal mobile devices.

## Exhibit ES-4 Heat Diagram Summary “What Would It Take?”

24-Hour, IH 35 between North Williamson County Line and South Hays County Line on General Purpose Lanes



### Additional Finding: Interim Improvement Is Helpful

Of particular note, Scenarios 2 and 7 most closely represent current local planning efforts toward an interim, short-term improvement—adding one lane for some yet-to-be-determined purpose in each direction to IH 35 within the existing right-of-way. Scenario 2 (which was modeled as one express lane in each direction) relieves some future congestion versus the base scenario and performed the best overall among the initial scenarios. For example, the two scenarios reduced person-miles traveled by 5% for the region overall, a substantial positive impact translating into roughly \$1 billion in travel time cost savings annually.

Further study of any express lane configuration should consider issues related to maximizing facility efficiency, including:

- The concept's potential for non-traditional funding of construction and maintenance.
- Social and environmental considerations.
- The number and design of access points; the study scenarios generally assumed open access to express lanes. However, if Central Texans are moving on and off the corridor to meet travel needs within the study area, the express lane may become congested if access is too frequent or too cheap.
- A tolling strategy that recognizes the study findings concerning the huge volume of potential users. It is likely that express bus transit will be the only reasonable toll-free users; any other

toll-free usage, for example by carpools, is likely to compromise the operational efficiency of the express lane facility.

The issue of tolling strategy was further examined as part of this study, as Scenario 2b. For this scenario, the Working Group directed the technical team to examine the impact of all HOV vehicles paying a toll except bus transit. For this scenario, region-wide system measures demonstrate only slightly less benefit relative to Scenario 0: 4% reduction in vehicle-hours traveled (VHT) or person-hours traveled (PHT) versus 5% for the original Scenario 2. With regard to point-to-point travel time, Scenario 2b delivers reasonable improvements for all movements on the general purpose lanes, except for a slight increase for IH 35 northbound during the evening peak period. Additional detailed analysis is recommended to determine which designs, operating practices, and tolling policies can maximize the efficiency of any IH 35 express lane facility while considering the benefits and costs to the region as a whole.

## **Next Steps**

The Mobility Investment Priorities project formally concludes in August 2013. This summary and the technical report represent the conclusion of the technical study of long-term scenarios for IH 35 through Central Texas. The conversation will continue, considering:

- Implications of this study's findings for on-going implementation efforts.
- Long-term IH 35 planning recommendations.

An additional recommendation resulting from this examination is the need to further maximize the efficiency of the Central Texas system, including in particular:

- Maximizing the multimodal options available to Central Texans.
- Reviewing other primary travel corridors serving Central Texas including further development of US 183, LP 360, RM 620, as well as continued investigation of approaches to utilize SH 130.
- Examining other north-south arterial roadways such as Red River, North Lamar, Burnet Road, and Pleasant Valley to maximize efficiency for local travel, including multimodal access and coordinating traffic signals to provide more consistent green time to commuters.
- Continuing to address the most critical bottlenecks to system-wide efficiency.
- Exploring options for additional parallel capacity to IH 35, for example a potential US 183 South connection to SH 45 South.

These findings and recommendations are merely a starting point; the ideas proposed by the MIP Working Group require further discussion and exploration to determine the best mobility options for Central Texas.