CENTRAL TEXAS
Regional Mobility Authority

AGENDA ITEM #8 SUMMARY

Authorize a traffic engineering analysis and a traffic impact report by the Center for Transportation Research at the University of Texas at Austin on northbound traffic from the proposed Loop 1 South express lanes exiting to West César Chavez Street.

Strategic Plan Relevance: Regional Mobility

Department: Engineering

Associated Costs: To be determined

Funding Source: To be determined

Board Action Required: Yes (by motion)

Description of Matter: In 2012 in connection with the review of the MoPac Improvement Project, we asked the Network Modeling Center of the Center for Transportation Research, University of Texas at Austin ("CTR") to study the potential impact of traffic exiting from MoPac Express Lanes onto Cesar Chavez and 5th Streets. That study contributed to the discussions with stakeholders on the MoPac Improvement Project and guided our decisions.

As the environmental review for the MoPac South project continues, questions have been raised about the traffic impact from northbound traffic exiting the proposed MoPac express lanes to West César Chavez Street and how that affects area streets. With Board authorization, the Executive Director will engage CTR study and report on traffic exiting the MoPac South Express Lanes onto West César Chavez Street to travel downtown.

Backup material: 2012 Report on MoPac Improvement Project Managed Lanes Traffic Impact

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MoPac Managed Lanes – Analysis of the Impact on Cesar Chavez and 5th Streets

Prepared by the Network Modeling Center at The University of Texas at Austin

For the Texas Department of Transportation

May 29, 2012

THE UNIVERSITY OF TEXAS AT AUSTIN
Network Modeling Center

Objective:

Analyze the impact of prohibiting southbound MoPac Expressway Managed Lane drivers from exiting onto 5th Street.

Summary of Method:

Use a Dynamic Traffic Assignment (DTA) model to compare three conditions on MoPac: 1) managed lanes where southbound drivers can exit onto Cesar Chavez St., but not 5th Street, 2) managed lanes with southbound exits onto Cesar Chavez and 5th Streets, and 3) no managed lanes. The DTA model takes as input an origin-destination trip matrix, which is fed into the model in 15-minute increments. The model allows drivers to choose their routes such that the travel cost for trips departing within a specific 15-minute time interval from each origin to each destination will be approximately the same. Origins and destinations are defined using the Capital Area Metropolitan Planning Organization (CAMPO) traffic analysis zone structure in the 2005 base year model. The travel demand was obtained by starting with the CAMPO 2010 demand matrix extracted for the downtown region (bordered by MoPac, IH-35, Cesar Chavez, and 35th Street) and adjusted to match 15-minute cordon counts collected by the City of Austin. The road network was taken from the CAMPO 2010 network (from the 2005 base year model) and improved to add all downtown local streets and intersection controls. At the request of TxDOT, additional improvements were made that are expected to be in the network when the managed lanes are planned to be open. These include signal controls at the intersections of 5th Street with Walsh Street, Pressler Street, and West Lynn Street, as well as continuing Pressler Street south to Reserve Road. The period of analysis is a weekday morning peak, defined as 7-9am. The base case (no managed lanes) DTA model was calibrated to count, turning movement, and travel time data gathered within the modeled area.

Comparison of Results:

Volume Comparison

To determine the effect of limiting managed lane driver access into downtown, volumes are compared across three scenarios at six downtown locations. The three scenarios are 1) MoPac managed lanes (ML) where southbound drivers can exit onto Cesar Chavez Street (CC), but not 5th Street, 2) MoPac managed lanes with southbound exits onto Cesar Chavez and 5th Streets, and 3) no managed lanes. The six locations are illustrated in Figure 1. Each location represents the eastbound traffic only. The locations are Cesar Chavez Street just east of MoPac, Cesar Chavez Street just east of Lamar Boulevard, Cesar Chavez Street just west of Congress Avenue, 5th Street just east of MoPac, 5th Street just east of Lamar

Boulevard, and 5th Street just west of Congress Avenue. The resulting volumes are reported in 15-minute time increments for each of the six locations in Figures 2 through 7.

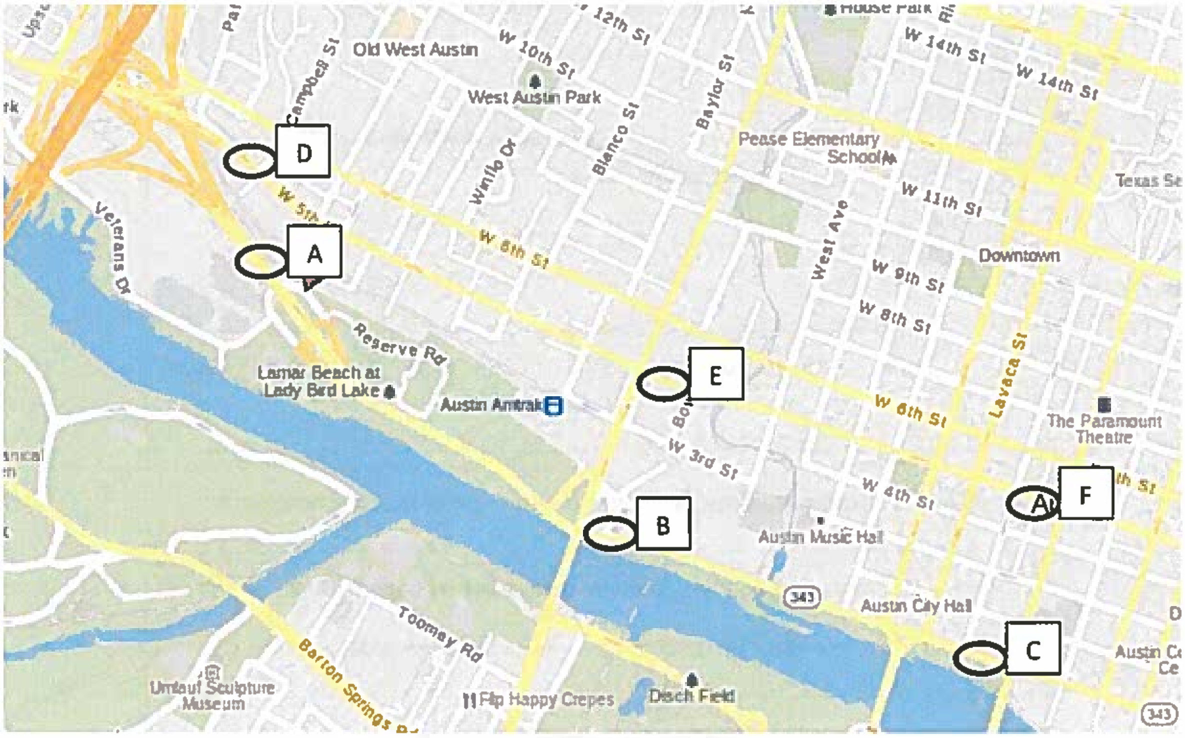

Figure 1. Volume Comparison Locations

For Cesar Chavez Street, the difference in volumes across scenarios is most pronounced at the location closest to MoPac Expressway; however the maximum difference is under 200 vehicles per hour. For locations B and C, further east in the network, the volumes are nearly identical across scenarios. This is expected since as we examine results further from the 5th St./Cesar Chavez St. exit, the impact of any change is confounded by other traffic in the network switching routes. Stated another way, since more traffic is exiting onto Cesar Chavez St. under the "ML – Exit to CC only" scenario, drivers who used this street to travel eastbound across downtown in the other scenarios are now finding alternate streets. This is happening because Cesar Chavez is already a congested street and cannot absorb significantly more traffic. Other models that do not account for route-switching behavior may show a more drastic impact on traffic on this street.

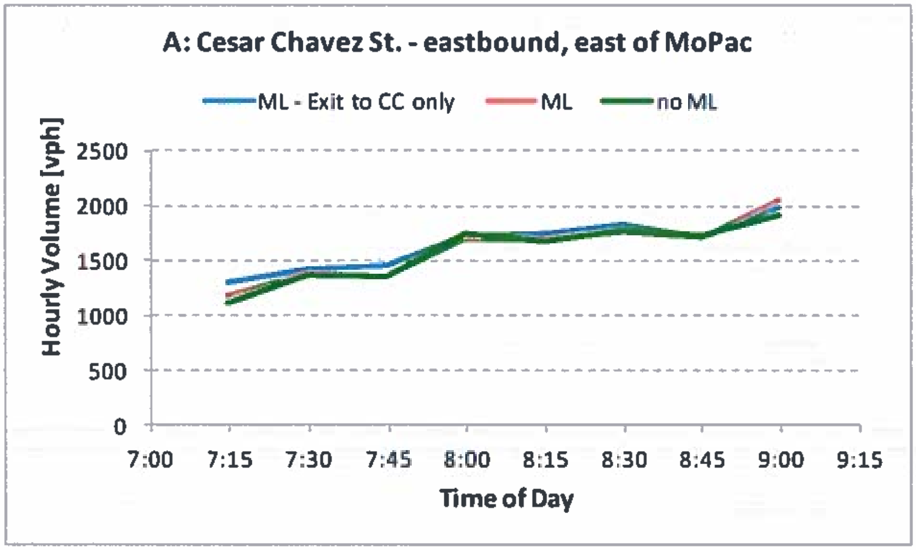

Figure 2. Hourly Volume by Scenario and Time of Day at Location A

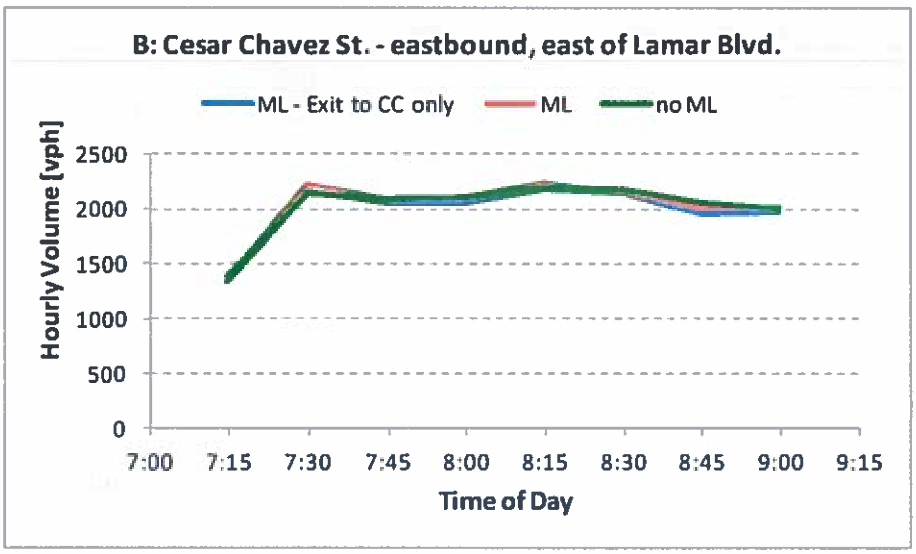

Figure 3. Hourly Volume by Scenario and Time of Day at Location B

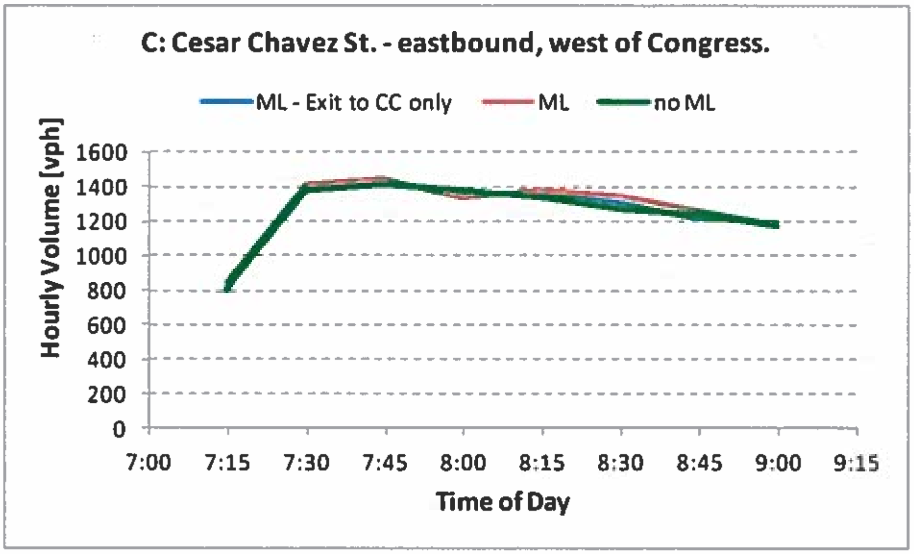

Figure 4. Hourly Volume by Scenario and Time of Day at Location C

The effect of limiting the 5th Street exit to only non-managed lane drivers is only slightly more pronounced on 5th Street than it is on Cesar Chavez Street. The maximum difference is just over 200 vehicles per hour. All three scenarios show very similar traffic volumes across all time periods. In the scenario where managed lane drivers have the same exiting options as non-managed lane drivers, the drivers are more evenly split among the exits. When the managed lane drivers are limited to exit onto Cesar Chavez Street, more of the non-managed lane drivers take 5th Street since it is now the less congested option. In effect, the route-switching behavior of drivers negates the desired result (less traffic on 5th Street) of prohibiting managed lane exiting onto 5th Street.

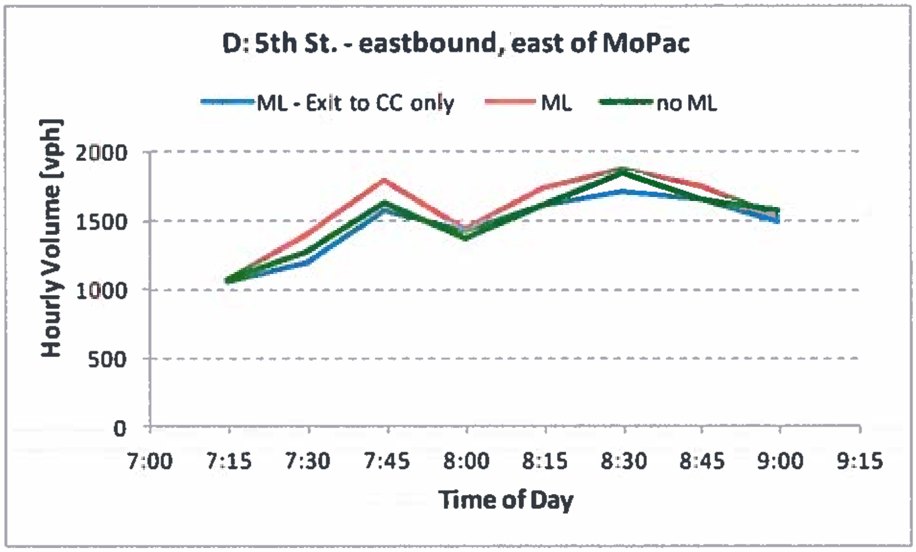

Figure 5. Hourly Volume by Scenario and Time of Day at Location D

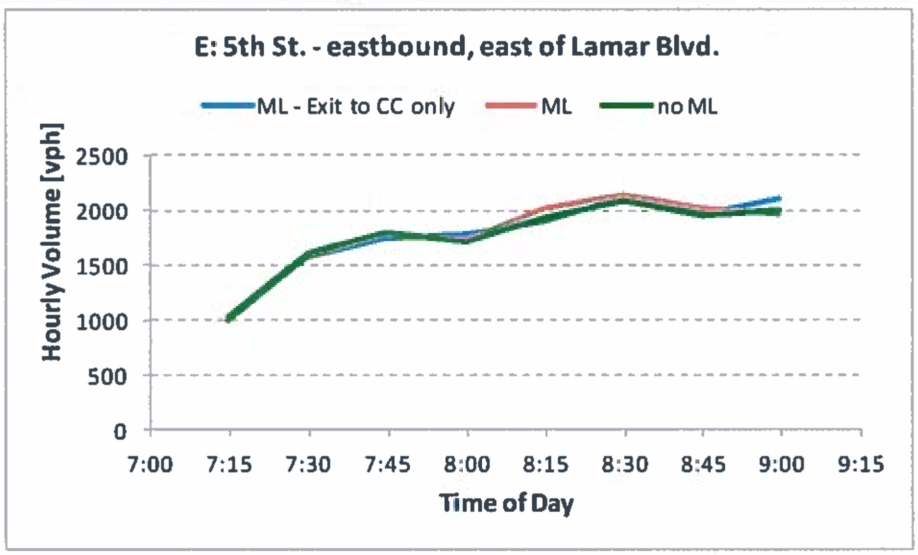

Figure 6. Hourly Volume by Scenario and Time of Day at Location E

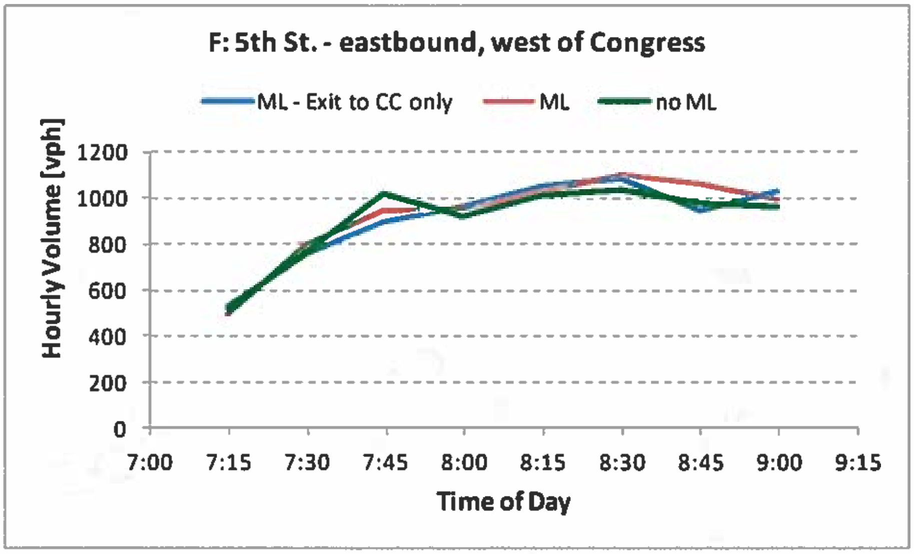

Figure 7. Hourly Volume by Scenario and Time of Day at Location F

Intersection Delay Comparison

In addition to volumes, turning movement counts were also evaluated at all major intersections with Cesar Chavez and 5th Streets and north-south roads between MoPac and Lavaca Street. The intersections of interest are highlighted in Figure 8.

The only intersection that experienced differences in turning movement delays over ten seconds per vehicle is Sandra Muraida Way and Cesar Chavez Street. This intersection is highlighted in red in Figure 8. An increase of approximately 16 seconds per vehicle was observed for right turns from Sandra Muraida Way onto westbound Cesar Chavez Street when the managed lanes were in place. The entrance to the northbound managed lane is accessible from westbound Cesar Chavez, which led to increased traffic using this route after entering the network from South Lamar Boulevard.

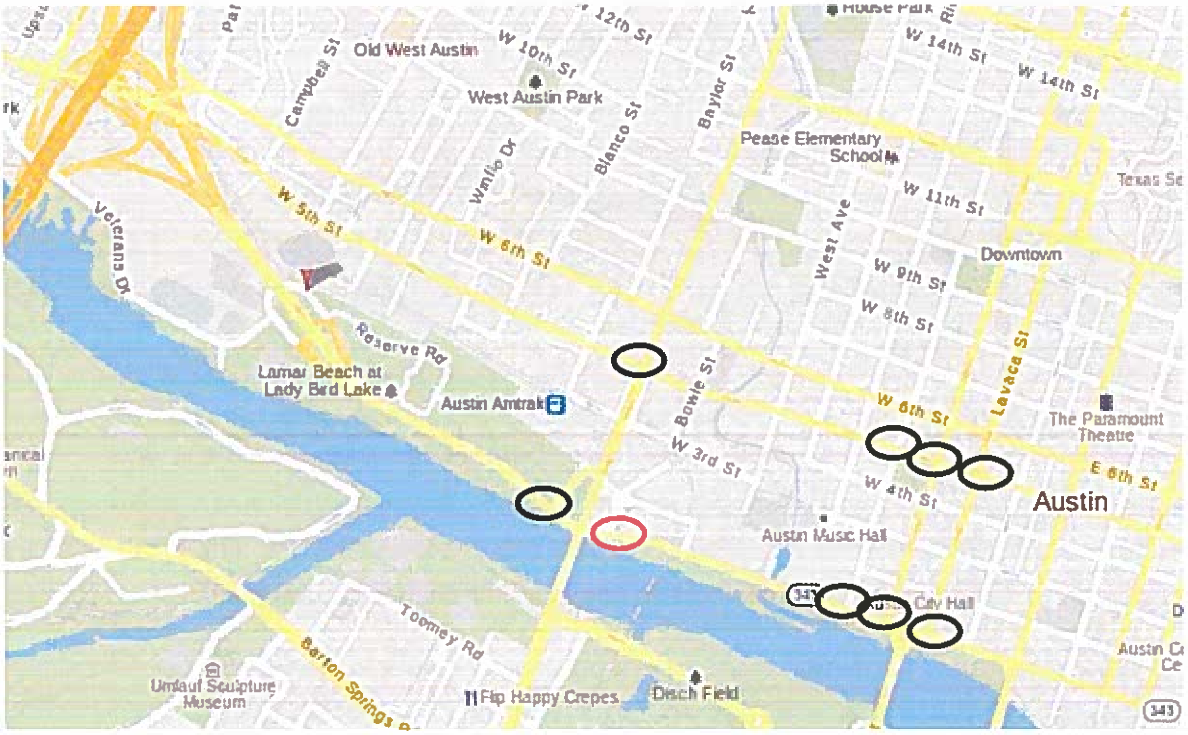

Figure 8. Turning Movement Comparison Locations

A DTA Assessment of the Impacts of MoPac Improvements on Downtown Austin Traffic

Final Report

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Project Summary

This project implemented a Dynamic Traffic Assignment (DTA) approach to study the impacts of incorporating managed lanes along MoPac on the traffic conditions in downtown Austin. The focus of this effort was to assess whether the new facilities are likely to encourage a major shift in traffic patterns, which would worsen the travel times in the downtown area during the AM peak period. More specifically, the proposed improvements will facilitate downtown access from MoPac through Cesar Chavez and 5th St., and this work is meant to address the concerns of the City of Austin (COA) regarding a potential increase in the delays along these arterials and some of the major south-north streets.

This report includes a description of the characteristics of the model, data and methodology used for the study, and a detailed analysis of the corresponding results. Our findings, summarized in the conclusions section, suggest that the proposed MoPac improvements are not likely to have a noticeable impact on the traffic conditions in the downtown Austin area given the assumptions described in this report.

Modeling Approach

In this study we developed two DTA models of the downtown Austin area: a Base Case model reflecting 2010 network and demand conditions, and a Managed Lanes Scenario model of the proposed scenario. The latter incorporates the managed lanes to the MoPac section included in the area of study, while keeping the travel demand set to its 2010 value. Maintaining the demand level at its original 2010 reduces the sources of uncertainty in the model, leading to a more realistic assessment of the possible direction of changes in traffic patterns.

The following sections briefly describe the DTA modeling approach, and the data and assumptions used for the two DTA models implemented in this study.

Dynamic Traffic Assignment Models

Traffic assignment models are a fundamental component of the four-step transportation planning process, used to identify drivers' path choice and the resulting traffic volumes on network links. Link flows are typically considered a good indicator of traffic conditions throughout the network, and may be used to estimate network performance measures (e.g., the ratio of volume to available capacity) for various planning-related applications.

The DTA approach incorporates a time dimension, unlike traditional "static" assignment models. This allows DTA models to represent the evolution of traffic conditions throughout the assignment period. By explicitly capturing the formation and dissipation of queues and the propagation of shockwaves and other dynamic traffic phenomena, DTA models provide a more realistic framework to analyze daily traffic conditions, along with traffic management and operation strategies, which are intrinsically time--dependent and cannot be adequately modeled using a static approach. Further, most of the available DTA packages include a traffic simulator, which allows for modeling the impacts of traffic control devices such as signals, variable message signs, and ramp meters.

DTA models require more detailed data than their static counterparts, and typically involve higher computational effort. However, their detailed outputs, sometimes based on aggregating individual vehicle trajectory information, allow for a variety of analyses which would not be possible using other modeling approaches.

Base Case Model & Data

The base case model network for this study, displayed in Figure 1, reaches from MoPac (West) to Red River Street (East) and from Cesar Chavez Street (South) to 35th Street (North). The network is a version of CAMPO's 2010 planning network, which the researchers then improved to include most of the local streets in the area delimited by West Avenue, Red River Street, 11th Street, and Cesar Chavez Street. Additional network refinements were conducted for this project; these focused on improving the representation of complex intersections along MoPac and Lamar Boulevard such as Lamar Boulevard at 29th Street and Northwood Road at Jefferson Street. The final network includes most of the traffic signals in the area, and the corresponding timing plans as provided by the City of Austin. Stop sign locations were identified by the researchers and incorporated into the model. Link attributes, such as free flow travel time and speed, were originally extracted from CAMPO's model and later adjusted during the calibration process.

The origin-destination (OD) trip table for the base case was constructed using vehicle trajectories produced by a DTA model of Austin's five-county region developed by the researchers. The regional model uses CAMPO's (projected) 2010 demand. Link count data collected in 2009 by the City of Austin (COA) was used as a reference to adjust the final OD matrix. This data consists of 15-minutes counts during the AM peak period on links that form a cordon around the core of downtown Austin (Figure 1). Further adjustments to the OD matrix were conducted based on Wilbur Smith's 2010 ramp-count and intersection movement data.

FIGURE 1. DOWNTOWN CORDON LINKS

Researchers also used field travel time measurements to validate the model's results, which were provided by COA and obtained from probe vehicle runs during the AM peak hour. There are approximately five data points per route between 7:30 and 8:30 AM. The routes followed by the vehicles used as probes are depicted in Figure 2 (validation routes), along with other routes used to compare travel times variations between different scenarios in our study.

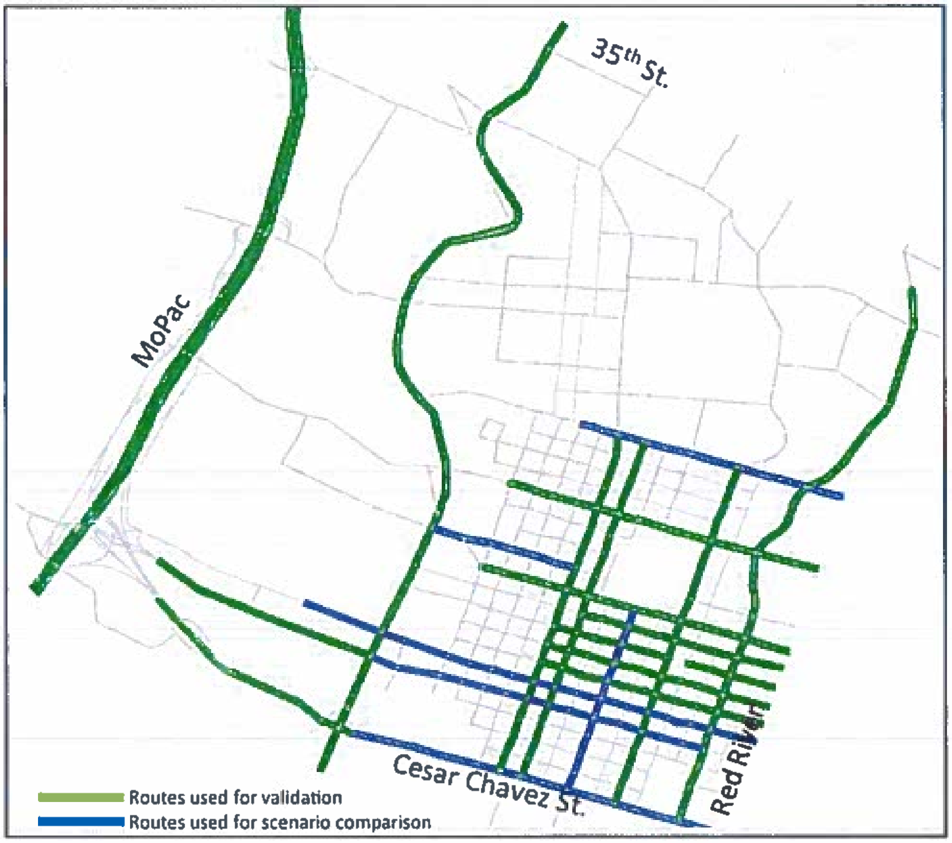


FIGURE 2.NETWORK BOUNDARIES AND DEFINITION OF ROUTES FOR TRAVEL TIME COMPARISSONS

The link counts used for validation, depicted in Figure 3, are part of the cordon counts described above. Due to the definition of the base case network for this project, these link counts can no longer be used to adjust the OD demand matrix, but are still valuable as validation points.

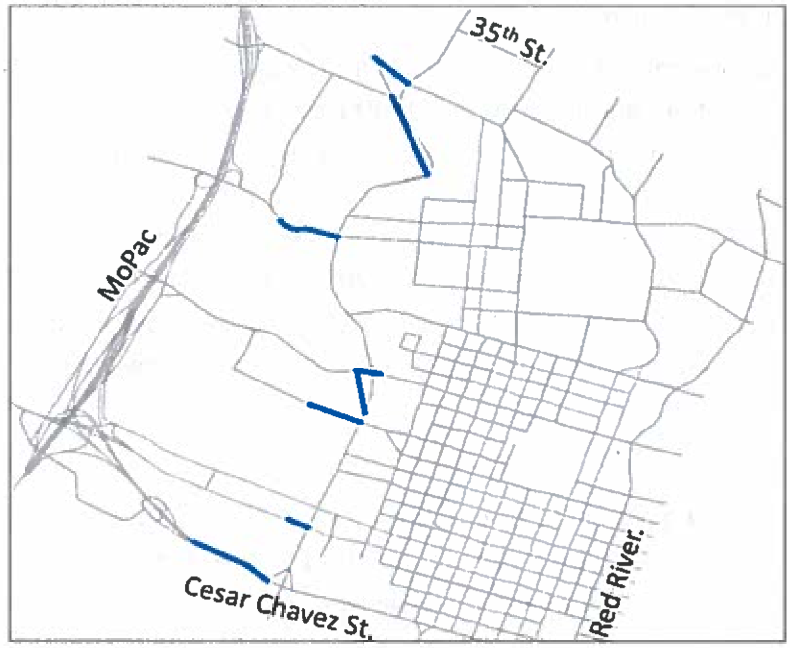


FIGURE 3: LOCATION OF EAST CORDON LINKS USED FOR VALIDATION

Managed Lanes Model & Data

The network data for the managed lanes model is identical to that used for the base case model, with the addition of new links and nodes corresponding to the managed lanes. Wilbur-Smith Associates provided the geometric data used to create the new links and nodes, which were then manually incorporated to the DTA model. The managed lanes run parallel to MoPac lanes in both directions. The northbound managed facilities can be accessed from Cesar Chavez Street using one of two projected new ramps in the area of study. The second ramp allows traffic using the southbound managed lane to exit the facility and join the existing Cesar Chavez/5th Streets exit. These are the only two points where managed lanes connect to the remainder of the network modeled for this study.

The demand data for the managed lane scenario remained the same as for the base case, but new centroid connectors were added to allow drivers entering the network from either end of MoPac to choose between using the main lane and the managed lane. This approach is somewhat limited, given that in reality drivers may make this decision further north, where congestion conditions are known to be different. The following section describes the managed lane utilization pattern observed in this model's results. It also provides some suggestions to generate more robust model results if desired.

Modeling Results

This section describes the individual results for all the models used in this study, and discusses the possible impacts of the proposed managed lanes implementation.

Base Case Model Validation Results

The following tables present the validation results for the calibrated base case model, obtained using the route travel time and link count data described in the previous section. Validation results are very satisfactory: the simulated route travel times are within 30 seconds of field measures in 58% of the cases, while exit ramp counts are within 20% of the observed values for those exits most relevant for this project. The total volume entering the downtown area from west of Lamar Boulevard in our model is within 20% of field values on 5th Street and Cesar Chavez Street. These results suggest that the calibrated model is capturing the current network behavior with enough accuracy to allow for reliable results during the analysis of the proposed scenario.

Validation of Route Travel Time

The point-to-point travel time measures described earlier were compared to the average travel time of special vehicles created in our model for this purpose. Such vehicles depart every 10 minutes between 7:30 and 8:30 AM and travel along the analyzed routes, emulating the probe vehicle runs used to collect the field travel time data.

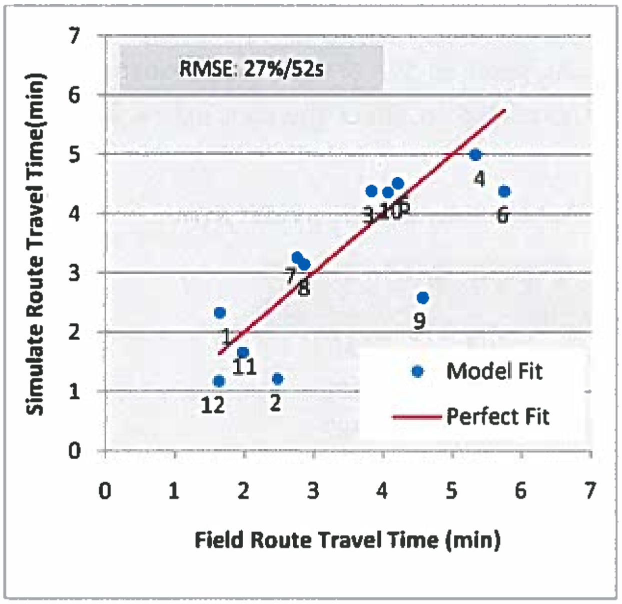
Table 1 and Figure 4 summarize the results of the comparisons described above.

TABLE 1. TRAVEL-TIME VALIDATION RESULTS (7:30-8:30AM)

Route	Field Travel Time (min)	Simulated Travel Time (min)	Difference (sec) **
12th EB	1.64	2.33	41
12th WB	2.48	1.21	-76
5th St.	3.83	4.38	33
6th St.	5.33	4.99	-20
Cesar Chavez EB	4.22	4.51	17
Cesar Chavez WB	5.75	4.38	-83
Congress NB	2.77	3.26	29
Congress SB	2.87	3.14	16
MLK EB	4.57	2.58	-119
MLK WB	4.07	4.36	17
MoPac NB	1.98	1.65	-20
MoPac SB	1.63	1.17	-28

** NEGATIVE VALUES INDICATE UNDERESTIMATION

The average error (Root Mean Squared Error or RMSE) in route travel times is 52 seconds (or 27%). Further, 58% of the errors are under 30 seconds, which is a very good fit considering that the travel time variation within the data itself exceeds one minute. The somewhat larger differences between model results and field data on MLK EB can be attributed to the need of further network refinements in the area. The results and conclusion derived from this work are not expected to be affected by these minor network imperfections.



Point	Route
1	12th EB
2	12th WB
3	5th St.
4	6th St.
5	Cesar Chavez EB
6	Cesar Chavez WB
7	Congress NB
8	Congress SB
9	MLK EB
10	MLK WB
11	MoPac NB
12	MoPac SB

FIGURE 4. TRAVEL TIME VALIDATION (7:30-8:30AM)

Validation of Ramp Counts

The counts on exit ramps along the MoPac segment modeled in this study were compared to the corresponding link flows between 7:00 and 9:00 AM, as predicted by the DTA model. The results (Table 2) exhibit a very good fit, particularly in the southbound direction which is expected to have the largest impact in the results of this study.

TABLE 2. RAMP COUNT VALIDATION IN VPH (7:00-9:00AM)

Exit Ramp	Field Counts	Model Flows	Difference**
SB-Off Westover	**165**	**208**	43
SB-Off Windsor	**629**	366	-263
SB-Off Enfield	**1043**	962	-81
SB-Off Lake Austin	**258**	234	-24
SB-Off Cesar Chavez/5th St.	**1781**	1966	186
NB-Off Westover	**252**	584	332
NB-Off Windsor	**407**	790	384
NB-Off Enfield	**1032**	1131	99
NB-Off Cesar Chavez/5th St.	**1958**	1550	-409

**NEGATIVE VALUES INDICATE UNDERESTIMATION

Validation of Link Counts

The cordon link counts, available every 15 minutes between 7:00 and 9:00 AM, were compared to the corresponding model's link flows for the same time period.

Table 3 presents the validation results for the former cordon links. These suggest that the model adequately reflects the access pattern to the downtown area from the west during the morning peak hour. The only access link for which the model results are less accurate than expected is 15th Street. However, the larger underestimation of link flows observed on 15th St. is likely to be correlated to the overestimation of link flows on 12th St. The characteristics of the network in the region are such that this is not expected to affect the conclusions from this work.

TABLE 3. VALIDATION OF COUNTS ON FORMER WEST CORDON LINKS (7:00-9:00AM). VALUES IN VPH.

Exit Ramp	Field Counts	Model Flows	Difference **
29th EB	393	479	86
Claire EB	34	138	105
12th EB	299	696	397
5th EB	2,023	1,795	-229
C.Chavez EB	2,143	1,791	-352
24th EB	928	1,004	76
Parkway EB	181	147	-34
15th EB	2,263	1,435	-828

**NEGATIVE VALUES INDICATE UNDERESTIIMATION

Managed Lanes Model Results

The managed lanes model was run using the same data developed for the base case model, and until it achieved a similar lever of convergence (approximately 3.5%). This convergence level is expected to provide stable results based on our previous experience working with DTA models.

Table 4 describes the utilization of managed lanes according to the DTA model. The observed values are close to Wilbur Smith Associate's estimate of a 1600 vph vehicle flow on the managed facilities. In our model, approximately 75% of the vehicles using the managed lane in the southbound direction take the Cesar Chavez/5th exit. This does not introduce a major change in the traffic conditions in the downtown area, given that the combined flow (main lane plus managed lane) exiting from southbound MoPac into Cesar Chavez/5th St. remains almost the same as observed in the base case model.

TABLE 4. UTILIZATION OF MANAGED LANES

Segment	Link Volume (vph)
Managed Lane SB Before Cesar Chavez/ 5th St. Exit	1723
Managed Lane SB After Cesar Chavez/ 5th St. Exit	397
Main Lane SB before Cesar Chavez/ 5th St. Exit	3157
Main Lane SB after Cesar Chavez/ 5th St. Exit	2320
Managed Lane NB after Cesar Chavez Entrance	1428
Managed Lane NB before Cesar Chavez Entrance	1164

The previous results are consistent with the traffic characteristics in the analyzed subnetwork. The segment of MoPac included in our network is not congested, and as a consequence drivers have no incentive to choose the managed lane over the mainlane. However, MoPac is known to be congested outside the limits of our model, and in reality drivers are likely to make their decision based on conditions that are not captured by this approach. As a result, even though the volumes on the ramp connecting MoPac to Cesar Chavez/5th Street are not likely to be higher from what our model predicts, the traffic composition (in terms of origin-destination patterns) could be somewhat different. If more vehicles destined to centroids north of 5th St. were to use the abovementioned exit, the delay at certain intersections could be affected in a different way than described below.

Impacts of Managed Lanes Incorporation on Downtown Traffic

In this section we assess the possible impacts on downtown traffic conditions of incorporating managed lanes to MoPac as specified at the beginning of this report. The study is focused on the AM peak period, between 7:00 and 9:00AM.

Most of the impacts on the downtown area are expected to be a result of the variation in the proportion of vehicles taking the Cesar Chavez/5th St. exit from southbound MoPac, and in the total number of vehicles using the same to exit from the managed lane, as the proposed geometric design does not include any exit ramp from the northbound managed lane into the area of study. Another potential source of changes in the downtown conditions is the composition of traffic on the Cesar Chavez/5th St. exit, in terms of their final destination. If a large number of drivers headed to locations north of 5th St. chose to utilize the managed lanes, turning movements at intersections as well as traffic volumes on northbound streets could be affected.

The following sections compare the results of the base case model and the managed lanes scenario model, focusing on the factors previously described.

Managed Lanes Utilization

Table 5 compares the downtown access pattern from the west between the base case and the managed lanes scenarios. The total number of vehicles entering downtown through 5th St. and Cesar Chavez remains practically the same in both cases, despite the large proportion of drivers taking the Cesar Chavez/5th St. exit from the managed lanes (Table 4). This suggests that in our model most of the drivers using the managed lanes are those originally taking the Cesar Chavez/5th St. exit, which explains the small magnitude of the changes in downtown traffic conditions described in the following sections.

TABLE 5. WEST CORDON LINK VOLUME COMPARISON (7:00-9:00AM)

Entry Link	Base Case Flow (veh)	Managed Lane Case Flow (veh)	Difference (veh) **
12th EB	1348	1342	-6
15th EB	2918	2920	2
24th EB	2086	2087	1
29th EB	1002	1038	36
5th EB	3827	3791	-36
C.Chavez EB	3688	3583	-105
Claire EB	256	203	-53
Parkway EB	296	393	97

**NEGATIVE VALUE INDICATES REDUCTION IN THE MANAGED LANES SCENARIO

Travel Time and Link Flow Changes Along Selected Routes

Travel times and link flows on the base case and the managed lanes scenario were compared along 30 routes (423 Links). Figures 5 and 6 display vehicle flow differences between scenarios, and do not exhibit a major change in the traffic pattern in downtown Austin during the AM peak hour.

Except for the expected flow changes along MoPac links, most of the link flow differences between scenarios are under 150 vph, which is not significant and can be attributed to imperfections in the model convergence.

A slightly more noticeable flow decrease is observed along 15th Street, probably reflecting the decision of some drivers previously taking the Enfield exit from southbound MoPac to use the managed facility. The former can also explain the reduction in the number of vehicles turning west from Guadalupe Street into 12th Street. The larger flow decreases observed on 5th and 6th Streets west of Lamar Boulevard are less intuitive, but they represent a small percentage of the corresponding link flows and are most likely a consequence of convergence imperfections.

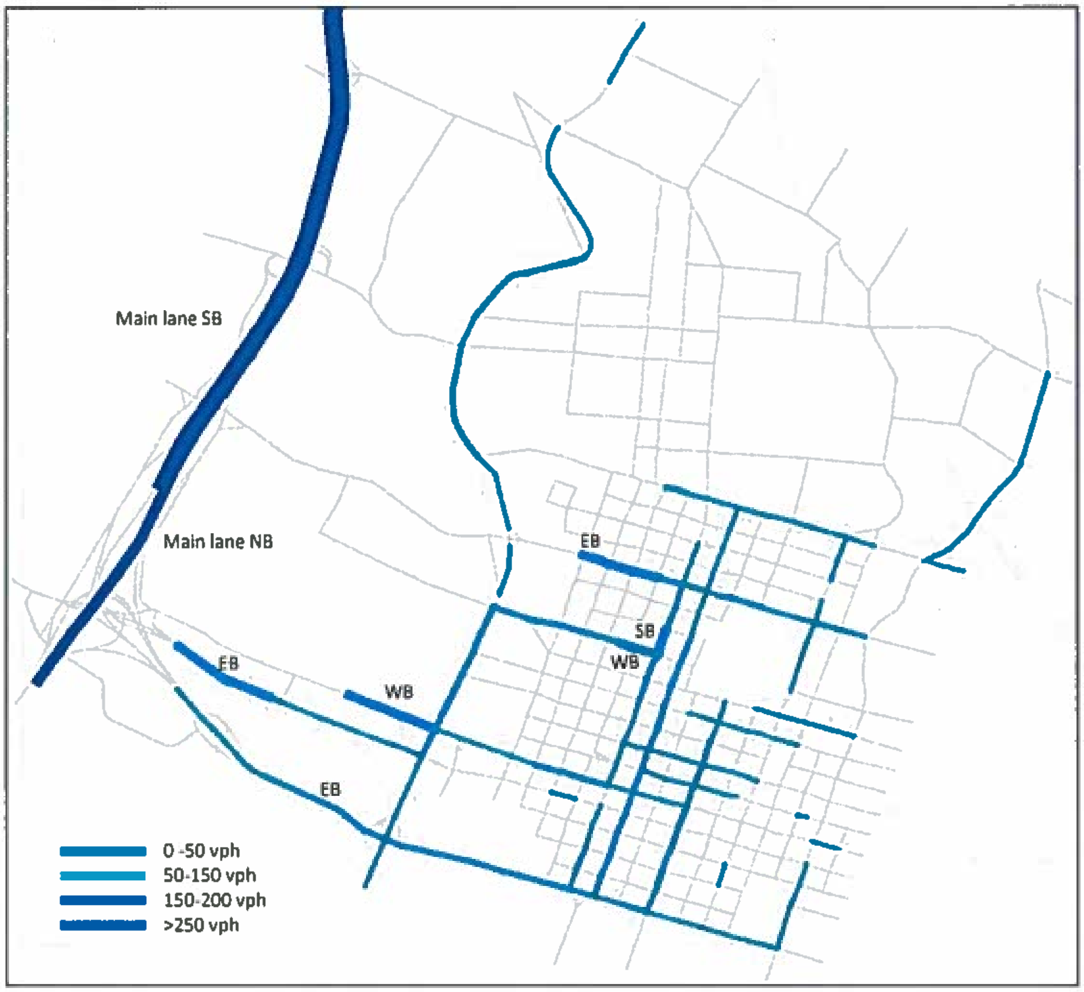


FIGURE 5. LINK FLOW REDUCTIONS IN MANAGED LANES SCENARIO
(STREET DIRECTION INDICATED WHEN DIFFERENCES ARE GREATER THAN 150 VPH)

FIGURE 6. LINK FLOW INCREASE IN MANAGED LANES SCENARIO
(STREET DIRECTION INDICATED WHEN DIFFERENCES ARE GREATER THAN 150 VPH)

Table 6 presents the difference in travel time along selected routes between the base case and the managed lane scenario models. The results, consistent with the corresponding link flow changes, do not point to any major change in traffic conditions in the downtown area. Changes lower than 30 seconds can easily be attributed to the normal variability of travel time along arterials. There are only three cases for which the observed differences are higher. In the case of southbound MoPac, the observed travel time changes are intuitive, and clearly correspond to a lesser utilization of the main lane in the first case.

The increased travel time on Cesar Chavez WB may be indicating slightly longer delay at intersections due to an increased number of left turning movements from Cesar Chavez EB into the downtown area. This impact is relatively small and may be exaggerated by the limitations of our simulation model which does not fully capture the priorities ruling permissive left turn movements.

The travel time reduction on Lamar NB is somewhat counterintuitive, but may correspond to a small shift in traffic from Lamar to the NB managed lane. The observed change represents 17% of the total route travel time.

TABLE 6. TRAVEL TIME DIFFERENCE ALONG SELECTED ROUTES

Route	Base Case Travel Time (s)	Managed Lanes Scenario Travel Time (s)	Difference (s)**
10th St.	189.5	191.5	2
11th St. EB	336.5	309.5	-27
11th St. WB	368.5	370	2
12th EB	139.5	130.5	-9
12th WB	72.5	63	-10
15th St. EB	228.5	220.5	-8
15th St. WB	276.5	275	-2
5th EB - West of Lamar	84	108	24
5th St.	262.5	263	1
6th St.	299.5	297.5	-2
7th EB	193	183	-10
8 WB	162.5	164.5	2
9th EB - 1	102.5	101.5	-1
9th EB - 2	63	63	0
Cesar Chavez EB	270.5	258	-13
Cesar Chavez WB	262.5	311	49
Chavez EB - West of Lamar	93	85.5	-8
Congress NB	195.5	174.5	-21
Congress SB	188.5	198	10
Guadalupe SB	304	303	-1
Lamar NB	992	826.5	-166
Lamar SB	640.5	647.8333	7
Lavaca NB	306.5	287	-20
Mainlane_NB	132	132	0
Mainlane_SB	160.5	119	-42
MLK EB	155	154.5	-1
MLK WB	261.5	258.8333	-3
Red River NB	618	615.5	-3
Red River SB	667.5	656	-12
San Jacinto SB	392.5	392	-1

**** NEGATIVE VALUES INDICATE TRAVEL TIME REDUCTIONS IN THE MANAGED LANES SCENARIO**

Selected Intersections Analysis: Delay and Turning Movement Volume

Turning movements at intersections, and the corresponding delays, were analyzed for five locations identified by COA as critical (Figure 7).

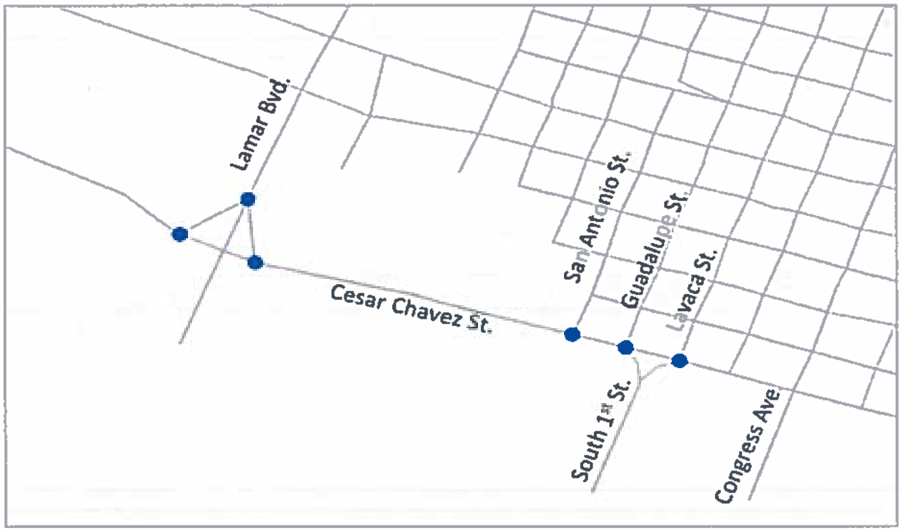


FIGURE 7. INTERSECTION MOVEMENTS AND DELAY ANALYSIS

Figure 8 presents the difference in turning movement volumes between the base case and the managed lanes scenario, for the only case in which such variation was somewhat noticeable. All of the remaining turning movement volume changes are less than 100 vph, while the corresponding delay variations remain well under five seconds per vehicle in the majority of the analyzed cases.

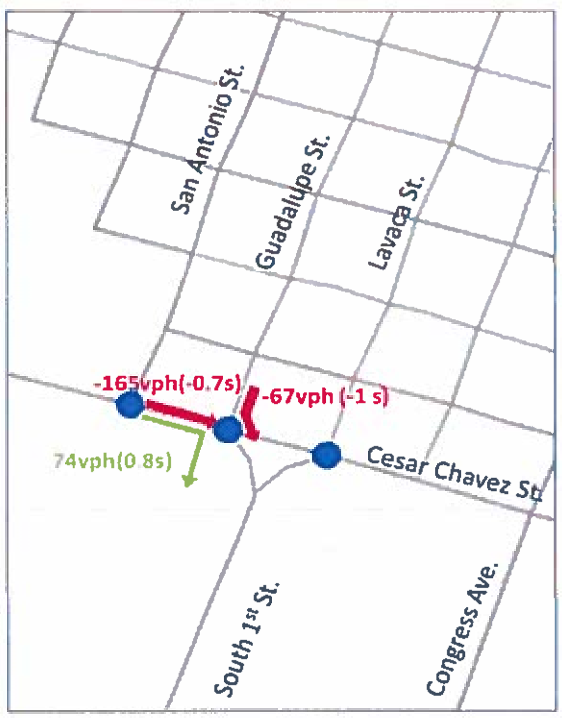


FIGURE 8. CHANGES IN TURNING MOVEMENT AND DELAY PER VEHICLE AT THE MOST AFFECTED INTERSECTION

The model's suggestion of an increased number of vehicles taking a left turn from Cesar Chavez to South First Street may indicate a stronger incentive for all vehicles traveling south of the river to exit on Cesar Chavez Street and not on other exits along MoPac.

Conclusions

In this work we developed two Dynamic Traffic Assignment (DTA) models of the central Austin area, in order to assess the possible impacts on AM peak downtown traffic of adding managed lanes to both directions of MoPac.

Our models account for dynamic changes in traffic conditions, and explicitly model the impact of traffic control devices. The base case model was built using 2010 network and demand data, and calibrated based on traffic count data. The model validation, conducted using travel time measurements along several routes and additional link count data, produced very satisfactory results. These suggest that the calibrated model is capturing the current network behavior with enough accuracy to allow for reliable results during the analysis of the proposed scenario.

The researchers constructed a Managed Lanes Scenario model using Wilbur Smith Associate's geometric data of the new facilities, and maintaining the same travel demand as in the base case.

The total number of vehicles using the proposed managed lanes in the Managed Lanes Scenario results is close to Wilbur Smith Associate's estimate of 1600 vph in each direction. However, in this model approximately 75% of the vehicles traveling southbound take the Cesar Chavez/5th exit, compared to only 25% in Wilbur Smiths Associate's simulation. Further, most of the drivers traveling on the southbound managed lane in the Managed Lanes Scenario are those taking the Cesar Chavez/5th Streets exit from MoPac in the Base Case model. These results are consistent with the modeling assumptions and calibration data used in this work. The latter suggest that segment of MoPac included in the DTA model is not congested. In virtue of this drivers, who choose their paths based on the network conditions, have no incentive to use the managed lane instead of the main lane.

Given our model characteristics, the comparison of downtown traffic conditions before and after the incorporation of managed lanes to MoPac does not suggest any major change in traffic flow patterns. Link flows and travel times along selected routes remain practically unchanged, and the same is true for intersection delays.

The Managed Lanes Scenario results show a slightly higher travel time on the westbound direction of Cesar Chavez Street, which may be indicating longer delay at the corresponding intersections due to an increased number of left turning movements from the eastbound direction of the same street into the downtown area. This impact is relatively small and may be exaggerated by the limitations of our simulation model which does not fully capture the priorities ruling permissive left turn movements. Similarly, the observation of somewhat lower flows and travel times on northbound Lamar Boulevard in the Managed Lanes Scenario, which corresponds to a small shift in traffic from Lamar Boulevard to the northbound managed lane, is no significant enough to suggest a major change in traffic flow patterns.

Based on our assumptions, the addition of managed lanes to MoPac will not affect downtown traffic significantly during the AM peak period. The DTA model results present what can be considered the worst-case scenario in terms of the number of drivers destined to downtown using the southbound managed lane. However, the destination pattern of the vehicles using the managed lane and exiting on the Cesar Chavez/5th Streets exit could be different if the congestion on MoPac outside the limits of our model is considered. If more vehicles destined to locations north of 5th St. chose to use the managed lane, the delay at certain intersections could be affected in a different way than described in this study. Even though results are not expected to change dramatically, further analysis exploring different destination patterns for the vehicles exiting on the Cesar Chavez/5th Streets exit from the southbound managed lane can be conducted if desired.