Craver Road Traffic Study
The University of North Carolina at Charlotte

Charlotte, North Carolina

RAMEY KEMP & ASSOCIATES

UNCCHARLOTTE

Prepared For:

The University of North Carolina at Charlotte
9201 University City Boulevard
Charlotte, NC 28223

Prepared By:

Ramey Kemp & Associates, Inc.
8307 University Executive Park
Suite 260
Charlotte, NC 28262

RAMEY KEMP & ASSOCIATES

RAMEY KEMP & ASSOCIATES
TRANSPORTATION ENGINEERS

RAMEY KEMP & ASSOCIATES, INC.
8307 University Executive Park Drive
Suite 260
Charlotte, NC 28262
Phone: 704-549-4260 Fax: 704-549-4277

TABLE OF CONTENTS

LIST OF TABLES

RAMEY KEMP & ASSOCIATES
TRANSPORTATION ENGINEERS

RAMEY KEMP & ASSOCIATES, INC.
8307 University Executive Park Drive
Suite 260
Charlotte, NC 28262
Phone: 704-549-4260 Fax: 704-549-4277

LIST OF FIGURES

TECHNICAL APPENDIX

RAMEY KEMP & ASSOCIATES
TRANSPORTATION ENGINEERS

RAMEY KEMP & ASSOCIATES, INC.
8307 University Executive Park Drive
Suite 260
Charlotte, NC 28262
Phone: 704-549-4260 Fax: 704-549-4277

TRAFFIC ANALYSIS REPORT
CRAVER ROAD STUDY
UNIVERSITY OF NORTH CAROLINA AT CHARLOTTE CAMPUS

1. INTRODUCTION

The contents of this report present the findings of the Traffic Analysis conducted for portions of the central campus area of the University of North Carolina at Charlotte (UNCC). The purpose of this study is to analyze both short-term and long-term solutions to the pedestrian and vehicular traffic problems along Craver Road. Recommendations were identified and analyzed to best address both existing transportation issues as well as issues expected over the next 5 years as the UNCC campus grows. Existing (2009) traffic conditions were analyzed as well as future (2015) traffic conditions.

2. PROJECT DESCRIPTION

The UNCC Student Union opened on the north side of Craver Road in August 2009. According to the University, the purpose of the student union is to be the active, safe, and inclusive center of campus life, hosting retail and food services as well as being a location for campus activities and events. The opening of the student union brought greatly increased pedestrian traffic to this central area of campus, particularly at a pedestrian crossing located directly in front of the new student union. This pedestrian crossing on Craver Road connects the student union to the heart of campus where the majority of academic buildings are located.

Immediately after the opening of the student union, extremely heavy pedestrian traffic at the crossing area began causing vehicular traffic to experience large delays, especially during class change hours. In addition, pedestrian safety was degraded as vehicles tried to pass through the crossing area in-between groups of pedestrians. Temporary stop signs were installed on Craver Road to stop vehicular traffic at the crossing.

University officials contacted Ramey Kemp & Associates, Inc. (RKA) to perform a traffic study for the Craver Road area of campus. After discussions with UNCC officials, the project scope was narrowed to the analysis of one short term solution and one long term solution.

The two analysis scenarios are as follows:

1. Installation of a traffic signal on Craver Road at the Student Union pedestrian crossing
2. Closure of Craver Road to non-essential through traffic (exceptions to include shuttles/busses, service vehicles, and other traffic as deemed appropriate by university officials)

Three peak hour periods for study were identified by UNCC staff as having the highest combination of pedestrian and vehicular traffic. The AM peak period coincides with the arrival of the majority off-campus students, faculty, and administration and the walk to morning classes. The mid-day period coincides with the lunch hour rush, both entering/leaving campus and travelling to the student union. The PM peak period coincides with the departing of the majority of off-campus students along with faculty and administration. Based on discussions with UNCC staff, Wednesdays are the highest pedestrian and vehicular traffic generators due to arrangement of class scheduling.

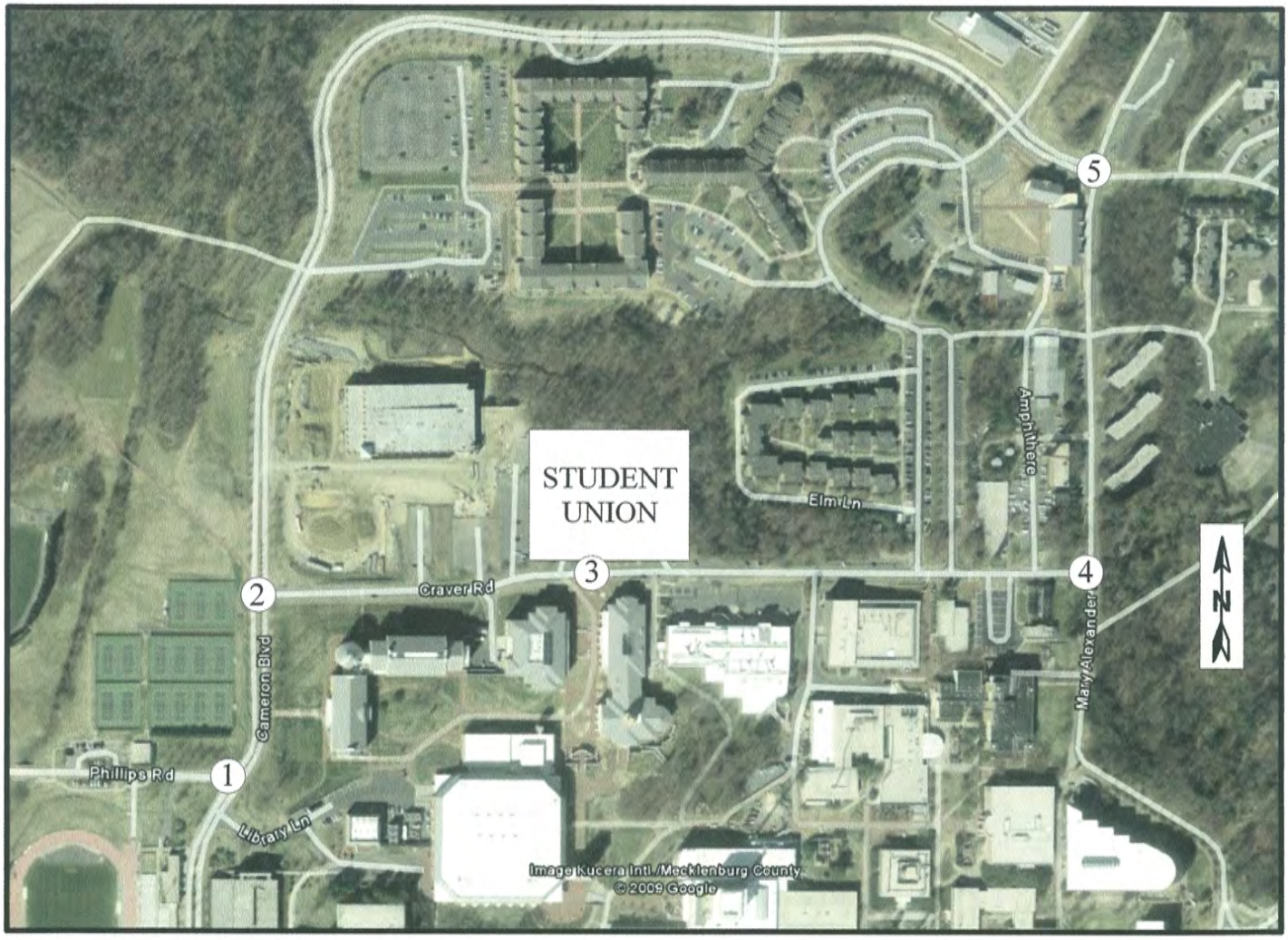
Analysis Scenario 1, the installation of a traffic signal on Craver Road at the Student Union pedestrian crossing, was analyzed under existing (2009) traffic conditions. Analysis Scenario 2, the Craver Road closure option, was studied both under existing (2009) and future (2015) traffic conditions. In an attempt to facilitate the analysis of Scenario 2, a scaled down origin-destination study was completed along Craver Road during all peak periods.

3. STUDY AREA

The study area for the project was established through coordination with UNCC officials. Along with the pedestrian crossing at the student union, intersections were identified that would be most impacted by the possible closure of Craver Road. The study area was determined to consist of the following intersections:

a. Cameron Boulevard and Phillips Road
b. Cameron Boulevard and Craver Road
c. Craver Road and Student Union Crossing
d. Mary Alexander Road and Craver Road
e. Cameron Boulevard and Mary Alexander Road

Refer to Figure 1 for an illustration of the site location and study area.



LEGEND

Ⓧ Study Intersection

CRAVER ROAD TRAFFIC STUDY - UNCC CHARLOTTE, NORTH CAROLINA		
Study Area and Site Location Map		
	Scale: Not to Scale	Figure 1

4. DATA COLLECTION

Vehicular traffic counts were performed for all intersections by Ramey Kemp & Associates, Inc. (RKA) during the AM (7:00 AM – 9:00 AM), mid-day (10:00 AM – 1:00 PM), and PM (4:00 PM – 6:00 PM) peak periods. Pedestrian counts were also performed at the student union pedestrian crossing during all peak periods. Counts were performed on Wednesday, November 18, 2009. Refer to Appendix A for raw count data for all intersections.

Video data was also recorded at the intersections of Craver Road with Cameron Boulevard and Mary Alexander Road during all peak periods. Video cameras were operated by traffic counters and recorded traffic patterns at each intersection.

5. TRAFFIC ANALYSIS PROCEDURE

Study intersections were analyzed using the methodology outlined in the 2000 Highway Capacity Manual (HCM) published by the Transportation Research Board. Capacity and level of service are the design criteria for this traffic study. A computer software package, Synchro (Version 7), was used to complete the analyses for all signalized and unsignalized intersections. Synchro 7 was developed by Trafficware Corporation and allows the user to input data into the Synchro software and calculate the output based on methodologies in the 2000 HCM. Therefore, Synchro 7 was used to conduct all capacity analyses at unsignalized and signalized intersections in this study. Please note that the unsignalized capacity analysis does not provide an overall level of service for an intersection; only delay for an approach with a conflicting movement.

The HCM defines capacity as "the maximum hourly rate at which persons or vehicles can reasonably be expected to traverse a point or uniform section of a lane or roadway during a given time period under prevailing roadway, traffic, and control conditions." Level of service (LOS) is a term used to represent different driving conditions, and is defined as a "qualitative measure describing operational conditions within a traffic stream, and their perception by motorists and/or passengers."

Level of service varies from Level "A" representing free flow, to Level "F" where breakdown conditions are evident. Refer to Table 1 for HCM levels of service and related average control delay per vehicle for both signalized and unsignalized intersections. Control delay as defined by the HCM includes "initial deceleration

delay, queue move-up time, stopped delay, and final acceleration delay". An average control delay of 50 seconds at a signalized intersection results in LOS "D" operation at the intersection.

TABLE 1
Highway Capacity Manual - Levels of Service and Delay

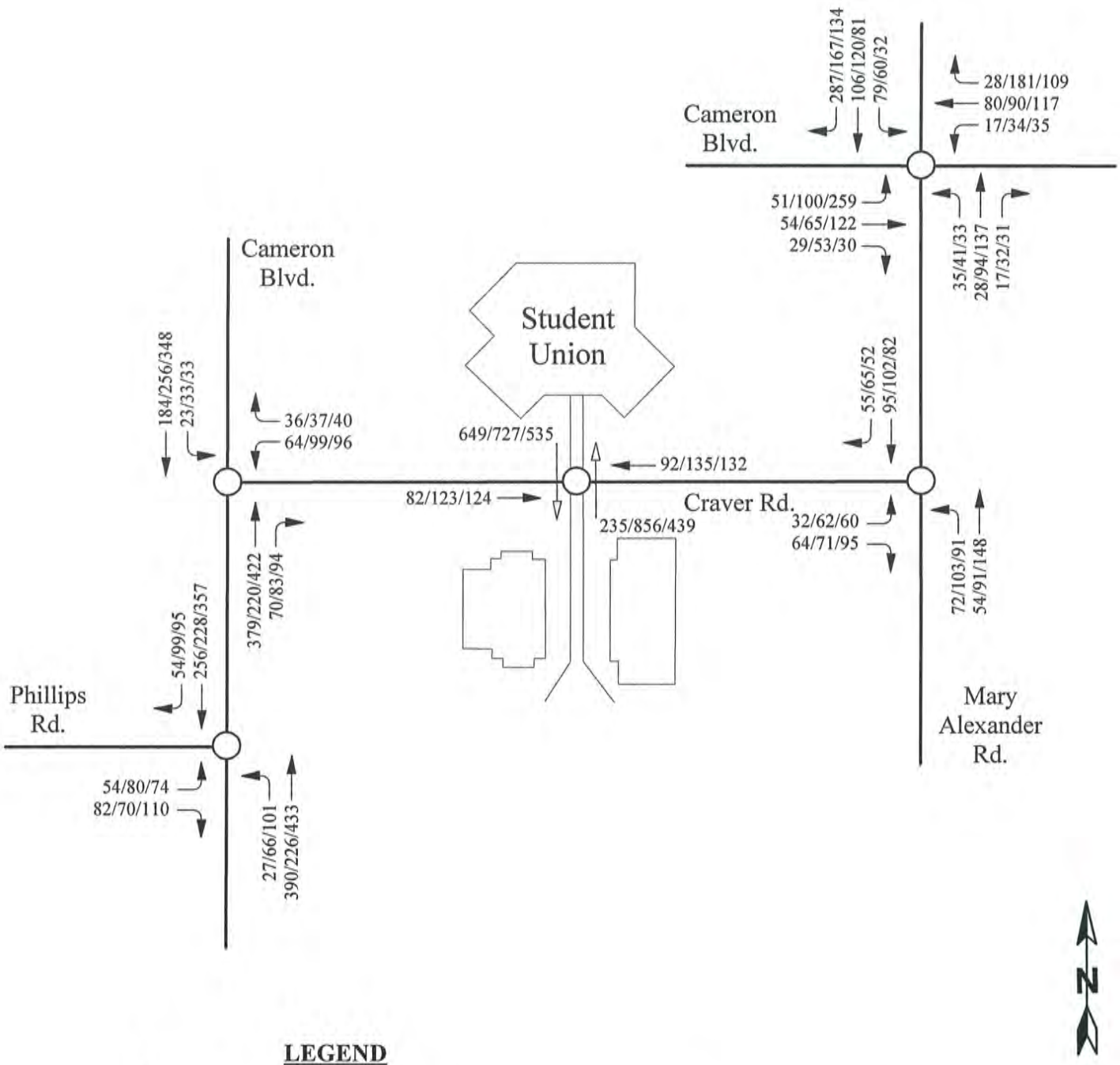
UNSIGNALIZED INTERSECTION		SIGNALIZED INTERSECTION	
LEVEL OF SERVICE	**AVERAGE CONTROL DELAY PER VEHICLE (SECONDS)**	**LEVEL OF SERVICE**	**AVERAGE CONTROL DELAY PER VEHICLE (SECONDS)**
A	0-10	A	0-10
B	10-15	B	10-20
C	15-25	C	20-35
D	25-35	D	35-55
E	35-50	E	55-80
F	>50	F	>80

Synchro's built-in simulation software SimTraffic was also used for analysis purposes. This simulation allows for a broad view of the network, and the identification of problems that might not be shown in a capacity analysis report.

In addition to Synchro and SimTraffic, SIDRA Intersection 3.2 was used to provide capacity analysis reports for all roundabout scenarios and pedestrian signal crossings. SIDRA allows for a more detailed and accurate capacity analysis of roundabouts and provides levels of service for pedestrian traffic at signalized intersections.

6. EXISTING (2009) PEAK HOUR CONDITIONS

As mentioned previously, traffic counts were conducted for all intersections within the study area. Due to the multiple driveways and parking areas between study intersections, traffic counts were not balanced between count locations. Refer to Figure 2 for an illustration of existing (2009) peak hour traffic. In addition to completing traffic counts, RKA observed traffic operations throughout the entire study area during the three peak hours.



LEGEND

- Signalized Intersection
- Unsignalized Intersection
- X/Y/Z → AM/Mid-Day/PM Weekday Vehicular Traffic
- X/Y/Z ⇨ AM/Mid-Day/PM Weekday Pedestrian Traffic

CRAVER ROAD TRAFFIC STUDY - UNCC CHARLOTTE, NORTH CAROLINA		
Existing (2009) Peak Hour Traffic		
	Scale: Not to Scale	Figure 2

7. CRAVER ROAD CLOSURE – VOLUME ADJUSTMENTS

As mentioned previously, video data was recorded for the intersections of Craver Road with Cameron Boulevard and Mary Alexander Road. The purpose of these video recordings were to provide data on the origin and destination of vehicles travelling on Craver Road during the peak hour periods.

Video data from each intersection were paired and viewed to attempt to determine the travel patterns of vehicles turning on to and off of Craver Road. The video data did not indicate any discernable patterns by vehicles travelling the Craver Road corridor. Vehicles destinations when turning off Craver Road did not appear to be affected by the direction from which they turned on to Craver Road. As a result, video data results were not used when determining diverted traffic from the Craver Road closure.

When projecting the effect on traffic due to the Craver Road closure, existing volumes were adjusted for the closure and then adjusted for future growth. Projected turning movement volumes were needed at the intersections of Craver Road with Cameron Boulevard and Mary Alexander Road as a result of the Craver Road closure. Turning movement volumes at these intersections were classified into four categories when projecting the effects of the Craver Road closure. The four categories are as follows:

a. Service vehicles
b. Drop-off traffic
c. Source/Sink traffic
d. Diverted trips

Service vehicle traffic along Craver Road was determined by counts performed at the pedestrian crossing in front of the student union. Included in these service vehicle counts were busses and shuttles, official UNCC service vehicles, and other service and vending vehicles. It was assumed that these vehicles would still be allowed to travel through the closure in the future. The service vehicle through volumes counted at the pedestrian crossing were assigned to turning movements at the two intersections using existing bus routes, existing travel patterns, and engineering judgment. Refer to Figure 3 for an illustration of the estimated service vehicle volumes on Craver Road after closure.

During field observations, a large number of vehicles were observed travelling on Craver Road for the purpose of dropping off pedestrians. After removing service vehicles, it is anticipated that 30% of the remaining existing turning vehicles would remain as turnaround trips. Refer to Figure 4 for an illustration of the estimated turnaround/drop-off volumes on Craver Road after closure.

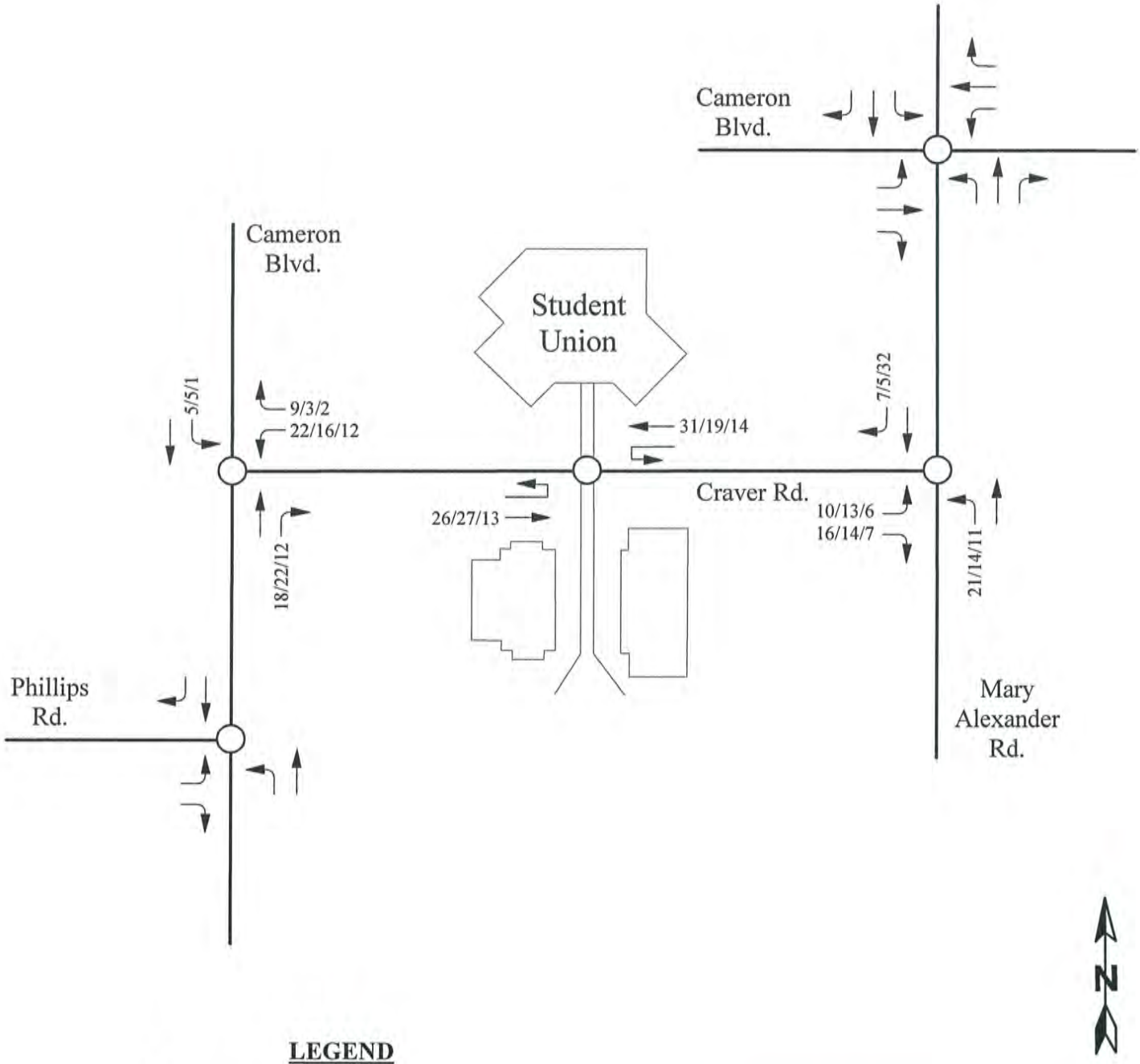
There are multiple driveways and parking areas along Craver Road that vehicles access during the peak hours. After removing service vehicles and turnaround traffic, it is anticipated that 10% of the remaining existing turning vehicles at the Craver/Cameron intersection and 30% of the remaining existing turning vehicles at the Craver/Mary Alexander intersection would remain as vehicles that are entering/exiting parking areas. The percentage of vehicles assumed to be utilizing parking areas was higher at the Craver/Mary Alexander intersection due to the greater amount of parking on the east end of Craver Road. Refer to Figure 5 for an illustration of the estimated source/sink volumes on Craver Road after closure.

After accounting for service vehicles, turnaround/drop-off traffic, and parking traffic, the remaining existing turning volumes were re-assigned as diverted traffic. This traffic was diverted throughout the study area based upon the location of commuter lots, campus exits and entrances, and engineering judgment. Refer to Figure 6 for an illustration of the estimated diverted traffic volumes in the study area after Craver Road closure.

Traffic from service vehicles, turnaround/dropoff traffic, parking traffic, and diverted trips were added to the study area to determine existing (2009) traffic volumes with the Craver Road closure. Refer to Figure 7 for an illustration of existing (2009) traffic volumes with the Craver Road closure.

8. FUTURE (2015) PEAK HOUR CONDITIONS

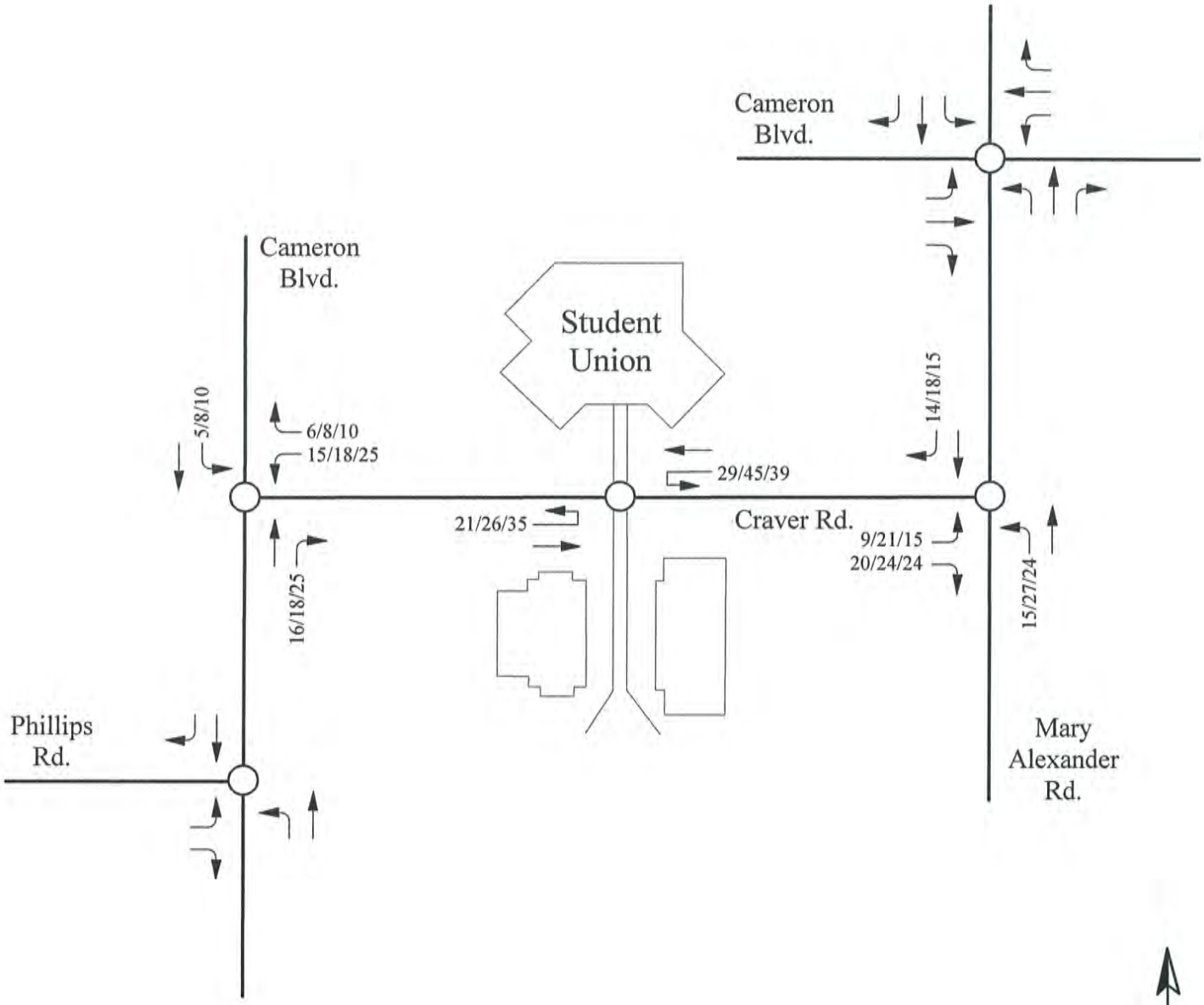
Existing traffic was projected out to the year 2015 for future analysis purposes. A compound annual growth rate of 3% was used to project existing traffic volumes to 2015. This growth rate was determined through examination of past student enrollment growth numbers, future enrollment goals shown in the UNCC Master Plan, and discussions with UNCC staff. Refer to Figure 8 for an illustration of future (2015) traffic volumes with the Craver Road closure (3% growth rate applied). Note that future analysis scenarios include the re-alignment and signalization of Phillips Road with Cameron Boulevard across from Craver Road. This project is planned and is expected to be completed in the next four to six years.



LEGEND

- Signalized Intersection
- Unsignalized Intersection
- X/Y/Z → AM/Mid-Day/PM Weekday Vehicular Traffic
- X/Y/Z ⇨ AM/Mid-Day/PM Weekday Pedestrian Traffic

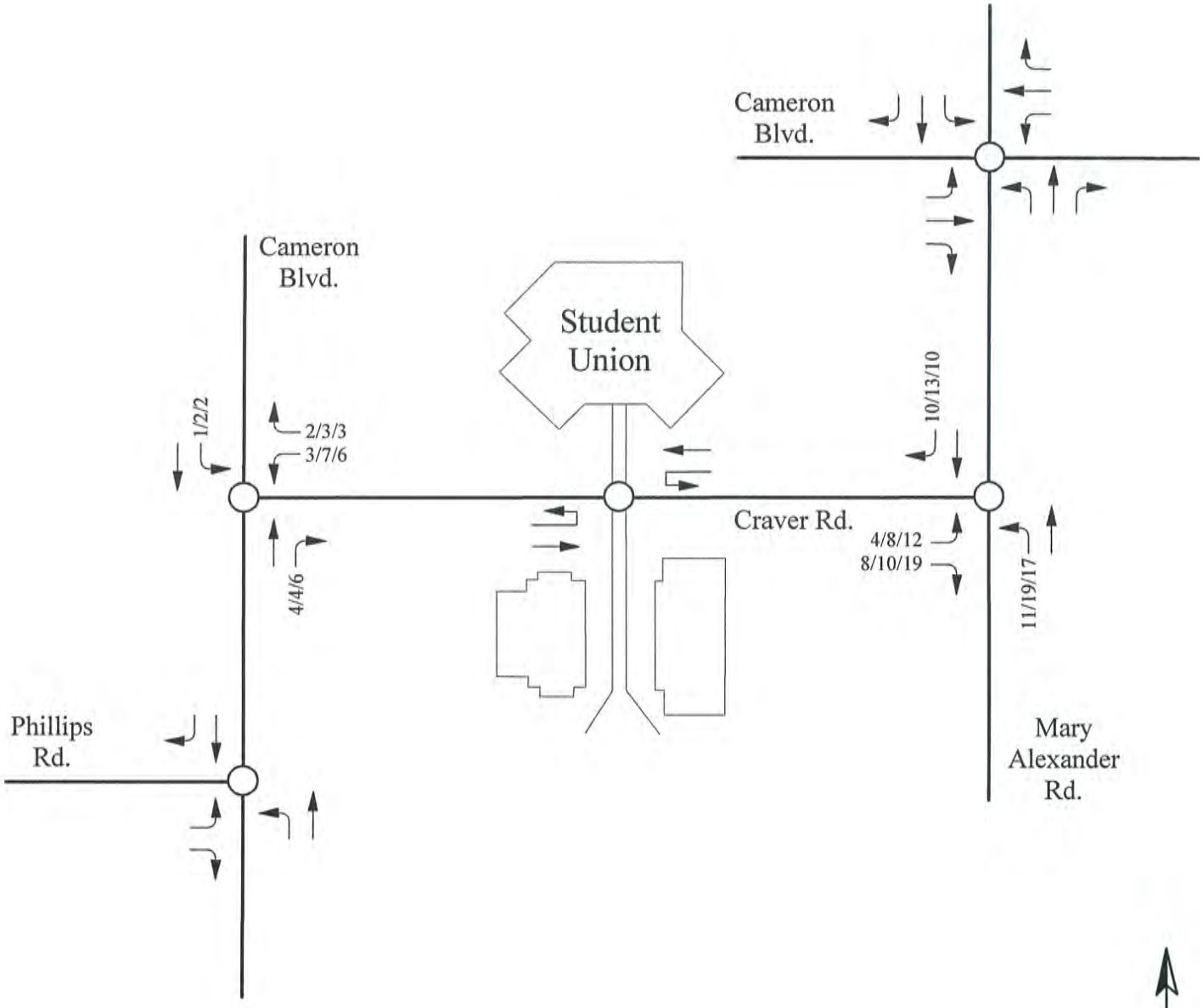
CRAVER ROAD TRAFFIC STUDY - UNCC CHARLOTTE, NORTH CAROLINA		
Estimated Service Vehicle Traffic (After Craver Road Closure)		
	Scale: Not to Scale	Figure 3



LEGEND

- Signalized Intersection
- Unsignalized Intersection
- X/Y/Z → AM/Mid-Day/PM Weekday Vehicular Traffic
- X/Y/Z ⇨ AM/Mid-Day/PM Weekday Pedestrian Traffic

CRAVER ROAD TRAFFIC STUDY - UNCC CHARLOTTE, NORTH CAROLINA		
Estimated Drop-Off Traffic (After Craver Road Closure)		
	Scale: Not to Scale	Figure 4



LEGEND

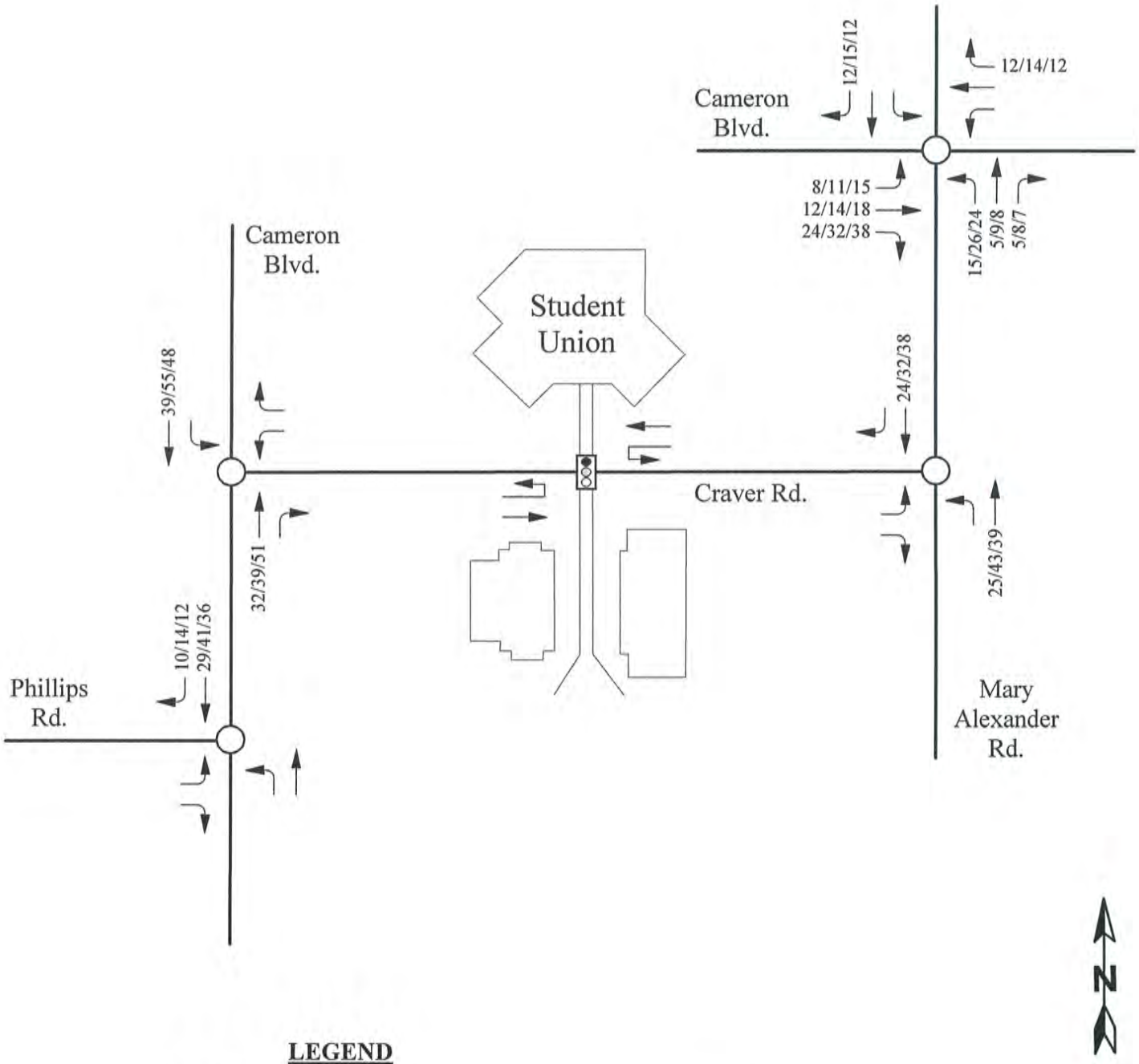
Signalized Intersection

Unsignalized Intersection

X/Y/Z → AM/Mid-Day/PM Weekday Vehicular Traffic

X/Y/Z ⇨ AM/Mid-Day/PM Weekday Pedestrian Traffic

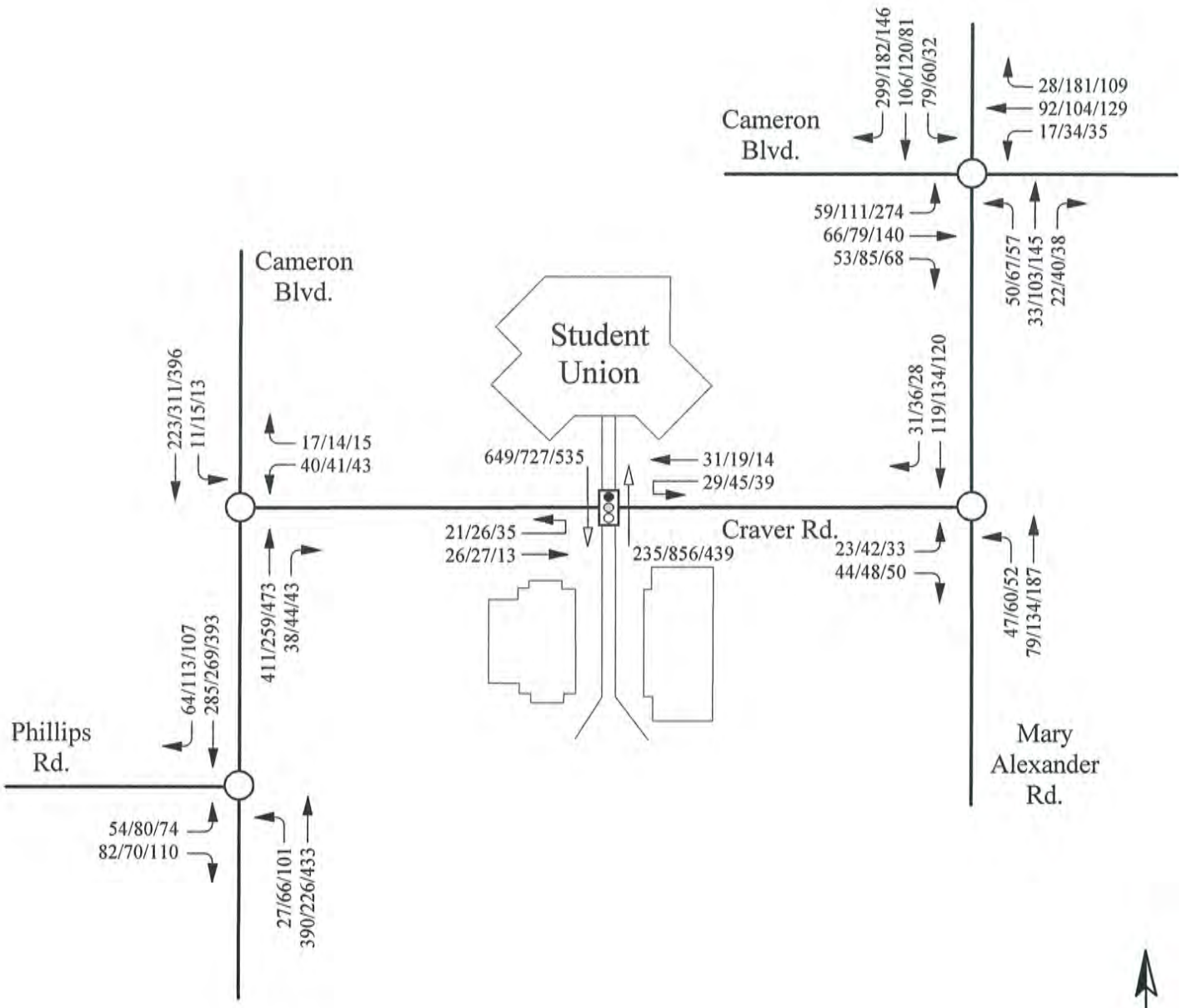
CRAVER ROAD TRAFFIC STUDY - UNCC CHARLOTTE, NORTH CAROLINA		
Estimated Source/Sink Traffic (After Craver Road Closure)		
	Scale: Not to Scale	Figure 5



LEGEND

- Signalized Intersection
- Unsignalized Intersection
- X/Y/Z → AM/Mid-Day/PM Weekday Vehicular Traffic
- X/Y/Z ⇨ AM/Mid-Day/PM Weekday Pedestrian Traffic

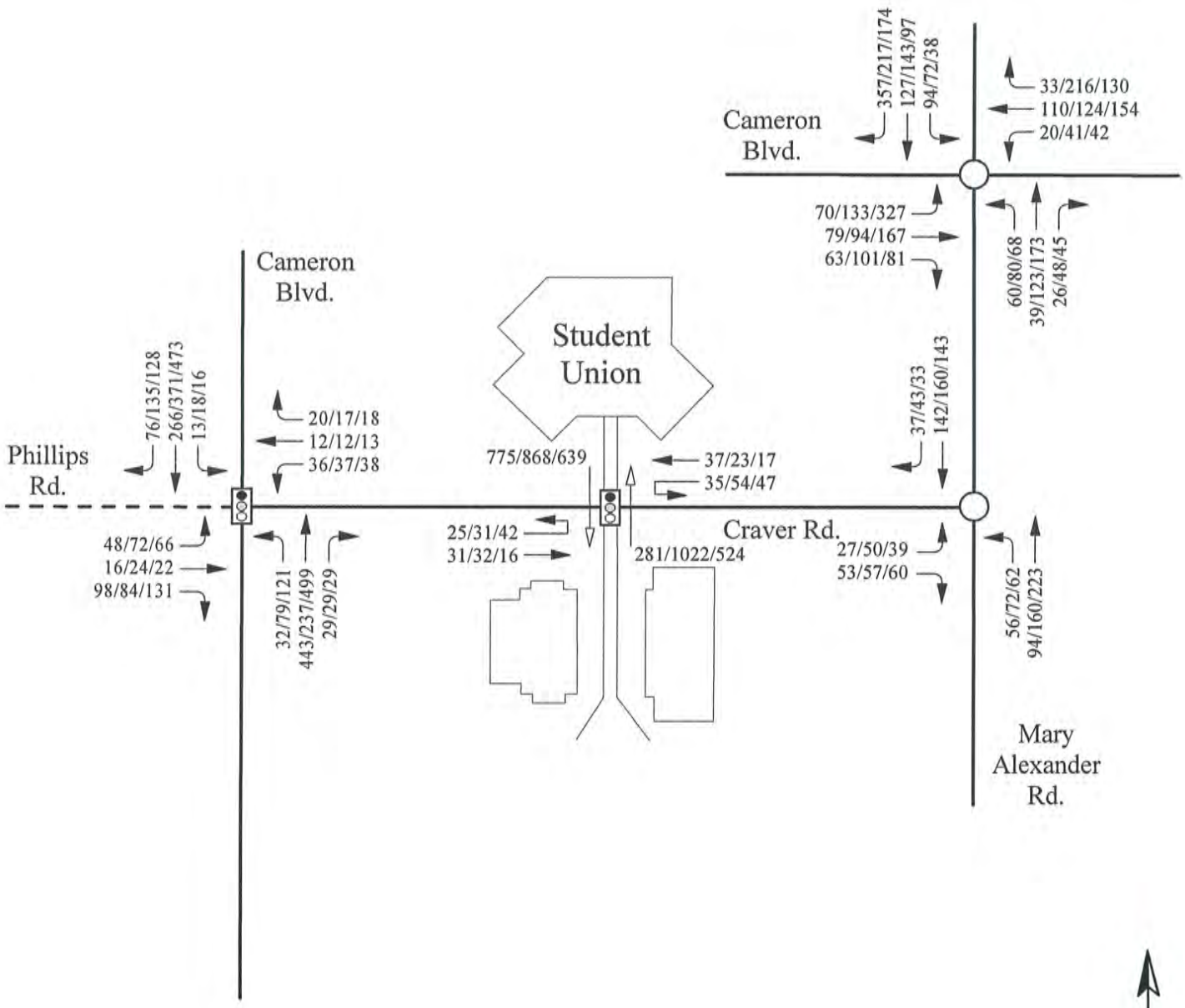
CRAVER ROAD TRAFFIC STUDY - UNCC CHARLOTTE, NORTH CAROLINA		
Estimated Diverted Traffic (After Craver Road Closure)		
	Scale: Not to Scale	Figure 6



LEGEND

- Signalized Intersection
- Unsignalized Intersection
- X/Y/Z → AM/Mid-Day/PM Weekday Vehicular Traffic
- X/Y/Z ⇨ AM/Mid-Day/PM Weekday Pedestrian Traffic

CRAVER ROAD TRAFFIC STUDY - UNCC CHARLOTTE, NORTH CAROLINA		
Existing (2009) Peak Hour Traffic Volumes With Craver Road Closure		
	Scale: Not to Scale	Figure 7



LEGEND

- Signalized Intersection
- Unsignalized Intersection
- X/Y/Z → AM/Mid-Day/PM Weekday Vehicular Traffic
- X/Y/Z ⇨ AM/Mid-Day/PM Weekday Pedestrian Traffic

CRAVER ROAD TRAFFIC STUDY - UNCC CHARLOTTE, NORTH CAROLINA		
Future (2015) Peak Hour Traffic Volumes With Craver Road Closure		
	Scale: Not to Scale	Figure 8

9. CAPACITY ANALYSIS

9.1. Existing (2009) Conditions With Traffic Signal at Crossing

The study area intersections were analyzed under existing traffic conditions, utilizing existing lane configurations, with a traffic signal installed at the student union pedestrian crossing. Refer to Table 2 for a summary of the analysis results. Refer to Appendix B for computer printouts of the capacity analysis reports.

Capacity analysis indicates that the eastbound approach of Phillips Road currently operates at LOS C during the AM and mid-day peak hours and LOS D during the PM peak hour. The northbound left turn movement currently operates at LOS A during all peak hours. Analysis indicates some queuing on the Phillips Road approach during all peak hours. A traffic signal is currently proposed for this intersection due to safety issues caused by the steep grade of Phillips Road. With the installation of a signal, this intersection is expected to operate well with minimal delays and queues.

Capacity analysis indicates that the westbound approach of Craver Road currently operates at LOS C during the AM and mid-day peak hours and LOS D during the PM peak hour. The southbound left turn movement currently operates at LOS A during all peak hours. Analysis indicates some queuing on the Craver Road approach during all peak hours.

The proposed signalized intersection of Craver Road with the student union pedestrian crossing was analyzed using SIDRA Intersection 3.2. With the installation of a signal at the existing pedestrian crossing, both vehicular and pedestrian movements are expected to experience minimal delays and queues during all peak hours with existing traffic volumes. These results are based on the assumption that both vehicles and pedestrians obey all traffic control measures.

Capacity analysis indicates that the eastbound approach of Craver Road currently operates at LOS B during the three peak hours. The northbound left turn movement currently operates at LOS A during all peak hours. Analysis indicates minimal queuing at this intersection.

TABLE 2
Existing (2009) Conditions With Traffic Signal at Pedestrian Crossing

LOCATION	APPROACH	LANE CONFIG.	WEEKDAY PEAK HOUR LEVEL OF SERVICE					
			AM		Mid-Day		PM	
			Approach	Overall	Approach	Overall	Approach	Overall
Cameron Boulevard and Phillips Road	EB NB SB	1 LT-RT 1 LT-TH 1 TH-RT	C[1] A[2] --	N/A	C[1] A[2] --	N/A	D[1] A[2] --	N/A
Cameron Boulevard and Phillips Road **(Signalized)**	EB NB SB	1 LT-RT 1 LT-TH 1 TH-RT	A A A	A	A A A	A	B B A	A
Cameron Boulevard and Craver Road	WB NB SB	1 LT-RT 1 TH-RT 1 LT-TH	C[1] -- A[2]	N/A	C[1] -- A[2]	N/A	D[1] -- A[2]	N/A
Craver Road and Student Union Crossing **(Signalized)***	EB WB NB/SB	1 TH 1 TH [PEDS]	A A A	A	A A A	A	A A A	A
Mary Alexander Road and Craver Road	EB NB SB	1 LT-RT 1 LT-TH 1 TH-RT	B[1] A[2] --	N/A	B[1] A[2] --	N/A	B[1] A[2] --	N/A
Mary Alexander Road and Cameron Boulevard	EB WB NB SB	1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT	B B A C	B	B C B C	C	D C C C	C

1. Level of service for minor street approach.
2. Level of service for major-street left-turn movement.

*** Analyzed in Sidra**

The intersection of Cameron Boulevard and Mary Alexander Road currently operates under all-way stop control. Analysis indicates that all approaches currently operate at LOS D or better, with the intersection operating at LOS C or better as a whole during all peak hours. Capacity analysis and simulation analysis both

indicate some significant queuing on the eastbound approach of Cameron Boulevard during the PM peak hour. The majority of vehicles on this approach are turning left to exit campus during the PM peak hour.

9.2. Existing (2009) Conditions With Craver Road Closure

The study area intersections were analyzed under existing traffic conditions with adjustments made for the Craver Road Closure, utilizing existing lane configurations, and assuming closure of Craver Road to non-essential university traffic. Refer to Table 3 for a summary of the analysis results. Refer to Appendix C for computer printouts of the capacity analysis reports.

TABLE 3
Existing (2009) Conditions With Craver Road Closure

LOCATION	APPROACH	LANE CONFIG.	WEEKDAY PEAK HOUR LEVEL OF SERVICE					
			AM		Mid-Day		PM	
			Approach	Overall	Approach	Overall	Approach	Overall
Cameron Boulevard and Phillips Road	EB NB SB	1 LT-RT 1 LT-TH 1 TH-RT	C[1] A[2] --	N/A	C[1] A[2] --	N/A	E[1] A[2] --	N/A
Cameron Boulevard and Craver Road	WB NB SB	1 LT-RT 1 TH-RT 1 LT-TH	C[1] -- A[2]	N/A	B[1] -- A[2]	N/A	C[1] -- A[2]	N/A
Mary Alexander Road and Craver Road	EB NB SB	1 LT-RT 1 LT-TH 1 TH-RT	B[1] A[2] --	N/A	B[1] A[2] --	N/A	B[1] A[2] --	N/A
Mary Alexander Road and Cameron Boulevard	EB WB NB SB	1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT	B B B C	C	C C C D	C	F C C C	E

1. Level of service for minor street approach.
2. Level of service for major-street left-turn movement.

Capacity analysis indicates that levels of service of the approaches at the intersection of Cameron Boulevard and Phillips Road are expected to remain approximately the same with closure of Craver Road. The only

expected difference in level of service is on the eastbound approach of Phillips Road during the PM peak hour. This approach is expected to operate at LOS E and experience increased queuing during the PM peak hour.

The intersections of Craver Road with Cameron Boulevard and Mary Alexander Road are expected to operate similarly with the Craver Road closure in place, with some improvement in the levels of service turning off Craver Road (due to the reduced traffic volumes).

The intersection of Cameron Boulevard and Mary Alexander Road is expected to experience some degraded levels of service with the Craver Road closure, especially during the PM peak hour. The added diverted trips are expected to create increased delays and queuing, particularly on the eastbound approach of Cameron Boulevard.

9.3. Future (2015) Conditions With Craver Road Closure

The study area intersections were analyzed under future (2015) traffic conditions with adjustments made for the Craver Road Closure, utilizing existing lane configurations, and assuming closure of Craver Road to non-essential university traffic. Intersections were also analyzed with any improvements recommended due to safety or operational concerns. As mentioned previously, analysis of future conditions includes the re-alignment of Phillips Road to intersect Cameron Boulevard across from Craver Road. Refer to Table 4 for a summary of the analysis results. Refer to Appendix D for computer printouts of the capacity analysis reports.

Capacity analysis indicates that proposed signalized intersection of Cameron Boulevard and Craver Road / Phillips Road is expected to operate well under future conditions with the Craver Road closure. This intersection was analyzed with exclusive northbound and southbound left turn lanes to remove the left turning vehicles from the through movements. These left turn lanes will provide safety benefits as well as reducing queuing along Cameron Boulevard.

The intersection of Craver Road and Mary Alexander Road is not expected to experience degraded levels of service under future conditions with the Craver Road closure. No improvements are recommended.

The intersection of Cameron Boulevard and Mary Alexander Road is expected to experience poor levels of service under future conditions with the Craver Road closure during all three peak hours. The future traffic

growth along with the added diverted trips is expected to create increased delays and queuing for most intersection approaches. The mid-day and PM peak hours are expected to experience especially poor levels of service, and significant queuing is expected.

TABLE 4
Future (2015) Conditions With Craver Road Closure

LOCATION	APPROACH	LANE CONFIG.	WEEKDAY PEAK HOUR LEVEL OF SERVICE					
			AM		Mid-Day		PM	
			Approach	Overall	Approach	Overall	Approach	Overall
Cameron Boulevard and Phillips Road / Craver Road **(Signalized)**	EB WB NB SB	1 LT-TH-RT 1 LT-TH-RT **1 LT**, 1 TH-RT **1 LT**, 1 TH-RT	A B A A	A	B B A B	B	B B B B	B
Mary Alexander Road and Craver Road	EB NB SB	1 LT-RT 1 LT-TH 1 TH-RT	B[1] A[2] --	N/A	B[1] A[2] --	N/A	B[1] A[2] --	N/A
Mary Alexander Road and Cameron Boulevard (Unsignalized)	EB WB NB SB	1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT	B B B E	D	E F D F	F	F E D E	F
Mary Alexander Road and Cameron Boulevard **(Signalized)**	EB WB NB SB	**1 LT**, 1 TH-RT 1 LT-TH-RT 1 LT-TH-RT 1 LT-TH, **1 RT**	A B A A	A	A B B A	B	B A C A	B
Mary Alexander Road and Cameron Boulevard **(Roundabout)***	EB WB NB SB	1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT	A A B B	B	B B B B	B	B B B A	B

1. Level of service for minor street approach.
2. Level of service for major-street left-turn movement.

*** Analyzed in Sidra**

Both signalization and construction of a roundabout were considered to mitigate the poor levels of service at this intersection. With the installation of a roundabout at this intersection under future conditions with the

Craver Road closure, all approaches are expected to operate at LOS B or better, with much improved queuing on all approaches. This intersection is also expected to work well as a signalized intersection with exclusive southbound right and eastbound left turn lanes.

10. RECOMMENDATIONS AND COST ESTIMATES

10.1. Cameron Boulevard and Phillips Road / Craver Road

A traffic signal is currently proposed at the existing intersection of Cameron Boulevard and Phillips Road due to safety concerns. Analysis indicates that this intersection will operate well with the installation of a signal. A traffic signal at this location is an appropriate short-term solution to mitigate the safety issues caused by the steep grade of Phillips Road.

At some point in the future, Phillips Road is proposed to be re-aligned to intersect Cameron Boulevard across from Craver Road. Analysis indicates that this intersection will operate well as a four-legged, signalized intersection in the future with the Craver Road closure. Northbound and southbound exclusive left turn lanes are recommended to remove left turning traffic from the through movement along Cameron Boulevard. Because these improvements would be part of a large scale university project to re-align Phillips Road, cost estimates are not provided for improvements at this intersection.

10.2. Craver Road Improvements

The pedestrian crossing on Craver Road was analyzed under existing conditions as a signalized intersection, and found to operate well under existing and future conditions. Both vehicular and pedestrian movements are proposed to be signalized in this scenario. Vehicular queues are expected to be reduced with the installation of a signal, and pedestrian safety is expected to increase. These results are based on the assumption that both vehicles and pedestrians obey all traffic control measures. Installation of a signal at this location is a viable short and possibly long-term solution to the current operational and safety concerns.

The proposed signal should operate with the north-south pedestrian movements as the main street (controller setting phase two and six) and the east-west vehicular traffic movements as the minor street (controller setting phase four and eight), with actuation (loop or video detection) for vehicles on Craver Road. A minimum green

time of approximately 10-15 seconds for the pedestrian phase should be used. However, it is recommended that someone monitor and field adjust the timings as needed once the signal is installed.

Closure of Craver Road to non-essential university traffic was also analyzed. Refer to Appendix E for a concept drawing illustrating the proposed Craver Road closure. As proposed, the concept includes two 90 foot diameter roundabouts at each end of the closure, with drop-off lanes provided to accommodate vehicles dropping off pedestrians near the student union. The roundabouts feature center islands with truck aprons to accommodate trucks making complete turnaround movements.

The western roundabout in this concept is shown aligning with a driveway between Woodward Hall and the College of Education building. The eastern roundabout is shown aligning with a driveway between Burson Hall and the Health and Human Services building. The proposed locations of these roundabouts were chosen to best accommodate and blend with the existing facilities and to minimize impact to the surrounding area.

The "closure" area between the two roundabouts is shown hatched in red and is recommended to be constructed as a raised area closed off to non-essential university traffic. The raised area would be signed as off-limits without authorization, but allowing shuttles, busses, and other university traffic to pass-through by mounting the raised area from the roundabout. Precise signage would be needed as well as enforcement in the early stages after the closure. If installed, the existing traffic signal could remain at the pedestrian crossing in front of the student union to allow the safe and efficient passage of university traffic through the crossing.

A preliminary design and construction cost estimate was performed for the proposed closure concept, including the proposed traffic signal at the pedestrian crossing. Refer to Appendix F for the preliminary construction cost estimates for the Craver Road closure. Preliminary estimates indicate that the improvements as shown in the concept drawing would cost approximately $854,000. This estimate includes engineering and design, all construction materials, installation, utilities, and a 30% buffer for general contingency and mobilization.

10.3. Cameron Boulevard and Mary Alexander Road

Capacity analysis indicates that the intersection of Cameron Boulevard and Mary Alexander Road will experience significant delays and queues under future conditions with the Craver Road closure in place. To

mitigate these problems, a roundabout is recommended at this intersection. A roundabout at this location will reduce both delays and queues as well as serving as an attractive entrance into the heart of campus. A traffic signal at this location would also provide adequate capacity under future conditions with the closure. Similar delays and queues are expected under future conditions during the peak hours when comparing a roundabout to a traffic signal at this intersection. However, during non-peak hour conditions a roundabout will provide reduced delays and queues at this intersection when compared to a traffic signal due to the free-flow nature of the traffic control. In addition, to operate similarly to a roundabout, a traffic signal would require the construction of southbound right and eastbound left turn lanes.

An initial roundabout concept was prepared for this location, and can be found in Appendix E. This concept includes a 110 foot diameter roundabout, again with center island and truck apron. By shifting the roundabout to the northwest, there is minimal impact to the quadrants containing the Student Health Center (southwest) and adjacent stream and mechanical areas (southeast). This roundabout will accommodate up to a WD-40 truck.

Refer to Appendix E for the preliminary construction cost estimates for the Cameron Boulevard / Mary Alexander roundabout concept. Preliminary estimates indicate that the improvements as shown in the concept drawing would cost approximately $442,000. This estimate includes engineering and design, all construction materials, installation, utilities, and a 30% buffer for general contingency and mobilization.

TECHNICAL APPENDIX

APPENDIX A

TRAFFIC COUNT DATA

1. Cameron Blvd. @ Phillips Road

	Southbound				Westbound				Northbound				Eastbound			
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds
7:00 AM	5	80	0	0	0	0	0	0	0	106	5	0	27	0	17	0
7:15 AM	10	74	0	0	0	0	0	0	0	83	5	0	27	0	12	0
7:30 AM	10	37	0	0	0	0	0	0	0	50	3	0	12	0	9	0
7:45 AM	7	46	0	0	0	0	0	0	0	53	2	0	20	0	10	0
8:00 AM	8	46	0	0	0	0	0	0	0	97	1	0	15	0	14	0
8:15 AM	11	57	0	0	0	0	0	0	0	95	4	0	25	0	9	0
8:30 AM	16	59	0	0	0	0	0	0	0	107	9	0	26	0	22	0
8:45 AM	19	94	0	0	0	0	0	0	0	91	13	0	16	0	9	0
8:00 AM	54	256	0	0	0	0	0	0	0	390	27	0	82	0	54	0
10:00 AM	11	38	0	0	0	0	0	0	0	51	8	0	13	0	6	0
10:15 AM	7	38	0	0	0	0	0	0	0	46	7	0	15	0	14	0
10:30 AM	13	71	0	0	0	0	0	0	0	71	16	0	12	0	18	0
10:45 AM	24	78	0	0	0	0	0	0	0	62	23	0	20	0	17	0
11:00 AM	20	35	0	0	0	0	0	0	0	40	12	0	8	0	7	0
11:15 AM	10	39	0	0	0	0	0	0	0	44	11	0	9	0	8	0
11:30 AM	12	46	0	0	0	0	0	0	0	47	9	0	8	0	12	0
11:45 AM	15	39	0	0	0	0	0	0	0	47	14	0	18	0	27	0
12:00 PM	24	62	0	0	0	0	0	0	0	78	11	0	19	0	21	0
12:15 PM	35	76	0	0	0	0	0	0	0	62	30	0	17	0	20	1
12:30 PM	25	51	0	0	0	0	0	0	0	39	11	0	16	0	12	0
12:45 PM	17	41	0	0	0	0	0	0	0	57	11	0	13	0	18	0
11:45 AM	99	228	0	0	0	0	0	0	0	226	66	0	70	0	80	1
4:00 PM	19	73	0	0	0	0	0	0	0	52	10	0	11	0	12	0
4:15 PM	13	58	0	0	0	0	0	0	0	81	10	0	15	0	14	0
4:30 PM	21	73	0	0	0	0	0	0	0	123	18	0	33	0	19	0
4:45 PM	22	89	0	0	0	0	0	0	0	122	27	0	41	0	25	0
5:00 PM	27	119	0	0	0	0	0	0	0	114	32	0	24	0	15	0
5:15 PM	25	76	0	0	0	0	0	0	0	74	24	0	12	0	15	0
5:30 PM	14	76	0	0	0	0	0	0	0	72	15	0	34	0	21	0
5:45 PM	12	68	0	0	0	0	0	0	0	82	22	0	25	0	19	0
4:30 PM	95	357	0	0	0	0	0	0	0	433	101	0	110	0	74	0

2. Cameron Blvd. @ Craver Rd.

	Southbound				Westbound				Northbound				Eastbound			
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds
7:00 AM	0	35	1	0	3	0	5	0	14	89	0	0	0	0	0	0
7:15 AM	0	65	0	0	10	0	17	0	15	89	0	0	0	0	0	0
7:30 AM	0	41	5	0	10	0	13	0	16	52	0	0	0	0	0	0
7:45 AM	0	29	1	0	5	0	13	0	9	58	0	0	0	0	0	0
8:00 AM	0	34	5	0	9	0	7	0	12	78	0	0	0	0	0	0
8:15 AM	0	45	3	0	8	0	14	0	20	95	0	0	0	0	0	0
8:30 AM	0	38	7	0	8	0	19	0	13	107	0	0	0	0	0	0
8:45 AM	0	67	8	0	11	0	24	0	25	99	0	0	0	0	0	0
8:00 AM	0	184	23	0	36	0	64	0	70	379	0	0	0	0	0	0
10:00 AM	0	41	0	0	6	0	7	0	11	39	0	0	0	0	0	0
10:15 AM	0	32	5	0	5	0	14	0	11	48	0	0	0	0	0	0
10:30 AM	0	59	10	0	9	0	18	0	20	52	0	0	0	0	0	0
10:45 AM	0	90	8	0	16	0	20	0	18	73	0	0	0	0	0	0
11:00 AM	0	41	4	0	5	0	20	0	16	44	0	0	0	0	0	0
11:15 AM	0	26	3	0	5	0	14	0	14	30	0	0	0	0	0	0
11:30 AM	0	52	0	0	6	0	15	0	15	43	0	2	0	0	0	0
11:45 AM	0	33	10	0	6	0	14	0	30	49	0	0	0	0	0	0
12:00 PM	0	41	6	0	5	0	22	0	23	69	0	0	0	0	0	0
12:15 PM	0	89	9	0	11	0	29	0	23	56	0	0	0	0	0	0
12:30 PM	0	68	9	0	12	0	25	0	14	41	0	0	0	0	0	0
12:45 PM	0	58	9	0	9	0	23	0	23	54	0	0	0	0	0	0
12:00 PM	0	256	33	0	37	0	99	0	83	220	0	0	0	0	0	0
4:00 PM	0	70	11	0	7	0	28	0	10	55	0	0	0	0	0	0
4:15 PM	0	50	1	0	5	0	14	0	16	79	0	0	0	0	0	0
4:30 PM	0	75	8	0	5	0	20	0	25	119	0	0	0	0	0	0
4:45 PM	0	96	4	0	12	0	25	0	27	113	0	0	0	0	0	0
5:00 PM	0	101	12	0	17	0	26	0	29	112	0	0	0	0	0	0
5:15 PM	0	76	9	0	6	0	25	0	13	78	0	0	0	0	0	0
5:30 PM	0	71	8	0	9	0	16	0	21	75	0	0	0	0	0	0
5:45 PM	0	58	3	0	10	0	19	0	22	80	0	0	0	0	0	0
4:30 PM	0	348	33	0	40	0	96	0	94	422	0	0	0	0	0	0

3. Craver Rd. @ Student Union

	Southbound				Westbound				Northbound				Eastbound			
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds
7:00 AM	0	74	0	0	0	5	5	0	0	5	0	0	0	12	4	0
7:15 AM	0	166	0	0	0	22	5	0	0	8	0	0	0	13	3	0
7:30 AM	0	88	0	0	0	14	7	0	0	6	0	0	0	15	5	0
7:45 AM	0	45	0	0	0	9	8	0	0	14	0	0	0	5	3	0
8:00 AM	0	69	0	0	0	8	5	0	0	27	0	0	0	6	5	0
8:15 AM	0	121	0	0	0	12	9	0	0	42	0	0	0	11	7	0
8:30 AM	0	197	0	0	0	15	7	0	0	76	0	0	0	12	6	0
8:45 AM	0	262	0	0	0	26	10	0	0	90	0	0	0	27	8	0
8:00 AM	0	649	0	0	0	61	31	0	0	235	0	0	0	56	26	0
10:00 AM	0	38	0	0	0	11	6	0	0	94	0	0	0	9	5	0
10:15 AM	0	56	0	0	0	14	6	0	0	93	0	0	0	8	5	0
10:30 AM	0	103	0	0	0	17	7	0	0	129	0	0	0	14	6	0
10:45 AM	0	284	0	0	0	30	5	0	0	308	0	0	0	18	5	0
11:00 AM	0	123	0	0	0	24	5	0	0	129	0	0	0	12	4	0
11:15 AM	0	63	0	0	0	16	6	0	0	78	0	0	0	9	8	0
11:30 AM	0	85	0	0	0	17	5	0	0	104	0	0	0	8	6	0
11:45 AM	0	126	0	0	0	17	4	0	0	109	0	0	0	23	15	0
12:00 PM	0	166	0	0	0	30	6	0	0	254	0	0	0	31	4	0
12:15 PM	0	282	0	0	0	41	2	0	0	369	0	0	0	27	4	0
12:30 PM	0	153	0	0	0	28	7	0	0	124	0	0	0	15	4	0
12:45 PM	0	155	0	0	0	21	7	0	0	94	0	0	0	24	4	0
11:45 AM	0	727	0	0	0	116	19	0	0	856	0	0	0	96	27	0
4:00 PM	0	75	0	0	0	30	4	0	0	87	0	0	0	15	2	0
4:15 PM	0	66	0	0	0	18	2	0	0	112	0	0	0	15	4	0
4:30 PM	0	138	0	0	0	23	2	0	0	152	0	0	0	26	2	0
4:45 PM	0	245	0	0	0	34	4	0	0	133	0	0	0	31	3	0
5:00 PM	0	130	0	0	0	34	6	0	0	141	0	0	0	33	2	0
5:15 PM	0	90	0	0	0	23	3	0	0	88	0	0	0	20	4	0
5:30 PM	0	70	0	0	0	27	1	0	0	77	0	0	0	27	4	0
5:45 PM	0	101	0	0	0	29	2	0	0	111	0	0	0	25	2	0
4:45 PM	0	535	0	0	0	118	14	0	0	439	0	0	0	111	13	0

4. Mary Alexander Rd. @ Craver Rd.

	Southbound				Westbound				Northbound				Eastbound			
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds
7:00 AM	9	18	0	0	0	0	0	0	0	3	22	0	16	0	2	0
7:15 AM	26	25	0	0	0	0	0	0	0	7	25	0	21	0	11	0
7:30 AM	14	13	0	0	0	0	0	0	0	6	14	0	11	0	3	0
7:45 AM	11	14	0	0	0	0	0	0	0	8	13	0	11	0	5	0
8:00 AM	10	14	0	0	0	0	0	0	0	8	13	0	9	0	6	0
8:15 AM	10	20	0	0	0	0	0	0	0	11	11	0	12	0	8	0
8:30 AM	15	28	0	0	0	0	0	0	0	9	22	0	13	0	5	0
8:45 AM	20	33	0	0	0	0	0	0	0	26	26	0	30	0	13	0
8:00 AM	55	95	0	0	0	0	0	0	0	54	72	0	64	0	32	0
10:00 AM	14	16	0	0	0	0	0	0	0	11	13	0	13	0	8	0
10:15 AM	12	10	0	0	0	0	0	0	0	9	18	0	10	0	5	0
10:30 AM	12	29	0	0	0	0	0	0	0	7	22	0	19	0	7	0
10:45 AM	24	38	1	0	0	0	0	0	0	37	32	0	17	0	15	0
11:00 AM	11	21	0	0	0	0	0	0	0	15	15	0	15	0	14	0
11:15 AM	6	10	0	0	0	0	0	0	0	10	13	0	19	0	10	0
11:30 AM	15	19	0	0	0	0	0	0	0	12	21	2	8	0	8	0
11:45 AM	12	19	0	0	0	0	0	0	0	22	19	0	10	0	15	0
12:00 PM	19	21	0	0	0	0	0	0	0	15	23	0	21	0	21	0
12:15 PM	18	36	0	0	0	0	0	0	0	36	29	0	19	0	13	0
12:30 PM	16	26	0	0	0	0	0	0	0	18	32	0	21	0	13	0
12:45 PM	14	17	0	0	0	0	0	0	0	20	12	0	17	0	8	0
11:45 AM	65	102	0	0	0	0	0	0	0	91	103	0	71	0	62	0
4:00 PM	6	16	0	0	0	0	0	0	0	19	25	0	14	0	15	0
4:15 PM	8	18	0	0	0	0	0	0	0	16	16	0	15	0	14	0
4:30 PM	7	26	0	0	0	0	0	0	0	34	25	0	40	0	6	0
4:45 PM	14	28	0	0	0	0	0	0	0	43	28	0	17	0	16	0
5:00 PM	22	13	0	0	0	0	0	0	0	44	22	0	21	0	23	0
5:15 PM	9	15	0	0	0	0	0	0	0	27	16	0	17	0	15	0
5:30 PM	8	16	0	0	0	0	0	0	0	22	20	0	17	0	14	0
5:45 PM	19	22	0	0	0	0	0	0	0	10	16	0	21	0	20	0
4:30 PM	52	82	0	0	0	0	0	0	0	148	91	0	95	0	60	0

5. Mary Alexander Rd. @ Cameron Blvd.

	Southbound				Westbound				Northbound				Eastbound			
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds
7:00 AM	96	22	13	0	0	26	4	0	0	4	0	0	4	3	3	0
7:15 AM	109	37	16	0	1	37	11	0	2	8	3	0	3	10	6	0
7:30 AM	72	21	8	0	1	17	2	0	4	5	6	0	7	4	6	0
7:45 AM	44	13	11	0	9	14	2	0	2	4	3	0	7	3	8	0
8:00 AM	54	21	6	0	3	18	4	0	4	4	5	0	4	10	3	0
8:15 AM	94	20	11	0	6	20	2	0	3	5	14	0	6	8	5	0
8:30 AM	85	31	31	0	2	19	0	0	4	6	7	0	8	20	14	0
8:45 AM	54	34	31	0	17	23	11	0	6	13	9	0	11	16	29	0
8:00 AM	287	106	79	0	28	80	17	0	17	28	35	0	29	54	51	0
10:00 AM	23	14	5	0	13	16	3	0	2	12	10	0	16	12	11	0
10:15 AM	14	17	10	0	7	12	4	0	2	10	6	0	4	13	7	0
10:30 AM	58	26	16	0	11	13	5	0	2	8	6	0	12	12	11	0
10:45 AM	34	36	30	0	22	50	6	0	3	26	21	0	20	21	49	0
11:00 AM	19	19	6	0	25	14	3	0	4	17	13	0	9	15	27	0
11:15 AM	13	6	10	0	10	9	4	0	6	10	5	0	7	11	13	0
11:30 AM	32	13	8	0	8	10	7	1	2	11	11	0	7	11	14	0
11:45 AM	21	18	9	0	11	20	8	0	8	10	19	0	7	14	11	0
12:00 PM	50	36	17	0	25	28	5	0	8	27	4	0	12	13	19	0
12:15 PM	48	38	22	0	73	28	12	0	6	24	16	0	10	17	30	0
12:30 PM	36	23	13	0	55	22	12	0	10	30	10	0	20	22	33	0
12:45 PM	33	23	8	0	28	12	5	0	8	13	11	0	11	13	18	0
12:00 PM	167	120	60	0	181	90	34	0	32	94	41	0	53	65	100	0
4:00 PM	18	12	10	0	14	19	5	0	6	15	9	0	5	22	41	0
4:15 PM	25	12	5	0	23	14	8	0	6	20	4	0	4	20	59	0
4:30 PM	43	22	7	0	19	28	11	0	5	22	8	0	10	35	60	1
4:45 PM	50	25	11	0	50	34	13	0	7	36	11	0	7	31	56	0
5:00 PM	21	20	6	0	31	34	7	0	12	52	12	0	8	24	80	0
5:15 PM	20	14	8	0	9	21	4	0	7	27	2	0	5	32	63	0
5:30 PM	31	20	10	0	16	19	4	0	4	19	7	0	3	15	57	0
5:45 PM	24	18	8	0	19	25	5	0	8	33	7	0	5	24	67	0
4:30 PM	134	81	32	0	109	117	35	0	31	137	33	0	30	122	259	1

APPENDIX B

CAPACITY ANALYSIS CALCULATIONS

EXISTING (2009) CONDITIONS WITH STUDENT UNION SIGNAL

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	54	82	27	390	256	54
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	60	91	30	433	284	60
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	808	314	344			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	808	314	344			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	82	87	98			
cM capacity (veh/h)	342	726	1215			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	151	463	344
Volume Left	60	30	0
Volume Right	91	0	60
cSH	502	1215	1700
Volume to Capacity	0.30	0.02	0.20
Queue Length 95th (ft)	31	2	0
Control Delay (s)	15.2	0.8	0.0
Lane LOS	C	A	
Approach Delay (s)	15.2	0.8	0.0
Approach LOS	C		

Intersection Summary			
Average Delay	2.8		
Intersection Capacity Utilization	56.8%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	80	70	66	226	228	99
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	89	78	73	251	253	110
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	706	308	363			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	706	308	363			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	76	89	94			
cM capacity (veh/h)	377	732	1195			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	167	324	363
Volume Left	89	73	0
Volume Right	78	0	110
cSH	488	1195	1700
Volume to Capacity	0.34	0.06	0.21
Queue Length 95th (ft)	38	5	0
Control Delay (s)	16.2	2.3	0.0
Lane LOS	C	A	
Approach Delay (s)	16.2	2.3	0.0
Approach LOS	C		

Intersection Summary			
Average Delay	4.0		
Intersection Capacity Utilization	52.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	74	110	101	433	357	95
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	82	122	112	481	397	106
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1155	449	502			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1155	449	502			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	58	80	89			
cM capacity (veh/h)	195	610	1062			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	204	593	502
Volume Left	82	112	0
Volume Right	122	0	106
cSH	328	1062	1700
Volume to Capacity	0.62	0.11	0.30
Queue Length 95th (ft)	99	9	0
Control Delay (s)	32.5	2.7	0.0
Lane LOS	D	A	
Approach Delay (s)	32.5	2.7	0.0
Approach LOS	D		

Intersection Summary			
Average Delay	6.3		
Intersection Capacity Utilization	73.8%	ICU Level of Service	D
Analysis Period (min)	15		

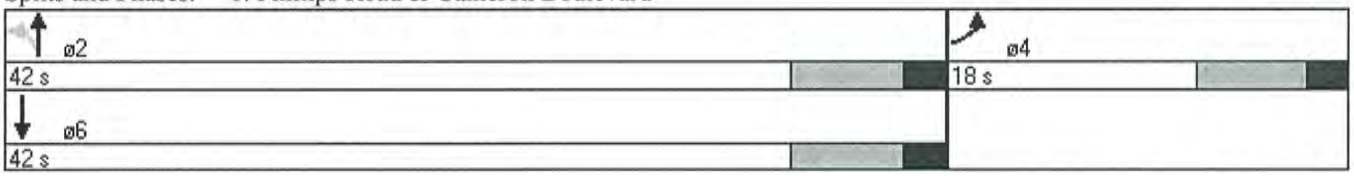
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	54	82	27	390	256	54
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.919				0.976	
Flt Protected	0.981			0.997		
Satd. Flow (prot)	1679	0	0	1857	1818	0
Flt Permitted	0.981			0.963		
Satd. Flow (perm)	1679	0	0	1794	1818	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)	91				33	
Link Speed (mph)	35			35	35	
Link Distance (ft)	692			213	476	
Travel Time (s)	13.5			4.1	9.3	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	60	91	30	433	284	60
Shared Lane Traffic (%)						
Lane Group Flow (vph)	151	0	0	463	344	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			0	0	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9	15			9
Turn Type			Perm			
Protected Phases	4			2	6	
Permitted Phases			2			
Detector Phase	4		2	2	6	
Switch Phase						
Minimum Initial (s)	7.0		7.0	7.0	7.0	
Minimum Split (s)	14.0		14.0	14.0	14.0	
Total Split (s)	18.0	0.0	42.0	42.0	42.0	0.0
Total Split (%)	30.0%	0.0%	70.0%	70.0%	70.0%	0.0%
Maximum Green (s)	11.0		35.0	35.0	35.0	
Yellow Time (s)	5.0		5.0	5.0	5.0	
All-Red Time (s)	2.0		2.0	2.0	2.0	
Lost Time Adjust (s)	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0
Total Lost Time (s)	5.0	2.0	5.0	5.0	5.0	2.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Recall Mode	None		Min	Min	Min	
Act Effct Green (s)	10.1			24.1	24.1	
Actuated g/C Ratio	0.26			0.61	0.61	
v/c Ratio	0.30			0.42	0.31	
Control Delay	8.3			7.9	6.2	
Queue Delay	0.0			0.0	0.0	

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Total Delay	8.3			7.9	6.2	
LOS	A			A	A	
Approach Delay	8.3			7.9	6.2	
Approach LOS	A			A	A	
Queue Length 50th (ft)	9			56	34	
Queue Length 95th (ft)	47			131	83	
Internal Link Dist (ft)	612			133	396	
Turn Bay Length (ft)						
Base Capacity (vph)	631			1639	1664	
Starvation Cap Reductn	0			0	0	
Spillback Cap Reductn	0			0	0	
Storage Cap Reductn	0			0	0	
Reduced v/c Ratio	0.24			0.28	0.21	

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 39.3
Natural Cycle: 40
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.42
Intersection Signal Delay: 7.4 Intersection LOS: A
Intersection Capacity Utilization 59.1% ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 1: Phillips Road & Cameron Boulevard



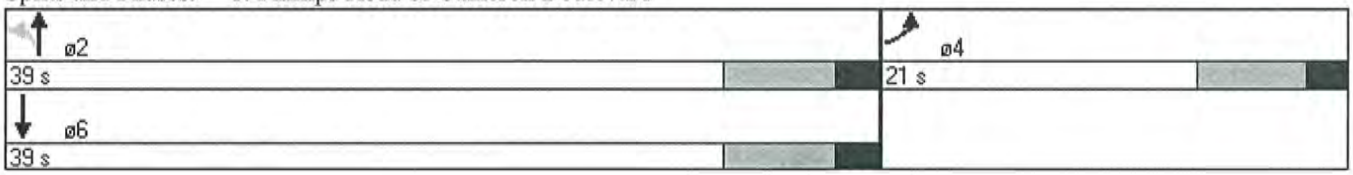
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	80	70	66	226	228	99
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.937				0.959	
Flt Protected	0.974			0.989		
Satd. Flow (prot)	1700	0	0	1842	1786	0
Flt Permitted	0.974			0.848		
Satd. Flow (perm)	1700	0	0	1580	1786	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)	72				60	
Link Speed (mph)	35			35	35	
Link Distance (ft)	692			213	476	
Travel Time (s)	13.5			4.1	9.3	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	89	78	73	251	253	110
Shared Lane Traffic (%)						
Lane Group Flow (vph)	167	0	0	324	363	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			0	0	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9	15			9
Turn Type			Perm			
Protected Phases	4			2	6	
Permitted Phases			2			
Detector Phase	4		2	2	6	
Switch Phase						
Minimum Initial (s)	7.0		7.0	7.0	7.0	
Minimum Split (s)	14.0		14.0	14.0	14.0	
Total Split (s)	21.0	0.0	39.0	39.0	39.0	0.0
Total Split (%)	35.0%	0.0%	65.0%	65.0%	65.0%	0.0%
Maximum Green (s)	14.0		32.0	32.0	32.0	
Yellow Time (s)	5.0		5.0	5.0	5.0	
All-Red Time (s)	2.0		2.0	2.0	2.0	
Lost Time Adjust (s)	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0
Total Lost Time (s)	5.0	2.0	5.0	5.0	5.0	2.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Recall Mode	None		Min	Min	Min	
Act Effct Green (s)	10.3			20.7	20.7	
Actuated g/C Ratio	0.28			0.57	0.57	
v/c Ratio	0.31			0.36	0.35	
Control Delay	8.8			8.4	6.9	
Queue Delay	0.0			0.0	0.0	

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Total Delay	8.8			8.4	6.9	
LOS	A			A	A	
Approach Delay	8.8			8.4	6.9	
Approach LOS	A			A	A	
Queue Length 50th (ft)	13			38	34	
Queue Length 95th (ft)	51			96	89	
Internal Link Dist (ft)	612			133	396	
Turn Bay Length (ft)						
Base Capacity (vph)	802			1445	1639	
Starvation Cap Reductn	0			0	0	
Spillback Cap Reductn	0			0	0	
Storage Cap Reductn	0			0	0	
Reduced v/c Ratio	0.21			0.22	0.22	

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 36.4
Natural Cycle: 40
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.36
Intersection Signal Delay: 7.8 Intersection LOS: A
Intersection Capacity Utilization 54.8% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 1: Phillips Road & Cameron Boulevard



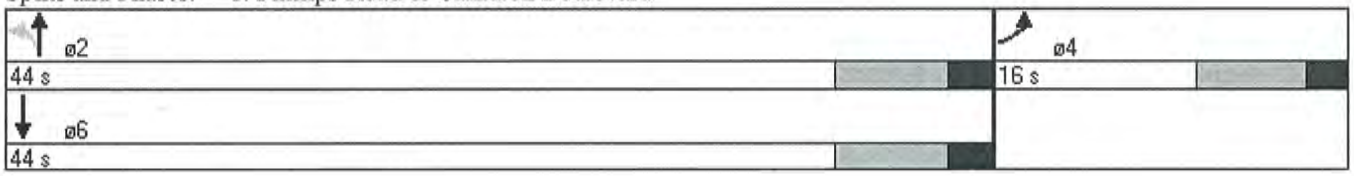
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	74	110	101	433	357	95
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.919				0.972	
Flt Protected	0.980			0.991		
Satd. Flow (prot)	1678	0	0	1846	1811	0
Flt Permitted	0.980			0.828		
Satd. Flow (perm)	1678	0	0	1542	1811	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)	109				46	
Link Speed (mph)	35			35	35	
Link Distance (ft)	692			213	476	
Travel Time (s)	13.5			4.1	9.3	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	82	122	112	481	397	106
Shared Lane Traffic (%)						
Lane Group Flow (vph)	204	0	0	593	503	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			0	0	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9	15			9
Turn Type			Perm			
Protected Phases	4			2	6	
Permitted Phases			2			
Detector Phase	4		2	2	6	
Switch Phase						
Minimum Initial (s)	7.0		7.0	7.0	7.0	
Minimum Split (s)	14.0		14.0	14.0	14.0	
Total Split (s)	16.0	0.0	44.0	44.0	44.0	0.0
Total Split (%)	26.7%	0.0%	73.3%	73.3%	73.3%	0.0%
Maximum Green (s)	9.0		37.0	37.0	37.0	
Yellow Time (s)	5.0		5.0	5.0	5.0	
All-Red Time (s)	2.0		2.0	2.0	2.0	
Lost Time Adjust (s)	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0
Total Lost Time (s)	5.0	2.0	5.0	5.0	5.0	2.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Recall Mode	None		Min	Min	Min	
Act Effct Green (s)	10.1			28.5	28.5	
Actuated g/C Ratio	0.21			0.58	0.58	
v/c Ratio	0.47			0.66	0.47	
Control Delay	13.7			11.0	6.8	
Queue Delay	0.0			0.0	0.0	

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Total Delay	13.7			11.0	6.8	
LOS	B			B	A	
Approach Delay	13.7			11.0	6.8	
Approach LOS	B			B	A	
Queue Length 50th (ft)	20			94	60	
Queue Length 95th (ft)	84			180	111	
Internal Link Dist (ft)	612			133	396	
Turn Bay Length (ft)						
Base Capacity (vph)	469			1256	1483	
Starvation Cap Reductn	0			0	0	
Spillback Cap Reductn	0			0	0	
Storage Cap Reductn	0			0	0	
Reduced v/c Ratio	0.43			0.47	0.34	

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 48.8
Natural Cycle: 45
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.66
Intersection Signal Delay: 9.8 Intersection LOS: A
Intersection Capacity Utilization 76.3% ICU Level of Service D
Analysis Period (min) 15

Splits and Phases: 1: Phillips Road & Cameron Boulevard



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	64	36	379	70	23	184
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	71	40	421	78	26	204
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	716	460			499	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	716	460			499	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	82	93			98	
cM capacity (veh/h)	388	601			1065	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	111	499	230
Volume Left	71	0	26
Volume Right	40	78	0
cSH	444	1700	1065
Volume to Capacity	0.25	0.29	0.02
Queue Length 95th (ft)	24	0	2
Control Delay (s)	15.8	0.0	1.1
Lane LOS	C		A
Approach Delay (s)	15.8	0.0	1.1
Approach LOS	C		

Intersection Summary			
Average Delay	2.4		
Intersection Capacity Utilization	41.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	99	37	220	83	33	256
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	110	41	244	92	37	284
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	648	291			337	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	648	291			337	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	74	95			97	
cM capacity (veh/h)	422	749			1223	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	151	337	321
Volume Left	110	0	37
Volume Right	41	92	0
cSH	479	1700	1223
Volume to Capacity	0.32	0.20	0.03
Queue Length 95th (ft)	34	0	2
Control Delay (s)	16.0	0.0	1.2
Lane LOS	C		A
Approach Delay (s)	16.0	0.0	1.2
Approach LOS	C		

Intersection Summary			
Average Delay	3.4		
Intersection Capacity Utilization	49.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	96	40	422	94	33	348
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	107	44	469	104	37	387
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	981	521			573	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	981	521			573	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	60	92			96	
cM capacity (veh/h)	266	555			1000	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	151	573	423
Volume Left	107	0	37
Volume Right	44	104	0
cSH	315	1700	1000
Volume to Capacity	0.48	0.34	0.04
Queue Length 95th (ft)	62	0	3
Control Delay (s)	26.6	0.0	1.1
Lane LOS	D		A
Approach Delay (s)	26.6	0.0	1.1
Approach LOS	D		

Intersection Summary			
Average Delay	3.9		
Intersection Capacity Utilization	60.1%	ICU Level of Service	B
Analysis Period (min)	15		

SIDRA INTERSECTION

Intersection Summary

Craver Road at Student Union Crossing

AM Peak

Performance Measure	Vehicles	Pedestrians	Persons
Demand Flows - Total	193 veh/h	1360 ped/h	1592 pers/h
Percent Heavy Vehicles	2.1 %		
Degree of Saturation	0.196	0.315	
Effective Intersection Capacity	613 veh/h		
95% Back of Queue (ft)	36 ft	2 ft	
95% Back of Queue (veh)	1.4 veh	0.6 ped	
Control Delay (Total)	0.45 veh-h/h	1.93 ped-h/h	2.47 pers-h/h
Control Delay (Average)	8.3 s/veh	5.1 s/ped	5.6 s/pers
Level of Service	LOS A	LOS A	
Level of Service (Worst Movement)	LOS A	LOS A	
Total Effective Stops	115 veh/h	870 ped/h	1009 pers/h
Effective Stop Rate	0.60 per veh	0.64 per ped	0.63 per pers
Proportion Queued	0.77	0.64	0.66
Travel Distance (Total)	62.1 veh-mi/h	21.6 ped-mi/h	96.2 pers-mi/h
Travel Distance (Average)	1700 ft	84 ft	319 ft
Travel Time (Total)	3.6 veh-h/h	9.3 ped-h/h	13.6 pers-h/h
Travel Time (Average)	66.3 secs	24.7 secs	30.7 secs
Travel Speed	17.5 mph	2.3 mph	7.1 mph
Operating Cost (Total)	46 $/h	71 $/h	117 $/h
Fuel Consumption (Total)	2.8 gal/h		
Carbon Dioxide (Total)	26.2 kg/h		
Hydrocarbons (Total)	0.044 kg/h		
Carbon Monoxide (Total)	1.41 kg/h		
NOX (Total)	0.040 kg/h		

SIDRA SOLUTIONS

Site: AM
E:\Work\Craver Rd\Student Union Crossing..aap
Processed Dec 04, 2009 02:28:43PM

M0126, Ramey Kemp & Associates, Medium Office

SIDRA INTERSECTION

Movement Summary

Craver Road at Student Union Crossing

AM Peak

Pedestrian crossing - Actuated isolated Cycle Time = 25 seconds

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (ft)	Prop. Queued	Eff. Stop Rate	Aver Speed (mph)
New E leg										
6T	T	102	2.0	0.196	8.4	LOS A	36	0.78	0.60	17.5
Approach		**102**	**2.0**	**0.195**	**8.4**	**LOS A**	**36**	**0.78**	**0.60**	**17.5**
New W leg										
2T	T	91	2.2	0.175	8.3	LOS A	32	0.77	0.59	17.5
Approach		**91**	**2.2**	**0.175**	**8.3**	**LOS A**	**32**	**0.77**	**0.59**	**17.5**
All Vehicles		**193**	**2.1**	**0.196**	**8.3**	**LOS A**	**36**	**0.77**	**0.60**	**17.5**

Pedestrian Movements

Mov ID	Dem Flow (ped/h)	Aver Delay (sec)	Level of Service	95% Back of Queue (ft)	Prop. Queued	Eff. Stop Rate
P7	1360	5.1	LOS A	2	0.64	0.64
All Peds	**1360**	**5.1**	**LOS A**	**2**	**0.64**	**0.64**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

Following Queue
- Density for continuous movement

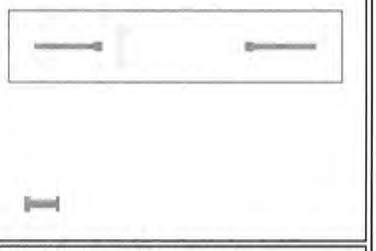
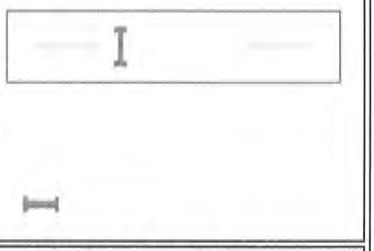
SIDRA INTERSECTION

Phasing Summary

Craver Road at Student Union Crossing

AM Peak

C = **25** seconds
Cycle Time Option: **Program calculated cycle time**
Phase times determined by the program.

Phase A	Phase B
	
Green Time = **10** seconds Phase Time = **14** seconds Phase Split = **56** %	Green Time = **7** seconds Phase Time = **11** seconds Phase Split = **44** %

Normal Movement	Permitted/Opposed
Slip-Lane	Opposed Slip-Lane
Stopped Movement	Continuous
Turn On Red	

SIDRA SOLUTIONS

Site: AM
E:\Work\Craver Rd\Student Union Crossing..aap
Processed Dec 04, 2009 02:28:43PM

M0126, Ramey Kemp & Associates, Medium Office

SIDRA INTERSECTION

Intersection Summary

Craver Road at Student Union Crossing

Mid Day Peak

Performance Measure	Vehicles	Pedestrians	Persons
Demand Flows - Total	287 veh/h	2435 ped/h	2779 pers/h
Percent Heavy Vehicles	2.1 %		
Degree of Saturation	0.288	0.564	
Effective Intersection Capacity	509 veh/h		
95% Back of Queue (ft)	54 ft	3 ft	
95% Back of Queue (veh)	2.1 veh	1.2 ped	
Control Delay (Total)	0.70 veh-h/h	3.46 ped-h/h	4.30 pers-h/h
Control Delay (Average)	8.8 s/veh	5.1 s/ped	5.6 s/pers
Level of Service	LOS A	LOS A	
Level of Service (Worst Movement)	LOS A	LOS A	
Total Effective Stops	181 veh/h	1558 ped/h	1776 pers/h
Effective Stop Rate	0.63 per veh	0.64 per ped	0.64 per pers
Proportion Queued	0.80	0.64	0.66
Travel Distance (Total)	92.4 veh-mi/h	38.7 ped-mi/h	149.6 pers-mi/h
Travel Distance (Average)	1700 ft	84 ft	284 ft
Travel Time (Total)	5.3 veh-h/h	16.7 ped-h/h	23.1 pers-h/h
Travel Time (Average)	66.7 secs	24.7 secs	29.9 secs
Travel Speed	17.4 mph	2.3 mph	6.5 mph
Operating Cost (Total)	69 $/h	127 $/h	196 $/h
Fuel Consumption (Total)	4.1 gal/h		
Carbon Dioxide (Total)	39.2 kg/h		
Hydrocarbons (Total)	0.066 kg/h		
Carbon Monoxide (Total)	2.13 kg/h		
NOX (Total)	0.060 kg/h		

SIDRA SOLUTIONS

Site: Mid Day
E:\Work\Craver Rd\Student Union Crossing..aap
Processed Dec 04, 2009 11:43:30AM

M0126, Ramey Kemp & Associates, Medium Office

SIDRA INTERSECTION

Movement Summary

Craver Road at Student Union Crossing

Mid Day Peak

Pedestrian crossing - Actuated isolated Cycle Time = 25 seconds

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (ft)	Prop. Queued	Eff. Stop Rate	Aver Speed (mph)
New E leg										
6T	T	150	2.0	0.288	8.8	LOS A	54	0.80	0.64	17.4
Approach		**150**	**2.0**	**0.288**	**8.8**	**LOS A**	**54**	**0.80**	**0.64**	**17.4**
New W leg										
2T	T	137	2.2	0.263	8.7	LOS A	49	0.79	0.63	17.4
Approach		**137**	**2.2**	**0.263**	**8.7**	**LOS A**	**49**	**0.79**	**0.63**	**17.4**
All Vehicles		**287**	**2.1**	**0.288**	**8.8**	**LOS A**	**54**	**0.80**	**0.63**	**17.4**

Pedestrian Movements

Mov ID	Dem Flow (ped/h)	Aver Delay (sec)	Level of Service	95% Back of Queue (ft)	Prop. Queued	Eff. Stop Rate
P7	2435	5.1	LOS A	3	0.64	0.64
All Peds	**2435**	**5.1**	**LOS A**	**3**	**0.64**	**0.64**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

Following Queue
- Density for continuous movement

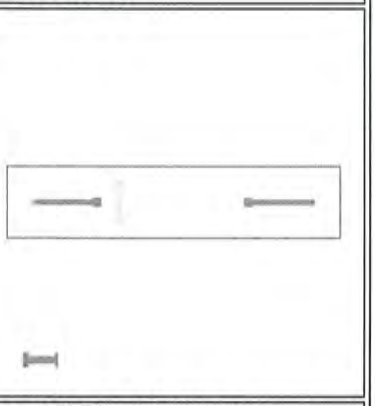
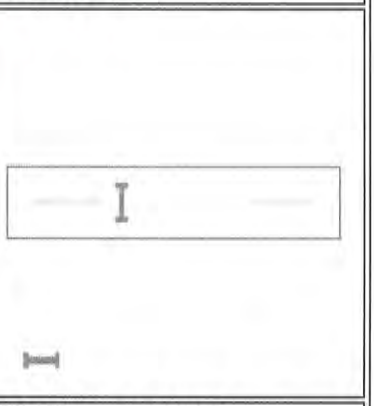
SIDRA INTERSECTION

Phasing Summary

Craver Road at Student Union Crossing

Mid Day Peak

C = **25** seconds
Cycle Time Option: **Program calculated cycle time**
Phase times determined by the program.

Phase A	Phase B
	
Green Time = **10** seconds Phase Time = **14** seconds Phase Split = **56** %	Green Time = **7** seconds Phase Time = **11** seconds Phase Split = **44** %

Normal Movement	Permitted/Opposed
Slip-Lane	Opposed Slip-Lane
Stopped Movement	Continuous
Turn On Red	

SIDRA SOLUTIONS

Site: Mid Day
E:\Work\Craver Rd\Student Union Crossing..aap
Processed Dec 04, 2009 11:43:30AM

M0126, Ramey Kemp & Associates, Medium Office
Produced by SIDRA Intersection 3.2.0.1455

www.sidrasolutions.com

SIDRA INTERSECTION

Intersection Summary

Craver Road at Student Union Crossing

PM Peak

Performance Measure	Vehicles	Pedestrians	Persons
Demand Flows - Total	285 veh/h	1498 ped/h	1840 pers/h
Percent Heavy Vehicles	2.1 %		
Degree of Saturation	0.282	0.347	
Effective Intersection Capacity	822 veh/h		
95% Back of Queue (ft)	53 ft	2 ft	
95% Back of Queue (veh)	2.1 veh	0.7 ped	
Control Delay (Total)	0.69 veh-h/h	2.13 ped-h/h	2.96 pers-h/h
Control Delay (Average)	8.8 s/veh	5.1 s/ped	5.8 s/pers
Level of Service	LOS A	LOS A	
Level of Service (Worst Movement)	LOS A	LOS A	
Total Effective Stops	180 veh/h	959 ped/h	1174 pers/h
Effective Stop Rate	0.63 per veh	0.64 per ped	0.64 per pers
Proportion Queued	0.80	0.64	0.67
Travel Distance (Total)	91.7 veh-mi/h	23.8 ped-mi/h	133.9 pers-mi/h
Travel Distance (Average)	1700 ft	84 ft	384 ft
Travel Time (Total)	5.3 veh-h/h	10.3 ped-h/h	16.6 pers-h/h
Travel Time (Average)	66.7 secs	24.7 secs	32.5 secs
Travel Speed	17.4 mph	2.3 mph	8.1 mph
Operating Cost (Total)	69 $/h	78 $/h	147 $/h
Fuel Consumption (Total)	4.1 gal/h		
Carbon Dioxide (Total)	38.9 kg/h		
Hydrocarbons (Total)	0.065 kg/h		
Carbon Monoxide (Total)	2.11 kg/h		
NOX (Total)	0.060 kg/h		

SIDRA SOLUTIONS

Site: PM
E:\Work\Craver Rd\Student Union Crossing..aap
Processed Dec 04, 2009 11:47:25AM

M0126, Ramey Kemp & Associates, Medium Office

SIDRA INTERSECTION

Movement Summary

Craver Road at Student Union Crossing

PM Peak

Pedestrian crossing - Actuated isolated Cycle Time = 25 seconds

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (ft)	Prop. Queued	Eff. Stop Rate	Aver Speed (mph)
New E leg										
6T	T	147	2.0	0.282	8.8	LOS A	53	0.80	0.63	17.4
Approach		**147**	**2.0**	**0.282**	**8.8**	**LOS A**	**53**	**0.80**	**0.63**	**17.4**
New W leg										
2T	T	138	2.2	0.265	8.7	LOS A	50	0.79	0.63	17.4
Approach		**138**	**2.2**	**0.265**	**8.7**	**LOS A**	**50**	**0.79**	**0.63**	**17.4**
All Vehicles		**285**	**2.1**	**0.282**	**8.8**	**LOS A**	**53**	**0.80**	**0.63**	**17.4**

Pedestrian Movements

Mov ID	Dem Flow (ped/h)	Aver Delay (sec)	Level of Service	95% Back of Queue (ft)	Prop. Queued	Eff. Stop Rate
P7	1498	5.1	LOS A	2	0.64	0.64
All Peds	**1498**	**5.1**	**LOS A**	**2**	**0.64**	**0.64**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

Following Queue
- Density for continuous movement

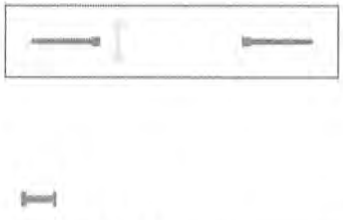
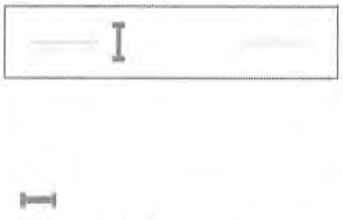
SIDRA INTERSECTION

Phasing Summary

Craver Road at Student Union Crossing

PM Peak

C = **25** seconds
Cycle Time Option: **Program calculated cycle time**
Phase times determined by the program.

Phase A	Phase B
	
Green Time = **10** seconds Phase Time = **14** seconds Phase Split = **56** %	Green Time = **7** seconds Phase Time = **11** seconds Phase Split = **44** %

Normal Movement	Permitted/Opposed
Slip-Lane	Opposed Slip-Lane
Stopped Movement	Continuous
Turn On Red	

SIDRA SOLUTIONS

Site: PM
E:\Work\Craver Rd\Student Union Crossing..aap
Processed Dec 04, 2009 11:47:25AM

M0126, Ramey Kemp & Associates, Medium Office

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	32	64	72	54	95	55
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	36	71	80	60	106	61
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	356	136	167			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	356	136	167			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	94	92	94			
cM capacity (veh/h)	606	913	1411			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	107	140	167
Volume Left	36	80	0
Volume Right	71	0	61
cSH	781	1411	1700
Volume to Capacity	0.14	0.06	0.10
Queue Length 95th (ft)	12	5	0
Control Delay (s)	10.3	4.6	0.0
Lane LOS	B	A	
Approach Delay (s)	10.3	4.6	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	4.2		
Intersection Capacity Utilization	30.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	62	71	103	91	102	65
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	69	79	114	101	113	72
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	479	149	186			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	479	149	186			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	86	91	92			
cM capacity (veh/h)	500	897	1389			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	148	216	186
Volume Left	69	114	0
Volume Right	79	0	72
cSH	655	1389	1700
Volume to Capacity	0.23	0.08	0.11
Queue Length 95th (ft)	22	7	0
Control Delay (s)	12.1	4.5	0.0
Lane LOS	B	A	
Approach Delay (s)	12.1	4.5	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	5.0		
Intersection Capacity Utilization	37.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	60	95	91	148	82	52
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	67	106	101	164	91	58
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	487	120	149			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	487	120	149			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	87	89	93			
cM capacity (veh/h)	502	931	1433			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	172	266	149
Volume Left	67	101	0
Volume Right	106	0	58
cSH	700	1433	1700
Volume to Capacity	0.25	0.07	0.09
Queue Length 95th (ft)	24	6	0
Control Delay (s)	11.8	3.3	0.0
Lane LOS	B	A	
Approach Delay (s)	11.8	3.3	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	5.0		
Intersection Capacity Utilization	39.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	51	54	29	17	80	28	35	28	17	79	106	287
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	57	60	32	19	89	31	39	31	19	88	118	319

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	149	139	89	524
Volume Left (vph)	57	19	39	88
Volume Right (vph)	32	31	19	319
Hadj (s)	-0.02	-0.07	-0.01	-0.30
Departure Headway (s)	5.6	5.6	5.4	4.6
Degree Utilization, x	0.23	0.22	0.13	0.67
Capacity (veh/h)	571	570	598	761
Control Delay (s)	10.3	10.1	9.3	16.2
Approach Delay (s)	10.3	10.1	9.3	16.2
Approach LOS	B	B	A	C

Intersection Summary			
Delay	13.6		
HCM Level of Service	B		
Intersection Capacity Utilization	49.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	100	65	53	34	90	181	41	94	32	60	120	167
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	111	72	59	38	100	201	46	104	36	67	133	186

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	242	339	186	386
Volume Left (vph)	111	38	46	67
Volume Right (vph)	59	201	36	186
Hadj (s)	-0.02	-0.30	-0.03	-0.22
Departure Headway (s)	6.4	6.0	6.6	5.9
Degree Utilization, x	0.43	0.56	0.34	0.63
Capacity (veh/h)	496	548	469	569
Control Delay (s)	14.2	16.3	12.9	18.7
Approach Delay (s)	14.2	16.3	12.9	18.7
Approach LOS	B	C	B	C

Intersection Summary			
Delay	16.1		
HCM Level of Service	C		
Intersection Capacity Utilization	63.9%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	259	122	30	35	117	109	33	137	31	32	81	134
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	288	136	33	39	130	121	37	152	34	36	90	149
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	457	290	223	274								
Volume Left (vph)	288	39	37	36								
Volume Right (vph)	33	121	34	149								
Hadj (s)	0.12	-0.19	-0.03	-0.27								
Departure Headway (s)	6.5	6.6	7.2	6.8								
Degree Utilization, x	0.82	0.53	0.44	0.52								
Capacity (veh/h)	457	488	449	471								
Control Delay (s)	33.0	16.9	15.7	16.8								
Approach Delay (s)	33.0	16.9	15.7	16.8								
Approach LOS	D	C	C	C								

Intersection Summary			
Delay	22.6		
HCM Level of Service	C		
Intersection Capacity Utilization	65.2%	ICU Level of Service	C
Analysis Period (min)	15		

APPENDIX C

CAPACITY ANALYSIS CALCULATIONS

EXISTING (2009) CONDITIONS WITH CRAVER ROAD CLOSURE

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	54	82	27	390	285	64
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	60	91	30	433	317	71
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	846	352	388			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	846	352	388			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	82	87	97			
cM capacity (veh/h)	324	691	1171			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	151	463	388
Volume Left	60	30	0
Volume Right	91	0	71
cSH	477	1171	1700
Volume to Capacity	0.32	0.03	0.23
Queue Length 95th (ft)	34	2	0
Control Delay (s)	16.0	0.8	0.0
Lane LOS	C	A	
Approach Delay (s)	16.0	0.8	0.0
Approach LOS	C		

Intersection Summary			
Average Delay	2.8		
Intersection Capacity Utilization	57.4%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	80	70	66	226	269	113
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	89	78	73	251	299	126
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	759	362	424			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	759	362	424			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	75	89	94			
cM capacity (veh/h)	350	683	1135			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	167	324	424
Volume Left	89	73	0
Volume Right	78	0	126
cSH	453	1135	1700
Volume to Capacity	0.37	0.06	0.25
Queue Length 95th (ft)	42	5	0
Control Delay (s)	17.5	2.4	0.0
Lane LOS	C	A	
Approach Delay (s)	17.5	2.4	0.0
Approach LOS	C		

Intersection Summary			
Average Delay	4.0		
Intersection Capacity Utilization	55.3%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	74	110	101	433	393	107
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	82	122	112	481	437	119
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1202	496	556			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1202	496	556			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	55	79	89			
cM capacity (veh/h)	181	574	1015			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	204	593	556
Volume Left	82	112	0
Volume Right	122	0	119
cSH	307	1015	1700
Volume to Capacity	0.67	0.11	0.33
Queue Length 95th (ft)	111	9	0
Control Delay (s)	37.3	2.8	0.0
Lane LOS	E	A	
Approach Delay (s)	37.3	2.8	0.0
Approach LOS	E		

Intersection Summary			
Average Delay	6.9		
Intersection Capacity Utilization	76.4%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	40	17	411	38	11	223
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	44	19	457	42	12	248
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	750	478			499	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	750	478			499	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	88	97			99	
cM capacity (veh/h)	375	588			1065	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	63	499	260
Volume Left	44	0	12
Volume Right	19	42	0
cSH	420	1700	1065
Volume to Capacity	0.15	0.29	0.01
Queue Length 95th (ft)	13	0	1
Control Delay (s)	15.1	0.0	0.5
Lane LOS	C		A
Approach Delay (s)	15.1	0.0	0.5
Approach LOS	C		

Intersection Summary			
Average Delay	1.3		
Intersection Capacity Utilization	33.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	41	14	259	44	15	311
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	46	16	288	49	17	346
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	691	312			337	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	691	312			337	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	89	98			99	
cM capacity (veh/h)	405	728			1223	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	61	337	362
Volume Left	46	0	17
Volume Right	16	49	0
cSH	456	1700	1223
Volume to Capacity	0.13	0.20	0.01
Queue Length 95th (ft)	11	0	1
Control Delay (s)	14.1	0.0	0.5
Lane LOS	B		A
Approach Delay (s)	14.1	0.0	0.5
Approach LOS	B		

Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	38.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	43	15	473	43	13	396
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	48	17	526	48	14	440
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1018	549			573	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1018	549			573	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	82	97			99	
cM capacity (veh/h)	259	535			1000	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	64	573	454
Volume Left	48	0	14
Volume Right	17	48	0
cSH	299	1700	1000
Volume to Capacity	0.22	0.34	0.01
Queue Length 95th (ft)	20	0	1
Control Delay (s)	20.3	0.0	0.4
Lane LOS	C		A
Approach Delay (s)	20.3	0.0	0.4
Approach LOS	C		

Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	41.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	23	44	47	79	119	31
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	26	49	52	88	132	34
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	342	149	167			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	342	149	167			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	96	95	96			
cM capacity (veh/h)	630	897	1411			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	74	140	167
Volume Left	26	52	0
Volume Right	49	0	34
cSH	783	1411	1700
Volume to Capacity	0.10	0.04	0.10
Queue Length 95th (ft)	8	3	0
Control Delay (s)	10.1	3.0	0.0
Lane LOS	B	A	
Approach Delay (s)	10.1	3.0	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	3.1		
Intersection Capacity Utilization	28.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	42	48	60	134	134	36
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	47	53	67	149	149	40
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	451	169	189			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	451	169	189			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	91	94	95			
cM capacity (veh/h)	539	875	1385			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	100	216	189
Volume Left	47	67	0
Volume Right	53	0	40
cSH	678	1385	1700
Volume to Capacity	0.15	0.05	0.11
Queue Length 95th (ft)	13	4	0
Control Delay (s)	11.2	2.7	0.0
Lane LOS	B	A	
Approach Delay (s)	11.2	2.7	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	3.4		
Intersection Capacity Utilization	34.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	33	50	52	187	120	28
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	37	56	58	208	133	31
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	472	149	164			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	472	149	164			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	93	94	96			
cM capacity (veh/h)	528	898	1414			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	92	266	164
Volume Left	37	58	0
Volume Right	56	0	31
cSH	702	1414	1700
Volume to Capacity	0.13	0.04	0.10
Queue Length 95th (ft)	11	3	0
Control Delay (s)	10.9	1.9	0.0
Lane LOS	B	A	
Approach Delay (s)	10.9	1.9	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	2.9		
Intersection Capacity Utilization	35.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	59	66	53	17	92	28	50	33	22	79	106	299
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	66	73	59	19	102	31	56	37	24	88	118	332

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	198	152	117	538
Volume Left (vph)	66	19	56	88
Volume Right (vph)	59	31	24	332
Hadj (s)	-0.08	-0.06	0.00	-0.30
Departure Headway (s)	5.8	5.9	5.8	4.8
Degree Utilization, x	0.32	0.25	0.19	0.72
Capacity (veh/h)	547	534	546	720
Control Delay (s)	11.5	10.9	10.1	19.5
Approach Delay (s)	11.5	10.9	10.1	19.5
Approach LOS	B	B	B	C

Intersection Summary			
Delay	15.5		
HCM Level of Service	C		
Intersection Capacity Utilization	52.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	111	79	85	34	104	181	67	103	40	60	120	182
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	123	88	94	38	116	201	74	114	44	67	133	202

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	306	354	233	402
Volume Left (vph)	123	38	74	67
Volume Right (vph)	94	201	44	202
Hadj (s)	-0.07	-0.29	-0.02	-0.23
Departure Headway (s)	7.1	6.7	7.4	6.7
Degree Utilization, x	0.60	0.66	0.48	0.74
Capacity (veh/h)	459	491	425	508
Control Delay (s)	20.1	22.0	16.9	26.6
Approach Delay (s)	20.1	22.0	16.9	26.6
Approach LOS	C	C	C	D

Intersection Summary			
Delay	22.0		
HCM Level of Service	C		
Intersection Capacity Utilization	67.3%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	274	140	68	35	129	109	57	145	38	32	81	146
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	304	156	76	39	143	121	63	161	42	36	90	162

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	536	303	267	288
Volume Left (vph)	304	39	63	36
Volume Right (vph)	76	121	42	162
Hadj (s)	0.06	-0.18	-0.01	-0.28
Departure Headway (s)	7.0	7.3	7.7	7.4
Degree Utilization, x	1.05	0.62	0.57	0.59
Capacity (veh/h)	507	466	439	452
Control Delay (s)	78.8	21.3	20.6	20.6
Approach Delay (s)	78.8	21.3	20.6	20.6
Approach LOS	F	C	C	C

Intersection Summary			
Delay	43.1		
HCM Level of Service	E		
Intersection Capacity Utilization	74.7%	ICU Level of Service	D
Analysis Period (min)	15		

APPENDIX D

CAPACITY ANALYSIS CALCULATIONS

FUTURE (2015) CONDITIONS WITH CRAVER ROAD CLOSURE

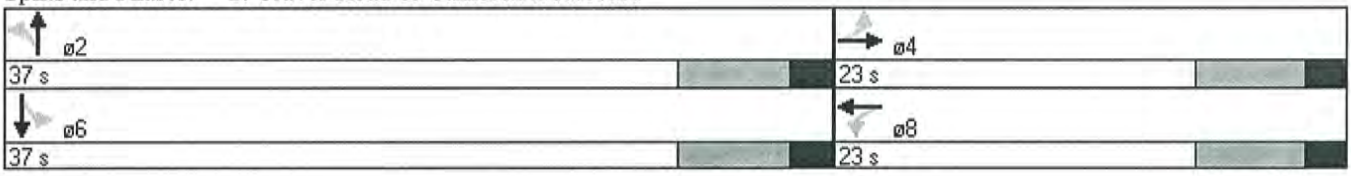
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	48	16	98	36	12	20	32	443	29	13	266	76
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	150		0	100		0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (ft)	100		100	100		100	100		100	100		100
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.918			0.960			0.991			0.967	
Flt Protected		0.985			0.974		0.950			0.950		
Satd. Flow (prot)	0	1684	0	0	1742	0	1770	1846	0	1770	1801	0
Flt Permitted		0.874			0.805		0.535			0.412		
Satd. Flow (perm)	0	1495	0	0	1440	0	997	1846	0	767	1801	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		109			22			8			36	
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		604			973			680			599	
Travel Time (s)		11.8			19.0			13.2			11.7	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	53	18	109	40	13	22	36	492	32	14	296	84
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	180	0	0	75	0	36	524	0	14	380	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Minimum Split (s)	21.0	21.0		21.0	21.0		21.0	21.0		21.0	21.0	
Total Split (s)	23.0	23.0	0.0	23.0	23.0	0.0	37.0	37.0	0.0	37.0	37.0	0.0
Total Split (%)	38.3%	38.3%	0.0%	38.3%	38.3%	0.0%	61.7%	61.7%	0.0%	61.7%	61.7%	0.0%
Maximum Green (s)	16.0	16.0		16.0	16.0		30.0	30.0		30.0	30.0	
Yellow Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0
Total Lost Time (s)	5.0	5.0	2.0	5.0	5.0	2.0	5.0	5.0	2.0	5.0	5.0	2.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		Min	Min		Min	Min	
Act Effct Green (s)		10.8			10.8		23.6	23.6		23.6	23.6	
Actuated g/C Ratio		0.27			0.27		0.59	0.59		0.59	0.59	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio		0.37			0.18		0.06	0.48		0.03	0.35	
Control Delay		9.3			11.8		6.1	8.7		5.9	6.9	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		9.3			11.8		6.1	8.7		5.9	6.9	
LOS		A			B		A	A		A	A	
Approach Delay		9.3			11.8			8.5			6.9	
Approach LOS		A			B			A			A	
Queue Length 50th (ft)		11			8		3	67		1	39	
Queue Length 95th (ft)		60			40		16	164		8	103	
Internal Link Dist (ft)		524			893			600			519	
Turn Bay Length (ft)							150			100		
Base Capacity (vph)		767			695		824	1526		634	1494	
Starvation Cap Reductn		0			0		0	0		0	0	
Spillback Cap Reductn		0			0		0	0		0	0	
Storage Cap Reductn		0			0		0	0		0	0	
Reduced v/c Ratio		0.23			0.11		0.04	0.34		0.02	0.25	

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 39.8
Natural Cycle: 45
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.48
Intersection Signal Delay: 8.3 Intersection LOS: A
Intersection Capacity Utilization 45.1% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 2: Craver Road & Cameron Boulevard



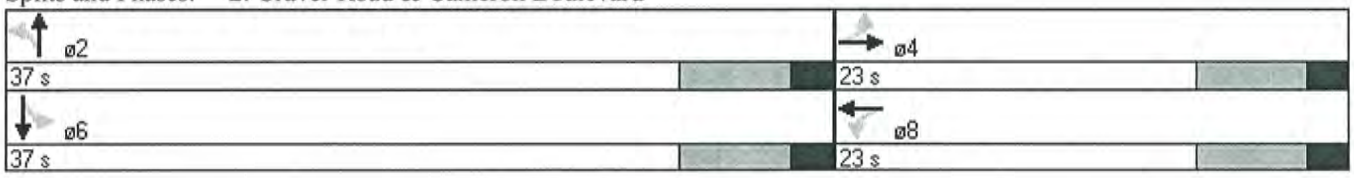
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	72	24	84	37	12	17	79	237	29	18	371	135
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	150		0	100		0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (ft)	100		100	100		100	100		100	100		100
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.937			0.965			0.984			0.960	
Flt Protected		0.980			0.973		0.950			0.950		
Satd. Flow (prot)	0	1710	0	0	1749	0	1770	1833	0	1770	1788	0
Flt Permitted		0.837			0.785		0.357			0.580		
Satd. Flow (perm)	0	1461	0	0	1411	0	665	1833	0	1080	1788	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		74			19			16			47	
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		604			973			680			599	
Travel Time (s)		11.8			19.0			13.2			11.7	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	80	27	93	41	13	19	88	263	32	20	412	150
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	200	0	0	73	0	88	295	0	20	562	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Minimum Split (s)	21.0	21.0		21.0	21.0		21.0	21.0		21.0	21.0	
Total Split (s)	23.0	23.0	0.0	23.0	23.0	0.0	37.0	37.0	0.0	37.0	37.0	0.0
Total Split (%)	38.3%	38.3%	0.0%	38.3%	38.3%	0.0%	61.7%	61.7%	0.0%	61.7%	61.7%	0.0%
Maximum Green (s)	16.0	16.0		16.0	16.0		30.0	30.0		30.0	30.0	
Yellow Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0
Total Lost Time (s)	5.0	5.0	2.0	5.0	5.0	2.0	5.0	5.0	2.0	5.0	5.0	2.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		Min	Min		Min	Min	
Act Effct Green (s)		12.1			12.1		23.5	23.5		23.5	23.5	
Actuated g/C Ratio		0.26			0.26		0.51	0.51		0.51	0.51	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio		0.46			0.19		0.26	0.31		0.04	0.60	
Control Delay		13.3			12.4		9.4	7.6		6.5	10.8	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		13.3			12.4		9.4	7.6		6.5	10.8	
LOS		B			B		A	A		A	B	
Approach Delay		13.3			12.4			8.0			10.6	
Approach LOS		B			B			A			B	
Queue Length 50th (ft)		23			9		11	35		2	76	
Queue Length 95th (ft)		84			40		40	91		11	194	
Internal Link Dist (ft)		524			893			600			519	
Turn Bay Length (ft)							150			100		
Base Capacity (vph)		636			583		479	1326		778	1302	
Starvation Cap Reductn		0			0		0	0		0	0	
Spillback Cap Reductn		0			0		0	0		0	0	
Storage Cap Reductn		0			0		0	0		0	0	
Reduced v/c Ratio		0.31			0.13		0.18	0.22		0.03	0.43	

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 46
Natural Cycle: 45
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.60
Intersection Signal Delay: 10.4 Intersection LOS: B
Intersection Capacity Utilization 57.6% ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 2: Craver Road & Cameron Boulevard



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	66	22	131	38	13	18	121	499	29	16	473	128
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	150		0	100		0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (ft)	100		100	100		100	100		100	100		100
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.919			0.964			0.992			0.968	
Flt Protected		0.985			0.973		0.950			0.950		
Satd. Flow (prot)	0	1686	0	0	1747	0	1770	1848	0	1770	1803	0
Flt Permitted		0.871			0.727		0.288			0.350		
Satd. Flow (perm)	0	1491	0	0	1305	0	536	1848	0	652	1803	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		123			20			8			37	
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		604			973			680			599	
Travel Time (s)		11.8			19.0			13.2			11.7	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	73	24	146	42	14	20	134	554	32	18	526	142
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	243	0	0	76	0	134	586	0	18	668	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Minimum Split (s)	21.0	21.0		21.0	21.0		21.0	21.0		21.0	21.0	
Total Split (s)	21.0	21.0	0.0	21.0	21.0	0.0	39.0	39.0	0.0	39.0	39.0	0.0
Total Split (%)	35.0%	35.0%	0.0%	35.0%	35.0%	0.0%	65.0%	65.0%	0.0%	65.0%	65.0%	0.0%
Maximum Green (s)	14.0	14.0		14.0	14.0		32.0	32.0		32.0	32.0	
Yellow Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0
Total Lost Time (s)	5.0	5.0	2.0	5.0	5.0	2.0	5.0	5.0	2.0	5.0	5.0	2.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		Min	Min		Min	Min	
Act Effct Green (s)		11.9			11.9		26.4	26.4		26.4	26.4	
Actuated g/C Ratio		0.25			0.25		0.54	0.54		0.54	0.54	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio		0.53			0.23		0.46	0.58		0.05	0.67	
Control Delay		13.6			14.5		13.7	10.4		6.2	11.8	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		13.6			14.5		13.7	10.4		6.2	11.8	
LOS		B			B		B	B		A	B	
Approach Delay		13.6			14.5			11.0			11.7	
Approach LOS		B			B			B			B	
Queue Length 50th (ft)		25			11		19	90		2	104	
Queue Length 95th (ft)		92			44		67	196		10	235	
Internal Link Dist (ft)		524			893			600			519	
Turn Bay Length (ft)							150			100		
Base Capacity (vph)		587			456		386	1334		470	1310	
Starvation Cap Reductn		0			0		0	0		0	0	
Spillback Cap Reductn		0			0		0	0		0	0	
Storage Cap Reductn		0			0		0	0		0	0	
Reduced v/c Ratio		0.41			0.17		0.35	0.44		0.04	0.51	

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 48.5
Natural Cycle: 55
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.67
Intersection Signal Delay: 11.8 Intersection LOS: B
Intersection Capacity Utilization 65.5% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 2: Craver Road & Cameron Boulevard

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	27	53	56	94	142	37
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	30	59	62	104	158	41
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	407	178	199			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	407	178	199			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	95	93	95			
cM capacity (veh/h)	573	865	1373			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	89	167	199
Volume Left	30	62	0
Volume Right	59	0	41
cSH	738	1373	1700
Volume to Capacity	0.12	0.05	0.12
Queue Length 95th (ft)	10	4	0
Control Delay (s)	10.5	3.1	0.0
Lane LOS	B	A	
Approach Delay (s)	10.5	3.1	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	3.2		
Intersection Capacity Utilization	32.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	50	57	72	160	160	43
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	56	63	80	178	178	48
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	539	202	226			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	539	202	226			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	88	92	94			
cM capacity (veh/h)	473	839	1343			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	119	258	226
Volume Left	56	80	0
Volume Right	63	0	48
cSH	616	1343	1700
Volume to Capacity	0.19	0.06	0.13
Queue Length 95th (ft)	18	5	0
Control Delay (s)	12.2	2.8	0.0
Lane LOS	B	A	
Approach Delay (s)	12.2	2.8	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	3.6		
Intersection Capacity Utilization	39.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	39	60	62	223	143	33
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	43	67	69	248	159	37
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	563	177	196			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	563	177	196			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	91	92	95			
cM capacity (veh/h)	463	866	1377			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	110	317	196
Volume Left	43	69	0
Volume Right	67	0	37
cSH	645	1377	1700
Volume to Capacity	0.17	0.05	0.12
Queue Length 95th (ft)	15	4	0
Control Delay (s)	11.7	2.0	0.0
Lane LOS	B	A	
Approach Delay (s)	11.7	2.0	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	3.1		
Intersection Capacity Utilization	40.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	70	79	63	20	110	33	60	39	26	94	127	357
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	78	88	70	22	122	37	67	43	29	104	141	397

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	236	181	139	642
Volume Left (vph)	78	22	67	104
Volume Right (vph)	70	37	29	397
Hadj (s)	-0.08	-0.06	0.01	-0.30
Departure Headway (s)	6.5	6.6	6.5	5.3
Degree Utilization, x	0.42	0.33	0.25	0.94
Capacity (veh/h)	534	515	519	674
Control Delay (s)	14.2	13.0	11.6	44.4
Approach Delay (s)	14.2	13.0	11.6	44.4
Approach LOS	B	B	B	E

Intersection Summary			
Delay	29.9		
HCM Level of Service	D		
Intersection Capacity Utilization	65.7%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	133	94	101	41	124	216	80	123	48	72	143	217
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	148	104	112	46	138	240	89	137	53	80	159	241

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	364	423	279	480
Volume Left (vph)	148	46	89	80
Volume Right (vph)	112	240	53	241
Hadj (s)	-0.07	-0.28	-0.02	-0.23
Departure Headway (s)	8.7	8.3	9.2	8.4
Degree Utilization, x	0.88	0.97	0.71	1.12
Capacity (veh/h)	397	423	378	413
Control Delay (s)	49.1	65.4	31.9	110.0
Approach Delay (s)	49.1	65.4	31.9	110.0
Approach LOS	E	F	D	F

Intersection Summary			
Delay	69.4		
HCM Level of Service	F		
Intersection Capacity Utilization	78.4%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	327	167	81	42	154	130	68	173	45	38	97	174
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	363	186	90	47	171	144	76	192	50	42	108	193

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	639	362	318	343
Volume Left (vph)	363	47	76	42
Volume Right (vph)	90	144	50	193
Hadj (s)	0.06	-0.18	-0.01	-0.28
Departure Headway (s)	8.3	8.2	8.6	8.3
Degree Utilization, x	1.47	0.83	0.76	0.79
Capacity (veh/h)	438	415	393	416
Control Delay (s)	246.1	40.3	34.1	35.8
Approach Delay (s)	246.1	40.3	34.1	35.8
Approach LOS	F	E	D	E

Intersection Summary			
Delay	117.3		
HCM Level of Service	F		
Intersection Capacity Utilization	87.3%	ICU Level of Service	E
Analysis Period (min)	15		

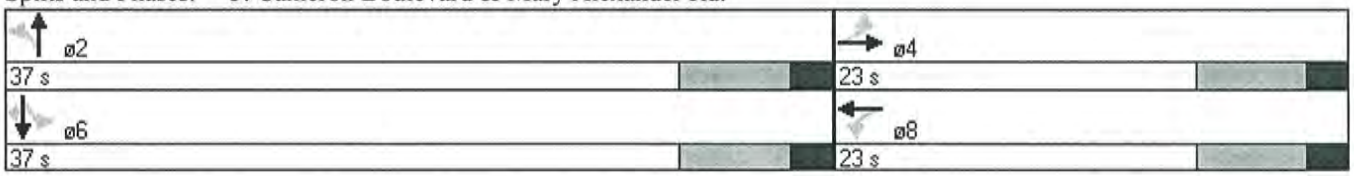
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	70	79	63	20	110	33	60	39	26	94	127	357
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200		0	0		0	0		0	0		150
Storage Lanes	1		0	0		0	0		0	0		1
Taper Length (ft)	100		100	100		100	100		100	100		100
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.934			0.972			0.972				0.850
Flt Protected	0.950				0.994			0.976			0.979	
Satd. Flow (prot)	1770	1740	0	0	1800	0	0	1767	0	0	1824	1583
Flt Permitted	0.790				0.931			0.773			0.815	
Satd. Flow (perm)	1472	1740	0	0	1686	0	0	1400	0	0	1518	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		68			22			29				397
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		1387			486			1017			821	
Travel Time (s)		27.0			9.5			19.8			16.0	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	78	88	70	22	122	37	67	43	29	104	141	397
Shared Lane Traffic (%)												
Lane Group Flow (vph)	78	158	0	0	181	0	0	139	0	0	245	397
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Perm			Perm			Perm			Perm		Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6
Detector Phase	4	4		8	8		2	2		6	6	6
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	7.0
Minimum Split (s)	14.0	14.0		14.0	14.0		14.0	14.0		14.0	14.0	14.0
Total Split (s)	23.0	23.0	0.0	23.0	23.0	0.0	37.0	37.0	0.0	37.0	37.0	37.0
Total Split (%)	38.3%	38.3%	0.0%	38.3%	38.3%	0.0%	61.7%	61.7%	0.0%	61.7%	61.7%	61.7%
Maximum Green (s)	16.0	16.0		16.0	16.0		30.0	30.0		30.0	30.0	30.0
Yellow Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	5.0
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	2.0
Lost Time Adjust (s)	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0
Total Lost Time (s)	5.0	5.0	2.0	5.0	5.0	2.0	5.0	5.0	2.0	5.0	5.0	5.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	None		None	None		Min	Min		Min	Min	Min
Act Effct Green (s)	11.2	11.2			11.2			19.1			19.1	19.1
Actuated g/C Ratio	0.31	0.31			0.31			0.53			0.53	0.53

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio	0.17	0.27			0.34			0.18			0.30	0.39
Control Delay	11.4	8.1			11.5			6.7			8.7	2.4
Queue Delay	0.0	0.0			0.0			0.0			0.0	0.0
Total Delay	11.4	8.1			11.5			6.7			8.7	2.4
LOS	B	A			B			A			A	A
Approach Delay		9.2			11.5			6.7			4.8	
Approach LOS		A			B			A			A	
Queue Length 50th (ft)	10	12			21			12			30	0
Queue Length 95th (ft)	39	50			71			40			78	34
Internal Link Dist (ft)		1307			406			937			741	
Turn Bay Length (ft)	200											150
Base Capacity (vph)	762	934			884			1245			1346	1449
Starvation Cap Reductn	0	0			0			0			0	0
Spillback Cap Reductn	0	0			0			0			0	0
Storage Cap Reductn	0	0			0			0			0	0
Reduced v/c Ratio	0.10	0.17			0.20			0.11			0.18	0.27

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 35.9
Natural Cycle: 40
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.39
Intersection Signal Delay: 6.9 Intersection LOS: A
Intersection Capacity Utilization 52.4% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 5: Cameron Boulevard & Mary Alexander Rd.



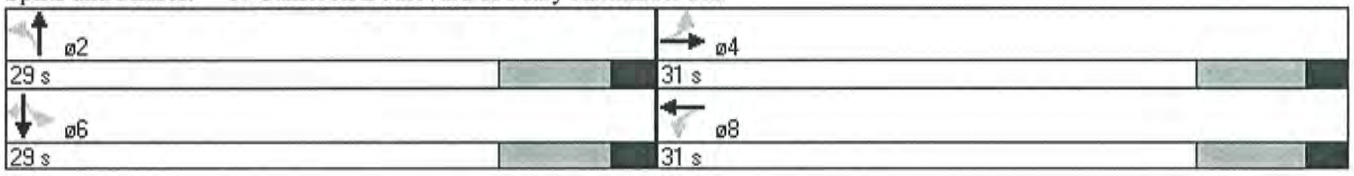
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	133	94	101	41	124	216	80	123	48	72	143	217
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200		0	0		0	0		0	0		150
Storage Lanes	1		0	0		0	0		0	0		1
Taper Length (ft)	100		100	100		100	100		100	100		100
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.922			0.924			0.974				0.850
Flt Protected	0.950				0.995			0.984			0.984	
Satd. Flow (prot)	1770	1717	0	0	1713	0	0	1785	0	0	1833	1583
Flt Permitted	0.499				0.940			0.809			0.821	
Satd. Flow (perm)	930	1717	0	0	1618	0	0	1468	0	0	1529	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		112			138			23				241
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		1387			486			1017			821	
Travel Time (s)		27.0			9.5			19.8			16.0	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	148	104	112	46	138	240	89	137	53	80	159	241
Shared Lane Traffic (%)												
Lane Group Flow (vph)	148	216	0	0	424	0	0	279	0	0	239	241
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Perm			Perm			Perm			Perm		Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6
Detector Phase	4	4		8	8		2	2		6	6	6
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	7.0
Minimum Split (s)	14.0	14.0		14.0	14.0		14.0	14.0		14.0	14.0	14.0
Total Split (s)	31.0	31.0	0.0	31.0	31.0	0.0	29.0	29.0	0.0	29.0	29.0	29.0
Total Split (%)	51.7%	51.7%	0.0%	51.7%	51.7%	0.0%	48.3%	48.3%	0.0%	48.3%	48.3%	48.3%
Maximum Green (s)	24.0	24.0		24.0	24.0		22.0	22.0		22.0	22.0	22.0
Yellow Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	5.0
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	2.0
Lost Time Adjust (s)	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0
Total Lost Time (s)	5.0	5.0	2.0	5.0	5.0	2.0	5.0	5.0	2.0	5.0	5.0	5.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	None		None	None		Min	Min		Min	Min	Min
Act Effct Green (s)	15.8	15.8			15.8			14.9			14.9	14.9
Actuated g/C Ratio	0.38	0.38			0.38			0.36			0.36	0.36

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio	0.42	0.30			0.60			0.51			0.43	0.33
Control Delay	14.5	6.3			11.3			14.3			13.9	3.4
Queue Delay	0.0	0.0			0.0			0.0			0.0	0.0
Total Delay	14.5	6.3			11.3			14.3			13.9	3.4
LOS	B	A			B			B			B	A
Approach Delay		9.6			11.3			14.3			8.6	
Approach LOS		A			B			B			A	
Queue Length 50th (ft)	22	14			44			40			37	0
Queue Length 95th (ft)	75	57			141			124			110	36
Internal Link Dist (ft)		1307			406			937			741	
Turn Bay Length (ft)	200											150
Base Capacity (vph)	626	1192			1134			921			950	1075
Starvation Cap Reductn	0	0			0			0			0	0
Spillback Cap Reductn	0	0			0			0			0	0
Storage Cap Reductn	0	0			0			0			0	0
Reduced v/c Ratio	0.24	0.18			0.37			0.30			0.25	0.22

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 41.4
Natural Cycle: 40
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.60
Intersection Signal Delay: 10.6 Intersection LOS: B
Intersection Capacity Utilization 75.2% ICU Level of Service D
Analysis Period (min) 15

Splits and Phases: 5: Cameron Boulevard & Mary Alexander Rd.



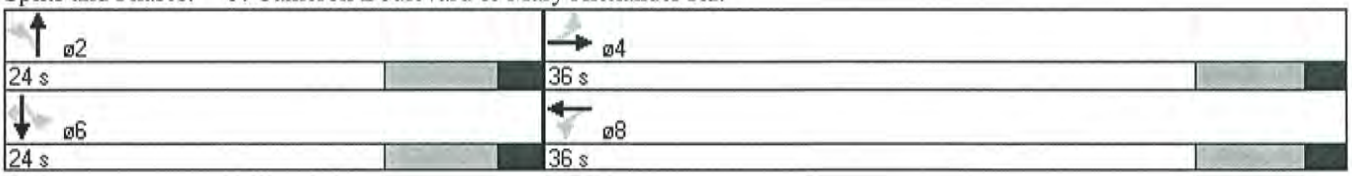
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	327	167	81	42	154	130	68	173	45	38	97	174
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200		0	0		0	0		0	0		150
Storage Lanes	1		0	0		0	0		0	0		1
Taper Length (ft)	100		100	100		100	100		100	100		100
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.951			0.946			0.979				0.850
Flt Protected	0.950				0.994			0.988			0.986	
Satd. Flow (prot)	1770	1771	0	0	1752	0	0	1802	0	0	1837	1583
Flt Permitted	0.556				0.928			0.877			0.849	
Satd. Flow (perm)	1036	1771	0	0	1635	0	0	1599	0	0	1581	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		60			82			16				193
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		1387			486			1017			821	
Travel Time (s)		27.0			9.5			19.8			16.0	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	363	186	90	47	171	144	76	192	50	42	108	193
Shared Lane Traffic (%)												
Lane Group Flow (vph)	363	276	0	0	362	0	0	318	0	0	150	193
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Perm			Perm			Perm			Perm		Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6
Detector Phase	4	4		8	8		2	2		6	6	6
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	7.0
Minimum Split (s)	14.0	14.0		14.0	14.0		14.0	14.0		14.0	14.0	14.0
Total Split (s)	36.0	36.0	0.0	36.0	36.0	0.0	24.0	24.0	0.0	24.0	24.0	24.0
Total Split (%)	60.0%	60.0%	0.0%	60.0%	60.0%	0.0%	40.0%	40.0%	0.0%	40.0%	40.0%	40.0%
Maximum Green (s)	29.0	29.0		29.0	29.0		17.0	17.0		17.0	17.0	17.0
Yellow Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	5.0
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	2.0
Lost Time Adjust (s)	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0
Total Lost Time (s)	5.0	5.0	2.0	5.0	5.0	2.0	5.0	5.0	2.0	5.0	5.0	5.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	None		None	None		Min	Min		Min	Min	Min
Act Effct Green (s)	24.0	24.0			24.0			15.7			15.7	15.7
Actuated g/C Ratio	0.48	0.48			0.48			0.31			0.31	0.31

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio	0.73	0.31			0.44			0.62			0.30	0.31
Control Delay	21.4	7.4			8.5			21.6			16.8	4.5
Queue Delay	0.0	0.0			0.0			0.0			0.0	0.0
Total Delay	21.4	7.4			8.5			21.6			16.8	4.5
LOS	C	A			A			C			B	A
Approach Delay		15.3			8.5			21.6			9.9	
Approach LOS		B			A			C			A	
Queue Length 50th (ft)	83	37			50			81			36	0
Queue Length 95th (ft)	#191	77			105			166			81	37
Internal Link Dist (ft)		1307			406			937			741	
Turn Bay Length (ft)	200											150
Base Capacity (vph)	673	1172			1091			646			630	746
Starvation Cap Reductn	0	0			0			0			0	0
Spillback Cap Reductn	0	0			0			0			0	0
Storage Cap Reductn	0	0			0			0			0	0
Reduced v/c Ratio	0.54	0.24			0.33			0.49			0.24	0.26

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 50.2
Natural Cycle: 45
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.73
Intersection Signal Delay: 13.9 Intersection LOS: B
Intersection Capacity Utilization 71.3% ICU Level of Service C
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 5: Cameron Boulevard & Mary Alexander Rd.



SIDRA INTERSECTION

Movement Summary

Cameron Boulevard at Mary Alexander Road

AM Peak

Roundabout

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (ft)	Prop. Queued	Eff. Stop Rate	Aver Speed (mph)
Northbound Mary Alexander										
3L	L	67	1.5	0.168	12.4	LOS B	29	0.49	0.72	26.5
8T	T	43	2.3	0.168	7.8	LOS A	29	0.49	0.62	28.6
8R	R	29	3.4	0.169	8.6	LOS A	29	0.49	0.62	28.3
Approach		**138**	**2.2**	**0.168**	**10.2**	**LOS B**	**29**	**0.49**	**0.67**	**27.5**
Westbound Cameron										
1L	L	22	4.3	0.204	11.8	LOS B	36	0.43	0.69	26.7
6T	T	122	1.6	0.203	7.2	LOS A	36	0.43	0.58	28.9
6R	R	37	2.7	0.203	8.1	LOS A	36	0.43	0.59	28.5
Approach		**182**	**2.2**	**0.203**	**8.0**	**LOS A**	**36**	**0.43**	**0.59**	**28.5**
Southbound Mary Alexander										
7L	L	104	1.9	0.675	14.0	LOS B	215	0.73	0.78	25.7
4T	T	141	2.1	0.675	9.4	LOS A	215	0.73	0.72	27.9
4R	R	397	2.0	0.674	10.2	LOS B	215	0.73	0.70	27.5
Approach		**642**	**2.0**	**0.674**	**10.6**	**LOS B**	**215**	**0.73**	**0.72**	**27.2**
Eastbound Cameron										
5L	L	78	2.6	0.293	12.7	LOS B	57	0.57	0.75	26.4
2T	T	88	2.3	0.292	8.1	LOS A	57	0.57	0.66	28.4
2R	R	70	1.4	0.293	8.9	LOS A	57	0.57	0.65	28.1
Approach		**236**	**2.1**	**0.293**	**9.8**	**LOS A**	**57**	**0.57**	**0.68**	**27.6**
All Vehicles		**1198**	**2.1**	**0.675**	**10.0**	**LOS B**	**215**	**0.62**	**0.69**	**27.5**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

Following Queue

SIDRA INTERSECTION

Movement Summary

Cameron Boulevard at Mary Alexander Road

Mid Day Peak

Roundabout

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (ft)	Prop. Queued	Eff. Stop Rate	Aver Speed (mph)
Northbound Mary Alexander										
3L	L	89	2.2	0.366	13.4	LOS B	73	0.63	0.79	26.0
8T	T	137	2.2	0.366	8.8	LOS A	73	0.63	0.72	28.2
8R	R	53	1.9	0.366	9.7	LOS A	73	0.63	0.69	27.8
Approach		**279**	**2.2**	**0.366**	**10.5**	**LOS B**	**73**	**0.63**	**0.74**	**27.4**
Westbound Cameron										
1L	L	46	2.2	0.575	16.0	LOS B	151	0.77	0.91	24.8
6T	T	138	2.2	0.573	11.4	LOS B	151	0.77	0.87	26.8
6R	R	240	2.1	0.573	12.2	LOS B	151	0.77	0.82	26.4
Approach		**424**	**2.1**	**0.573**	**12.3**	**LOS B**	**151**	**0.77**	**0.84**	**26.3**
Southbound Mary Alexander										
7L	L	80	2.5	0.571	14.0	LOS B	150	0.71	0.81	25.7
4T	T	159	1.9	0.570	9.4	LOS A	150	0.71	0.75	27.9
4R	R	241	2.1	0.571	10.2	LOS B	150	0.71	0.72	27.5
Approach		**480**	**2.1**	**0.571**	**10.6**	**LOS B**	**150**	**0.71**	**0.75**	**27.3**
Eastbound Cameron										
5L	L	148	2.0	0.454	13.2	LOS B	99	0.65	0.78	26.1
2T	T	104	1.9	0.454	8.6	LOS A	99	0.65	0.71	28.1
2R	R	112	1.8	0.453	9.5	LOS A	99	0.65	0.69	27.9
Approach		**364**	**1.9**	**0.453**	**10.7**	**LOS B**	**99**	**0.65**	**0.73**	**27.2**
All Vehicles		**1547**	**2.1**	**0.575**	**11.1**	**LOS B**	**151**	**0.70**	**0.77**	**27.0**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

Following Queue

SIDRA INTERSECTION

Movement Summary

Cameron Boulevard at Mary Alexander Road

PM Peak

Roundabout

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (ft)	Prop. Queued	Eff. Stop Rate	Aver Speed (mph)
Northbound Mary Alexander										
3L	L	76	2.6	0.567	19.3	LOS B	147	0.88	1.06	23.3
8T	T	192	2.1	0.565	14.7	LOS B	147	0.88	1.03	25.1
8R	R	50	2.0	0.568	15.6	LOS B	147	0.88	0.94	24.7
Approach		**318**	**2.2**	**0.565**	**16.0**	**LOS B**	**147**	**0.88**	**1.02**	**24.6**
Westbound Cameron										
1L	L	47	2.1	0.644	22.1	LOS C	185	0.90	1.12	22.2
6T	T	171	1.8	0.643	17.5	LOS B	185	0.90	1.10	23.8
6R	R	144	2.1	0.642	18.4	LOS B	185	0.90	1.03	23.4
Approach		**363**	**1.9**	**0.642**	**18.5**	**LOS B**	**185**	**0.90**	**1.07**	**23.4**
Southbound Mary Alexander										
7L	L	42	2.4	0.438	13.3	LOS B	94	0.66	0.78	26.1
4T	T	108	1.9	0.435	8.7	LOS A	94	0.66	0.71	28.1
4R	R	193	2.1	0.436	9.5	LOS A	94	0.66	0.69	27.8
Approach		**343**	**2.0**	**0.436**	**9.7**	**LOS A**	**94**	**0.66**	**0.71**	**27.7**
Eastbound Cameron										
5L	L	363	1.9	0.664	13.4	LOS B	209	0.72	0.75	26.0
2T	T	186	2.2	0.664	8.8	LOS A	209	0.72	0.69	27.9
2R	R	90	2.2	0.662	9.6	LOS A	209	0.72	0.68	27.7
Approach		**639**	**2.0**	**0.664**	**11.5**	**LOS B**	**209**	**0.72**	**0.72**	**26.7**
All Vehicles		**1663**	**2.0**	**0.664**	**13.5**	**LOS B**	**209**	**0.78**	**0.85**	**25.7**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

Following Queue

APPENDIX E

CONCEPT DRAWINGS AND COST ESTIMATES

RAMEY KEMP & ASSOCIATES

Preliminary Design and Construction Cost Estimate for Proposed Roundabouts along Craver Road

University of North Carolina at Charlotte
Charlotte, NC
(March 11, 2010)

Item	Unit	Price/Unit	Quantity Total	Cost
Fine Grading	s.y.	$6.00	3,060	$18,360.00
Paving Type S9.5B (3") Resurfacing	tons	$105.00	50	$5,250.00
Paving Type S9.5B (3")	tons	$105.00	515	$54,075.00
Paving Type I19.0B (4")	tons	$105.00	700	$73,500.00
Paving Type B25.0B (5")	tons	$105.00	875	$91,875.00
Brick Pavers	s.f.	$8.00	4,400	$35,200.00
4" Thermoplastic Pavement Markings (120 mils)	l.f.	$2.00	670	$1,340.00
8" Thermoplastic Pavement Markings (120 mils)	l.f.	$4.00	55	$220.00
12" Thermoplastic Pavement Marks (120 mils)	l.f.	$6.00	85	$510.00
24" Thermoplastic Pavement Markings	l.f.	$12.00	235	$2,820.00
Thermoplastic Symbols	ea.	$100.00	6	$600.00
5" Monolithic Island	s.y.	$70.00	315	$22,050.00
1'-6" Curb & Gutter	l.f.	$20.00	2,070	$ 41,400.00
Concrete Expressway Gutter	l.f.	$30.00	135	$4,050.00
Concrete Wheelchair Ramp	ea.	$800.00	12	$9,600.00
Construction Surveying	l.s.	$20,000	1	$20,000.00
Cut	c.y.	$20.00	1,500	$30,000.00
Fill	c.y.	$20.00	1,000	$20,000.00
Proposed Drainage Structures	l.s.	$50,000	1	$50,000.00
Traffic Control	l.s.	$10,000	1	$10,000.00
Proposed Signal	l.s.	$50,000	1	$10,000.00
Erosion Control	l.s.	$10,000	1	$10,000.00
SubTotal 1				**$550,850.00**
Engineering & design (10%)	%			$55,085.00
Utility Contingency (15% for adjustments, etc.)	%			$82,675.50
General Contingency and Mobilization -- 30%	%			$165,255.00
SubTotal 2				**$303,015.50**
Total				**$853,865.50**
SAY				**$854,000.00**

The above unit prices and total cost represent Ramey Kemp & Associates, Inc. ***opinion of most probable cost*** *for the subject project. RKA utilized unit costs obtained from contractors, vendors, and NCDOT bid packages in preparing this opinion. While RKA endeavors to use the most accurate and up to date unit cost available, the current market conditions are causing these costs to change daily. Additionally, RKA's* ***opinion*** *is based solely on quantity and not on construction phasing or ease of construction. The construction bid prices that are received by the owner will vary from contractor to contractor and their individual operating procedures. Also, any necessary right-of-way/property acquisitions are not included in this estimate. RKA is providing this* ***opinion of most probable cost*** *as an aid to the owner in budgeting, but is meant to serve only as a guideline for this project.*

RAMEY KEMP & ASSOCIATES

Preliminary Construction Cost Estimate for Proposed Roundabout at Cameron Blvd. and Mary Alexander Rd.

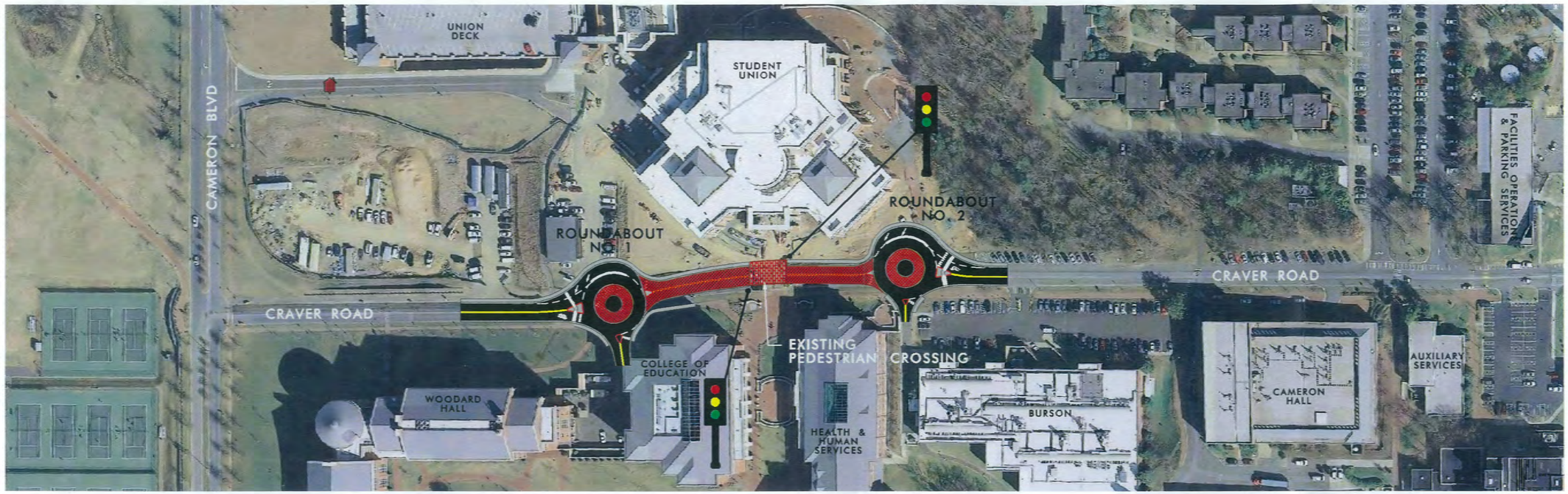
University of North Carolina at Charlotte
Charlotte, NC
(March 11, 2010)

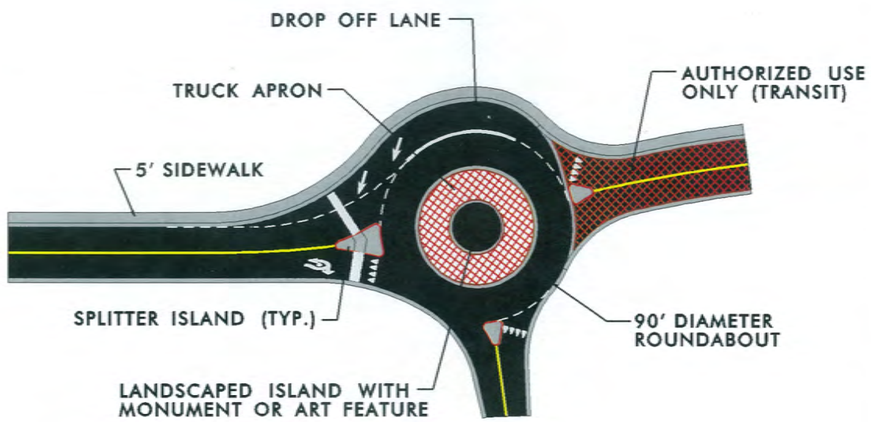
Item	Unit	Price/Unit	Quantity Total	Cost
Fine Grading	s.y.	$6.00	1,455	$8,730.00
Paving Type S9.5B (3") Resurfacing	tons	$105.00	80	$8,400.00
Paving Type S9.5B (3")	tons	$105.00	245	$25,725.00
Paving Type I19.0B (4")	tons	$105.00	335	$35,175.00
Paving Type B25.0B (5")	tons	$105.00	415	$43,575.00
Brick Pavers	s.f.	$8.00	7,520	$60,160.00
4" Thermoplastic Pavement Markings (120 mils)	l.f.	$2.00	110	$220.00
8" Thermoplastic Pavement Markings (120 mils)	l.f.	$4.00	20	$80.00
12" Thermoplastic Pavement Marks (120 mils)	l.f.	$6.00	40	$240.00
24" Thermoplastic Pavement Markings	l.f.	$12.00	170	$2,040.00
Thermoplastic Symbols	ea.	$100.00	4	$400.00
5" Monolithic Island	s.y.	$70.00	50	$3,500.00
1'-6" Curb & Gutter	l.f.	$20.00	345	$6,900.00
Concrete Wheelchair ramp	ea.	$800.00	6	$4,800.00
Construction Surveying	l.s.	$15,000	1	$15,000.00
Cut	c.y.	$20.00	600	$12,000.00
Fill	c.y.	$20.00	400	$8,000.00
Proposed Drainage Structures	l.s.	$30,000	1	$30,000.00
Traffic Control	l.s.	$15,000	1	$15,000.00
Erosion Control	l.s.	$5,000	1	$5,000.00
SubTotal 1				**$284,945.00**
Engineering & design (10%)	%			$28,494.50
Utility Contingency (15% for adjustments, etc.)	%			$42,741.75
General Contingency and Mobilization -- 30%	%			$85,483.50
SubTotal 2				**$156,719.75**
Total				**$441,664.75**
SAY				**$442,000.00**

The above unit prices and total cost represent Ramey Kemp & Associates, Inc. ***opinion of most probable cost*** *for the subject project. RKA utilized unit costs obtained from contractors, vendors, and NCDOT bid packages in preparing this opinion. While RKA endeavors to use the most accurate and up to date unit cost available, the current market conditions are causing these costs to change daily. Additionally, RKA's* ***opinion*** *is based solely on quantity and not on construction phasing or ease of construction. The construction bid prices that are received by the owner will vary from contractor to contractor and their individual operating procedures. Also, any necessary right-of-way/property acquisitions are not included in this estimate. RKA is providing this* ***opinion of most probable cost*** *as an aid to the owner in budgeting, but is meant to serve only as a guideline for this project.*

RAMEY KEMP & ASSOCIATES

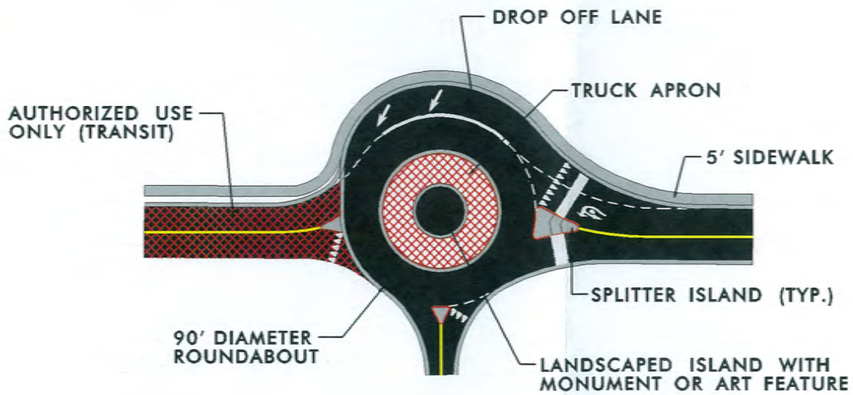
8307 University Executive Park Drive,
Suite 260
Charlotte, NC 28262
Phone: 704-549.4260
Fax: 704.549.4277
www.rameykemp.com





BLOWUP OF ROUNDABOUT NO. 1

1" = 40'



BLOWUP OF ROUNDABOUT NO. 2

1" = 40'

REVISIONS

RAMEY KEMP ASSOCIATES
TRANSPORTATION ENGINEERS
5808 Farlington Place
Suite 100
Raleigh, NC 27609
P: 919.872.5115
F: 919.878.5416
www.rameykemp.com
NC License No. C-0910

UNCCHARLOTTE
9201 UNIVERSITY CITY BOULEVARD
CHARLOTTE, NORTH CAROLINA 28223
704 - 687- 8622

CONCEPTUAL LAYOUT FOR THE PROPOSED ROUNDABOUTS ALONG CRAVER ROAD

SCALE
80 40 0 80 160
Horizontal Scale:
Vertical Scale:

DATE: 12-02-09
DRAWN BY: DAP
CHECKED BY: MSC

SCALE: 1" = 80'
PROJECT:
DRAWING:

DRAWING NUMBER

REVISIONS

RAMEY KEMP ASSOCIATES
TRANSPORTATION ENGINEERS
5808 Faringdon Place
Suite 100
Raleigh, NC 27609
P: 919.872.5115
F: 919.876.5416
www.rameykemp.com
NC License No. C-0910

UNCCHARLOTTE
9201 UNIVERSITY CITY BOULEVARD
CHARLOTTE, NORTH CAROLINA 28223
704 - 687- 8622

CONCEPTUAL LAYOUT FOR PROPOSED ROUNDABOUT AT THE INTERSECTION OF CAMERON BLVD & MARY ALEXANDER RD

SCALE
30 15 0 30 60
Horizontal Scale:
Vertical Scale:

DATE: 12-02-09
DRAWN BY: DAP
CHECKED BY: MSC

SCALE: 1" = 30'
PROJECT:
DRAWING:

DRAWING NUMBER