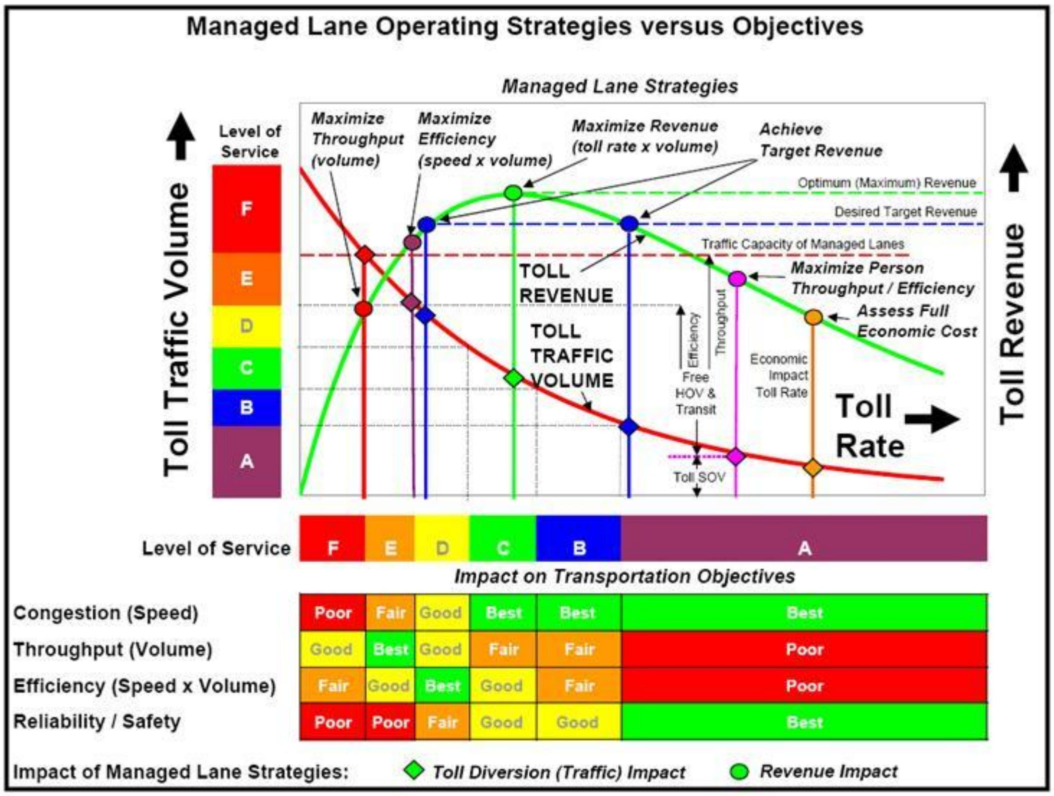
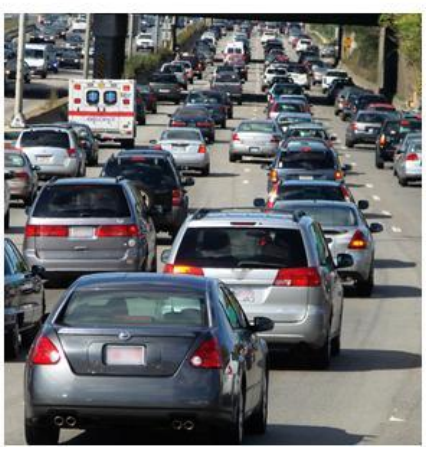
Chicago Regional Congestion Pricing Study





November 2010

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CHAPTER 1

INTRODUCTION

The Texas Transportation Institute's Urban Mobility Report ranks the Chicago metropolitan region ***third*** among urban areas nationwide with respect to travel delay, excess fuel consumption and the cost of traffic congestion, surpassed only by the Los Angeles and New York-New Jersey metropolitan regions. In 2007, Chicago-region travelers lost an estimated 189 million hours and wasted over 129 million gallons of fuel due to traffic congestion. ***The annual cost of the wasted travel time and fuel alone was estimated at $4.2 billion***. This estimate, while substantial, does not account for the true economic impact of traffic congestion in the region. [1]

Other studies have estimated the costs of traffic congestion in the Chicago metropolitan region to be even higher – a study conducted by the Metropolitan Planning Council estimated that traffic congestion on the Chicago region's expressways and arterials results in an annual loss of $7.3 billion, comprised of wasted time, fuel and environmental damage. The study estimated that eliminating roadway congestion would create approximately 87,000 jobs that are lost due to labor and transportation costs. The study further estimated that congestion adds 22 percent to peak period travel times in the region. [2]

These studies illustrate the magnitude and scale of the impact of traffic congestion on mobility and economic activity in the Chicago region. While these issues are not new or unique to the Chicago metropolitan region, they provide the backdrop for the current study.

[1] 2009 Urban Mobility Report, Texas Transportation Institute, Texas A&M University, http://mobility.tamu.edu, July 2009.
[2] Moving at the Speed of Congestion: The True Costs of Traffic in the Chicago Metropolitan Area, Metropolitan Planning Council, August 2008.

FHWA VALUE PRICING PILOT PROGRAM

The FHWA's Value Pricing Pilot Program was initially authorized by the Intermodal Surface Transportation Efficiency Act (ISTEA) as the Congestion Pricing Pilot Program. The program has continued under subsequent Federal transportation reauthorizations, most recently under the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU), with the goal of encouraging implementation and evaluation of value pricing pilot projects to manage congestion on highways through tolling and other pricing mechanisms.

In 2007, the U.S. Department of Transportation's Federal Highway Administration (FHWA) awarded the Illinois State Toll Highway Authority (the Illinois Tollway) a grant under the FHWA's Value Pricing Pilot Program to study the potential of congestion pricing in the Chicago region. The FHWA provided the majority of the funding for the study, with a twenty percent match from the Illinois Tollway. The Illinois Tollway subsequently selected Wilbur Smith Associates, Inc. as the technical consultant for the study.

PRIOR ILLINOIS TOLLWAY VALUE PRICING PILOT STUDY

The current study is the second grant awarded to the Illinois Tollway under the FHWA Value Pricing Pilot Program. The prior effort, the Illinois Tollway Value Pricing Study, awarded by FHWA in 2003, was focused on developing a congestion (or "Value") pricing pilot project on the Illinois Tollway system. During the course of this study, the Illinois Tollway decided that its long range objectives were best achieved through a system-wide capital improvement program and new toll rate structure, rather than a pilot project on a specific corridor. The scope of the study was subsequently modified with FHWA approval to provide input to the system-wide toll rate change.

To fund the new 10-year capital program, "Open Roads for a Faster Future," the Illinois Tollway adopted a new toll rate structure in September 2004 that took effect on January 1, 2005. The new program included implementation of open road tolling at all its mainline toll plazas, extensive rehabilitation and widening of much of the urban portions of the system, and the construction of a 12.5-mile extension to the Tollway system. The new toll structure established a two-tier system for passenger vehicles, with drivers paying via electronic toll collection receiving a 50 percent discount over cash-paying customers. Truck toll rates were converted from a multi-class system based on the number of axles to a three tier system (small, medium and large trucks). In addition, trucks using electronic toll collection were provided discounted rates for traveling during off-peak periods, overnight and on weekends. The new toll structure thus incorporated elements of congestion pricing, charging higher rates to trucks during peak periods and differential toll rates by payment type for passenger vehicles.

PURPOSE OF THE STUDY

The Chicago Regional Congestion Pricing Study, the focus of this report, is a federally-funded study to determine the feasibility of congestion pricing in the Chicago region. The goals of the study are:

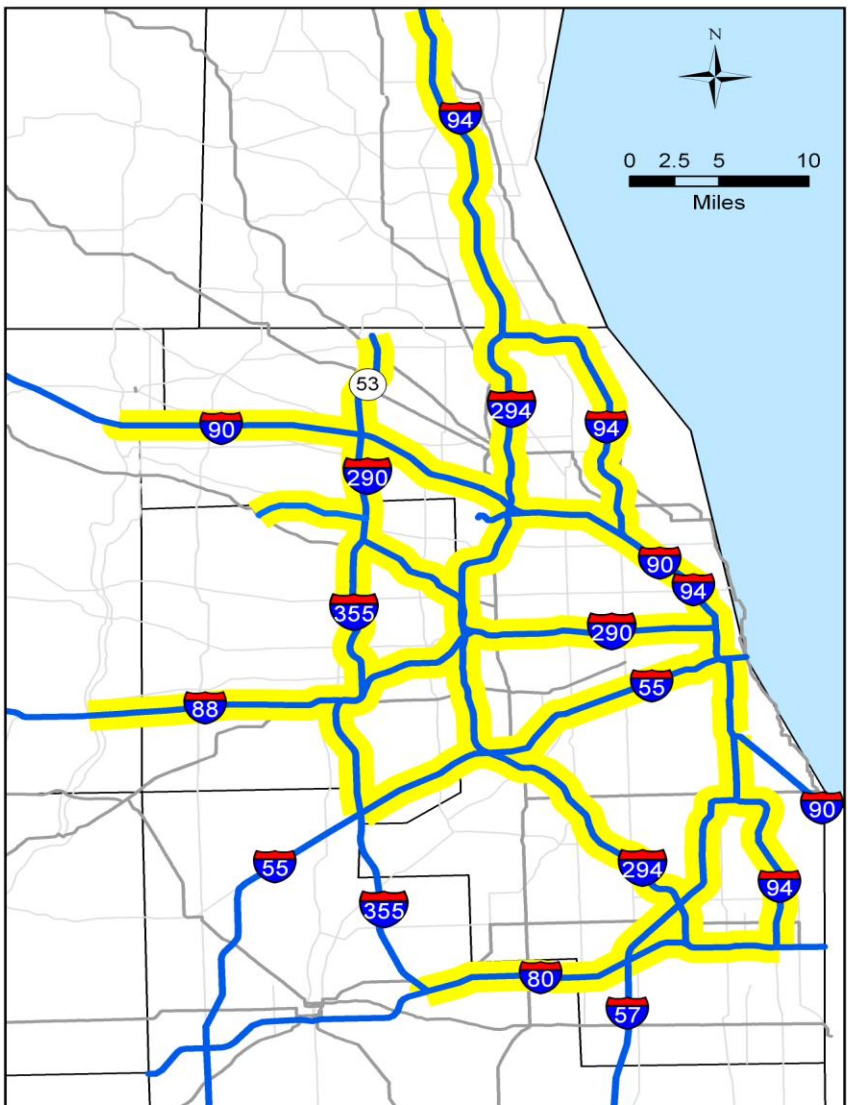
- To define the appropriate role for congestion pricing in the Chicago region;
- To educate the public and policy makers about congestion pricing;
- To obtain input from stakeholders and select appropriate congestion pricing strategies;
- To prioritize routes for implementation of congestion pricing;
- To quantify the traffic and mobility impacts of alternative congestion pricing strategies; and,
- To estimate the potential toll revenue that could be generated from congestion pricing.

SCOPE OF THE STUDY

The current Chicago Regional Congestion Pricing Study differs from the prior Illinois Tollway Value Pricing Pilot Study primarily in its geographic reach – the current study considers the impact of congestion pricing on both *tolled and non-tolled* expressway routes in the Chicago Metropolitan region. Expressway routes that generally fall within the urban areas of Cook, Lake and DuPage Counties were included as candidates. The southern extension of the Veterans Memorial Tollway within Will County (designated as Interstate 355) from Interstates 55 to 80 was ***not*** included in the study as it opened as recently as November 2007, and does not currently experience traffic congestion. The only non-tolled expressway study route that falls outside the three counties is Interstate 80, a portion of which falls in Will County. Figure 1 illustrates the candidate routes considered for pricing in this study.

The Chicago Regional Congestion Pricing Study also considered variable pricing, primarily higher toll rates during the morning and evening peak-periods, compared to the midday off-peak period. In addition, the study included a concentrated outreach effort to educate stakeholders and policy makers on congestion pricing, as well as to obtain input from stakeholders in defining the appropriate role that pricing can play in managing regional mobility, prioritizing routes for implementation, and developing a consensus among stakeholders and policy makers.

Figure 1: Candidate Congestion Pricing Corridors



CANDIDATE ROUTES FOR STUDY

STUDY PARTNERS

This study required a variety of expertise to achieve its goals. The study was led by the Illinois State Toll Highway Authority (the Illinois Tollway), an instrument of the State of Illinois created to provide for the construction, operation, regulation and maintenance of a system of toll highways in northern portion of Illinois, including the Chicago suburban area. The Illinois Tollway operates approximately 286 miles of limited access highways, all of which are designated as part of the Interstate Highway system. The Illinois Tollway is joined by the Metropolitan Planning Council (MPC), a nonprofit group of business and civic leaders, who conducted public and stakeholder outreach for the study. Wilbur Smith Associates, Inc., served as the technical consultant for the study, with assistance from EJM Engineering, Regina Webster & Associates, and the Resource Systems Group, Inc.

The study required input from, and coordination with, planning agencies in the Chicago region. This was accomplished by establishing a technical committee within the Chicago Metropolitan Agency for Planning (CMAP). The CMAP Transportation Committee was selected as the appropriate technical committee to provide input to the study, as it included representatives from research and academia, transportation advocacy groups, the Illinois Department of Transportation, the Chicago Department of Transportation, regional transit agencies, the Illinois Tollway, all Chicago metropolitan region counties, as well as the Councils of Mayors, FHWA and the Federal Transit Administration (FTA). Results of the study were presented to the CMAP Transportation Committee on a periodic basis.

CURRENT CHICAGO AREA CONGESTION

The most recent CMAP Congestion Management System report for northeastern Illinois, dated July 2006, estimated through travel demand modeling that 11.3 percent of the daily arterial roadway vehicle miles traveled (VMT) experienced congestion in 2005, as did 6.4 percent of the daily expressway VMT. The study estimated that, by the year 2030, congested arterial VMT would increase to 12.8 percent, while 6.5 percent of the expressway VMT would experience congestion. Congested conditions were expected to occur if the volume of traffic on a roadway segment exceeded its capacity, i.e., the Volume/Capacity ratio (V/C) is greater than one.

The daily arterial roadway congested vehicle hours of travel (VHT) was estimated to increase from 26.6 percent to 29.1 percent between 2005 and 2030, while daily expressway congested VHT was expected to drop from 28.6 percent to 24.1 percent. The decrease in the estimated share of congested VHT between 2005 and 2030 reflects higher traffic growth in less-congested outlying areas.

More recent estimates provided by the 2009 Urban Mobility report published by the Texas Transportation Institute indicated that, in 2007, 79 percent of Chicago-area peak-period VMT was congested. Congestion was estimated to occur on 62 percent of the total freeway and arterial roadway lane-miles in the Chicago region in 2007.

Travel demand modeling conducted for two-hour morning and evening peak periods by Wilbur Smith Associates using the 2030 regional travel demand model (obtained from CMAP in 2007), estimated that, for expressway roadways (Illinois Tollway routes and IDOT Expressways combined), approximately 37 percent of AM peak period VMT and 25 percent of PM peak period VMT in 2010 experiences congestion (congestion is defined by V/C ratios exceeding 1). Fourteen percent of AM peak period and 9.6 percent of PM peak period VMT was estimated to occur under severely congested conditions (defined by V/C ratios greater than or equal to 1.2) in 2010.

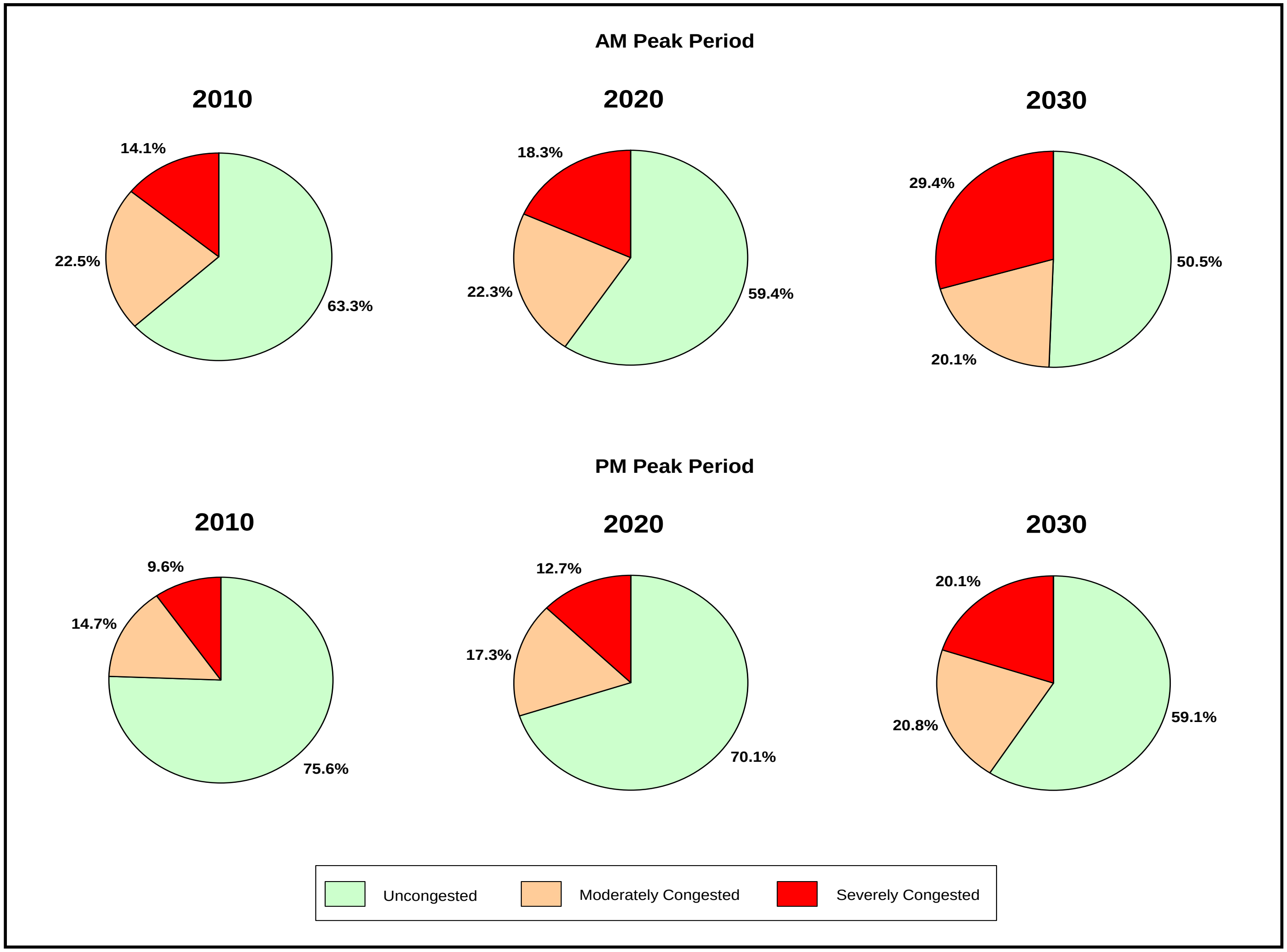
THE IMPACT OF DOING NOTHING

Even assuming the committed capital and operational improvements in the 2030 Regional Transportation Plan, traffic congestion in the Chicago region is expected to continue to increase.

PROJECTED EXPRESSWAY ROADWAY CONGESTION

By the year 2020, AM and PM peak period congested VMT on expressways are projected to increase to 41 and 30 percent, respectively, with the proportion of severely congested VMT in the AM and PM peak periods increasing to 18.3 and 12.7 percent, respectively. By 2030, the share of congested VMT is expected to increase to approximately 50 and 41 percent in the AM and PM peak periods, respectively. 29.4 percent and 20 percent of the AM and PM peak period VMT is projected to occur under severe congestion by 2030. These projections are summarized graphically in Figure 2.

Figure 2: Projected Expressway Congestion



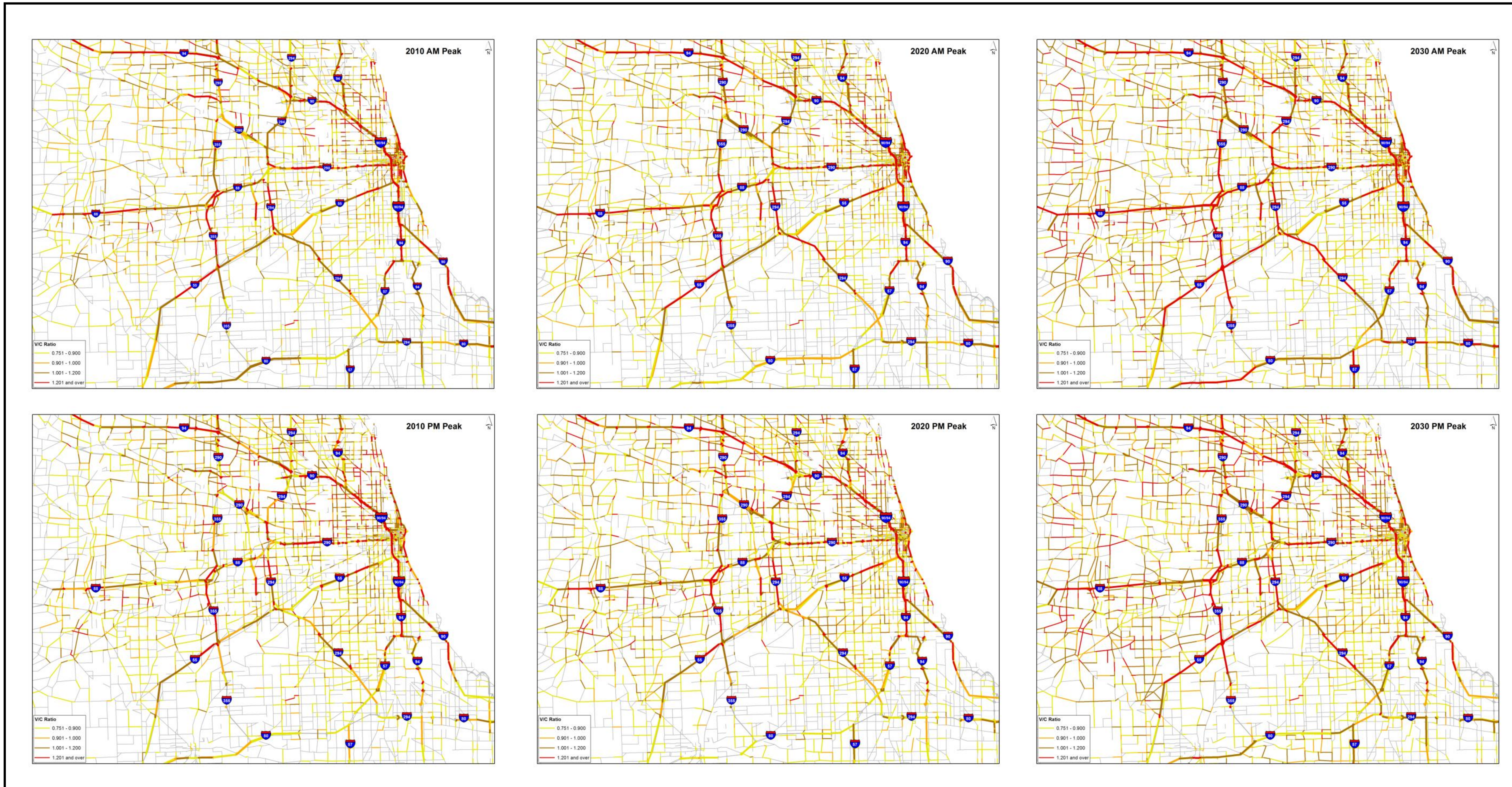
The spatial pattern of congestion in the region is illustrated for the AM and PM peak periods for the years 2010, 2020 and 2020 in Figure 3.

Based on the prior discussion, it is evident that congestion management strategies must be implemented to manage future traffic congestion. Investments in infrastructure and adoption of operational strategies will be necessary to mitigate the impacts of traffic congestion. However, these investments must be made strategically, and where possible, incorporate policies that result in more efficient utilization of the transportation system. Congestion pricing is one such strategy, which, if properly designed and implemented, can help manage and mitigate future traffic congestion.

REPORT STRUCTURE

Chapter 2 of this document presents the approach employed in this study. The baseline data collection and development of operating profiles for each of the candidate corridors is described in Chapter 3. A summary of the literature review and case studies conducted is presented in Chapter 4. Chapter 5 presents the market research conducted, including the results of focus groups and a Stated Preference survey. Chapter 6 presents the results of the stakeholder outreach. The goals and objectives for congestion pricing established for the Chicago region, as well as the congestion pricing strategies selected for evaluation by stakeholders, are described in Chapter 6. The managed lane concept is described in Chapter 7, together with alternative management objectives and strategies to achieve those objectives. Chapter 8 outlines the modeling approach and key assumptions for managed lanes, the selected congestion pricing strategy. The Corridor Screening Analysis, the first phase of technical evaluation is described in Chapter 9. Chapter 10 presents refined analysis for three selected corridors. Chapter 11 presents high-level toll collection equipment and operating and maintenance costs for managed lanes on the three selected corridors. Finally, Chapter 12 outlines the subsequent studies and steps required for implementation of congestion pricing in the Chicago region.

Figure 3: Projected Spatial Congestion Patterns – 2010, 2020 and 2030



CHAPTER 2

STUDY APPROACH

The primary goal of the Chicago Regional Congestion Pricing Study is to conduct a feasibility study of the potential of congestion pricing to improve mobility in the Chicago metropolitan region. While tolling has been in effect on the Illinois Tollway routes in the Chicago region for over fifty years, efforts to manage traffic through congestion pricing have only received attention since the Illinois Tollway's adoption of a new toll rate structure in 2005. Furthermore, the use of congestion pricing has been limited to time-of-day toll rates for commercial trucks on the Illinois Tollway system.

Therefore, before congestion pricing could be considered across the region, on both tolled and non-tolled routes, a broad educational and outreach effort was required. Policy makers, stakeholders and the public needed to be educated about the benefits and costs of congestion pricing, before a regional consensus can be achieved to pursue congestion pricing as a traffic demand management and financing strategy.

The Wilbur Smith Associates team used the following approach in conducting the study:

- Baseline traffic data was obtained from existing traffic counting stations for each of the candidate routes to develop an operating profile. In addition, travel time and speed runs were conducted for both the candidate expressway routes and a selected alternate arterial route to assess the advantages that expressway routes provide to adjacent arterials;
- A literature review was conducted to identify specific implementations of congestion pricing for which detailed case studies were developed;
- Market research was conducted through focus groups of automobile drivers and commercial trucking association representatives to

ascertain attitudes towards congestion pricing and traveler preferences among alternative congestion pricing strategies. In addition, a Stated Preference survey was conducted of a large sample of travelers to determine their sensitivity to tolling and likely travel-time changes that would result from the implementation of congestion pricing in the Chicago region;

- Outreach to stakeholders was conducted via two avenues – initially presentations were made to each of the local Councils of Government in the Chicago region, followed by three interactive stakeholder workshops. The stakeholder workshops were used to identify the appropriate role of congestion pricing in the Chicago region, selecting pricing strategies, and establishing the primary goals of congestion pricing;
- A Corridor Screening Analysis was conducted to provide a high-level assessment of the potential for congestion pricing on each of the candidate corridors. This assessment was used to select three corridors for detailed analysis and modeling;
- The analysis of the impacts of congestion pricing was refined for the three selected corridors to estimate the traffic and toll revenue impacts of congestion pricing; and,
- The cost of toll collection equipment and toll collection operating and maintenance (O&M) costs were estimated for each corridor based on prior efforts performed by the Illinois Tollway, or published reports of congestion pricing feasibility studies and implementations elsewhere in the country. These cost estimates were then compared to the estimated toll revenue generated by each of the three selected corridors. Estimating the capital costs of roadway construction required for implementation of congestion pricing was beyond the scope of this study.

These activities are described in greater detail in the following sections.

BASELINE DATA COLLECTION

The Wilbur Smith Associates team compiled traffic and speed data for each of the study corridors using data archived by the Illinois Tollway's private partner, Traffic.com. This provided a single source for detailed traffic volume and speed data by direction for the urban sections of the Illinois Tollway as well as each of the IDOT expressways. Data for the year 2007, the last year for which a complete dataset was available at the beginning of the study, was used to develop operating profiles for each route.

In addition, travel time and speed runs were conducted for each of the candidate routes and a selected alternate arterial route using probe vehicles. The probe vehicle runs were conducted during the morning and evening peak periods to assess the benefit travelers' gain by using the expressways relative to competing arterial routes. This information was considered valuable in assessing whether motorists would divert from the expressways as a result of congestion pricing. For example, if a typical trip currently takes ten to fifteen minutes longer when made using arterial roadways than via an expressway route, the potential for traffic diversion due to the implementation of congestion pricing on the expressway will be limited.

Chapter 3 provides an overview of the traffic and speed data collection and analysis conducted for the study as well as sample operating profiles for a selected route. Appendix A presents the operating profiles of the expressway routes and a comparative summary of expressway and arterial speeds and travel times.

LITERATURE REVIEW

Wilbur Smith Associates conducted a literature review and developed case studies to define the range of congestion pricing implementations. The literature review and case studies focused on projects implemented in the United States.

Case studies included: the New Jersey Turnpike Authority; Port Authority of New York and New Jersey (PANYNJ); the New York State Thruway Authority's Tappan Zee Bridge; Lee County, Florida; SR 91 Express Lanes in Orange County, California; the I-15 High-Occupancy Toll (HOT) Lanes in San Diego, California; the QuickRide Program in Houston, Texas; and, the MnPASS Express Lanes in Minneapolis, Minnesota.

While these case studies do not include pricing approaches such as cordon, area-wide and distance-based pricing, they cover the range of implementations that were considered candidate strategies for the Chicago region. For example: the New Jersey Turnpike implemented differential peak and off-peak period toll rates on *all lanes* throughout the system, with discounts for electronic toll collection use; the PANYNJ, Tappan Zee and Lee County implemented variable toll rates by time-of-day for *all* *lanes on bridges*; the SR 91 Express Lanes assessed tolls that varied by time of day on *express toll lanes adjacent to free lanes*; while the I-15 HOT and MnPASS Express lanes include *dynamic pricing that is responsive to the operation of the priced HOT lanes*.

Chapter 4 provides an overview of the literature review conducted for the study. A detailed report on this effort is included in Appendix B.

MARKET RESEARCH – FOCUS GROUPS & STATED PREFERENCE SURVEYS

In order to assess current perceptions regarding congestion pricing and obtain traveler preferences for pricing strategies in the Chicago region, the WSA team conducted four focus groups in March 2008. Each focus group was comprised of a different segment of travelers: (a) frequent Illinois Tollway users who pay their tolls via I-PASS, the Illinois Tollway's electronic toll collection program; (b) frequent Illinois Tollway users who pay cash; (c) infrequent Illinois Tollway users; and, (d) commercial trucking industry representatives. The focus groups were held in downtown Chicago at the offices of Focus Pointe Global, a market research firm, and were moderated by staff of the Resource Systems Group, Inc. (RSG).

Personal vehicle drivers were recruited to participate by the market research firm, while commercial trucking industry representatives were invited to participate from the Illinois Trucking Association and Mid-West Truckers Association.

A companion market research effort conducted for the study was a Stated Preference Survey of almost two thousand Chicago area motorists. The survey was conducted in July 2008 by RSG, via an Internet-based interactive questionnaire. The survey was targeted at motorists who had traveled on either the Illinois Tollway system or any of the area's non-tolled expressways during peak periods on weekdays in the prior month. Survey participants were recruited via: (a) recipients of the Illinois Tollway's monthly newsletter to I-PASS holders; (b) motorists who stopped to pay cash at one of six toll plazas on the Illinois Tollway; and, (c) recipients of the MPC's bi-weekly Talking Transit electronic newsletter.

Chapter 5 summarizes the market research conducted for the study. Detailed results of the focus groups and SP survey are presented in Appendices C and D, respectively.

COMMUNITY OUTREACH & STAKEHOLDER WORKSHOPS

The study dedicated a significant amount of effort to community outreach and obtaining input from key stakeholders and policy makers in the region.

In March and April 2008, MPC, the community outreach lead partner, made a presentation on the study to each of the eleven sub-regional Councils of Mayors within the CMAP jurisdiction. The sub-regional councils are defined by geographic boundaries – six within suburban Cook County and one for each of the collar counties, DuPage, Lake, Kane/Kendall, Will and McHenry. The individual councils range in membership from 12 to 47 municipalities, with the mayors and municipal presidents or their designees serving as voting members. The intent of the presentations was to educate elected officials about congestion pricing, explain the scope of the study and understand their concerns. In addition, MPC outlined the scope of the study to the CMAP Policy Committee at its March 2008 meeting.

Subsequently, three stakeholder workshops were organized in May and June 2008, one comprised of transportation agency representatives, and two comprised of elected officials and representatives from the Councils of Mayors. Of the workshops, two (the transportation agency, and the first elected official/council) incorporated an interactive keypad polling component to allow participants to provide anonymous feedback on the congestion pricing strategies discussed. The third workshop was held to obtain additional input from elected officials who were unable to participate previously.

The key intent of the stakeholder workshops was to establish goals and objectives for congestion pricing in the region, and to prioritize congestion pricing strategies to be evaluated in the study.

An overview of the outreach efforts and the results of the stakeholder workshops are presented in Chapter 6. Appendices E and F, respectively, present the outreach results and a detailed report on the stakeholder workshops.

CORRIDOR SCREENING ANALYSIS

Technical analysis of the potential of congestion pricing in the Chicago region began with a screening analysis of the fourteen candidate expressway routes. The Corridor Screening Analysis was performed in several steps: (a) defining a process for evaluating the candidate corridors; (b) establishing criteria for evaluation; (c) rating each corridor on each criterion; and, (d) developing a composite rating for each candidate route.

Initially, four broad criteria were defined for evaluating the corridors – existing weekday traffic congestion, ease of constructability, toll revenue potential, and the traffic management potential. Subsequently, a range of measures were defined for each criterion against which to rate each corridor. Finally, a subjective overall rating was assigned to each corridor, based on the individual criteria, and the corridors were ranked. The Corridor Screening Analysis was performed for two scenarios – conversion of existing lanes to congestion-priced lanes, and addition of new congestion-priced lanes. These two scenarios arose from the stakeholder workshops conducted previously.

Existing weekday traffic congestion was assessed based on the operating profiles developed previously, using traffic volumes, vehicle speeds, the severity and duration of congestion, as well as travel reliability measures. In assessing the ease of constructability, aerial photographs were examined for each route to determine the right-of-way available for expansion, the existence of adequate shoulder clearances, the number of overpasses and underpasses within the limits of the corridors, the existence of left-hand exit/entrance ramps, the extents of retaining walls and the length of elevated sections of the corridor. Assessment of the ease of constructability was, by necessity, qualitative in nature, due to the large number of corridors under consideration. Toll revenue estimates were developed for each route by modeling a range of toll rates, from $0.02 to $0.40 per mile. The toll revenue potential of each candidate corridor was assessed by comparing the revenues generated at a toll rate of $0.15 per mile. Finally, the peak period traffic management potential of congestion pricing was assessed based on two measures, the estimated traffic diversion and the utilization of the congestion priced lanes.

The Corridor Screening Analysis was presented to the CMAP Transportation Committee in July 2009 for discussion and comment. Subsequently, a survey was conducted of Transportation Committee members to obtain a priority ranking of the corridors. The three corridors that ranked highest were selected for further evaluation of the impacts of congestion pricing.

Chapter 8 outlines the modeling approach utilized in the study, while the results of the Corridor Screening Analysis are presented in Chapter 9. Detailed results of the Corridor Screening Analysis are presented in Appendix G, together with the results of the CMAP Transportation Committee survey.

EVALUATION OF SELECTED CORRIDORS

The selected corridors: (a) the Stevenson Expressway (Interstate 55); (b) the Jane Addams Memorial Tollway (Interstate 90); and, (c) the reversible lanes of the Kennedy Expressway (Interstate 90), were examined in detail to determine the impacts of congestion pricing with respect to travel impacts and toll revenue potential.

Travel demand modeling was conducted for toll rates ranging from $0.05 to $0.30 per mile. For each corridor, a toll rate structure that assessed rates that varied by time period was constructed, using travel demand model runs at individual toll rates. The traffic and revenue impacts resulting from the time-of-day toll rate structure were then estimated.

Chapter 10 presents the evaluation results for the selected corridors.

ESTIMATED TOLL COLLECTION EQUIPMENT, OPERATING & MAINTENANCE COSTS

The estimation of the capital costs of roadway construction required for implementation of congestion pricing on the three selected corridors was beyond the scope of this study. Among the three corridors, the reversible lanes on the Kennedy Expressway (I-90) exist today, and are not anticipated to require major modifications other than toll collection equipment, communication and additional signing. Widening of the Jane Addams Memorial Tollway (I-90) and the Stevenson Expressway (I-55) are recommended in the 2030 Regional Transportation Plan in the medium and long term, respectively. While funding has not been committed for these two projects as yet, it is likely that they will be included in future regional plans.

Congestion pricing typically does not generate sufficient toll revenue to offset the capital costs of new expressway lanes. However, it is generally recommended that congestion pricing be implemented in cases where the revenue collected at a minimum covers the cost of toll collection equipment and annual O & M. Therefore, high-level estimates were developed of the cost of toll collection equipment and O & M costs for each selected corridor, based on prior efforts performed by the Illinois Tollway, or published reports of congestion pricing feasibility studies and implementations elsewhere in the country.

These cost estimates were then compared to the estimated toll revenue generated by each of the three selected corridors to assess the net revenue available for enhanced transit or travel options for the corridor.

Chapter 11 presents the estimated toll collection and O & M costs for each corridor, and compares these costs to the estimated toll revenue.

CHAPTER 3
BASELINE DATA COLLECTION

TRAFFIC DATA COLLECTION

DATA COLLECTION

Wilbur Smith Associates' team member, EJM Engineering, Inc., compiled traffic and speed data for each of the study corridors using data archived by the Illinois Tollway's private partner, Traffic.com. This provided a single source for detailed traffic volume and speed data by direction for the urban sections of the Illinois Tollway as well as each of the IDOT expressways. Data for the year 2007, the most recent year for which a complete dataset was available at the beginning of the study, was analyzed to develop operating profiles for each route.

Traffic data for the urban sections of Illinois Tollway and IDOT expressway corridors in the Chicago region was obtained for Remote Traffic Microwave Sensors (RTMS) and in-pavement loop detectors, respectively.

Data from all detectors was aggregated into 15 minute time intervals. The data collected by the sensors includes the number of lanes monitored, count of vehicles detected in the 15-minute interval (volume), and the percentage of time the detector was occupied by a vehicle (occupancy). The average traffic speed across all lanes for the 15-minute interval was estimated based on the volume and occupancy measurements. In addition to traffic data, each detector provides location identifiers and the direction of traffic being monitoring.

ERROR CHECKING

The data was reviewed to check for validity and abnormalities that would indicate faulty data. Common errors in the data set were found to be of two types:

- Missing values: The detector did not collect or record data for one or more time intervals.
- Data Errors: The data collected is suspect due to the outlying nature of the values.

Volume, occupancy, or speed records that contained no value or a '0' value were indicative of such errors. Data records with speeds lower than 5 mph or occupancy values higher than 80% were also considered to indicate data error. Records in the data set that were identified to belong to the above categories were excluded from the analysis.

DATA PROCESSING

To highlight the major traffic characteristics and their variation over time and location each corridor was divided into smaller segments. The segments were delineated by their physical characteristics such as the number of lanes, the location of major interchanges, etc. The goal of the segmentation was to divide the corridor into manageable sections without aggregating disparate traffic trends along a single corridor.

TRAVEL TIME AND SPEED STUDIES

In addition, travel time and speed runs were conducted for the candidate routes and a selected alternative arterial roadway using probe vehicles. The probe vehicle runs were conducted during the morning and evening peak periods to assess the benefit travelers' gain by using the expressways relative to competing arterial routes. This information was considered valuable in assessing whether motorists would divert from the expressways as a result of congestion pricing. For example, if a typical trip currently takes ten to fifteen minutes longer when made using arterial roadways than via an expressway route, the potential for traffic diversion due to the implementation of congestion pricing on the expressway will be limited.

Travel time and speed runs were not conducted for routes that were under construction during the study.

DEVELOPMENT OF CORRIDOR OPERATING PROFILES

PERFORMANCE MEASURES

A number of performance measures were computed in analyzing the existing traffic flow on the Illinois Tollway and IDOT expressway segments. The following baseline assumptions were used in developing the performance measures:

- Free Flow Speed: Average speed under light traffic conditions, assumed to be equal to 60 mph. This is the desired speed for the study corridors. Roadway congestion was assumed to occur at speeds below 51.1 mph, the assumed threshold between Level of Service E and F as defined by the TRB's 2000 Highway Capacity Manual.
- Free Flow Travel Time: Travel time over a roadway segment under free flow conditions.

Traffic Demand and Performance Measures

- Volume: Total volume of cars traversing a point in the segment for a given
- Duration of time (for 15 minute interval).
- Vehicle Miles Traveled (VMT): (Volume) x (Length of segment).
- Average Speed: Average speed of traffic stream as obtained from the detectors.
- Average Travel Time: (Length of segment)/ (Average Speed)
- Vehicle Hours Traveled (VHT): (Volume) x (Average Travel Time)
- Travel Time Index (TTI): (Average Travel Time)/(Free Flow Travel Time)
- Average Delay (per vehicle): (Average Travel Time) - (Free Flow Travel Time)
- Total Delay: (Volume) x (Average Delay) (for 15 minute interval)
- Percentage Delay: (Average Delay)/(Average Travel Time)
- 95th Percentile Travel Time/Planning Time: Travel time that must be budgeted to ensure on-time arrival 95% of the time.

- Buffer Time: (95th Percentile Travel Time) – (Average Travel Time)
- Planning Time Index: (95th Percentile Travel Time)/(Free Flow Travel Time)
- Buffer Index: (Buffer Time)/(Average Travel Time) under congested conditions.

The performance measures were compiled into a single-page summary for each roadway segment of the candidate corridors to produce an operating profile. Both weekday and weekend traffic was analyzed, for typical Summer and non-Summer months. A sample operating profile is presented in Figure 4.

Similarly, Figure 5 provides a graphical comparison of vehicle speed data for a candidate expressway corridor and a competing arterial route.

The operating profiles and traffic demand data were used to determine the length of the morning and evening peak periods, the duration of congestion and to identify critical locations for sections of each corridor.

Figure 4: Sample Roadway Operating Profile (Interstate 290 – Eisenhower Expressway, Westbound Between Cicero Avenue and Austin Boulevard)

Segment	:	I-290 WB between Cicero Ave. and Austin Blvd.	
Number of Lanes	:	4	
Segment Length	:	1.53	miles
Free-Flow Speed (Assumed/Estimated)	:	60	mph
Percent of Congested Travel in 2007	:	32.16%	

CORRIDOR: I-290
SEGMENT: 4W

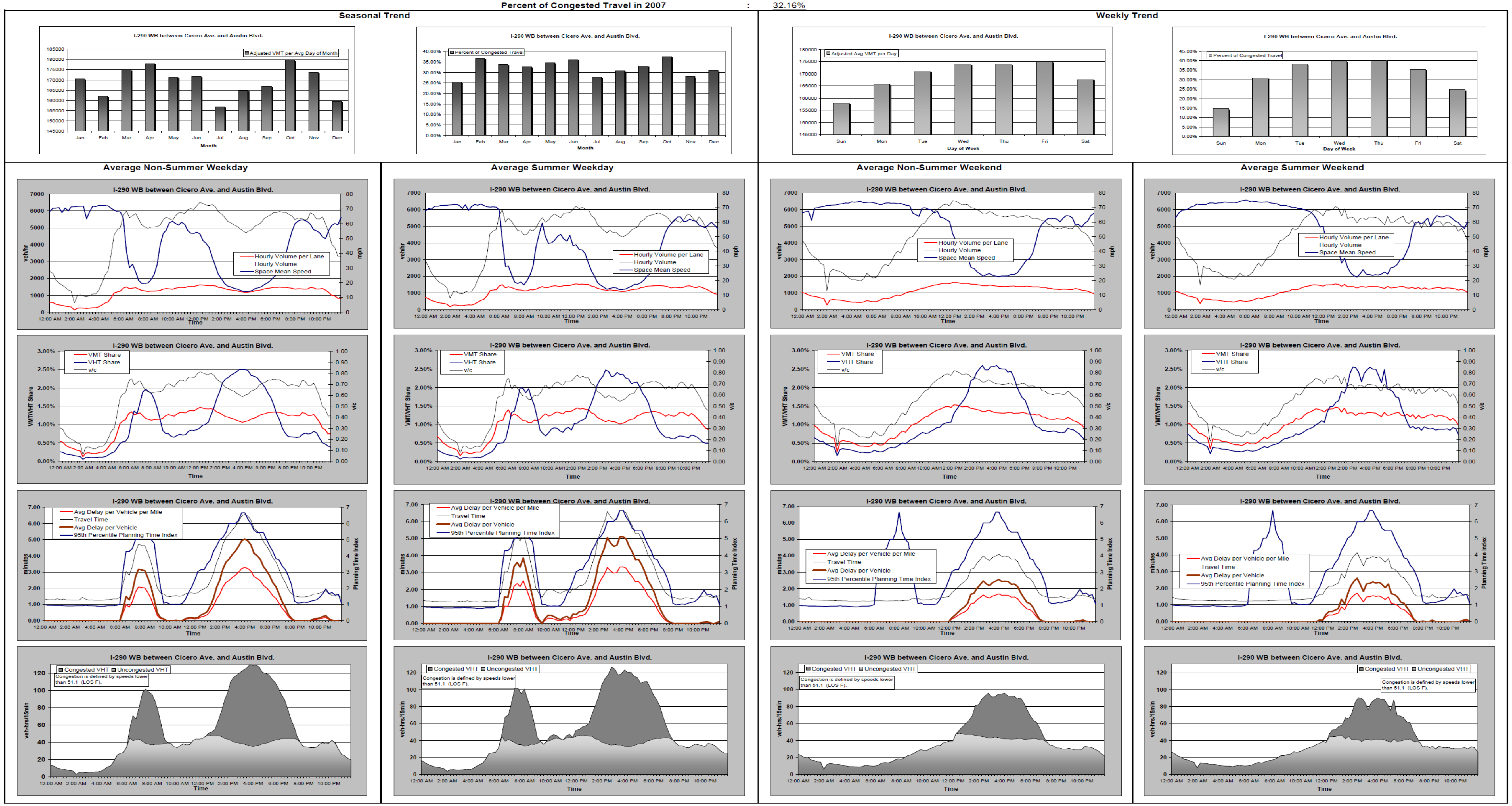


Figure 5: Sample Travel Time and Speed Run Summary (Interstate 290 – Eisenhower Expressway, Westbound Between I-90/94 and US 12/20 Mannheim)

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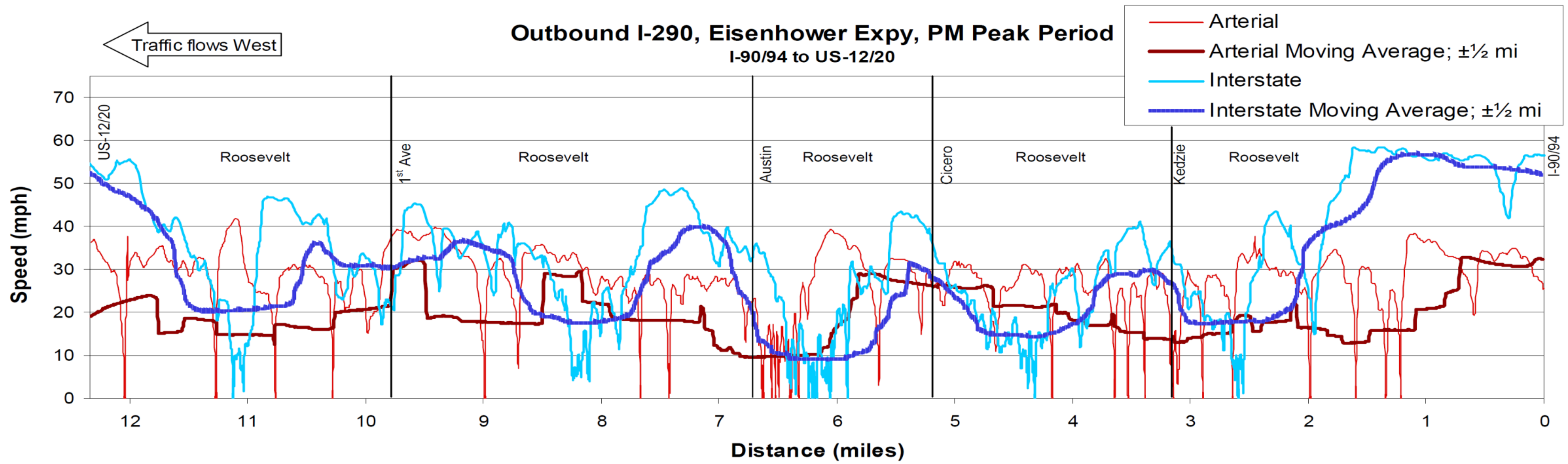


Arterial	Travel Time (hr:min:sec)	0:08:42	0:08:47	0:07:09	0:05:52	0:10:48
	Average Posted Speed	32 mph	32 mph	30 mph	30 mph	30 mph
	Space Mean Speed	18 mph	21 mph	13 mph	21 mph	18 mph
	Number of Lanes	2	1, 2	2, 2	2, 1, 2	2
	Roadways	Roosevelt	Roosevelt	Roosevelt	Roosevelt	Roosevelt
	Number of Stops	4	4	5	5	7
Interstate	Travel Time (hr:min:sec)	0:05:23	0:06:46	0:07:20	0:06:10	0:06:03
	Posted Speed Limit	55 mph	55 mph	55 mph	55 mph	55 mph
	Space Mean Speed	45.8 mph	23.7 mph	16.5 mph	16.5 mph	60.9 mph
	Number of Lanes	3	3	4	4	4
	Number of Stops	2	2	5	3	2
	Average Hourly Volume	5497	4238	4831	4643	5195
	Ave. Hourly Volume / Lane	1832	1413	1208	1161	1299
	V/C Ratio	0.92	0.71	0.6	0.58	0.65
	Ave. Delay Per Vehicle	0.81 min	4.84 min	4.11 min	5.52 min	0.00 min
	Planning Time Index	1.71	3.98	5.74	6.36	1.81
	% of Congestion (VMT)					
Travel Time Difference		0:03:19	0:02:01	-0:00:11	-0:00:18	0:04:45

Wilbur Smith & Assoc. / Regina Webster & Assoc.	Chicago Regional Congestion Pricing Study	
Date: 1/26/2009	Prepared By: MRC	Exhibit 1

CHAPTER 4

LITERATURE REVIEW

OVERVIEW

The focus of this chapter is on the impacts of congestion pricing policies and projects that have been implemented in the United States. The discussion includes a definition of congestion pricing, an overview of notable congestion pricing implementations in the United States, and a general summary of the impacts of congestion pricing that have been observed. Special attention was given to impacts on travel behavior, public perception, equity, and the environment. Specific case studies of congestion pricing are discussed in detail in Appendix B.

DEFINING CONGESTION PRICING

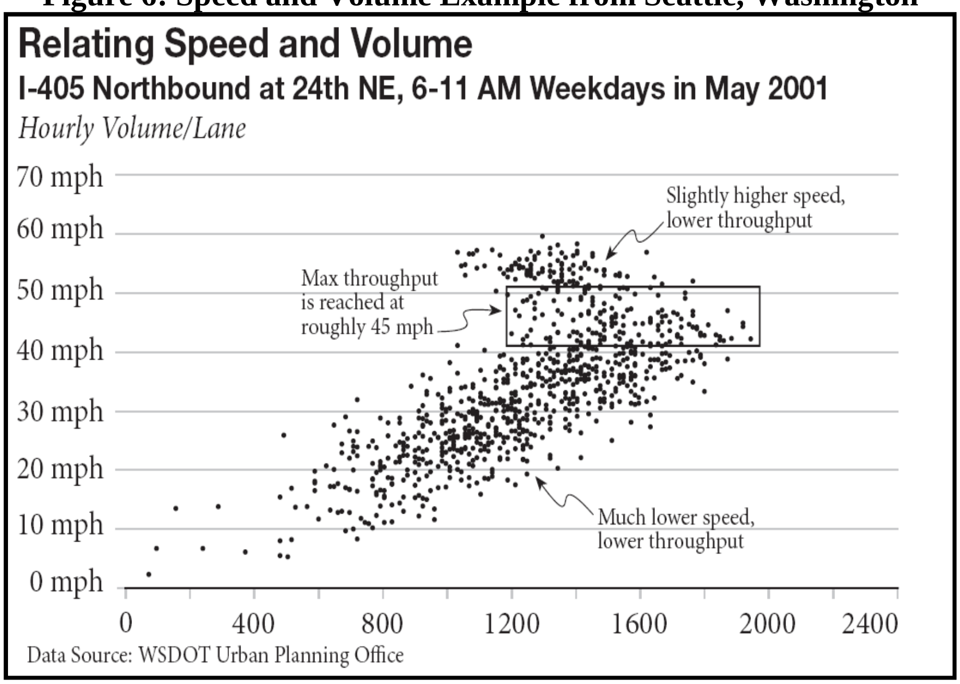
The Federal Highway Administration (FHWA) defines congestion pricing as policies that harness the power of the market to reduce the waste associated with traffic congestion. These policies aim to reduce congestion by giving incentives to travelers to shift peak-period trips to off-peak, shift low-capacity trips to other more efficient modes, combine trips, or decide to no longer make certain trips. Congestion pricing works by shifting some less critical or more discretionary rush-hour highway travel to other transportation modes or to off-peak periods. By removing a fraction (even as small as 5%) of the vehicles from a congested roadway, pricing enables the system to flow much more efficiently, allowing more cars to move through the same physical space. [3]

Traffic congestion typically results in lost time, increased vehicle operating costs, and increased pollution. These losses are especially

[3] Congestion Pricing: A Primer, Federal Highway Administration, U.S. Department of Transportation, FHWA-HOP-08-039, October 2008.

significant on roadways where traffic demand exceeds the available capacity. When traffic demand exceeds the roadway capacity, the addition of only a few vehicles to the traffic stream can severely impact all users on the roadway. For example, Figure 6 shows a speed and hourly volume per lane relationship on I-405 in Seattle, Washington during the morning peak period. According to the Transportation Research Board's Highway Capacity Manual, the theoretical maximum hourly capacity of a highway lane is well over 2,000 vehicles. This capacity is not achieved in this example which likely suggests a bottleneck exists upstream of this location. For this severely congested highway it can be observed that maximum throughput is achieved at roughly 45 mph. As speeds drop below 45 mph however (over-capacity conditions), vehicle throughput quickly diminishes. Maintaining speeds at 45 mph would be the most efficient use of capacity in this example. A congestion pricing policy to achieve this end would be to charge a variable toll on I-405 during this time period so that only enough drivers are willing to pay to maintain the 45 mph speed. This would limit the number of vehicles attempting to enter the bottlenecked condition in order to maintain maximum throughput.

Figure 6: Speed and Volume Example from Seattle, Washington



Recently, technological advances in electronic toll collection (ETC) technology have made congestion pricing on roadways more feasible. With ETC, tolls can be collected at highway speeds, eliminating the slowdowns associated with traditional toll collection booths. Increased awareness of energy and environmental effects of automobile travel have recently heightened interest in congestion pricing. Also many congested urban areas have latent demand for automobile travel too high to be feasibly met by capacity increases alone. Congestion pricing can be a tool to manage this demand.

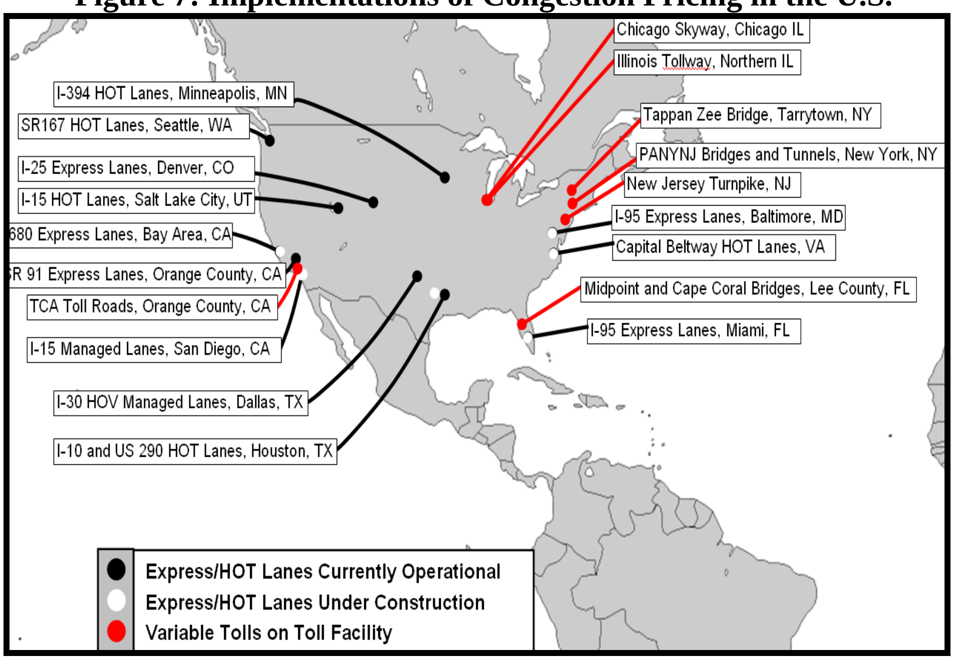
ALTERNATIVE FORMS OF CONGESTION PRICING

Congestion pricing can be implemented in various forms, including:

- Variable Tolls on Toll Facilities
- Express or High Occupancy Toll (HOT) Lane Facilities
- Cordon Tolling
- Distance-based Tolling

Figure 7 shows the locations of roadway systems with congestion pricing policies in the United States. Several other projects and policies are under consideration throughout the country.

Figure 7: Implementations of Congestion Pricing in the U.S.



Variable Tolls on Toll Facilities

Variable tolls on toll facilities systems charge higher tolls during peak periods than during off-peak hours. These types of policies have been implemented on bridges in Lee County Florida, on the bridges and tunnels managed by the Port Authority of New York and New Jersey, on the Tappan Zee Bridge near New York City, for commercial trucks on the Illinois Tollway, and on the New Jersey Turnpike.

Express and HOT Lane Facilities

Express and HOT lane facilities are the most widespread use of congestion pricing in the United States. They can either be newly-built toll lanes or toll lanes converted from existing under-utilized or over-utilized high occupancy vehicle (HOV) lanes. Currently no facilities have been converted from existing general purpose lanes. The FHWA defines HOT lanes as those that allow specific groups of users to travel on the system for free during all operational periods while charging other users. On the other hand, express lanes refer to systems that charge (at least during certain time periods) all users on the system. Discounted tolls may be offered to specific vehicle groups in express lane systems (and free access in HOT systems). These vehicles usually include carpools, buses, and motorcycles.

HOT lanes currently in operation include the I-394 HOT Lanes (MnPass) in Minneapolis, SR 167 HOT Lanes in Seattle, I-25 Express Lanes in Denver, I-15 HOT Lanes in Salt Lake City, I-15 Managed Lanes in San Diego, I-30 HOV Managed Lanes in Dallas, US 290 HOT Lanes in Houston, and the I-95 Express Lanes in Miami. The I-15 Managed Lanes in San Diego and the I-95 Express Lanes in Miami are also currently being expanded. The Capital Beltway HOT Lanes in northern Virginia and the I-680 Express Lanes in the bay area of California are currently being constructed as HOT lanes. The express lane system currently in operation is the SR 91 Express Lanes in Orange County, California. The I-95 Express Lanes in Baltimore, Maryland are also under construction as express lanes.

Cordon Tolling

Cordon tolling refers to when a toll is charged to drivers who enter a congested area, often a city’s central business district. No cordon tolls have been implemented in the United States but several have been implement in other part of the world. The most publicized cordon toll systems are in Singapore, London, and Stockholm. Cordon tolls have been proposed in the United States, the most well-known example being in part of Manhattan in New York City. The proposal did not ultimately gain approval from the state legislature.

DISTANCE BASED TOLLING

While not congestion pricing by itself, distance based tolling or vehicle miles traveled (VMT) based tolling can also incorporate congestion pricing concepts if a higher toll rate per mile is charged by time or location. Distance based or VMT based tolling systems have gained interest lately as an alternative to fuel taxes. Currently no distance or VMT based tolling systems (with or without congestion pricing) have been implemented in the United States. Privacy issues and the cost of the tolling infrastructure are among the problems with implementation.

SUMMARY OF IMPACTS

The potential impacts of the implementation of congestion pricing policies that are the focus of this report are travel, public perception, equity, and environmental.

TRAVEL IMPACTS

Congestion pricing can have a number of travel impacts depending upon price schedule and levels, the price elasticity of demand for the tolled facility, the level of availability of travel alternatives, and schedule flexibility of travelers. Congestion pricing has been found to be most effective when people have alternate routes, alternate departure times, transit, and ridesharing.

Examples of potential travel impacts of congestion pricing include:

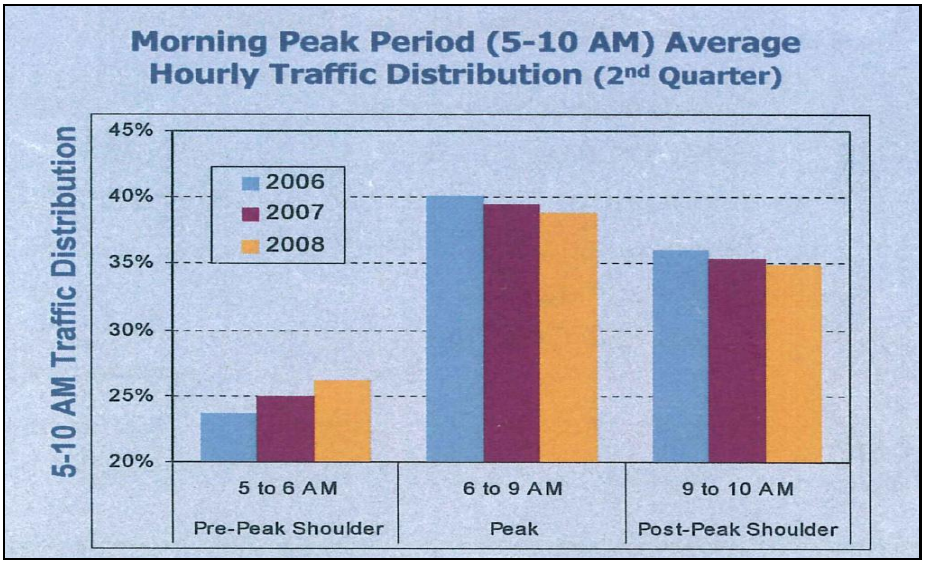
- A change in the time of travel. Peak traffic may shift to off-peak with a consequent reduction of peak period traffic. Afterward, some off-peak traffic may also shift to the peak period to take advantage of the improved conditions (if they are willing to pay the increased toll).
- A shift in mode from single occupant automobile to alternative travel modes such as carpooling, transit, or bicycling that now have new incentives.
- A shift in routes to untolled or lower-tolled roads (or lanes).
- Combining more activities into a single trip or eliminating trips now deemed unnecessary.

- Change in destinations. For example, over the short term stores that are closer could become more favorable to shop at. If congestion pricing were to be implemented on a regional level, over the long term land use patterns may also be affected. There are opposing theories in this area; some argue that it would discourage sprawl while others believe it would increase decentralization.

One measure of travel impacts is price elasticity which varies with different system characteristics. This measure can apply to all types of congestion pricing systems. For example, cities with quality public transportation systems would likely have higher price elasticities to tolling because alternatives to automobile travel would be easily accessible. Many studies have arrived at price elasticity estimates of between -0.1 to -0.4 for urban highways (a ten percent increase in tolls would reduce traffic volumes by one to four percent). A 2002 survey of automobile long-distance commuters indicates that financial incentives are the most effective strategy for reducing car trips (*Assessing the Potential for Road and Parking Charges to Reduce Demand for Single Occupancy Vehicle Commuting in the Greater Vancouver Region*). A $3 round-trip toll was expected to reduce automobile commuting by 25 percent. A 2000 study involving time and mileage-based pricing (*Distance and Time Based Road pricing Trial in Dublin*) found that motorists reduced peak-period trips by 22 percent, total trips by 6 percent, peak mileage by 25 percent, and total mileage by 12 percent.

A specific example of shifting traffic to off-peak periods using variable tolls on a tolled facility was reported by the Port Authority of New York and New Jersey (PANYNJ) in January 2009. In 2008, the toll for crossing the bridges and tunnels managed by PANYNJ during peak hours was increased from $6 to $8 for passenger car drivers paying electronically. Tolls during off-peak times were set at $6 for these drivers. This change doubled the off-peak price differential to $2. Significant reductions in AM peak period traffic were observed in 2008 with corresponding increases in traffic the hour before peak. This continued the trend from 2006 to 2007 when there was a $1 off-peak price differential. These changes were largely attributed to the off peak price incentive that exists for the approximately 75% of passenger car drivers that pay electronically. Figure 8 below illustrates these changes.

Figure 8: PANYNJ Average Hourly Traffic Distribution



Source: "Port Authority of NYNJ Congestion Pricing – The Results", Poster Presentation at TRB 2009 Annual Meeting

Shifts in mode to carpooling and transit are often one of the main objectives of HOT and express lane facilities to maximize person throughput. These facilities often offer price incentives to carpool or take a bus service. Also, considering HOV to HOT conversions, existing HOV lanes often suffer from high violation rates. These violation rates can deteriorate service so much that the HOV lane fills with single occupant vehicles and offers little travel time benefit for carpoolers and buses. This was the case on the I-95 HOV lanes near Miami, Florida which are now being converted and expanded into HOT lanes. Implementing congestion pricing policies in these situations has been found to reduce violation rates significantly and ensure benefits to carpoolers and buses. For example, the *I-394 MnPASS Technical Evaluation Final Report* stated that violation rates on the MnPass HOT system in Minnesota went from 20% to 9% on the non-barrier section after conversion from HOV to HOT. At the same time speeds improved in the general purpose lanes as single occupant vehicles were able to legally buy into the HOT lane. It should be noted that part of the speed improvement was likely due to a Minneapolis area wide reduction in traffic. However, HOT and express lane systems may encourage more drivers to travel during the peak period in some cases. For example, the MnPASS technical evaluation stated that overall peak period volume increases suggesting drivers who previously shifted their travel out of the peak periods due to congestion may have incentives to return to the peak period with the reliable HOT lane alternative.

Policy changes with respect to vehicle occupancy can have large impacts on HOT and express lane systems as discussed in the *Continuation Study to Evaluate the Impacts of the SR 91 Value-Priced Lanes Final Report*. Within three months of the December 1995 implementation of the SR 91 Express Lanes in Orange County, California a 40% increase in vehicles with at least three people in them (HOV3+) was observed on all lanes of the highway. These vehicles where allowed to travel on the express lanes at no charge while single occupant vehicles and vehicles with two people paid the full toll. In January 1998, when a 50% toll was implemented on HOV3+ vehicles their numbers dropped by about one third (approximately 2000 vehicles per day).

The *Value Pricing Pilot Program Lessons Learned Final Report* listed several impacts that were found in the Value Pricing Pilot Program (VPPP) program. This program was part of the last two federal transportation bills and funded the implementation of a certain number of selected congestion pricing projects. One finding from the VPPP program was that variable tolls on existing toll facilities have lead to more efficient facility use, generally preserving or increasing revenues. Another finding was that HOT lane conversions had gained better use of underutilized HOV lanes while not slowing or dissuading HOV users. There was some non-conclusive evidence that these conversions had brought relief to adjoining general purpose lanes by attracting some of the traffic from these lanes. New construction express and HOT lane systems were found to have a much higher throughput at significantly higher speeds than adjoining general purpose lanes and to reduce congestion on the overall facility.

PUBLIC PERCEPTION

The impact of a congestion pricing project on public perception is especially important during the planning and implementation process. In the end, the public will determine the success or failure of a proposed system. It has been shown that public perception of a proposed congestion pricing system generally improves after implementation, making pilot projects important.

In the report, *The Public Supports Pricing If...: A Synthesis of Public Opinion Studies on Tolling and Road Pricing*, 110 studies on public perception of road tolling were examined. Of these, 19 of the 26 studies (73%) relating to HOT lanes and eight out of the 13 studies (62%) relating to express lanes showed a majority support from the general public. However, of the 19 studies on cordon or area type pricing only six (32%) showed majority support. These studies show that public support does exist for congestion pricing (especially HOT and express lane type systems), but there are still many cases when majority support is not achieved (especially for cordon style systems). Although variable tolling on toll facilities studies were not specifically examined, 25 of the 35 studies (71%) on traditional tolling showed majority support.

Several factors were identified in the report as being important to positively impact public perception of road pricing. These include:

- The level of support from the public is higher if road pricing can be "perceived of as a choice" rather than "a punishment". "In many European examples, support was higher when road pricing was put forth as part of a comprehensive policy package of road and public transit investments".
- The public tends to support the projects where revenues are dedicated to highway infrastructure or public transit rather than special interest groups.
- "The public learns from experience" and shows even higher support after experiencing the benefits of the projects.
- Get the public fully informed of the pros and cons of the project tends to gain more supports. "In surveys in both Denver and Alameda County, support for HOT lane projects increased after information and clarification on how the HOT lanes worked. In San Diego, equity concerns dissolved and support for a pricing project strengthened when participants received clarifying information on the features of the project."
- People "do not want to pay for roads that they have gotten for free in the past". This "relates to why having an "alternative cost-free route" is so important for public support, and why support for tolling new roads and bridges is higher than for tolling existing facilities".
- "In terms of equity, there is general agreement that decisions to use or not use a priced facility revolve around people's needs and preferences. Everyone, regardless of who they are or where they live, benefits from having a choice."
- The public wants the mechanics of tolling to be simple and clear.
- "The public favors tolls if the alternative is taxes."

Another report, *Marketing the Managed Lanes Concept*, focused on the importance of education in the public outreach process. The report lists several common messages that have been well received by the pubic. These include focusing on congestion pricing projects as a choice for commuters, one tool as part of a comprehensive congestion management plan, a way to maximize available road capacity, and something that has been successfully implemented elsewhere. Additionally, the public is generally unaware of how transportation projects are funded so education in this area as well as clear definitions of how revenues will be used after implementation has been found to be important.

One example of increased support after implementation of a HOT lane system is in the Minneapolis-St. Paul region. Congestion pricing as a tool to manage congestion in the region had been discussed since 1994. Proponents worked through several unsuccessful attempts to implement a congestion pricing pilot project in the 1990s before gaining legislative approval for the MnPASS system in 2003. There was still widespread uncertainty about the I-394 MnPASS system before its implementation in 2005, but it has since been generally regarded as successful. Building on this success, a current proposal to implement congestion pricing (by variable pricing the inside shoulder) on I-35W south of Minneapolis has thus far been much less controversial than the I-394 HOT lanes.

EQUITY

Equity refers to the fair distribution of benefits and costs resulting from a congestion pricing policy decision. One common equity-based objection to congestion pricing is that low-income people may be priced off the road during the peak period. Another is that congestion pricing is actually a double tax because motorists are being asked to pay to use a facility that was initially financed through gasoline and other taxes.

However, the *Value Pricing Pilot Program Lessons Learned Final Report* noted that the perception of unfairness may be overdone. Equity evaluations have found higher income travelers often use facilities somewhat more than lower income groups, but general use exists across a wide range of incomes. Concerns have been raised during the planning of HOT and express lane systems about catering to the rich. However these concerns are usually not sufficient to halt projects and normally diminish as projects get underway. One study associated with a planned expansion project found strong support with few differences about fairness based on ethnicity or income.

In general, congestion pricing will be inequitable if low income drivers are not adequately compensated for the higher tolls or if there are insufficient reasonable transportation alternatives. Addressing how revenues will be spent has been found to be important to compensate low income groups. Investing the money in expanded transit service on the system has been one successful strategy.

If the value to the traveler of the saved time using a system plus a portion of the redistributed revenues accessed is larger than the cost of the toll, then the traveler is better off. While value of travel time savings normally increases with income, lower income travelers still have certain trips that have a high value of travel time. This relates to the findings on several HOT lane systems that most users access the systems relatively infrequently (such as one or two days a week) when their value of travel time savings is higher. Also, if redistributed revenues are directed to transit, benefits can accrue to lower income travelers that never (or very infrequently) pay the toll.

ENVIRONMENTAL IMPACTS

In theory, measurable environmental improvements could be achieved by the implementation of a congestion pricing system. This is especially true with larger cordon or area type pricing systems.

Few environmental impacts studies have been undertaken on HOT and express lane systems after implementation. One study as part of the *I-394 MnPASS Technical Evaluation Final Report* found no substantial impacts on air quality and noise after implementation.

In the cordon-style charging system in London, England measurable reductions in carbon dioxide, nitrogen oxide, and particulate matter emissions were attributed to the congestion charge. These environmental improvements are documented in *Central London Congestion Scheme: ex post Evaluation of the Quantified Impacts of the Original Scheme* and include the original toll and the July 2004 toll increase. However, the London congestion charging implementation is of a much larger scale than any current congestion pricing implementation in the US.

CHAPTER 5

MARKET RESEARCH

FOCUS GROUPS

In order to assess current perceptions regarding congestion pricing and obtain traveler preferences for pricing strategies in the Chicago region, the WSA team conducted four focus groups in March 2008. Each focus group was comprised of a different segment of travelers: (a) frequent Illinois Tollway users who pay their tolls via I-PASS, the Illinois Tollway's electronic toll collection program; (b) frequent Illinois Tollway users who pay cash; (c) infrequent Illinois Tollway users; and, (d) commercial trucking industry representatives. The focus groups were held in downtown Chicago at the offices of Focus Pointe Global, a market research firm, and were moderated by staff of the Resource Systems Group, Inc. (RSG).

Personal vehicle drivers were recruited to participate in the focus groups by the market research firm, while commercial trucking industry representatives from the Illinois Trucking Association and Mid-West Truckers Association were invited to participate.

OBJECTIVES

The objectives of the focus groups were:

- To explore Chicago area travelers' current perceptions of travel conditions;
- To explore Chicago area travelers' current understanding and opinions of congestion pricing;
- To educate participants regarding potential congestion pricing options and to show the costs and benefits associated with each option; and,

- Explore reactions to potential congestion pricing options in the Chicago region.

PARTICIPANT RESPONSES

Each focus group comprised a different traveler segment: automobile I-PASS users, automobile cash users, automobile infrequent toll road users (both I-PASS and cash), and commercial vehicle industry representatives. Below is a summary of participants' reactions.

Current Perception of Travel Conditions

- Almost all participants perceived roads to be more congested during peak travel periods, and some found roads surprisingly congested during off-peak travel periods. Those with flexible schedules sometimes traveled earlier or later to avoid traveling during peak travel periods and those who traveled during peak hours allowed for traffic delays when calculating the approximate length of their trip;
- Cash customers do not fully understand I-PASS policies and costs. Many cash participants believed start-up costs for an I-PASS account are higher than the actual costs and some were not aware of the discounted toll costs that I-PASS users currently pay;
- I-PASS customers are very satisfied with the I-PASS program and most could give only very approximate estimates of their toll expenditures; and,
- Most automobile participants felt that the Illinois Tollway routes are better maintained; however, commercial vehicle industry representatives did not acknowledge differences in road maintenance and conditions between the Tollways and IDOT expressways.

Suggested "Solutions" to Relieve Congestion Problems

- Participants suggested adding signs along the roadways encouraging slower traffic and commercial vehicles to travel in the right lanes;
- Some automobile participants suggested expanding current transit service to growing suburban areas as well as increasing the frequency of some services, particularly Metra, to encourage transit ridership; and,

- Several commercial vehicle industry representatives and automobile users recommended adding carpool lanes to existing roadways and a few automobile users requested that existing express lanes on the Kennedy Expressway be open more regularly and consistently.

Potential Congestion Pricing Options

- Only a few participants were vaguely aware of congestion pricing schemes in other cities, and no participants were aware of the pricing schemes along Interstate 15 (I-15) in San Diego or State Route 91 (SR-91) in Los Angeles;
- The majority of participants believed that raising toll costs during peak travel periods would be perceived as a "punishment" for those without flexible work schedules;
- Commercial vehicle industry representatives are opposed to tolling changes, and most preferred the use of gas taxes instead of increasing toll costs. All representatives emphasized the need to work with municipalities and customers to allow for less restrictive delivery times, noting that many delivery schedules are determined by municipal regulations;
- Participants in all groups were unsure if fixed pricing or dynamic pricing would truly reduce congestion in the greater Chicago area. All participants expressed interest in seeing "proof" that a fixed pricing or dynamic pricing system would increase travel time reliability and decrease congestion. Such "proof" that congestion pricing is effective could be to implement it on one corridor initially before implementing it throughout the Chicago area;
- The majority of participants approved of congestion reduction measures that give travelers a choice either in the form of an HOV lane, truck-only toll lane, or carpool lane to reduce congestion. Generally, participants liked the idea of having a choice so they could use an HOV lane, carpool lane, or truck-only toll lane when they needed to reach their destination in a certain amount of time and not be delayed. However, most also felt that there should be at least two such lanes to allow more freedom of movement;
- Most I-PASS and cash users were amenable to open-road tolling along the Tollways; however, most cash travelers who infrequently use the Tollways felt they would not purchase an I-PASS even with the possible implementation of open-road tolling; and,

- Participants in all four focus groups generally felt that generated revenue should be used for roadway improvement and maintenance. A few participants felt that any revenue generated should also be put towards Chicago-area schools.

The majority of participants were not initially aware of the concept of congestion pricing. Yet, the more participants learned about how congestion pricing has been successful in other areas and the options for the structure of a congestion pricing system in the Chicago area, the more open participants were to trying it to reduce congestion.

Equity for all travelers was a concern for most participants. This was indicated in several ways, such as participants' support for a congestion pricing scheme that provides travelers with the choice to travel in regular lanes or to use an HOV lane, a truck-only lane, or a carpool lane. Others were concerned about the fairness for travelers who are forced to travel during peak time periods because of restrictive work schedules.

Further community outreach and education about congestion pricing and its effects on relieving congestion, saving travel time, and increasing travel time reliability will play a critical role in informing travelers and customers as the study moves forward. In particular, initial explanations of congestion pricing allow travelers to see the obvious benefit of decreased congestion, but the benefit of greater travel time reliability is much less immediately obvious to travelers. Community outreach and education will be essential for providing the "proof" that congestion pricing can benefit all travelers, including those that must travel during the peak time periods.

It is also clear that collaborative discussions with local municipalities, the Illinois Tollway, IDOT, and commercial vehicle industry representatives may need to take place to address concerns of commercial vehicle drivers.

AUTOMOBILE DRIVER OPINIONS – TOLLS VERSUS TAXES

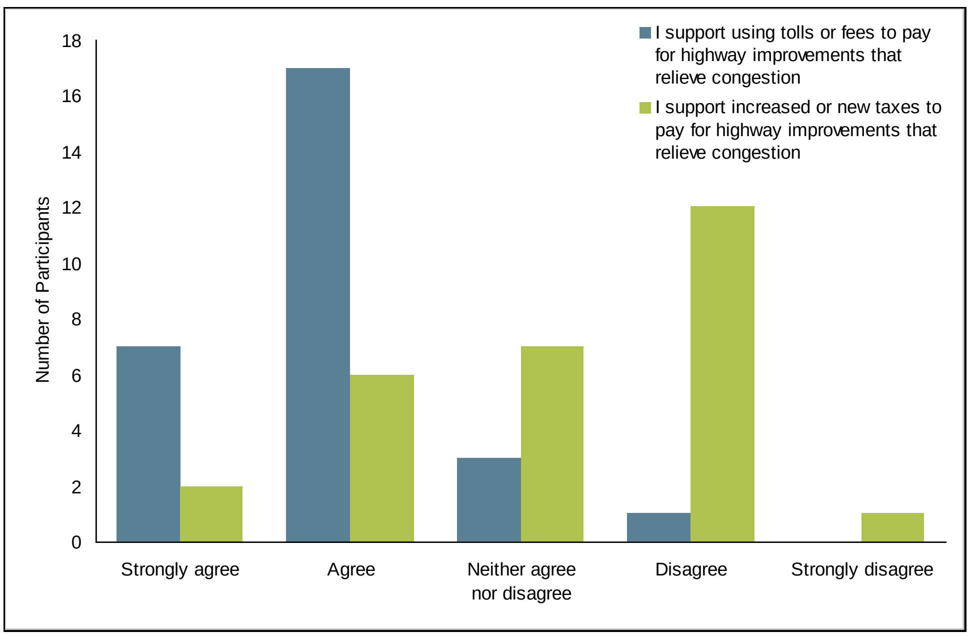
At the end of the automobile focus groups, the 29 automobile participants answered a one page questionnaire. Respondents were asked how they get news about transportation issues in the Chicago area, how often they check traffic conditions before making a trip, and how they would prefer to receive live up-to-date information about traffic conditions. Each automobile participant also answered five opinion questions.

Of the 29 automobile focus group participants, 18 reported checking traffic conditions before making a trip at least once a week. Television

(22 participants), radio (19 participants), and newspaper (19 participants) were the most frequently mentioned manners by which respondents get their news about transportation issues. Lastly, almost all participants (24 individuals) cited radio as a preferred means for receiving live up-to-date information about traffic conditions.

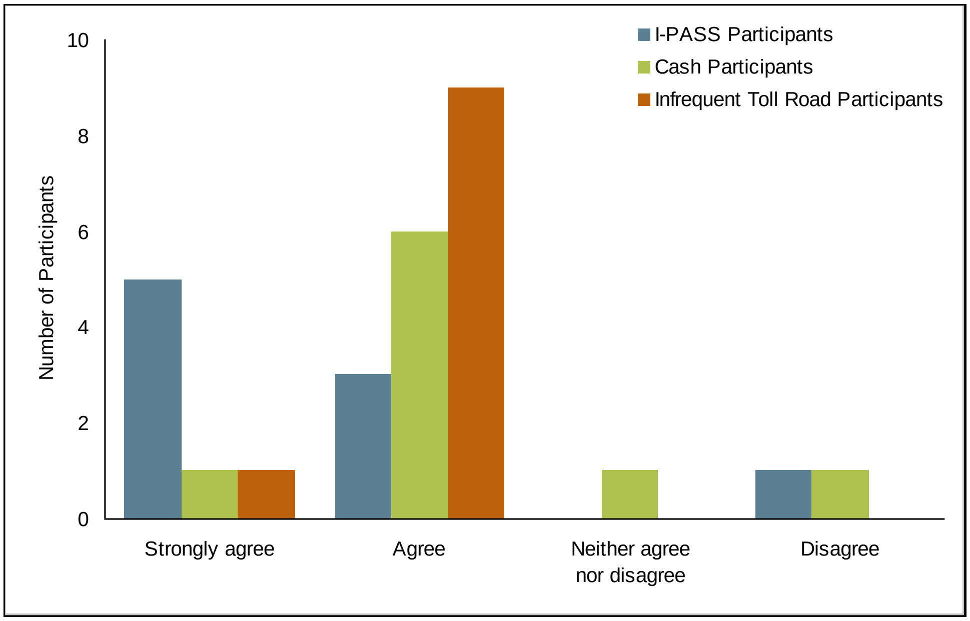
Twenty-eight automobile participants answered how strongly they agreed or disagreed with five opinion questions. One participant did not answer the five opinion questions. Participants were more in favor of using tolls or fees than using increased or new taxes to pay for pay for highway improvements that relieve congestion (Figure 9). Twenty-four participants agreed or strongly agreed in using tolls or fees to pay for highway improvements, while only eight participants agreed or strongly agreed in using increased or new taxes to pay for highway improvements.

Figure 9: Using Tolls/Fees and Taxes to Pay for Highway Improvements that Relieve Congestion



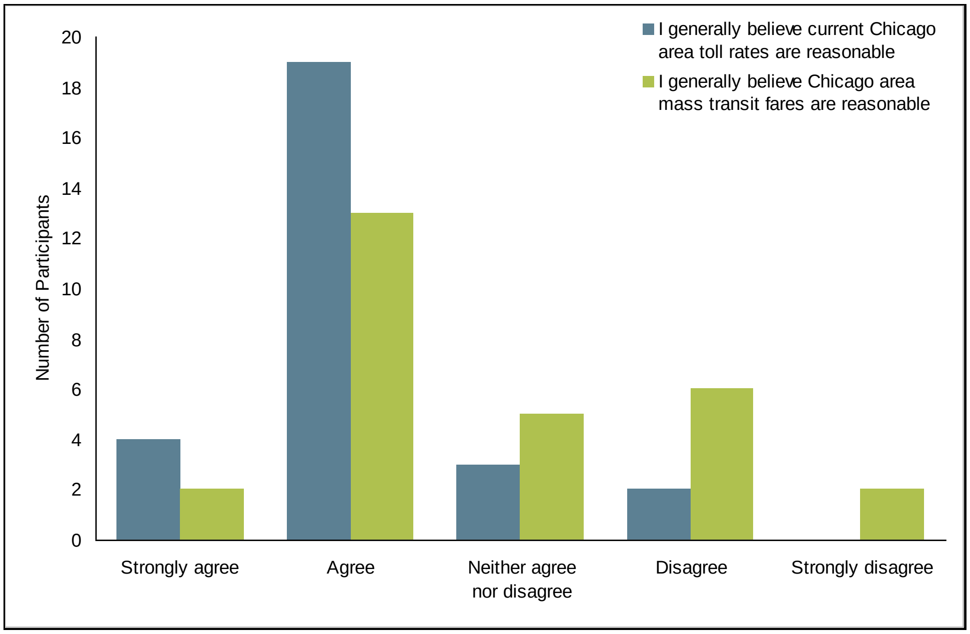
Secondly, participants indicated their level of agreement with the statement, "I will use a toll route if the tolls are reasonable and I will save time." Only three participants disagreed or neither agreed nor disagreed with the statement, while 25 participants agreed or strongly agreed with the statement (Figure 10). In particular, five of the nine I-PASS participants strongly agreed that they would use a toll route if the tolls were reasonable and they would save time.

Figure 10: Level of Agreement for: "Will Use A Toll Route if the Tolls Are Reasonable and I Save Time"



Finally, the automobile participants indicated their opinion of current Chicago area toll rates and Chicago area transit fares (Figure 11). Of the 28 participants who answered the two questions, 23 agreed or strongly agreed that toll rates are reasonable and 15 agreed or strongly agreed that transit fares are reasonable. Participants appear to have viewed transit fares less favorably than toll rates, with eight participants disagreeing or strongly disagreeing with the statement, "I generally believe Chicago area mass transit fares are reasonable."

Figure 11: Level of Agreement toward Current Pricing of Chicago Area Toll Rates and Transit Fares



Detailed results of the focus groups are presented in Appendix C.

STATED PREFERENCE SURVEY

A companion market research effort conducted for the study was a Stated Preference (SP) survey of almost two thousand Chicago area motorists. The survey was conducted in July 2008 by RSG, via an Internet-based interactive questionnaire.

The purpose of the SP survey was to obtain information that could be used to determine the sensitivity of travelers toward tolling and travel-time changes that would result from the addition of a managed lane or the implementation of congestion pricing on the Tollways and IDOT expressways in the Chicago area. The estimates of travelers' toll price sensitivities are intended to support estimates of highway traffic and revenue.

This section documents the survey approach, design, and administration. The results of the SP survey and estimated travelers' values of time are summarized as well.

SURVEY APPROACH

The SP survey was designed and administered to identify the travel patterns and preferences of passenger and commercial vehicle drivers who currently travel the Tollways and IDOT expressways in the Chicago area.

The SP survey employed a computer-assisted self-interview (CASI) technique developed by RSG. The stated preference survey instrument was customized for each respondent by presenting questions and modifying wording based on respondents' previous answers. These dynamic survey features provide an accurate and efficient means of data collection and allow presentation of future conditions that correspond with the respondents' reported experiences. The survey was programmed for administration over the Internet via email distribution to targeted audiences.

SURVEY QUESTIONNAIRE

The questionnaire consisted of four parts: questions about each respondent's recent trip, stated preference trade-off questions, debrief questions, and demographic questions.

Context Questions

At the onset of the survey, respondents reported which of the listed four Tollway and/or ten toll-free expressway routes they had used on a weekday between the hours of 5–10 AM or 3–8 PM within the last month. The four Tollway routes were the Jane Addams Memorial, the Ronald Reagan Memorial, the Tri-State, and the Veterans Memorial Tollways. The ten toll-free expressways were the Dan Ryan, the Edens, the Eisenhower, the Elgin-O'Hare, the Kennedy, and Stevenson Expressways, IL 53, I-57, I-80, and the Bishop Ford Freeway. Respondents who had not traveled on any of the fourteen highways in the past month were screened out of the survey.

Next, respondents indicated which one of their selected roads they traveled on most frequently on weekdays from 5–10 AM or 3–8 PM. Respondents were subsequently directed to answer the remainder of questions in the survey while thinking about their most recent trip on their most frequently traveled road that was at least 15 minutes long. Respondents reported details of their trip including the direction of their trip, roads used, trip purpose, day of week, and time of day. Additionally, airport travelers provided the direction of their trip (to or from the airport) and if applicable, the purpose of their flight.

Each respondent indicated whether their trip began or ended at home. They were able to enter an address or click on a map of Chicago and the surrounding region to indicate the locations where their trip began and ended. Respondents' origins and destinations were geo-coded to a latitude and longitude.

Respondents were asked to report their total door-to-door travel time. If the travel time indicated by a respondent was substantially higher or lower than the time it should take to complete the indicated trip, the respondents were prompted to confirm their travel time.

Next, respondents answered if they experienced a delay on their trip, how frequently they made their trip, and the number of passengers in the vehicle. Respondents who paid a toll on their trip reported the toll amount paid by road traveled. All respondents also reported if they owned an electronic toll collection transponder.

Lastly, this section of the questionnaire asked respondents questions about their use of transit, the preferred form of transit, the available forms of transit, the frequency of using transit, and the method of traveling to transit.

Stated Preference Questions

All respondents were categorized into one of three groups. Based on the details of their trip, respondents could have either made a trip only using Tollway routes, a trip using both Tollways and IDOT expressways, or a trip only using expressways. Within each group, respondents were presented stated preference questions in random order about a change in the highway toll pricing or about the addition of a managed lane (Table 1).

Table 1: Seven Stated Preference Segments (Based Upon Trip Type)

Trip Type	Stated Preference Segment	
Tollway Only Trip	1	Price Highways - Tollways
	2	Managed Lane
Tollway & Expressway Trip	3	Price Highways - Tollways
	4	Price Highways - Tollways & Expressways
	5	Managed Lane
Expressway Only Trip	6	Price Highways - Expressways
	7	Managed Lane

Before beginning the stated preference trade-off questions, all respondents were presented with introductory information and introduced to the travel alternatives that would be presented. Questionnaire wording was customized for each segment according to the trip type (Tollway trip, Tollway and expressway trip, or expressway trip) and according to the stated preference type (highway toll pricing or managed lane).

The stated preference section was designed to construct quantitative experiments to evaluate respondents' preferences among travel alternatives. The survey presented each respondent with eight stated preference trade-off scenarios designed as choice experiments with four travel alternatives. Respondents who reported that they did not have an available form of transit for completing their trip were only shown three alternatives (Table 2).

Table 2: Stated Preference Alternatives

Stated Preference Type		Stated Preference Alternatives
Price Highways	1	Current Route
	2	Current Route at a Different Time of Day
	3	City Streets/Local Roads only
	4	Preferred Form of Transit*
Managed Lane	1	Managed Lane
	2	Regular Lanes
	3	City Streets/Local Roads only
	4	Preferred Form of Transit*

* Note: Respondents with no available form of transit did not see this alternative

Each stated preference question listed the four (or three) travel alternatives and asked respondents to make a choice based on the conditions presented. Specific details in each alternative presented were customized based on responses to questions regarding the respondents' most recent trip. All alternatives included information about the travel time, toll cost, and reliability on the route. Across all scenarios, each respondent was presented with different levels of each of these attributes and asked to "trade-off" between the choice alternatives.

To ensure that the scenarios presented were realistic to each respondent, the base values for travel times and toll cost were based on characteristics of the recent trip reported by the respondent. By varying the travel times and toll shown in each scenario, the respondent was faced with different time savings for different costs, allowing them to demonstrate their travel preferences across a range of values of time.

Figure 12: Example Stated Preference Screen (Highway Pricing Segment)

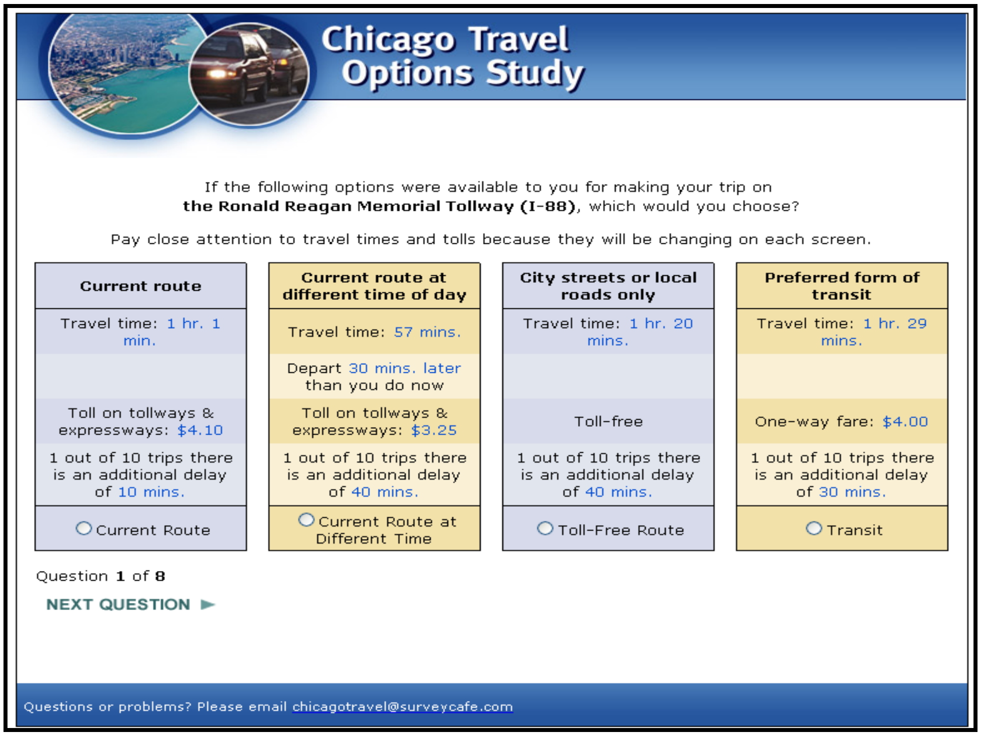
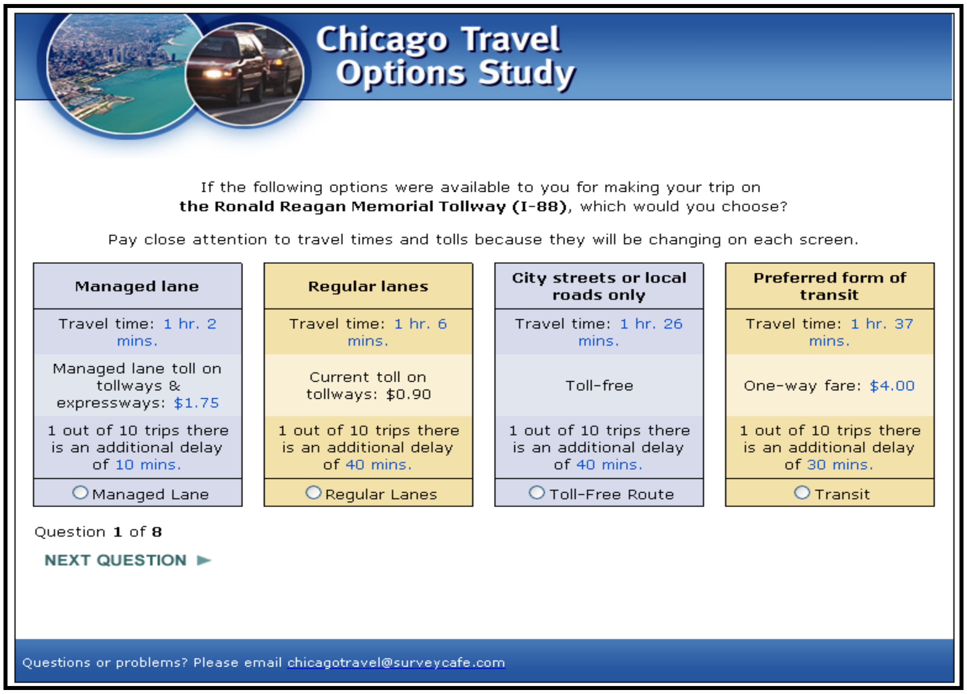


Figure 13: Example Stated Preference Screen (Managed Lane Segment)



Debrief Questions

At the conclusion of the stated preference scenarios, respondents who saw the managed lane stated preference section but never chose the managed lane alternative were asked to indicate their primary reason for doing so. Similarly, respondents who saw the highway pricing stated preference section and who never chose to travel their current route at a different time of day were asked to indicate their primary reason for not changing the time of their trip. Additionally, respondents who saw the public transit alternative, but never chose it were asked to give their primary reason for not doing so.

The final set of debrief questions addressed respondents' opinions. First, respondents were asked to provide their overall support or opposition to the concepts seen in the stated preference section. Respondents who completed the managed lane stated preference scenarios were asked what their opinion would be if a managed lane was implemented to address rush-hour congestion. Respondents who completed the stated preference section regarding a change in highway pricing were asked what their opinion would be if the Illinois Tollway were to implement higher toll rates to reduce rush-hour congestion.

Lastly, respondents answered questions related to their general opinion of travel behavior, toll rates, public transit, and vehicle carbon emissions.

Demographic Questions

To conclude the questionnaire, several demographics questions were asked to verify that the sample contained a diverse cross section of the population. Respondents were assured that their individual responses would be kept confidential.

Respondents answered a series of questions having to do with county or state of residence, household size, number of household vehicles, gender, age, employment status, and annual income in order to attain information about the sample and to determine differences in responses among different traveler segments.

Respondents were given the opportunity to enter a raffle for one of twenty-five $50 cash prizes and to leave comments about the survey or about travel in the Chicago area in general.

SURVEY ADMINISTRATION

Data collection was conducted in July 2008. Participants were recruited in one of three ways:

- Online administration of the survey to recipients of the Illinois Tollway's monthly e-newsletter to I-PASS holders. A total of 1,852 respondents completed the survey online after clicking on an individualized web link in the electronic newsletter they received from the Illinois Tollway.
- Online administration of the survey to travelers who stopped to pay a cash toll at one of six mainline toll plazas across the four Tollways. These travelers were given an invitation postcard with a unique password to take the stated preference survey online. 24,800 postcards were printed for distribution at the toll plazas, although not all were distributed to motorists. A total of 106 individuals completed the survey online after receiving the invitation postcard.
- Online administration of the survey to recipients of the Metropolitan Planning Council's bi-weekly *Talking Transit* e-newsletter. Of the approximately 1,000 individuals who received

the newsletter, a total of 18 respondents completed the survey online.

A total of 1,976 respondents completed the automobile survey.

SURVEY RESULTS

The survey was designed to produce a generally representative sample of travelers who use the Tollways and expressways in the Chicago area. It is important to sample a sufficient range of travelers and trip types to support the development of statistical models. By collecting data from a range of traveler and trip types, it is possible to identify the ways in which different characteristics affect travel choices. These differences can then be reflected in the structure and coefficients of the resulting choice model.

The descriptive analysis of the data presented in this section of the report is based on the 1,976 responses and is provided in three sections: trip characteristics, debrief, and demographics.

Trip Characteristics

Of the roads a respondent had traveled on, they were asked to select the one road that they traveled on the most frequently and to think about their most recent trip using that road during a weekday peak period (5–10AM or 3–8PM) for the rest of the survey (Figure 14). Based on the answer to this question, respondents were split with 52% choosing to report a recent trip that used one of the four Tollways, and 48% choosing to report a recent trip that used one of the 10 expressways.

Figure 14: Most Frequently Traveled Road

Road	Respondents	Percentage
Tri-State Tollway	465	23.5%
Ronald Reagan Memorial Tollway	203	10.3%
Edens Expressway	193	9.8%
Jane Addams Memorial Tollway	193	9.8%
Kennedy Expressway	184	9.3%
Veterans Memorial Tollway	175	8.9%
Stevenson Expressway	151	7.6%
Eisenhower Expressway	135	6.8%
IL 53	95	4.8%
Dan Ryan Expressway	57	2.9%
Elgin-O'Hare Expressway	47	2.4%
I-80	41	2.1%
I-57	27	1.4%
Bishop Ford Freeway	10	0.5%
Total	1,976	100.0%

Respondents were also asked to provide the other Tollways and/or expressways they used on their trip. Based upon the reported roads used, respondents were classified into three categories: respondents who reported a trip that only used Tollways, respondents who reported a trip that used both Tollways and expressways, and respondents who reported a trip that only used expressways (Figure 15).

Figure 15: Trip Type Segmentation

Trip Type	Respondents	Percentage
Tollway only trip	435	22.0%
Tollway & expressway trip	986	49.9%
Expressway only trip	555	28.1%
Total	1,976	100.0%

Each respondent then reported the direction traveled on their most recent trip. Overall, 41% reported a trip toward downtown Chicago, 35% reported a trip away from downtown Chicago, and 23% reported a trip neither toward nor away from downtown Chicago. Almost all respondents (93%) in the expressway only trip segment reported trips toward or away from downtown Chicago, while only 7% reported a trip neither toward, nor away from downtown Chicago. Alternatively, 34% of respondents in the Tollway only trip segment and 28% of respondents in the Tollway and expressway trip segment reported making a trip neither toward, nor away from downtown Chicago.

Work commute (44%), work-related business (16%), and social or recreational trips (19%) accounted for the largest percentage of trip purposes. Airport (O'Hare and Midway) trips (5%), vacation trips (4%), shopping trips (2%), school trips (2%), and other personal business trips (8%) were also reported as trip purposes.

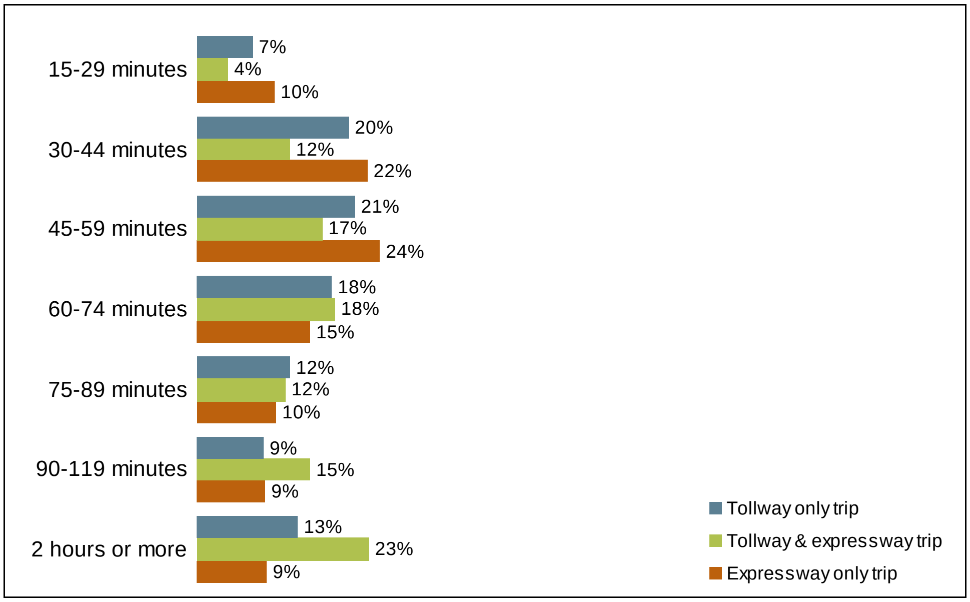
The 89 respondents who reported an airport trip answered additional questions about their airport trip. Almost half (49%) stated they went to the airport to pick up or drop off someone and 46% traveled to or from the airport because of a flight they themselves took. Only 5% reported that they worked at the airport.

Each respondent reported the time, in 30 minute increments, that they began their trip and were then categorized according to the time period that they began their trip. Overall, 37% of respondents reporting making a trip during the AM peak (6–9AM), 24% during the AM shoulder period (5–6AM or 9–10AM), 24% during the PM peak (3:30–6:30PM), and 16% during the PM shoulder period (3–3:30PM or 6:30–8:00PM). The trip time period was similar across trip types with 41% of Tollway only trip respondents, 36% of Tollway and expressway trip respondents, and 34% of expressway only trip respondents reporting that they traveled during the AM peak period (6–9AM).

Two-thirds (67%) of respondents indicated that they began their trip at home, while 20% began their trip at work, and 13% began their trip at another location. With regard to trip destination, 24% of respondents completed their trip at home, 35% at work, and 41% at another location.

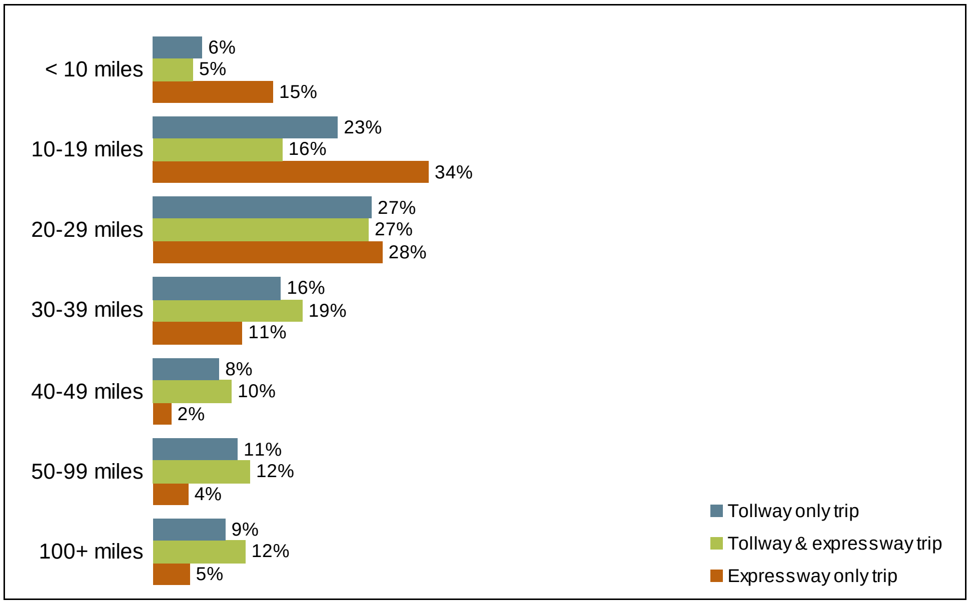
Next, respondents reported their trip travel time (Figure 16). Logically, respondents in the Tollway and expressway trip segment reported longer travel times, with 49% reporting a travel time of more than one hour. Only 29% of expressway only trip segment respondents and 34% of Tollway only trip segment respondents reported a travel time of more than one hour.

Figure 16: Reported Travel Time by Trip Type



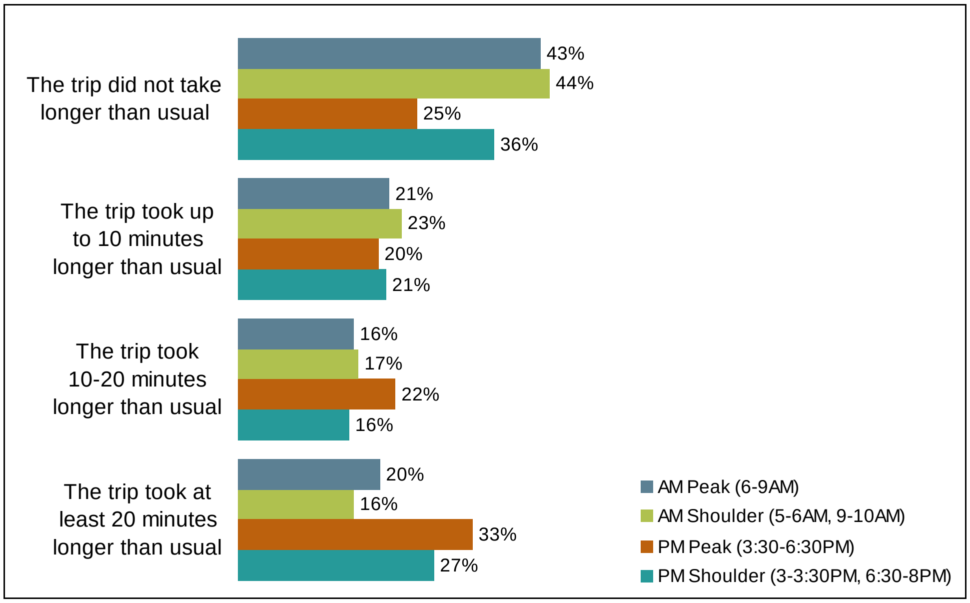
Based on the reported starting point and ending point of the trip, a trip distance was calculated for each respondent. Two-thirds (66%) of respondents had a trip distance of 10–40 miles. As expected, respondents in the Tollway and expressway trip segment had longer trip distances (Figure 17).

Figure 17: Calculated Trip Distance by Trip Type



Overall, 38% of respondents reported that their trip did not take longer than normal due to traffic conditions, while 21% reported experiencing a delay of up to 10 minutes, 18% reported a delay of 10–20 minutes, and 23% reported a delay of at least 20 minutes longer than usual (Figure 18). More than half (55%) of respondents traveling during the PM peak period reported a delay of at least 10 minutes longer than usual, while a lesser percentage (36%) of AM peak period respondents reported the same amount of delay.

Figure 18: Trip Delay by Time of Day



Respondents also reported how frequently they made their trip with 37% making their trip four or more times per week, 19% making their trip 1–3 times per week, 25% making their trip 1–3 times per month, and 19% making their trip less than once per month. Three-quarters (75%) of respondents making work commute trips reported making their trip four or more times per week. Alternatively, three-quarters or more of respondents making shopping, social/recreational, other personal business, airport trips, and vacation trips reported making their trip less than once per week.

With regard to vehicle occupancy, 70% of respondents reported traveling alone, while 20% reported traveling with another person, and 10% of respondents reported traveling with two or more fellow passengers.

Given that 94% of respondents were recruited from the I-PASS e-newsletter database, a similar percentage (95% of all respondents) reported owning an ETC transponder. All respondents in the Tollway only trip segment and Tollway and expressway trip segment reported paying a toll on their trip. Only 15% of respondents in the expressway only trip segment reported paying a toll on their trip and these respondents may have traveled on non Illinois Tollway roads such as the Chicago Skyway or the Indiana toll-road. The three-quarters (76%) of all respondents who reported paying a toll on their trip were asked how much they paid. Overall, 20% of those who reported paying a toll paid less than

$0.50, 36% paid $0.50–$0.99, 17% paid $1.00–$1.49, 9% paid $1.50–$1.99, and 18% paid more than $2.00 in tolls on their trip.

To conclude the trip characteristic section of the questionnaire, respondents answered a few questions about their transit usage. Only 14% of respondents indicated that they travel by transit once per week or more, while 12% travel by transit more 1–3 times per month, 32% travel by transit less than once per month, and 42% never travel by transit. Metra was two-thirds (66%) of respondents' preferred form of transit, followed by the CTA train for 19% of respondents. Expressway only trip segment respondents were more likely to prefer the CTA train and less likely to prefer Metra than respondents who traveled on Tollways: 32% of expressway only trip segment respondents preferred the CTA train, while only 6% of Tollway-only trip segment respondents and 12% of Tollway and expressway trip segment respondents preferred traveling the CTA train to travel by transit.

Debrief

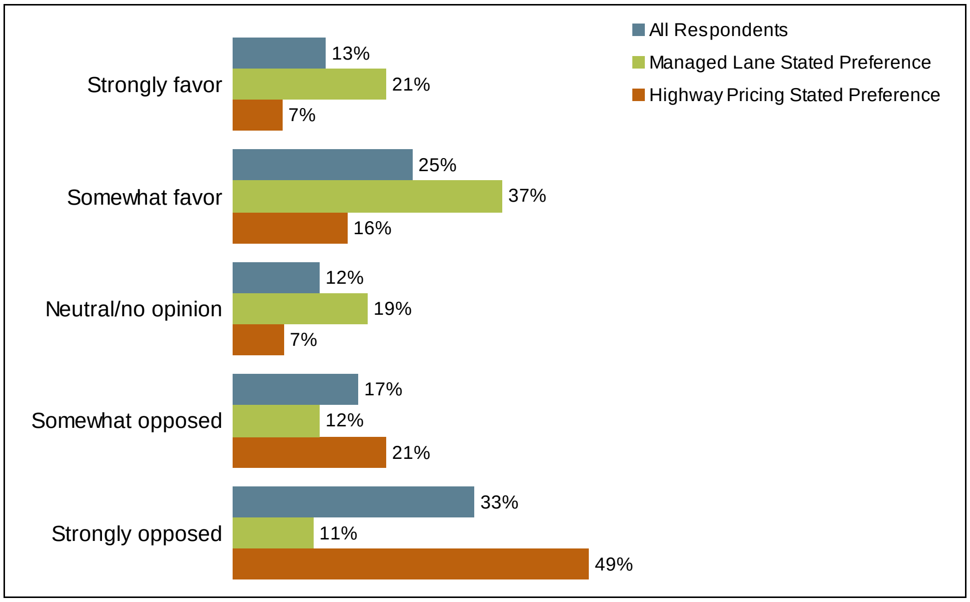
Following the stated preference section of the questionnaire, a respondent may have seen one or more of three questions asking the reasons behind their selections in the stated preference section. All respondents who never selected the transit alternative in the stated preference section were asked their primary reason why they did not select the transit alternative. Of the 666 respondents who saw the question, 23% felt that traveling by car was most convenient, 16% felt they needed their car for other reasons, 16% felt that public transit is not convenient, and 16% felt their travel time using public transit is too long. However, differences among trip types showed that of the respondents who reported a trip that used a Tollway, but did not use an expressway, 26% felt that their travel time using public transit is too long.

The second debrief question was asked of respondents who saw the managed lane stated preference section and never selected the managed lane option out. Of the 268 respondents who saw the question, 38% stated that the time savings was not worth the toll cost and 24% were opposed to paying an additional managed lane fee. A smaller percentage (14%) felt that the managed lane fee was too high and 12% felt that the time savings were not great enough.

Similarly, respondents who saw the highway pricing stated preference section and never selected the option to make their current trip at a different time of day (for a lower toll amount) were asked why they were resistant to changing the time of their reported trip. Almost half (49%) of the 342 people who saw the question stated that they did not have flexibility in their trip arrival time, and an additional 11% stated that other appointments would not allow them to change their travel schedule.

Having answered questions about their decisions in the stated preference section, respondents were asked their opinion. The wording of the opinion question varied: respondents who saw the managed lane stated preference section were asked how they would feel if a managed lane were implemented and respondents who saw the highway pricing stated preference section were asked their opinion if toll rates changed (Figure 19). Logically, very few people were in favor of toll rates changing (without an obvious benefit), while more were in favor of implementing a managed lane (with a clearer benefit to travel time).

Figure 19: Respondent Preferences for Pricing Options



To conclude the debrief section all respondents were asked a series of opinion questions about their driving behavior, attitudes toward public transit and the environment. The extent to which respondents agreed or disagreed with each statement is shown in Figures 20, 21 and 22.

Figure 20: Automobile Driver Behavior Attitude Questions

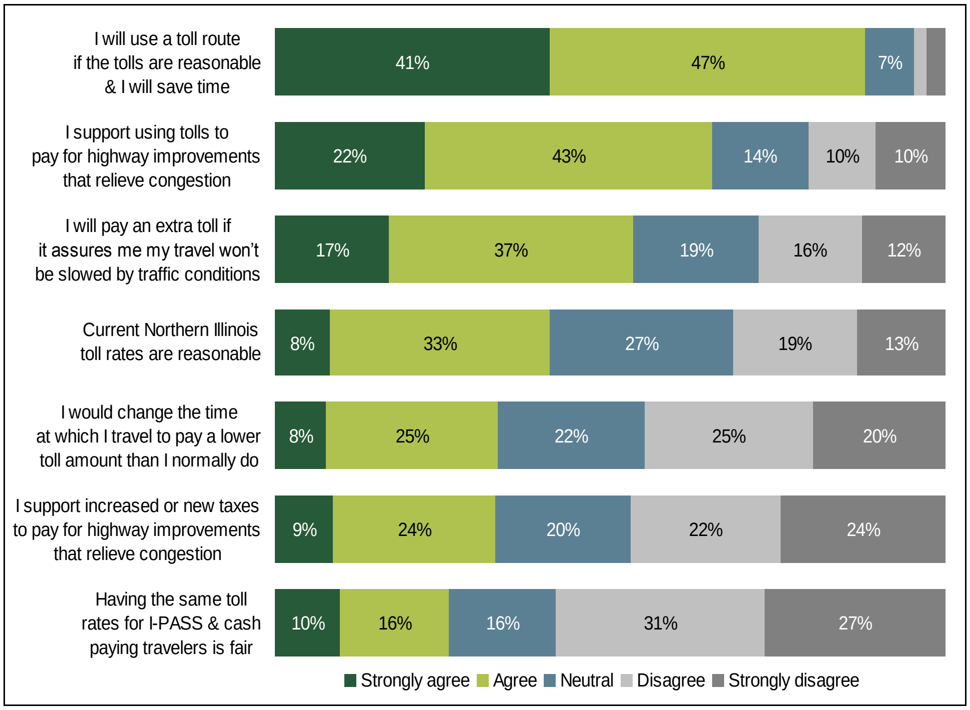


Figure 21: Public Transit Attitude Questions

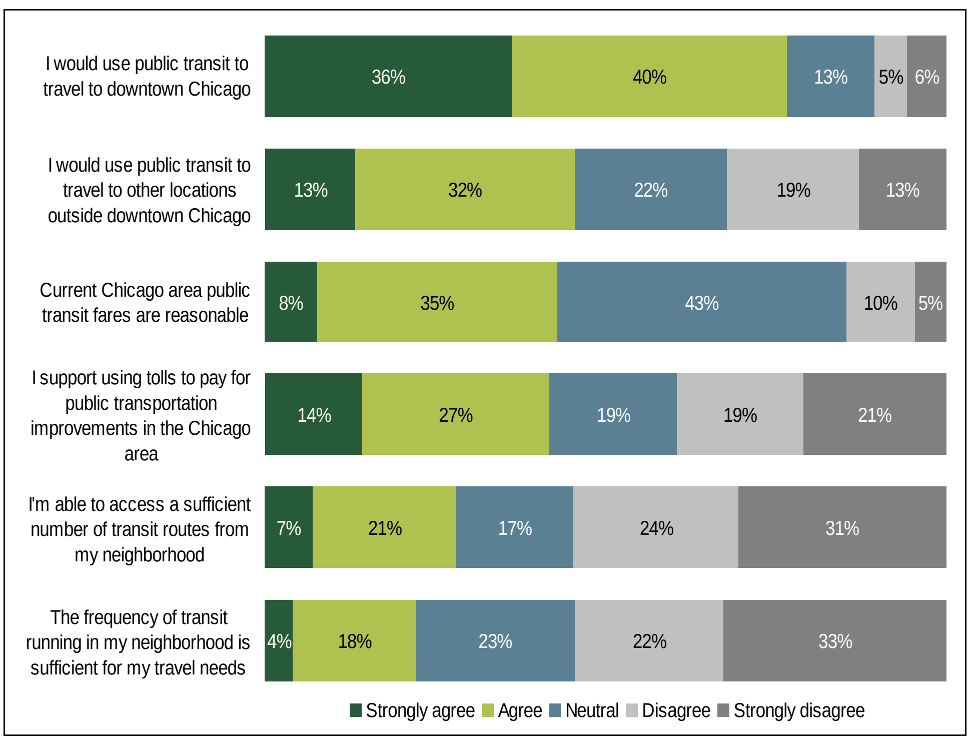
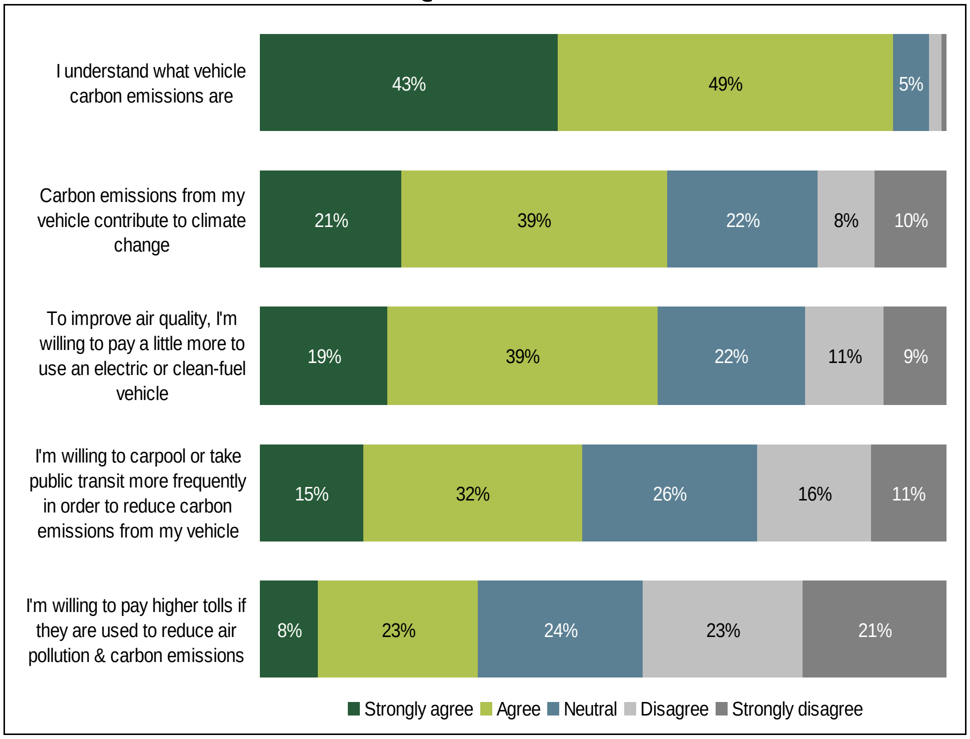


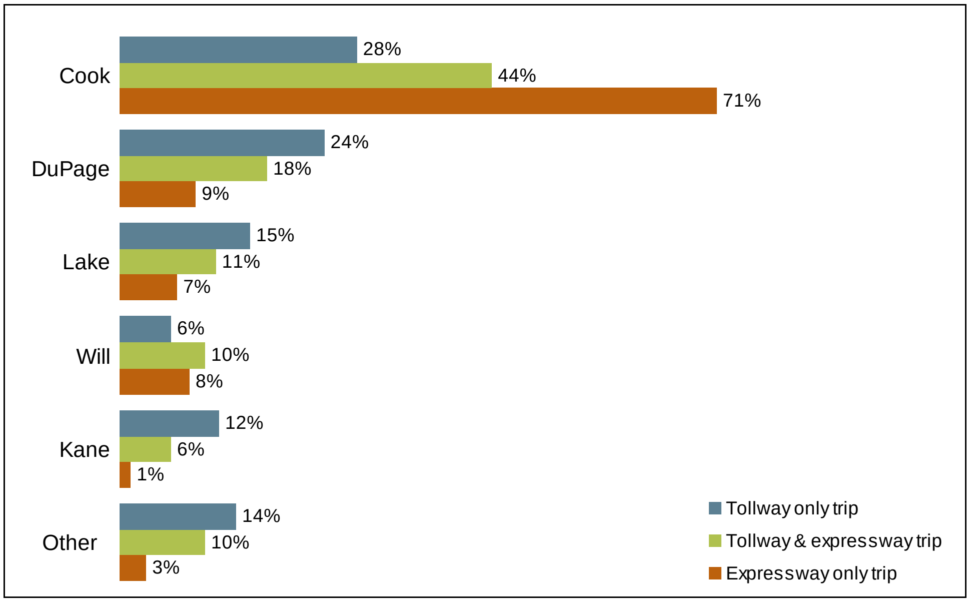
Figure 22: Travel Behavior & the Environment Attitude Questions



Demographics

Ninety percent of respondents reported living in Illinois, 5% of respondents were Wisconsin residents, 3% were Indiana residents, and the remaining 2% of respondents were residents of other states. Of the Illinois residents, 49% were Cook County residents, 17% were DuPage County residents, 11% were Lake County residents, and 9% were Will County residents. Overall, residents of 23 Illinois counties completed the survey. As expected, location of residence (and therefore proximity to the Tollways) affected the type of trip reported, with Cook County residents more likely to report an expressway only trip and those living in other counties more likely to report trips that used one or more Tollways (Figure 23).

Figure 23: Illinois County of Residence by Trip Type

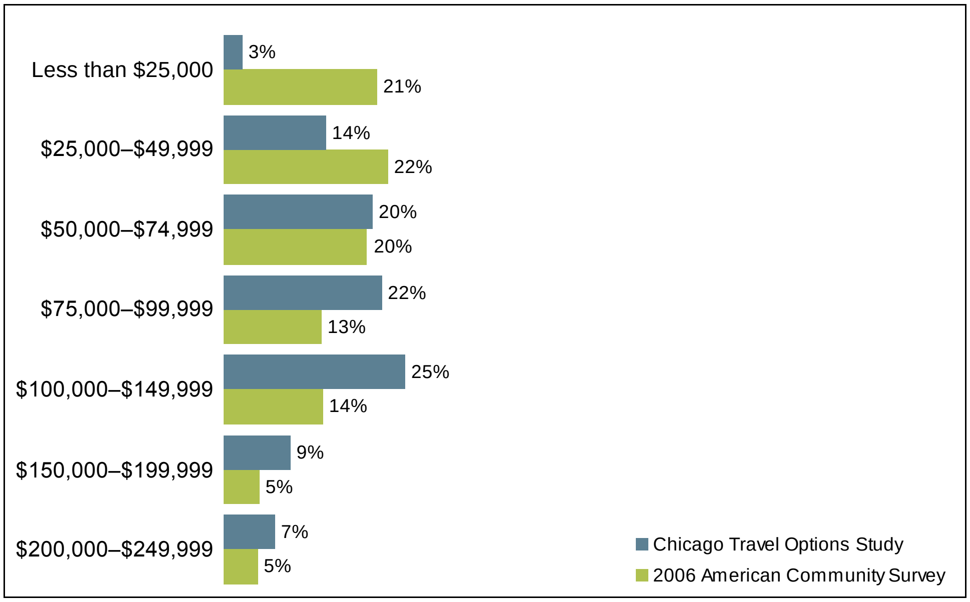


Household size and vehicle ownership varied among respondents. Thirty-seven percent of respondents lived in two-person households, while 18% lived in three-person households, 15% lived in four-person households, and 10% lived in households with five or more people. One in five respondents (20%) lived in single-person households. Similarly, 24% of respondents owned one vehicle, 46% owned two vehicles, 18% owned three vehicles, and 12% owned four or more vehicles.

Men were 57% of respondents, while women accounted for 43% of respondents. The age among respondents varied with 3% age 16–24, 17% age 25–34, 21% age 35–44, 27% age 45–54, 23% age 55–64, 9% age 65 or older. Overall, 73% of respondents were employed full-time, with an additional 12% employed part-time or self-employed.

Annual household income among respondents was distributed as shown in Figure 24. When compared to U.S. Census data from the 2006 American Community Survey for the Chicago-Naperville-Joliet Metropolitan Statistical Area, the SP survey has slightly higher income than the census data. It is typical for household incomes in the population of drivers to be slightly higher than incomes in the population as a whole. This is due to households without vehicles being concentrated in the lowest income categories.

Figure 24: Survey Sample Income Compared to 2006 American Community Survey Census Data



STATED PREFERENCE MODEL ESTIMATION

The stated preference data collected was used to estimate choice models to understand likely future travel behavior of current and potential travelers on the Tollways and expressways in the Chicago region.

Responses from the stated preference experiments were expanded into a dataset containing eight observations for each respondent, yielding a total of 14,768 observations. The data were used to support estimation of the coefficients of multinomial logit (MNL) choice models for several trip purpose segments. The model specifications and coefficients for different trip purpose segments are presented in Appendix D.

VALUES OF TIME

Mean Values of Time

Mean values of time based on the MNL model results for each of the four trip purpose segments are shown in Table 3.

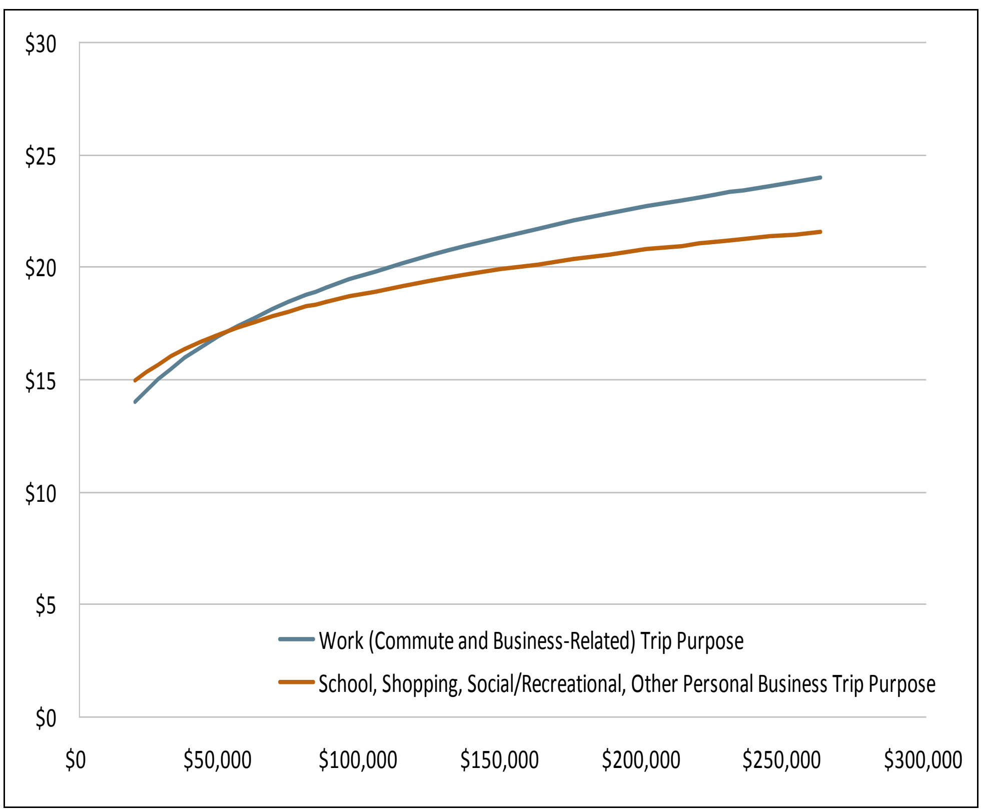
Table 3: Mean Values of Time

Segment	Value of Time ($/hour)
Work (Commute & Business-Related)	$18.84
Shopping, School, Social/Recreational	$17.98
Airport (O'Hare & Midway)	$15.47
Vacation	$14.38

Relationship Between Values of Time and Household Income

For work (commute and business-related) and shopping/social/school trips, cost sensitivity and hence value of time was interacted with household income. Figure 25 compares the resulting value of time – income curves for the work and shopping/social/school segments. Due to small sample sizes, the airport and vacation segments were not interacted with household income.

Figure 25: Value of Time ($/hour) by Annual Household Income



CHAPTER 6

COMMUNITY OUTREACH & STAKEHOLDER WORKSHOPS

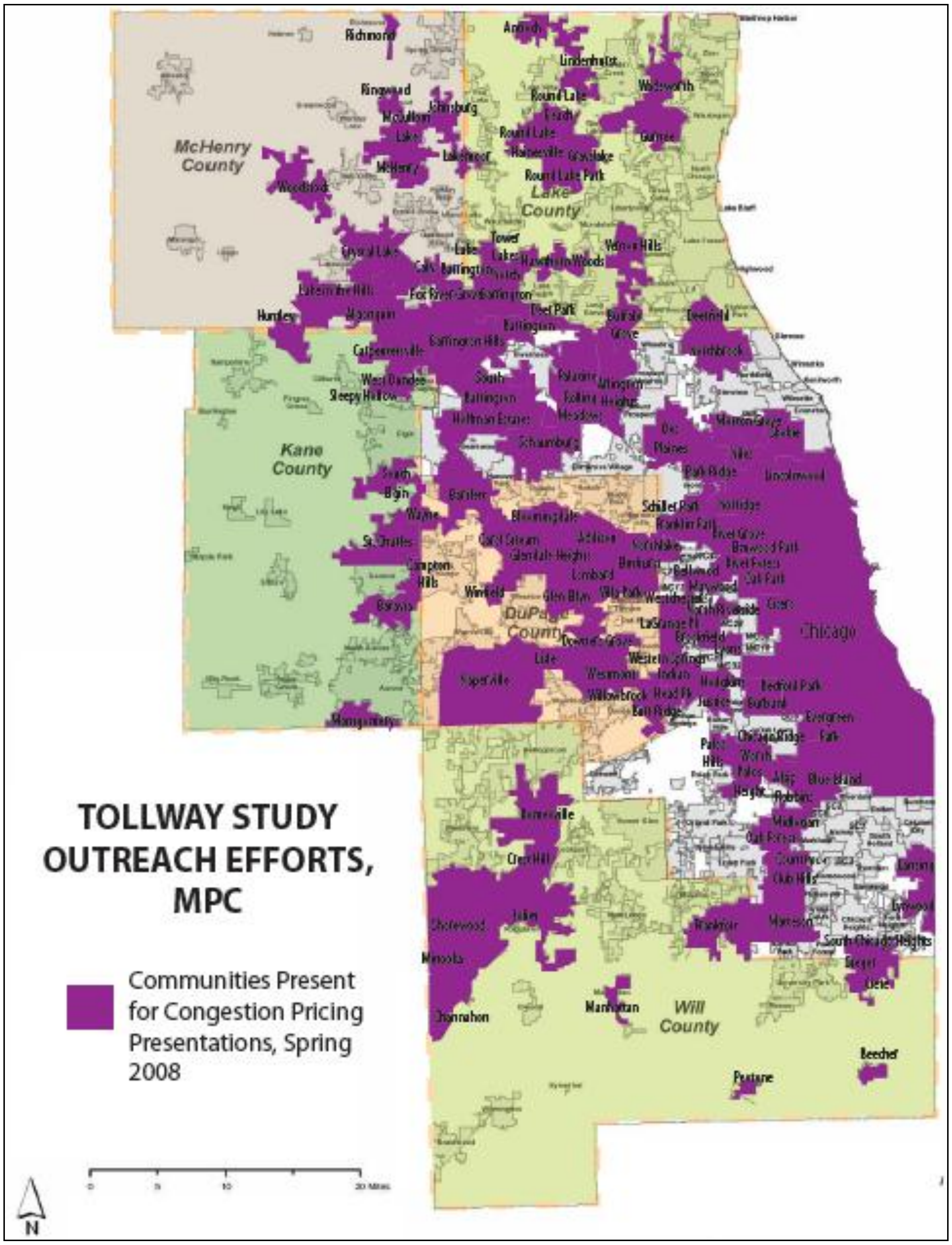
The study dedicated a significant amount of effort to community outreach and obtaining input from key stakeholders and policy makers in the region. This chapter summarizes community outreach efforts and stakeholder involvement in establishing goals and objectives for pricing in the Chicago region as well as in prioritizing pricing strategies evaluated as part of the study.

COMMUNITY OUTREACH

Over March and April 2008, MPC, the community outreach lead partner, made a presentation on the study to each of the eleven sub-regional Councils of Mayors within the CMAP jurisdiction. The sub-regional councils are defined by geographic boundaries – six within suburban Cook County and one for each of the collar counties, DuPage, Lake, Kane/Kendall, Will and McHenry. The individual councils range in membership from 12 to 47 municipalities, with the mayors and municipal presidents or their designees serving as voting members. The intent of the presentations was to educate elected officials about congestion pricing, explain the scope of the study and understand their concerns. In addition, MPC outlined the scope of the study to the CMAP Policy Committee at its March 2008 meeting.

Over three hundred and fifty people attended the community outreach meetings, including over a hundred elected officials. Figure 26 illustrates the geographic area represented by elected officials who attended the presentations.

Figure 26: Communities Represented at Outreach Meetings



The issues raised in conducting the outreach to the Councils of Mayors ranged from general questions about how congestion pricing would work, to specific questions on implementation. The primary issues raised are listed below.

GENERAL CONCERNS

- What happens to local roads if congestion pricing is implemented?
- How do you ensure that traffic won't be diverted to local roads?
- What incentives could be provided to encourage employers to allow flexible work schedules?
- Would congestion pricing most likely affect the working poor?
- How will the revenues be used?
- Will there be incentives for operational improvements?
- Who bears the cost of implementation?
- How would we provide transit alternatives to make congestion pricing work?

SPECIFIC ISSUES

- What are the optimal conditions – free flowing traffic?
- What is the plan for discussing policies, obtaining public input, and conducting outreach?
- How will the study impact Metra's STAR line plans?
- Will the study conduct a cost-benefit analysis?
- Are land use models a part of the study?
- Will there be opportunities to include current community plans already established?

STAKEHOLDER WORKSHOPS

Stakeholder workshops were hosted by the study partners, MPC and the Illinois Tollway. Study team members, Wilbur Smith Associates and EJM Engineering, provided technical support and workshop facilitation.

Three stakeholder workshops were organized, one comprised of transportation agency representatives, and two comprised of elected officials and representatives from the Councils of Mayors. It was determined that separate workshops for agency representatives and elected officials would be appropriate.

The first workshop held on May 13, 2008 at CMAP's offices focused on transportation officials and was attended by representatives from DuPage, Kane, Lake, Cook and McHenry Counties, CDOT, IDOT, Illinois Tollway, PACE, CTA, RTA, Metra, CMAP and the FHWA. Representatives from Will County and the Illinois Environmental Protection Agency were invited but could not attend.

A second workshop was held on May 21, 2008 at the Oakbrook offices of the DuPage Mayors and Managers Conference, for elected officials and their representatives. The Northwest Municipal Conference, West Central Municipal Conference, Southwest Municipal Conference, South Suburban Mayors and Managers Conference, DuPage Mayors and Managers Conference, and Tollway Oversight Committee were represented. The Metropolitan Mayors Caucus, Lake County Municipal League, McHenry County Council of Governments, Will County Government League, Metro West Council of Governments and the remaining members of the Tollway Oversight Committee were invited but unable to attend.

Subsequently, a third stakeholder workshop was held at the City of Naperville in June 2008 to obtain additional input from elected officials who were unable to participate previously. No keypad polling was conducted for the third workshop.

The primary purposes of the stakeholders' workshops were:

- To inform the stakeholders about the congestion pricing study
- To inform the stakeholders of congestion pricing strategies in other urban regions, and to determine their general reaction to congestion pricing for the Chicago region.
- To obtain input on the perceived benefits of congestion pricing and obstacles to its implementation.
- To garner stakeholders' opinions on alternative congestion pricing strategies for the region.
- To provide scenarios specific to the Chicago region and gather feedback on their viability.
- To seek suggestions for addressing community concerns related to congestion pricing, and disseminating information to public.

Workshop Design and Methodology

Initially, MPC made a presentation summarizing applications of congestion pricing elsewhere in the country. Existing traffic conditions and projections for the Chicago region were also briefly discussed, to establish the scope of Chicago's congestion problem.

Workshop attendees were asked to suggest the various goals, benefits, and obstacles of congestion pricing. They were then asked to rank all responses given. They were also asked to select from a list of potential congestion pricing strategies via anonymous polling. The results of these polls are discussed later in this chapter. The opinions expressed by the attendees were assumed to represent the views of the community or agency they represent. However, the expressed views were not attributed to any specific organization. The goal was to make a determination of the stakeholders' general perspective on the various issues and options related to congestion pricing.

The polls were conducted using keypad polling equipment provided by CMAP. The equipment allowed each participant to vote anonymously using their individual keypads on the choices presented to them.

The first half of each workshop was spent in listing and ranking benefits, obstacles, and goals for congestion pricing in the Chicago region. Then, various scenarios for implementation of congestion pricing were presented to the attendees. Finally, the workshops were used to gather suggestions for public outreach.

BENEFITS AND OBSTACLES OF CONGESTION PRICING

BENEFITS OF CONGESTION PRICING

- Public agency officials considered the reinvestment of revenue in transit and roadway facilities to be the foremost benefit of congestion pricing. Reduction of traffic congestion, transit improvements, and enhanced traffic management were also listed.
- Elected officials chose congestion reduction to be the most important benefit. A region-wide comprehensive traffic solution, greater transit ridership, and fuel savings were also considered important.

The benefits of congestion pricing were ranked through keypad polling as shown in Table 4.

Table 4: Rankings of Benefits of Congestion Pricing

Public Agencies	Elected Officials
1. Reinvest revenues	1. Shift traffic (reduce congestion)
2. Reduce congestion	2. Potential comprehensive solution
3. Providing alternatives	3. Mode shift
4. Traffic management	4. Save money (gas consumption)
5. Increase revenues	5. Reduce pollution
6. Environmental	6. Economic benefit
	7. Create additional revenue

OBSTACLES TO CONGESTION PRICING

- Both agency and elected officials were concerned about the lack of transportation alternatives. Both groups felt that viable transit and other transportation alternatives must be provided in conjunction with the congestion pricing.
- Agency representatives felt that lack of public approval and political commitment may prove to be major hurdles for the congestion pricing plan. They also anticipated opposition due to diversion of traffic to arterials and social equity issues.
- Elected officials considered equity issues to pose a challenge to congestion pricing. They also identified implementation costs and traffic diversion to local streets as important obstacles.

The ranking of these obstacles is shown in Table 5.

Table 5: Rankings of Obstacles to Congestion Pricing

Public Agencies	Elected Officials
1. Lack of transportation options	1. Social equity (affordability)
2. Public acceptance	2. Lack of options (transit/transportation)
3. Lack of political will	3. Cost of implementation
4. Diversion to arterials	4. Diversion to local roads
5. Social equity	5. Public opinion
6. Public education	6. Inability to shift work hours
7. Diversion to transit (unfunded)	7. Piecemeal approach
8. Implementation costs	8. Economic impacts (businesses)
9. Determining peak hours	9. Potential to create more congestion

GOALS FOR CONGESTION PRICING IN THE CHICAGO REGION

- Both agency representatives and elected officials considered reduction of traffic congestion, shift to other modes of transportation, and increasing the available transportation alternatives to be the most important goals of a congestion pricing program in the Chicago region.

The goals of congestion pricing are presented in Table 6, in order of importance.

Table 6: Rankings of Goals for Congestion Pricing

Public Agencies	Elected Officials
1. Congestion reduction	1. Congestion reduction
2. Diversion to other modes	2. Shift to transit
3. Provide additional transportation options	3. Increase travel options
4. Revenue generated	4. Comprehensive change in traffic movement
5. Environmental benefits	5. Reinvest revenue in improved transportation
6. Free flow speeds on expressways	6. Improved quality of life
7. Support commercial vehicles	7. Pollution reduction
8. Improved safety	8. Revenue generation

PREFERRED PRICING STRATEGIES

The study team presented various congestion pricing scenarios under consideration for the Chicago region to participants in the stakeholder workshops. Participant outlook on these scenarios is summarized here.

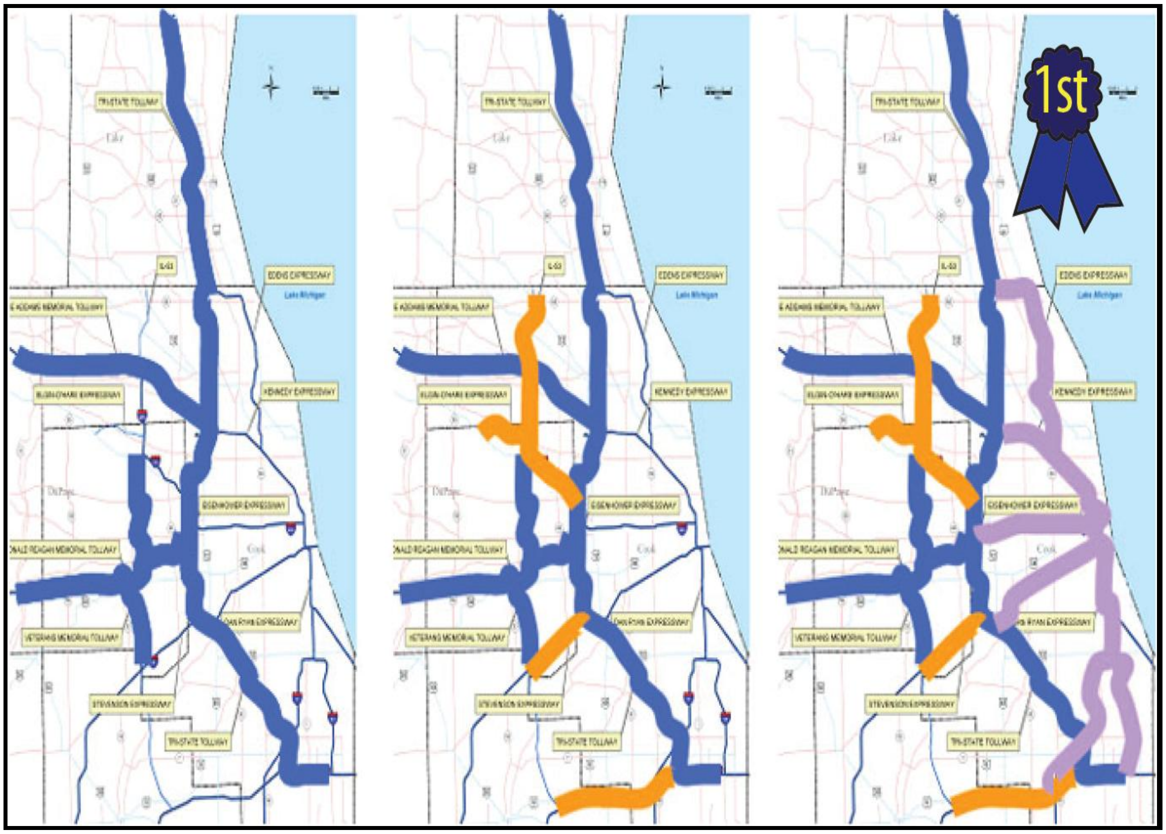
ROADWAY NETWORK OPTIONS

Three alternative roadway networks were presented for potential implementation of congestion pricing. The options were:

1. Existing Tollway routes east of the Fox River, with the exception of the south extension of I-355;
2. Existing Tollway routes and all IDOT expressways west of the Tri-State Tollway; and,
3. Existing Tollway routes and all IDOT expressways in the region.

These roadway options are illustrated in Figure 27.

Figure 27: Alternative for Priced Roadways



- Both agency representatives and elected officials selected a scenario that encompassed all Tollway and IDOT expressways as the most appropriate for congestion pricing in the region.
- Elected officials proposed an option consisting of all Tollways, and IDOT routes east of Tri-State Tollway, to be included as a part of the study.

Lane Configuration Options

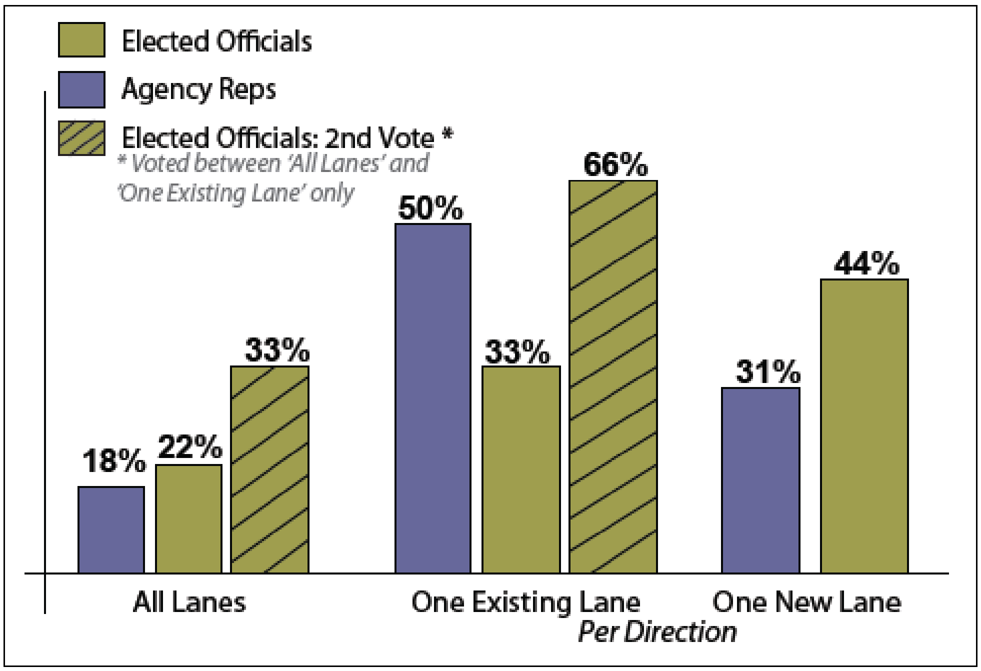
Next, three scenarios were presented to stakeholders consisted of congestion pricing on:

1. All existing lanes;
2. One or more existing lanes per direction; and,
3. One or more new lanes per direction.

Participants were asked to select from the options based on two criteria: (1) which option is the most appropriate for the Chicago region, and (2) which option is the most effective in reducing congestion.

Figure 28 illustrates the keypad polling results regarding the most appropriate lane configurations for congestion pricing in the Chicago region.

Figure 28: Congestion Pricing Lane Configuration Preferences



Most appropriate lane configuration option

- Public agency officials felt that congestion pricing implemented on one existing lane in each direction would be the most appropriate for the Chicago region.
- Elected officials voted for the configuration with pricing on a new lane in each direction.
- Both groups felt that the study should consider pricing on one or more lanes (existing and new) to overcome the operational limitations imposed by a single express lane.

Most effective lane configuration option

- Attendees at both workshops agreed that pricing on all existing lanes would be the most effective in reducing traffic congestion.

FIXED SCHEDULE VERSUS DYNAMIC PRICING

When presented with a choice between a fixed peak period pricing and dynamically varying pricing, both groups preferred congestion pricing using a fixed schedule (public agency 60%, elected officials 89%). This was prompted by concerns that a pricing structure that varies dynamically based on traffic volumes would be complicated and hinder the ability of the user to make an informed decision about his/her travel mode in advance. A simple fee structure was preferred as a first step toward implementing congestion pricing in the Chicago region.

TOLLING REGIME OPTIONS

Two alternative tolling regimes were presented to participants:

1. Congestion pricing during peak period
2. Congestion pricing throughout the peak period, with a higher rate for "super-peak" times

The agency representatives voted unanimously for the second option, while the elected officials selected it by a small margin (55/45 percent). The majority in both groups felt that the super-peak pricing, though more complex, could better manage traffic demand. The elected officials also suggested that off-peak discounts be offered as an additional incentive for shifting travel times.

PUBLIC OUTREACH AND EDUCATION

- Congestion pricing outreach needs to focus on educating the traveling public on the various transit options available to them.
- The public outreach effort needs to gain public trust and should clarify how and where the generated revenues will be directed.
- Both groups indicated that obtaining support from elected officials and the general public are separate goals that should be pursued separately.
- Efforts to address concerns over social inequity need to be made early, in partnership with local advocacy groups.

- Reach out to business communities to listen to their concerns and search for solutions and incentives to gain their support.
- The public education component should highlight the construction and maintenance costs of transportation infrastructure and clarify that congestion pricing is just one of the many options available to finance the transportation system.

Appendices E and F, respectively, present the outreach results and a detailed report on the stakeholder workshops.

CHAPTER 7

MANAGED LANE CONCEPTS

This chapter introduces the concept of managed lanes as a flexible tool for managing corridor operations and describes the conditions under which different strategies may be better suited. A description is provided of the main concepts and objectives related to managed lane implementation.

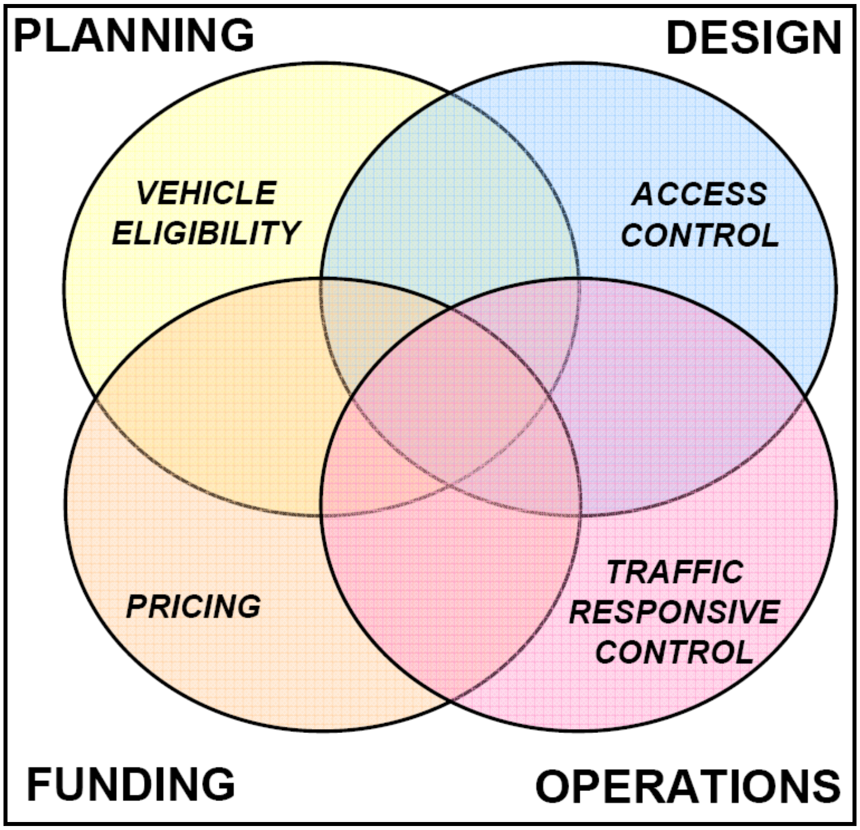
THE CONCEPT OF MANAGED LANES

Freeway systems are the crucial backbone of nearly every urban area's transportation system. Growing travel demand continues to strain these systems to the practical limits of performance. Since options for additional capacity are limited, existing facilities must be managed more effectively. Latent demand in most moderate to hyper-congested corridors can quickly fill new capacity that is not managed. The managed lane concept preserves a portion of highway capacity to serve as an "escape value" for users needing a reliable transportation alternative. These facilities provide an option to travelers urgently in need of a reliable trip travel time, and most of whom may be occasional/infrequent users. A successful managed lane project provides a safe, convenient, reliable transportation alternative for eligible users while achieving desired performance objectives.

MANAGED LANE OBJECTIVES AND OPERATING STRATEGIES

Managed lane objectives are achieved using a mixture of operating strategies that originate from planning, design, operations and funding considerations, as depicted in Figure 29. Strategies from any one source can potentially prevent congestion in the managed lanes. However, most corridors require implementation of a combination of strategies to fully optimize lane capacity utilization and generate revenues to build, operate and maintain transportation infrastructure.

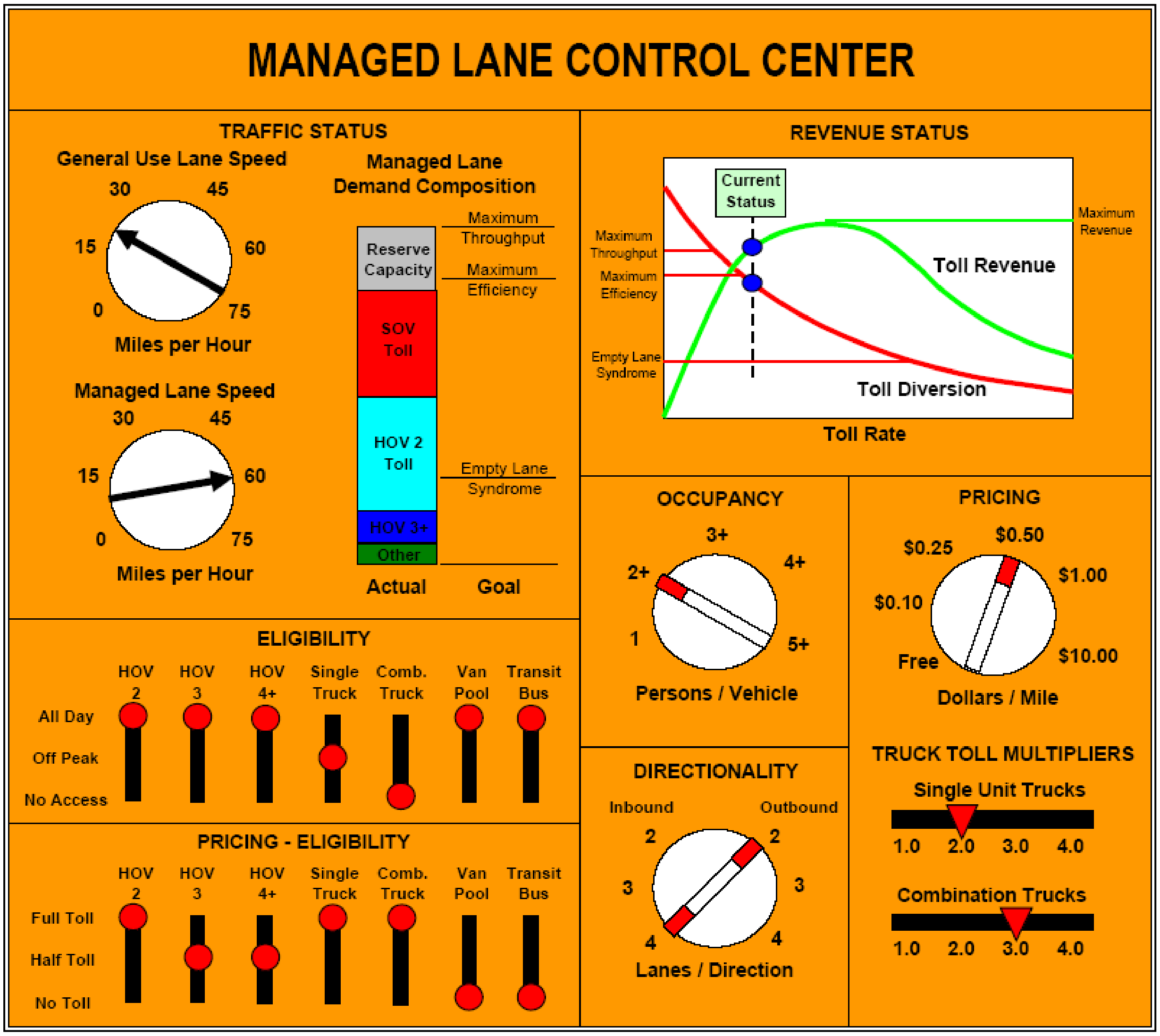
Figure 29: Origins of Managed Lane Strategies



Vehicle eligibility strategies are a product of planning and congestion management practices, while access control strategies are developed through the design process. The traffic responsive control strategies include elements of traffic management practices, and pricing strategies originate from the need for new transportation infrastructure funding sources. All four elements can be used in different combinations to optimize performance against multiple objectives such as lane utilization, funding, throughput, and system operation reliability. Typically, pricing and eligibility strategies are the most common combination of strategies applied on existing managed lane facilities.

The "control center" depiction in Figure 30 provides a simplified sense of the flexible package of managed lane operating strategies that can be used to meet different transportation objectives.

Figure 30: Simplified Illustration of Flexible Control



The top of the control panel contains status displays that measure the corridor and managed lane performance in real time, including toll revenue generation status. Switches and knobs below the status displays illustrate how some strategies provide "discrete control" using thresholds (such as vehicle occupancy), while others provide "continuous control" over a range of settings (such as toll rates). Discrete controls have a large scale impact on traffic demand and operations while the continuous controls provide the flexibility to "fine tune" performance towards desired levels.

Key considerations in implementing a managed lane project include:

- a recognition that application of active lane management through operating strategies can optimize lane utilization;
- an understanding that changing traffic conditions and characteristics may warrant changes to the combination of operating strategies applied within individual corridors and across the different facilities;
- a willingness to provide the necessary degree of flexibility depending on the level of volatility in corridor demand and operations;
- an appreciation that any given combination of strategies will not necessarily produce optimum performance for multiple objectives at the same time; and,
- a recognition of the long-term need for a monitoring and reevaluation process to periodically modify the package of objectives in response to changes in corridor traffic characteristics.

Due to the level of complexity associated with managed lane implementation, experimentation is required to determine the strategy package that best addresses policy objectives. Facility performance must also be monitored to provide advanced notice of when current objectives are no longer met due to changing traffic characteristics.

The next section describes the various transportation performance objectives that can be achieved by a package of managed lane operating strategies.

Transportation Management Objectives

Transportation infrastructure is built to meet objectives that fall into three general categories: operational objectives to optimize the utilization of the managed lane facility, financial objectives to generate revenue and user objectives to improve travelers' experience on the facility. The most common objectives under each category are briefly described below.

Operational Objectives

- *Congestion management:* Managed lanes can influence corridor demands by leveling out fluctuations in corridor traffic flows and can improve mobility and reliability for eligible users needing a reliable, congestion-free alternative.

- *Throughput maximization*: This objective maximizes either the person or vehicle volumes of a corridor through appropriate managed lane operating strategies.
- *Operational efficiency:* Managed lane operating strategies that maintain high operating speeds while maximizing throughput achieve the best level of efficiency.

Financial Objectives

- *Revenue maximization:* This objective produces the highest total revenue the travel market can sustain through continuous optimization of toll rates in response to travel market demand and congestion levels.
- *Revenue target:* This objective seeks to achieve a specific level of total revenue to meet a defined cost/liability target.
- *Economic efficiency:* This theoretical objective sets tolls at levels equal to the marginal economic cost imposed by additional travelers on a congested transportation system. It has never been used in practice.

User Objectives

- *Safety:* This objective applies operating strategies that produce traffic conditions that minimize accident risk.
- *Reliability:* This objective maintains traffic operations at a level that minimizes the variation in travel time.
- *Convenience:* This objective minimizes additional effort required to take advantage of a managed lane facility.
- *Cost Effectiveness:* Managed lanes can reduce user costs associated with congestion. These benefits can be quantified to optimize benefits against toll costs.

The prioritization between the operational, financial and user objectives is highly dependent on the importance that revenue generation plays in funding the project. Prioritization of objectives is a policy decision that must be made in collaboration with stakeholders. The prioritization will affect the overall operation of managed lanes. The user objectives are usually a lower priority and are addressed to the extent possible within the constraints of the selected operational and financial objectives.

MANAGED LANE OPERATING STRATEGIES

Operating strategies for managed lanes can be defined in four distinct categories: eligibility, responsiveness, pricing, and access control. The *vehicle eligibility*, *traffic responsive control* and *pricing* strategies focus on demand-side considerations. *Access control* strategies encompass facility design characteristics that are supply-side considerations. In general, more restrictive and inflexible strategies require a more frequent re-evaluation as corridor travel conditions change. Therefore, strategy restrictions have a tendency to limit the flexibility required to manage demand over the potential range of traffic conditions. On the other hand, a comprehensive and flexible set of managed lane operating strategies will limit the frequency of such re-evaluations but may require more resources to operate and maintain.

Eligibility Strategies

The early history of managed lane implementation is dominated by application of eligibility strategies to limit traffic on the managed lanes and avoid congestion. These strategies consist of lane use restrictions based on vehicle type or person occupancy to achieve the operational objectives. The following are examples of eligibility strategies:

- *Vehicle Occupancy:* This strategy restricts eligible use of managed lanes to high-occupancy vehicles (HOVs), which could include transit buses. The occupancy strategy supports person throughput and/or person efficiency objectives. The definition of minimum occupancy is used to manage the number of vehicles in the lane to remain below a targeted capacity/level of service.

- *Vehicle Type:* This strategy restricts eligible use of managed lanes to specific vehicle types. Busways for transit buses or truck-only-lanes provide a mechanism to manage demand for an exclusive market and can improve vehicular throughput, efficiency and safety.

Eligibility strategies applied alone may not provide sufficient control to optimize managed lane operations against defined objectives. For example, switching from a two-occupant to a three-occupant HOV requirement generally removes so much traffic from the managed lane that both vehicle and person throughput are reduced (this can result in the low-volume "empty lane syndrome"). Eligibility strategies can be combined with traffic responsive control and/or pricing strategies to better utilize excess capacity.

Traffic Responsive Control Strategies

Managed lanes improve traffic flow within a transportation corridor using operational strategies dependent on prevailing traffic conditions. As traffic conditions change, managed lane strategies must adapt accordingly. Traffic conditions that are more sporadic (thus less predictable) require greater flexibility within the operating strategies. The following list describes different levels of "temporal control flexibility" from least to most flexible that can be implemented as part of any one strategy:

- *Fixed:* Operating strategies do not change throughout the day in response to operational conditions. Strategies are only changed after performance statistics indicate poor performance of the current strategy package.
- *Time of Day:* Time of day operating strategies are applied during defined time intervals that are determined through periodic analysis of corridor traffic characteristics.
- *Variable (Static):* Operational strategy changes are triggered by defined traffic performance thresholds and implemented through a set of variable control measures.
- *Demand Responsive (Dynamic):* Strategies can change continuously throughout the day in response to changing traffic conditions and are implemented through a dynamic demand responsive set of control measures.

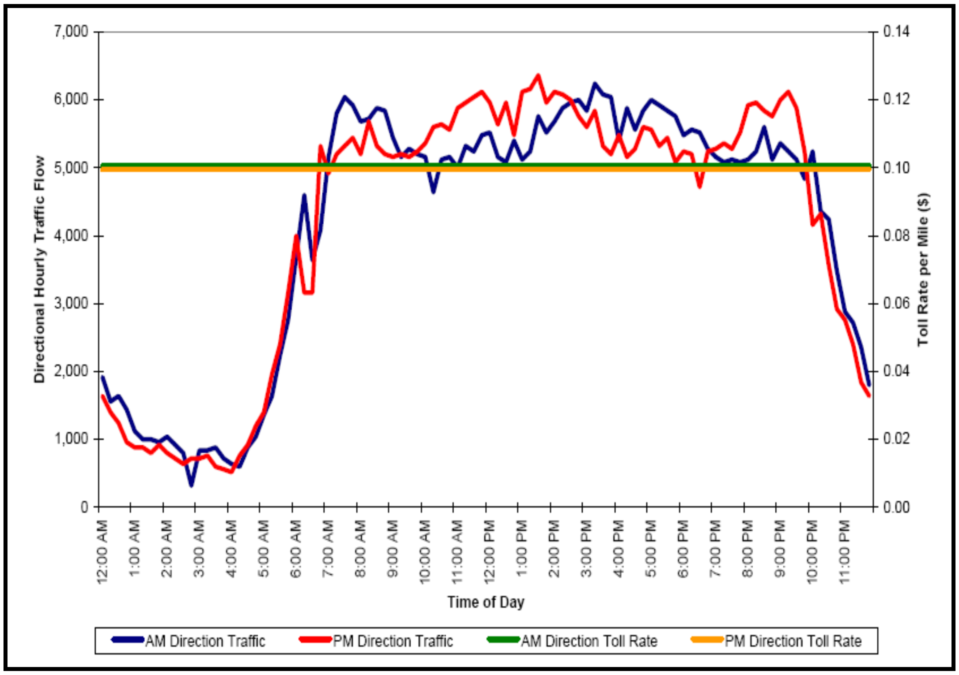
Pricing Strategies

Pricing strategies provide a flexible mechanism to fine tune traffic demand patterns to meet traffic management objectives such as throughput and/or efficiency maximization. Pricing regulates facility demand by charging a toll and can be used in conjunction with eligibility strategies and/or traffic responsive control strategies. Pricing improves lane utilization by allowing non-eligible users to "buy in" to unused facility capacity.

The following section illustrates some temporal pricing strategies that can be implemented to suit different 24-hour corridor traffic flow patterns. The patterns are charted in 15-minute increments (left vertical axis) to illustrate the level of variability in traffic flow in each direction of travel. Each chart also provides an illustration of how toll rates may be varied (right vertical axis) in response to changing traffic flow rates.

Fixed Pricing (also Set Pricing or One Price): Under this pricing strategy, toll rates are fixed for all users and all times of the day. A toll rate sensitivity study is typically conducted to determine a suitable fixed toll rate that is high enough to maintain a target traffic demand level. This pricing mechanism is best suited for facilities with stable traffic volumes throughout the day with no distinct high peaking characteristics and when demand management is not a significant issue as shown in Figure 31.

Figure 31: Traffic Flow Pattern – Fixed Toll Rates



Time-of-Day Pricing (Peak/Off Peak Pricing): Under this pricing strategy, higher fixed toll rates are used in the high volume direction during the peak, with a lower rate used during the off peak periods. Peak period pricing can encourage peak shifting of some traffic as a result of discounted rates during off peak periods, which could increase overall facility throughput. This strategy is most effective where traffic patterns exhibit a consistently stable, high-volume peak period and stable, lower volumes during all other periods as shown in Figure 32.

Variable Threshold Pricing: Under this pricing strategy, the toll rates are changed to different levels when corridor traffic characteristic cross different thresholds of performance. Typical characteristics include traffic volume, speed, or travel time savings versus general use lanes. Like the fixed/peak strategy, variable threshold pricing can encourage better utilization of capacity during off peak periods. This strategy is most effective when traffic patterns are stable within more than two different levels, and/or there are consistent and stable day-to-day fluctuations as shown in Figure 33. A four-tiered volume-based variable pricing strategy is illustrated in the figure.

Figure 32: Traffic Flow Pattern – Fixed Peak/Off Peak Toll Rates

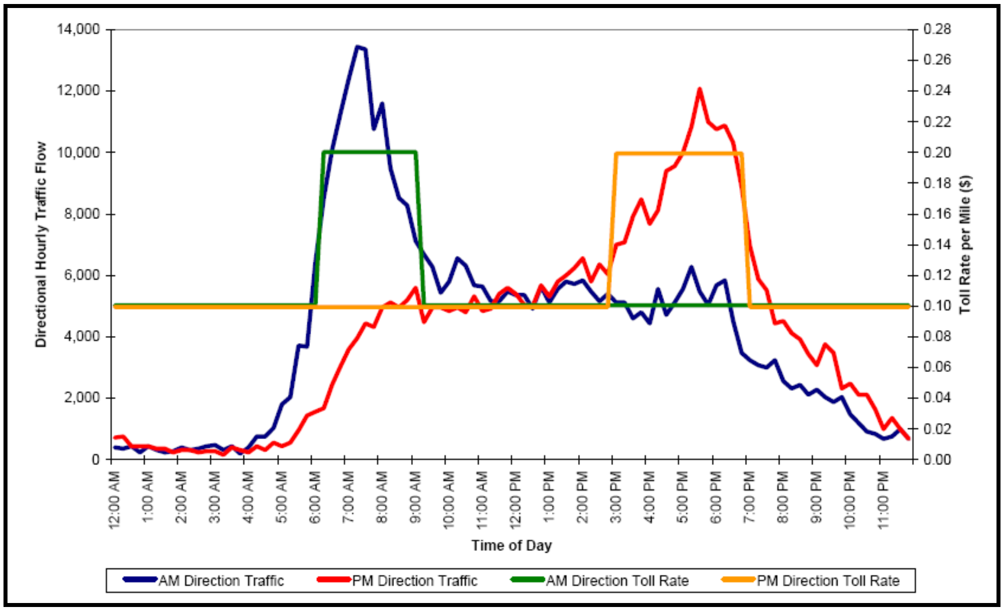
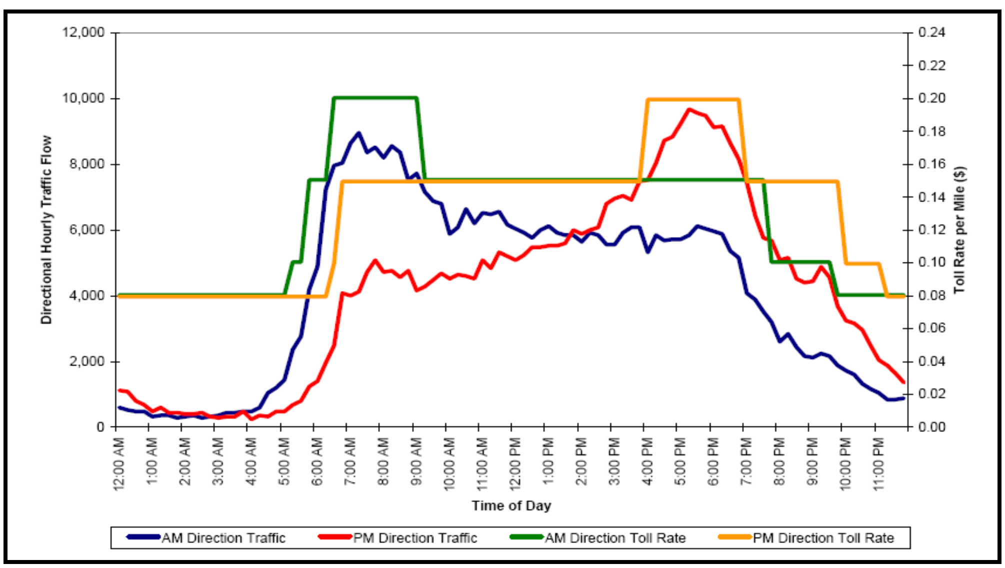
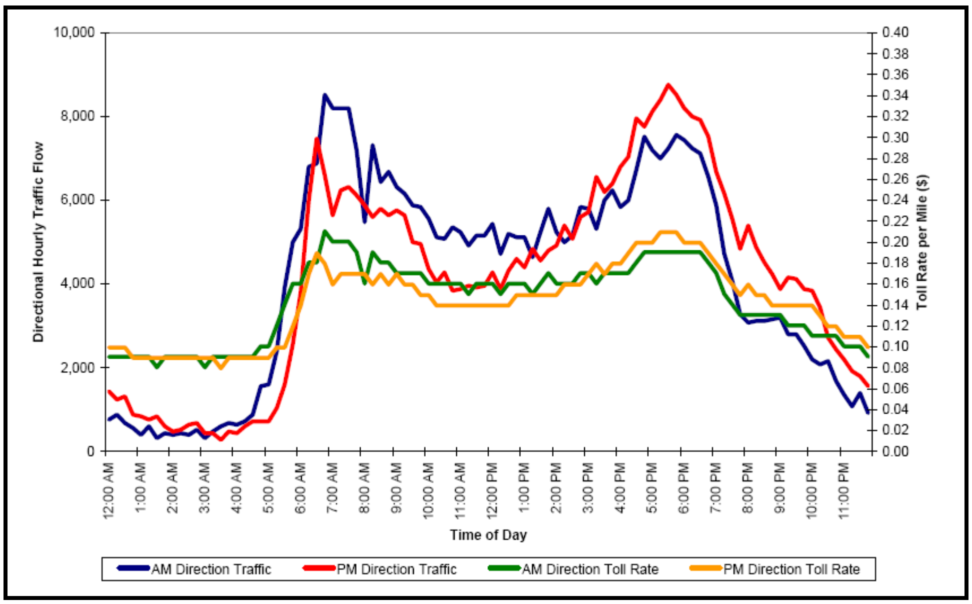


Figure 33: Traffic Flow Pattern – Preset Time-of-Day Toll Rates



Dynamic Pricing: Under this pricing strategy, toll rates are dynamically linked to traffic performance based on traffic conditions monitored in real time. Toll rates can be changed at intervals of 3 to 15 minutes, and can be set to whatever level is necessary to achieve defined objectives. This pricing strategy is most effective in conditions where the traffic volumes are extremely high, volatile and/or sporadic, thus requiring constant toll rate adjustments to ensure performance objectives are met. This strategy is best suited for corridors that continuously experience reliability problems and are prone to high incident rates and/or special event traffic as shown in Figure 34. The dynamic nature of this pricing strategy makes it the most capable of managing traffic demands to achieve throughput and/or efficiency objectives.

Figure 34: Traffic Flow Pattern – Dynamic Time-of-Day Toll Rates



Access Control Strategies

Access control strategies are physical characteristics of managed lane facilities that determine where they can be accessed and the degree of protection provided against the friction of congestion in adjacent general purpose lanes. These physical attributes affect both demand and supply-side considerations. On the demand side, fewer access points limit the patterns of traffic that can access the facility. On the supply side, both access constraints and cross-section design characteristics affect the useable (hence reliable) capacity of the lanes. The key physical attributes of a managed lane are listed below:

- *Type of Traffic Separation:* Barrier, pylon, buffer or striped;
- *Number of Access Points:* Provides a trade-off decision between cost and size/distributional characteristics of user market;
- *Type of Access Points:* Continuous, limited indirect, limited-direct or express (end points only);
- *Number of Lanes per Direction:* Multilane facilities can provide more operational flexibility with a higher revenue generation potential; and,
- *Shoulder Width:* Consideration for reliability and safety.

The most common manner in which the above access control strategies are applied to different managed lane cross-section configurations are briefly listed below:

- *Dual–Divided Lanes:* This configuration splits at least two lanes in each direction from other lanes using a physical barrier;
- *Concurrent Flow Lanes:* These lanes run along-side existing general purpose lanes and are separated by striping;
- *Two-way Barrier Separated Lanes:* These lanes are physically separated from the general purpose lanes, thus providing natural enforcement;
- *Contra Flow Lanes:* This configuration uses non-peak direction lanes to accommodate the peak direction traffic flow; and,
- *Reversible Barrier Separated Lanes:* These are permanent reversible lanes that do not require closure of off-peak direction travel lanes. These are best suited for traffic flows that are directionally imbalanced during peak periods.

MERGING OBJECTIVES AND FACILITY CHARACTERISTICS

The strategies previously discussed present a complex list of options to consider when developing a suitable strategy package for a managed lane facility. It is not always possible to achieve optimum performance for all objectives at the same time, primarily because some objectives counteract one another. Also, the list of desirable objectives may include performance standards for general use lanes or consideration of secondary objectives such as energy consumption and emissions. As such, the development of a strategy package must prioritize and weight multiple objectives to achieve a balance among financial, traffic operations, and user objectives.

Where no pricing strategies are applied, managed lane strategies are limited to eligibility strategies that achieve a combination of operational and user objectives. Since eligibility strategies provide very few options to regulate traffic in the managed lanes, it can be difficult to achieve optimal performance of objectives such as throughput or efficiency.

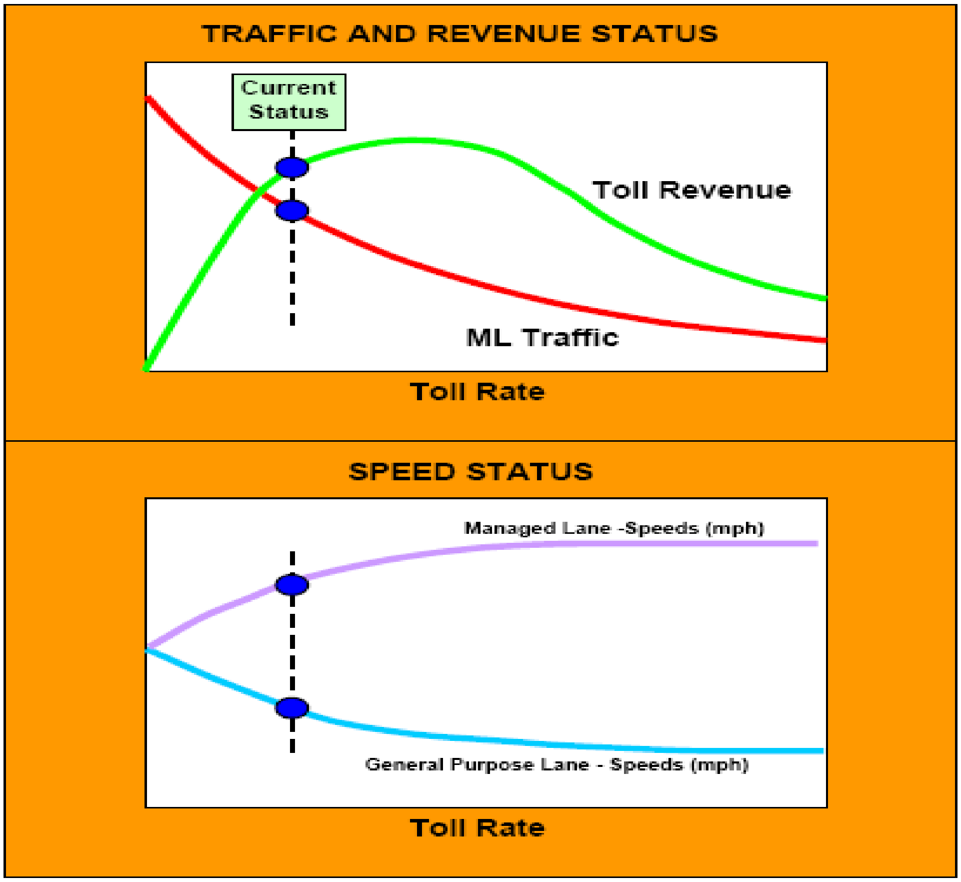
With busway and truck-only facilities, vehicle eligibility strategies are normally managed by adequately sizing the facility to handle expected demand. If necessary, truck lanes can be managed by prohibiting trucks with a certain number of axles from using the facility.

With occupancy-based eligibility strategies, as corridor demand patterns evolve, additional strategies may be needed to optimize throughput or efficiency. Pricing strategies add more options to manage traffic demand and potentially optimize toward specific objectives. Pricing on a per mile basis along a managed lane facility is an effective means of managing demand. Pricing strategies help regulate travel speeds between the general purpose and managed lanes as depicted in Figure 35.

At low toll rates, managed lane operating speeds decline as additional users fill remaining managed lane capacity. Increasing toll rates diverts some users back into the general purpose lanes, and improves the managed lane speed at the expense of the general purpose lanes' speed. Therefore, a balance between managed and general purpose lane volumes is desired under a throughput maximization objective to ensure that adequate volumes are processed through the corridor. This can be achieved by considering overall corridor performance measures as an element of the monitoring process.

Managed lanes typically attract a wide spectrum of infrequent users from multiple markets with different willingness-to-pay characteristics and sensitivities to congested travel times within the general purpose lanes. This market of infrequent managed lane makes it difficult to quantify the effectiveness of a single pricing strategy. A pricing strategy implemented along a corridor that serves multiple markets may be suitable for one corridor segment, but may not be as effective on another segment. Balancing the complexity of the pricing strategies with the length of the corridor to address these variations in market is a critical component.

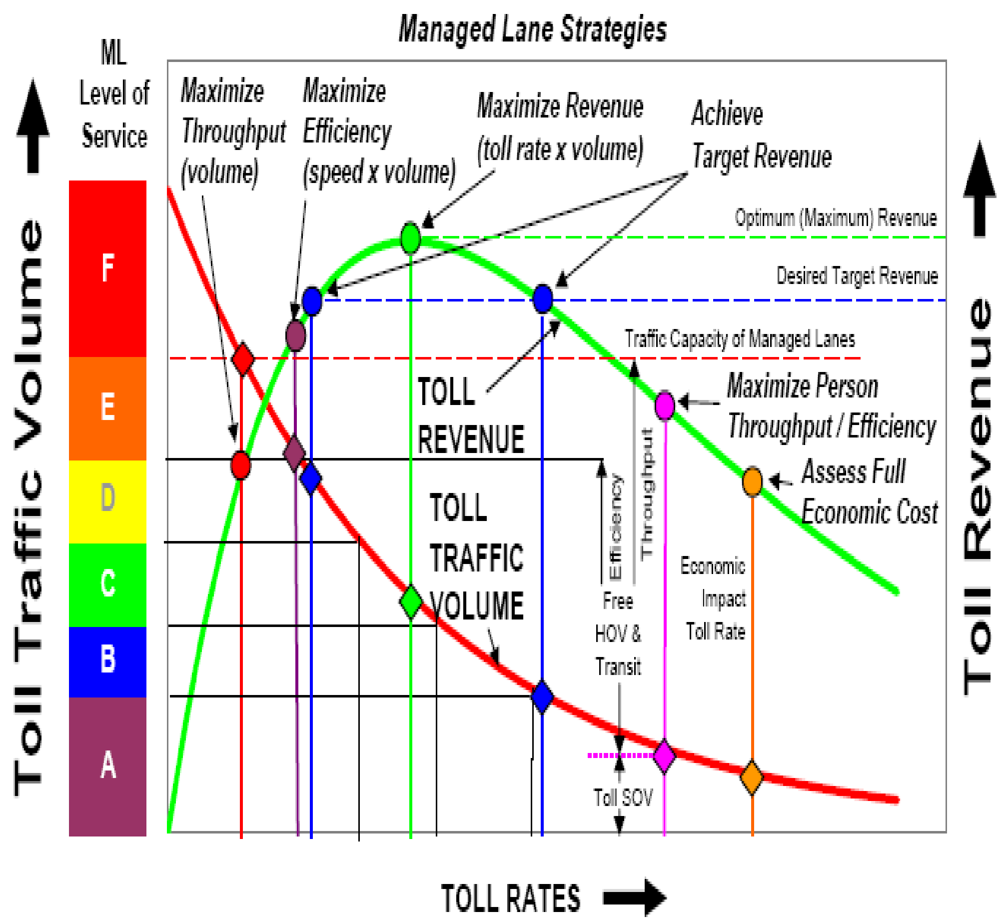
Figure 35: Toll Traffic, Revenue, and Facility Operating Speeds versus Toll Rate



The complexity with which pricing strategies interact with managed lane operational and revenue objectives is further illustrated in Figure 36.

- The red curve illustrates the *tolled traffic* (portion of potential traffic that uses the managed lane) as a function of increasing toll rate. This managed lane traffic volume decreases from the maximum potential level at the zero toll rate levels, to a minimum volume at high toll rate levels. The green curve illustrates the *total revenue* as a function of toll rate level and traffic demand. As the toll rate increases, less traffic uses the facility, and the level at which this reduction occurs is dependent on the income distribution of travelers in the corridor and their willingness-to-pay characteristics.
- The colored pairs of diamond-shaped and circular points indicate hypothetical traffic and revenue levels under specific management objectives.

Figure 36: Managed Lane Operating Strategies versus Objectives



Impact on Transportation Objectives

ML Congestion (Speed)	Poor	Fair	Good	Best	Best	Best
ML Throughput (Volume)	Good	Best	Good	Fair	Fair	Poor
ML Efficiency (Speed x Volume)	Fair	Good	Best	Good	Fair	Poor
ML Reliability / Safety	Poor	Poor	Fair	Good	Good	Best

Impact of Managed Lane Strategies: ◆ Tolled Traffic ● Toll Revenues

- Each managed lane facility will have a maximum revenue generation point as depicted by the horizontal green dashed line and is referred to as the *revenue optimum/maximization* toll rate. This is the level of traffic volume and toll rate that meets the *maximum revenue* objective (green points in Figure 34). Increasing the toll rate beyond this level yields lower toll traffic and less total revenue potential.
- The vertical axes show color bands indicating the traffic operations *level of service* (LOS) under the different toll rate level conditions. Note the horizontal hypothetical red dashed line depicting the *traffic capacity* of the managed lane. If tolled traffic exceeds this capacity, the managed lane becomes congested (LOS F). This level of traffic defines the *maximum throughput* threshold beyond which the managed lane could not physically carry any additional vehicular traffic (red points). As shown for this illustration, the *maximum revenue* toll rate yields a LOS C traffic flow scenario (green points).
- *Maximum efficiency* of the managed lane is achieved when throughput is fairly high – less than maximum capacity – with a good level of service that yields reliable speeds (violet points). This point can be defined as the boundary between LOS D and E.
- The blue dashed horizontal line shows an example of a *target revenue* objective (blue points). It is worth noting that the target revenue can be achieved at two different toll rates. At the lower toll rate level, the managed lane traffic levels result in LOS D operations (near the maximum efficiency toll rate), while the higher toll rate levels results in LOS A operations (empty lane syndrome). A toll rate level selected between the two extremes would satisfy the revenue target objective and achieve a varied level of service criteria (throughput efficiency).
- Toll traffic and revenue conditions for a hypothetical *maximum person throughput* or *maximum person efficiency* are also depicted simultaneously (pink points). If a sizeable portion of managed lane capacity is allocated to eligible non-tolled users (carpools or transit), the toll rates may need to be set high enough to force the buy-in non-eligible demand down to match the limited reserve capacity of the lane. This type of operation can once again achieve two objectives. If objectives include a *target revenue*, and either *maximum person efficiency* or *throughput*, application of the higher *target revenue* toll rate (rightmost blue points) could reduce tolled demand levels low enough to accommodate carpools and transit without tolls, thus achieving both objectives.

- If the *full economic cost* levels reflect the need for high toll rate levels, then the managed lanes may be underutilized (empty lane syndrome) with a LOS A traffic flow pattern on the facility (orange points).
- A series of transportation objectives and associated ratings can be developed as shown by the color-coded matrix below the graph. Note that the ratings for each scenario will vary by level of service in such a way that no level of traffic (or level of service) will necessarily produce conditions that are optimum for all four objectives. As such, trade-offs must be made to prioritize the various objectives.

The structure and effects of Figure 34 are highly dependent on the characteristics of the managed lane corridor and will vary for different times of the day, travel markets, and regional locations – sometimes within the same corridor. During the extreme case, the managed lane demand may be too high thus requiring very high tolls to maintain reliable speeds and prevent congestion. At the other extreme, low toll rates may be required to improve lane utilization. Facility design can also influence strategy effects. For example, a barrier separated facility may provide more reliability and safety compared to a buffer separated facility.

ALTERNATIVE MANAGED LANES TOLLING CONCEPTS

Managed lane pricing can be implemented in several ways. The most common approach used in existing managed lane facilities is a zone-based tolling scheme, with motorists being charged a single flat toll rate for traveling through a zone, independent of the actual distance traveled in the zone. This approach tends to increase the share of long distance trips, due to a relatively higher price for trips using only a short portion of a tolling zone. Zone-based pricing is illustrated in Figure 37.

An alternative managed lane tolling scheme is distance-based pricing, where motorists are charged toll rates based on the actual distance traveled in the managed lane. This tolling scheme is more equitable, although it could result in less than optimal managed lane operation due to higher usage for short distance trips than the zone-based tolling scheme. Distance-based pricing is illustrated in Figure 38.

Figure 37: Zone-Based Tolling Concept

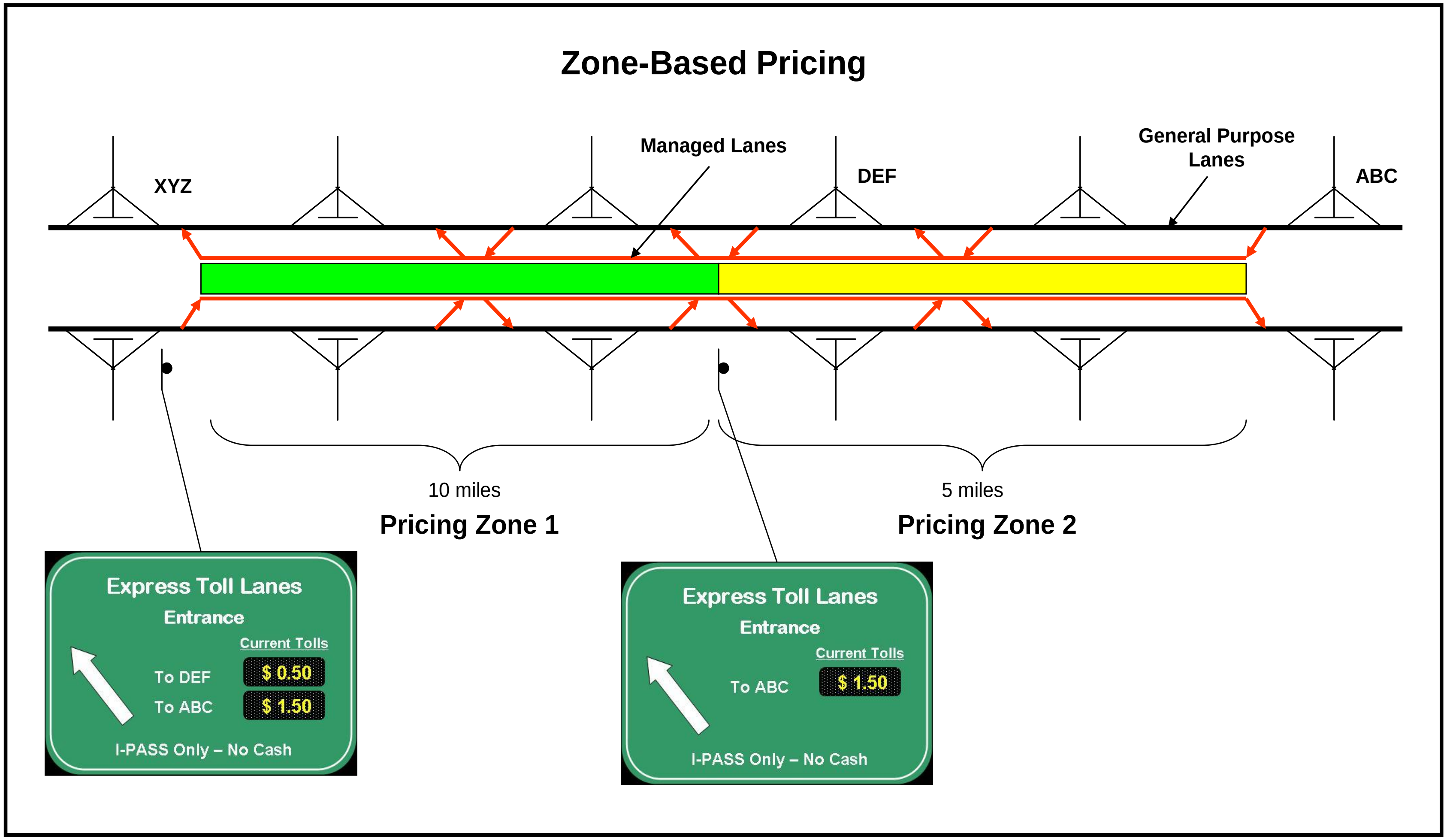
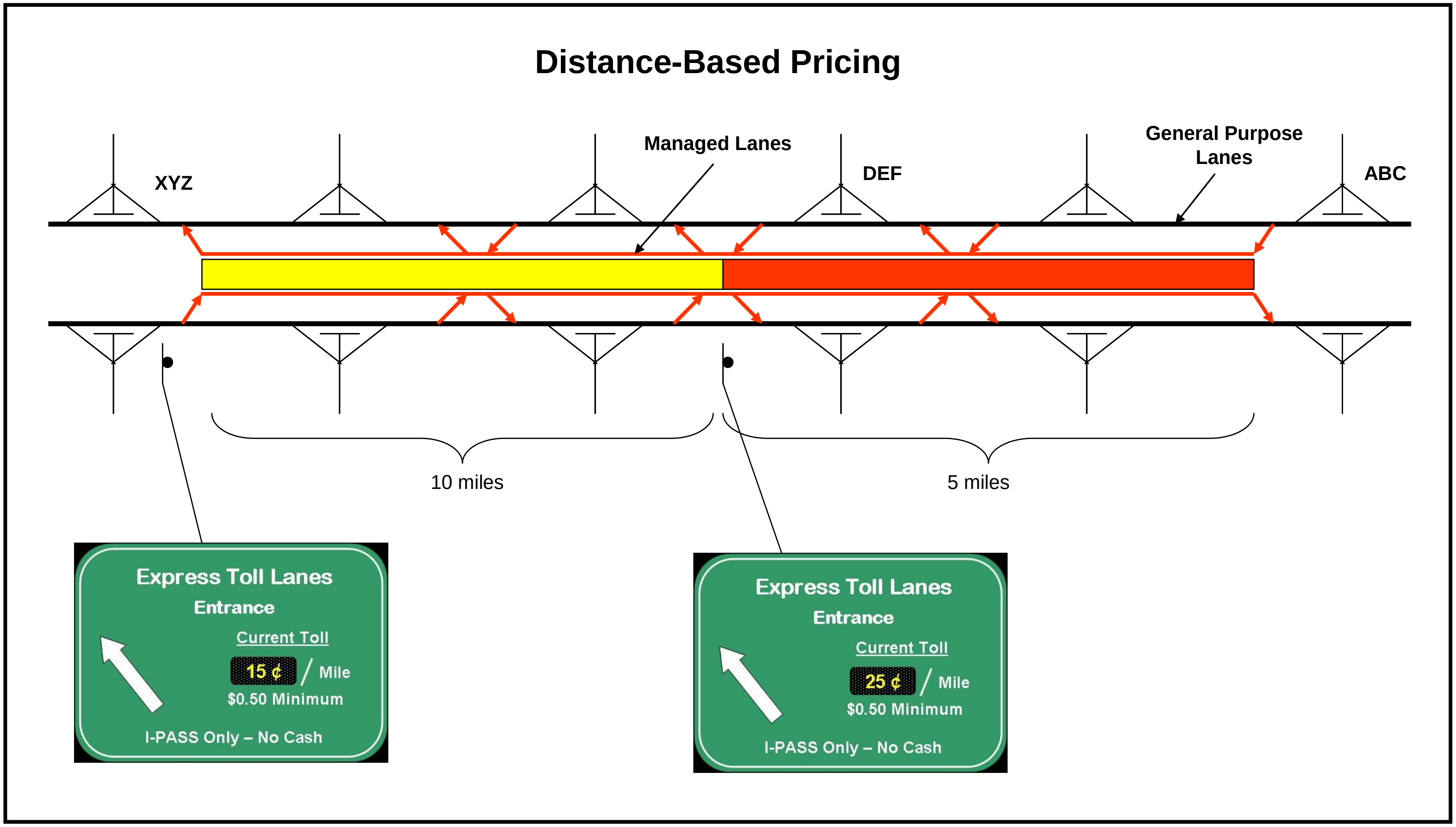


Figure 38: Distance-Based Tolling Concept



CHAPTER 8

MODELING APPROACH

Traffic and revenue modeling conducted for this study utilized the Chicago Metropolitan Agency for Planning's (CMAP) 2030 regional travel demand model. Wilbur Smith Associates (WSA) obtained the roadway networks and trip tables from CMAP in 2007. Adjustments were made to the CMAP base model for the Illinois Tollway system as part of WSA's planning assistance to the Illinois Tollway. These adjustments typically consisted of refinements to the Illinois Tollway network, and adjustment of speed parameters to calibrate the model against actual toll transaction counts at Illinois Tollway toll plazas. WSA's proprietary toll algorithm was applied in conducting traffic assignments using the refined model.

ASSUMED CONGESTION PRICING STRATEGY

TYPE OF CONGESTION PRICING

Based on the input received in the stakeholder workshops, managed lanes were selected as the pricing strategy for evaluation on each of the fourteen candidate corridors and subsequent detailed analysis of selected corridors.

ROADWAYS TO BE EVALUATED FOR CONGESTION PRICING

All fourteen candidate corridors were included for preliminary evaluation. The three highest ranked corridors resulting from the screening analysis would be considered for detailed evaluation.

FIXED VERSUS DYNAMIC PRICING

Congestion pricing using a fixed toll schedule that assessed different toll rates by time period was the preferred pricing method.

Selection of Priced Lanes

Two priced lane options: (1) one or more existing lanes; and, (2) one or more new lanes; were preferred for managed lane implementation.

Tolling Regime

The preferred tolling regime included higher peak-period toll rates, with prices during the most congested hour of the peak being priced even higher. Off-peak discounts were also preferred.

Goal of Congestion Pricing

The stakeholders overwhelmingly chose reduction in traffic congestion as the primary goal for congestion pricing in the region. Therefore, the selection of toll rates was based on maximizing utilization of the managed lanes, rather than maximizing toll revenues. Higher utilization of the managed lanes would result in lower traffic in the general purpose lanes, and subsequently minimize traffic diversions to local streets.

ASSUMED MANAGED LANE OPERATING PARAMETERS

Orientation of the Managed Lanes

Managed lanes were assumed to be implemented either by converting one or more existing left-hand lanes on the corridors, or by adding a managed lane to the left of existing lanes.

Vehicle Eligibility

Only passenger vehicles were assumed to be eligible to use the managed lanes. It was assumed that all vehicles using the managed lanes would pay – no discount or toll free passage is assumed for high-occupancy, low emission or alternative-fueled vehicles.

Managed Lane Access Restrictions & Spacing

Access to and from the managed lane was permitted at locations spaced about five miles apart while still ensuring access to and from major interchanges. This was applied as a general rule of thumb, to ensure the efficient operation of the managed lane and minimize friction due to entering or exiting traffic. It was assumed that each access location would provide both ingress to and egress from the managed lane.

SEPARATION OF MANAGED AND GENERAL PURPOSE LANES

Two approaches are typically used in delineating managed lanes - either a physical barrier (such as a concrete barrier), or a painted buffer-zone is provided between the managed and adjacent general purpose lane. Current managed lane design guidelines call for a minimum desirable painted buffer zone width of 4 feet, with an absolute minimum buffer width of 2 feet. The selection of the type of delineation will depend on a number of factors, including available right-of-way, cost, design standards and safety considerations. The majority of HOV to HOT lane conversions implemented in the U.S. have used a painted buffer-zone. However, newly constructed managed or Express Toll Lanes are increasingly being implemented as barrier-separated lanes. The type of separation has a significant impact on managed lane operation – with painted buffer-zones, drivers in the managed lanes are often wary of general purpose lane vehicles unexpectedly crossing the buffer zone to enter the managed lane. This concern becomes more significant when large speed differentials exist between adjacent managed and general purpose lanes. Subsequently, managed lane users reduce their speeds to allow more time to respond to an entering vehicle from the general purpose lane, effectively reducing the capacity of the managed lane. With barrier-separation, managed lanes are less impacted by general purpose lane traffic, and drivers feel more comfortable traveling at higher speeds even if the general purpose lanes are highly congested.

In this study, most scenarios assumed a single managed lane per direction, separated by a painted buffer-zone, with an assumed capacity of 1,600 passenger cars/hour/lane. However, since the Kennedy Expressway provides two barrier-separated reversible lanes, both of which were assumed to be converted to managed lanes, a higher capacity of 1,800 passenger cars/hour/lane was assumed for the reversible lanes.

MANAGED LANE SPEED

The managed lanes are anticipated to operate better than adjacent general purpose lanes due to the limited access locations, separation of the lanes, and management of traffic demand through pricing. Consequently, the volume-delay function for the managed lane was adjusted to reflect these anticipated operational advantages. The adjusted volume-delay function results in managed lane speeds approximately 5 miles per hour higher than adjacent general purpose lanes assuming the same per lane travel demand.

MANAGED LANE CAPACITY

In order to keep the managed lanes operating at free-flow conditions, the traffic demand using the facility has to be limited by charging appropriate toll rates. The capacity assumptions used to determine the necessary toll charges, are dependent on the number and configuration of the managed lanes. When determining the toll charges, the available room for toll-free and tolled traffic is determined by the number of toll lanes and the corresponding capacity threshold (1,600 vehicles per lane per hour on single lane, buffer-separated sections and 1,800 vehicles per lane per hour on two-lane, barrier-separated sections).

DURATION OF MANAGED LANE TOLLING

A review of the operating profiles of the candidate corridors indicated that the duration of traffic congestion varies significantly in the region. It was determined that weekday traffic volumes typically begin to rise sharply at 5:00 a.m. and generally dissipate after 8:00 p.m. Therefore, it was assumed that managed lanes would be tolled between 5:00 a.m. and 8:00 p.m. each weekday. No tolls on managed lanes were assumed to occur on weekends and overnight on weekdays for the purpose of this study.

ASSUMED TOLLING CONCEPT

The tolling concept for this study assumes that a vehicle using the managed lane is charged a toll rate based on the actual distance traveled in the lane. This tolling concept was adopted to easily assess the toll revenue potential of each corridor, since the access locations were chosen using general rules of thumb, rather than an optimized access scheme.

ASSUMED VALUES OF TRAVEL TIME SAVED

A key assumption of the traffic and revenue analysis is the value of travel time saved, generally referred to as the Value of Time (VOT). The VOT varies by income, location, trip purpose and type of travel. Two options were available to the study team in determining appropriate assumptions for VOTs:

- Using VOT’s developed based on the SP survey conducted in the study; and,
- Using VOT’s based on accepted standards of practice.

VOT's were developed in the SP survey for passenger vehicle drivers for four trip purposes: $18.84 for work trips (commute and business-related); $17.98 for shopping, school and social/recreational trips; $15.47 for airport-related trips; and, $14.38 for vacation trips, per hour of travel time saved. The SP survey focused primarily on passenger vehicle drivers.

The U.S. Department of Transportation (U.S. DOT) recommends developing VOT's based on Decennial Census data, using the median annual household income and the hours worked per year. Initially, an hourly wage rate is calculated by dividing median annual income by the number of hours worked (assumed as 2,000 hours per year). Next, VOT is estimated by assuming a proportion of the hourly wage rate, depending on the type of travel. For example, for passenger vehicle drivers the U.S. DOT recommends using VOT estimates based on 50 percent of the wage rate for all local personal travel regardless of the mode of travel, 70 percent of the wage rate for all intercity personal travel, and 100 percent of the wage (plus fringe benefits) for all local and intercity business travel, including travel by truck drivers. [4]

Applying the U.S. DOT's approach, WSA developed VOT estimates for passenger vehicles and commercial trucks for the Chicago region, to be used in travel demand modeling. WSA used census-tract level data from the 2000 U.S. Census for the Chicago metropolitan region (that provided travel data for 1999) to develop VOT estimates for passenger vehicle travel. Census-tract level data was aggregated to a traffic analysis zone (TAZ) level. VOTs were developed for four time periods – AM peak, Midday, PM peak and Daily. Weights were applied for specific trip purposes to develop VOTs for each time period. Subsequently, the Consumer Price Index for Urban consumers (CPI-U) for the Chicago-Gary-Kenosha region was used to convert the VOT estimates to year 2007 dollar estimates. For commercial trucks, WSA reviewed a number of studies to develop VOT estimates for three categories – small, medium and large trucks. The commercial truck VOT estimates were also converted to 2007 dollars using historical CPI-U data for the Chicago region. Table 7 summarizes the resulting average VOT estimates in 2007 dollars.

[4] Departmental Guidance (dated April 9, 1997) and Revised Departmental Guidance (dated February 11, 2003) for the Valuation of Travel Time in Economic Analysis, U.S. Department of Transportation.

Table 7: VOT Estimates for Chicago Region Using 2000 Census Data

Vehicle Category	Average Values of Time: $ per Hour (2007 Dollars)			
	Time Period			
	AM Peak	Midday	PM Peak	Daily
Passenger Vehicle	$14.40	$12.60	$14.40	$14.40
Small Commercial Trucks	$40.80	$40.80	$40.80	$40.80
Medium Commercial Trucks	$48.00	$48.00	$48.00	$48.00
Large Commercial Trucks	$55.80	$55.80	$55.80	$55.80

Since the traffic and revenue analysis required VOT estimates for both passenger and commercial vehicles, WSA elected to use the VOTs presented in Table 7 for travel demand modeling purposes. The 2007 VOTs were not inflated to 2010 levels due to the current economic recession, which has likely depressed incomes nationally and regionally. While the SP survey was conducted in 2008, it only provided VOTs for passenger vehicles. Furthermore, the average peak period passenger vehicle VOT in Table 7 of $14.40 is lower than those obtained from the SP survey. Using lower VOTs would result in conservative estimates of traffic and revenue.

The traffic and revenue analysis used the VOTs in Table 7 for modeling all analysis years. Traffic and revenue estimates were produced in 2010 dollars. The estimates for year 2020 were then converted to current (2020) dollars using an average annual inflation rate of 2.5 percent.

LEVELS OF ANALYSIS

Traffic and revenue modeling was required for two phases of the technical evaluation – a screening analysis of multiple corridors, and detailed analysis of three selected corridors. The level of detail used in modeling each phase is described below.

CORRIDOR SCREENING ANALYSIS

Traffic assignments for a base (no-build) and the managed lane scenarios assuming per mile toll rates of $0.02, $0.05, $0.10, $0.15, $0.20, $0.25, $0.30, and $0.40 were modeled for each corridor. For Illinois Tollway routes, these managed lane toll rates were assessed in addition to any existing tolls.

Traffic assignments were performed for two scenarios: (a) the conversion of one or more existing lanes to managed lanes; and, (b) the addition of a managed lane for roadway sections that currently (as of 2010) provide fewer than four mainline lanes per direction. Additional alternatives were also considered: (i) for the section of the Kennedy Expressway between the Edens Expressway and Ohio Street, both reversible lanes were assumed to be converted to managed lanes; and, (ii) on the Dan Ryan Expressway conversion of one and two left lanes out of the four express lanes were modeled as managed lanes. All traffic assignments were performed for the 2010 model year.

Individual traffic assignments were conducted assuming each toll rate for two-hour morning and evening peak periods, as well as two four-hour midday periods. The same toll rate was assumed for each peak and off-peak period for each candidate corridor section.

Subsequently, weekday toll revenue estimates (for each assumed toll rate) were developed for the corridors using existing traffic profiles. For example, if the morning peak period on a candidate corridor section extended for 4 hours, the toll revenue estimated based on a two-hour peak was expanded to cover the entire peak period. The midday off-peak period toll revenue was then adjusted to account for a shortened off-peak period. The resulting peak and off-peak toll revenue estimates were summed up to produce a weekday toll revenue estimate. No adjustments were made for the shoulder hours of the peak periods in the Corridor Screening Analysis.

Traffic impacts were assessed by comparing the base (no-build) and managed lane scenarios, for each toll rate modeled. The traffic diversion for each managed lane toll rate scenario was estimated by subtracting the total vehicle miles of travel (VMT), across all general purpose and managed lanes on the expressway/Tollway route, from the VMT on the expressway/Tollway route under the no-build base case.

In addition, the managed lane utilization rate, defined as the managed lane VMT share of the total VMT on the expressway (across all managed and general purpose lanes), was computed. The traffic diversion and managed lane utilization rates provided easily comparable measures to assess both the negative and positive impacts of the managed lane. If the implementation of a managed lane results in low traffic diversions and high managed lane utilization, the managed lane would be considered to be contributing positively in managing traffic demand and minimizing negative traffic impacts.

Detailed Evaluation of Selected Corridors

The three highest ranked corridors resulting from the screening analysis were considered for detailed evaluation. For these selected corridors, no-build and managed lane per mile toll rates of $0.05, $0.10, $0.15, $0.20, $0.25, and $0.30 were modeled for each scenario and roadway section. In this round of analysis, the roadway network was refined and traffic assignments were performed for two model years – 2010 and 2020. These two analysis years were selected to represent short and medium term scenarios of managed lane implementation. For Illinois Tollway routes, these managed lane toll rates were assessed in addition to any existing tolls.

Traffic demand patterns were examined in detail to determine the critical roadway sections that would determine the toll rates that need to be assessed in order to maintain free-flowing traffic conditions in the managed lane. In contrast to the Corridor Screening Analysis, the traffic assignments for the selected corridors were used to develop a toll schedule that assessed higher toll rates during the peak periods and lower toll rates during the off-peak period. Toll rates were selected using toll sensitivity curves developed by modeling a range of rates for each peak and off-peak period.

Similar to the Corridor Screening Analysis, individual traffic assignments were conducted assuming each toll rate for two-hour morning and evening peak periods, as well as two four-hour midday periods. The peak periods were subsequently expanded using existing traffic profiles to generate peak-period traffic and revenue estimates representative of current operating conditions on the corridors, and off-peak periods were correspondingly shortened.

A further enhancement was the estimation of the traffic and revenue during the shoulder hours of the peak period. It was assumed that each peak period was bracketed by a shoulder period of one hour that occurred both before and after the peak period. Since traffic assignments were conducted only for peak and off-peak periods, it was assumed that traffic demand during the shoulder hours was approximately three-quarters of peak hour demand. This assumption was based on a review of existing hourly traffic profiles. The midday off-peak period was further shortened to account for the peak-shoulder hours.

It was assumed that peak-spreading would occur by the year 2020, with each peak period extending for one hour longer than currently exists. This was accounted for in developing traffic and revenue estimates for this model year.

The estimated toll revenues were further adjusted based on the assumption that a proportion of the estimated managed lane traffic would choose to shift to a shoulder hour to avail themselves of lower toll rates. A general assumption was made that 5 percent of the estimated managed lane traffic would shift from the peak period to the shoulder hours.

Traffic impacts were assessed by comparing the base (no-build) and managed lane scenarios, for the hourly toll rate schedule developed in this task. The utilization of the managed lane, the share of total expressway/Tollway traffic utilizing the managed lane and traffic diversions were estimated for each corridor section. In addition, the estimated travel time savings provided by the managed lane were computed for each corridor based on the traffic assignments.

The estimated mode shift, from driving to a transit alternative along the corridor, was assessed with the assistance of CMAP staff. WSA provided the peak and off-peak year 2010 roadway networks, trip tables and impedance (toll costs and travel times) matrices for two modeled toll rate scenarios ($0.05 and $0.15 per mile) to CMAP. Based on the data provided, CMAP conducted a mode share analysis using the mode split component of the regional travel demand model. The resulting changes in the auto mode share were assumed to represent the estimated shift to transit alternatives in each corridor.

OVERALL MODELING APPROACH

The overall modeling process was designed to answer a series of questions:

- How much demand exists in the corridor?
- How will demand grow?
- How much are motorists willing to pay to use the managed lanes?
- What share of traffic can be expected to use the managed lanes?
- What toll levels are needed to manage demand and maintain reliable travel times in the managed lanes?

The modeling approach used in the study is outlined below:

- Estimating global traffic demand – The global demand is an estimate of the total amount of traffic that would be expected to be using the project corridor under the improved conditions.
- Estimating the managed lane market share – This is the estimated share of total traffic in each corridor that would choose the managed lanes, versus the general purpose lanes, under varying operating conditions and toll rates. The share of corridor traffic in the managed lanes is based on several factors, including location of access points, differences in configurations, time savings offered by the managed lanes, and the toll rates being charged.
- During the traffic assignment process, travel time between a path using the tolled managed lanes was compared to travel time on a path using the next best free routes (most likely the general purpose lanes). For each travel movement, the proportion of motorists expected to use the managed lanes is a function of the computed time savings and the cost to use the lanes vs. the value placed on time savings by the motorist value of time (VOT).
- In modeling managed lanes on toll-free expressways, the prior steps are performed in a single operation. However, in modeling managed lanes on tolled facilities, these steps have to be performed separately, since the traffic assignment process for managed lane requires a choice between tolled managed lanes and free routes. In the first step, the global traffic demand was estimated assuming the total number of resulting lanes operating as general purpose lanes – in the case of a managed lane added to each direction of a six-lane tolled route (three existing lanes per direction), the demand is estimated based on an eight-general purpose lane facility. Next, a sub-area model is extracted that only includes the toll facility. Origin-destination patterns are also extracted that aggregate trips relevant to the sub-area model. Subsequently, traffic assignments are conducted using the sub-area model and aggregated trip tables, treating the general purpose lanes as toll free and the managed lane as the tolled route.
- The traffic and revenue analysis attempts to estimate the amount of traffic willing to pay a toll of $X to save Y minutes. Within the model, for each origin-destination pair, the model identifies the travel movements that are eligible to use the managed lane based on available access points. These movements are considered to be the travel market for the project. The model then estimates the

travel time differential between the managed and general purpose lanes. The toll charged for each movement is compared to its time savings to estimate a ratio of "cost-per-minute saved." This cost-per-minute saved is compared to the value-of-time for travelers. Those travelers with values-of-time higher than the cost-per-minute-saved would tend to choose the tolled lanes, while those with lower values of time would tend to choose the free alternative. Drivers' values-of-time are not uniform, so for any given toll rate/time savings combination, only a portion of those eligible to use the managed lanes would actually choose to use them. As traffic moves from the general purpose to the managed lanes, the time savings advantage offered by the managed lanes is altered. For each toll rate level, the market share corridor model finds the equilibrium point between changes in travel time due to traffic shifting and the willingness-to-pay.

- A range of toll rates were tested, from $0.02 to $0.40 per mile for the Corridor Screening Analysis, and from $0.05 per mile to $0.30 per mile for the detailed evaluation of selected corridors, for each time period and travel direction. This per mile rate was translated into toll charges at each tolling zone by direction.

TRAFFIC OPTIMAL VERSUS REVENUE MAXIMIZING TOLL RATES

The determination of optimum toll rates of a managed lanes facility is considerably different than that of a typical toll facility. Optimum rates for managed lanes can be dictated by three, sometimes conflicting criteria:

- Maximizing toll revenue potential;
- Maximizing demand in the managed lanes yet assuring a congestion free ride; and,
- Optimizing the distribution of traffic between the toll-free general purpose lanes and the tolled, managed lanes.

Usually, the objectives of revenue maximization and demand management generally function in concert, although the demand management objective usually controls in the event of a conflict. That is, in some cases it may be necessary to use rates beyond the revenue maximizing point to effectively manage demand in the managed lanes. This is more likely to occur under highly congested conditions.

However, the objectives of revenue maximization and optimization of demand between free and tolled lanes may well be in conflict. Revenue maximization may occur at one toll rate, but may result in traffic on the tolled managed lanes that is well below the capacity of those lanes. It may be an objective to increase the amount of traffic served by the managed lanes, thereby reducing demand and congestion in the general purpose lanes. This optimum distribution is often attained at toll rates below those which would produce maximum revenue.

Based on the consensus view of the stakeholders, traffic and revenue estimates developed in the study are based on toll rates which reflect a tolling policy to primarily optimize the utilization of the managed lanes. Revenue was not the primary goal when setting toll rates. The traffic and revenue results, shown later in this report, reflect this policy decision.

CHAPTER 9

CORRIDOR SCREENING ANALYSIS

OVERVIEW

This chapter presents the results of a Corridor Screening Analysis for the Chicago Regional Congestion Pricing Study. Based on the outcome of the market research, community outreach and stakeholder workshops, two primary scenarios were defined: (a) Scenario 1, converting one or more existing lanes per direction to managed lanes on all the candidate corridors; and, (b) Scenario 2, adding one managed lane per direction in sections with less than four lanes per direction. Three corridors in Scenario 2 currently provide a combination of three and four-lanes per direction. These corridors were analyzed with an added managed lane in the three-lane (per direction) sections, and a converted lane in the four-lane (per direction) sections.

The Corridor Screening Analysis considers the impacts of pricing lanes on different highway sections in order to identify corridors that are most feasible for congestion pricing. Both Illinois Tollway and IDOT expressway routes were considered in this analysis. The analysis was bounded by Illinois State Route 176 to the north, Interstate 80 to the south, the Fox River to the west, and Interstate 94 to the east. The analysis was conducted for the 2010 base year.

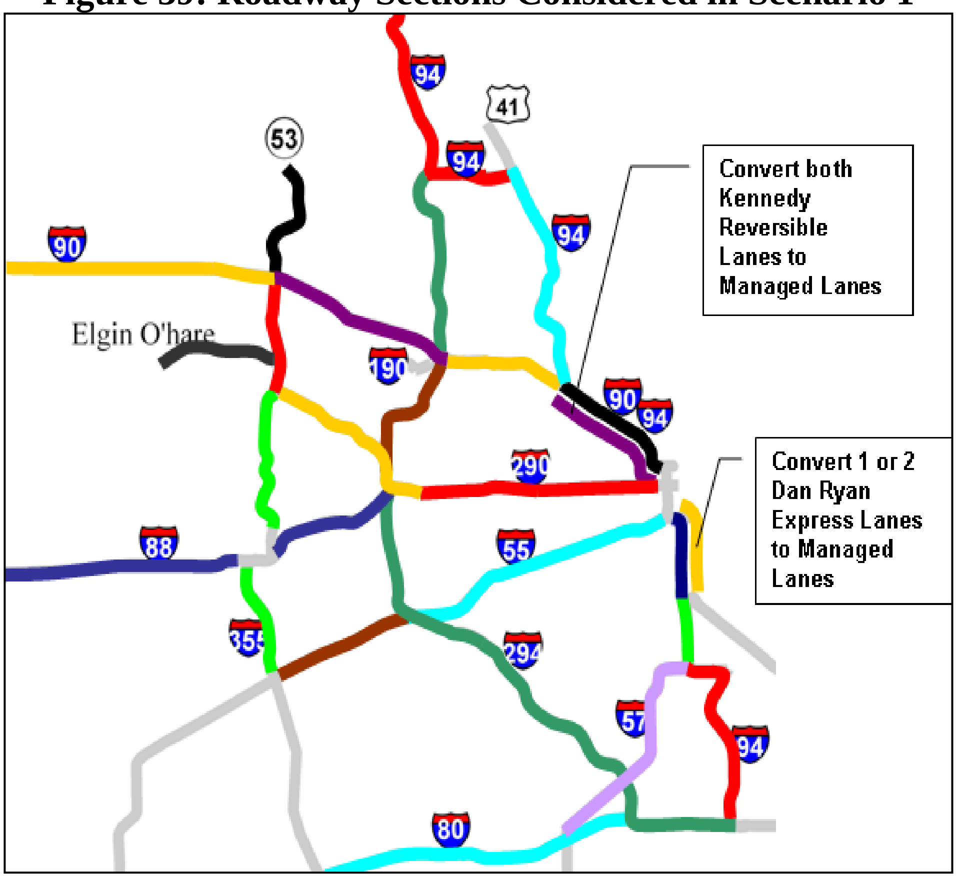
In Scenario 1, two special cases exist: the Dan Ryan and Kennedy Expressways, which are both currently toll-free. The Dan Ryan Expressway is designated Interstate 94 and Interstate 90/94 and runs north and south from Interstate 57 to Interstate 290 west of downtown Chicago. From the Chicago Skyway to Interstate 55 it is made up of either three or five local lanes in addition to either three or four express lanes in both directions. Because of the unique characteristics of this Expressway, both converting one and two express lanes to managed lanes was considered in Scenario 1. The local lanes always remained toll-free in this scenario. The Kennedy Expressway is also designated as both Interstate 90/94 and

Interstate 94. It runs northwest and southeast from Interstate 290 to Interstate 190. From the interchange with the Edens Expressway to Ohio Street the Kennedy Expressway is made up of four local lanes in both directions and two reversible lanes. The reversible lanes run inbound to the City of Chicago in the morning and outbound in the afternoon. In Scenario 1, both the reversible lanes were considered for tolling, with the local lanes remaining toll-free.

ROADWAY SECTIONS ANALYZED

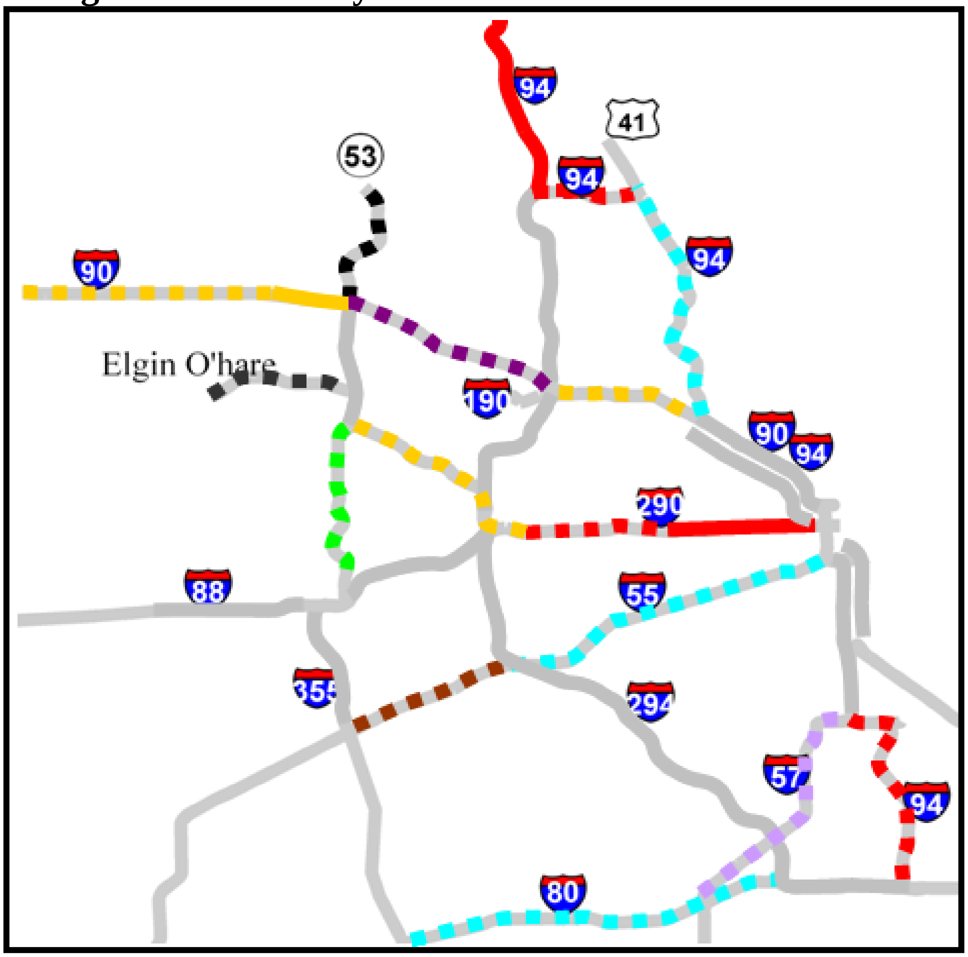
For Scenario 1 the 14 corridors within the analysis limits were divided into a total of 27 roadway sections for analysis. Generally, the divisions were at major system interchanges with other highways. It should be noted that Interstate 190 was not included in the analysis because it was considered to be too short to be feasible for a managed lane. Figure 39 below shows the analysis sections. Color coding is used to illustrate the extents of the roadway sections. Grey sections were not included in the study.

Figure 39: Roadway Sections Considered in Scenario 1



For Scenario 2, corridors with three or fewer lanes per direction were considered for an added managed lane. Figure 40 illustrates the 15 roadway sections analyzed in Scenario 2. All 15 segments have at least a portion of the corridor providing three or fewer lanes per direction (denoted with dashed lines). Three corridors have both three or fewer lanes and four or more lanes per direction.

Figure 40: Roadway Sections Considered in Scenario 2



Tables 8 and 9 summarize the limits, length, number of lanes, and directions of each roadway section. It should be noted that the number of lanes is listed as of 2007 and several of the Illinois Tollway segments have been widened. For analysis purposes, the number of lanes expected to be open as of the end of 2010 was used in modeling these sections.

Table 8: Illinois Tollway Sections Evaluated

Route	Name	ID	From/To	To/From	Miles	# Lanes (2007)	Direction
Illinois Tollway							
I-355	Veterans Memorial	1	I-55	Ogden Ave.	7.22	3	NB SB
		2	Butterfield Ave.	I-290	9.10	3	NB SB
I-294/I-94	Tri-State / Edens Sur	3	US-41 (Edens Spur)	IL-176	14.13	2,3,4	EB/SB WB/NB
		4	I-90	Lake Cook Rd.	11.96	3	EB/SB WB/NB
		5	I-88 North Interchange	I-90	9.73	4,5	EB/SB WB/NB
		6	I-94	I-88 South Interchange	29.02	3,4	EB/SB WB/NB
I-90	Jane Addams	7	IL-31	I-290	13.47	3,4	EB WB
		8	I-290	I-294	10.69	3	EB WB
I-88	Reagan Memorial	9	IL-31	I-355 West Interchange	14.25	3 3,4	EB WB
		10	I-355 East Interchange	I-290	7.42	3	EB WB

Table 9: IDOT Sections Evaluated

Route	Name	ID	From/To	To/From	Miles	# Lanes (2007)	Direction
Illinois DOT							
I-80		11	I-355	I-294	15.41	2,3	EB WB
I-290	Eisenhower	12	I-90	I-355	6.97	4	EB WB
		13	I-355	US 12/20	10.11	3	EB WB
		14	US 12/20	Dan Ryan	12.33	3,4	EB WB
I-90	Kennedy Local	15	I-190	I-94 Edens	5.80	3	EB WB
		16	I-94 Edens	Ohio St.	7.00	4	EB WB
I-90	Kennedy Reversible	17	I-94 Edens	Ohio St.	7.00	2	EB WB
I-90/94	Dan Ryan Local	18	I-57	Chicago Skyway	4.00	5	EB WB
		19	Chicago Skyway	I-55	4.80	3	EB WB
I-90/94	Dan Ryan Express	20	Chicago Skyway	I-55	4.80	4 3,4	EB WB
I-57		21	I-80	I-94	13.28	3	NB SB
I-94	Bishop Ford	22	I-80	Dan Ryan	11.16	3,2	EB WB
I-55	Stevenson	23	I-355	I-294	8.25	3	NB SB
		24	I-294	Dan Ryan	14.80	3	NB SB
IL-53		25	I-90	Lake Cook Rd.	7.50	3	NB SB
Elgin O'Hare		26	US 20	I-290	6.50	2	EB WB
I-94	Edens	27	I-90	US-41 (Edens Spur)	13.54	3	EB WB

DEFINING THE SCREENING PROCESS

The Corridor Screening Analysis began by: (a) defining a process for evaluating the candidate corridors; (b) establishing criteria for evaluation; (c) rating each corridor on each criterion; and, (d) developing a composite rating for each candidate route.

A rational approach was required to compare the various corridors. This required devising a system that combined qualitative and quantitative criteria.

All roadway sections were ranked on a five-tier scale of low, low/medium, medium, medium/high, or high for each of the screening criteria. The criteria ratings were then compiled into an overall rating for each segment, with higher ratings indicating that a managed lane would be more feasible in a particular section. The overall ratings were developed using a points system with low ratings receiving one point and increasing to high ratings receiving five points. Points for each criterion were added together for an overall score. The overall ratings where assigned to the overall point totals as shown in Table 10.

Table 10: Overall Ratings and Corresponding Point Totals

Points	Overall Rating
20	High
15 or 16	Medium/High
14	Medium
12 or 13	Low/Medium
8, 9, 10, or 11	Low

CORRIDOR SCREENING CRITERIA

The following criteria were selected for rating the candidate corridor sections:

- 2007 weekday congestion
- Constructability
- Revenue potential
- Peak period traffic management potential

CRITERIA #1 – 2007 WEEKDAY CONGESTION

Measures of 2007 congestion and reliability were developed for each segment. To develop these measures, data were obtained from loop detectors and RTMS sensors on Illinois Department of Transportation expressways and Illinois Tollway routes for the entire year of 2007. The raw volume and speed data were compiled in 15 minute increments for each hour and weekday. The loop detector and RTMS sensor data were aggregated into the 27 system sections. Table 11 illustrates the measures used for assessing traffic congestion and travel time reliability.

Table 11: Measures for Assessing Congestion and Reliability

Criteria	Units	Calculation
Severely Congested VMT	%	(VMT at speeds < 35mph)/(Total VMT)*100
Hours With Severe Congestion	daily	Sum of Periods(in 15mins) with Average Speed under 35mph
Av. Daily Delay/Mile	min/veh	(Actual Travel Time - Free Flow Travel Time)/(Segment Length * # Vehicles)
AM Peak Av. Speed	mph	Section Length/(Actual Travel Time 7am-9am)
AM Peak Planning Time Index	-	(95% Percentile Travel Time 7am-9am)/(Free Flow Travel Time 7am-9am)
PM Peak Av. Speed	mph	Section Length/(Actual Travel Time 4pm-6pm)
PM Peak Planning Time Index	-	(95% Percentile Travel Time 4pm-6pm)/(Free Flow Travel Time 4pm-6pm)

Table 12 presents the thresholds used for rating the measures listed in Table 11. Low/Med and Med/High were given to segments that had ratings for individual measures that were on the border or were evenly spread between two ratings. Note that average daily delay per mile was not used to rank congestion even though it was included in the measures for each candidate section.

Table 12: Thresholds for Rating 2007 Weekday Congestion

Criteria	Low	Med	High
Severely Congested VMT	<5%	5 -10%	>10%
Hours With Severe Congestion	<1	1 - 4	>4
Av. Speed (AM and PM peaks)	>50	40 - 50	<40
PTI (AM and PM peaks)	<1.2	1.2 - 1.8	>1.8

CRITERIA #2 – CONSTRUCTABILITY

Constructability was assessed based on evaluating aerial photographs and by using engineering judgment. For sections where a managed lane conversion was considered, a small amount of additional roadway space would be needed for a buffer zone between the managed lane and the general purpose lane. Also, adequate inside shoulders would also be required to serve as break down zones. The following factors were used for the lane conversion constructability evaluation:

- Inside shoulder width
- Outside shoulder width
- Number of overpasses
- Number of underpasses
- Left hand exit/entrance ramps

For adding a managed lane to existing two and three lane segments, the capacity necessary for the additional lane and buffer area could be taken from the existing median, by converting part of existing inside or outside shoulders, or by adding to the outside of existing lanes. Adding to the outside of the highway was less favorable than adding to the median or inside shoulder because of the exit and entrance ramp re-alignment that would be required. The following factors were used to evaluate constructability for sections where the addition of a managed lane was considered:

- Inside shoulder width
- Outside shoulder width
- Median type
- Median width
- Available right of way outside
- Number of entrance ramps
- Number of exit ramps
- Number of overpasses
- Number of underpasses
- Length of roadway on elevated bridges (not including normal overpasses)
- Length of roadway with retaining walls
- Left hand exit/entrance ramps

By necessity, constructability ratings were more subjective than ratings for traffic congestion. For a lane conversion, a high constructability rating had a wide inside shoulder (generally greater than 12 feet), and fewer interchanges. For a managed lane addition, a high rating had enough ROW to add a lane and fewer obstructions (such as overpasses, retaining walls, etc.) that would significantly increase the cost of adding a lane.

CRITERIA #3 – REVENUE POTENTIAL

Revenue potential was evaluated by calculating the total annual managed lane revenue per mile at the $0.15 per mile toll rate for each segment. Table 13 summarizes the rating rationale for each corresponding revenue group. As a basis for comparison, annual electronic toll collection maintenance and operation (M&O) costs are generally around $100,000 per mile. Therefore, a segment with a low/medium ranked revenue potential could be expected to cover O&M costs and a segment with a revenue potential of medium or higher could be expected to cover more than O&M costs. A review of other managed lane implementations found that they typically do not cover their capital costs.

Table 13: Rating Scheme for Revenue Potential

Annual Revenue per Mile at $0.15 per Mile Toll Rate (in thousands)	Rating
More than $1,000	High
$500 to $1,000	Medium/High
$150 to $500	Medium
$80 to $150	Low/Medium
Less than $80	Low

It should be noted that impacts on general purpose toll revenue on the Illinois Tollway routes was not included in the revenue potential in this screening level analysis. The revenue analyzed includes only the managed lane portion of the revenue. The inclusion of a managed lane on a Tollway route or an adjacent Illinois DOT expressway could impact the general purpose lane revenue on that Tollway route or on nearby Tollway routes.

CRITERIA #4 – PEAK PERIOD TRAFFIC MANAGEMENT POTENTIAL

The peak period traffic management potential was evaluated by reviewing the traffic diversion rate at the $0.15 per mile toll rate for the AM and PM peaks. Table 14 presents the ratings used for different levels of traffic diversion. Lower diversion rates (and corresponding high traffic management potential ratings) at similar levels of 2007 congestion generally indicate either more spare capacity existed on the roadway, or fewer arterial and local street alternatives to the candidate expressway route exist. Note that utilization rates were not used to rank peak period traffic management potential even though it was included in the Appendix sheets.

Table 14: Rating Scheme for Peak Period Traffic Management Potential

Diversion Rate at $0.15 per Mile Toll Rate (%)	Management Potential Rating
Less than 5	High
5 to 10	Medium/High
10 to 15	Medium
15 to 20	Low/Medium
More than 20	Low

OTHER CONSIDERATIONS

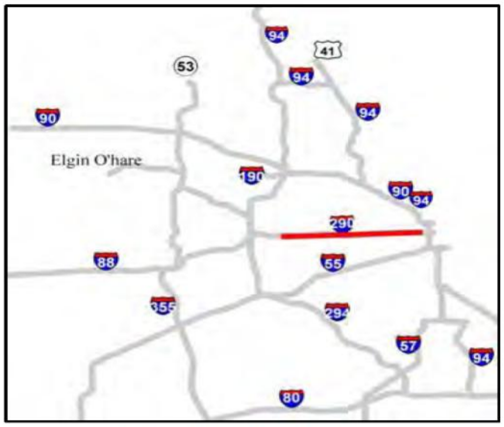
In addition to 2007 weekday congestion, constructability, and traffic and revenue impacts, existing transit service was also considered. Both bus service traveling on the given segment and train service traveling parallel to the given segment was identified. Bus service identified included PACE Suburban and Chicago Transportation Authority (CTA) buses. Train service identified included Metra Commuter and CTA trains running parallel within approximately three miles on either side of a given segment. Transit service was not assigned a rating and did not impact the overall rating, but will be important to consider in more detailed managed lane feasibility studies of individual segments.

Summaries were prepared for each candidate corridor section that included information on each of the rating criteria. A sample summary is presented in Figure 41.

Figure 41: Sample Criteria Rating Summary

Chicago Regional Congestion Pricing Study – Segment Analysis Results

Inside Lane Converted to Managed Lane



Segment 14 – I-290 Eisenhower
Between US 12/20 and I-90/94.

OVERALL RATING = Med

Segment length (mi): 12.33
Number of Lanes: 3 lanes both directions between US-12/20 and Austin, 4 lanes both directions between Austin and I-90/94

Overall Comments:

Criteria #1 – 2007 Weekday Congestion **Rating = High**

	% Severely Congested VMT	# Hours/Day With Severe Congestion	Av. Daily Delay/Mile (min/veh)	AM Peak		PM Peak	
				Av. Speed (mph)	PTI	Av. Speed (mph)	PTI
EB	25.09%	10	0.54	31.2	>3	40.3	>3
WB	18.43%	7	0.44	37.3	>3	30.0	>3

Comments:

Criteria #2 – Constructability **Rating = Low**

	Normal Shoulder Width (ft)		# Per Mile	
	Inside	Outside	Over-passes	Under-passes
EB	6-10	10	4.0	0.2
WB	6-10	10	4.0	0.2

Comments: Left hand entrance and exit ramps, no inside shoulder by cemetery, train tracks next to EB direction of roadway west of Austin, train tracks in median east of Austin, inside shoulder 3ft and outside shoulder 8ft under most bridges east of Austin

Criteria #3 –Revenue Potential **Rating = Med/High**

Toll ($/mile)	$0.02	$0.05	$0.10	$0.15	$0.20	$0.25	$0.30	$0.40
Annual Weekday Net Revenue (Thousands)	$2,512	$5,362	$8,443	$9,346	$8,775	$7,988	$6,402	$3,435

Comments: Rating based on revenue per mile at $0.15 toll rate

Criteria #4 –Peak Period Traffic Management Potential **Rating = Med/High**

Toll ($/mile)		$0.02	$0.05	$0.10	$0.15	$0.20	$0.25	$0.30	$0.40
Diversion Rate	AM	-0.7%	0.5%	2.3%	4.3%	7.6%	11.3%	15.3%	19.9%
	PM	-0.3%	1.0%	3.6%	7.7%	10.9%	12.3%	13.4%	15.3%
Utilization Rate	AM	26.2%	24.9%	23.3%	20.9%	17.7%	13.6%	9.0%	2.8%
	PM	23.7%	21.9%	18.2%	13.0%	8.7%	6.6%	5.5%	2.9%

Comments: Rating based on diversion rate at $0.15 toll rate

Other Considerations

Existing Transit Service: Pace buses 391, 747, 757, 767; Metra UP-W; CTA blue line, green line

CORRIDOR SCREENING RESULTS

The WSA Team presented the results of the Corridor Screening Analysis to the CMAP Transportation Committee on July 29, 2009 for discussion and comment.

Detailed results were presented for each candidate corridor section (similar to Figure 29), as well as summary rankings. The results were presented jointly by MPC, the Illinois Tollway and WSA for both the scenarios described previously.

Figure 42 and Table 15 summarize the rankings for Scenario 1, conversion of the inside lane(s) to managed lanes.

Figure 42: Summary Results for Scenario 1

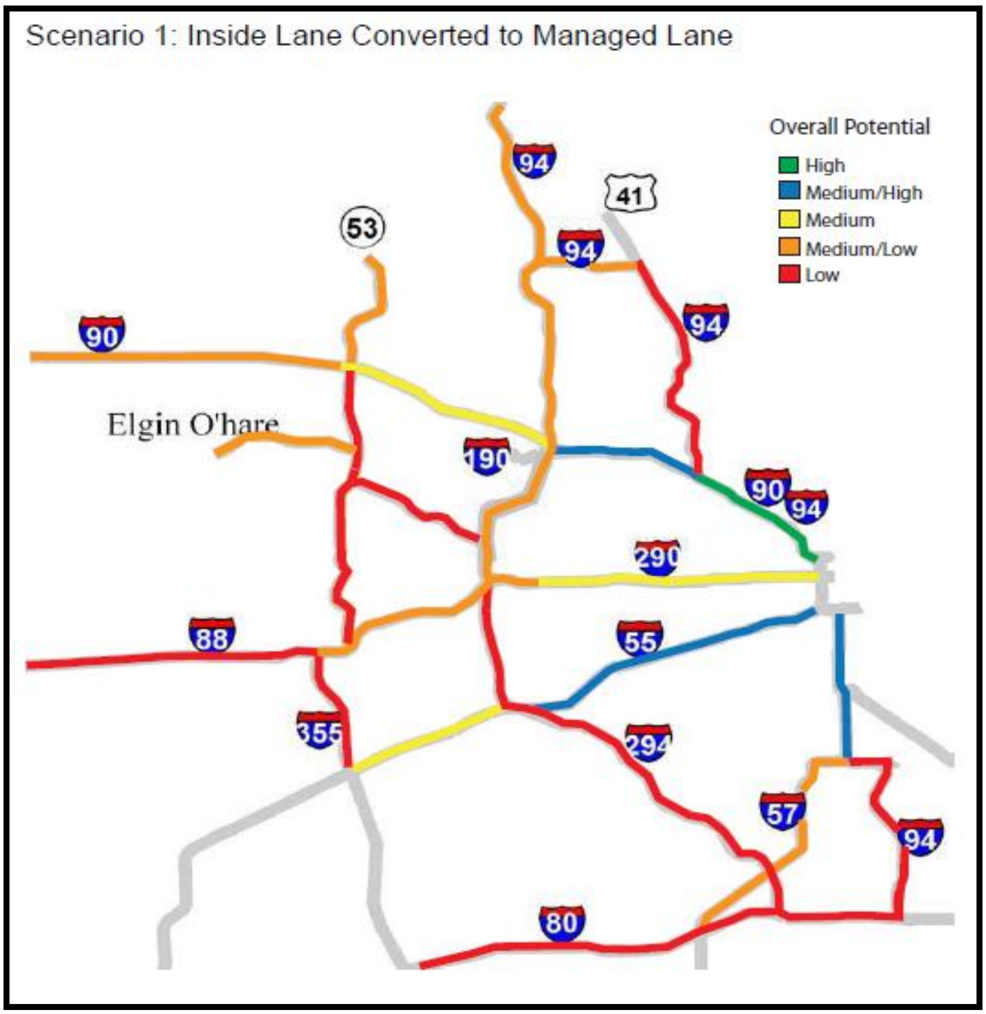


Table 15: Summary Corridor Rankings – Scenario 1

Legend: ◌ Low (1 point) ○ Low/Medium (2) ◍ Medium (3) ◉ Medium/High (4) ● High (5)

ID #	Segment	2007 Weekday Congestion	Construct-ability	Revenue Potential	Traffic Management Potential	Total Points	Overall Ranking
17	I-90 Kennedy Reversible between I-94 Edens and Ohio St. (both reversible lanes converted to managed lanes)	High (5)	High (5)	High (5)	High (5)	20	High (5)
18a	I-90/94 Dan Ryan between I-57 and I-90 Chicago Skyway (one managed lane converted on express lanes case)	High (5)	Low (1)	High (5)	High (5)	16	Medium/High (4)
18b	I-90/94 Dan Ryan between I-57 and I-90 Chicago Skyway (two managed lanes converted on express lanes case)	High (5)	Low (1)	High (5)	High (5)	16	Medium/High (4)
15	I-90 Kennedy between I-190 and I-94 Edens	High (5)	Low (1)	High (5)	Medium/High (4)	15	Medium/High (4)
20b	I-90/94 Dan Ryan Express between I-90 Chicago Skyway and I-55 (two managed lanes converted on express lanes case)	Medium/High (4)	Low (1)	High (5)	High (5)	15	Medium/High (4)
24	I-55 Stevenson between I-294 and I-90/94	High (5)	Medium/High (4)	Medium (3)	Medium (3)	15	Medium/High (4)
8	I-90 Jane Addams Tollway between I-290 and I-294	Medium/High (4)	Medium/High (4)	Medium (3)	Medium (3)	14	Medium (3)
14	I-290 Eisenhower between US-12/US-20 and I-90/94	High (5)	Low (1)	Medium/High (4)	Medium/High (4)	14	Medium (3)
20a	I-90/94 Dan Ryan Express between I-90 Chicago Skyway and I-55 (one managed lane converted on express lanes case)	Medium/High (4)	Low (1)	Medium/High (4)	High (5)	14	Medium (3)
23	I-55 Stevenson between I-355 and I-294	Medium/High (4)	High (5)	Low/Medium (2)	Medium (3)	14	Medium (3)
4	I-294/I-94 Tri-State Tollway between I-90 and Lake Cook Rd.	Medium (3)*	Medium/High (4)	Low (1)	High (5)	13	Low/Medium (2)
7	I-90 Jane Addams Tollway between IL-31 and I-290	Low/Medium (2)	Medium/High (4)	Medium (3)	Medium/High (4)	13	Low/Medium (2)
25	IL-53 between I-90 and Lake Cook Rd.	Medium (3)	Medium/High (4)	Low/Medium (2)	Medium/High (4)	13	Low/Medium (2)
1	I-355 Veterans Tollway between I-55 and Ogden Ave.	Low (1)*	Medium/High (4)	Low/Medium (2)	High (5)	12	Low/Medium (2)
3	I-294/I-94 Tri-State Tollway between US-41 (Edens Spur) and IL-176	Low (1)*	Medium (3)	Medium (3)	High (5)	12	Low/Medium (2)
5	I-294/I-94 Tri-State Tollway between I-88 North Interchange and I-90	Medium/High (4)	Medium (3)	Low (1)	Medium/High (4)	12	Low/Medium (2)
10	I-88 Ronald Reagan Tollway between I-355 East Interchange and I-290	Medium (3)*	Medium/High (4)	Low (1)	Medium/High (4)	12	Low/Medium (2)
21	I-57 between I-80 and I-94	Medium (3)	Low/Medium (2)	Medium (3)	Medium/High (4)	12	Low/Medium (2)

Table 15: Summary Corridor Rankings – Scenario 1 (Contd.)

26	Elgin-O'Hare between US-20 and I-290	○	○	◉	◉	12	○
9	I-88 Ronald Reagan Tollway between IL-31 and I-355 West Interchange	○*	◉	◌	◉	11	◌
13	I-290 Eisenhower between I-355 and US-12/US-20	●	◌	○	◍	11	◌
2	I-355 Veterans Tollway between Butterfield Ave. and I-290	◌	○	○	●	10	◌
6	I-294/I-94 Tri-State Tollway between I-94 and I-88 South Interchange	○*	◍	◌	◉	10	◌
12	I-290 Eisenhower between I-90 and I-355	◍	○	◌	◉	10	◌
22	I-94 Bishop Ford between I-80 and Dan Ryan	○	◌	◉	◍	10	◌
11	I-80 between I-355 and I-294	○	○	○	◍	9	◌
27	I-94 Edens between I-90 and US-41 (Edens Spur)	●	◌	◌	○	9	◌

Figure 43 and Table 16 summarize the rankings for Scenario 2, addition of an inside managed lane on roadway sections with fewer than four lanes per direction.

Detailed results of the Corridor Screening Analysis are presented in Appendix G.

Figure 43: Summary Results for Scenario 2

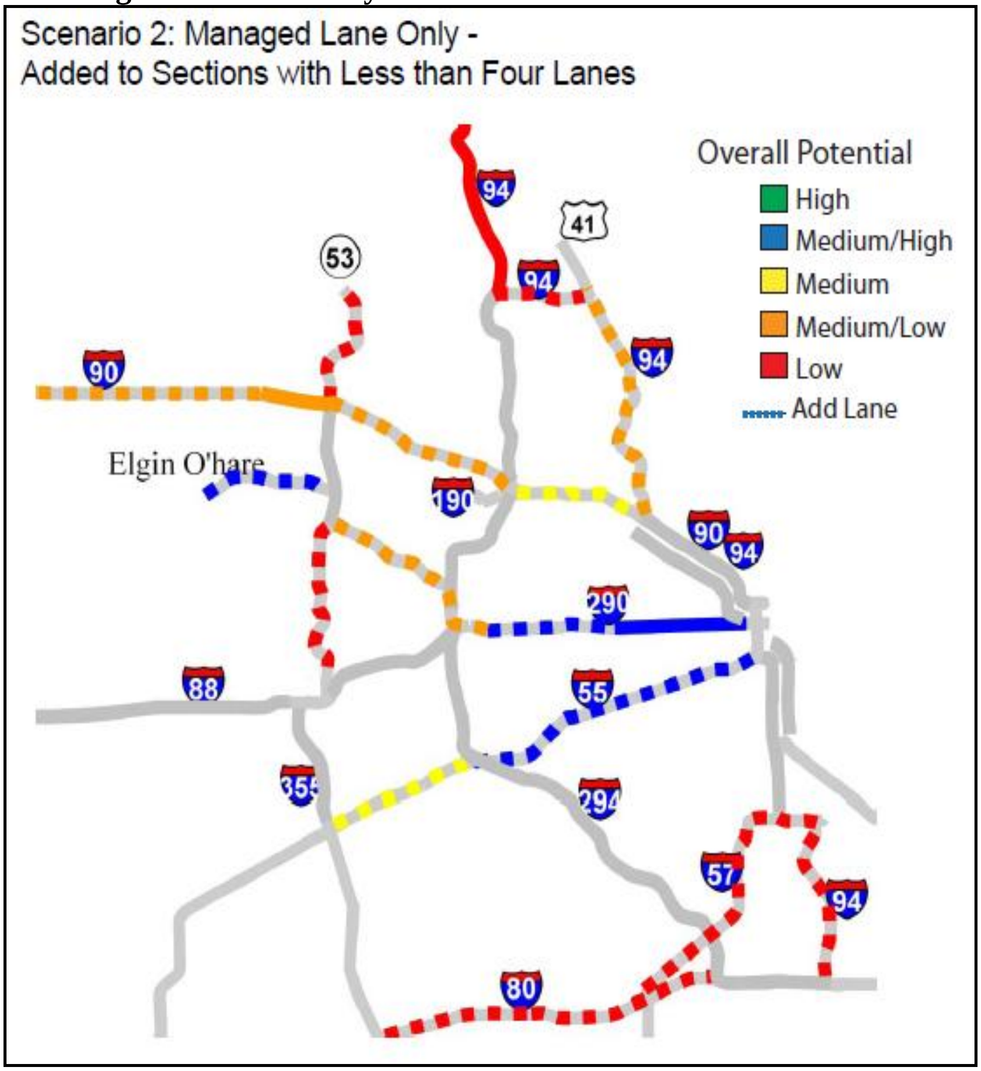


Table 16: Summary Corridor Rankings – Scenario 2

Legend: Low (1 point) | Low/Medium (2) | Medium (3) | Medium/High (4) | High (5)

ID #	Segment	2007 Weekday Congestion	Construct-ability	Revenue Potential	Traffic Management Potential	Total Points	Overall Rating
14	I-290 Eisenhower between US-12/US-20 and I-90/94 (Add Lane between US-12/20 and Austin only)	High	Low	Medium/High	High	15	Medium/High
24	I-55 Stevenson between I-294 and I-90/94	High	Medium	Low/Medium	High	15	Medium/High
26	Elgin-O'Hare between US-20 and I-290	Low/Medium	High	Medium	High	15	Medium/High
15	I-90 Kennedy between I-190 and I-94 Edens	High	Low	Medium	High	14	Medium
23	I-55 Stevenson between I-355 and I-294	Medium/High	Medium/High	Low	High	14	Medium
7	I-90 Jane Addams Tollway between IL-31 and I-290 (Add Lane between IL-31 and Roselle Rd. only)	Low/Medium	Medium	Medium	High	13	Low/Medium
13	I-290 Eisenhower between I-355 and US-12/US-20	High	Low/Medium	Low	High	13	Low/Medium
8	I-90 Jane Addams Tollway between I-290 and I-294	Medium/High	Low/Medium	Low	High	12	Low/Medium
27	I-94 Edens between I-90 and US-41/Edens Spur	High	Low	Low	High	12	Low/Medium
3	I-294/I-94 Tri-State Tollway between US-41 (Edens Spur) and IL-176 (Add Lane Edens Spur only)	Low	Low/Medium	Medium	High	11	Low
11	I-80 between I-355 and I-294	Low/Medium	Medium	Low	High	11	Low
22	I-94 Bishop Ford between I-80 and Dan Ryan	Low/Medium	Low	Medium	High	11	Low
25	IL-53 between I-90 and Lake Cook Rd.	Medium	Low/Medium	Low	High	11	Low
21	I-57 between I-80 and I-94	Medium	Low	Low	High	10	Low
2	I-355 Veterans Tollway between Butterfield Ave. and I-290	Low	Low	Low	High	8	Low

CORRIDORS RECOMMENDED FOR FURTHER ANALYSIS

Subsequently, MPC conducted an online survey of the CMAP Transportation Committee to obtain feedback and a priority ranking of the candidate corridors analyzed. The survey was available online between August 13 and September 4, 2009.

Of the 30 agencies, organizations and service providers on the CMAP Transportation Committee, 22 members responded to the survey, of which 21 were committee members. Two respondents did not select their top three corridors. The Illinois Tollway abstained from the survey.

The results of the survey included:

- 86 percent of respondents felt that congestion pricing should be considered on both Illinois Tollway and IDOT expressway routes;
- Congestion reduction was considered the top goal of congestion pricing, followed by a tie between environmental benefits, increased travel options and revenue generation;
- 65 percent of respondents selected the reversible lanes on the Kennedy Expressway between the Edens Expressway and Ohio Street as one of their top three choices for further study;
- 55 percent of respondents selected the Jane Addams Tollway (I-90), between I-290 and I-294; and,
- 45 percent of respondents selected the Stevenson Expressway (I-55), between I-294 and I-90/94.

Respondents also provided alternative criteria to be considered in evaluating the suitability of managed lanes (not in any order of preference): governance; current operational characteristics; the locations of housing and jobs; where managed lanes can have their greatest positive impact; the ability to run express buses; carpooling/ridesharing potential; congestion relief; and, public acceptance.

Detailed results of the CMAP Transportation Committee survey are presented in Appendix G.

CHAPTER 10

EVALUATION OF SELECTED CORRIDORS

OVERVIEW

This chapter presents the results of traffic and revenue analysis conducted for the three corridors selected by the CMAP Transportation Committee. Initially, the existing traffic and operational characteristics of each corridor are described. Subsequently, an assessment is provided of the toll levels needed to manage traffic demand and maintain travel speeds in the managed lanes at different times of the day, for the analysis years 2010 and 2020. Estimates of managed lane traffic and toll revenue are then presented for each corridor for these two years. Finally, the traffic impacts of managed lanes are described.

CORRIDORS SELECTED FOR DETAILED EVALUATION

The three corridors ranked highest by the CMAP Transportation Committee were selected by the study team for further evaluation of the impacts of congestion pricing. These included the following:

- Reversible lanes on the Kennedy Expressway (I-90)
- Jane Addams Memorial Tollway (I-90); and,
- Stevenson Expressway (I-55).

ASSUMED LIMITS OF MANAGED LANES

The limits of study for the Jane Addams Memorial Tollway and Stevenson Expressway were extended beyond those recommended by the CMAP Transportation Committee for the following reasons – major capital projects identified by the ***draft*** 2040 Regional Transportation Plan for the

Chicago region include an added managed lane in each direction on: the Jane Addams Memorial Tollway from I-294 to I-39; and, on the Stevenson Expressway from Weber Road to I-90/94. While funding has not yet been committed for these projects, they are included on the fiscally constrained list of projects, meaning that their costs can be covered within the region's expected transportation revenue and they have met air quality conformity requirements. Projects on the fiscally constrained list are given the highest priority among major capital projects. In addition, the RTA is currently studying the feasibility of using the shoulders on the Stevenson Expressway to provide bus rapid transit service between Bolingbrook and downtown Chicago. Therefore, extending the study limits to include these projects could provide information to support these complementary efforts.

The assumed limits of the managed lanes are:

- Kennedy Expressway (I-90): Both reversible lanes between the Edens Expressway and Ohio Street;
- Jane Addams Memorial Tollway (I-90): From east of Illinois Route 31 to west of I-294; and,
- Stevenson Expressway (I-55): From east of I-355 to west of I-90/94.

KEY ASSUMPTIONS

The key assumptions used in conducting the traffic and revenue analysis of the selected corridors are listed below:

- A single *added* managed lane in each direction is assumed for the Jane Addams Memorial Tollway and the Stevenson Expressway.
- *Both* the reversible lanes on the Kennedy Expressway between the Edens Expressway (I-94) and Ohio Street are assumed to be converted to managed lanes. The managed lanes would continue to operate as reversible lanes;
- All the managed lanes are assumed to be tolled between 5:00 a.m. and 8:00 p.m. on weekdays. No tolling is assumed on weekends, or overnight on weekdays between 8:00 p.m. and 5:00 a.m.;
- Access to and from the managed lanes will be provided as shown in exhibits for each corridor later in this chapter. All access locations are assumed to provide both entry to and exit from the managed lanes;

- Only passenger vehicles are eligible to use the managed lanes. All vehicles are assumed to pay to use the managed lane – no discounts or toll-free passage are assumed for high-occupancy, low emission or alternative fueled vehicles;
- Tolls will be collected entirely through electronic toll collection. Toll rates are assessed on a per-mile basis and vary by direction and time period;
- Tolls are selected to maximize utilization of the managed lane, subject to the constraint that free-flow conditions are maintained in the managed lanes. *Maximum* managed lane usage thresholds of: 1,600 vehicles per hour for single, buffer-separated, managed lanes; and, 1,800 vehicles per hour per lane (3,600 vehicles per hour for both lanes combined) for dual, barrier-separated, managed lanes were assumed to represent free flow operation.
- The modeling approach described previously was applied for the three corridors. It should be noted that traffic analysis results presented here are based on travel demand modeling. Traffic operations analyses were beyond the scope of this study, but will be required as part of detailed engineering studies prior to implementation;
- No adjustments for "ramp up" have been made in developing the estimates of toll revenue provided here;
- Strict enforcement of the managed lanes is assumed. No adjustments for toll evasion have been made in developing the toll revenue estimates;
- No other competing routes, capacity improvements or additional general purpose lane capacity will be implemented in the study corridors;
- Economic growth in each of the study corridors will generally follow patterns consistent with currently adopted regional land use forecasts which are incorporated into the regional travel demand model used in this analysis.

KENNEDY EXPRESSWAY (I-90) REVERSIBLE LANES

Dual reversible lanes exist for approximately 7.3 miles of the Kennedy Expressway, extending from their western terminus, just east of the junction with the Edens Expressway (I-94), to their eastern terminus at Ohio Street. The reversible lanes are separated from the Kennedy Expressway general purpose lanes by concrete barrier walls, with one intermediate access point approximately located at California Avenue. Full access (entry and exit) between the reversible and general purpose lanes is provided in both directions at California Avenue. The intermediate access is located approximately midway along the reversible lane section, 3.5 miles east of the I-94 junction.

Four general purpose lanes exist in each direction for the entire section of the Kennedy Expressway between the Edens Expressway (I-94) junction and Ohio Street, with five general purpose lanes for the 1.3 mile section between Ohio Street and the junction with the Eisenhower Expressway (I-290).

On weekdays, the reversible lanes typically operate inbound to the City of Chicago (eastbound) during the morning, are closed for reversal between approximately 12:00 and 12:30 p.m., and then operate outbound from the City. The reversible lanes are closed at some point overnight, and reopened to serve inbound morning traffic.

EXISTING TRAFFIC AND OPERATIONAL CHARACTERISTICS

Figure 44 presents traffic and speed data for selected locations along the general purpose lanes of the Kennedy Expressway, between the Edens Expressway and Ohio Street. Figure 45 presents similar data for the reversible lanes.

Average summer weekday traffic and speed data from 2007 is presented in Figures 44 and 45. In addition to hourly variations of traffic volumes and speeds, charts are presented illustrating the congested vehicle hours of travel (VHT) for the selected locations. Congested VHT was calculated based on the assumed speed threshold of 51.1 mph. This is the minimum speed below which traffic is assumed to be operating under breakdown conditions (Level of Service F), as defined by the Highway Capacity Manual.

The general purpose lanes in both directions of the Kennedy Expressway experience severe congestion for much of the period between 6:00 a.m.

Figure 44: 2007 Traffic and Operational Characteristics – Kennedy Expressway (I-90) General Purpose Lanes

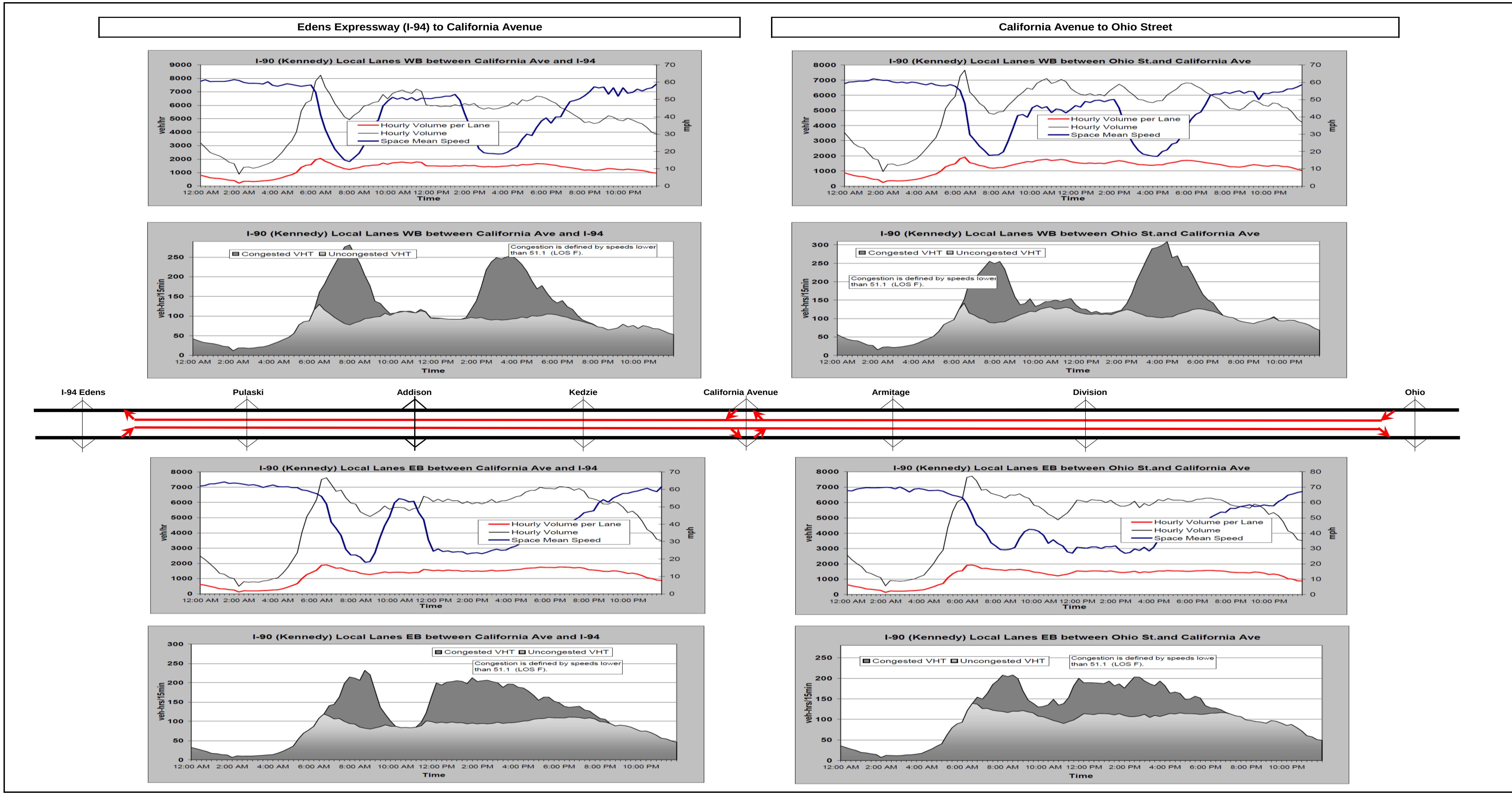
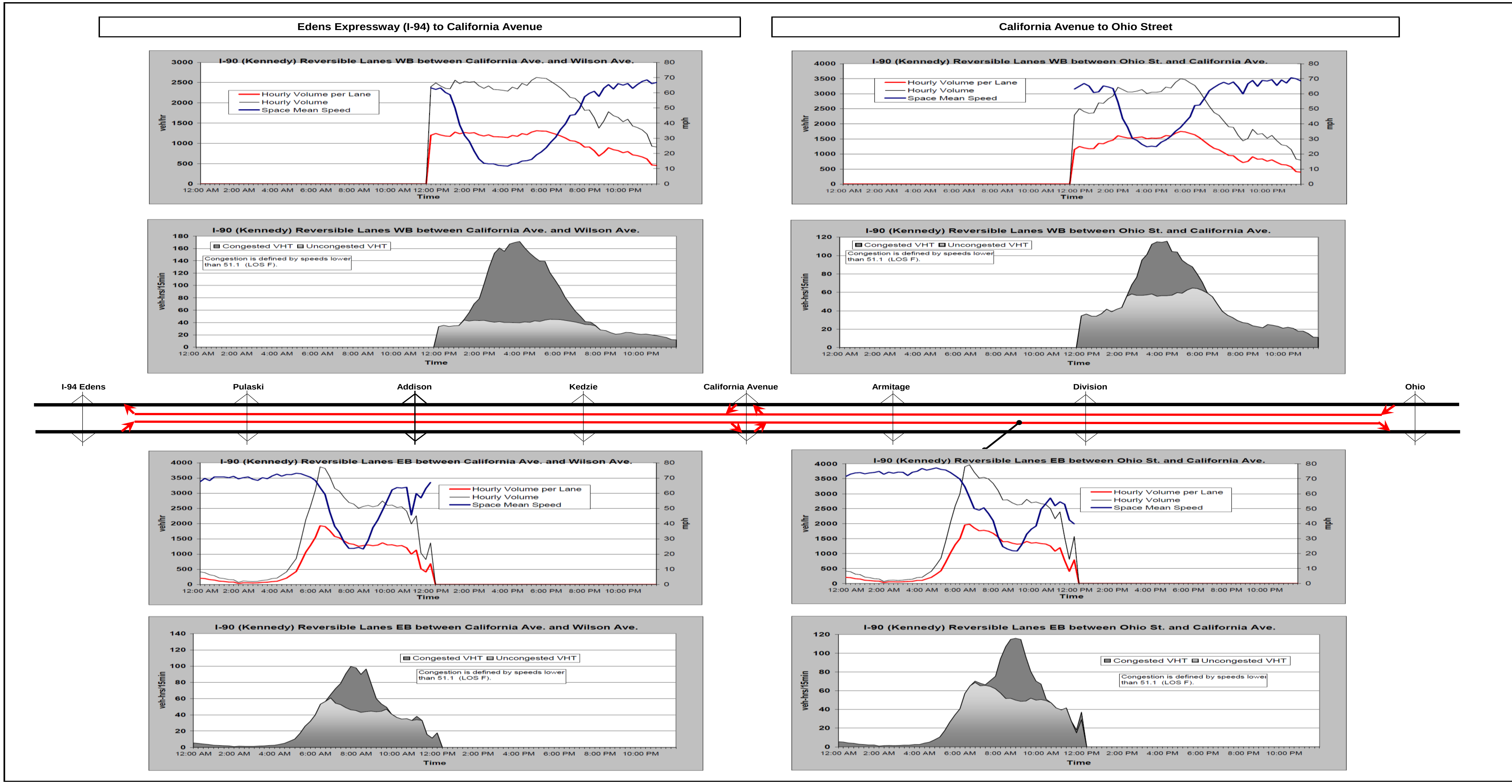


Figure 45: 2007 Traffic and Operational Characteristics – Kennedy Expressway (I-90) Reversible Lanes



and 7:00 p.m. on weekdays, as shown by the dark shaded areas on the VHT charts. Between the Edens Expressway and California Avenue, inbound traffic volumes begin to rise sharply by 6:00 a.m. and travel speeds quickly deteriorate to below 20 mph. Speeds recover sharply to about 55 mph from 10 a.m. to 12:00 p.m., but deteriorate again to around 25 mph as the reversible lanes are closed for reversal. Speeds for the section between California Avenue and Ohio Street follow a similar pattern, but appear to remain at or above 30 mph.

Outbound (westbound) Kennedy Expressway general purpose lanes also experience congestion through much of the day, although of less severity, with speeds recovering to between 45 and 50 mph from 10:00 a.m. to 2:00 p.m.

The reversible lanes also experience congestion, from approximately 6:30 to 10:00 a.m. inbound and from 3:00 to 7:30 p.m. outbound. Speeds in the reversible lanes decrease as low as 20-25 mph inbound and 10-25 mph outbound. The outbound direction of the reversible lanes between California Avenue and the Edens Expressway experiences the most severe congestion, likely due to congested conditions at the Kennedy-Edens junction.

Roadway Sections Evaluated

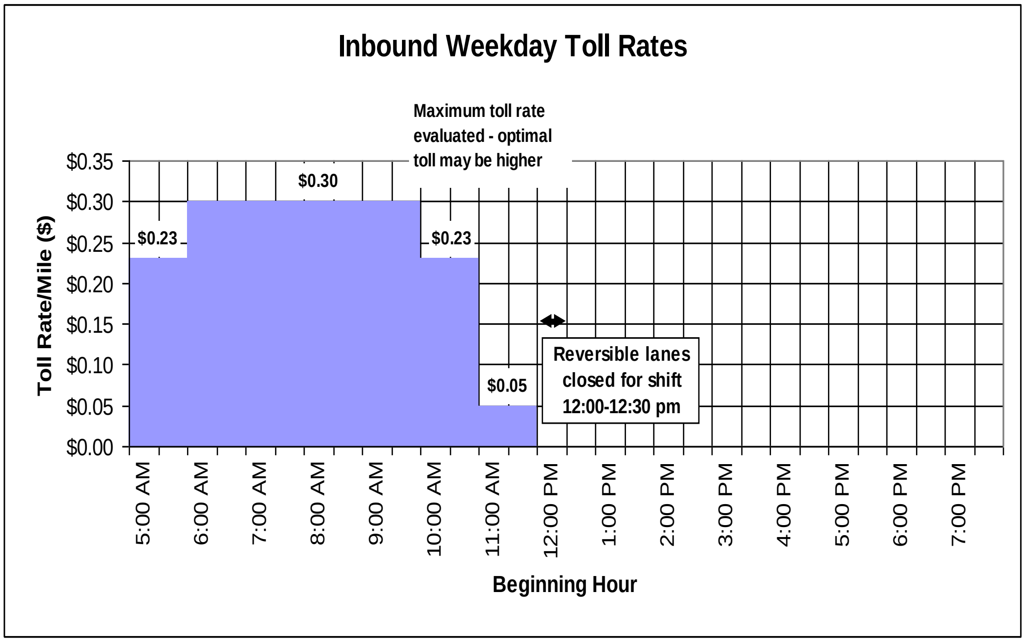
The traffic and revenue analysis for the Kennedy Expressway was performed for two sections – between the Edens Expressway and California Avenue, and from California Avenue to Ohio Street.

Traffic and revenue data is summarized based on these two sections. Since the reversible lanes are only 7.3 miles in length, toll rates selected for the most critical section based on traffic demand, California Avenue to Ohio Street, were applied to both sections of the reversible lanes.

Toll Levels Needed to Manage Traffic Demand and Maintain Travel Speeds

The toll rates required to manage traffic demand and maintain travel speeds in the managed (reversible) lanes are presented for 2010 and 2020 in Figures 46 and 47, respectively. The toll rates are presented in 2010 dollars.

Figure 46: 2010 Estimated Average Toll Rates (2010 $)



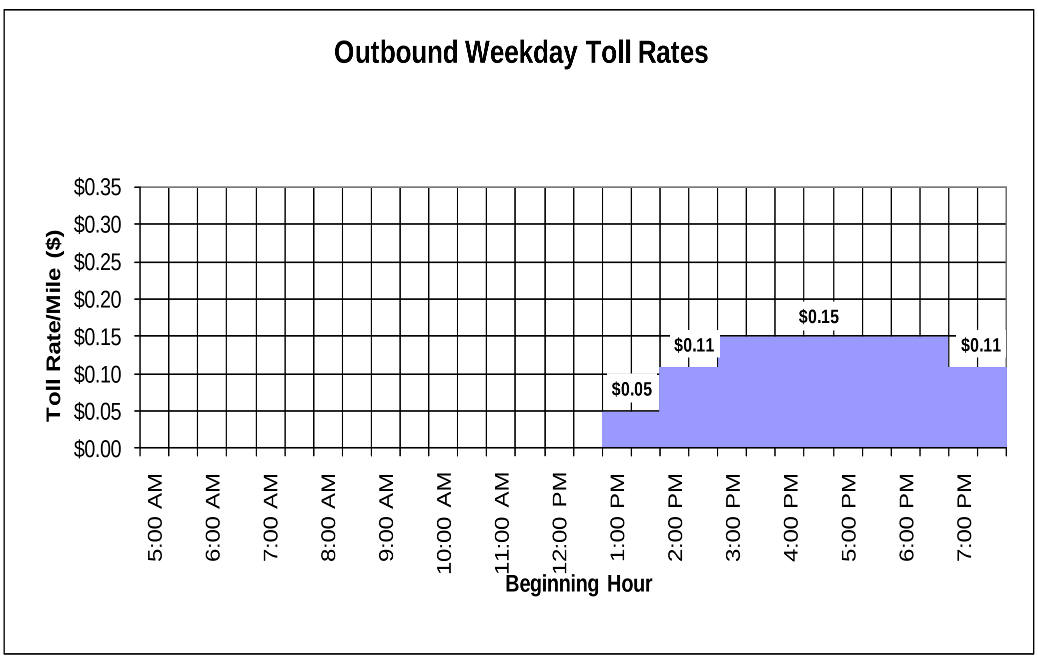
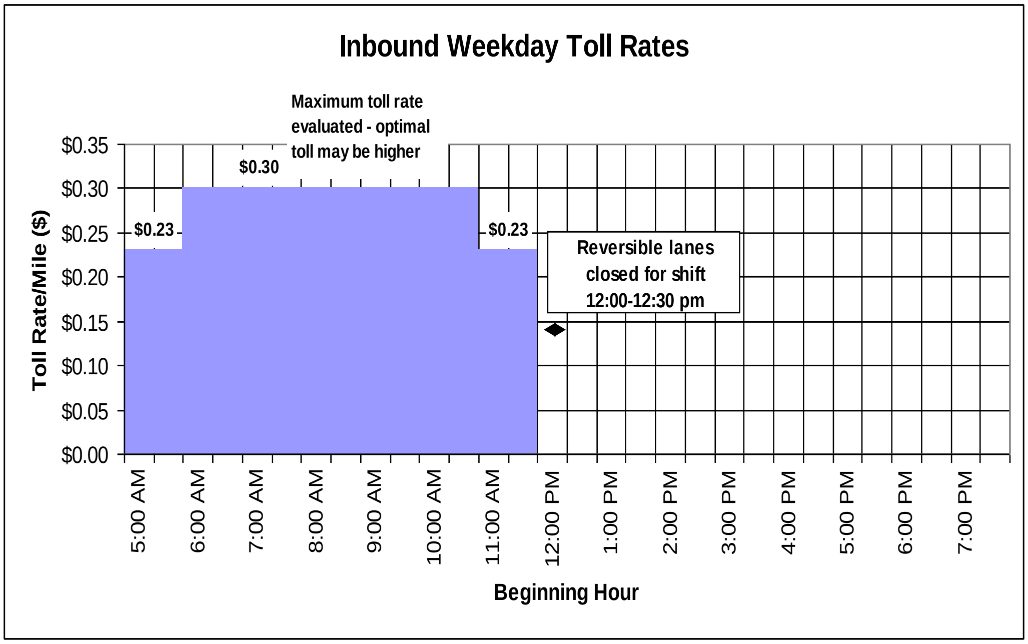
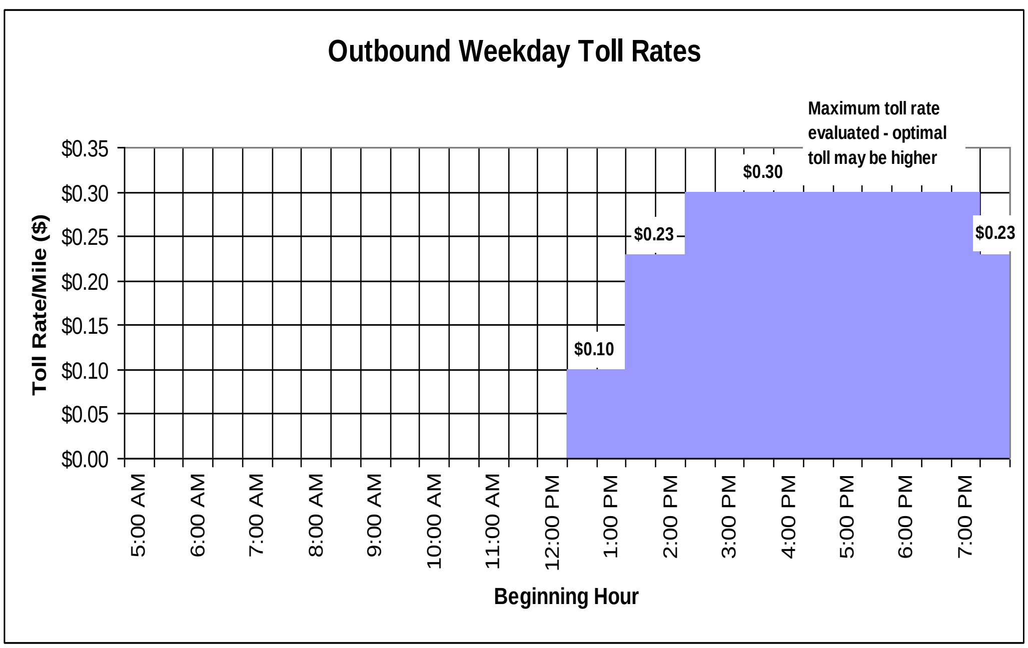


Figure 47: 2020 Estimated Average Toll Rates (2010 $)





During the inbound morning peak period in 2020, between California Avenue and Ohio Street, usage of the managed lanes reached 2,020 vehicles per lane per hour, exceeding the acceptable threshold of 1,800 vehicles per lane per hour. The optimal toll rate is therefore even higher than the maximum rate tested ($0.30 per mile).

ESTIMATED MANAGED LANE TRAFFIC AND TOLL REVENUE

For each of the morning and evening peak periods in 2010 and 2020, this section presents the estimated usage of the managed lane, the share of the corridor traffic carried by the managed lane and the estimated travel time savings that the managed lanes provide over the general purpose lanes. These estimates were developed assuming the per-mile toll rates presented in Figure 35 and 36.

In addition, the estimated total annual weekday toll revenue is presented for each managed lane roadway section for 2010 and 2020, combined for both reversible managed lanes. These estimates were developed assuming 250 working days per year, and are presented in 2010 dollars. Subsequently, estimates of annual gross toll revenue are presented in both constant (2010) dollars and inflation-adjusted dollars. An average annual rate of 2.5 percent was used to produce inflation-adjusted toll revenue estimates. It should be noted that no adjustments have been made for toll evasion and ramp up, and no discounts or toll-free passage are assumed for high-occupancy, low emission or alternative fueled vehicles.

Estimated Managed Lane Traffic

Table 17 summarizes the estimated managed (reversible) lane usage for the peak direction of the morning and evening peak periods. These estimates are provided on a per lane per hour basis.

Usage of the managed lanes is estimated to exceed the assumed acceptable threshold (1,800 vehicles/hour/lane) required to maintain free-flowing conditions during the morning peak periods inbound to the City of Chicago in both 2010 and 2020. In 2010, managed lane usage marginally exceeds the threshold at the maximum toll rate tested ($0.30/mile). However, in 2020, usage of the managed lane exceeds the acceptable threshold by over 10 percent, indicating that higher toll rates may be required to manage traffic demand.

Table 17: Managed Lane Usage

Section	Managed Lane Usage (Vehicles/Hour/Lane)			
	2010		2020	
	AM Peak Inbound	PM Peak Outbound	AM Peak Inbound	PM Peak Outbound
I-94 to California Ave	1,540	1,180	1,650	1,190
California Ave to Ohio St	1,810 *	1,630	2,020 **	1,760

Notes:

* Marginally exceeds acceptable threshold of 1,800 vehicles/hour/lane.

** Managed lane volume exceeds acceptable threshold of 1,800 veh/hr/lane at maximum toll rate tested ($0.30/mile) - optimal toll rate may be higher.

Managed Lane Market Share

The two reversible lanes on the Kennedy Expressway represent approximately one third (33 percent) of peak-period, peak direction corridor capacity (2 of the 6 lanes available). The estimated share of corridor traffic carried by the managed lanes is presented in Table 18.

The managed lanes are estimated to carry between 23 and 27 percent of peak period corridor traffic, indicating efficient utilization of the managed lanes, in both 2010 and 2020.

Table 18: Managed Lane Market Share

Section	Managed Lane Market Share			
	2010		2020	
	AM Peak Inbound	PM Peak Outbound	AM Peak Inbound	PM Peak Outbound
I-94 to California Ave	26%	24%	27%	23%
California Ave to Ohio St	26%	26%	27%	26%

Managed Lane Travel Time Savings

The estimated time savings that the managed lanes provide over the Kennedy Expressway general purpose lanes is summarized in Table 19. As shown, over the entire 7.3 mile length, the managed lanes are anticipated to save drivers between 9 and 11 minutes in 2010. The time saved is estimated to increase to 11 to 14 minutes by the year 2020. The managed lanes are anticipated to allow speeds of 50-55 mph.

Table 19: Managed Lane Time Savings

Section	Length (Miles)	Managed Lane Time Savings (Minutes)			
		2010		2020	
		AM Peak Inbound	PM Peak Outbound	AM Peak Inbound	PM Peak Outbound
I-94 to California Ave	**3.5**	3.5	4.6	4.3	6.1
California Ave to Ohio St	**3.8**	5.6	6.5	6.8	8.2
Entire Length	**7.3**	**9.1**	**11.1**	**11.1**	**14.3**

Estimated Toll Cost

Table 20 presents the estimated peak-period toll cost for using the managed lanes. Using the managed lanes during peak periods would cost motorists approximately $1.10 to $2.20 for the entire length of the managed lanes in 2010, and $2.20 in 2020.

Estimated Managed Lane Toll Revenue

Assuming the toll rates presented previously, the estimated annual weekday managed lane revenue that could be generated is presented in Table 21. These toll revenue estimates are presented in 2010 dollars.

Based on the toll revenue estimates for the forecast years 2010 and 2020, a twenty five year revenue stream was developed, by interpolating between the two years, and extrapolating beyond 2020. Assuming that toll rates rise with inflation at an average annual rate of 2.5 percent, an inflation-adjusted revenue stream was also developed. The revenue streams, in constant (2010) dollars and inflation-adjusted dollars, are presented in Table 22.

Table 20: Full-Length & Per-Mile Peak-Period Toll Rates

Section	Length (miles)	2010 Toll Rates (2010 $)			
		AM Peak Inbound		PM Peak Outbound	
		Full Length Toll ($)	Average Rate ($/mile)	Full Length Toll ($)	Average Rate ($/mile)
I-94 to California Ave	3.5	$1.05	$0.30 **	$0.53	$0.15
California Ave to Ohio St	3.8	$1.14	$0.30 **	$0.57	$0.15
Entire Length	7.3	$2.19	$0.30 **	$1.10	$0.15

Section	Length (miles)	2020 Toll Rates (2010 $)			
		AM Peak Inbound		PM Peak Outbound	
		Full Length Toll ($)	Average Rate ($/mile)	Full Length Toll ($)	Average Rate ($/mile)
I-94 to California Ave	3.5	$1.05	$0.30 **	$1.05	$0.30 **
California Ave to Ohio St	3.8	$1.14	$0.30 **	$1.14	$0.30 **
Entire Length	7.3	$2.19	$0.30 **	$2.19	$0.30 **

Notes: ** Maximum toll rate tested $0.30/mile - optimal toll higher

Table 21: Estimated Annual Weekday Toll Revenues

Section	Annual Weekday Toll Revenue (in 2010 $)	
	2010	2020
I-94 to California Ave	$6,000,000	$9,450,000
California Ave to Ohio St	$7,970,000	$13,690,000
Entire Length	$13,970,000	$23,140,000

Table 22: Estimated Annual Gross Toll Revenue

	Annual Gross Toll Revenue	
Year	In 2010 Dollars (1)	In Current Year Dollars (2)
2010	$13,970,000	$13,970,000
2011	$14,887,000	$15,535,000
2012	$15,804,000	$17,100,000
2013	$16,721,000	$18,665,000
2014	$17,638,000	$20,230,000
2015	$18,555,000	$21,796,000
2016	$19,472,000	$23,361,000
2017	$20,389,000	$24,926,000
2018	$21,306,000	$26,491,000
2019	$22,223,000	$28,056,000
2020	$23,140,000	$29,621,000
2021	$24,057,000	$31,186,000
2022	$24,974,000	$32,751,000
2023	$25,891,000	$34,316,000
2024	$26,808,000	$35,881,000
2025	$27,725,000	$37,447,000
2026	$28,642,000	$39,012,000
2027	$29,559,000	$40,577,000
2028	$30,476,000	$42,142,000
2029	$31,393,000	$43,707,000
2030	$32,310,000	$45,272,000
2031	$33,227,000	$46,837,000
2032	$34,144,000	$48,402,000
2033	$35,061,000	$49,967,000
2034	$35,978,000	$51,532,000
Total	**$624,350,000**	**$818,780,000**

Notes:
(1) From traffic and revenue analysis, reflecting values of time in 2010 dollars.
(2) Adjusted for inflation, assuming an average rate of 2.5 percent per year.

ESTIMATED MANAGED LANE TRAFFIC IMPACTS

The traffic impacts of converting the Kennedy Expressway reversible lanes to managed lanes were estimated by comparing the peak-period corridor traffic with the managed lane to the no-build condition for each forecast year.

The estimated traffic diversions were then compared to the anticipated mode shift to transit alternatives estimated by CMAP staff to assess the net traffic diversion to other expressways and local roadways.

Estimated Traffic Diversion

Table 23 summarizes the estimated peak hour traffic diversions from the Kennedy Expressway resulting from the conversion of the reversible lanes to managed lanes. Assuming a three-hour morning and four-hour evening peak period, this would result in morning and evening peak period excess traffic of 1,950 and 1,680 passenger vehicles respectively, that would either forego their trip, switch to transit alternatives or shift to other times of the day.

Table 23: Estimated Traffic Diversion

Section	Estimated Traffic Diversion			
	2010		2020	
	AM Peak Inbound	PM Peak Outbound	AM Peak Inbound	PM Peak Outbound
Traffic Diversion (Vehicles/Hour)	650	420	810	1,500
Percentage of Corridor Traffic	2.4%	1.8%	2.9%	5.9%

Modeling conducted by CMAP indicates that, on a daily basis, an estimated 4,000 automobile trips would switch to transit in 2010 at toll rates of $0.25 per mile. This translates to approximately 500 trips shifted to transit in each of the morning and evening peak periods in 2010.

Therefore, the net traffic diversion in 2010 is estimated to be 1,450 and 1,180 vehicles during the morning and evening peak periods, respectively.

No mode shift analysis was conducted for 2020. Therefore, assuming the average hourly 2010 mode shift estimates in 2020 will provide conservative estimates of net traffic diversions. In 2020, net traffic diversions of 2,580 and 6,875 vehicles are estimated for the morning and evening peak periods, respectively.

JANE ADDAMS MEMORIAL TOLLWAY (I-90)

Three mainline lanes exist in each direction for the entire section of the Jane Addams Memorial Tollway between Illinois Route 31 and the Tri-State Tollway (I-294), except for two short segments, Roselle Road to IL 53/I-290 and approximately one mile west of Lee Street to the Kennedy Expressway. Between Roselle Road and IL 53, a fourth lane exists in each direction that serves as an auxiliary lane. The fourth lane terminates at Roselle Road. Between Lee Street and the Kennedy Expressway, four and five lanes are provided, depending on the direction. In the eastbound direction, the fourth lane serves as an auxiliary lane between Lee Street and the Kennedy Expressway. However, in the westbound direction, five lanes exist between the Devon Avenue Toll Plaza (Plaza 17) and Lee Street. The westbound outside lane terminates at the Lee Street exit as an auxiliary lane, while the left lane terminates approximately a half mile west of Lee Street, with three mainline lanes continuing beyond that point.

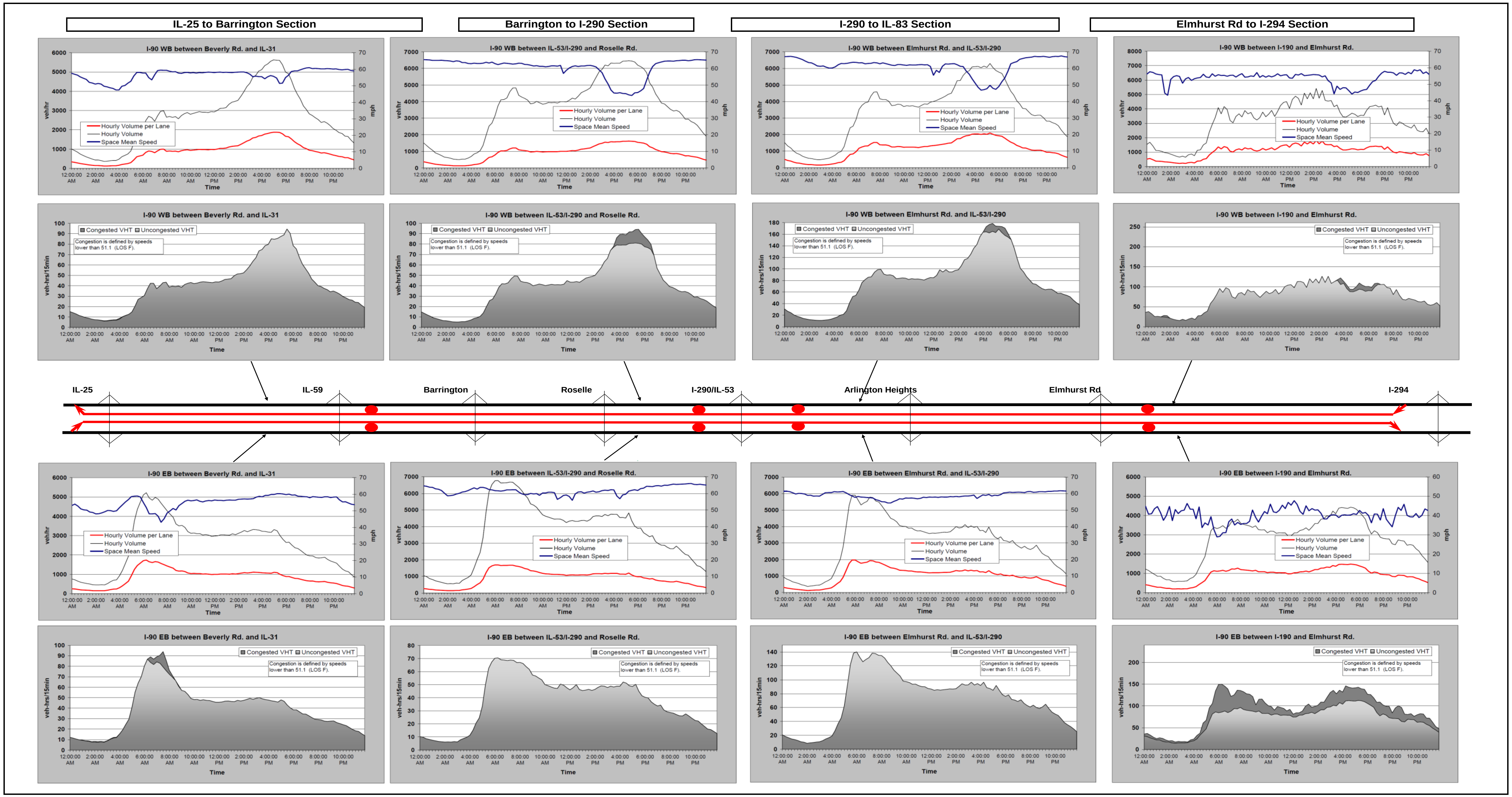
EXISTING TRAFFIC AND OPERATIONAL CHARACTERISTICS

Figure 48 presents average summer weekday traffic and speed data from 2007 for selected locations along the Jane Addams Memorial Tollway, between Illinois Route 31 and the Tri-State Tollway (I-294).

During the morning peak period, the Jane Addams Tollway experiences moderate congestion primarily in the eastbound direction between IL 25 and Barrington Road and from Elmhurst Road and I-294, as shown by the dark shaded areas on the VHT charts. During the evening peak period, the eastbound direction between Elmhurst Road and I-294 exhibits congestion, with moderate congestion westbound between I-294 and Barrington Road. Traffic volumes begin to rise sharply by 5:00 a.m. eastbound, although travel speeds are generally maintained above 45 mph.

The eastbound section between Elmhurst Road and I-294 experiences lower speeds, dipping to 30 mph in the morning peak period, with speeds remaining below 50 mph through much of the day. Eastbound traffic in this section is impacted by heavy traffic on the Kennedy Expressway. In the westbound direction speeds over 45 mph are generally maintained, although congestion is often experienced in the evening peak period between IL 53 and Roselle Rd.

Figure 48: Traffic and Operational Characteristics – Jane Addams Memorial Tollway (I-90)



Traffic patterns on the Jane Addams Tollway exhibit significant directional peaking, except between Elmhurst Road and I-294. Traffic volumes peak sharply eastbound in the morning, and westbound in the evening.

ROADWAY SECTIONS EVALUATED

The traffic and revenue analysis for the Jane Addams Tollway was conducted for four roadway sections – from IL 25 to Barrington Road, Barrington Road to IL 53/I-290, I-290 to Elmhurst Road, and from Elmhurst Road to I-294/I-190.

A single, added, managed lane is assumed in each direction for the entire section between IL 31 and I-294 – it is assumed that one lane in each direction is converted to a managed lane in sections which currently provide four or more lanes per direction. Figure 48 also illustrates the assumed managed lanes, highlighted in red, and the assumed access locations between the managed and general purpose lanes (shown as red circles).

The managed lanes are assumed to extend from west of IL 25 to between Elmhurst Road and I-294 in the east. This represents an approximately 21-mile managed lane corridor.

TOLL LEVELS NEEDED TO MANAGE TRAFFIC DEMAND AND MAINTAIN TRAVEL SPEEDS

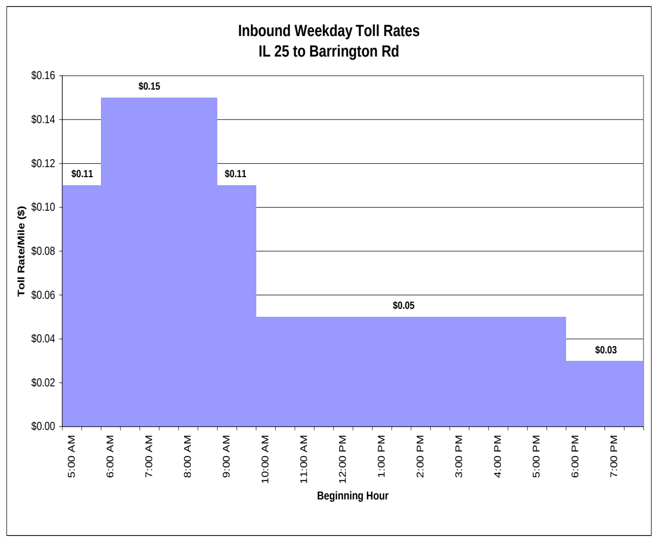
The toll rates required to manage traffic demand and maintain travel speeds in the managed lanes are presented for 2010 and 2020 in Figures 49 and 50, respectively. The toll rates are presented in 2010 dollars.

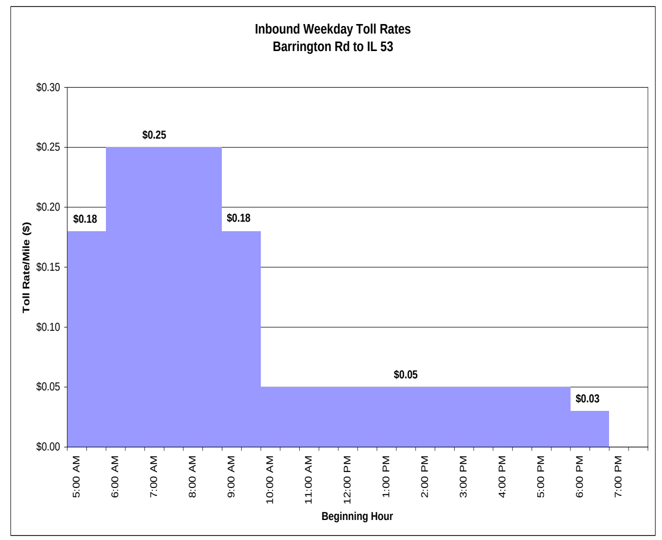
The estimated 2010 and 2020 toll rates reflect the directional peaking characteristics of the corridor. Toll rates for the section between Elmhurst Road and I-294, eastbound direction in 2010, and both eastbound and westbound in 2020, reflect heavy traffic demand in both morning and evening peak periods.

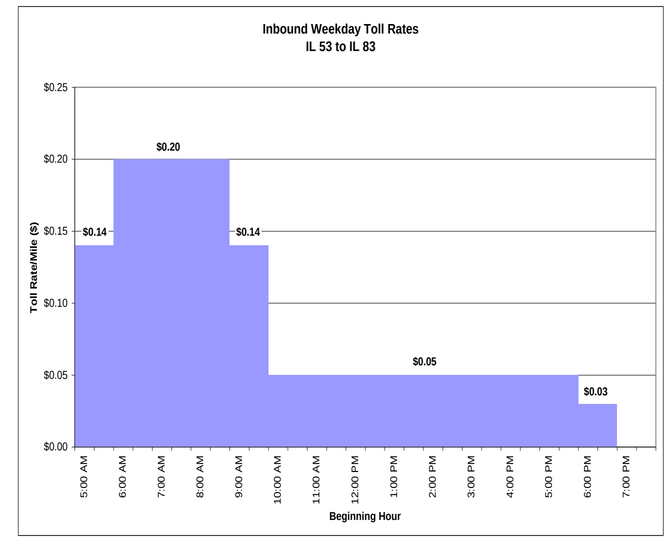
In 2020, even at the maximum toll rate tested of $0.30 per mile, managed lane traffic in the westbound direction exceeded the assumed threshold of 1,600 vehicles/hour between IL 53 and I-294. The optimal toll rate may be even higher for this section.

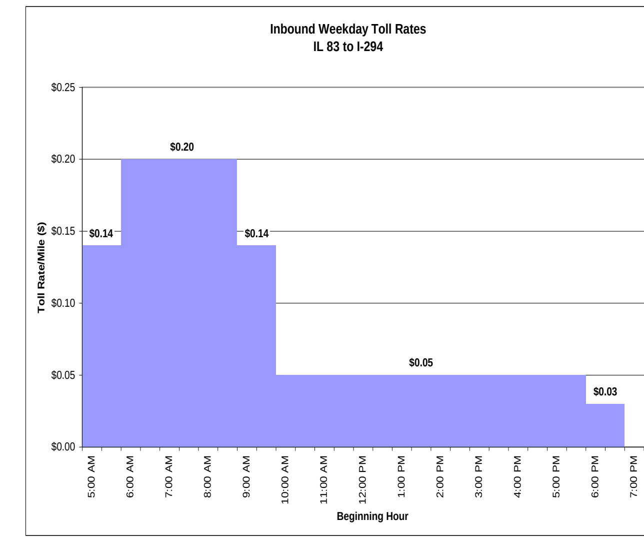
Figure 49: 2010 Estimated Average Toll Rates (2010 $)

INBOUND WEEKDAY AVERAGE TOLL RATES

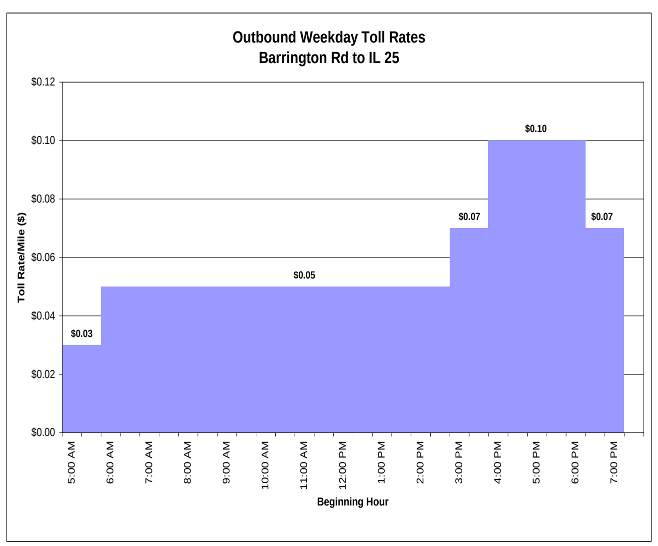


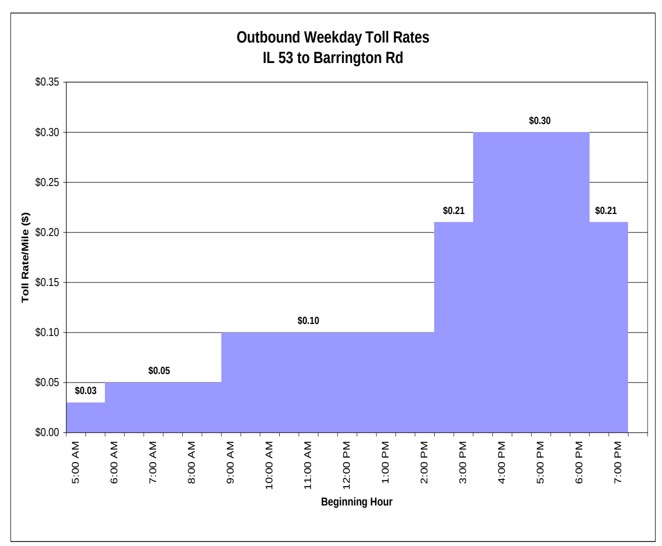


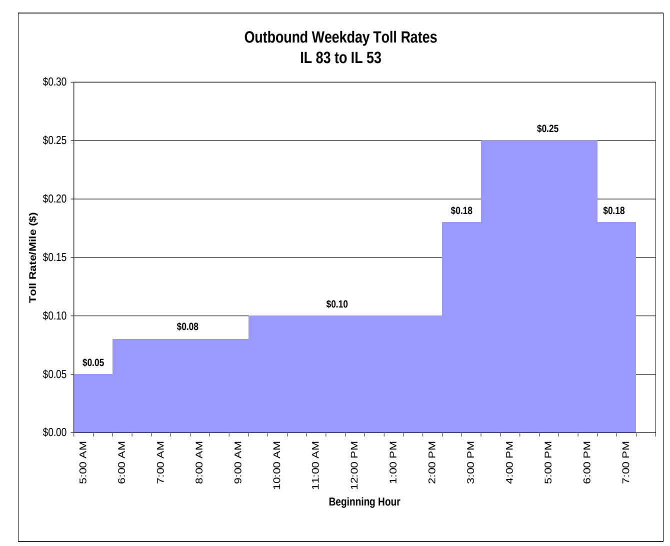




OUTBOUND WEEKDAY AVERAGE TOLL RATES







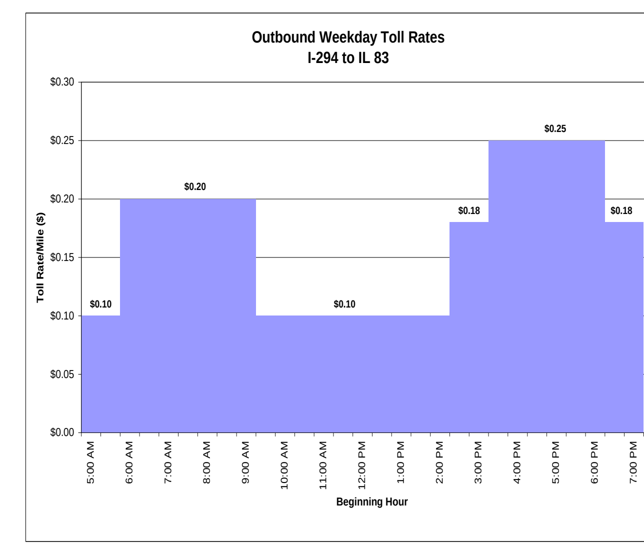
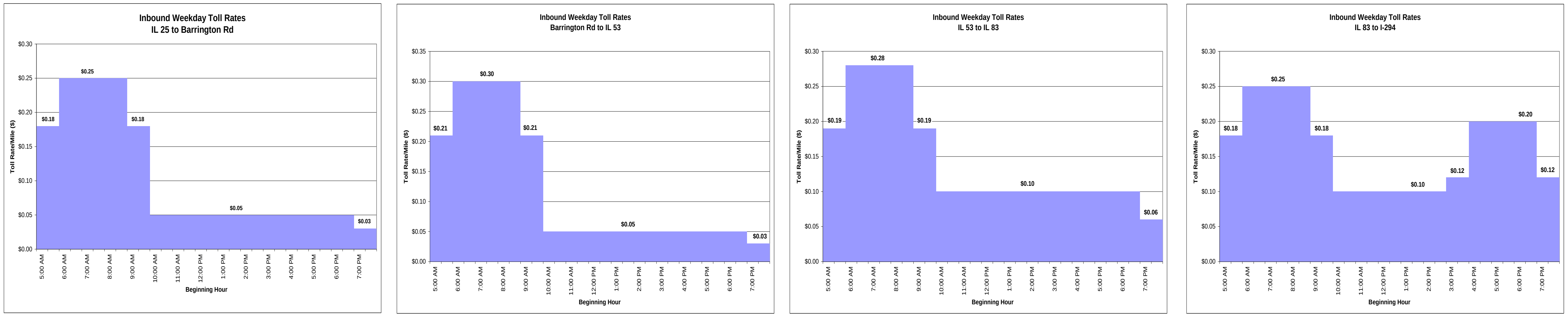
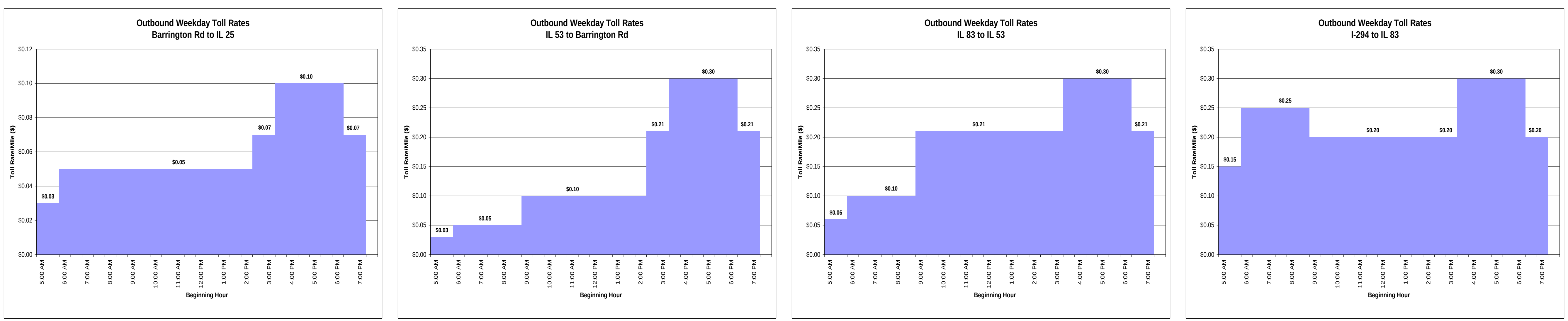


Figure 50: 2020 Estimated Average Toll Rates (2010 $)

INBOUND WEEKDAY AVERAGE TOLL RATES



OUTBOUND WEEKDAY AVERAGE TOLL RATES



ESTIMATED MANAGED LANE TRAFFIC AND TOLL REVENUE

For each of the morning and evening peak periods in 2010 and 2020, the estimated usage of the managed lane, the share of the corridor traffic carried by the managed lane and the estimated travel time savings that the managed lanes provide over the general purpose lanes are presented here. These estimates were developed assuming the per-mile toll rates presented in Figure 38 and 39.

The estimated total annual weekday toll revenue is presented for each managed lane roadway section for 2010 and 2020, combined for both directions. These estimates were developed assuming 250 working days per year, and are presented in 2010 dollars. Subsequently, estimates of annual gross toll revenue are presented in both constant (2010) dollars, and inflation-adjusted dollars using an average annual rate of 2.5 percent. No adjustments have been made for toll evasion and ramp up, and no discounts or toll-free passages are assumed for high-occupancy, low emission or alternative fueled vehicles.

Results are presented for two consolidated sections –IL 31 to IL 53/I-290, and IL 53/I-290 to I-294.

Estimated Managed Lane Traffic

Table 24 summarizes the estimated average managed lane usage for the peak direction of the morning and evening peak periods. These estimates are provided on a per lane per hour basis.

Usage of the managed lanes is estimated to exceed the assumed acceptable threshold (1,600 vehicles/hour/lane) required to maintain free-flowing conditions for the following sections and peak periods: inbound during the morning peak between Barrington Road and IL 53/I-290 in 2010; outbound in the evening peak between Barrington Road and I-294 in 2010; inbound during the morning peak between Barrington Road and I-294 in 2020; and, outbound during the evening peak between Barrington Road and I-294 in 2020. For these sections, managed lane demand exceeded acceptable usage at the maximum toll rate tested ($0.30/mile), indicating that higher toll rates may be required to manage traffic demand.

Table 24: Managed Lane Usage

Section	Managed Lane Usage (Vehicles/Hour/Lane)			
	2010		2020	
	AM Peak Inbound	PM Peak Outbound	AM Peak Inbound	PM Peak Outbound
IL 31 to IL 53/I-290	1,470	1,450	1,560	1,410
IL 53/I-290 to I-294	1,360	1,220	1,590	1,710

Managed Lane Market Share

The managed lanes on the Jane Addams Memorial Tollway represent a quarter (25 percent) of the directional corridor capacity (1 of the 4 lanes available). The estimated share of corridor traffic carried by the managed lanes is presented in Table 25.

The managed lanes are estimated to carry between 14 and 19 percent of peak period corridor traffic, indicating efficient utilization of the managed lanes, in both 2010 and 2020.

Table 25: Managed Lane Market Share

Section	Managed Lane Market Share			
	2010		2020	
	AM Peak Inbound	PM Peak Outbound	AM Peak Inbound	PM Peak Outbound
IL 31 to IL 53/I-290	17%	19%	17%	18%
IL 53/I-290 to I-294	19%	14%	19%	19%

Managed Lane Travel Time Savings

The estimated time savings that the managed lanes provide over the general purpose lanes is summarized in Table 26. As shown, over the entire 21.8 mile length, the managed lanes are anticipated to save drivers approximately 8 and 9 minutes in 2010. The time saved is estimated to increase to approximately 15 minutes by the year 2020. The managed lanes are anticipated to allow speeds of 55 mph.

Table 26: Managed Lane Time Savings

Section	Length (Miles)	Managed Lane Time Savings (Minutes)			
		2010		2020	
		AM Peak Inbound	PM Peak Outbound	AM Peak Inbound	PM Peak Outbound
IL 31 to IL 53/I-290	**12.1**	7.4	2.9	10.3	2.3
IL 53/I-290 to I-294	**9.7**	1.7	5.4	4.9	5.3
Entire Length	**21.8**	**9.1**	**8.3**	**15.2**	**7.7**

Estimated Toll Cost

Table 27 presents the estimated peak-period toll cost for using the managed lanes. Using the managed lanes during peak periods would cost motorists approximately $5 for the entire length of the managed lanes in 2010, rising to almost $6 in 2020.

Estimated Managed Lane Toll Revenue

Assuming the toll rate schedules presented previously, the estimated annual weekday managed lane revenue that could be generated is presented in Table 28. These toll revenue estimates are presented in 2010 dollars.

Table 29 presents twenty five year revenue streams developed by interpolating between the two years modeled, and extrapolating beyond 2020. An inflation-adjusted revenue stream was also developed assuming that toll rates rise at an average annual rate of 2.5 percent.

Table 27: Full-Length & Per-Mile Peak-Period Toll Rates

Section	Length (miles)	2010 Toll Rates (2010 $)			
		AM Peak Inbound		PM Peak Outbound	
		Full Length Toll ($)	Average Rate ($/mile)	Full Length Toll ($)	Average Rate ($/mile)
IL 31 to IL 53/I-290	12.1	$2.43	$0.20 *	$2.43	$0.20
IL 53/I-290 to I-294	9.7	$1.94	$0.20	$2.56	$0.26 *
Entire Length	**21.8**	**$4.37**	**$0.20**	**$4.99**	**$0.23**
Section	**Length (miles)**	**2020 Toll Rates (2010 $)**			
		AM Peak Inbound		**PM Peak Outbound**	
		Full Length Toll ($)	**Average Rate ($/mile)**	**Full Length Toll ($)**	**Average Rate ($/mile)**
IL 31 to IL 53/I-290	12.1	$3.33	$0.28 *	$2.43	$0.20
IL 53/I-290 to I-294	9.7	$2.56	$0.26 *	$2.91	$0.30 *
Entire Length	**21.8**	**$5.89**	**$0.27**	**$5.34**	**$0.24**

Notes: * Maximum toll rate tested $0.30/mile between Barrington Road and IL 53, and east of IL 53 - optimal toll higher

Table 28: Estimated Annual Weekday Toll Revenues

Section	Annual Weekday Toll Revenue (in 2010 $)	
	2010	2020
IL 31 to IL 53/I-290	$9,787,000	$11,951,000
IL 53/I-290 to I-294	$8,977,000	$17,305,000
Entire Length	**$18,764,000**	**$29,256,000**

Table 29: Estimated Annual Gross Toll Revenue

	Annual Gross Toll Revenue	
Year	In 2010 Dollars (1)	In Current Year Dollars (2)
2010	$18,764,000	$18,764,000
2011	$19,813,200	$20,632,600
2012	$20,862,400	$22,501,200
2013	$21,911,600	$24,369,800
2014	$22,960,800	$26,238,400
2015	$24,010,000	$28,107,000
2016	$25,059,200	$29,975,600
2017	$26,108,400	$31,844,200
2018	$27,157,600	$33,712,800
2019	$28,206,800	$35,581,400
2020	$29,256,000	$37,450,000
2021	$29,728,000	$38,291,000
2022	$30,725,000	$40,066,000
2023	$31,722,000	$41,841,000
2024	$32,718,000	$43,616,000
2025	$33,715,000	$45,392,000
2026	$34,712,000	$47,167,000
2027	$35,709,000	$48,942,000
2028	$36,705,000	$50,717,000
2029	$37,702,000	$52,492,000
2030	$38,699,000	$54,267,000
2031	$39,696,000	$56,043,000
2032	$40,692,000	$57,818,000
2033	$41,689,000	$59,593,000
2034	$42,686,000	$61,368,000
Total	**$771,008,000**	**$1,006,790,000**

Notes:
(1) From traffic and revenue analysis, reflecting values of time in 2010 dollars.
(2) Adjusted for inflation, assuming an average rate of 2.5 percent per year.

ESTIMATED MANAGED LANE TRAFFIC IMPACTS

Since a managed lane was assumed to be added to each direction of the Jane Addams Memorial Tollway, no negative traffic impacts are anticipated. The added capacity results in improved operation of the general purpose lanes, compared to the no-build baseline scenario. Consequently, no traffic diversions are anticipated for this corridor.

Modeling conducted by CMAP indicated negligible changes in transit use for the corridor resulting from the managed lanes.

STEVENSON EXPRESSWAY (I-55)

The Stevenson Expressway generally provides three mainline lanes in each direction between the Veterans Memorial Tollway (I-355) and the Dan Ryan Expressway (I-90/94), except for a portion of the segment from I-355 and Lemont Road.

A left-hand exit ramp is provided from the northbound Stevenson Expressway to Joliet Road, close to the Tri-State Tollway (I-294) system interchange. Accommodating this movement will present special challenges if a managed lane were added to the left of existing lanes.

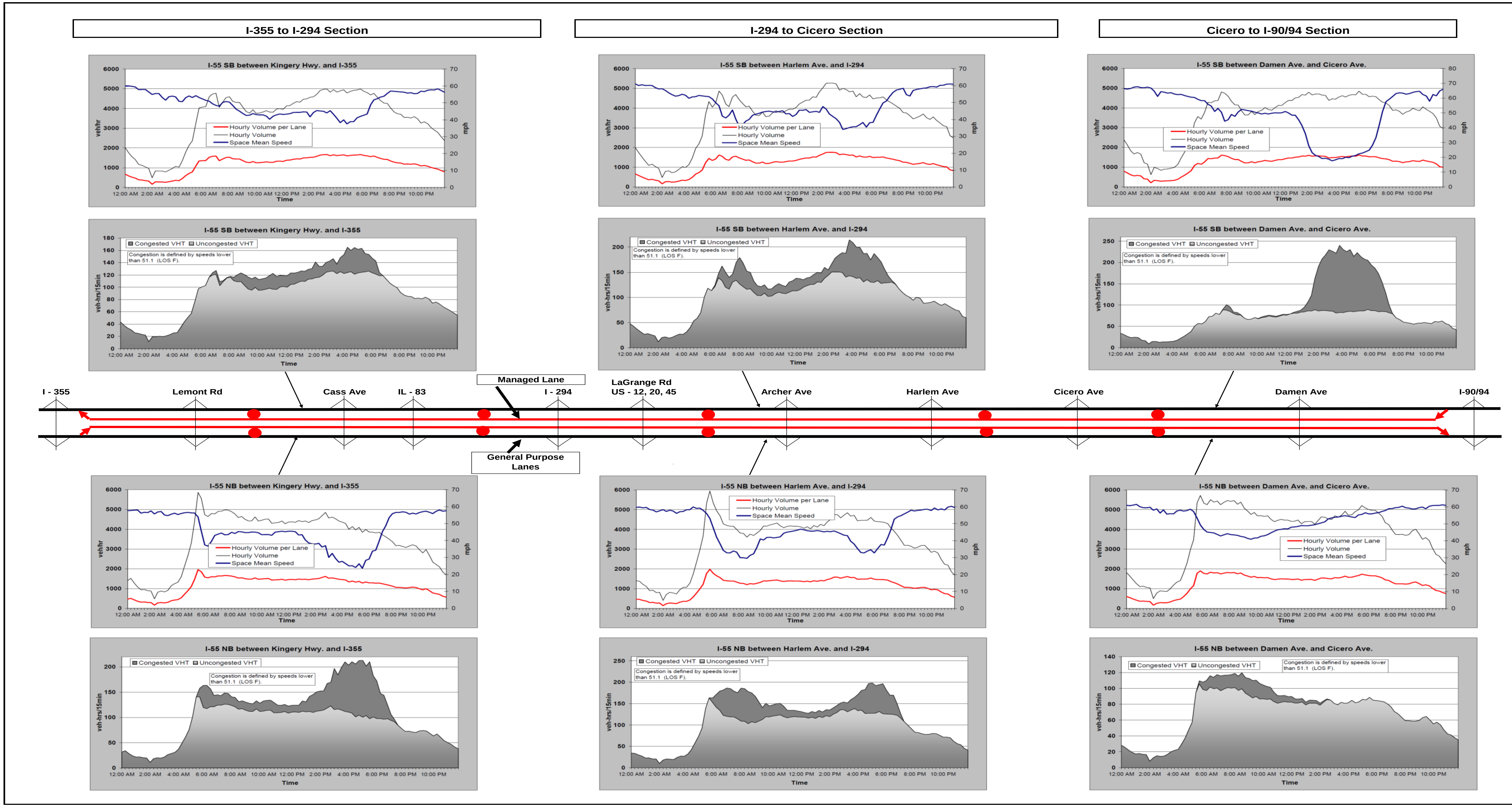
EXISTING TRAFFIC AND OPERATIONAL CHARACTERISTICS

The Stevenson Expressway exhibits moderate to severe congestion at several locations between I-355 and Cicero Avenue, with severe congestion between Cicero Avenue and the Dan Ryan Expressway. Travel speeds in the northbound (inbound) direction between I-355 and I-294 drop to about 40 mph in the morning peak, and deteriorate significantly to approximately 25 mph during the evening peak. From I-294 to Cicero Avenue, inbound speeds drop to 30-35 mph in both the morning and evening peak periods. However, east of Cicero Avenue, average speeds in the inbound direction drop to about 40 mph in the morning and generally remain above 45 mph for the evening peak period (Figure 51).

Travel speeds in the outbound direction between the Dan Ryan Expressway and Cicero Avenue are significantly worse, with evening peak period speeds reaching 20 mph for several hours. West of Cicero Avenue, speeds improve somewhat, generally exceeding 35 mph between Cicero Avenue and I-355.

Traffic demand on the Stevenson Expressway exhibits less directional peaking than the Jane Addams Memorial Tollway.

Figure 51: Traffic and Operational Characteristics – Stevenson Expressway (I-55)



ROADWAY SECTIONS EVALUATED

Three roadway sections were defined for conducting the traffic and revenue analysis – from the Veterans Memorial Tollway (I-355) to the Tri-State Tollway (I-294), from the Tri-State Tollway to Cicero Avenue, and from Cicero Avenue to the Dan Ryan Expressway (I-90/94).

A single, added, managed lane is assumed in each direction for the entire corridor – it is assumed that one out of the existing four lanes is converted to a managed lane in each direction between I-355 and Lemont Road. Figure 51 illustrates the assumed managed lanes, highlighted in red, and the assumed access locations between the managed and general purpose lanes (shown as red circles).

The managed lanes are assumed to extend from east of I-355 to east of I-90/94. This represents an approximately 23-mile managed lane corridor.

TOLL LEVELS NEEDED TO MANAGE TRAFFIC DEMAND AND MAINTAIN TRAVEL SPEEDS

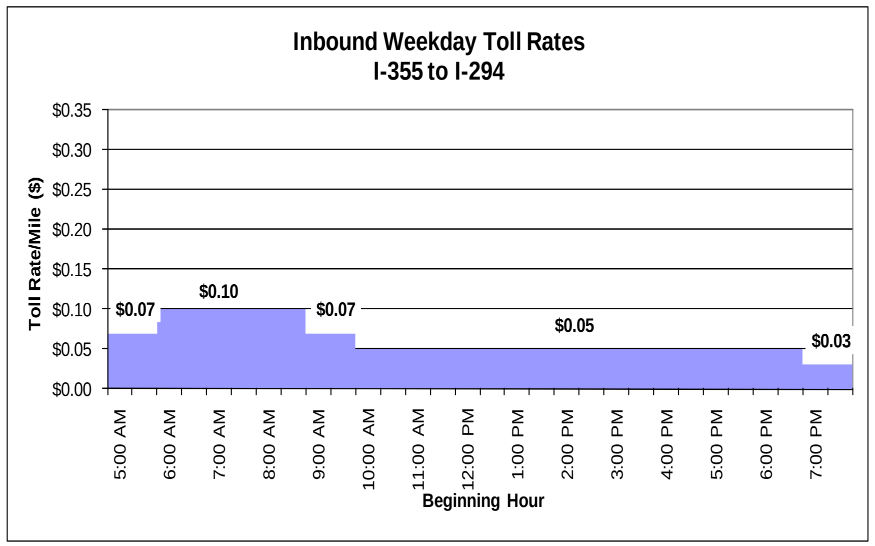
The toll rates required to manage traffic demand and maintain travel speeds in the managed lanes are presented for 2010 and 2020 in Figures 52 and 53, respectively. The toll rates are presented in 2010 dollars.

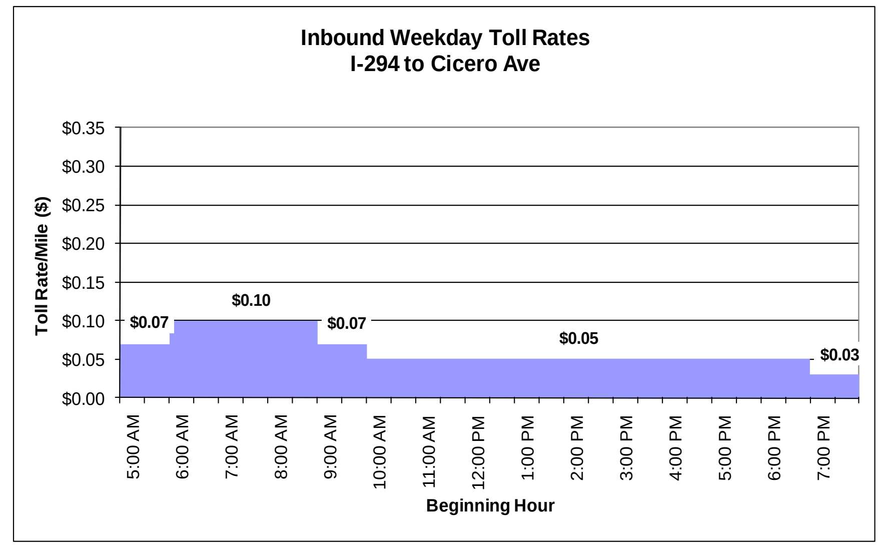
The estimated 2010 and 2020 toll rates reflect the traffic characteristics of the corridor. Higher toll rates for the section between Cicero Avenue and I-90/94, northbound in 2010, and both northbound and southbound in 2020, reflect heavy traffic demand in both morning and evening peak periods.

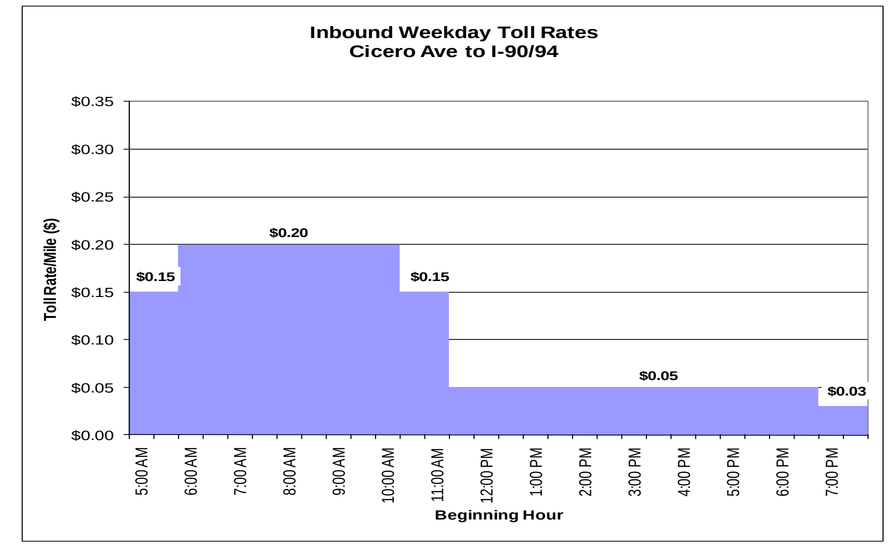
In 2020, although the maximum toll rate $0.30 per mile was estimated to be required to manage traffic demand in the outbound direction between the Dan Ryan Expressway and Cicero Avenue, the managed lane traffic did *not* exceed the assumed threshold of 1,600 vehicles/hour.

Figure 52: 2010 Estimated Average Toll Rates (2010 $)

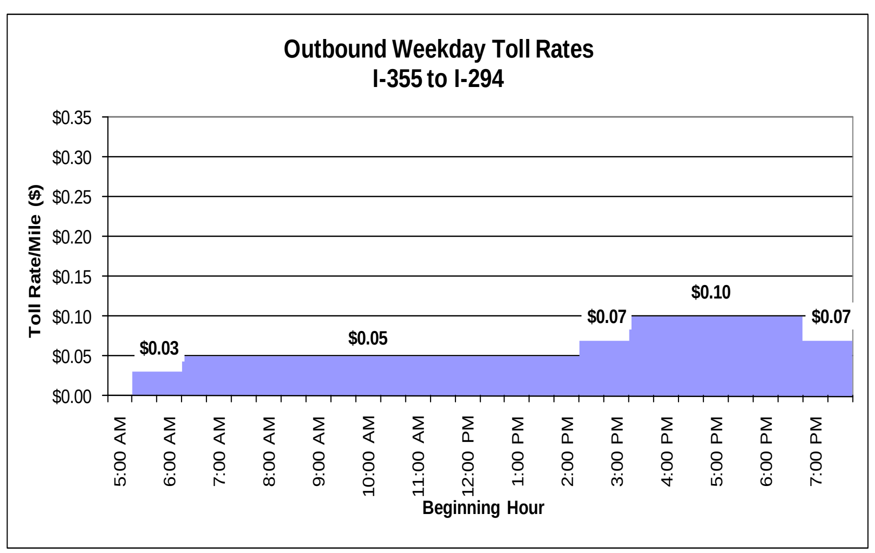
INBOUND WEEKDAY AVERAGE TOLL RATES

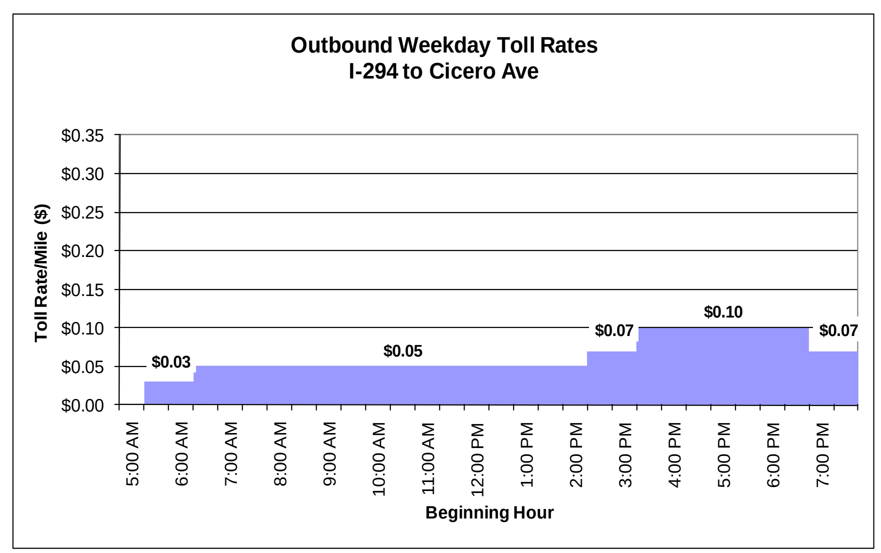






OUTBOUND WEEKDAY AVERAGE TOLL RATES





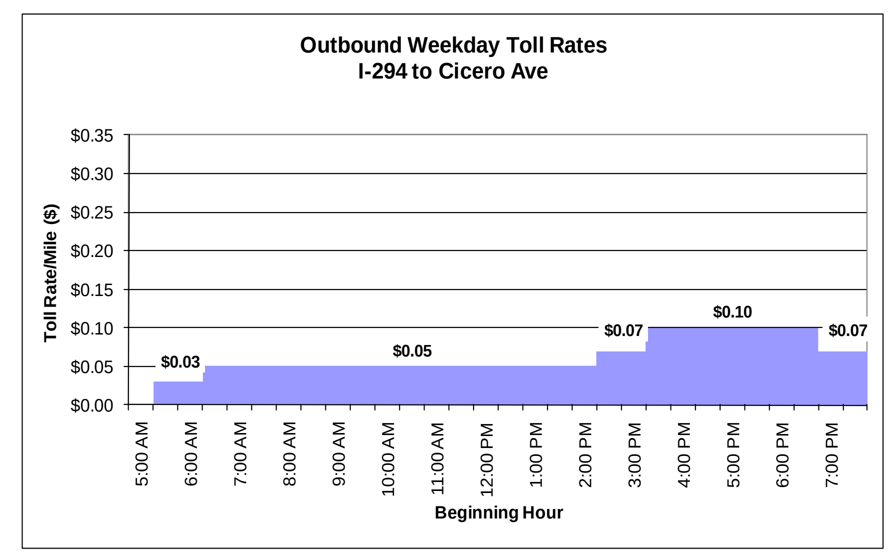
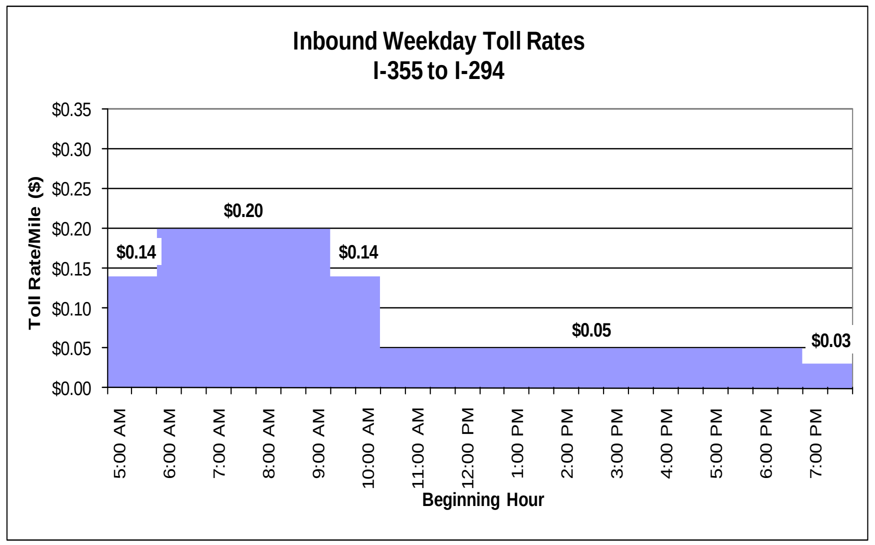
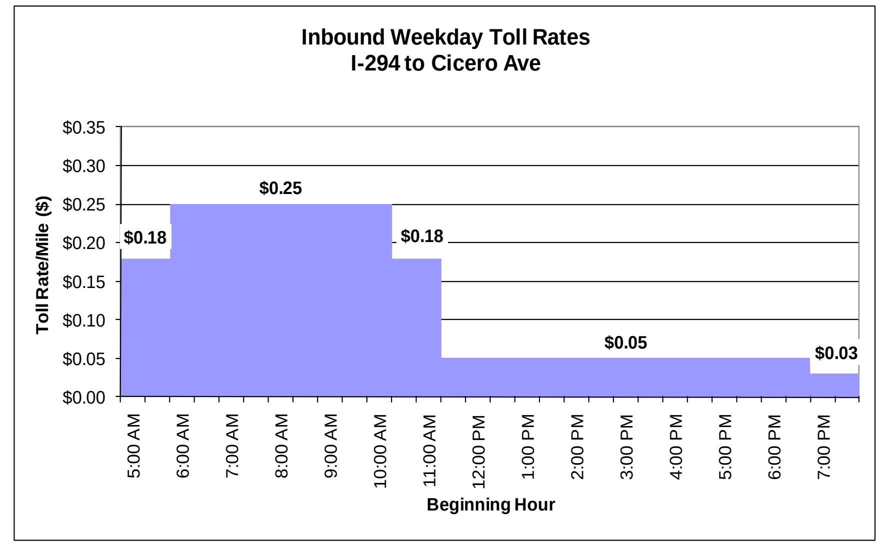
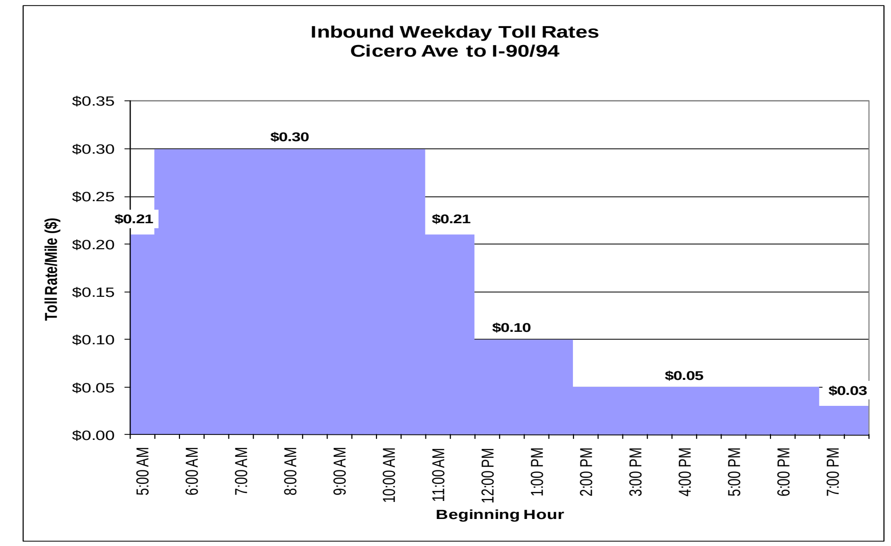


Figure 53: 2020 Estimated Average Toll Rates (2010 $)

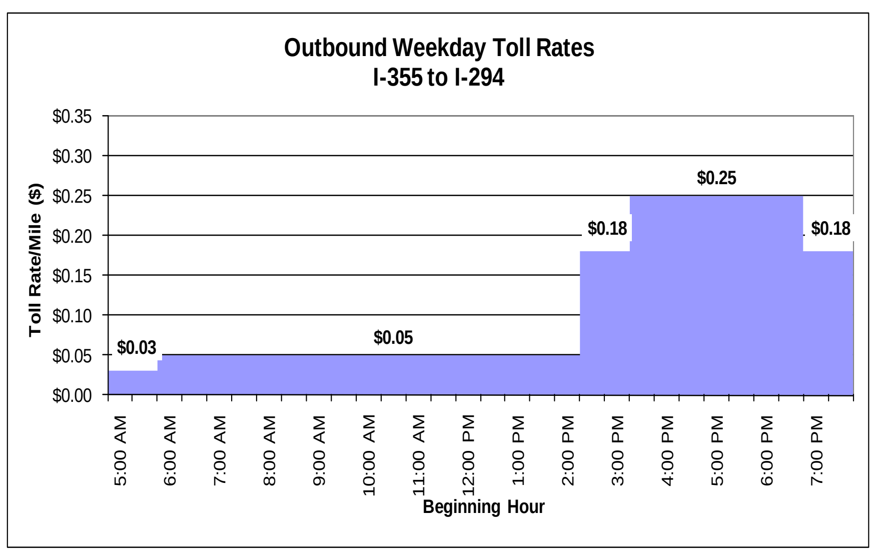
INBOUND WEEKDAY AVERAGE TOLL RATES

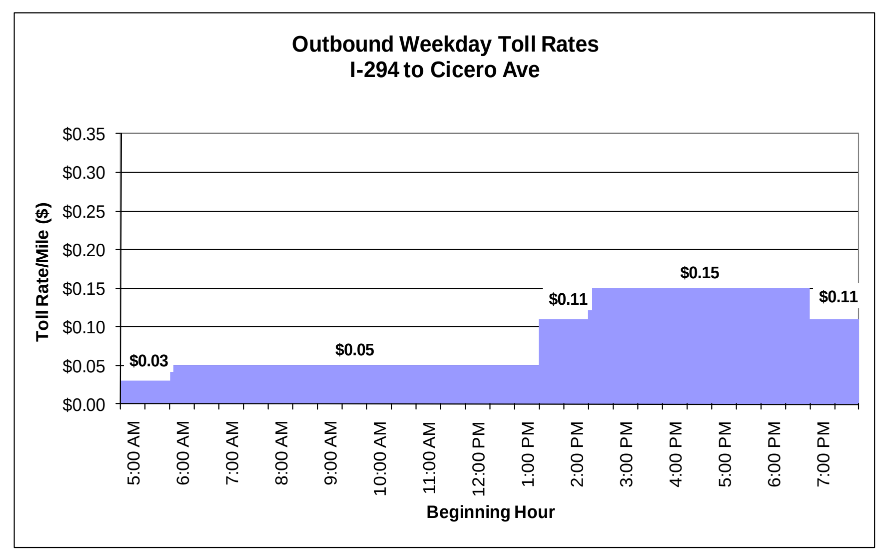


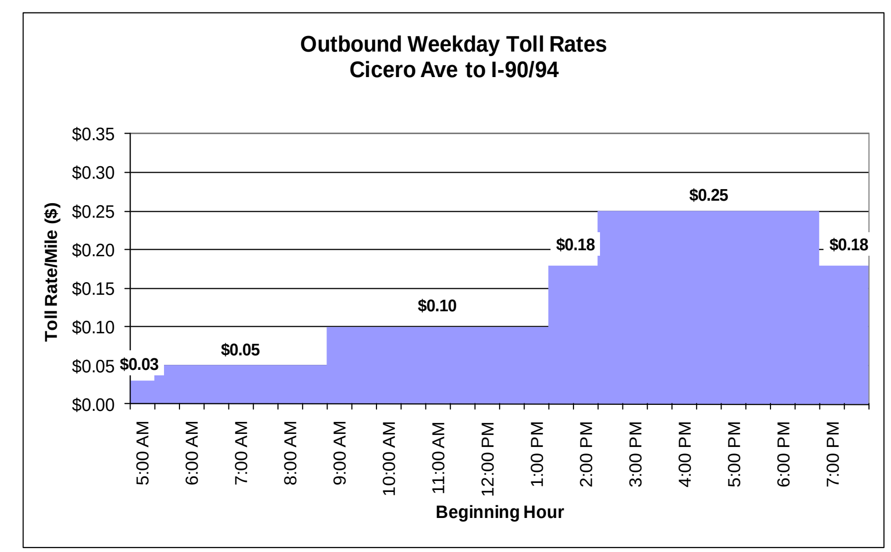




OUTBOUND WEEKDAY AVERAGE TOLL RATES







ESTIMATED MANAGED LANE TRAFFIC AND TOLL REVENUE

The estimated usage of the managed lane, the share of the corridor traffic carried by the managed lane and the estimated travel time savings that the managed lanes provide over the general purpose lanes are presented here for each of the morning and evening peak periods in 2010 and 2020. The estimates were developed assuming the per-mile toll rates presented in Figures 52 and 53.

The 2010 and 2020 total annual weekday toll revenue estimates assume 250 working days per year, and are presented in 2010 dollars. Subsequently, estimates of annual gross toll revenue are presented in both constant (2010) dollars, and inflation-adjusted dollars using an average annual rate of 2.5 percent. No adjustments were made for toll evasion and ramp up, and no discounts or toll-free passage are assumed for high-occupancy, low emission or alternative fueled vehicles.

Results are presented for three consolidated sections – I-355 to I-294, I-294 to Cicero Avenue, and Cicero Avenue to I-90/94.

Estimated Managed Lane Traffic

Table 30 summarizes the estimated average managed lane usage for the peak direction of the morning and evening peak periods. These estimates are provided on a per lane per hour basis.

The estimated usage of the managed lanes does not exceed the assumed acceptable threshold (1,600 vehicles/hour/lane) required to maintain free-flowing conditions on the Stevenson Expressway, even on the section between Cicero Avenue and I-90/94 where the maximum toll rate tested of $0.30 per mile was required to maintain free flowing conditions in the inbound direction during the morning peak period.

Managed Lane Market Share

The managed lanes on the Stevenson Expressway represent a quarter (25 percent) of the directional corridor capacity (1 of the 4 lanes available). The estimated share of corridor traffic carried by the managed lanes is presented in Table 31.

The managed lanes are estimated to carry between 17 and 21 percent of peak period corridor traffic, indicating efficient utilization of the managed lanes, in both 2010 and 2020.

Table 30: Managed Lane Usage

Section	Managed Lane Usage (Vehicles/Hour/Lane)			
	2010		2020	
	AM Peak Inbound	PM Peak Outbound	AM Peak Inbound	PM Peak Outbound
I-355 to I-294	1,140	1,220	1,390	1,400
I-294 to Cicero Avenue	1,520	1,280	1,430	1,560
Cicero Avenue to I-90/94	1,420	1,510	1,410	1,440

Table 31: Managed Lane Market Share

Section	Managed Lane Market Share			
	2010		2020	
	AM Peak Inbound	PM Peak Outbound	AM Peak Inbound	PM Peak Outbound
I-355 to I-294	17%	20%	20%	21%
I-294 to Cicero Avenue	21%	19%	20%	21%
Cicero Avenue to I-90/94	17%	20%	17%	19%

Managed Lane Travel Time Savings

The estimated time savings that the managed lanes provide over the general purpose lanes is summarized in Table 32. As shown, over the entire 23 mile length, the managed lanes are anticipated to save drivers approximately 3 to 5 minutes in 2010. The time saved is estimated to increase to approximately 6 minutes by the year 2020. The managed lanes are anticipated to allow speeds of 55 mph.

Table 32: Managed Lane Time Savings

Section	Length (Miles)	Managed Lane Time Savings (Minutes)			
		2010		2020	
		AM Peak Inbound	PM Peak Outbound	AM Peak Inbound	PM Peak Outbound
I-355 to I-294	8.2	0.8	0.3	1.3	0.6
I-294 to Cicero Avenue	9.1	1.4	1.7	1.7	1.9
Cicero Avenue to I-90/94	5.7	2.8	1.4	2.8	1.9
Entire Length	**23.0**	**5.1**	**3.4**	**5.8**	**4.5**

Estimated Toll Cost

Table 33 presents the estimated peak-period toll cost for using the managed lanes. Using the managed lanes during peak periods would cost motorists approximately $2.30 to $2.90 for the entire length of the managed lanes in 2010, rising to almost $4.40 to $5.30 in 2020.

Estimated Managed Lane Toll Revenue

Assuming the toll rate schedules presented previously, the estimated annual weekday managed lane revenue that could be generated is presented in Table 34. These toll revenue estimates are presented in 2010 dollars.

Table 35 presents twenty five year revenue streams developed by interpolating between the two years modeled, and extrapolating beyond 2020. An inflation-adjusted revenue stream was also developed assuming that toll rates rise at an average annual rate of 2.5 percent.

Table 33: Full-Length & Per-Mile Peak-Period Toll Rates

Section	Length (miles)	2010 Toll Rates (2010 $)			
		AM Peak Inbound		PM Peak Outbound	
		Full Length Toll ($)	Average Rate ($/mile)	Full Length Toll ($)	Average Rate ($/mile)
I-355 to I-294	8.2	$0.82	$0.10	$0.82	$0.10
I-294 to Cicero Avenue	9.1	$0.91	$0.10	$0.91	$0.10
Cicero Avenue to I-90/94	5.7	$1.14	$0.20	$0.57	$0.10
Entire Length	**23.0**	**$2.87**	**$0.12**	**$2.30**	**$0.10**
Section	**Length (miles)**	**2020 Toll Rates (2010 $)**			
		AM Peak Inbound		**PM Peak Outbound**	
		Full Length Toll ($)	**Average Rate ($/mile)**	**Full Length Toll ($)**	**Average Rate ($/mile)**
I-355 to I-294	8.2	$1.34	$0.16	$1.60	$0.19
I-294 to Cicero Avenue	9.1	$2.28	$0.25	$1.37	$0.15
Cicero Avenue to I-90/94	5.7	$1.71	$0.30	$1.42	$0.25
Entire Length	**23.0**	**$5.32**	**$0.23**	**$4.39**	**$0.19**

Table 34: Estimated Annual Weekday Toll Revenues

Section	Annual Weekday Toll Revenue (in 2010 $)	
	2010	2020
I-355 to I-294	$2,987,000	$6,981,000
I-294 to Cicero Avenue	$4,269,000	$9,510,000
Cicero Avenue to I-90/94	$4,116,000	$8,004,000
Entire Length	**$11,372,000**	**$24,495,000**

Table 35: Estimated Annual Gross Toll Revenue

	Annual Gross Toll Revenue	
Year	In 2010 Dollars (1)	In Current Year Dollars (2)
2010	$11,372,000	$11,372,000
2011	$12,684,300	$13,370,400
2012	$13,996,600	$15,368,800
2013	$15,308,900	$17,367,200
2014	$16,621,200	$19,365,600
2015	$17,933,500	$21,364,000
2016	$19,245,800	$23,362,400
2017	$20,558,100	$25,360,800
2018	$21,870,400	$27,359,200
2019	$23,182,700	$29,357,600
2020	$24,495,000	$31,356,000
2021	$25,086,000	$32,255,000
2022	$26,332,000	$34,154,000
2023	$27,579,000	$36,052,000
2024	$28,826,000	$37,951,000
2025	$30,072,000	$39,849,000
2026	$31,319,000	$41,748,000
2027	$32,566,000	$43,646,000
2028	$33,812,000	$45,545,000
2029	$35,059,000	$47,443,000
2030	$36,306,000	$49,342,000
2031	$37,552,000	$51,240,000
2032	$38,799,000	$53,139,000
2033	$40,046,000	$55,037,000
2034	$41,292,000	$56,936,000
Total	**$661,914,500**	**$859,341,000**

Notes:
(1) From traffic and revenue analysis, reflecting values of time in 2010 dollars.
(2) Adjusted for inflation, assuming an average rate of 2.5 percent per year.

ESTIMATED MANAGED LANE TRAFFIC IMPACTS

Similar to the Jane Addams Memorial Tollway, a managed lane added to each direction of the Stevenson Expressway is not anticipated to result in negative traffic impacts. The added capacity improved operation of the general purpose lanes, compared to the no-build baseline scenario. Consequently, no traffic diversions are anticipated for this corridor.

Modeling conducted by CMAP indicated negligible changes in transit use for the corridor resulting from the managed lanes.

WHAT ARE THESE TRAFFIC AND REVENUE ESTIMATES INTENDED TO BE USED FOR?

The analysis conducted for the three selected corridors and the revenue estimates presented here are intended to provide an indication of the range of toll rates that may be needed to manage traffic demand on the facility, and to provide a sketch-level estimate of toll revenues for planning purposes. These revenues are not intended for use in the financing of these facilities. No adjustments were made for ramp-up or toll evasion, and no discounts or toll-free passage is analyzed for HOV/low-emission/alternative fueled vehicles. Furthermore, estimates of managed lane usage and traffic operations are based on the regional travel model. Detailed operations analyses were not conducted as part of the study. Additional traffic and revenue, operations and design studies will be required prior to implementation.

CHAPTER 11

HIGH LEVEL TOLL COLLECTION COSTS

OVERVIEW

Since each of the selected study corridors – Kennedy Expressway, Jane Addams Memorial Tollway, and the Stevenson Expressway – currently experience significant traffic congestion, investments in these facilities will be required in the near to mid term. Among these corridors, while the section of the Kennedy Expressway between the Edens Expressway and Ohio Street is most in need of additional capacity, the corridor is heavily built up and few opportunities exist for acquiring the right-of-way (ROW) needed for widening. On the other hand, widening of the Jane Addams Memorial Tollway and Stevenson Expressway, although expensive to implement, is feasible. This has been recognized by the region; with their inclusion among major capital projects identified by the Draft 2040 Regional Transportation Plan. While funding has not yet been committed for widening of these two corridors, they are included on the fiscally constrained list of projects, meaning that their capital costs can be covered within the regions' expected transportation revenue.

Congestion pricing typically does not generate sufficient toll revenue to fully cover the capital costs of new expressway lanes. The estimation of the capital costs of roadway construction required for implementation of congestion pricing on the three selected corridors was beyond the scope of this study. Among the three corridors, the reversible lanes on the Kennedy Expressway (I-90) exist today, and are not anticipated to require major modifications other than toll collection equipment, communication and additional signing.

It is generally recommended that congestion pricing be implemented in cases where the revenue collected, at a minimum, covers the cost of toll collection equipment and annual toll collection operating and maintenance (O&M) costs. Therefore, high-level estimates were developed of the cost of toll collection equipment and annual O & M costs for each selected corridor, based on prior efforts performed by the Illinois Tollway, or published reports of congestion pricing feasibility studies and implementations elsewhere in the country. The cost estimates are then compared to the estimated toll revenue generated by each of the three selected corridors to assess the net revenue available for enhanced transit or travel options for the corridor.

ASSUMED TOLL COLLECTION SYSTEM

The toll collection system for the managed lanes is assumed to provide the following elements:

- Open road tolling - exclusive use of electronic toll collection that record either a toll or violation transaction at the prevailing highway speed in non-stop, continuous highway lanes. Tolling is typically accomplished electronically by reading an encoded transponder attached to the vehicle's windshield by an overhead antenna.
- The managed lane projects use identical ETC technology employed by the Illinois Tollway, leveraging the high penetration of I-PASS, the Illinois Tollway's ETC program;
- Accommodation of either "pre-set" time of day (TOD) or "dynamic" variable pricing to more accurately capture the increasing value of the differential time savings realized during periods of congested flow.
- Pricing can be transactional based, whereby a user charge is recorded for each transponder read, or trip based, whereby a single user charge consisting of one or more transponder reads is recorded for each directional trip on the express toll lanes. For this analysis, trip based, TOD pricing is assumed for all managed lanes because it can be posted along the facility, documented in various forms of distributed user information and advertised through the media. This combination is expected to minimize potential confusion regarding the current price to use the toll facility, and thereby reduce the customer service center call volume.

FIELD SUPPORT STRUCTURES

Physical implementation of ETC typically involves installation of gantry or bridge and cantilever structures above the mainline express toll lanes and access points, respectively, to mount antennae to transmit signals between either a small toll and communication building or roadside cabinet housing an ETC reader/controller and the vehicle mounted transponder.

ELECTRONIC TOLL COLLECTION EQUIPMENT

Managed lanes are assumed as all-electronic facilities, with no provisions for cash toll collection. To assure interoperability, the transponder and other ETC equipment are assumed to be compatible with the transponder and equipment used on the Illinois Tollway. In addition, one lane controller is assumed per direction to more efficiently handle cross lane reads, vehicles straddling two lanes and violation trigger messages.

VIOLATION ENFORCEMENT SUBSYSTEM EQUIPMENT

Managed lanes require the implementation of a violation enforcement subsystem (VES) to capture the license plates of vehicles that fail to record a valid transaction when traveling through a tolling point. This subsystem captures multiple license plate images of violating vehicles traveling in the managed lane or adjacent shoulders, if sufficiently wide.

EXPRESS LANE SIGNING

Dynamic message signs (DMS) would typically be installed in advanced of the managed lane facility to notify prospective users of the approaching facility, locations serviced by the facility and selected pricing information. Notification of the current managed lane trip charges for selected destinations will be made using the DMS signs. Fixed static signs are also assumed to inform users of approaching exits, posted speed limits, violator fines, and other pertinent managed lane information.

HOST COMPUTER SUBSYSTEM

The host computer system processes, stores and reports transactions and maintenance events received from the lane controllers. In turn, the host computer sends ETC and account information, time synchronization and configuration data to the lane controllers. A primary function of the host computer system is to support the accounting and reconciliation process needed to accurately report revenues and expenses. The host computer system interfaces with a customer service and account management subsystem to send valid ETC transactions and receive transponder status lists and updates to the list.

CUSTOMER SERVICE AND ACCOUNT MANAGEMENT SUBSYSTEM

The customer service and account management subsystem supports the back-office operations for ETC including functions such as opening and closing an account, account management, transponder inventory and tracking, generating reports, and interfaces to a credit card clearinghouse, the violation processing subsystem, and the host computer subsystem. These functions would also be available from the Illinois Tollway and a Web site. A call center supporting customer calls regarding account establishment and management, ancillary issues related to the operation of the managed lanes, and calls from violators requesting information on violation citations is required, and are also assumed to be provided by the Illinois Tollway.

VIOLATION PROCESSING SUBSYSTEM

The violation processing subsystem processes violations using license plate images and violation transactions transmitted from the violation enforcement subsystem. This subsystem performs functions such as review and confirmation of video images, issuing tracking, and aging citations, processing payments, generating hearing evidence packages and interfacing with the Department of Motor Vehicles, the VES subsystem and customer service subsystem. It is assumed that the Illinois Tollway's existing toll violation system will be used to process managed lane violations.

TOLL COLLECTION CAPITAL COST ELEMENTS

The toll system capital costs are typically subdivided into the following categories:

- Structures - The capital cost for overhead equipment mounting structures and roadside structures for housing equipment.
- Communications - The capital cost for installing a fiber optic communication backbone interconnecting dynamic and changeable signs and tolling points with the local carriers network interconnection.
- Power - The capital cost to install electrical and power backup to the roadside structure housing transaction processing and communication equipment.

- Electronic Toll Collection (ETC) - The capital cost to furnish and install the components of the ETC subsystem to record transactions that are used to build trips and charge accounts for facility usage.
- Vehicle Detection and Violation Trigger - The capital cost to furnish and install the detection and triggering components of the violation enforcement system that is implemented to assure the integrity of the System by issuing citations to users who fail to obtain a valid transponder to use the facility.
- Violation Enforcement System - The capital cost to furnish and install the components of the of the violation enforcement system that is implemented to assure the integrity of the System by issuing citations to users who fail to obtain a valid transponder to use the facility.
- Lane Processing - The capital cost to furnish and install the lane processing equipment used to identify valid transactions based on the transponder ID read from the vehicle, coordinate updates to the list of transponder ID, and build transaction records that are subsequently used to build trips by the customer service center server.
- Vehicle Access Control - The capital cost to furnish and install overhead dynamic message and combined fixed, static and changeable message signs for informing users regarding the approaching managed lane facility and the trip charges to various destinations.
- Host Processing - The capital cost for the host computer system that is located at the agency's office used to process the transactions sent from the lane processing equipment and then forwarded to the customer service center server.
- Project Delivery - The capital costs for the System Integrator's project management, document preparation in accordance with the contract and successful system and acceptance testing as a condition of acceptance by the Agency.

TOLL COLLECTION ANNUAL OPERATIONS AND MAINTENANCE COST ELEMENTS

Annual toll collection O & M costs are the costs incurred annually to operate and maintain the toll system. The two categories of costs included are administration and maintenance.

Administration costs are the expenses incurred by the agency to manage operations and maintenance, and perform the audit and reconciliation activities required. This includes daily review of system, revenue and violation performance to identify anomalies and trends. The Illinois Tollway's host computer system is assumed to be used to process managed lane transactions, with modifications, and the customer service and violation processing functions are provided by the Illinois Tollway. Payment for these services to the Illinois Tollway is included in the cost estimates developed.

The maintenance category includes the cost to maintain the field level toll system equipment. This work is performed by trained technicians, who must be provided with a vehicle, a cell phone, test equipment, and tools to perform preventative maintenance and restore failures.

ASSUMED TOLL COLLECTION CAPITAL AND O&M COSTS

A variety of published studies were reviewed to determine appropriate assumptions of toll collection capital (equipment) and O&M costs. Based on these studies, typical costs were developed on a lane-mile basis for application in this study.

Table 36 summarizes the unit capital and O&M costs.

Table 36: Assumed Capital and O&M Costs

Assumed Toll Collection Costs Per Lane-Mile (in 2010 $)	
Capital Cost	Annual O&M Cost
$625,000	$172,500

These unit costs were used to develop estimated capital and O&M costs for each of the three corridors. Tables 37 to 39 compare these costs to the gross toll revenues estimated for each managed lane corridor to provide an estimate of the net revenue that is available for managed lane construction and transit or roadway improvements.

Table 37: Estimated Net Toll Revenue – Kennedy Expressway Reversible Lanes

Year	Gross Toll Revenue (2010 $)	Capital Cost (2010 $)	Annual O&M Cost (2010 $)	Net Toll Revenue (2010 $)
2010	$13,970,000	$20,000,000	$5,520,000	($11,550,000)
2011	$14,887,000		$5,520,000	$9,367,000
2012	$15,804,000		$5,520,000	$10,284,000
2013	$16,721,000		$5,520,000	$11,201,000
2014	$17,638,000		$5,520,000	$12,118,000
2015	$18,555,000		$5,520,000	$13,035,000
2016	$19,472,000		$5,520,000	$13,952,000
2017	$20,389,000		$5,520,000	$14,869,000
2018	$21,306,000		$5,520,000	$15,786,000
2019	$22,223,000		$5,520,000	$16,703,000
2020	$23,140,000		$5,520,000	$17,620,000
2021	$24,057,000		$5,520,000	$18,537,000
2022	$24,974,000		$5,520,000	$19,454,000
2023	$25,891,000		$5,520,000	$20,371,000
2024	$26,808,000		$5,520,000	$21,288,000
2025	$27,725,000		$5,520,000	$22,205,000
2026	$28,642,000		$5,520,000	$23,122,000
2027	$29,559,000		$5,520,000	$24,039,000
2028	$30,476,000		$5,520,000	$24,956,000
2029	$31,393,000		$5,520,000	$25,873,000
2030	$32,310,000		$5,520,000	$26,790,000
2031	$33,227,000		$5,520,000	$27,707,000
2032	$34,144,000		$5,520,000	$28,624,000
2033	$35,061,000		$5,520,000	$29,541,000
2034	$35,978,000		$5,520,000	$30,458,000
Total	**$624,350,000**	**$20,000,000**	**$138,000,000**	**$466,350,000**

Table 38: Estimated Net Toll Revenue – Jane Addams Memorial Tollway

Year	Gross Toll Revenue (2010 $)	Capital Cost (2010 $)	Annual O&M Cost (2010 $)	Net Toll Revenue (2010 $)
2010	$18,764,000	$27,500,000	$7,590,000	($16,326,000)
2011	$19,813,200		$7,590,000	$12,223,200
2012	$20,862,400		$7,590,000	$13,272,400
2013	$21,911,600		$7,590,000	$14,321,600
2014	$22,960,800		$7,590,000	$15,370,800
2015	$24,010,000		$7,590,000	$16,420,000
2016	$25,059,200		$7,590,000	$17,469,200
2017	$26,108,400		$7,590,000	$18,518,400
2018	$27,157,600		$7,590,000	$19,567,600
2019	$28,206,800		$7,590,000	$20,616,800
2020	$29,256,000		$7,590,000	$21,666,000
2021	$29,728,000		$7,590,000	$22,138,000
2022	$30,725,000		$7,590,000	$23,135,000
2023	$31,722,000		$7,590,000	$24,132,000
2024	$32,718,000		$7,590,000	$25,128,000
2025	$33,715,000		$7,590,000	$26,125,000
2026	$34,712,000		$7,590,000	$27,122,000
2027	$35,709,000		$7,590,000	$28,119,000
2028	$36,705,000		$7,590,000	$29,115,000
2029	$37,702,000		$7,590,000	$30,112,000
2030	$38,699,000		$7,590,000	$31,109,000
2031	$39,696,000		$7,590,000	$32,106,000
2032	$40,692,000		$7,590,000	$33,102,000
2033	$41,689,000		$7,590,000	$34,099,000
2034	$42,686,000		$7,590,000	$35,096,000
Total	**$771,008,000**	**$27,500,000**	**$189,750,000**	**$553,758,000**

Table 39: Estimated Net Toll Revenue – Stevenson Expressway

Year	Gross Toll Revenue (2010 $)	Capital Cost (2010 $)	Annual O&M Cost (2010 $)	Net Toll Revenue (2010 $)
2010	$11,372,000	$30,000,000	$8,280,000	($26,908,000)
2011	$12,684,300		$8,280,000	$4,404,300
2012	$13,996,600		$8,280,000	$5,716,600
2013	$15,308,900		$8,280,000	$7,028,900
2014	$16,621,200		$8,280,000	$8,341,200
2015	$17,933,500		$8,280,000	$9,653,500
2016	$19,245,800		$8,280,000	$10,965,800
2017	$20,558,100		$8,280,000	$12,278,100
2018	$21,870,400		$8,280,000	$13,590,400
2019	$23,182,700		$8,280,000	$14,902,700
2020	$24,495,000		$8,280,000	$16,215,000
2021	$25,086,000		$8,280,000	$16,806,000
2022	$26,332,000		$8,280,000	$18,052,000
2023	$27,579,000		$8,280,000	$19,299,000
2024	$28,826,000		$8,280,000	$20,546,000
2025	$30,072,000		$8,280,000	$21,792,000
2026	$31,319,000		$8,280,000	$23,039,000
2027	$32,566,000		$8,280,000	$24,286,000
2028	$33,812,000		$8,280,000	$25,532,000
2029	$35,059,000		$8,280,000	$26,779,000
2030	$36,306,000		$8,280,000	$28,026,000
2031	$37,552,000		$8,280,000	$29,272,000
2032	$38,799,000		$8,280,000	$30,519,000
2033	$40,046,000		$8,280,000	$31,766,000
2034	$41,292,000		$8,280,000	$33,012,000
Total	**$661,914,500**	**$30,000,000**	**$207,000,000**	**$424,914,500**

CHAPTER 12

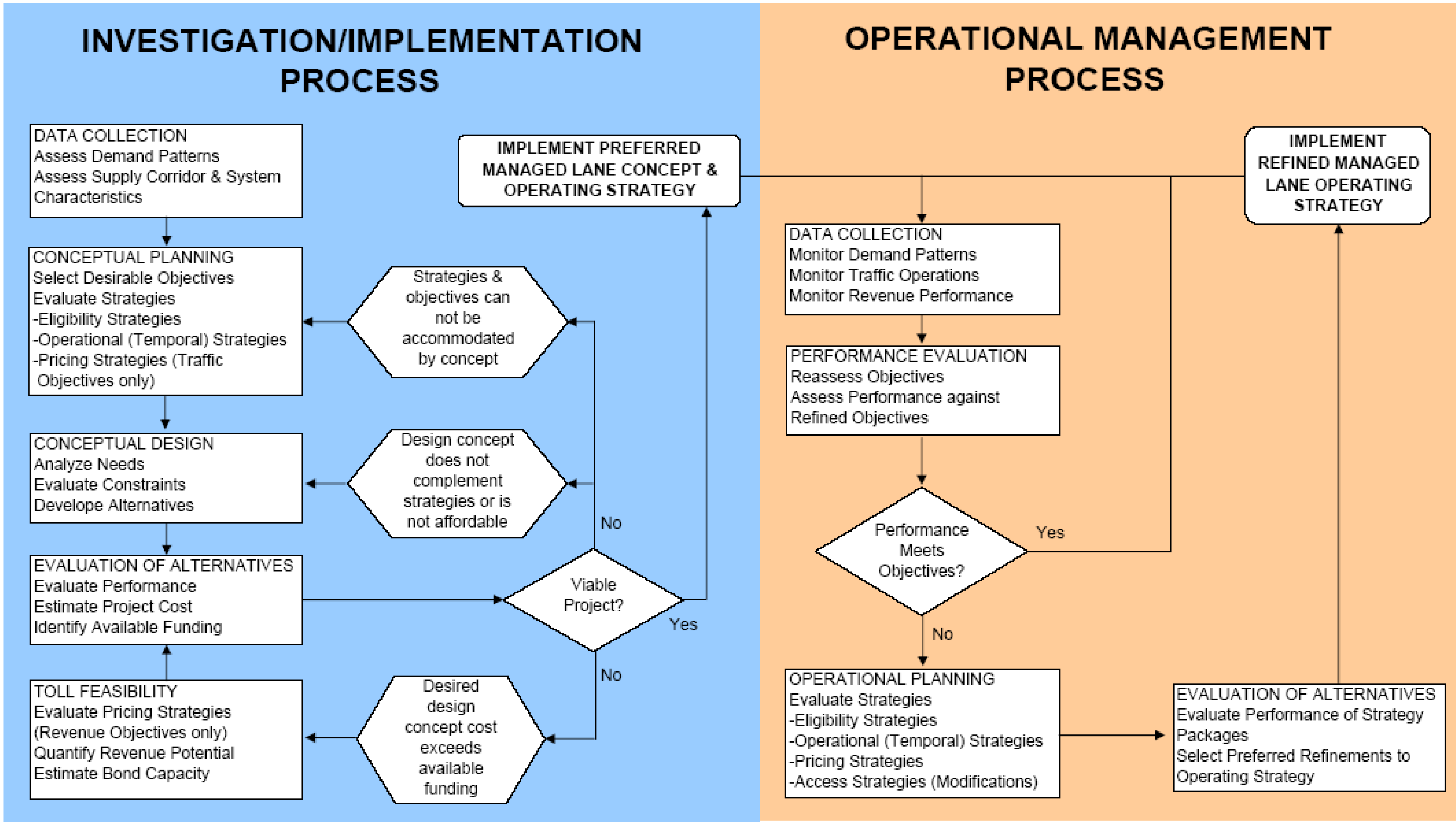
MANAGED LANE IMPLEMENTATION & NEXT STEPS

OVERVIEW

The implementation of a managed lane facility requires the evaluation of a myriad of elements, as depicted in Figure 54. The process begins with an investigation /implementation phase, which leads to construction of a managed lane facility under certain initial operating strategies with the intent to meet defined primary objectives. Upon implementation of the project, an ongoing monitoring, evaluation and adjustment process is then needed to refine or modify the operating strategies as conditions deviate from the opening year conditions.

The managed lane investigation/implementation process on the left side of Figure 54 is a rational sequence of procedures and considerations required to identify candidate operating strategies, evaluate cross section design and access requirements, and assess the effectiveness of the project against specific management objectives. The process is an extension of the project implementation process that leads to a conceptual design and operating strategy for the managed lane project. When pricing strategies are incorporated, the process includes a toll feasibility evaluation process during the early stages. Financial management objectives are weighed against operational and user objectives to achieve a viable business plan that quantifies toll revenue as a funding source for use in implementing the project, and/or operating and maintaining it.

Figure 54: Managed Lane Process Flow Chart



Major elements of the process include data collection, conceptual planning, conceptual design, performance evaluation and toll feasibility. Each one of the elements has an influence on the other such that a feedback loop is necessary when evaluating the suitability of the strategies to meet established objectives. The individual elements of the implementation process are briefly described below.

DATA COLLECTION

A data collection effort is generally necessary to obtain the geometric and operational information within a corridor that helps in assessing what strategy packages and design concepts would be effective to manage the travel markets that the facility will serve. Data elements needed to perform an effective analysis can be classified into three groups: characteristics of the transportation demand, characteristics of the transportation supply, and the regional highway network characteristics.

CONCEPTUAL PLANNING

Conceptual strategy planning links the corridor travel characteristics to appropriate operational strategies and design characteristics to achieve desired objectives. This process can begin with the operational and user objectives to see if a viable concept can be identified that meets defined objectives. If the objectives cannot be achieved solely using eligibility, operational and access control strategies, pricing strategies can then be accessed to gauge their effectiveness in achieving the operational and user objectives. Obviously, if the project requires additional funding sources outside of the available tax funding, revenue objectives may begin to take on a higher priority.

The sequential process typically used to help identify candidate strategies begins with a look at the eligibility strategies. Their effectiveness is assessed in relation to the size and composition of the eligible user groups that would be best served by the managed lanes. The operational flexibility is then evaluated to address the fluctuating and volatile nature of the identified corridor demand to determine the proper segmentation of the markets into respective time periods. Finally, pricing strategies are integrated to complement the eligibility and operational strategies. The pricing can also be used to fine tune/optimize the demand to satisfy the desired overall objectives.

CONCEPTUAL DESIGN

The conceptual design evaluation considers the corridor's physical constraints and influence of traffic characteristics in establishing a concept for the facility. Design characteristics are briefly summarized below:

- *Project Limits:* The length of the managed lanes should extend through the entire length of congested operations in the general use lanes.
- *Directionality Evaluation:* The directionality of traffic patterns determines whether a one-way reversible facility will be more effective than a two-way facility.
- *Access Pattern Evaluation:* An evaluation of ramp volumes and origin-destination data reveals the most effective locations for managed lane access.
- *Lane Requirements and Cross Section Design:* Available right-of-way may dictate practical limitations to the cross section of a managed lane facility.

As part of this conceptual design, another critical factor that must be considered pertains to the communication and signage of the managed lane strategies. The level of complexity for managed lane strategies are in most cases constrained by the amount of information that can be effectively relayed to the users of the facility. Multiple price segmentations by vehicle type, eligibility and time period can very quickly become too overwhelming for users to understand. Therefore, a simplistic and easy to understand strategy is preferred. Drivers' abilities to interpret the signage coupled with the limited space most signs have to display the critical information to the travelers further supports the need for the implementation of a simpler overall strategy. This is even more critical in the implementation of a long dynamically priced facility where individuals may experience several rate changes while they are traveling in the managed lane facility.

MERGING OF STRATEGIES AND DESIGN CONCEPT OPTIONS

Following the determination of effective strategies and possible design concepts, the two are merged to achieve a set of project implementation alternatives. Managed lane strategies provide a wide range of travel demand management options that can effectively adapt to changing conditions regardless of physical or operational constraints. Figure 54 illustrates a feedback process to reassess objectives, strategies and concepts based on factors other than viability (cost versus funding and revenue). The natural sequence in determining a suitable managed lane strategy for a defined corridor includes:

- Evaluate the managed lane capacity and access requirements to support desired eligibility/operations strategies.
- Evaluate the order of magnitude of costs required to provide minimal, desirable and optimal design characteristics.
- Consider the trade-off between available funding and the cost to provide different levels of design.
- Consider flexible pricing strategies to assist in maintaining defined LOS criteria under different eligibility strategies that also provides the desired revenue generation potential.
- Prioritize the objectives and implement a strategy package that is best suited to meet the established objectives.
- Provide the flexibility to restructure strategies as corridor characteristics evolve.

Ongoing Monitoring and Maintenance of Managed Lane Facilities

Upon implementation of the managed lane facility, a monitoring system is necessary to evaluate the effectiveness of current operating strategies and to determine when a refinement or restructuring becomes necessary. The right half of Figure 54 illustrates the typical ongoing management and maintenance process for managed lanes implementation. Key components include the monitoring of demand patterns and performance, assessing options to improve performance, refining operating strategy packages and procedures and, in some cases, refining objectives and priorities.

As travel patterns evolve, so will the need to enhance operating strategies from fixed/peak to variable, or variable to dynamic control levels. A fundamental change in demand patterns, transportation network characteristics, and/or policies may also provoke the need to refine the overall objectives and priorities applied to a managed lane facility from time to time. The advancement of technology in the implementation of toll collection systems, violation enforcement, vehicle occupancy detection, and vehicle classification systems all play a role in the degree of flexibility available for different strategy implementation.