TRAFFIC ENGINEERING STUDY ASSOCIATED WITH THE ADDITION OF THE STADIUM GARAGE LOCATED ON HOLMAN STREET
FINAL REPORT

UNIVERSITY OF HOUSTON

HOUSTON, TX

Prepared for:
UNIVERSITY OF HOUSTON

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EXECUTIVE SUMMARY

The University of Houston is finalizing plans for the construction of a new parking garage on campus. The parking garage is to be located directly north of the football stadium on the existing parking lot 15D. The construction of the parking garage will permanently remove 792 existing surface lot parking spaces; add an addition 2,276 structured parking spaces for a net increase of 1,484 parking spaces.

Three peak hour traffic time periods were studied, including an a.m. weekday, a p.m. weekday and a post football. Further discussion of the data collection periods can be found on page 11. Eleven intersections surrounding the University of Houston were studied and include:

1. Scott St. & Elgin St.
2. Scott St. & Holman St.
3. Scott St. & Wheeler St.
4. Cullen Blvd. & Elgin St.
5. Cullen Blvd. & Music Building Lot
6. Cullen Blvd. & Holman St.
7. Cullen Blvd. & Wheeler St.
8. General Services Parking Lot & Elgin St.
9. Spur 5 Frontage (west) & Elgin St.
10. Calhoun Rd. & Wheeler St.
11. Spur 5 Frontage (west) & Wheeler St.

EXISTING INTERSECTION TRAFFIC CONDITIONS

Overall the existing traffic conditions for the intersections studied operate at an acceptable level-of-service (LOS which is defined on page 12) with the exception of:

- Sold Out Football Games: Scott Street/Elgin Street and Cullen Boulevard/Elgin Street intersections.
- a.m. Peak Hour: Scott Street/Wheeler Street and Scott Street/Holman Street.

FUTURE INTERSECTION TRAFFIC CONDITIONS: SCENARIO 1

The future traffic conditions for the study area intersections were analyzed following construction of the parking garage. The future post football game traffic projections include increasing the football stadium seating capacity from 32,000 seats to 40,000 seats.

AM PEAK HOUR TRAFFIC CONDITIONS

The intersections studied operate at an acceptable LOS during the morning peak hour with the exception of Scott Street/ Holman Street and Scott Street/Wheeler Street. These intersections operate at a poor level-of-service because of high southbound traffic volumes. At an average rate of ten vehicles per minute the data does not support a scenario where the intersection of Cullen Blvd./Holman Street will be impacted by the location of the student entry point into the garage.

PM PEAK HOUR TRAFFIC CONDITIONS

The p.m. peak hour traffic remains at an acceptable LOS throughout the study area with the exception of the intersection of Scott Street/Elgin Street and Cullen Boulevard /Elgin Street. These delays are caused from traffic delays for various turning movements

POST FOOTBALL GAME PEAK HOUR TRAFFIC CONDITIONS

Following the construction of the parking garage and proposed expansion of the football stadium, five of the intersections are projected to operate at an unacceptable LOS due to traffic delays for various turning movements. These intersections include:

- Scott Street and Elgin Street;
- Scott Street and Holman Street;
- Cullen Boulevard and Elgin Street;
- Cullen Boulevard and Holman Street; and
- Calhoun Road and Wheeler Street.

The intersection LOS becomes unacceptable due to the additional traffic added from the 25% increase in stadium seating capacity and the additional traffic added from the proposed parking structure.

FUTURE TRAFFIC CONDITIONS: SCENARIO 2, METRO LIGHT RAIL

Scenario 2 reflects that no physical roadway changes will be implemented and the Metro Light Rail (MLR) project is included in the traffic model analysis. The intersections of Scott Street/Elgin Street; Scott Street/Holman Street; Scott Street/Wheeler Street; and Cullen Blvd./Wheeler Street will be affected by the MLR project.

The rail line will generally run north/south within the study area, adjacent to Scott Street. North of Holman Street, the rail line is proposed to be on the west side of the street. The rail line will then cross Scott Street just to the north of the intersection of Holman Street. South of Holman Street, the rail line will be on the east side of Scott Street. At the intersection of Scott Street and Wheeler Street the rail line will turn to the east along the north side of Wheeler Street. The University indicated that the MLR would operate at six to ten minute headways during peak periods of the day. The University indicates each train is anticipated to delay the intersection at Scott Street and Holman Street by ten to fifteen seconds as it crosses Scott Street. This delay will be in addition to the existing intersection delay at this location. This additional delay will not reduce the intersection LOS below an acceptable level. It should be noted that this delay will only occur up to ten times an hour assuming a headway of six minutes.

Once the MLR project is complete, some drivers familiar with the area will likely reroute their travel through this intersection in order to not be delayed by the train. The drivers likely to reroute their travel are those that pass through this intersection in route to another destination. It is difficult to accurately project the number of drivers that would reroute their travel paths due to the implementation of the MLR project. In order to make projections for the number of drivers that would reroute their travel, a survey is recommended for parkers at the University to project the impact.

FUTURE TRAFFIC CONDITIONS: SCENARIO 3, METRO LIGHT RAIL WITH MULTI-MODAL TRANSIT CENTER

Scenario 3 considers a Multi-Modal Transportation Facility (MMTF) to be constructed in association with the MLR platform at the intersection of Scott Street/Holman Street. The MLR will be constructed as described in Scenario 2 above. Though the proposed MMTF has not been designed, initial plans indicate it would be located on the surface parking lot located to the west of the new parking garage. The MMTF would provide a connection for MLR and the bus connections for the Campus and City system. Bus traffic would enter the MMTF from Holman Street.

Quantifiable traffic impact for the MMTF cannot be projected until the facility is further designed; however, schematic level traffic impacts are projected as follows. Peak hour passenger car traffic would be reduced at the surrounding intersections including Scott Street/Holman Street; Scott Street/Elgin Street; Cullen Blvd./Holman Street; Cullen

Blvd./Elgin Street. The remaining study area intersection volumes will be reduced; however, not as significantly as the intersections in the immediate area as outlined above because they are farther from the MMTF site. The reduction in peak hour passenger traffic is due to the loss of the existing surface parking to the west of the new parking garage for construction of the MMTF. The actual number of surface parking lot spaces that would be lost is unknown at this time but could range between 300-500 spaces.

Bus traffic within the immediate area of the MMTF would increase throughout the day. The increase in peak hour bus trips in the immediate area of the MMTF is likely less than that of the peak hour passenger vehicle trips that would be lost from the reduction in the surface parking lot capacity.

The proposed MMTF will likely result in a net reduction of total peak hour trips through the immediate intersections; therefore, the LOS would not change or improve slightly.

SCENARIO 4: ADDITIONAL SCENARIOS DISCUSSED

The University also discussed several other options for future consideration. The options were disused; however, were not analyzed as part of this scope and include:

- Dividing Holman into two one-way road segments; whereas traffic utilizing the new parking garage would enter and exit Holman Street from Cullen. Surface parking west of the new parking garage or the proposed MMTF traffic would enter and exit Holman Street from Scott Street. This would redistribute the traffic within the study area.
- The potential closing of Cullen Blvd. becomes less feasible as traffic will likely be re-distributed to avoid the MLR on Scott Street.
- Potentially converting Holman Street to either one-way westbound or one-way eastbound becomes less desirable with the MLR project as traffic may become congested at the intersection of Scott Street and Holman Street.

RECOMMENDED INTERSECTION IMPROVEMENTS UNDER EXISTING TRAFFIC CONDITIONS

Modification to signal timing, phasing, and in some cases turning restrictions at intersections with poor levels-of-service are recommended to improve their operations to an acceptable level. The proposed signal timing and phasing modifications are shown in the appendices. No physical street improvements are necessary for the intersections to properly operate in the future. The Universities Police Department should continue to provide traffic assistance following football games.

POST FOOTBALL GAME

Two intersections currently operate at an unacceptable LOS. The existing post-football traffic concerns and their recommended improvements are listed below:

Scott Street and Elgin Street - The intersection of Scott Street & Elgin Street operates at an unacceptable LOS of F with an overall intersection delay of 225 seconds. The significant post-football delay is due to the large number of northbound through movements (1,226 per hour). The off peak signal cycle for this intersection post football games is 90 seconds. Changing the cycle length to 120 seconds will improve the intersection LOS to C. The 120 second cycle length is the same as the a.m. and p.m. peak hour cycle length.

Cullen Boulevard and Elgin Street - The intersection of Cullen Boulevard & Elgin Street operates at a LOS of F with a delay of 87 seconds. The significant post-football delay is due from the large northbound through traffic movement (757 vph). This cycle length is not long enough to allow all 757 vehicles to clear the intersection; thus causing the delay. The off peak signal cycle for this intersection post football games is 90 seconds. Changing the cycle length to 120 seconds will improve the intersection LOS to D. The 120 second cycle length is the same as the a.m. and p.m. peak hour cycle length.

SCENARIO 1: FUTURE INTERSECTION IMPROVEMENT RECOMMENDATIONS

Scenario 1 reflects no roadway improvements would be made and the MLR is not included in the analysis.

AM PEAK HOUR

Scott Street and Holman Street – The intersection of Scott Street and Holman Street delay can be improved by optimizing the signal timing.

Scott Street and Wheeler Street – The intersection of Scott Street and Wheeler Street delay can be improved by optimizing the signal timing.

PM PEAK HOUR

Cullen Boulevard and Elgin Street - The intersection of Cullen Boulevard & Elgin Street is projected to operate at an unacceptable LOS E following construction of the parking garage. This poor LOS is caused by northbound through traffic. Increasing the cycle length to 120 seconds for this movement will provide a satisfactory LOS.

POST FOOTBALL GAME

The post football game scenario includes construction of the parking garage and expansion of the football stadium seating capacity from 32,000 to 40,000.

Scott Street and Elgin Street - The intersection of Scott Street and Elgin Street is projected to operate at an unacceptable LOS F. In order to improve the intersection the following improvements are recommended to provide a LOS of D:

- Prohibit southbound left and eastbound left turning movements;
- Modify signal phasing so westbound left traffic becomes a permitted turn rather than a current protected phase and
- Optimize signal timing at the intersection. The optimized signal timing sheet is shown in the appendix.

Scott Street and Holman Street - The intersection of Scott Street and Holman Street is projected to operate at an unacceptable LOS F. In order to improve the intersection LOS to D, the following improvements are recommended:

- Restrict parking on the north side of Holman Street between Scott Street and Cullen Blvd. This will allow for two temporary westbound right turning lanes.
- Modify signal phasing so southbound left turning movements become permitted from the current protected phase; and
- Optimize signal timing at the intersection. The optimized signal timing sheet is shown in the appendix.

Cullen Boulevard and Elgin Street - The intersection of Cullen Boulevard and Elgin Street is projected to operate at an unacceptable LOS F. In order to improve the intersection to a LOS of D the following improvements are recommended:

- Prohibit eastbound left and westbound left turning movements; and
- Optimize signal timing at the intersection. The optimized signal timing sheet is shown in the appendix.

Cullen Boulevard and Holman Street - The intersection of Cullen Boulevard and Holman Street is projected to operate at an unacceptable LOS F. In order to improve the intersection to a LOS of D, the following improvement is recommended:

- Optimize signal timing at the intersection. The optimized signal timing sheet is shown in the appendix.

Calhoun Road and Wheeler Street - The intersection of Calhoun Road and Wheeler Street is projected to operate at an unacceptable LOS F. In order to improve the intersection to a LOS of D, the following improvement is recommended:

- Optimize signal timing at the intersection. The optimized signal timing sheet is shown in the appendix.

SCENARIO 2: RECOMMENDED INTERSECTION IMPROVEMENT UNDER FUTURE CONDITIONS

Scenario 2 reflects the implementation of the MLR project and is included in the traffic model analysis.

The MLR project will most significantly impact the intersections along Scott Street. Traffic signal phasing and timing improvements will be required to accommodate the train crossing the street. Another signal phase will be required to stop traffic at the intersection of Scott Street and Holman Street when the train crosses. The signal phasing will need to be coordinated directly with the Metro and City as final details for the project were not complete at the time of the study.

Signal timing and offset coordination between the surrounding immediate intersections will also be required to allow traffic to efficiently flow through the study area intersections.

The remaining recommendations presented in Scenario 1apply to this scenario as well.

SCENARIO 3: RECOMMENDED INTERSECTION IMPROVEMENT UNDER FUTURE CONDITIONS

Scenario 3 reflects the introduction of the MLR and the MMTF in the traffic model analysis.

The recommendations for this scenario are the same as those outlined in Scenario 1 and 2. Additionally, providing curb cuts in and out of the MMTF that accommodate bus traffic would be required with the modifications to the site.

INTRODUCTION

BACKGROUND

The University of Houston (University) is expanding their parking availability on campus by constructing a 2,276 stall parking garage to the north of Robertson Stadium. The parking garage will be located on the existing surface parking Lot 15D as illustrated in Figure 1. The new parking garage will serve all campus user groups including faculty/staff, students, visitors and football game parkers. The parking garage is anticipated to be opened in 2012.

Future plans also include the addition of the Metro Light Rail along the Scott Street and Wheeler Street corridor. A Multi-Modal Transportation Facility is also proposed to be located on the remaining surface lot west of the stadium garage, not being removed for construction of the parking garage.

OBJECTIVES

The purpose of this study is to determine the impact the parking garage will place on the intersection utilization, also called level-of-service (LOS) at existing intersections on campus following the construction of the Holman Street parking garage. The University desires to understand these impacts during the weekday morning, weekday afternoon/evening and post football game peak hour periods which are defined on page 11.

The analysis considers the traffic impact with and without the proposed Metro Light Rail project.

STUDY AREA

For the purpose of this study we have defined eleven intersections on campus that will be affected by the proposed parking garage. A map identifying analyzed intersections is shown in Figure 1. The intersections studied include:

1. Scott Street and Elgin Street;
2. Scott Street and Holman Street;
3. Scott Street and Wheeler Street;
4. Cullen Boulevard and Elgin Street;
5. Cullen Boulevard and Music Building Lot;
6. Cullen Boulevard and Holman Street;
7. Cullen Boulevard and Wheeler Street;
8. General Services Parking Lot and Elgin Street;
9. Spur 5 Frontage (west) and Elgin Street;

10. Calhoun Road and Wheeler Street; and
11. Spur 5 Frontage (west) and Wheeler Street.

The on and off ramps to I-45 were not studied since modifications are not possible.

Figure 1: Study Area

Source: Google Earth

METHODOLOGY

This section discusses the steps that were taken to determine the results.

LEVEL-OF-SERVICE

The concept of levels of service uses qualitative measures that characterize operational conditions within a traffic stream and their perception to motorists and passengers. The descriptions of individual levels of service characterize these conditions in terms of such factors as speed and travel time, freedom to maneuver, traffic interruptions, comfort and convenience.

Six levels-of-service are defined from A to F, with LOS A representing the best operating conditions and F the worst.

A= Free flow
B= Reasonably free flow
C=Stable flow
D=Approaching unstable flow
E=Unstable flow
F=Forced or breakdown flow

LOS calculations were conducted using techniques described in the 2000 Highway Capacity Manual (TRB 2000). The computer simulation program, Synchro, was utilized to determine the existing and future LOS for the signalized and one-way/two-way and all-way stop intersections.

SIGNALIZED INTERSECTIONS

LOS for signalized intersections is defined in terms of delay. Delay is a measure of discomfort, frustration, fuel consumption, and lost travel time. The delay experienced by a motorist is made up of a number of factors that relate to control, geometrics (roadway layout and configuration), traffic, and incidents. The delay is the difference between the travel time actually experienced and the reference travel time that would result during ideal conditions: in the absence of traffic control, in the absence of geometric delay, in the absence of any incidents, and when there are no other vehicles on the road.

For signalized and un-signalized intersections, only the portion of total delay attributed to the control facility is quantified. This delay is called *control delay*. Control delay includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. For

signalized intersections, control delay may also be referred to as *signal delay.*

Specifically, LOS criteria for traffic signals are stated in terms of the average control delay per vehicle, typically for a 15-min. analysis period as shown in the following table:

Table 1: LOS Criteria for Signalized Intersections

Highway Capacity Manual Transportation Research Board, 2000	
LEVEL OF SERVICE	DELAY RANGE (seconds)
A	≤ 10
B	> 10 and ≤ 20
C	> 20 and ≤ 35
D	> 35 and ≤ 55
E	> 55 and ≤ 80
F	> 80

TWO-WAY STOP INTERSECTIONS

LOS for non-signalized two-way intersections is defined as the total elapsed time from when a vehicle stops at the end of the queue until the vehicle departs from the stop line; this time includes the time required for the vehicle to travel from the last-in-queue position to first-in-queue position. The levels of service criteria are given in the following Table.

Table 2: LOS Criteria for Stop Sign Controlled Intersections

Highway Capacity Manual Transportation Research Board, 2000	
LEVEL OF SERVICE	DELAY RANGE (seconds)
A	≤ 10 sec.
B	> 10 and ≤ 15 sec.
C	> 15 and ≤ 25 sec.
D	> 25 and ≤ 35 sec.
E	> 35 and ≤ 50 sec.
F	> 50 sec.

INTERSECTION COUNT DAY

Intersection turning movement traffic counts were conducted during three different time periods and include:

- Following the season's final football game on November 13, 2010 during the hours of 9:30 p.m. to 12:15 a.m.;
- Afternoon peak period of 4:00 p.m. to 6:00 p.m. on January 18, 2011; and
- Morning peak period of 7:00 a.m. to 9:00 a.m. on March 24, 2011.

In our professional opinion, the greatest amount of traffic is not between 9:00 a.m. to 10:00 a.m. because the background street traffic is greater earlier in the day.

These turning movement counts were conducted to determine baseline conditions. The data was analyzed to determine the peak hour periods. The peak hour of traffic following the football game was determined to be 10:15 p.m. to 11:15 p.m. The weekday afternoon peak hour period was identified as 4:45 p.m. to 5:45 p.m., and the a.m. peak hour was determined to be 7:45 a.m. to 8:45 a.m.

This data was collected prior to construction of the Holman Street Parking Garage.

CURRENT DESIGN DAY TRAFFIC COUNTS

The collected vehicle turning movement traffic count data was adjusted to more accurately reflect traffic patterns during more representative time periods outlined below.

Football attendance during the November 13, 2010 game was determined by the University to be 21,091. The current seating capacity of the stadium is 32,000 seats. The intersection count day turning movements were; therefore, increased by 25% to reflect a sold out football game.

Fall enrollment at public universities is typically higher than spring semester enrollment; therefore, historical student enrollment and faculty statistics were compared to determine the enrollment ratio between semesters. Calendar year 2009 and 2010 figures were obtained from the university at:

(http://www.uh.edu/ir/fileadmin/reports/SEM%20SP05%20TO%20FA%2010.pdf).
The statistics indicate an 8% increase in campus population during the fall semester. The weekday a.m. and p.m. peak hour vehicle turning movements were then increased by this rate to better reflect the busier fall semester.

The adjusted intersection turning movement traffic counts was inputted into a computer simulation model and analyzed to determine the existing intersection level-of-service (LOS).

FUTURE VEHICLE TRAFFIC

Future vehicle traffic was determined by the following process. The area of the existing surface parking lot on the site which the parking garage will be constructed has 792 spaces. 240 of those spaces are designated for staff/facility and the remaining 552 spaces are designated for students. These parking spaces will be permanently removed when the parking garage is constructed.

The new parking garage supply will be 2,276 spaces, of which, 500 are designated for staff/faculty, 1,427 spaces for students and 349 spaces designated for visitors. A table identifying the net gain in parking supply on this site is shown below.

Table 3: Net Parking Supply Gain after Garage Construction

	Net Parking Supply Gain	Existing Surface Lot Spaces Removed	New Parking Garage
Staff/Faculty	260	240	500
Students	875	552	1,427
Visitor	349		349
Total	1,484	792	2,276

Source: Walker Parking Consultants

Peak hour entry and exit statistics were determined for each of the parking user groups. The existing *Welcome Center* parking garage *peak* hour entry and exit statistics were used from previous data collected by WPC. These peak hour drive statistics vary for each user group because staff/faculty, visitors and students each arrive and leave the campus at various times throughout the day. The following

table represents the peak hour entry and exit statistics used in the analysis for the various users of the parking garage.

Table 4: User Group Entry/Exit Statistics

	a.m. Peak Hour		p.m. Peak Hour		Post Football Game	
User Group	Enter	Exit	Enter	Exit	Enter	Exit
Staff/Faculty	33%	1%	1%	54%	-	-
Students	29%	2%	7%	21%	-	-
Visitor	38%	16%	1%	36%	0%	80%

Source: Walker Parking Consultants

Additional net peak hour trips were developed and added to the models study area intersections. The net parking supply is the total of the new parking supply to be constructed less the existing parking supply lost.

The University indicated the stadium capacity could be expanded to reach 40,000 seats; therefore, an overall increase of traffic was added for the post football game peak hour model. The increase traffic applied was 25%, and is the difference between the current 32,000 seats and the proposed 40,000 seats. This projection was used for the purpose of further analysis and does not include actual and current game day attendance.

The additional net parking trips to the site are shown in the following table.

Table 5: Additional Net Vehicle Trips

	a.m. Peak Hour		p.m. Peak Hour		Post Football Game	
User Group	Enter	Exit	Enter	Exit	Enter	Exit
Staff/Faculty	86	3	3	140	-	-
Students	225	16	54	163	-	-
Visitor	133	56	3	126	0	1,107
Total	443	74	60	429	0	1,107

Source: Walker Parking Consultants

EXISTING TRAFFIC CONDITIONS

Overall, the existing traffic conditions for the intersections studied operate at acceptable LOS as shown in the following table. The freeway on and off ramps were not studied as part of this study. Intersections that operate an un-acceptable LOS are shown in red.

EXISTING INTERSECTION LEVEL-OF-SERIVE CONDITIONS

Table 6: Existing Intersection LOS

Intersection	Time	LOS	Delay (s)
Scott St.	AM	C	33.1
Elgin St.	PM	D	41.8
	Post Game	F	225.0

Intersection	Time	LOS	Delay (s)
Scott St.	AM	F	122.8
Holman St.	PM	C	26.6
	Post Game	C	21.4

Intersection	Time	LOS	Delay (s)
Scott St.	AM	F	99.5
Wheeler St.	PM	C	24.0
	Post Game	C	23.5

Intersection	Time	LOS	Delay (s)
Cullen Blvd.	AM	D	50.2
Elgin St.	PM	D	45.9
	Post Game	F	86.6

Intersection	Time	LOS	Delay (s)
Cullen Blvd.	AM	A	2.9
Music Bldg.	PM	B	23.4
	Post Game	A	7.4

Intersection	Time	LOS	Delay (s)
Cullen Blvd.	AM	B	19.0
Holman St.	PM	C	20.7
	Post Game	C	21.8

Intersection	Time	LOS	Delay (s)
Cullen Blvd.	AM	C	28.7
Wheeler St.	PM	D	41.6
	Post Game	C	23.4

Intersection	Time	LOS	Delay (s)
General Svcs.	AM	B	15.4
Elgin St.	PM	C	27.3
	Post Game	C	22.8

Intersection	Time	LOS	Delay (s)
Spur 5 Frontage	AM	B	10.8
Elgin St.	PM	B	13.7
	Post Game	A	8.6

Intersection	Time	LOS	Delay (s)
Calhoun Rd.	AM	C	26.5
Wheeler St.	PM	D	50.2
	Post Game	C	29.5

Intersection	Time	LOS	Delay (s)
Spur 5 Frontage	AM	B	19.3
Wheeler St.	PM	B	14.8
	Post Game	B	10.1

Source: Walker Parking Consultants

FUTURE TRAFFIC CONDITIONS: SCENARIO 1

Scenario 1 reflects that no physical roadway changes will be implemented and the Metro Light Rail is not included in the traffic model analysis. The future morning and afternoon traffic conditions for the study area intersections are projected with the parking garage constructed. The future post football game traffic projections include an expansion of the football stadium totaling 40,000 seats.

The following table summarizes the future intersection LOS for each of the three time periods analyzed. The intersections that operate at an unacceptable LOS are shown in red.

FUTURE INTERSECTION LEVEL-OF-SERVICE CONDITIONS

Table 7: Future Intersection LOS

Intersection	Time	LOS	Delay (s)
Scott St.	AM	C	33.1
Elgin St.	PM	D	44.1
	Post Game	F	512.8

Intersection	Time	LOS	Delay (s)
Cullen Blvd.	AM	B	19.0
Holman St.	PM	C	27.9
	Post Game	F	213.8

Intersection	Time	LOS	Delay (s)
Scott St.	AM	F	122.8
Holman St.	PM	C	28.4
	Post Game	F	187.8

Intersection	Time	LOS	Delay (s)
Cullen Blvd.	AM	C	27.5
Wheeler St.	PM	D	41.1
	Post Game	C	28.0

Intersection	Time	LOS	Delay (s)
Scott St.	AM	F	99.5
Wheeler St.	PM	C	24.5
	Post Game	C	29.4

Intersection	Time	LOS	Delay (s)
General Svcs.	AM	B	15.4
Elgin St.	PM	C	26.5
	Post Game	C	25.3

Intersection	Time	LOS	Delay (s)
Cullen Blvd.	AM	D	50.2
Elgin St.	PM	E	58.1
	Post Game	F	315.1

Intersection	Time	LOS	Delay (s)
Spur 5 Frontage	AM	B	10.8
Elgin St.	PM	B	13.9
	Post Game	B	10.1

Intersection	Time	LOS	Delay (s)
Cullen Blvd.	AM	A	2.9
Music Bldg.	PM	D	46.3
	Post Game	C	94.6

Intersection	Time	LOS	Delay (s)
Calhoun Rd.	AM	C	26.5
Wheeler St.	PM	D	49.8
	Post Game	F	126.3

Intersection	Time	LOS	Delay (s)
Spur 5 Frontage	AM	B	19.3
Wheeler St.	PM	B	14.6
	Post Game	B	12.9

Source: Walker Parking Consultants

AM PEAK HOUR TRAFFIC CONDITIONS

The intersections studied operate at an acceptable LOS during the morning peak hour with the exception of Scott Street/ Holman Street and Scott Street/Wheeler Street. These intersections operate at a poor level-of-service because of high southbound traffic volumes.

Concern was expressed about westbound vehicles backing up on Holman Street due to student vehicles entering the new parking garage. To address this concern, we modeled the entry/exit lanes using field collected data provided by University of Houston Parking and Transportation for the Welcome Center Garage to understand peak hour arrival volumes. The design of the parking garage utilized an a.m. peak hour arrival value of 29% for student parking capacity (total of 414 vehicles). Based upon current parking equipment technology the service rate determined that two lanes would be required to handle the peak student volume. University of Houston Parking requested that three lanes be provided for student access and redundancy of service. Based upon this configuration the peak hour volume reservoir for queuing student vehicles is less than one vehicle per lane. The setback for the parking gates in the student section is approximately 90' from the curb which allows a queue of 4 vehicles per lane or 12 student vehicles total without impacting the westbound traffic on Holman Street. The projected westbound traffic during the a.m. peak hour on Holman Street is approximately 606 (GUNDA Report) vehicles assuming Cullen Blvd. is closed (projected worst case scenario). At an average rate of ten vehicles per minute the data does not support a scenario where the intersection of Cullen Blvd./Holman Street will be impacted by the location of the student entry point into the garage.

PM PEAK HOUR TRAFFIC CONDITIONS

The p.m. peak hour traffic remains at an acceptable LOS throughout the study area with the exception of the Cullen Boulevard and Elgin Street intersection.

POST FOOTBALL GAME PEAK HOUR TRAFFIC CONDITIONS

With the construction of the parking garage and proposed expansion of the football stadium to 40,000 seat capacity, many of the intersections are projected to operate at an unacceptable LOS. These intersections include:

- Scott Street and Elgin Street;
- Scott Street and Holman Street;
- Cullen Boulevard and Elgin Street;
- Cullen Boulevard and Holman Street; and
- Calhoun Road and Wheeler Street.

The intersections LOS become unacceptable because of the 25% increase in stadium seating capacity and the redistribution of traffic due to the proposed parking garage adjacent to the stadium.

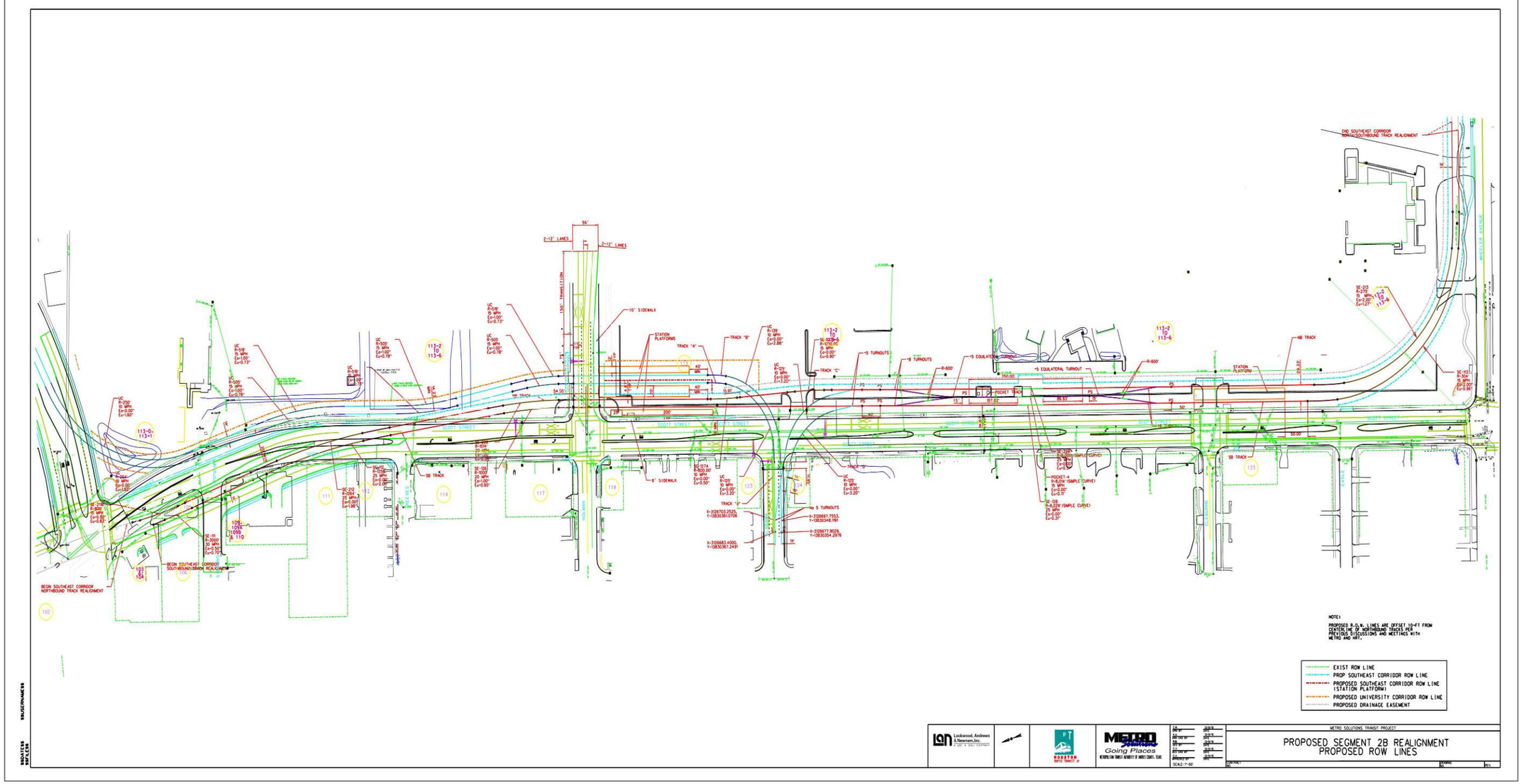
FUTURE TRAFFIC CONDITIONS: SCENARIO 2, METRO LIGHT RAIL

Scenario 2 reflects that no physical roadway changes will be implemented and the Metro Light Rail (MLR) project is included in the traffic model analysis. The intersections of Scott Street/Elgin Street; Scott Street/Holman Street; Scott Street/Wheeler Street; and Cullen Blvd./Wheeler Street will be affected by the MLR project.

The rail line will generally run north/south within the study area, adjacent to Scott Street. North of Holman Street the rail line is proposed to be on the west side of the street. The rail line will cross just to the north of the intersection of Scott Street and Holman Street. South of Holman Street the tracks will be on the east side of Scott Street. At the intersection of Scott Street and Wheeler Street the rail line will turn to the east along the north side of Wheeler Street.

A platform is proposed just south of Holman Street. The proposed layout of the MLR as provided by the University is shown in Figure 2.

Figure 2: Proposed Metro Line Rail



Source: Provided by the University of Houston

The University indicated that the MLR would operate at six to ten minute headways during peak periods of the day. The University indicates each train is anticipated to delay the intersection at Scott Street and Holman Street by ten to fifteen seconds as it crosses Scott Street. This delay will be in addition to the existing intersection delay at this location. This additional delay will not reduce the intersection LOS below an acceptable level. It should be noted that this delay will only occur up to ten times an hour assuming a headway of six minutes.

Once the MLR project begins construction, some drivers familiar with the area will likely reroute their travel through this intersection in order to not be delayed by the train. The drivers likely to reroute their travel are those that pass through this intersection in route to another destination. It is not possible to accurately project the number of drivers that would reroute their travel paths due to the implementation of the MLR project. In order to make projections for the number of drivers that would reroute their travel, a survey is recommended for parkers at the University to project the impact.

FUTURE TRAFFIC CONDITIONS: SCENARIO 3, METRO LIGHT RAIL WITH MULTI-MODAL TRANSIT CENTER

The University of Houston indicated there is potential for a Multi-Modal Transportation Facility (MMTF) to be constructed in association with the MLR platform at the intersection of Scott Street/Holman Street. The MLR will be constructed as described in Scenario 2 above. Though the proposed MMTF has not been designed, initial plans indicate it would be located on the surface parking lot located to the west of the new parking garage. The MMTF would provide a connection for MLR and the bus connections for the Campus and City system. Bus traffic would enter the MMTF from Holman Street.

Quantifiable traffic impact for the MMTF cannot be projected until the facility is further designed; however, schematic level traffic impacts are projected as follows.

Peak hour passenger car traffic would be reduced at the surrounding intersections including Scott Street/Holman Street; Scott Street/Elgin Street; Cullen Blvd./Holman Street; Cullen Blvd./Elgin Street. The remaining study area intersection volumes will be reduced; however, not as significantly as the intersections in the immediate area as outlined above because they are farther from the MMTF site. The reduction in peak hour passenger traffic is due to the loss of the existing surface parking to the west of the new parking garage for

construction of the MMTF. The actual number of surface parking lot spaces that would be lost is unknown at this time but could range between 300-500 spaces.

Bus traffic within the immediate area of the MMTF would increase throughout the day. The increase in peak hour bus trips in the immediate area of the MMTF is likely less than that of the peak hour passenger vehicle trips that would be lost from the reduction in the surface parking lot capacity.

The proposed MMTF will likely result in a net reduction of total peak hour trips through the immediate intersections; therefore, the LOS would not change or improve slightly.

RECOMMENDED INTERSECTION IMPROVEMENT UNDER EXISTING CONDITIONS

RECOMMENDATIONS TO IMPROVE POOR LEVELS-OF-SERVICE

Overall the existing traffic conditions for the intersections studied operate at an acceptable level-of-service (LOS) with the exception of:

- Sold Out Football Games: Scott Street/Elgin Street and Cullen Boulevard/Elgin Street intersections.
- a.m. Peak Hour: Scott Street/Wheeler Street and Scott Street/Holman Street.

POST FOOTBALL GAME

Two intersections currently operate at a poor LOS and include Scott Street/Elgin Street and Cullen Boulevard /Elgin Street.

Scott Street and Elgin Street - The intersection of Scott Street & Elgin Street operates at a LOS of F with a delay of 225 seconds. The significant delay at this intersection is due to the large northbound through traffic movements (1,226 vph) following a football game. The off peak signal cycle for this intersection post football games is 90 seconds. Changing the cycle length to 120 seconds will improve the intersection LOS to C. The 120 second cycle length is the same as the a.m. and p.m. peak hour cycle length.

Cullen Boulevard and Elgin Street - The intersection of Cullen Boulevard & Elgin Street operates at a LOS of F with a delay of 87 seconds following a football game. The significant delay from this intersection is due to the heavy northbound through traffic (757 vph). The off peak signal cycle for this intersection post football games is 90 seconds. Changing the cycle length to 120 seconds will improve the intersection LOS to D. The 120 second cycle length is the same as the a.m. and p.m. peak hour cycle length.

SCENARIO 1: RECOMMENDED INTERSECTION IMPROVEMENT UNDER FUTURE CONDITIONS

Scenario 1 reflects that no physical roadway changes will be implemented and the MLR is not included in traffic model analysis.

AM PEAK HOUR

Scott Street and Holman Street – The intersection of Scott Street and Holman Street delay can be improved by optimizing the signal timing.

Scott Street and Wheeler Street – The intersection of Scott Street and Wheeler Street delay can be improved optimizing the signal timing.

PM PEAK HOUR

Cullen Boulevard and Elgin Street - The intersection of Cullen Boulevard & Elgin Street is projected to operate at an unacceptable LOS of E following construction of the parking garage. These poor LOS is caused by heavy northbound through traffic (974 vph). Increasing the green time for northbound through traffic will improve the LOS to a satisfactory LOS.

POST FOOTBALL GAME

The post football game scenario includes construction of the parking garage and expansion of the football stadium seating capacity from 32,000 to 40,000.

Scott Street and Elgin Street - The intersection of Scott Street and Elgin Street is projected to operate at an unacceptable LOS F. In order to improve the intersection the following improvements are recommended to increase the LOS to a D.

- Prohibit southbound and eastbound left turns;
- Modify signal phasing so westbound left traffic becomes a permitted turn rather than a current protected phase; and
- Optimize signal timing at the intersection. The optimized signal timing sheet is shown in the appendix.

Scott Street and Holman Street - The intersection of Scott Street and Holman Street is projected operate at an unacceptable LOS F. In order to improve the intersection, the following improvements are recommended to be made to increase the LOS to a D.

- Restrict parking on the north side of Holman Street between Scott Street and Elgin Street. This will allow for two westbound right turning lanes. The University indicated they could temporarily prohibit parking by paying the City approximately $900 per day.

- Modify signal phasing so southbound left turning movements become permitted from the current protected phase.
- Optimize signal timing at the intersection. The optimized signal timing sheet is shown in the appendix.

Cullen Boulevard and Elgin Street - The intersection of Cullen Boulevard and Elgin Street is projected to operate at an unacceptable LOS F. In order to improve the intersection the following improvements are recommended to be made to increase the LOS to a D.

- Prohibit eastbound and westbound left turning movements; and
- Optimize signal timing at the intersection. The optimized signal timing sheet is shown in the appendix.

Cullen Boulevard and Holman Street - The intersection of Cullen Boulevard and Holman Street is projected operate at an unacceptable LOS F. In order to improve the intersection the following improvement is recommended to be made to increase the LOS to a D.

- Optimize signal timing at the intersection. The optimized signal timing sheet is shown in the appendix.

Calhoun Road and Wheeler Street - The intersection of Calhoun Road and Wheeler Street is projected to operate at an unacceptable LOS F. In order to improve the intersection the following improvement is recommended to be made to increase the LOS to a D.

- Optimize signal timing at the intersection. The optimized signal timing sheet is shown in the appendix.

SCENARIO 2: RECOMMENDED INTERSECTION IMPROVEMENT UNDER FUTURE CONDITIONS

Scenario 2 reflects the implementation of the MLR project is included in the traffic model analysis.

The MLR project will most significantly impact the intersections along Scott Street. Traffic signal phasing and timing improvements will be required to accommodate the train crossing the street. Another signal phase will be required to stop traffic at the intersection of Scott Street and Holman Street when the train crosses. The signal phasing will need to be coordinated directly with Metro and City of Houston as final details for the project were not complete at the time of the study.

Signal timing and offset coordination between the surrounding immediate intersections will also be required to allow traffic to efficiently flow through the study area intersections.

The remaining recommendations presented in Scenario1 apply to this scenario as well.

SCENARIO 3: RECOMMENDED INTERSECTION IMPROVEMENT UNDER FUTURE CONDITIONS

Scenario 3 reflects the introduction of the MLR and the MMTF in the traffic model analysis.

The recommendations for this scenario are the same as those outlined in Scenario 1 and 2. Additionally, providing curb cuts in and out of the MMTF that accommodate bus traffic would be required with the modifications to the site.

SCENARIO 4: ADDITIONAL SCENARIOS DISCUSSED

The University also discussed several other options for future consideration. The options were discussed; however, were not analyzed as part of this scope and include:

- Dividing Holman into two one-way road segments; whereas traffic utilizing the new parking garage would enter and exit Holman Street from Cullen. Surface parking west of the new parking garage or the proposed MMTF traffic would enter and exit Holman Street from Scott Street. This would redistribute the traffic within the study area.
- The potential closing of Cullen Blvd. becomes less feasible as traffic will likely be re-distributed to avoid the MLR on Scott Street.
- Potentially converting Holman Street to either one-way westbound or one-way eastbound becomes less desirable with the MLR project as traffic may become congested at the intersection of Scott Street and Holman Street.

APPENDIX A

TRAFFIC ENGINEERING ANALYSIS TABLES

WALKER
PARKING CONSULTANTS

Table 8: Field Collected Turning Movement Counts*

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Scott St.	AM	30	666	26	125	108	10	45	273	87	32	196	91
Elgin St.	PM	35	474	9	210	222	24	107	543	100	66	236	121
	Post Game	5	150	6	83	103	41	89	1,041	96	27	51	52

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Scott St.	AM	263	567	18	44	17	41	21	413	114	30	33	24
Holman St.	PM	77	739	16	112	34	106	60	724	63	39	30	10
	Post Game	5	313	19	80	45	390	65	805	13	115	1	35

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Scott St.	AM	155	277	10	20	18	72	12	560	96	10	15	16
Wheeler St.	PM	147	754	15	165	29	193	19	617	135	18	43	39
	Post Game	108	416	5	132	36	161	13	226	58	11	11	13

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Cullen Blvd.	AM	270	987	97	265	188	28	58	143	62	32	206	131
Elgin St.	PM	121	394	99	125	284	233	106	667	174	76	270	112
	Post Game	16	82	25	48	112	290	67	569	121	49	98	51

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Cullen Blvd.	AM	321	1,032	29	16	1	11	30	237	177	0	0	0
Music Bldg.	PM	90	500	14	86	3	181	9	698	91	0	0	1
	Post Game	7	171	4	42	0	120	18	648	17	2	0	9

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Cullen Blvd.	AM	0	561	524	0	0	0	91	305	0	122	0	30
Holman St.	PM	0	427	201	0	0	0	118	473	0	315	0	80
	Post Game	0	232	20	0	0	0	15	349	0	307	0	39

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Cullen Blvd.	AM	24	161	38	111	122	11	12	99	152	32	264	73
Wheeler St.	PM	197	266	20	65	243	225	60	262	80	37	256	62
	Post Game	49	225	42	55	127	88	12	169	85	26	151	37

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
General Svcs.	AM	1	25	15	223	409	18	39	22	19	22	173	342
Elgin St.	PM	15	9	22	55	257	0	248	12	132	5	388	147
	Post Game	10	2	17	13	42	3	254	3	221	4	200	48

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Spur 5 Frontage	AM	72	120	28	394	673	0	0	0	0	0	135	56
Elgin St.	PM	139	101	6	222	328	0	0	0	0	0	470	85
	Post Game	46	13	3	51	57	0	0	0	0	0	414	50

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Calhoun Rd.	AM	13	45	63	42	229	48	209	357	50	100	54	56
Wheeler St.	PM	59	300	223	38	84	15	89	204	74	146	212	172
	Post Game	11	109	79	26	44	5	29	41	30	82	225	56

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Spur 5 Frontage	AM	2	274	323	0	70	0	0	0	0	0	121	6
Wheeler St.	PM	0	545	168	0	11	0	0	0	0	0	322	30
	Post Game	8	73	76	1	1	0	0	0	0	0	278	11

*The peak hour of traffic following the football game was determined to be 10:15 p.m. to 11:15 p.m. and was collected on November 13, 2010. The weekday afternoon peak hour period was identified as 4:45 p.m. to 5:45 p.m. and was collected on January 18, 2011, and the a.m. peak hour was determined to be 7:45 a.m. to 8:45 a.m. and was collected on March 24, 201.

Table 9: 2011 Fall Semester Design Day Vehicle Turning Movements

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Scott St.	AM	32	719	28	135	117	11	49	295	94	35	212	98
Elgin St.	PM	38	512	10	227	240	26	116	586	108	71	255	131
	Post Game	7	201	8	111	138	55	119	1,395	129	36	68	70

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Scott St.	AM	284	612	19	48	18	44	23	446	123	32	36	26
Holman St.	PM	83	798	17	121	37	114	65	782	68	42	32	11
	Post Game	7	419	25	107	60	523	87	1,079	17	154	1	47

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Scott St.	AM	167	299	11	22	19	78	13	605	104	11	16	17
Wheeler St.	PM	159	814	16	178	31	208	21	666	146	19	46	42
	Post Game	145	557	7	177	48	216	17	303	78	15	15	17

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Cullen Blvd.	AM	292	1,066	105	286	203	30	63	154	67	35	222	141
Elgin St.	PM	131	426	107	135	307	252	114	720	188	82	292	121
	Post Game	21	110	34	64	150	389	90	762	162	66	131	68

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Cullen Blvd.	AM	347	1,115	31	17	1	12	32	256	191	0	0	0
Music Bldg.	PM	97	540	15	93	3	195	10	754	98	0	0	1
	Post Game	9	229	5	56	0	161	24	868	23	3	0	12

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Cullen Blvd.	AM	0	606	566	0	0	0	98	329	0	132	0	32
Holman St.	PM	0	461	217	0	0	0	127	511	0	340	0	86
	Post Game	0	311	27	0	0	0	20	468	0	411	0	52

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Cullen Blvd.	AM	26	174	41	120	132	12	13	107	164	35	285	79
Wheeler St.	PM	213	287	22	70	262	243	65	283	86	40	276	67
	Post Game	66	302	56	74	170	118	16	226	114	35	202	50

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
General Svcs.	AM	1	27	16	241	442	19	42	24	21	24	187	369
Elgin St.	PM	16	10	24	59	278	0	268	13	143	5	419	159
	Post Game	13	3	23	17	56	4	340	4	296	5	268	64

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Spur 5 Frontage	AM	78	130	30	426	727	0	0	0	0	0	146	60
Elgin St.	PM	150	109	6	240	354	0	0	0	0	0	508	92
	Post Game	62	17	4	68	76	0	0	0	0	0	555	67

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Calhoun Rd.	AM	14	49	68	45	247	52	226	386	54	108	58	60
Wheeler St.	PM	64	324	241	41	91	16	96	220	80	158	229	186
	Post Game	15	146	106	35	59	7	39	55	40	110	302	75

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Spur 5 Frontage	AM	2	296	349	0	76	0	0	0	0	0	131	6
Wheeler St.	PM	0	589	181	0	12	0	0	0	0	0	348	32
	Post Game	11	98	102	1	1	0	0	0	0	0	373	15

Table 10: Inbound Vehicle Turning Movements Generated by Parking Garage

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Scott St.	AM												
Elgin St.	PM		19%										5%
	Post Game												

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Scott St.	AM												
Holman St.	PM	23%								25%		2%	
	Post Game												

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Scott St.	AM												
Wheeler St.	PM								24%		1%		
	Post Game												

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Cullen Blvd.	AM												
Elgin St.	PM		15%		28%								
	Post Game												

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Cullen Blvd.	AM												
Music Bldg.	PM		30%										
	Post Game												

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Cullen Blvd.	AM												
Holman St.	PM			30%				20%					
	Post Game												

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Cullen Blvd.	AM												
Wheeler St.	PM						10%		10%				
	Post Game												

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
General Svcs.	AM												
Elgin St.	PM			1%		13%							
	Post Game												

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Spur 5 Frontage	AM												
Elgin St.	PM					13%							
	Post Game												

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Calhoun Rd.	AM												
Wheeler St.	PM					7%		1%					
	Post Game												

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Spur 5 Frontage	AM												
Wheeler St.	PM			7%									
	Post Game												

Table 11: Outbound Vehicle Turning Movements Generated by Parking Garage

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Scott St.	AM												
Elgin St.	PM							3%	16%				
	Post Game							4%	38%				

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Scott St.	AM												
Holman St.	PM				20%	1%	25%						
	Post Game				10%	5%	45%						

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Scott St.	AM												
Wheeler St.	PM		22%										
	Post Game		15%										

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Cullen Blvd.	AM												
Elgin St.	PM								20%	20%			
	Post Game								21%	15%			

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Cullen Blvd.	AM												
Music Bldg.	PM								40%				
	Post Game								36%				

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Cullen Blvd.	AM												
Holman St.	PM										40%		10%
	Post Game										40%		4%

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Cullen Blvd.	AM												
Wheeler St.	PM		8%										
	Post Game	2%	2%										

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
General Svcs.	AM												
Elgin St.	PM											20%	
	Post Game											15%	

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Spur 5 Frontage	AM												
Elgin St.	PM											14%	6%
	Post Game												

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Calhoun Rd.	AM												
Wheeler St.	PM											10%	5%
	Post Game											15%	2%

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Spur 5 Frontage	AM												
Wheeler St.	PM		6%									10%	
	Post Game		2%									10%	

Table 12: Net Additional Inbound Vehicle Turning Movements Generated by Parking Garage

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Scott St.	AM	0	0	0	0	0	0	0	0	0	0	0	0
Elgin St.	PM	0	11	0	0	0	0	0	0	0	0	0	3
	Post Game	0	0	0	0	0	0	0	0	0	0	0	0

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Scott St.	AM	0	0	0	0	0	0	0	0	0	0	0	0
Holman St.	PM	14	0	0	0	0	0	0	0	15	0	1	0
	Post Game	0	0	0	0	0	0	0	0	0	0	0	0

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Scott St.	AM	0	0	0	0	0	0	0	0	0	0	0	0
Wheeler St.	PM	0	0	0	0	0	0	0	14	0	1	0	0
	Post Game	0	0	0	0	0	0	0	0	0	0	0	0

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Cullen Blvd.	AM	0	0	0	0	0	0	0	0	0	0	0	0
Elgin St.	PM	0	9	0	17	0	0	0	0	0	0	0	0
	Post Game	0	0	0	0	0	0	0	0	0	0	0	0

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Cullen Blvd.	AM	0	0	0	0	0	0	0	0	0	0	0	0
Music Bldg.	PM	0	18	0	0	0	0	0	0	0	0	0	0
	Post Game	0	0	0	0	0	0	0	0	0	0	0	0

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Cullen Blvd.	AM	0	0	0	0	0	0	0	0	0	0	0	0
Holman St.	PM	0	0	18	0	0	0	12	0	0	0	0	0
	Post Game	0	0	0	0	0	0	0	0	0	0	0	0

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Cullen Blvd.	AM	0	0	0	0	0	0	0	0	0	0	0	0
Wheeler St.	PM	0	0	0	0	0	6	0	6	0	0	0	0
	Post Game	0	0	0	0	0	0	0	0	0	0	0	0

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
General Svcs.	AM	0	0	0	0	0	0	0	0	0	0	0	0
Elgin St.	PM	0	0	1	0	8	0	0	0	0	0	0	0
	Post Game	0	0	0	0	0	0	0	0	0	0	0	0

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Spur 5 Frontage	AM	0	0	0	0	0	0	0	0	0	0	0	0
Elgin St.	PM	0	0	0	0	8	0	0	0	0	0	0	0
	Post Game	0	0	0	0	0	0	0	0	0	0	0	0

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Calhoun Rd.	AM	0	0	0	0	0	0	0	0	0	0	0	0
Wheeler St.	PM	0	0	0	0	4	0	1	0	0	0	0	0
	Post Game	0	0	0	0	0	0	0	0	0	0	0	0

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Spur 5 Frontage	AM	0	0	0	0	0	0	0	0	0	0	0	0
Wheeler St.	PM	0	0	4	0	0	0	0	0	0	0	0	0
	Post Game	0	0	0	0	0	0	0	0	0	0	0	0

Table 13: Net Additional Outbound Vehicle Turning Movements Generated by Parking Garage

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Scott St.	AM	0	0	0	0	0	0	0	0	0	0	0	0
Elgin St.	PM	0	0	0	0	0	0	13	69	0	0	0	0
	Post Game	0	0	0	0	0	0	44	421	0	0	0	0

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Scott St.	AM	0	0	0	0	0	0	0	0	0	0	0	0
Holman St.	PM	0	0	0	86	4	107	0	0	0	0	0	0
	Post Game	0	0	0	111	55	498	0	0	0	0	0	0

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Scott St.	AM	0	0	0	0	0	0	0	0	0	0	0	0
Wheeler St.	PM	0	94	0	0	0	0	0	0	0	0	0	0
	Post Game	0	166	0	0	0	0	0	0	0	0	0	0

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Cullen Blvd.	AM	0	0	0	0	0	0	0	0	0	0	0	0
Elgin St.	PM	0	0	0	0	0	0	0	86	86	0	0	0
	Post Game	0	0	0	0	0	0	0	233	166	0	0	0

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Cullen Blvd.	AM	0	0	0	0	0	0	0	0	0	0	0	0
Music Bldg.	PM	0	0	0	0	0	0	0	172	0	0	0	0
	Post Game	0	0	0	0	0	0	0	399	0	0	0	0

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Cullen Blvd.	AM	0	0	0	0	0	0	0	0	0	0	0	0
Holman St.	PM	0	0	0	0	0	0	0	0	0	172	0	43
	Post Game	0	0	0	0	0	0	0	0	0	443	0	44

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Cullen Blvd.	AM	0	0	0	0	0	0	0	0	0	0	0	0
Wheeler St.	PM	0	34	0	0	0	0	0	0	0	0	0	0
	Post Game	22	22	0	0	0	0	0	0	0	0	0	0

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
General Svcs.	AM	0	0	0	0	0	0	0	0	0	0	0	0
Elgin St.	PM	0	0	0	0	0	0	0	0	0	0	86	0
	Post Game	0	0	0	0	0	0	0	0	0	0	166	0

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Spur 5 Frontage	AM	0	0	0	0	0	0	0	0	0	0	0	0
Elgin St.	PM	0	0	0	0	0	0	0	0	0	0	60	26
	Post Game	0	0	0	0	0	0	0	0	0	0	0	0

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Calhoun Rd.	AM	0	0	0	0	0	0	0	0	0	0	0	0
Wheeler St.	PM	0	0	0	0	0	0	0	0	0	0	43	21
	Post Game	0	0	0	0	0	0	0	0	0	0	166	22

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Spur 5 Frontage	AM	0	0	0	0	0	0	0	0	0	0	0	0
Wheeler St.	PM	0	26	0	0	0	0	0	0	0	0	43	0
	Post Game	0	22	0	0	0	0	0	0	0	0	111	0

Table 14: Future Fall Vehicle Turning Movements after Parking Garage Construction

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Scott St.	AM	32	719	28	135	117	11	49	295	94	35	212	98
Elgin St.	PM	38	523	10	227	240	26	128	655	108	71	255	134
	Post Game	8	241	10	133	166	66	196	2179	154	43	82	84

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Scott St.	AM	284	612	19	48	18	44	23	446	123	32	36	26
Holman St.	PM	97	798	17	207	41	222	65	782	83	42	34	11
	Post Game	8	503	31	262	139	1225	105	1294	21	185	2	56

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Scott St.	AM	167	299	11	22	19	78	13	605	104	11	16	17
Wheeler St.	PM	159	909	16	178	31	208	21	681	146	20	46	42
	Post Game	174	868	8	212	58	259	21	363	93	18	18	21

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Cullen Blvd.	AM	292	1066	105	286	203	30	63	154	67	35	222	141
Elgin St.	PM	131	435	107	152	307	252	114	806	274	82	292	121
	Post Game	26	132	40	77	180	466	108	1194	394	79	158	82

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Cullen Blvd.	AM	347	1115	31	17	1	12	32	256	191	0	0	0
Music Bldg.	PM	97	558	15	93	3	195	10	925	98	0	0	1
	Post Game	11	275	6	68	0	193	29	1520	27	3	0	14

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Cullen Blvd.	AM	0	606	566	0	0	0	98	329	0	132	0	32
Holman St.	PM	0	461	235	0	0	0	140	511	0	512	0	129
	Post Game	0	373	32	0	0	0	24	561	0	1025	0	116

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Cullen Blvd.	AM	26	174	41	120	132	12	13	107	164	35	285	79
Wheeler St.	PM	213	322	22	70	262	249	65	289	86	40	276	67
	Post Game	105	388	68	88	204	142	19	272	137	42	243	59

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
General Svcs.	AM	1	27	16	241	442	19	42	24	21	24	187	369
Elgin St.	PM	16	10	24	59	285	0	268	13	143	5	505	159
	Post Game	16	3	27	21	68	5	408	5	355	6	521	77

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Spur 5 Frontage	AM	78	130	30	426	727	0	0	0	0	0	146	60
Elgin St.	PM	150	109	6	240	362	0	0	0	0	0	568	118
	Post Game	74	21	5	82	92	0	0	0	0	0	666	80

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Calhoun Rd.	AM	14	49	68	45	247	52	226	386	54	108	58	60
Wheeler St.	PM	64	324	241	41	95	16	97	220	80	158	272	207
	Post Game	18	175	127	42	71	8	47	66	48	132	561	117

		Southbound			Westbound			Northbound			Eastbound		
Intersection	Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Spur 5 Frontage	AM	2	296	349	0	76	0	0	0	0	0	131	6
Wheeler St.	PM	0	614	186	0	12	0	0	0	0	0	391	32
	Post Game	13	144	122	2	2	0	0	0	0	0	580	18

APPENDIX B

FUTURE INTERSECTION TRAFFIC SIGNAL TIMING

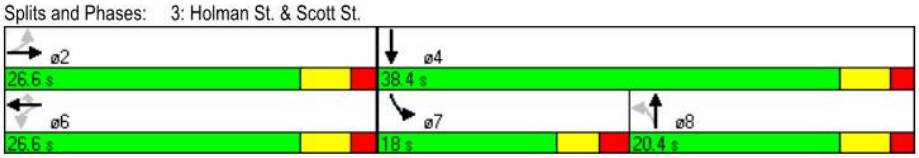
WALKER
PARKING CONSULTANTS

Timings
3: Holman St. & Scott St. 3/30/2011

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations									
Volume (vph)	32	36	48	18	44	23	446	284	612
Turn Type	Perm		Perm		Perm	Perm		Prot	
Protected Phases		2		6			8	7	4
Permitted Phases	2		6		6	8			
Detector Phase	2	2	6	6	6	8	8	7	4
Switch Phase									
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	15.0	15.0	8.0	15.0
Minimum Split (s)	26.5	26.5	26.5	26.5	26.5	20.4	20.4	13.2	21.4
Total Split (s)	26.6	26.6	26.6	26.6	26.6	20.4	20.4	18.0	38.4
Total Split (%)	40.9%	40.9%	40.9%	40.9%	40.9%	31.4%	31.4%	27.7%	59.1%
Yellow Time (s)	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.0	3.6
All-Red Time (s)	1.9	1.9	1.9	1.9	1.9	1.8	1.8	2.2	1.8
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.5	5.5	5.5	5.5	5.5	5.4	5.4	5.2	5.4
Lead/Lag						Lag	Lag	Lead	
Lead-Lag Optimize?									
Recall Mode	C-Max	C-Max	C-Max	C-Max	C-Max	None	None	None	Max
Act Effct Green (s)		21.1		21.1	21.1	15.0	15.0	12.8	33.0
Actuated g/C Ratio		0.32		0.32	0.32	0.23	0.23	0.20	0.51
v/c Ratio		0.19		0.18	0.09	0.15	0.76	0.91	0.39
Control Delay		13.2		17.2	5.9	22.8	28.9	59.1	10.6
Queue Delay		0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay		13.2		17.2	5.9	22.8	28.9	59.1	10.6
LOS		B		B	A	C	C	E	B
Approach Delay		13.2		12.7			28.7		25.6
Approach LOS		B		B			C		C

Intersection Summary	
Cycle Length: 65	
Actuated Cycle Length: 65	
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green	
Natural Cycle: 65	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.91	
Intersection Signal Delay: 25.2	Intersection LOS: C
Intersection Capacity Utilization 57.3%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 3: Holman St. & Scott St.

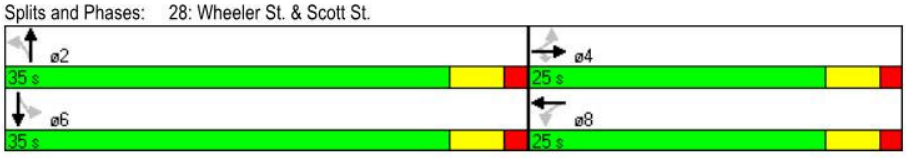


Timings
28: Wheeler St. & Scott St. 3/30/2011

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations									
Volume (vph)	11	16	17	22	19	13	605	167	299
Turn Type	Perm		Perm	Perm		Perm		Perm	
Protected Phases		4			8		2		6
Permitted Phases	4		4	8		2		6	
Detector Phase	4	4	4	8	8	2	2	6	6
Switch Phase									
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	9.0	9.0	9.0	9.0
Minimum Split (s)	25.0	25.0	25.0	25.0	25.0	30.0	30.0	30.0	30.0
Total Split (s)	25.0	25.0	25.0	25.0	25.0	35.0	35.0	35.0	35.0
Total Split (%)	41.7%	41.7%	41.7%	41.7%	41.7%	58.3%	58.3%	58.3%	58.3%
Yellow Time (s)	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
All-Red Time (s)	1.6	1.6	1.6	1.6	1.6	1.7	1.7	1.7	1.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.2	5.2	5.2	5.2	5.2	5.3	5.3	5.3	5.3
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	Max	Max	Max	Max	Max	C-Max	C-Max	C-Max	C-Max
Act Effct Green (s)		19.8	19.8		19.8	29.7	29.7	29.7	29.7
Actuated g/C Ratio		0.33	0.33		0.33	0.50	0.50	0.50	0.50
v/c Ratio		0.06	0.03		0.22	0.03	0.45	0.63	0.20
Control Delay		14.3	7.2		7.5	8.1	10.3	24.1	8.6
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0	0.0
Total Delay		14.3	7.2		7.5	8.1	10.3	24.1	8.6
LOS		B	A		A	A	B	C	A
Approach Delay		11.6			7.5		10.3		14.0
Approach LOS		B			A		B		B

Intersection Summary	
Cycle Length: 60	
Actuated Cycle Length: 60	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Natural Cycle: 60	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.63	
Intersection Signal Delay: 11.4	Intersection LOS: B
Intersection Capacity Utilization 56.1%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 28: Wheeler St. & Scott St.



Timings
8: Elgin St. & Scott St. 3/7/2011

Lane Group	EBT	WBL	WBT	NBL	NBT	SBT
Lane Configurations						
Volume (vph)	127	210	166	196	2333	249
Turn Type		Perm		Prot		
Protected Phases	2		6	3	8	4
Permitted Phases		6				
Detector Phase	2	6	6	3	8	4
Switch Phase						
Minimum Initial (s)	10.0	14.0	14.0	14.0	14.0	8.0
Minimum Split (s)	15.5	19.5	19.5	26.1	20.1	14.1
Total Split (s)	22.4	22.4	22.4	33.4	107.6	74.2
Total Split (%)	17.2%	17.2%	17.2%	25.7%	82.8%	57.1%
Yellow Time (s)	3.6	3.6	3.6	3.6	3.6	3.6
All-Red Time (s)	1.9	1.9	1.9	2.5	2.5	2.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.5	5.5	5.5	6.1	6.1	6.1
Lead/Lag				Lead		Lag
Lead-Lag Optimize?						
Recall Mode	None	Max	Max	None	C-Max	C-Max
Act Effct Green (s)	16.9	16.9	16.9	21.1	101.5	74.3
Actuated g/C Ratio	0.13	0.13	0.13	0.16	0.78	0.57
v/c Ratio	0.46	0.97	0.58	0.77	1.02	0.14
Control Delay	34.5	108.8	56.2	69.7	37.7	13.7
Queue Delay	0.0	0.0	0.0	0.0	26.8	0.0
Total Delay	34.5	108.8	56.2	69.7	64.5	13.7
LOS	C	F	E	E	E	B
Approach Delay	34.5		81.2		64.8	13.7
Approach LOS	C		F		E	B

Intersection Summary	
Cycle Length: 130	
Actuated Cycle Length: 130	
Offset: 0 (0%), Referenced to phase 4:SBTL and 8:NBT, Start of Green	
Natural Cycle: 130	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.02	
Intersection Signal Delay: 61.4	Intersection LOS: E
Intersection Capacity Utilization 115.4%	ICU Level of Service H
Analysis Period (min) 15	

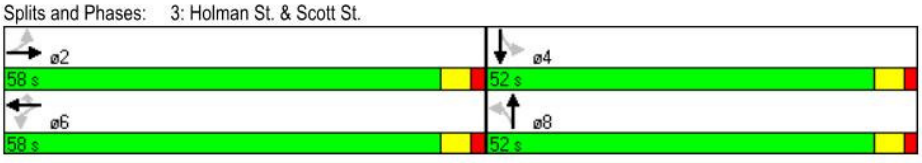
Splits and Phases: 8: Elgin St. & Scott St.

Timings
3: Holman St. & Scott St. 3/7/2011

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations									
Volume (vph)	185	2	262	139	1225	105	1294	8	511
Turn Type	Perm		Perm		Perm	Perm		Perm	
Protected Phases		2		6			8		4
Permitted Phases	2		6		6	8		4	
Detector Phase	2	2	6	6	6	8	8	4	4
Switch Phase									
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	15.0	15.0	15.0	15.0
Minimum Split (s)	26.5	26.5	26.5	26.5	26.5	20.4	20.4	21.4	21.4
Total Split (s)	58.0	58.0	58.0	58.0	58.0	52.0	52.0	52.0	52.0
Total Split (%)	52.7%	52.7%	52.7%	52.7%	52.7%	47.3%	47.3%	47.3%	47.3%
Yellow Time (s)	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
All-Red Time (s)	1.9	1.9	1.9	1.9	1.9	1.8	1.8	1.8	1.8
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.5	5.5	5.5	5.5	5.5	5.4	5.4	5.4	5.4
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	Max	Max	Max	Max	Max	C-Max	C-Max	C-Max	C-Max
Act Effct Green (s)		52.5		52.5	52.5	46.6	46.6	46.6	46.6
Actuated g/C Ratio		0.48		0.48	0.48	0.42	0.42	0.42	0.42
v/c Ratio		0.77		0.83	1.03	0.42	0.99	0.14	0.41
Control Delay		39.1		41.0	61.2	28.1	53.0	25.9	22.9
Queue Delay		0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay		39.1		41.0	61.2	28.1	53.0	25.9	22.9
LOS		D		D	E	C	D	C	C
Approach Delay		39.1		56.2			51.2		22.9
Approach LOS		D		E			D		C

Intersection Summary	
Cycle Length: 110	
Actuated Cycle Length: 110	
Offset: 0 (0%), Referenced to phase 4:SBTL and 8:NBTL, Start of Green	
Natural Cycle: 110	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.03	
Intersection Signal Delay: 48.5	Intersection LOS: D
Intersection Capacity Utilization 106.7%	ICU Level of Service G
Analysis Period (min) 15	

Splits and Phases: 3: Holman St. & Scott St.

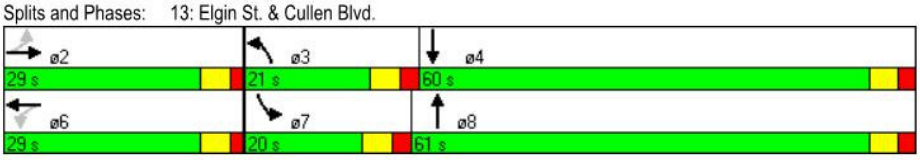


Timings
13: Elgin St. & Cullen Blvd. 3/7/2011

Lane Group	EBT	WBT	NBL	NBT	SBL	SBT
Lane Configurations						
Volume (vph)	280	257	108	1194	26	132
Turn Type			Prot		Prot	
Protected Phases	2	6	3	8	7	4
Permitted Phases						
Detector Phase	2	6	3	8	7	4
Switch Phase						
Minimum Initial (s)	5.0	5.0	4.0	8.0	4.0	8.0
Minimum Split (s)	24.3	24.3	15.0	25.0	20.0	30.0
Total Split (s)	29.0	29.0	21.0	61.0	20.0	60.0
Total Split (%)	26.4%	26.4%	19.1%	55.5%	18.2%	54.5%
Yellow Time (s)	3.6	3.6	3.6	3.6	3.6	3.6
All-Red Time (s)	1.7	1.7	2.2	2.2	2.2	2.2
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.3	5.3	5.8	5.8	5.8	5.8
Lead/Lag			Lead	Lag	Lead	Lag
Lead-Lag Optimize?						
Recall Mode	C-Max	C-Max	Max	Max	Max	Max
Act Effct Green (s)	23.7	23.7	15.2	55.2	14.2	54.2
Actuated g/C Ratio	0.22	0.22	0.14	0.50	0.13	0.49
v/c Ratio	0.53	0.96dr	0.50	1.03	0.13	0.11
Control Delay	38.2	44.1	51.8	55.7	44.1	11.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	38.2	44.1	51.8	55.7	44.1	11.6
LOS	D	D	D	E	D	B
Approach Delay	38.2	44.1		55.5		15.9
Approach LOS	D	D		E		B

Intersection Summary	
Cycle Length: 110	
Actuated Cycle Length: 110	
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green	
Natural Cycle: 110	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.03	
Intersection Signal Delay: 48.0	Intersection LOS: D
Intersection Capacity Utilization 85.1%	ICU Level of Service E
Analysis Period (min) 15	
dr Defacto Right Lane. Recode with 1 though lane as a right lane.	

Splits and Phases: 13: Elgin St. & Cullen Blvd.

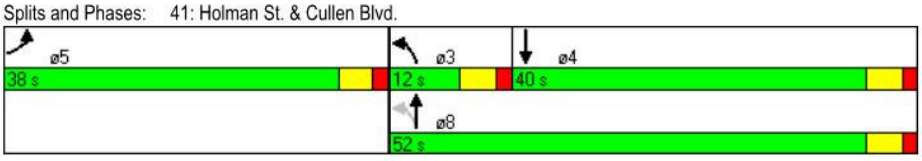


Timings
41: Holman St. & Cullen Blvd. 3/7/2011

Lane Group	EBL	NBL	NBT	SBT
Lane Configurations				
Volume (vph)	1025	24	561	294
Turn Type		pm+pt		
Protected Phases	5	3	8	4
Permitted Phases		8		
Detector Phase	5	3	8	4
Switch Phase				
Minimum Initial (s)	8.0	6.0	10.0	10.0
Minimum Split (s)	17.0	12.0	45.0	40.0
Total Split (s)	38.0	12.0	52.0	40.0
Total Split (%)	42.2%	13.3%	57.8%	44.4%
Yellow Time (s)	3.2	3.6	3.6	3.6
All-Red Time (s)	1.8	1.5	1.5	1.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.1	5.1	5.1
Lead/Lag		Lead		Lag
Lead-Lag Optimize?				
Recall Mode	Max	Max	C-Max	C-Max
Act Effct Green (s)	33.0	46.9	46.9	34.9
Actuated g/C Ratio	0.37	0.52	0.52	0.39
v/c Ratio	1.02	0.05	0.34	0.27
Control Delay	59.7	12.9	15.9	18.7
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	59.7	12.9	15.9	18.7
LOS	E	B	B	B
Approach Delay	59.7		15.8	18.7
Approach LOS	E		B	B

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 43 (48%), Referenced to phase 4:SBT and 8:NBTL, Start of Green	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.02	
Intersection Signal Delay: 40.6	Intersection LOS: D
Intersection Capacity Utilization 59.7%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 41: Holman St. & Cullen Blvd.



Timings
33: Wheeler St. & Calhoun Rd. 3/7/2011

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations									
Volume (vph)	132	545	117	42	71	47	66	18	175
Turn Type	Prot		Perm	Prot		Perm		pm+pt	
Protected Phases	7	4		3	8		2	1	6
Permitted Phases			4			2		6	
Detector Phase	7	4	4	3	8	2	2	1	6
Switch Phase									
Minimum Initial (s)	5.0	7.0	7.0	5.0	7.0	5.0	5.0	3.0	5.0
Minimum Split (s)	15.0	21.5	21.5	15.0	21.5	21.7	21.7	15.0	21.7
Total Split (s)	20.0	38.0	38.0	15.0	33.0	22.0	22.0	15.0	37.0
Total Split (%)	22.2%	42.2%	42.2%	16.7%	36.7%	24.4%	24.4%	16.7%	41.1%
Yellow Time (s)	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
All-Red Time (s)	1.9	1.9	1.9	1.9	1.9	2.1	2.1	2.1	2.1
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.5	5.5	5.5	5.5	5.5	5.7	5.7	5.7	5.7
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lag	Lead	
Lead-Lag Optimize?									
Recall Mode	None	None	None	None	None	Max	Max	None	Max
Act Effct Green (s)	11.4	29.2	29.2	7.5	27.5	27.4	27.4	32.0	32.0
Actuated g/C Ratio	0.14	0.36	0.36	0.09	0.34	0.34	0.34	0.40	0.40
v/c Ratio	0.59	0.90	0.21	0.28	0.15	0.15	0.21	0.04	0.47
Control Delay	44.3	44.8	11.1	42.0	12.2	27.9	20.5	19.3	20.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	44.3	44.8	11.1	42.0	12.2	27.9	20.5	19.3	20.4
LOS	D	D	B	D	B	C	C	B	C
Approach Delay		39.8			21.5		22.6		20.4
Approach LOS		D			C		C		C

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 80.2	
Natural Cycle: 90	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.90	
Intersection Signal Delay: 31.8	Intersection LOS: C
Intersection Capacity Utilization 63.9%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 33: Wheeler St. & Calhoun Rd.