TRAFFIC IMPACT ANALYSIS
NC16 BUSINESS CIRCLE K
LINCOLN COUNTY, NORTH CAROLINA

RAMEY KEMP & ASSOCIATES

TRAFFIC IMPACT ANALYSIS

FOR THE

NC 16 Business Circle K

LOCATED
IN
LINCOLN COUNTY, NORTH CAROLINA

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NC 16 BUSINESS CIRCLE K
LINCOLN COUNTY, NORTH CAROLINA

1. EXECUTIVE SUMMARY

This report summarizes the findings of the Traffic Impact Analysis (TIA) that was performed for the proposed Circle K to be located along the east side of NC 16 Business and north of Unity Church Road in Lincoln County, North Carolina. The purpose of this study is to determine the potential impact to the surrounding transportation system caused by the traffic generated by the proposed development.

The site is proposed to consist of a 5,200 square feet gas station with a super convenience market. Access to the site will be via one full access driveway on Unity Church Road, a right-in/right-out driveway on Unity Church Road, and a leftover on NC 16 Business. The site is expected to be fully built by the year 2020.

The study area for the TIA was determined through coordination with the North Carolina Department of Transportation (NCDOT) and Lincoln County and consists of the following intersections:

1. NC 16 Business and Triangle Circle/Unity Church Road (Signalized)
2. NC 16 Business and Triangle Circle (Unsignalized)
3. NC 16 Business and Access A (Unsignalized)
4. Unity Church Road and Access B (Unsignalized)
5. Unity Church Road and Access C (Unsignalized)

Based on coordination with NCDOT and Lincoln County, one offsite development was determined to have an impact on the project study area. The following adjacent development was included:

- Rivercross Residential – consists of 135 single family homes and 133 townhomes to be located west of the intersection of NC 16 Business and Cherry Point Drive.

There are improvements proposed with the construction of the NCDOT State Improvement Program R-5712. These improvements are set to undergo construction in 2020.

Several scenarios were analyzed using traffic analysis software, Synchro 10. Traffic operations during the AM and PM peak hours were modeled for each scenario. The results of each scenario were compared in order to determine impacts from the proposed development. The intersection of NC 16 Business and Unity Church Road/Triangle Circle was analyzed with and without R-5712 STIP improvements in future scenarios. The following scenarios were modeled:

- 2019 Existing
- 2020 No-Build
- 2020 Build

Based on the analysis results, the following improvements are recommended to be constructed by the developer:

NC 16 Business and Unity Church Road/Triangle Circle

- Extend the westbound left turn lane from 250’ of storage to 300’ and the appropriate taper.

NC 16 Business and Access A

- Construct Access A as a leftover with one ingress lane and one egress lane (1 right).
- Construct a NC 16 Business northbound right turn lane with a 100’ feet of storage and the appropriate taper.
- Construct a NC 16 Business southbound left turn lane with a 100’ feet of storage and the appropriate taper.

Unity Church Road and Access B

- Construct Access B as a right-in/right-out with one ingress lane and one egress lane (1 right).

Unity Church Road and Access C

- Construct Access C as full access with one ingress lane and two egress lanes (1 left and 1 right).

2. INTRODUCTION

2.1. Purpose of Report

This report summarizes the findings of the Traffic Impact Analysis (TIA) that was performed for the proposed Circle K to be located along the east side of NC 16 Business and north of Unity Church Road in Lincoln County, North Carolina. The purpose of this study is to determine the potential impact to the surrounding transportation system caused by the traffic generated by the proposed development.

2.2. Study Objectives

The site is proposed to consist of a 5,200 square feet gas station with a super convenience market. Access to the site will be via one full access driveway on Unity Church Road, a right-in/right-out driveway on Unity Church Road, and a leftover on NC 16 Business. The site is expected to be fully built by the year 2020.

Refer to Figure 1 in Appendix A for an illustration of the site location map and to Figure 2 for the preliminary site plan. Refer to Appendix A for all figures. The objective of this report is to determine what geometric improvements are necessary to mitigate traffic conditions on the transportation network surrounding the site with the proposed development fully built out.

3. AREA CONDITIONS

3.1. Transportation Network Study Area

3.1.1. Area Roadway System

The project study area for this TIA was determined through coordination with NCDOT and Lincoln County. Table 1 summarizes the characteristics of the roadways within the study area. The NCDOT Functional Class map was used to determine the classification of each road. Traffic Volume maps from NCDOT (count station 5401622, 5403402, and 5400009) were used to find the average daily traffic (ADT) volumes in vehicles per day (vpd) for the roadways.

TABLE 1
STUDY AREA ROADS

ROADWAY	CLASSIFICATION	CROSS-SECTION	ADT (vpd)	SPEED LIMIT
NC 16 Business	Minor Arterial	Three-Lane	18,000	45
Triangle Circle	Local Road	Two-Lane	4,400	45
Unity Church Road	Local Road	Two-Lane	6,000	45

3.1.1.1. Existing Roadway Conditions

Existing lane configurations (number of traffic lanes on the intersection approach), storage capacities, and other intersection and roadway information within the study area was collected by Ramey Kemp and Associates, Inc. (RKA). Refer to Figure 3A for the existing lane configurations and traffic control at the study intersections.

3.1.1.2. Future Roadway Conditions

The NCDOT STIP project R-5712 is expected to start construction in 2020 and would have an impact on the project study area. STIP project R-5712 will consist of turn lane improvements at the intersection of NC 16 Business and Unity Church Road/Triangle Circle. Refer to Figure 3B for the 2020 No-Build lane configurations and traffic control at the study intersections. The future roadway improvements documents can be found in Appendix B. The following improvements are assumed to be in place for the future scenarios:

<u>NC 16 Business and Unity Church Road/Triangle Circle</u>

- Extension of the northbound NC 16 Business left turn lane to provide 250’ of storage and the appropriate taper.
- Construction of a northbound NC 16 Business right turn lane to provide 175’ of storage and the appropriate taper.
- Extension of the southbound NC 16 Business left turn lane to provide 200’ of storage and the appropriate taper.
- Construction of a southbound NC 16 Business right turn lane to provide 175’ of storage and the appropriate taper.
- Construction of an eastbound Triangle Circle left turn lane to provide 500’ of storage and the appropriate taper.

- Construction of a westbound NC 16 Business left turn lane to provide 250' of storage and the appropriate taper.
- Construction of a westbound NC 16 Business right turn lane to provide 225' of storage and the appropriate taper.

3.1.2. Study Area and Existing Traffic Volumes

The study area for the TIA was determined through coordination with NCDOT and Lincoln County and consists of the following intersections:

1. NC 16 Business and Triangle Circle/Unity Church Road (Signalized)
2. NC 16 Business and Triangle Circle (Unsignalized)
3. NC 16 Business and Access A (Unsignalized)
4. Unity Church Road and Access B (Unsignalized)
5. Unity Church Road and Access C (Unsignalized)

Existing traffic volumes were determined through traffic counts conducted during the AM peak period (7:00-9:00 AM) and the PM peak period (4:00-6:00 PM). Traffic counts were performed in November 2018 and then projected to 2019 using a 2% growth rate as confirmed by NCDOT. A copy of the traffic count data can be found in Appendix C of this report. Figure 4 shows the 2019 existing peak hour volumes.

3.2. Study Area – Adjacent Land Use

3.2.1. Existing Land Uses

The existing site is undeveloped. The surrounding land is primarily commercial and residential.

3.2.2. Anticipated or Approved Future Development

Based on coordination with NCDOT and Lincoln County, one offsite development was determined to have an impact on the project study area. The approved Transportation Technical Memorandum for the Rivercross Residential development was used to determine appropriate adjacent development volumes. The Rivercross Residential development is expected to be built out for the future scenarios. Rivercross Residential consists of 135 single family homes and 133 townhomes

to be located west of the intersection of NC 16 Business and Cherry Point Drive. Table 2 shows the Rivercross Residential trip generation.

TABLE 2
RIVERCROSS RESIDENTIAL TRIP GENERATION

LAND USE	SIZE	DAILY TRIPS (VPD)	PEAK HOUR TRIPS (VPH)			
			AM		PM	
			ENTER	EXIT	ENTER	EXIT
Single Family Homes (210)	135 DU	1,384	26	78	87	51
Townhomes (230)	133 DU	824	11	54	51	25
Total New External Trips		2,208	37	132	138	76

Appendix D contains excerpts from a previous traffic study regarding the trip generation and trip assignments for this development. Refer to Figures 5-6 for the trip distribution and trip assignments for the Rivercross Residential site.

4. PROJECTED TRAFFIC

4.1. Site Traffic

In order to determine the future traffic conditions after the proposed development is completed, an estimate of traffic projected to travel to/from the proposed development is required. The average weekday daily, AM peak hour, and PM peak hour site trips for this study were calculated based on the ITE *Trip Generation Manual, 10th Edition*.

4.1.1. Trip Generation

The site is proposed to consist of a 5,200 square feet gas station with a super convenience market. Table 3 presents a summary of the trip generation calculations for the proposed development.

TABLE 3
PROPOSED SITE TRIP GENERATION

LAND USE	SIZE	DAILY TRIPS (VPD)	PEAK HOUR TRIPS (VPH)			
			AM		PM	
			ENTER	EXIT	ENTER	EXIT
Super Convenience Market/Gas Station (960)	5.2 KSF	4,356	216	216	180	180
Pass-By Trips (Limited to 10% of Adjacent Street Traffic)			-104	-104	-101	-101
Total External Trips		4,356	112	112	79	79

(1) Based on *ITE Trip Generation – 10th Edition*

4.1.2. Trip Distribution and Assignment

Trip distribution percentages were developed based on existing traffic patterns, nearby land uses, location of population/employment centers, and engineering judgment. Figure 7 illustrates the site trip distribution percentages. These trip distribution percentages were applied to the trip generation data in Table 3 to determine the site trip assignments shown in Figure 8.

The pass-by assignment for the proposed site was based on existing traffic volumes along the roadways adjacent to the site and was limited to 10% of the volumes on the adjacent streets. Figures 9 and 10 illustrate the pass-by trip distribution and assignments, respectively.

The summation of the primary and pass-by trip assignment equals the total site trips generated by the proposed site. Refer to Figure 11 for an illustration of the total trip assignment for the proposed site.

5. TRAFFIC ANALYSIS

5.1. Traffic Analysis Scenarios

Several scenarios were analyzed using traffic analysis software, Synchro 10. Traffic operations during the AM and PM peak hours were modeled for each scenario. The results of each scenario were compared in order to determine impacts from background traffic growth and the proposed development. The intersection of NC 16 Business and Unity Church Road/Triangle Circle was analyzed with and without R-5712 STIP improvements in future scenarios. The following scenarios were modeled:

- 2019 Existing
- 2020 No-Build
- 2020 Build

The following Congestion Management guidelines were followed in the capacity analysis:

- PHF of 0.90 was used in the analysis.
- Right-turn on red (RTOR) was not allowed in the analysis.
- Protected-Only left turn treatment was used for left turn movements in future scenarios.

- Total lost time adjustment was kept to 5 seconds for each movement.
- Volume movements less than 4 per hour were rounded up to 4 per hour in the analysis.

The 2019 Existing scenario included the traffic characteristics that currently exist in the study area. Existing peak hour traffic volumes were used from the intersection counts (Figure 4). The signal phasing and timing data can be found in Appendix E. No changes to the existing lane configurations were made.

The 2020 No-Build scenario was analyzed to determine the expected future traffic operations. Existing peak hour traffic counts were projected to the year 2020 using a compounded growth rate of 2% per year. Refer to Figure 12 for the 2020 projected peak hour traffic volumes. The 2020 projected volumes were added to the traffic from the offsite development (Figure 6) to determine the 2020 No-Build peak hour traffic volumes. The 2020 No-Build peak hour traffic volumes are illustrated in Figure 13. The splits at the signalized intersection were optimized. Congestion Management minimum cycle lengths were met. Improvements to the intersection of NC 16 Business and Unity Church Road/Triangle Circle were included as they are expected to undergo construction in 2020.

The 2020 Build scenario was compared to the 2020 No-Build scenario to determine expected impacts caused by the proposed site. This scenario included the same assumptions as the 2020 No-Build scenario. The trips expected to be generated by the proposed site (Figure 11) were added to the 2020 No-Build peak hour volumes (Figure 13) to determine the 2020 Build peak hour traffic volumes. Refer to Figure 14 for the 2020 Build peak hour traffic volumes. The splits at the signalized intersection were optimized. Congestion Management minimum cycle lengths were met. Site Access A, B, and C were added to the existing lane configurations.

5.2. Traffic Analysis Procedure

All study intersections (both unsignalized and roundabouts) were analyzed using the methodology outlined in the Highway Capacity Manual (HCM) published by the Transportation Research Board. The computer software packages, Synchro 10 and SimTraffic 10, were used to complete the analyses for all the study area intersections. Synchro 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 HCM. SimTraffic creates a traffic simulation model from the Synchro inputs. SimTraffic was used in this study to determine expected queue lengths.

Analysis results for signalized intersections provide delay and level of service (LOS) for all movements and approaches. The overall intersection delay and LOS is also provided. The capacity analysis for an unsignalized intersection does not provide an overall LOS for the intersection, rather a LOS for movements and/or approaches that have 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". 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". LOS varies from Level "A" representing free flow, to Level "F" where greater vehicle delays are evident.

Refer to Table 4 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". As shown in Table 4, an average control delay of 40 seconds at a signalized intersection results in a LOS D.

TABLE 4
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

5.3. Mitigation Requirements

NCDOT has guidelines for determining when improvements are needed by the developer. The District Engineer is responsible for the final determination of the improvements. NCDOT typically requires mitigation to be identified when developments are expected to impact the traffic operations as described below:

- Overall intersection or intersection approach delay increases by 25% or more.
- LOS degrades by at least one level
- LOS is F
- Synchro 95th or SimTraffic maximum queue results are greater than the existing turn lane storage length

5.4. Capacity and Level of Service at Study Intersections

5.4.1. NC 16 Business and Unity Church Road/Triangle Circle

The intersection of NC 16 Business and Unity Church Road/Triangle Circle was analyzed as a four-leg signalized intersection with existing lane configurations. Future scenarios were analyzed with and without STIP project R-5712 improvements. Table 5 summarizes the capacity analysis results. Impacts requiring mitigation are highlighted in yellow. Refer to Appendix F for the Synchro reports for this intersection. All SimTraffic reports can be found in Appendix K.

Analysis indicates that the intersection is expected to operate at LOS D during the AM peak hour and LOS E during the PM peak hour of the 2019 Existing scenario. Without R-5712 improvements, the intersection is expected to operate at LOS D in the AM peak hour and LOS E during the PM peak hour of the 2020 No-Build scenario. Adding in the site traffic, the intersection is expected to degrade to LOS E in AM peak hour and LOS F in the PM peak hour of the 2020 Build scenario. Without R-5712 improvements, delay is expected to increase more than 25% during both peak hours. Although there are technical impacts at the intersection without the R-5712 improvements between the 2020 No-Build and 2020 Build, R-5712 is a funded project that is expected to start construction in 2020 to fix many of the poor conditions.

With R-5712 improvements, the intersection is expected to operate at LOS C in the AM and PM peak hours of the 2020 No-Build scenario. Adding in the site traffic, the intersection is expected to degrade to LOS C in the AM peak hour and LOS D in the PM peak hour of the 2020 Build scenario. The northbound approach delay increases by 25% or more in the AM peak hour of the 2020 Build scenario. No queue issues were identified on the northbound approach. The westbound left 95th queue goes from 197’ in the AM peak hour of 2020 No-Build scenario to 288’ in the AM peak hour of the 2020 Build scenario. A 2020 Build with Improvements and R-5712 scenario was analyzed.

The 2020 Build with Improvements and R-5712 scenario provided the same delay and LOS results as the 2020 Build with R-5712. Additional lanes were considered but are not recommended. Construction of an eastbound right turn lane would not decrease intersection delays due to the low volume of traffic making this right turn movement. Construction of any other turn lanes would require the construction of an additional departure lane. The extent of this type of improvement should be considered beyond the scope of this development. The 2020 Build with Improvements analysis included extension of the westbound left turn lane. This improvement addresses all queue issues at the intersection. Based on the results, it is recommended that the developer provide the following improvements:

- Extend the westbound left turn lane from 250' of storage to 300' and the appropriate taper.

TABLE 5
ANALYSIS SUMMARY OF
NC 16 BUSINESS AND UNITY CHURCH ROAD/TRIANGLE CIRCLE

ANALYSIS SCENARIO	APPROACH	LANE CONFIGURATIONS	AM PEAK HOUR		PM PEAK HOUR	
			Approach LOS (Delay)	Overall LOS (Delay)	Approach LOS (Delay)	Overall LOS (Delay)
2019 Existing	EB WB NB SB	1 LT-TH-RT 1 LT-TH-RT 1 LT, 1 TH-RT 1 LT, 1 TH-RT	E (68.0) E (73.3) D (45.8) D (36.1)	D (49.6)	F (105.6) F (114.7) E (67.2) D (36.6)	E (67.8)
2020 No-Build without R-5712	EB WB NB SB	1 LT-TH-RT 1 LT-TH-RT 1 LT, 1 TH-RT 1 LT, 1 TH-RT	E (68.3) E (69.5) D (48.3) D (44.2)	D (53.0)	F (114.8) F (123.0) F (81.4) D (36.4)	E (75.1)
2020 Build without R-5712	EB WB NB SB	1 LT-TH-RT 1 LT-TH-RT 1 LT, 1 TH-RT 1 LT, 1 TH-RT	F (95.9) F (82.8) E (67.4) D (44.2)	E (66.4)	F (157.2) F (161.5) F (107.1) D (35.7)	F (99.2)
2020 No-Build with R-5712	EB WB NB SB	**1 LT**, 1 TH-RT **1 LT**, 1 TH, **1 RT** **1 LT**, 1 TH, **1 RT** **1 LT**, 1 TH, **1 RT**	D (45.0) D (43.4) C (23.9) C (22.0)	C (29.5)	D (45.4) D (48.1) C (28.9) C (25.7)	C (32.7)
2020 Build with R-5712	EB WB NB SB	1 LT, 1 TH-RT 1 LT, 1 TH, 1 RT 1 LT, 1 TH, 1 RT 1 LT, 1 TH, 1 RT	D (47.7) D (46.9) C (30.8) C (24.5)	C (34.3)	D (48.9) D (54.9) C (34.2) C (25.4)	D (36.7)
2020 Build with R-5712 and Improvements	EB WB NB SB	1 LT, 1 TH-RT **1 LT**, 1 TH, 1 RT 1 LT, 1 TH, 1 RT 1 LT, 1 TH, 1 RT	D (47.7) D (46.9) C (30.8) C (24.5)	C (34.3)	D (48.9) D (54.9) C (34.2) C (25.4)	D (36.7)

Bold denotes improvement on approach.

5.4.2. NC 16 Business and Triangle Circle

The intersection of NC 16 Business and Triangle Circle was analyzed as a three-leg unsignalized intersection with existing lane configurations. Table 6 summarizes the capacity analysis results. Impacts requiring mitigation are highlighted in yellow. Refer to Appendix G for the Synchro reports for this intersection. All SimTraffic reports can be found in Appendix K.

Analysis indicates that the eastbound approach is expected to operate at LOS D or better during the peak hours of the 2019 Existing scenario. The eastbound approach of the intersection degrades to LOS E in the AM peak hour of the 2020 No-Build and 2020 Build scenarios. The increase in delay for the eastbound approach is a result of the increased through traffic on NC 16 Business. The site does not add traffic to the eastbound approach. No improvements by the developer are recommended.

TABLE 6
ANALYSIS SUMMARY OF
NC 16 BUSINESS AND TRIANGLE CIRCLE

ANALYSIS SCENARIO	APPROACH	LANE CONFIGURATIONS	AM PEAK HOUR		PM PEAK HOUR	
			Approach LOS (Delay)	Overall LOS (Delay)	Approach LOS (Delay)	Overall LOS (Delay)
2019 Existing	EB[2] NB[1] SB	1 LT-RT 1 LT, 1 TH 1 TH-RT	D (29.6) B (10.3) -	NA[3]	C (19.7) B (10.7) -	NA[3]
2020 No-Build	EB[2] NB[1] SB	1 LT-RT 1 LT, 1 TH 1 TH-RT	E (35.1) B (10.9) -	NA[3]	D (25.7) B (11.3) -	NA[3]
2020 Build	EB[2] NB[1] SB[1]	1 LT-RT 1 LT, 1 TH 1 TH-RT	E (41.4) B (11.2) -	NA[3]	D (28.0) B (11.6) -	NA[3]

1. Major street left-turn movement for unsignalized intersection.
2. Stop controlled approach for unsignalized intersection.
3. Overall intersection LOS is not provided for unsignalized intersections

5.4.3. NC 16 Business and Access A

The intersection of NC 16 Business and Access A was analyzed as a three-leg unsignalized intersection where Access A is a leftover. Table 7 summarizes the capacity analysis results. Impacts requiring mitigation are highlighted in yellow. Refer to Appendix H for the Synchro reports and turn lane warrants for this intersection. All SimTraffic reports can be found in Appendix K.

Analysis indicates that the westbound approach is expected to operate at LOS C during both the AM and PM peak hours of the 2020 Build scenario. There is a 116' queue in the AM peak hour and 173' queue in the PM peak hour on the northbound approach. NCDOT turn lane warrants were checked for the southbound left and northbound right movements. A NC 16 Business northbound right and southbound left turn lane are warranted. No queue was observed on the northbound approach with a northbound right turn lane included. The following improvements are recommended by the developer:

- Construct Access A as a leftover with one ingress lane and one egress lane (1 right).
- Construct a NC 16 Business northbound right turn lane with a 100' feet of storage and the appropriate taper.
- Construct a NC 16 Business southbound left turn lane with a 100' feet of storage and the appropriate taper.

TABLE 7
ANALYSIS SUMMARY OF
NC 16 BUSINESS AND ACCESS A

ANALYSIS SCENARIO	APPROACH	LANE CONFIGURATIONS	AM PEAK HOUR		PM PEAK HOUR	
			Approach LOS (Delay)	Overall LOS (Delay)	Approach LOS (Delay)	Overall LOS (Delay)
2020 Build	WB[2] NB SB[1]	1 RT 1 TH-RT 1 LT, 1 TH	C (16.0) - A (9.7)	NA[3]	C (20.0) - B (10.5)	NA[3]
2020 Build with Improvements	WB[2] NB SB[1]	1 RT 1 TH, **1 RT** 1 LT, 1 TH	C (16.0) - A (9.7)	NA[3]	C (20.0) - B (10.5)	NA[3]

1. Major street left-turn movement for unsignalized intersection.
2. Stop controlled approach for unsignalized intersection.
3. Overall intersection LOS is not provided for unsignalized intersections

Bold denotes improvement on approach.

5.4.4. Unity Church Road and Access B

The intersection of Unity Church Road and Access B will form a three-leg intersection where Access B is right-in/right-out (RIRO). Table 8 summarizes the capacity analysis results. Refer to Appendix I for the Synchro reports and turn lane warrants for this section. All SimTraffic reports can be found in Appendix K.

Analysis indicates that the southbound approach is expected to operate at LOS B during both the AM and PM peak hours of the 2020 Build scenario. NCDOT turn lane warrants were checked for the westbound right movement. A westbound right turn lane was not warranted. The following improvements are recommended by the developer:

- Construct Access B as a right-in/right-out with one ingress lane and one egress lane (1 right).

TABLE 8
ANALYSIS SUMMARY OF
UNITY CHURCH ROAD AND ACCESS B

ANALYSIS SCENARIO	APPROACH	LANE CONFIGURATIONS	AM PEAK HOUR		PM PEAK HOUR	
			Approach LOS (Delay)	Overall LOS (Delay)	Approach LOS (Delay)	Overall LOS (Delay)
2020 Build	EB WB SB[2]	1 TH 1 TH-RT 1 RT	- - B (10.7)	NA[3]	- - B (10.2)	NA[3]

1. Major street left-turn movement for unsignalized intersection.
2. Stop controlled approach for unsignalized intersection.
3. Overall intersection LOS is not provided for unsignalized intersections

5.4.5. Unity Church Road and Access C

The intersection of Unity Church Road and Access C will form a three-leg intersection where Access C is full access. Table 9 summarizes the capacity analysis results. Refer to Appendix J for the Synchro reports and turn lane warrants for this section. All SimTraffic reports can be found in Appendix K.

Analysis indicates that the southbound approach is expected to operate at LOS B during both the AM and PM peak hours of the 2020 Build scenario. NCDOT turn lane warrants were checked for the eastbound left and westbound right movements. A NC 16 Business eastbound left and westbound right turn lane are not warranted. The following improvements are recommended by the developer:

- Construct Access C as full access with one ingress lane and two egress lanes (1 left and 1 right).

TABLE 9
ANALYSIS SUMMARY OF
UNITY CHURCH ROAD AND ACCESS C

ANALYSIS SCENARIO	APPROACH	LANE CONFIGURATIONS	AM PEAK HOUR		PM PEAK HOUR	
			Approach LOS (Delay)	Overall LOS (Delay)	Approach LOS (Delay)	Overall LOS (Delay)
2020 Build	EB[1] WB SB[2]	1 LT-TH 1 TH-RT 1 LT, 1 RT	A (8.0) - B (11.3)	NA[3]	A (7.8) - B (10.8)	NA[3]

1. Major street left-turn movement for unsignalized intersection.
2. Stop controlled approach for unsignalized intersection.
3. Overall intersection LOS is not provided for unsignalized intersections

6. CONCLUSIONS

This report summarizes the findings of the Traffic Impact Analysis (TIA) that was performed for the proposed Circle K to be located along the east side of NC 16 Business and north of Unity Church Road in Lincoln County, North Carolina. The purpose of this study is to determine the potential impact to the surrounding transportation system caused by the traffic generated by the proposed development.

The site is proposed to consist of a 5,200 square feet gas station with a super convenience market. Access to the site will be via one full access driveway on Unity Church Road, a right-in/right-out driveway on Unity Church Road, and a leftover on NC 16 Business. The site is expected to be fully built by the year 2020.

6.1 Summary of Recommended Improvements

Based on the analysis results, minimal impacts are expected by the proposed development. Figure 15 illustrates the improvements recommended to be completed by the developer. Based on the analysis results, the following improvements are recommended to be constructed by the developer:

<u>NC 16 Business and Unity Church Road/Triangle Circle</u>

- Extend the westbound left turn lane from 250’ of storage to 300’ and the appropriate taper.

<u>NC 16 Business and Access A</u>

- Construct Access A as a leftover with one ingress lane and one egress lane (1 right).
- Construct a NC 16 Business northbound right turn lane with a 100’ feet of storage and the appropriate taper.
- Construct a NC 16 Business southbound left turn lane with a 100’ feet of storage and the appropriate taper.

<u>Unity Church Road and Access B</u>

- Construct Access B as a right-in/right-out with one ingress lane and one egress lane (1 right).

Unity Church Road and Access C

- Construct Access C as full access with one ingress lane and two egress lanes (1 left and 1 right).

TECHNICAL APPENDIX

APPENDIX A

FIGURES

LEGEND

Proposed Site Location

Study Intersection

N

RAMEY KEMP & ASSOCIATES
TRANSPORTATION ENGINEERS

NC 16 Business Circle K
Lincoln County, NC

Site Location Map

Scale: Not to Scale

Figure 1

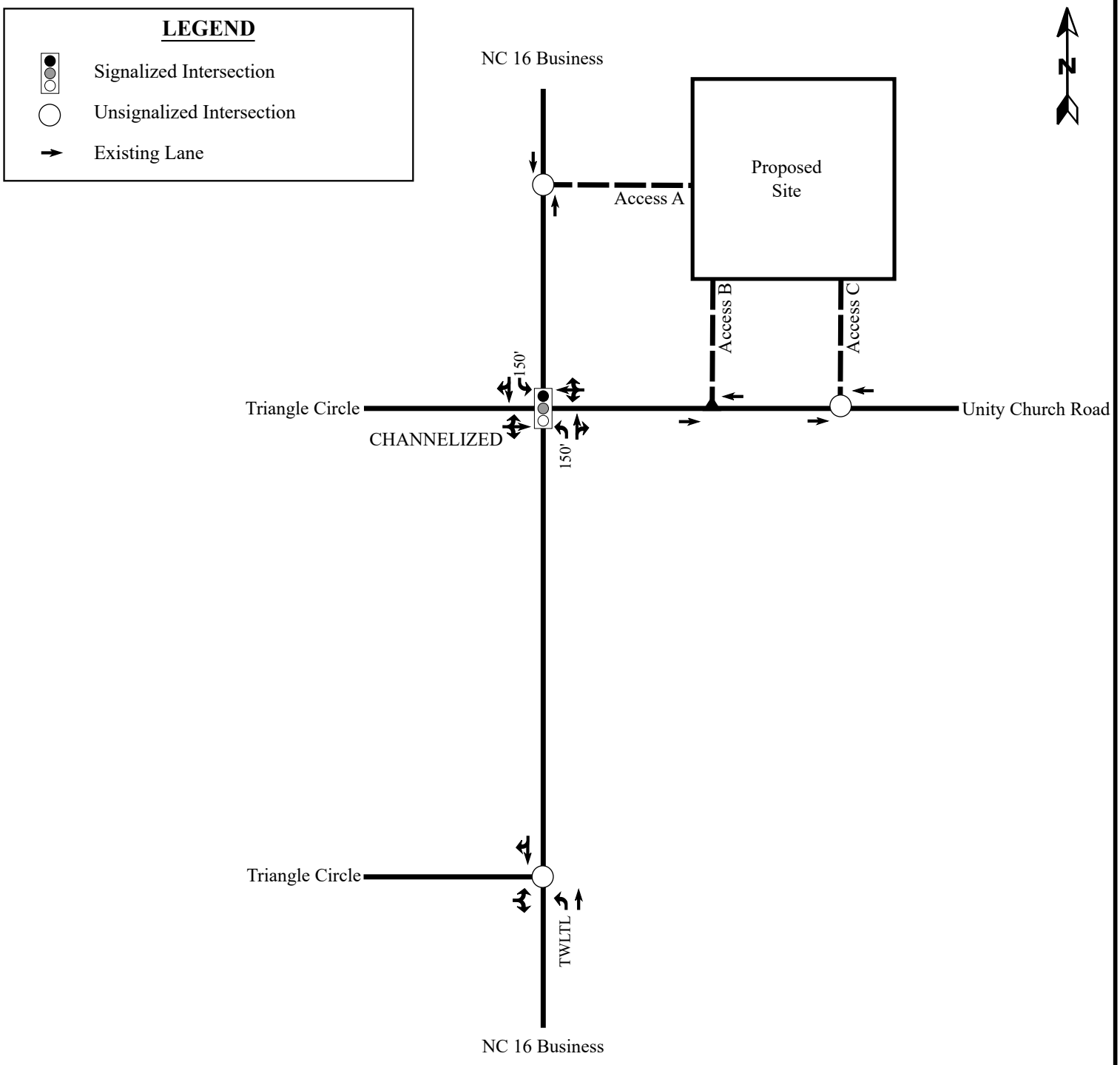
RAMEY KEMP & ASSOCIATES
TRANSPORTATION ENGINEERS

NC 16 Business Circle K
Lincoln County, NC

Preliminary Site Plan

Scale: Not to Scale

Figure 2



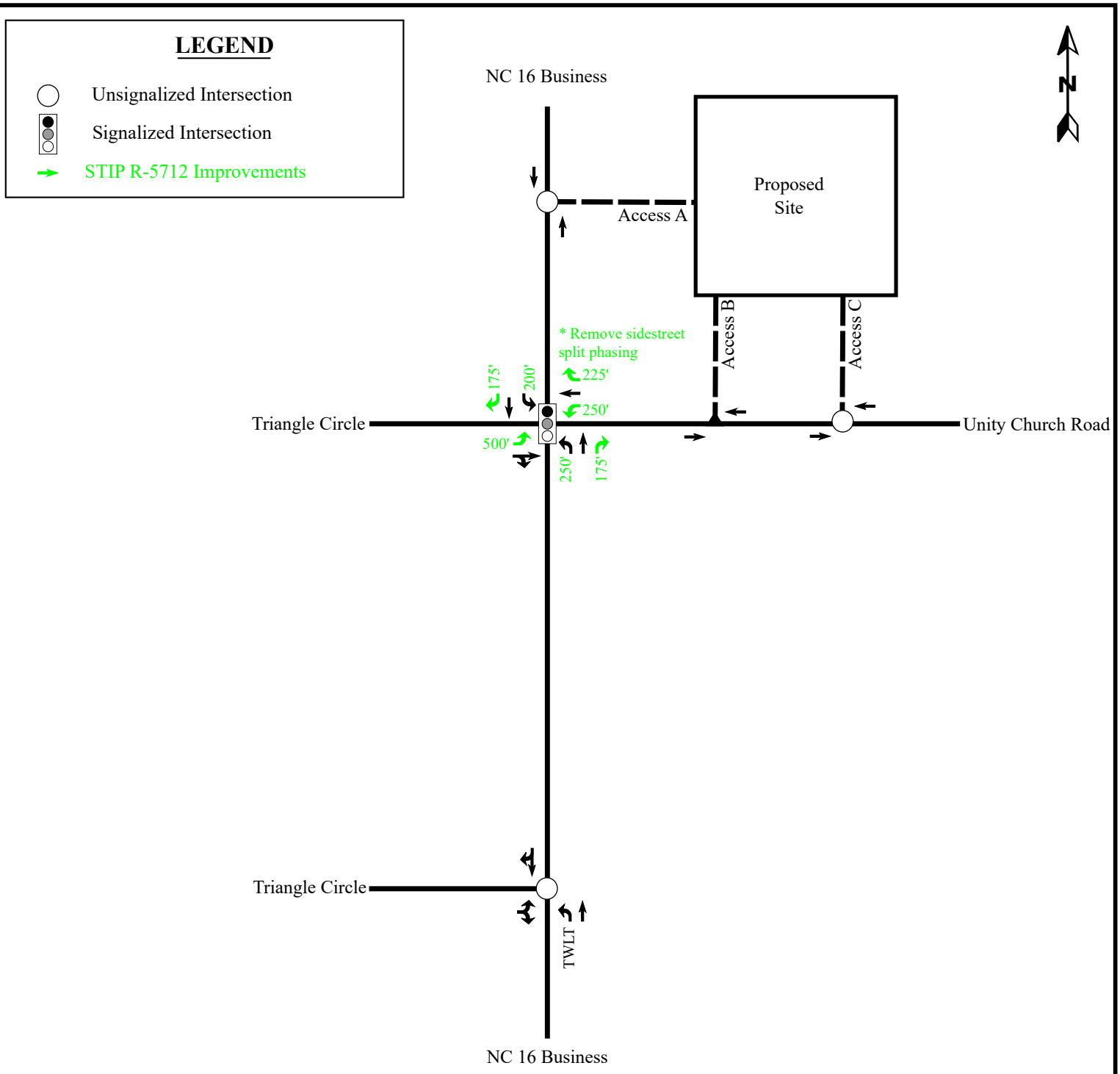
RAMEY KEMP & ASSOCIATES
TRANSPORTATION ENGINEERS

NC 16 Business Circle K
Lincoln County, NC

2019 Existing Lane Configurations

Scale: Not to Scale

Figure 3A



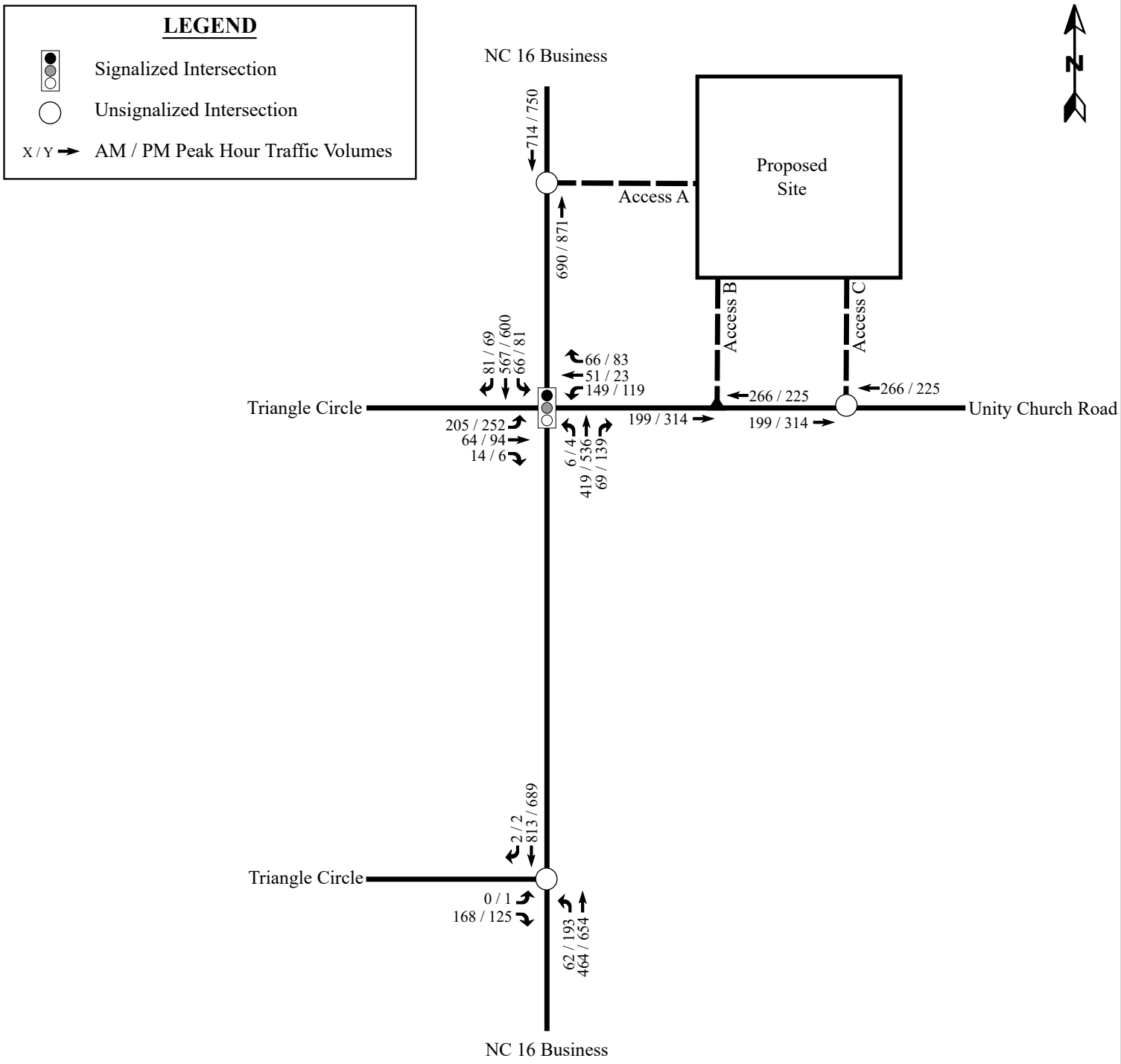
RAMEY KEMP & ASSOCIATES
TRANSPORTATION ENGINEERS

NC 16 Business Circle K
Lincoln County, NC

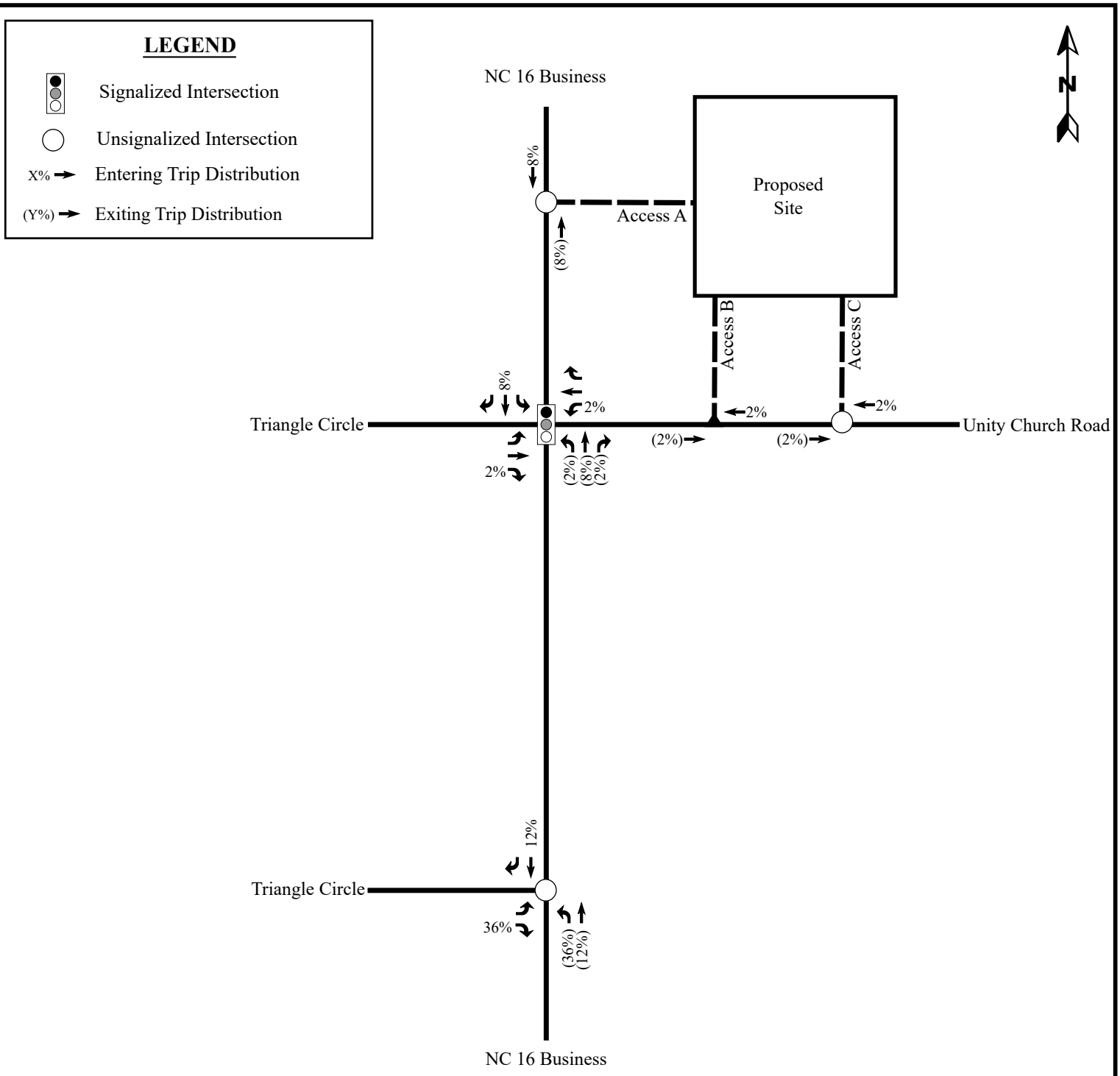
2020 No-Build Lane Configurations

Scale: Not to Scale

Figure 3B



RAMEY KEMP & ASSOCIATES TRANSPORTATION ENGINEERS	NC 16 Business Circle K Lincoln County, NC	2019 Existing Peak Hour Traffic Volumes
		Scale: Not to Scale / Figure 4



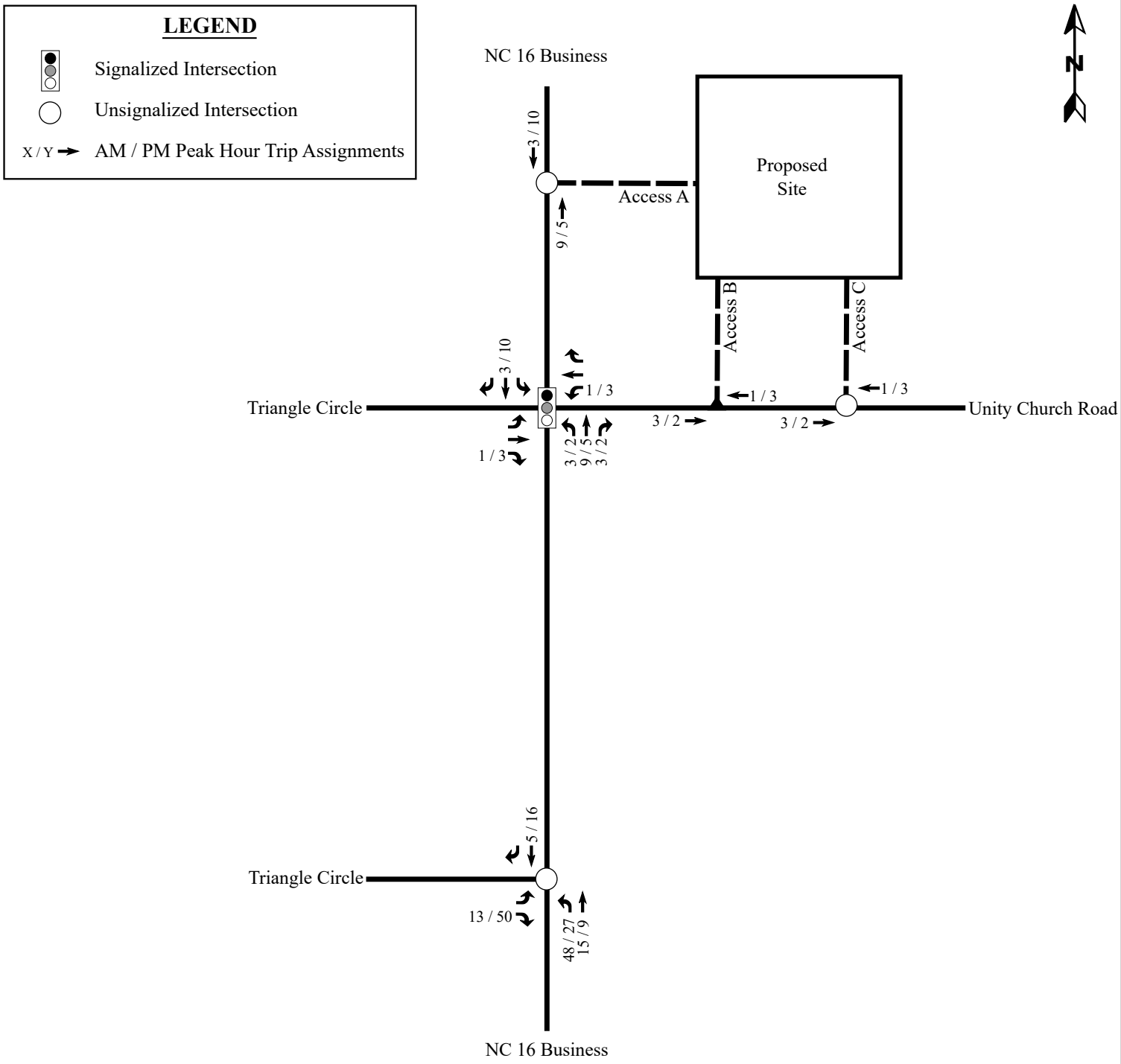
RAMEY KEMP & ASSOCIATES
TRANSPORTATION ENGINEERS

NC 16 Business Circle K
Lincoln County, NC

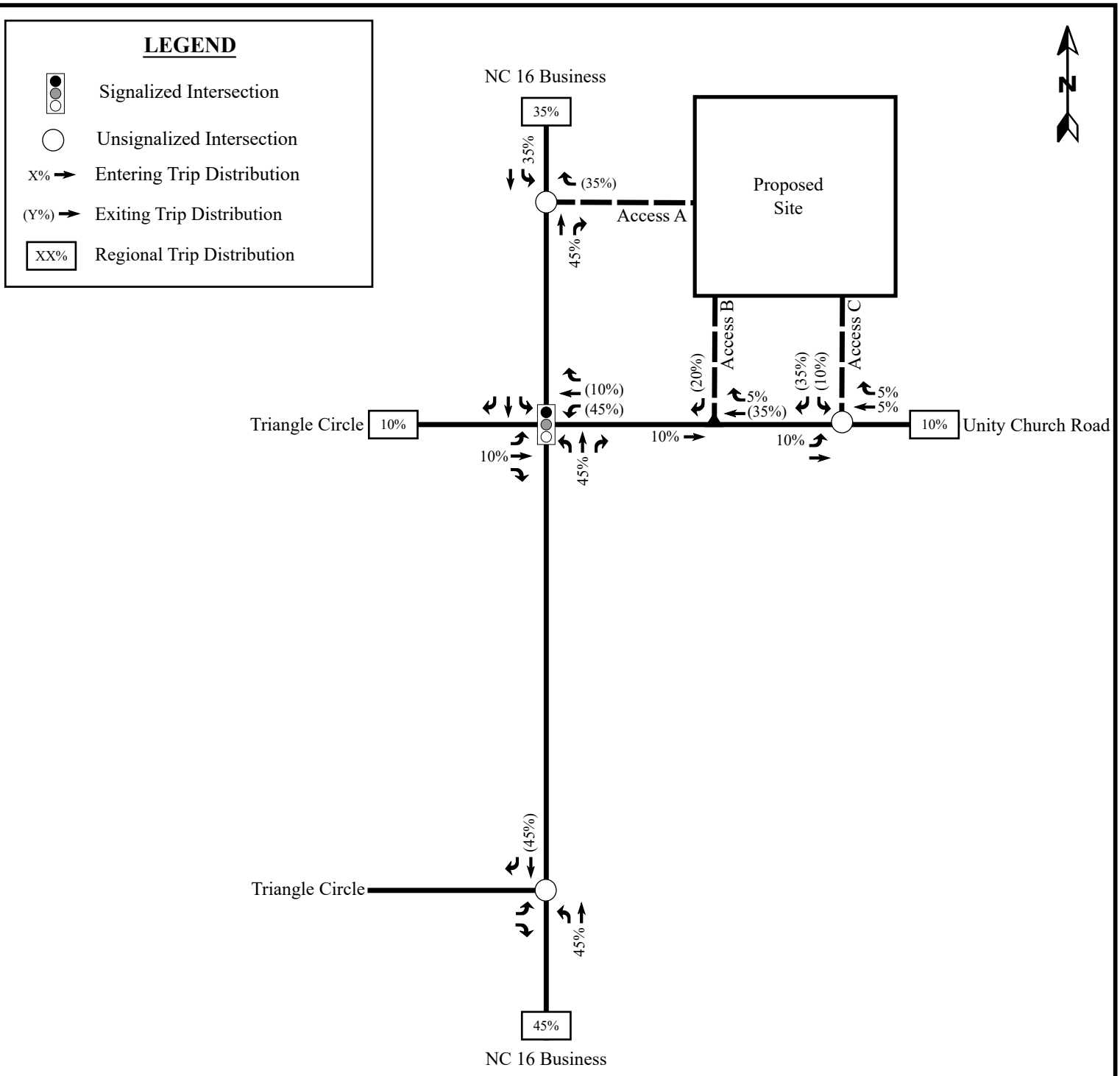
Rivercross Residential
Trip Distribution Percentages

Scale: Not to Scale

Figure 5



RAMEY KEMP & ASSOCIATES TRANSPORTATION ENGINEERS	NC 16 Business Circle K Lincoln County, NC	Rivercross Residential Trip Assignments
		Scale: Not to Scale / Figure 6



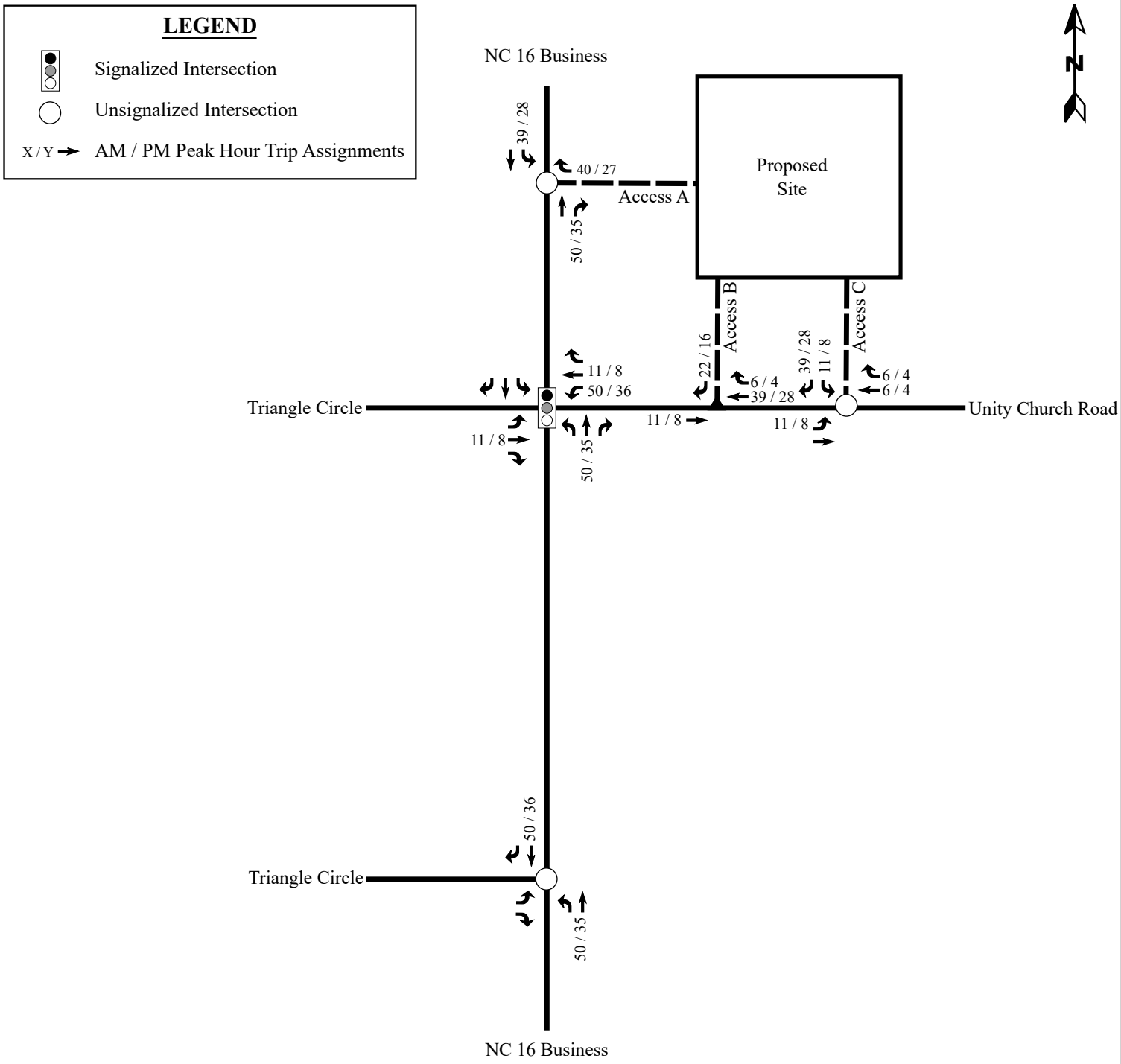
RAMEY KEMP & ASSOCIATES
TRANSPORTATION ENGINEERS

NC 16 Business Circle K
Lincoln County, NC

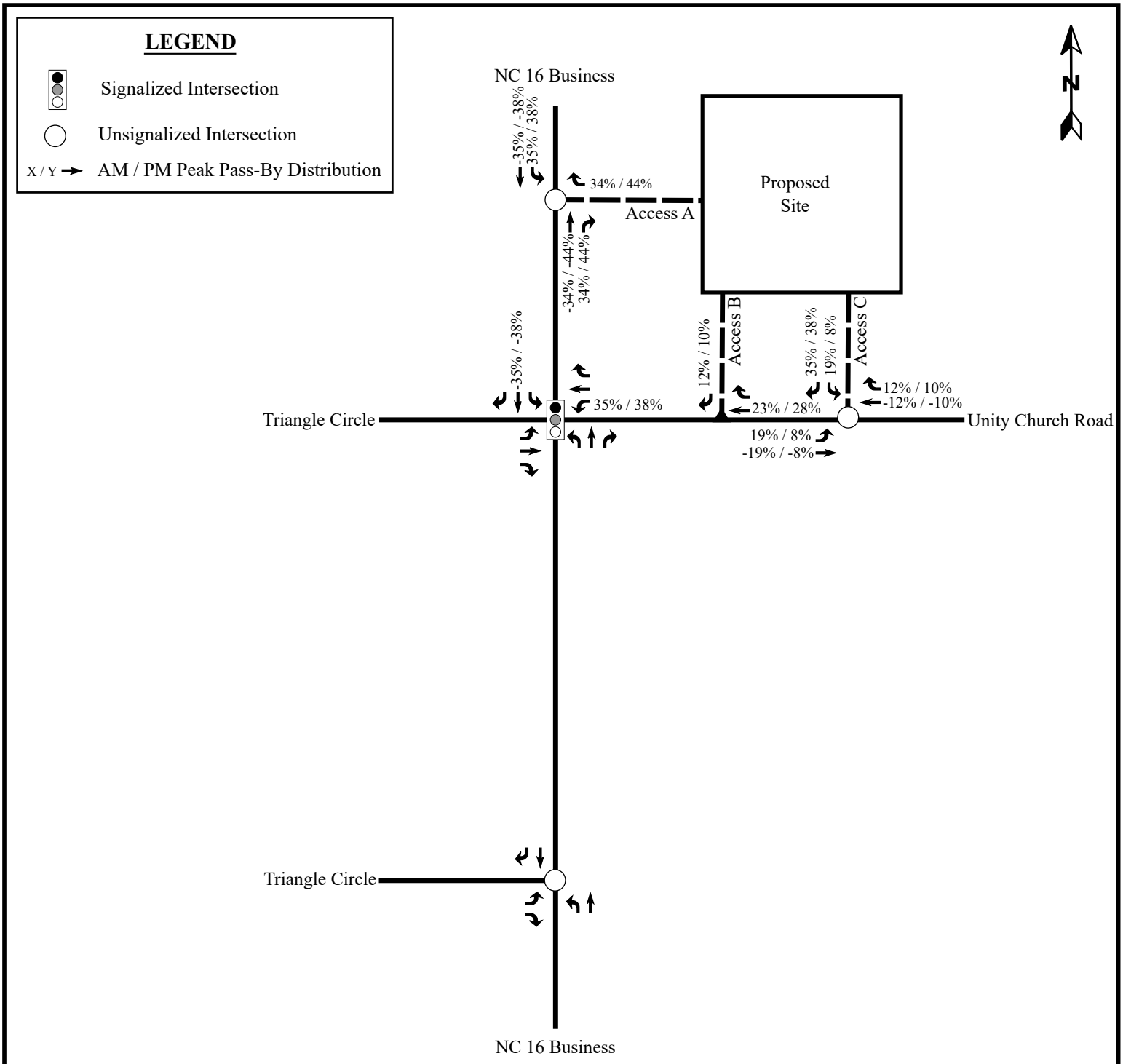
Proposed Site
Trip Distribution Percentages

Scale: Not to Scale

Figure 7



RAMEY KEMP & ASSOCIATES TRANSPORTATION ENGINEERS	NC 16 Business Circle K Lincoln County, NC	Proposed Site Trip Assignments
		Scale: Not to Scale / Figure 8



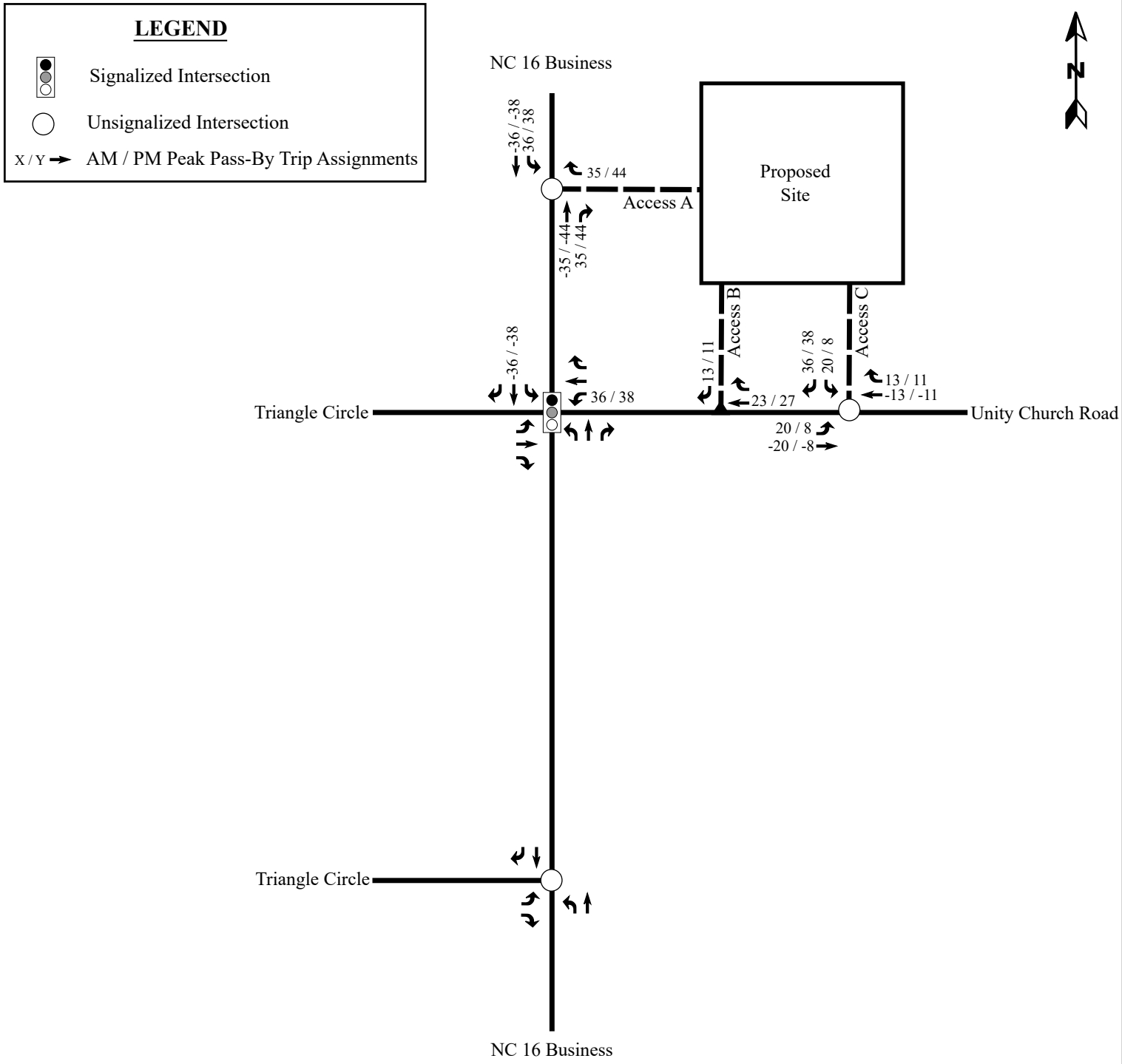
RAMEY KEMP & ASSOCIATES
TRANSPORTATION ENGINEERS

NC 16 Business Circle K
Lincoln County, NC

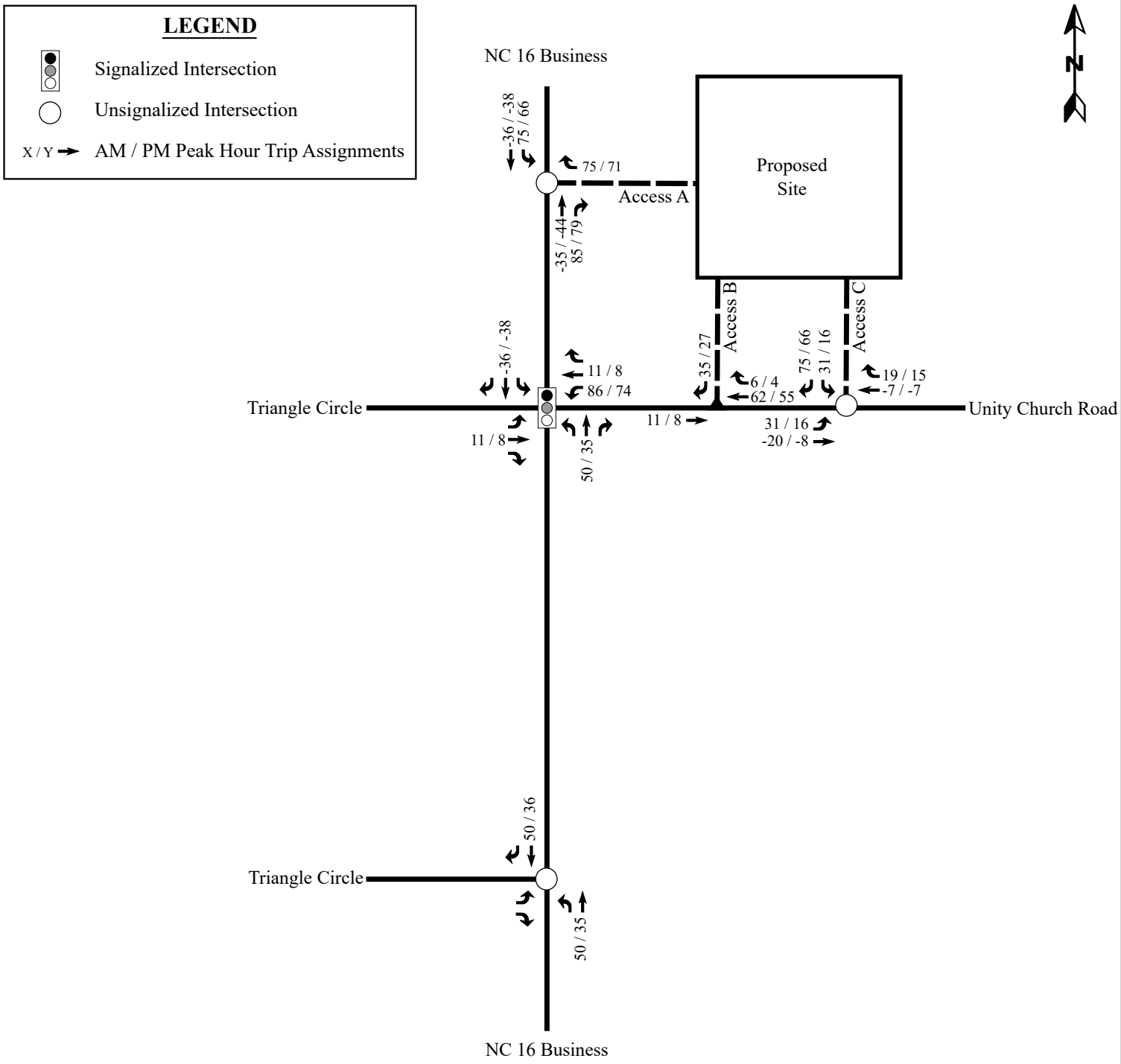
Proposed Site
Pass-By
Trip Distribution Percentages

Scale: Not to Scale

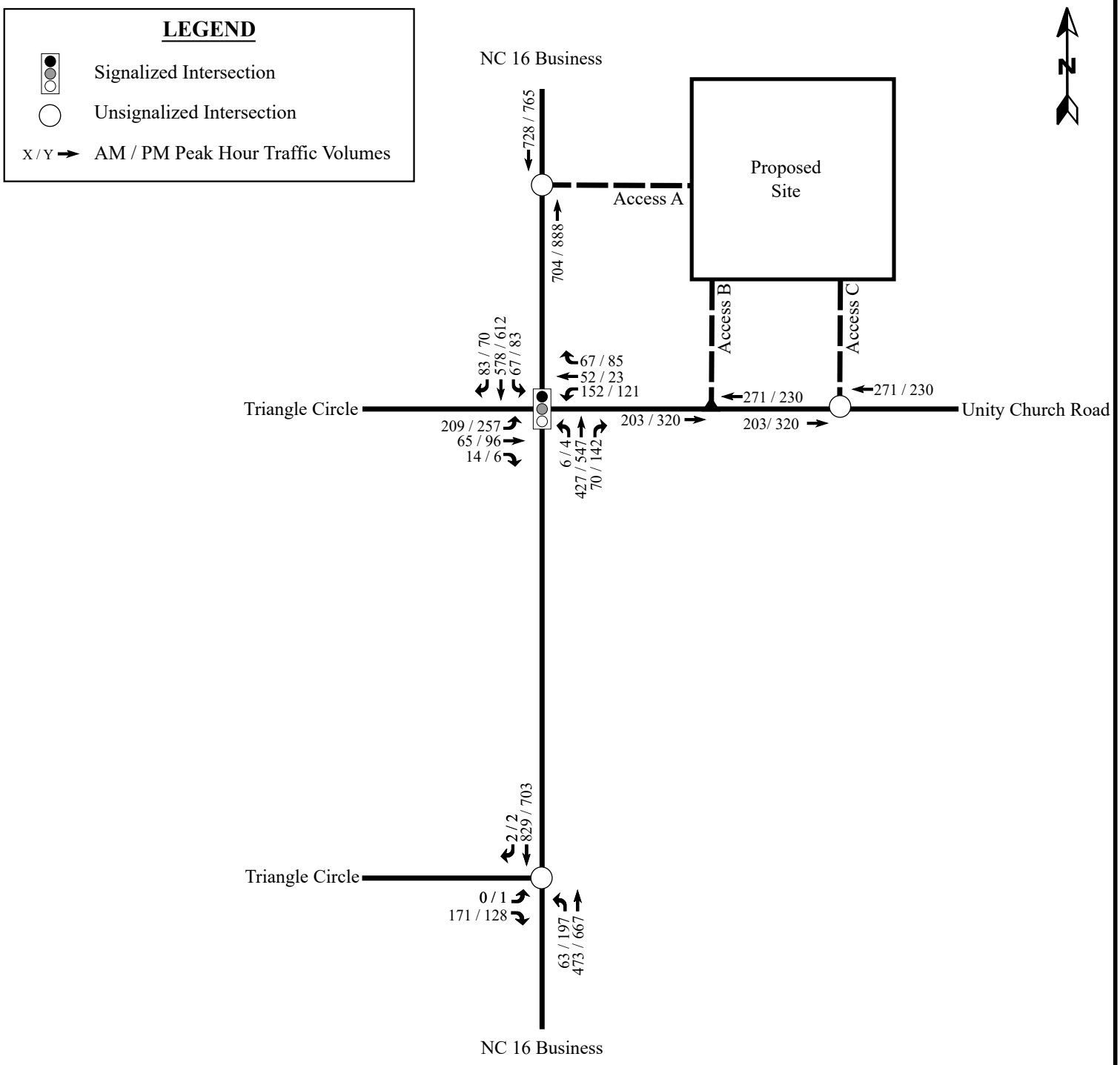
Figure 9



RAMEY KEMP & ASSOCIATES TRANSPORTATION ENGINEERS	NC 16 Business Circle K Lincoln County, NC	Proposed Site Pass-By Trip Assignments
		Scale: Not to Scale / Figure 10



RAMEY KEMP & ASSOCIATES TRANSPORTATION ENGINEERS	NC 16 Business Circle K Lincoln County, NC	Proposed Site Total Trip Assignments
		Scale: Not to Scale / Figure 11



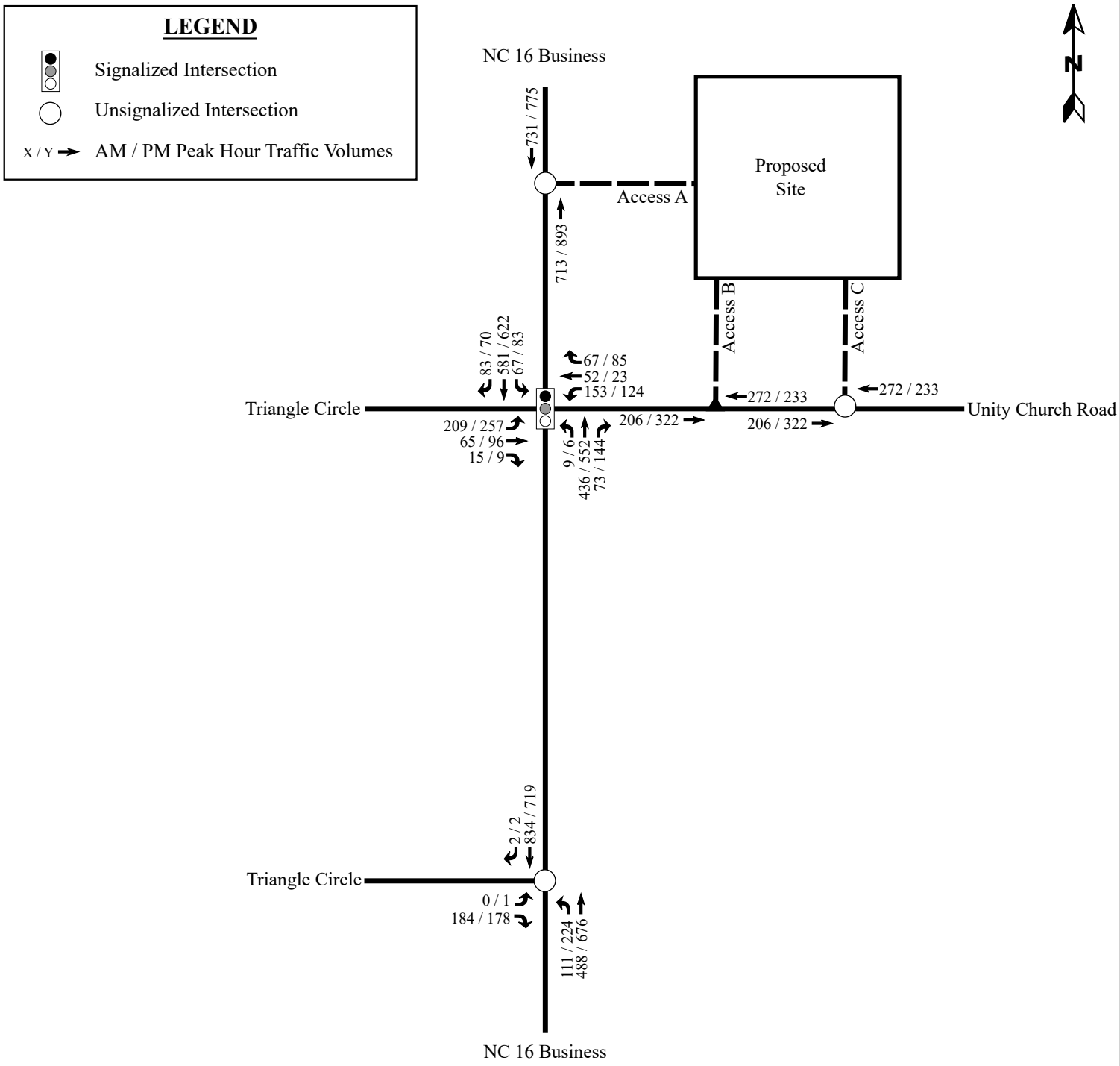
RAMEY KEMP & ASSOCIATES
TRANSPORTATION ENGINEERS

NC 16 Business Circle K
Lincoln County, NC

2020 Projected
Peak Hour Traffic Volumes

Scale: Not to Scale

Figure 12

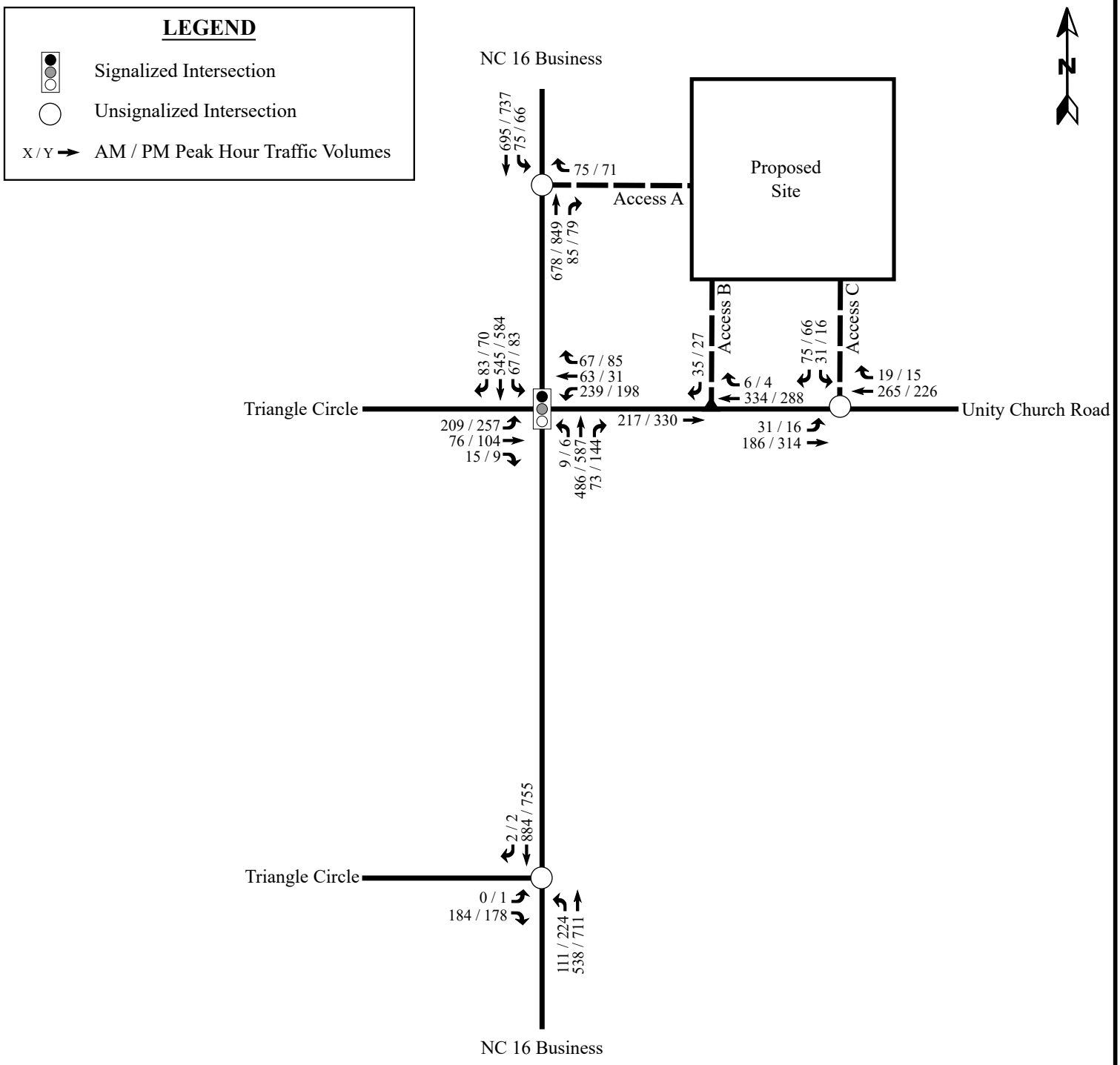


RAMEY KEMP & ASSOCIATES
TRANSPORTATION ENGINEERS

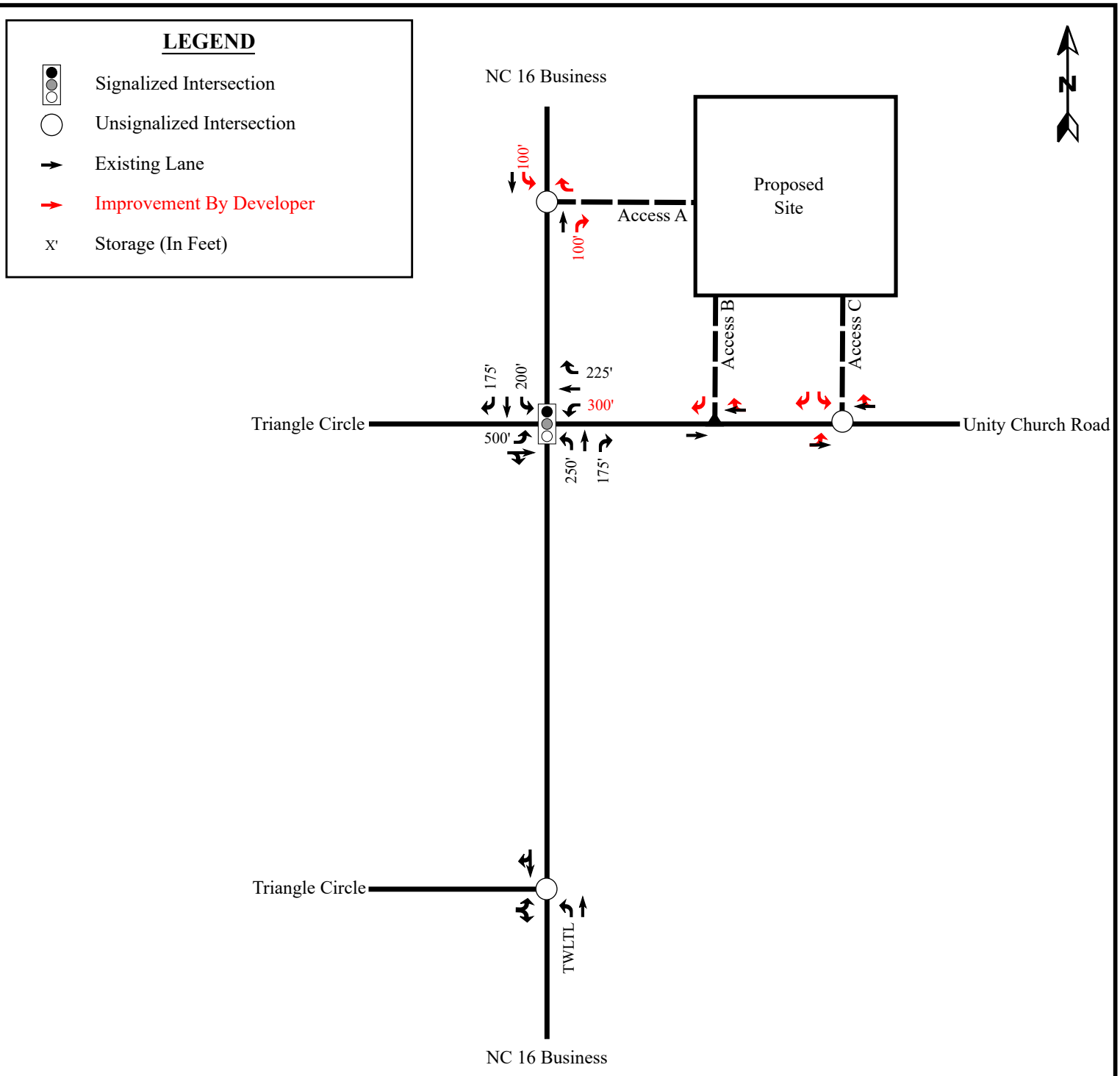
NC 16 Business Circle K
Lincoln County, NC

2020 No-Build
Peak Hour Traffic Volumes

Scale: Not to Scale | Figure 13



RAMEY KEMP & ASSOCIATES TRANSPORTATION ENGINEERS	NC 16 Business Circle K Lincoln County, NC	2020 Build Peak Hour Traffic Volumes
		Scale: Not to Scale / Figure 14



RAMEY KEMP & ASSOCIATES
TRANSPORTATION ENGINEERS

NC 16 Business Circle K
Lincoln County, NC

Recommended
Lane Configurations

Scale: Not to Scale | Figure 15

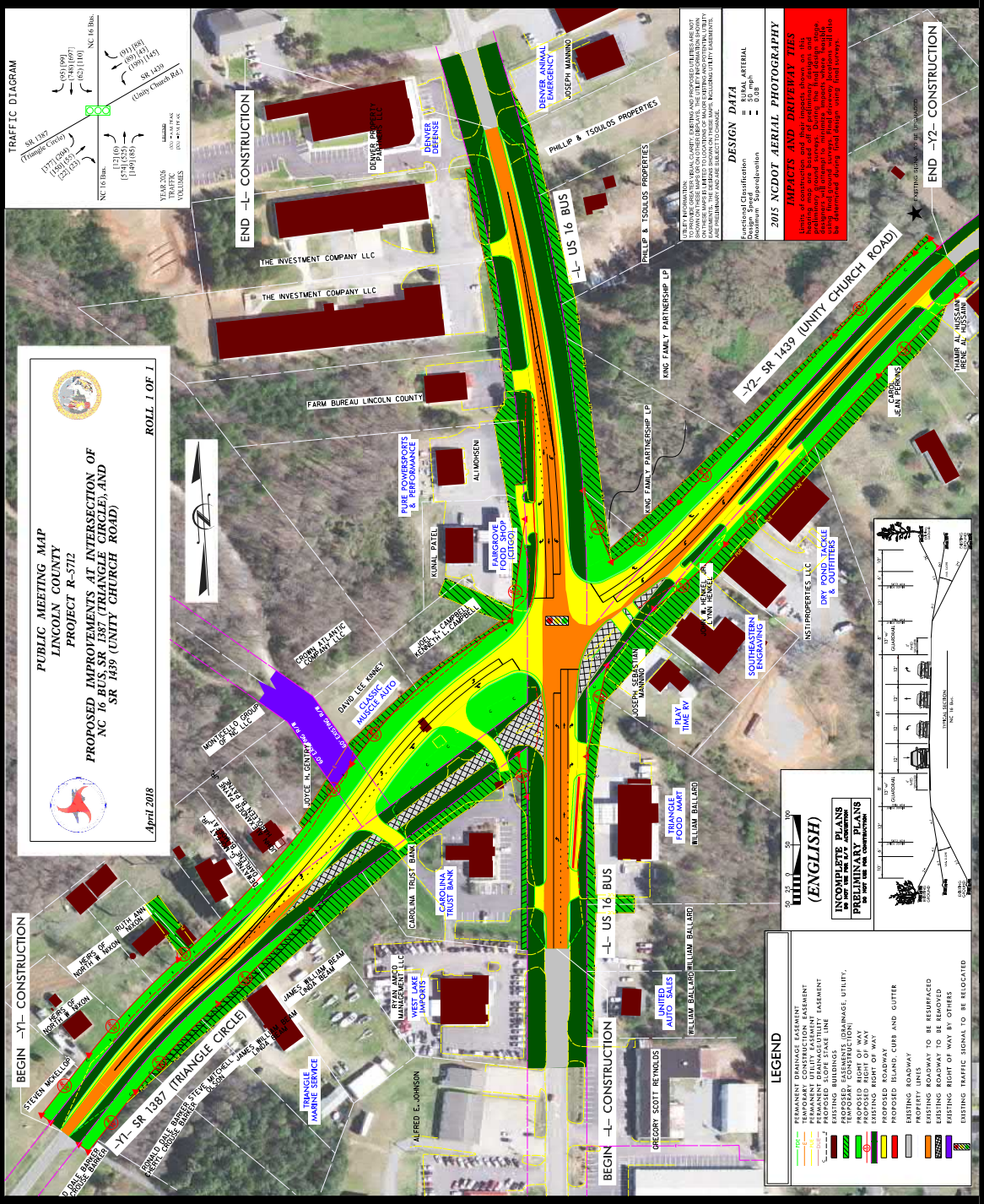
APPENDIX B

FUTURE ROADWAY INFORMATION

PUBLIC MEETING MAP
LINCOLN COUNTY
PROJECT R-5712

PROPOSED IMPROVEMENTS AT INTERSECTION OF NC 16 BUS, SR 1387 (TRIANGLE CIRCLE), AND SR 1439 (UNITY CHURCH ROAD)

April 2018 — **ROLL 1 OF 1**



PUBLIC MEETING MAP
LINCOLN COUNTY
PROJECT R-5712

PROPOSED IMPROVEMENTS AT INTERSECTION OF NC 16 BUS, SR 1387 (TRIANGLE CIRCLE), AND SR 1439 (UNITY CHURCH ROAD)

April 2018 — **ROLL 1 OF 1**

APPENDIX C

TRAFFIC COUNT DATA

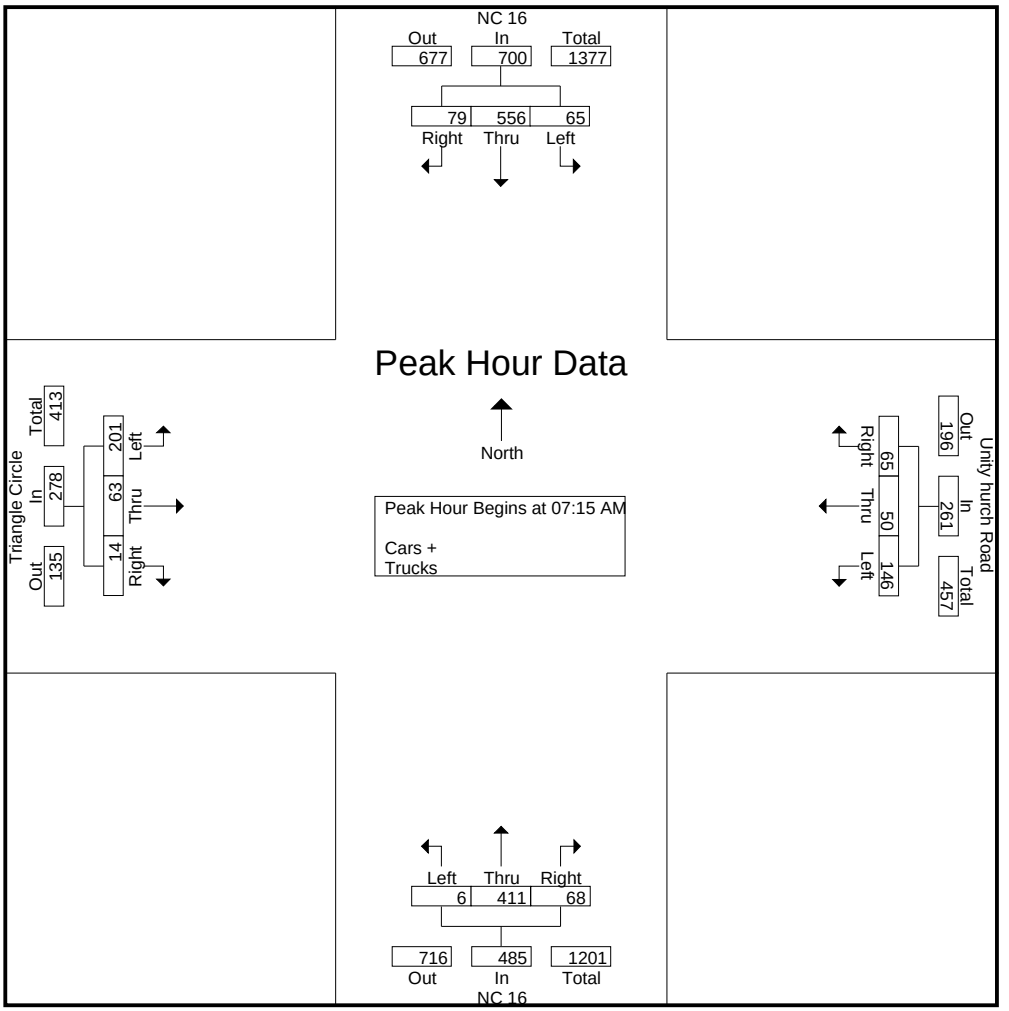
File Name : Denver(NC-16 and Unity Church) AM Peak
Site Code :
Start Date : 11/28/2018
Page No : 1

Groups Printed- Cars + - Trucks

	NC 16 Southbound				Unity hurch Road Westbound				NC 16 Northbound				Triangle Circle Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
07:00 AM	21	127	7	155	9	19	49	77	5	45	3	53	1	5	22	28	313
07:15 AM	22	145	10	177	14	13	40	67	11	87	2	100	3	8	42	53	397
07:30 AM	30	132	17	179	14	15	35	64	17	126	1	144	1	13	57	71	458
07:45 AM	13	157	18	188	26	17	41	84	26	133	1	160	4	12	52	68	500
Total	86	561	52	699	63	64	165	292	59	391	7	457	9	38	173	220	1668
08:00 AM	14	122	20	156	11	5	30	46	14	65	2	81	6	30	50	86	369
08:15 AM	13	115	17	145	16	10	38	64	14	94	3	111	3	15	23	41	361
08:30 AM	14	119	19	152	18	6	33	57	17	114	2	133	3	16	21	40	382
08:45 AM	19	140	25	184	28	13	38	79	23	95	0	118	6	13	25	44	425
Total	60	496	81	637	73	34	139	246	68	368	7	443	18	74	119	211	1537
Grand Total	146	1057	133	1336	136	98	304	538	127	759	14	900	27	112	292	431	3205
Apprch %	10.9	79.1	10		25.3	18.2	56.5		14.1	84.3	1.6		6.3	26	67.7		
Total %	4.6	33	4.1	41.7	4.2	3.1	9.5	16.8	4	23.7	0.4	28.1	0.8	3.5	9.1	13.4	
Cars +	145	1048	132	1325	136	98	304	538	127	752	14	893	27	110	292	429	3185
% Cars +	99.3	99.1	99.2	99.2	100	100	100	100	100	99.1	100	99.2	100	98.2	100	99.5	99.4
Trucks	1	9	1	11	0	0	0	0	0	7	0	7	0	2	0	2	20
% Trucks	0.7	0.9	0.8	0.8	0	0	0	0	0	0.9	0	0.8	0	1.8	0	0.5	0.6

File Name : Denver(NC-16 and Unity Church) AM Peak
Site Code :
Start Date : 11/28/2018
Page No : 2

	NC 16 Southbound				Unity hurch Road Westbound				NC 16 Northbound				Triangle Circle Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:15 AM																	
07:15 AM	22	145	10	177	14	13	40	67	11	87	2	100	3	8	42	53	397
07:30 AM	30	132	17	179	14	15	35	64	17	126	1	144	1	13	57	71	458
07:45 AM	13	157	18	188	26	17	41	84	26	133	1	160	4	12	52	68	500
08:00 AM	14	122	20	156	11	5	30	46	14	65	2	81	6	30	50	86	369
Total Volume	79	556	65	700	65	50	146	261	68	411	6	485	14	63	201	278	1724
% App. Total	11.3	79.4	9.3		24.9	19.2	55.9		14	84.7	1.2		5	22.7	72.3		
PHF	.658	.885	.813	.931	.625	.735	.890	.777	.654	.773	.750	.758	.583	.525	.882	.808	.862



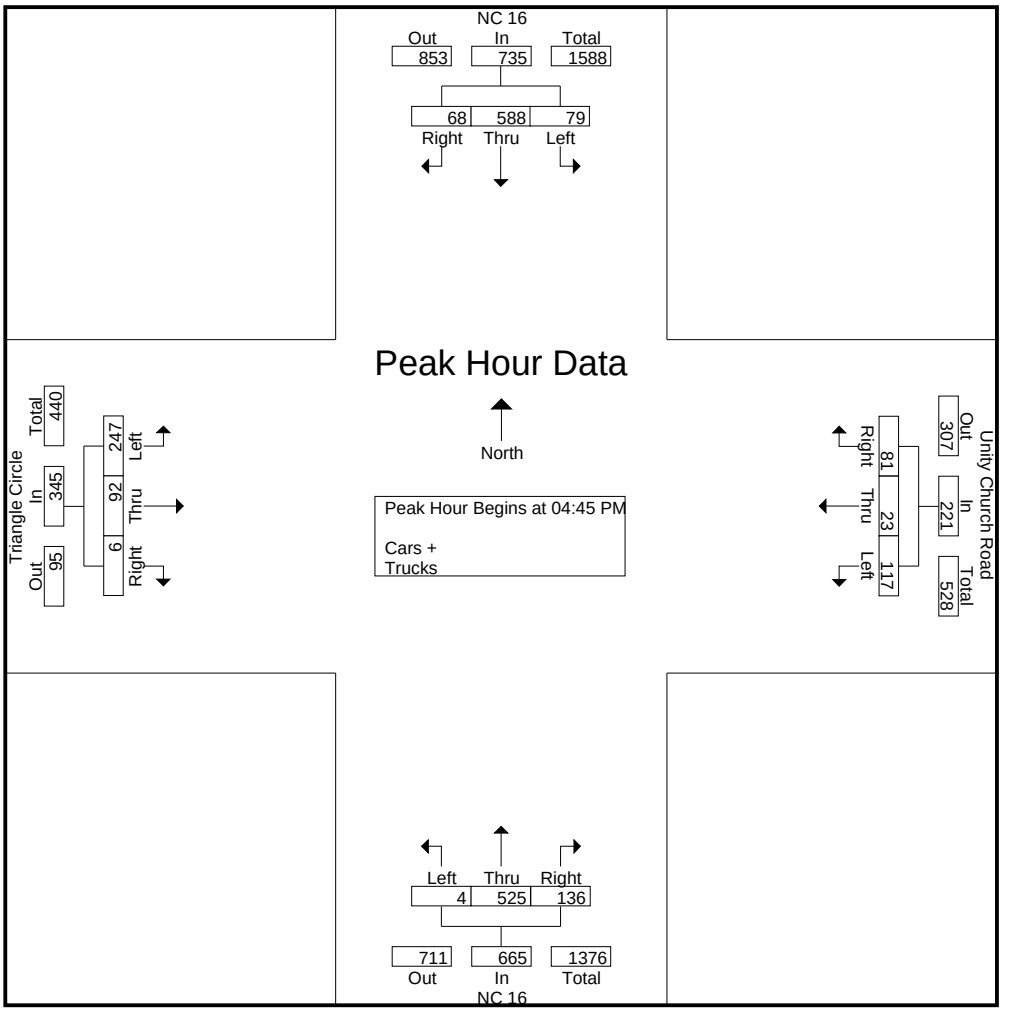
File Name : Denver(NC-16 and Unity Church) PM Peak
Site Code :
Start Date : 11/28/2018
Page No : 1

Groups Printed- Cars + - Trucks

	NC 16 Southbound				Unity Church Road Westbound				NC 16 Northbound				Triangle Circle Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
04:00 PM	14	148	25	187	19	10	28	57	27	142	3	172	4	26	60	90	506
04:15 PM	12	148	21	181	15	9	27	51	27	138	0	165	2	23	40	65	462
04:30 PM	16	118	20	154	16	10	33	59	25	134	1	160	5	31	46	82	455
04:45 PM	14	158	25	197	21	6	35	62	30	124	0	154	1	19	63	83	496
Total	56	572	91	719	71	35	123	229	109	538	4	651	12	99	209	320	1919
05:00 PM	23	133	17	173	23	7	36	66	31	126	3	160	1	30	75	106	505
05:15 PM	14	165	16	195	22	5	25	52	36	136	1	173	2	23	56	81	501
05:30 PM	17	132	21	170	15	5	21	41	39	139	0	178	2	20	53	75	464
05:45 PM	22	102	20	144	15	19	15	49	32	123	0	155	2	23	50	75	423
Total	76	532	74	682	75	36	97	208	138	524	4	666	7	96	234	337	1893
Grand Total	132	1104	165	1401	146	71	220	437	247	1062	8	1317	19	195	443	657	3812
Apprch %	9.4	78.8	11.8		33.4	16.2	50.3		18.8	80.6	0.6		2.9	29.7	67.4		
Total %	3.5	29	4.3	36.8	3.8	1.9	5.8	11.5	6.5	27.9	0.2	34.5	0.5	5.1	11.6	17.2	
Cars +	131	1100	165	1396	145	71	219	435	246	1059	8	1313	19	192	442	653	3797
% Cars +	99.2	99.6	100	99.6	99.3	100	99.5	99.5	99.6	99.7	100	99.7	100	98.5	99.8	99.4	99.6
Trucks	1	4	0	5	1	0	1	2	1	3	0	4	0	3	1	4	15
% Trucks	0.8	0.4	0	0.4	0.7	0	0.5	0.5	0.4	0.3	0	0.3	0	1.5	0.2	0.6	0.4

File Name : Denver(NC-16 and Unity Church) PM Peak
Site Code :
Start Date : 11/28/2018
Page No : 2

	NC 16 Southbound				Unity Church Road Westbound				NC 16 Northbound				Triangle Circle Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:45 PM																	
04:45 PM	14	158	25	197	21	6	35	62	30	124	0	154	1	19	63	83	496
05:00 PM	23	133	17	173	23	7	36	66	31	126	3	160	1	30	75	106	505
05:15 PM	14	165	16	195	22	5	25	52	36	136	1	173	2	23	56	81	501
05:30 PM	17	132	21	170	15	5	21	41	39	139	0	178	2	20	53	75	464
Total Volume	68	588	79	735	81	23	117	221	136	525	4	665	6	92	247	345	1966
% App. Total	9.3	80	10.7		36.7	10.4	52.9		20.5	78.9	0.6		1.7	26.7	71.6		
PHF	.739	.891	.790	.933	.880	.821	.813	.837	.872	.944	.333	.934	.750	.767	.823	.814	.973



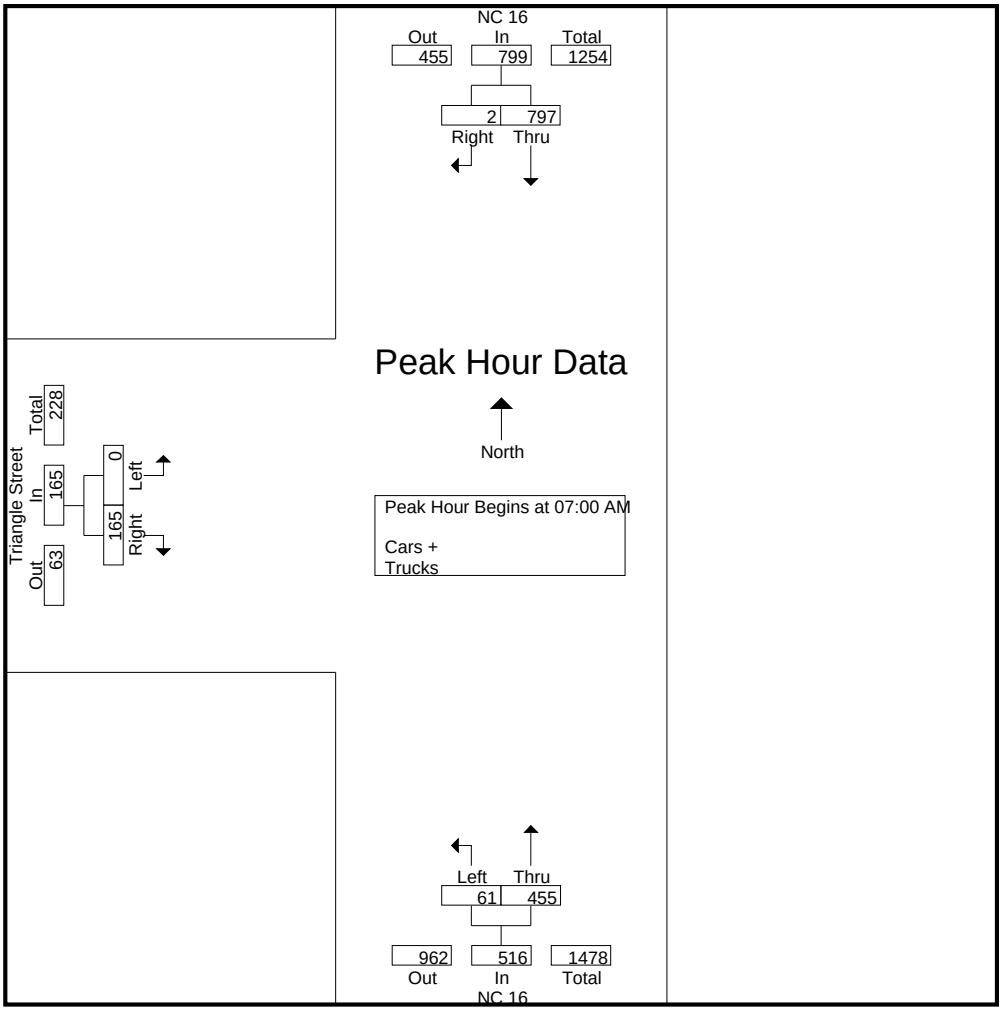
File Name : Denver(NC-16 and Trangle Circle) AM Peak
Site Code :
Start Date : 11/28/2018

Groups Printed- Cars + - Trucks

	NC 16 Southbound			NC 16 Northbound			Triangle Street Eastbound			
Start Time	Right	Thru	App. Total	Thru	Left	App. Total	Right	Left	App. Total	Int. Total
07:00 AM	0	214	214	47	16	63	35	0	35	312
07:15 AM	0	219	219	116	13	129	39	0	39	387
07:30 AM	0	173	173	178	16	194	37	0	37	404
07:45 AM	2	191	193	114	16	130	54	0	54	377
Total	2	797	799	455	61	516	165	0	165	1480
08:00 AM	1	164	165	95	8	103	30	0	30	298
08:15 AM	0	151	151	106	9	115	35	0	35	301
08:30 AM	1	133	134	116	11	127	19	0	19	280
08:45 AM	2	172	174	139	18	157	17	0	17	348
Total	4	620	624	456	46	502	101	0	101	1227
Grand Total	6	1417	1423	911	107	1018	266	0	266	2707
Apprch %	0.4	99.6		89.5	10.5		100	0		
Total %	0.2	52.3	52.6	33.7	4	37.6	9.8	0	9.8	
Cars +	6	1393	1399	894	107	1001	265	0	265	2665
% Cars +	100	98.3	98.3	98.1	100	98.3	99.6	0	99.6	98.4
Trucks	0	24	24	17	0	17	1	0	1	42
% Trucks	0	1.7	1.7	1.9	0	1.7	0.4	0	0.4	1.6

File Name : Denver(NC-16 and Trangle Circle) AM Peak
Site Code :
Start Date : 11/28/2018
Page No : 2

	NC 16 Southbound			NC 16 Northbound			Triangle Street Eastbound			
Start Time	Right	Thru	App. Total	Thru	Left	App. Total	Right	Left	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 07:00 AM										
07:00 AM	0	214	214	47	16	63	35	0	35	312
07:15 AM	0	219	219	116	13	129	39	0	39	387
07:30 AM	0	173	173	178	16	194	37	0	37	404
07:45 AM	2	191	193	114	16	130	54	0	54	377
Total Volume	2	797	799	455	61	516	165	0	165	1480
% App. Total	0.3	99.7		88.2	11.8		100	0		
PHF	.250	.910	.912	.639	.953	.665	.764	.000	.764	.916



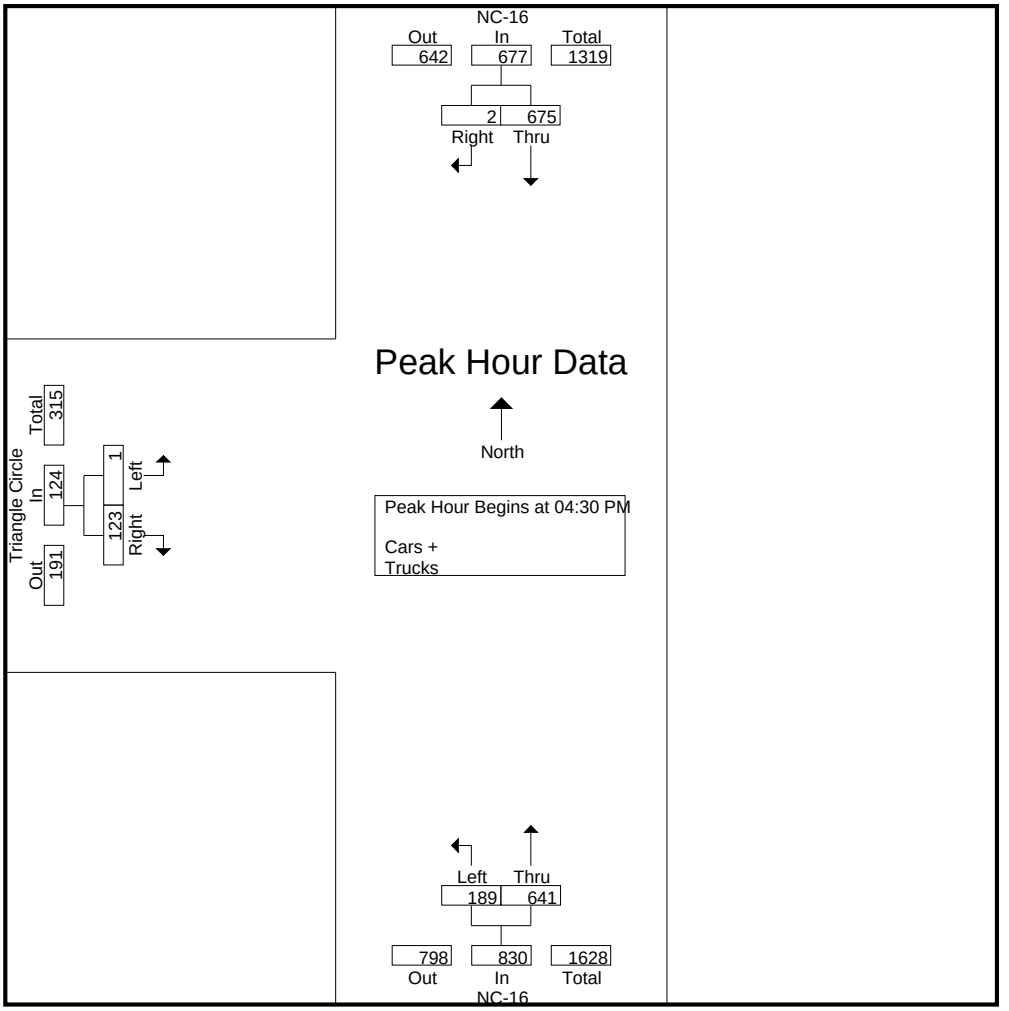
File Name : Denver(NC-16 and Triangle Circle) PM Peak
Site Code :
Start Date : 11/28/2018
Page No : 1

Groups Printed- Cars + - Trucks

	NC-16 Southbound			NC-16 Northbound			Triangle Circle Eastbound			
Start Time	Right	Thru	App. Total	Thru	Left	App. Total	Right	Left	App. Total	Int. Total
04:00 PM	1	170	171	154	36	190	21	0	21	382
04:15 PM	2	179	181	155	29	184	29	0	29	394
04:30 PM	0	160	160	156	44	200	30	0	30	390
04:45 PM	0	183	183	169	43	212	23	1	24	419
Total	3	692	695	634	152	786	103	1	104	1585
05:00 PM	2	180	182	156	53	209	26	0	26	417
05:15 PM	0	152	152	160	49	209	44	0	44	405
05:30 PM	4	153	157	150	33	183	30	0	30	370
05:45 PM	0	139	139	175	41	216	24	0	24	379
Total	6	624	630	641	176	817	124	0	124	1571
Grand Total	9	1316	1325	1275	328	1603	227	1	228	3156
Apprch %	0.7	99.3		79.5	20.5		99.6	0.4		
Total %	0.3	41.7	42	40.4	10.4	50.8	7.2	0	7.2	
Cars +	9	1303	1312	1269	328	1597	226	1	227	3136
% Cars +	100	99	99	99.5	100	99.6	99.6	100	99.6	99.4
Trucks	0	13	13	6	0	6	1	0	1	20
% Trucks	0	1	1	0.5	0	0.4	0.4	0	0.4	0.6

File Name : Denver(NC-16 and Triangle Circle) PM Peak
Site Code :
Start Date : 11/28/2018

	NC-16 Southbound			NC-16 Northbound			Triangle Circle Eastbound			
Start Time	Right	Thru	App. Total	Thru	Left	App. Total	Right	Left	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 04:30 PM										
04:30 PM	0	160	160	156	44	200	30	0	30	390
04:45 PM	0	183	183	169	43	212	23	1	24	419
05:00 PM	2	180	182	156	53	209	26	0	26	417
05:15 PM	0	152	152	160	49	209	44	0	44	405
Total Volume	2	675	677	641	189	830	123	1	124	1631
% App. Total	0.3	99.7		77.2	22.8		99.2	0.8		
PHF	.250	.922	.925	.948	.892	.979	.699	.250	.705	.973



APPENDIX D

ADJACENT DEVELOPMENT INFORMATION

DESIGN RESOURCE GROUP

NORTH CAROLINA PROFESSIONAL SEAL 16315 ENGINEER RANDY E. GODDARD

Randy E. Goddard

MAR. 14, 2017

TRANSPORTATION TECHNICAL MEMORANDUM

Date: March 14, 2017

To: Timothy W. Anderson, P.E.
District Engineer
NCDOT Division 12, District 3

From: Randy E. Goddard, P.E.
Managing Principal
Design Resource Group, PA (C-2165)

Subject: **Rivercross Residential** (659-002)

EXECUTIVE SUMMARY

As discussed below, the residential portion (Phase I) of the Rivercross development generates a minor percentage of the total traffic (54% of the AM peak hour trips, 31% of the PM peak hour trips, and 29% of the total two-way daily trips) when compared to the overall Approved Development Master Plan.

NC 16 Business Facing South to Cherry Point Drive

In our professional opinion the only mitigation required in Phase I are the originally recommended improvements (with the exception of the traffic signal) at the site access on NC Business 16. The developer, in conjunction with improvements to be made as part of the multi-family site (Hawthorne), will extend the right turn lane storage (the right turn lane construction is a required mitigation of the Hawthorne multi-family) to be built on Optimist Club Road by an additional 100'. The developer has also agreed to deposit the previously discussed $75,000 contribution, along with an additional $25,000 into an escrow account to be used for the future installation of traffic signals (when warranted) at the intersections of Optimist Club Road & Triangle Circle and NC Business 16 & Cherry Point Drive/Rivercross Access (or other roadway mitigations in the surrounding area if the signals do not get installed). The remaining mitigation should be provided with the completion of the Rivercross Master Plan Development (the specifics are described later in this document). Therefore, we recommend the following mitigation phasing plan:

2459 Wilkinson Boulevard, Suite 200
Charlotte, NC 28208

O 704.343.0608
W www.drgrp.com

PHASE I (Residential):

NC 16 Business & Cherry Point Drive/Proposed Site Access

- **Remark the current northbound two-way left-turn lane (TWLTL) on NC Business 16 with a dedicated left turn lane with 375 feet of storage**
- **Remark the current southbound TWLTL on NC Business 16 with a dedicated left turn lane with 100 feet of storage (to Cherry Point Drive)**
- **Construct a new southbound right turn lane on NC Business 16 with 200 feet of storage and an appropriate bay taper**
- **Construct the Proposed Access with one westbound ingress lane, an eastbound left turn egress lane with 250 feet of storage (and an appropriate bay taper) and an eastbound combined through-right egress lane**

Optimist Club Road & Triangle Circle

- **In conjunction with the improvements to be made as part of the Hawthorne multi-family development, construct or participate in the construction of an additional 100' of storage for an eastbound right turn lane on Optimist Club Road at Triangle Circle that is required to be constructed as part of the approved Hawthorne multi-family plan.**

The $75,000.00 that had been included in the previously approved Rivercross master plan will be deposited into an escrow account to be used for the mitigation of traffic from the overall Rivercross Master Plan Development and specifically for the future installation of traffic signals (when warranted) at the intersection of Optimist Club Rd. and Triangle Circle and at the major site entrance road, Cherry Point Dr., and NC 16 Business. The developer will deposit an additional $25,000.00 to this escrow fund for a total escrowed amount of $100,000.00 to be used for future traffic signal installation. These funds will remain in escrow for a period not to exceed 7 years from the date of the deposit. If after 7 years the traffic signals have not been installed, those funds will be transferred to an escrow account for the benefit of Lincoln County for road improvements in the surrounding area to be deployed at the sole discretion of Lincoln County in conjunction with NCDOT. The first $50,000.00 of the total amount will be escrowed at the time of plat approval for Phase I and the remaining $50,000.00 will be escrowed at the time of plat approval for Phase II.

PHASE II (with completion of the Rivercross Master Plan Development):

NC 16 Business & Cherry Point Drive/Proposed Site Access

- **Install a traffic signal at the intersection (upon meeting warrants) to be partially funded from the $100,000 escrow account.**

Optimist Club Road & Triangle Circle

- **Construct a northbound left turn lane on Triangle Circle with 250 feet of storage and an appropriate bay taper**
- **Extend the eastbound right turn lane on Optimist Club Road to 350 feet of storage and an appropriate bay taper**
- **Install a traffic signal at the intersection (upon meeting warrants) to be partially funded from the $100,000 escrow account.**

DISCUSSION

Background/Location:

Southeastern Land Development, LLC previously proposed a development plan for a mixed-use site in Lincoln County, NC consisting of 220 single family homes, 40 townhomes, 200 apartments, and 100,000 SF of retail land uses (PD# 2014-2 which was approved as of February 23, 2015 by NCDOT and Lincoln County). The site is located on the west side of NC Business 16 in Lincoln County, NC - with access opposite Cherry Point Drive.

Per Lincoln County's Approved Rivercross Phasing Plan Modification Memorandum dated March 10, 2016, Hawthorne Development Group requested the rights to develop the 200 apartment homes as a separate development before the other Rivercross Phases were developed. The Hawthorne multi-fmaily development agreed to roadway improvements at the site access on Triangle Circle along with a 125' right turn lane at the intersection of Optimist Club Road and Triangle Circle by their 2018 proposed buildout year (see Figure 1 for the apartment site's layout and required roadway improvements). This memo was approved by Lincoln County Board of Commisioners on March 21, 2016. It should be noted: there is currently an amendment submitted to Lincoln County to increase the apartment dwelling unit count that has yet to be approved. Since the the Hawthorne multi-family development is no longer included as a part of the total Rivercross development, the 200 apartments were not included in any of the phasing calculations below.

The developer is now proposing a phasing plan, of which Phase I consists of only the residential portion of the development, now includes a modified development project of 135 single family homes & 133 townhomes. The purpose of this TTM is to evaluate the mitigation required from the original Traffic Impact Analysis (TIA) for the full buildout in comparison to the proposed Phase I plan and assign mitigation responsibilities based on the percentage of the overall trip generation.

Per MD7 Financial, LLC's request, Design Resource Group, PA (DRG) provides the following information pertaining to the location of the development, roadway/access information, proposed site trip generation, and our mitigation recommendations by development phase:

Required Mitigation:

Per the NCDOT and Lincoln County approved Development Plan dated February 23, 2015, the agreed upon roadway improvements are as follows (see Figure 1 for the location of the site and the required coinciding intersection mitigations):

NC 16 Business & Cherry Point Drive/Proposed Site Access

- Remark the current northbound two-way left-turn lane (TWLTL) on NC Business 16 with a dedicated left turn lane with 375 feet of storage
- Remark the current southbound TWLTL on NC Business 16 with a dedicated left turn lane with 100 feet of storage
- Construct a new southbound right turn lane on NC Business 16 with 200 feet of storage and an appropriate bay taper
- Construct the Proposed Access with one westbound ingress lane, an eastbound left turn egress lane with 250 feet of storage (and an appropriate bay taper) and an eastbound combined through-right egress lane
- Install a traffic signal at the intersection (upon meeting warrants)

Cherry Point Drive Facing West Towards NC 16 Business

Optimist Club Road & Triangle Circle

- Construct a northbound left turn lane on Triangle Circle with 250 feet of storage and an appropriate bay taper
- Construct an eastbound right turn on Optimist Club Road with 350 feet of storage and an appropriate bay taper
- Install a traffic signal at the intersection (upon meeting warrants)

Optimist Club Road Facing East at Rufus Road/Triangle Circle

Main Boulevard Extension

- Contribute $75,000 towards the cost of the Main Boulevard roadway extension to Airlie Parkway

Trip Generation:

The AM and PM peak-hour-trip-generation data for the mixed-use development is presented in Table 1. The values for the trips generated by the residential and commercial land uses are obtained from the Institute of Transportation Engineers, Trip Generation Manual, 9th Edition, 2012.

Table 1: Trip Generation Comparison

Land Use [ITE Code]			Weekday Daily	AM Peak Hour			PM Peak Hour		
				Enter	Exit	Total	Enter	Exit	Total
February 23, 2015 Approved Development Plan (Rivercross Development Only)									
Single Family Homes [210]	220	DUs	2,169	41	123	164	135	79	214
Townhomes [230]	40	DUs	290	4	21	25	19	9	28
Retail [820]	100,000	SF	6,791	97	59	156	288	311	599
Approved Plan Total Trips			**9,250**	**142**	**203**	**345**	**442**	**399**	**841**
*5% Internal Capture Reduction**			*-463*	*0*	*0*	*0*	*-22*	*-20*	*-42*
*20% Passby Credit**			*-1,290*	*-18*	*-11*	*-30*	*-55*	*-59*	*-114*
Approved Plan Total New Trips			**7,497**	**124**	**192**	**315**	**365**	**320**	**685**
Proposed Phase I									
Single Family Homes [210]	135	DUs	1,384	26	78	104	87	51	138
Townhomes [230]	133	DUs	824	11	54	65	51	25	76
Proposed Phase I Total Trips			**2,208**	**37**	**132**	**169**	**138**	**76**	**214**
Proposed Phase I Percentage of Approved Development			**29%**	**30%**	**69%**	**54%**	**38%**	**24%**	**31%**

References:
Trip Generation, 9th Edition, Institute of Transportation Engineers, Washington, DC. 2012.
* Internal Capture/Passby Reductions from original Rivercross TIA.

The Approved Development Plan is expected to generate 7,497 new two-way daily trips, 315 new trips in the AM peak hour and 685 new trips in the PM peak hour (after internal capture and passby reductions).

The Proposed Phase I development is expected to generate 2,208 two-way daily trips, 169 trips in the AM peak hour and 214 trips in the PM peak hour.

When comparing the Approved Development Plan & the Proposed Phase I Plan, the retail portion of the development generates the majority of the trips. Overall, the estimated Phase I Plan trip generation only accounts for 54% of the AM peak hour trips, 31% of the PM peak hour trips, and 29% of the total two-way daily trips.

The distribution used for the site traffic trip assignment is derived from the previous Rivercross TIA and Hawthorne Apartment TTM (both previously approved) and is expected to be as follows:

- Approximately 52% of the site traffic is expected to arrive/depart from the south via NC 16 Business
- Approximately 36% of the site traffic is expected to arrive/depart from the east via Optimist Club Road/NC 16
- The remaining 12% of the site traffic is expected to arrive from the north via NC 16 Business

The site directional distribution, recommended laneage, and trip assignments for the morning and afternoon peak hour traffic volumes associated with the Approved Development and the Proposed Phase I plans are presented in Figures 2 and 3.

CONCLUSION

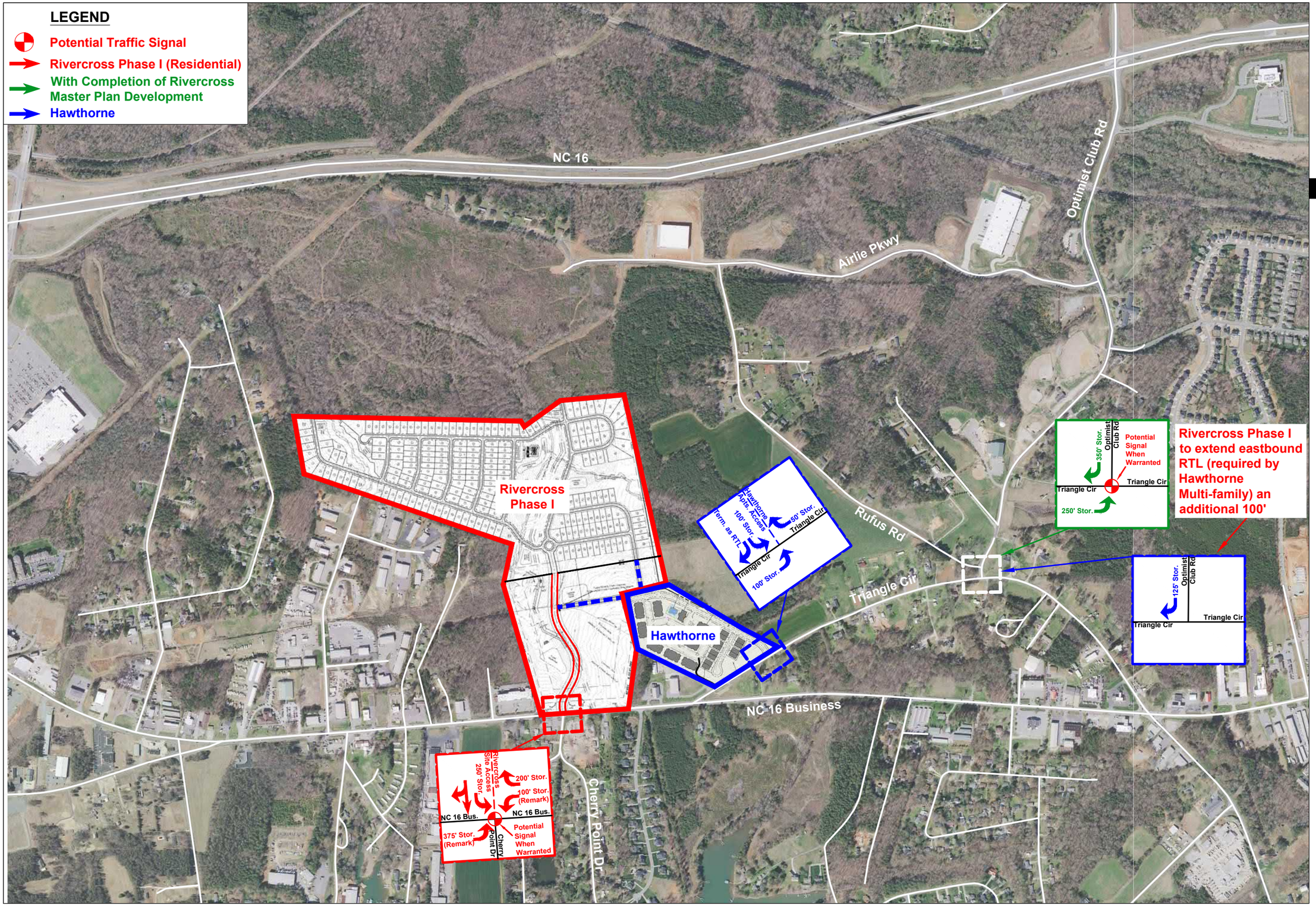
As discussed previously, the residential portion (Phase I) of the Rivercross development generates a minor percentage of the total traffic (54% of the AM peak hour trips, 31% of the PM peak hour trips, and 29% of the total two-way daily trips) when compared to the overall Approved Master Plan Development.

In our professional opinion the only mitigation required in Phase I are the originally recommended improvements (with the exception of the traffic signal) at the site access on NC Business 16. The developer, in conjunction with improvements to be made as part of the multi-family site (Hawthorne), will extend the right turn lane storage (the right turn lane construction is a required mitigation of the Hawthorne multi-family) to be built on Optimist Club Road by an additional 100'. The developer has also agreed to deposit the previously discussed $75,000 contribution, along with an additional $25,000 into an escrow account to be used for the future installation of traffic signals (when warranted) at the intersections of Optimist Club Road & Triangle Circle and NC Business 16 & Cherry Point Drive/Rivercross Access (or other roadway mitigations in the surrounding area if the signals do not get installed). The remaining mitigation should be provided with the completion of the Rivercross Master Plan Development (specifics as described previously in this document).

Please contact us should you need any additional information.

Attachments:	Figure 1	Rivercross/Hawthorne TIA Required Roadway Improvements on Aerial
	Figure 2	Site Directional Distribution & Recommended Improvements
	Figure 3	2/23/15 Approved Plan vs Proposed Phase I Plan AM and PM Peak Hour Site Volumes

cc:	Brian Foster	MD7 Financial, LLC
	Walter Fields	Walter Fields Group, Inc.
	File	



DESIGN RESOURCE GROUP
LANDSCAPE ARCHITECTURE
CIVIL ENGINEERING
TRANSPORTATION PLANNING
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W www.drgrp.com

RIVERCROSS RESIDENTIAL TTM

LINCOLN COUNTY, NC

MD7 FINANCIAL, LLC
8905 PRIMULA DRIVE
GAITHERSBURG, MD 20882
301-908-5522

RIVERCROSS & HAWTHORE APTS REQUIRED IMPROVEMENTS

0 400' 800'
SCALE: 1" = 800'
N

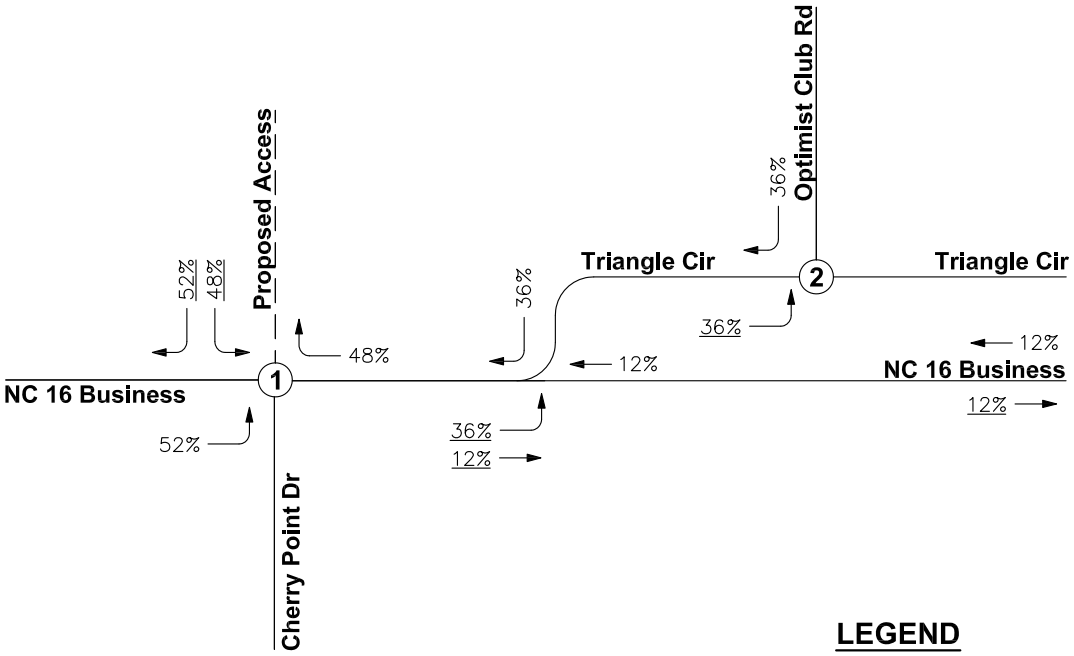
PROJECT #: 659-002
DRAWN BY: MWW
CHECKED BY: REG

MARCH 2017

REVISIONS:

Figure 1

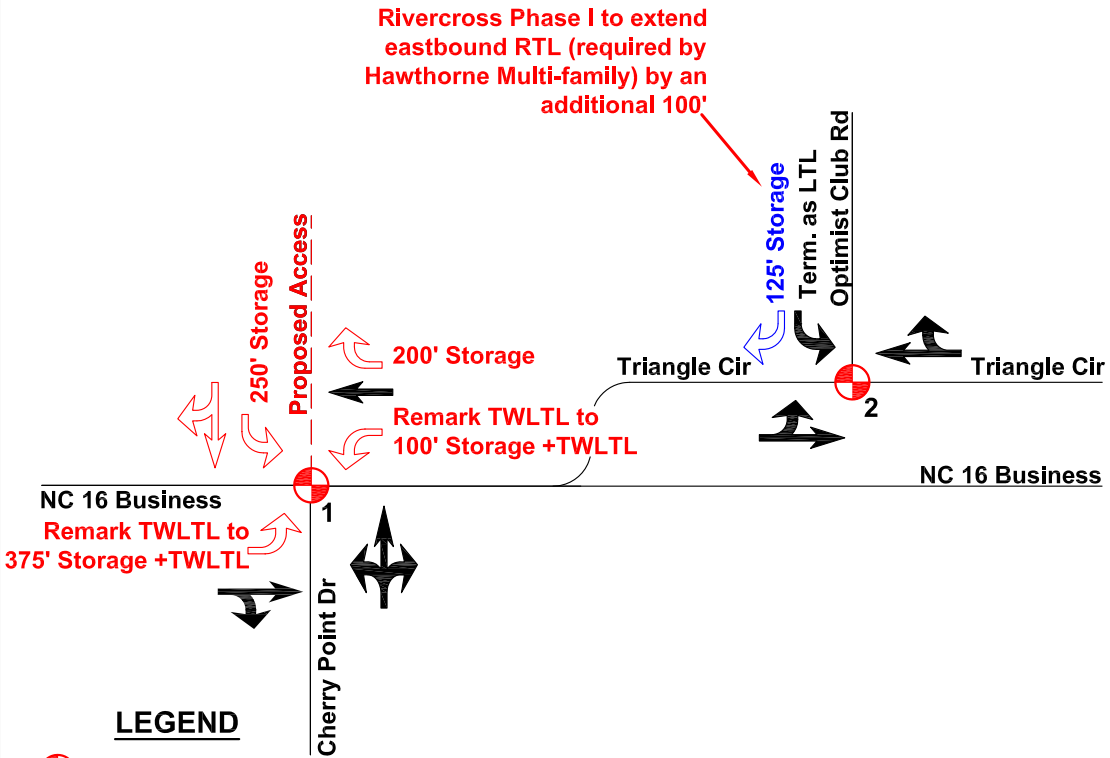
SITE DIRECTIONAL DISTRIBUTION



LEGEND

- Stop Sign Control
- Directional Movement
- xx% / xx% Enter/Exit Dist. %

RECOMMENDED IMPROVEMENTS



LEGEND

- Potential Traffic Signal When Warranted
- Existing Laneage
- Rivercross Phase I (Res.) Recommended Improvement
- Hawthorne Apartments Required Improvement

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RIVERCROSS RESIDENTIAL TTM

LINCOLN COUNTY, NC

MD7 FINANCIAL, LLC
8905 PRIMULA DRIVE
GAITHERSBURG, MD 20882
301-908-5522

SITE DIRECTIONAL DISTRIBUTION & PHASE I RECOMMENDED IMPROVEMENTS

0 NTS

SCALE: NTS

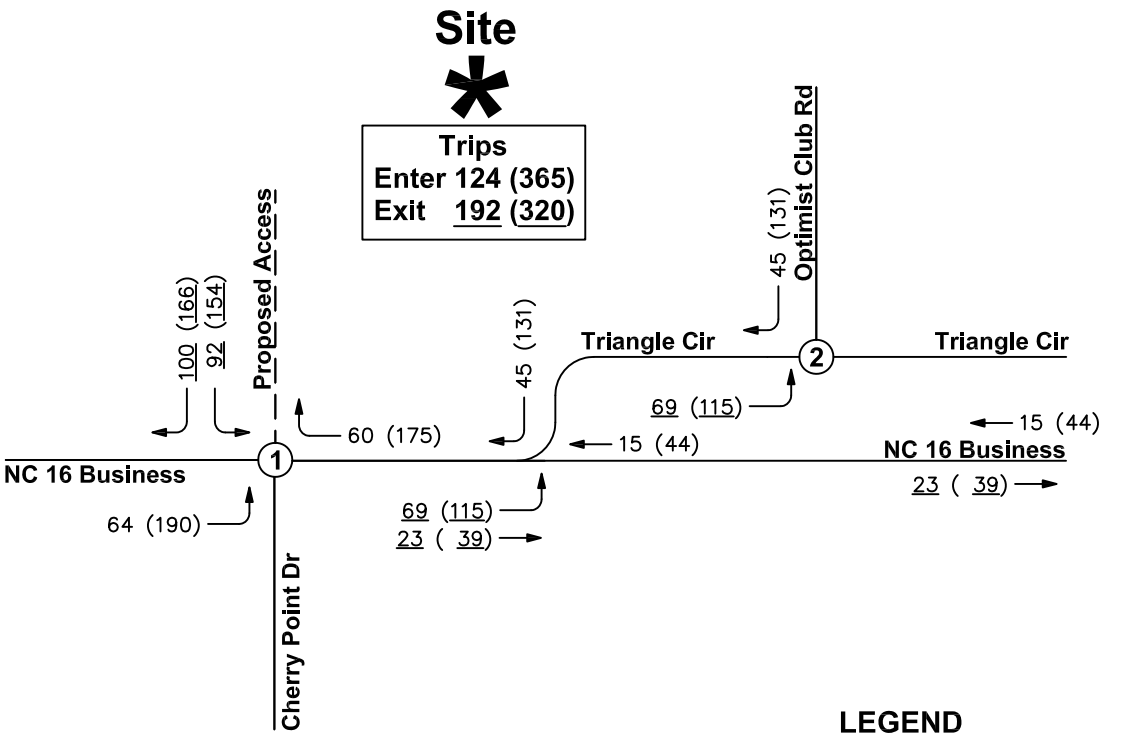
PROJECT #:	659-001
DRAWN BY:	MWW
CHECKED BY:	REG

MARCH 2017

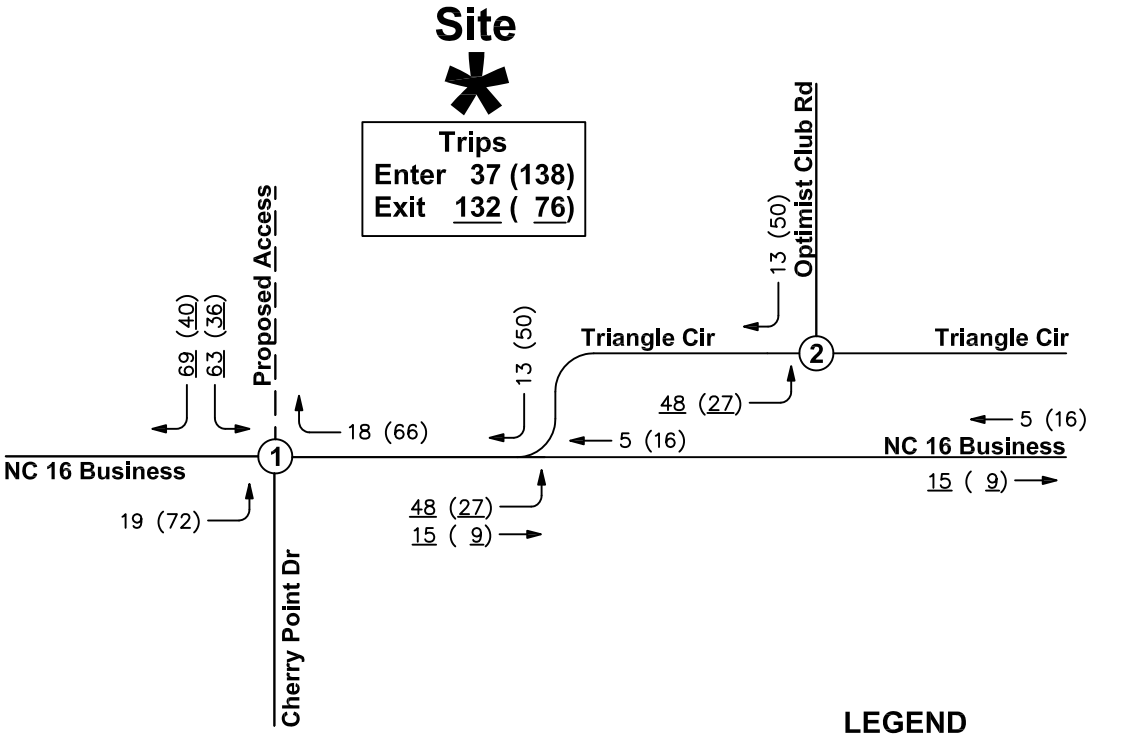
REVISIONS:

Figure 2

2/23/15 APPROVED PLAN PEAK HOUR SITE TRAFFIC VOLUMES



PROPOSED PHASE I PEAK HOUR SITE TRAFFIC VOLUMES



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LINCOLN COUNTY, NC

MD7 FINANCIAL, LLC
8905 PRIMULA DRIVE
GAITHERSBURG, MD 20882
301-908-5522

2/23/15 APPROVED PLAN vs PROPOSED PHASE I PLAN

SCALE: NTS

PROJECT #: 659-001
DRAWN BY: MWW
CHECKED BY: REG

DECEMBER 2016

REVISIONS:

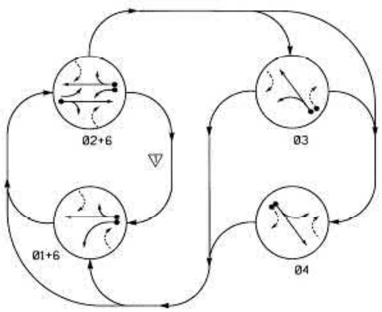
Figure 3

APPENDIX E

SIGNAL DATA

PROJECT REFERENCE NO.	SHEET NO.
N/A	Sig. 1

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

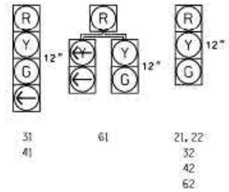
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø1+6	Ø2+6	Ø3	Ø4	FLASH
21, 22	R	G	R	R	Y
31	R	R	G (←)	R	R
32	R	R	G	R	R
41	R	R	R	G (←)	R
42	R	R	R	G	R
61	G (←)	G	R	R	Y
62	G	G	R	R	Y

SIGNAL FACE I.D.

All Heads L.E.D.



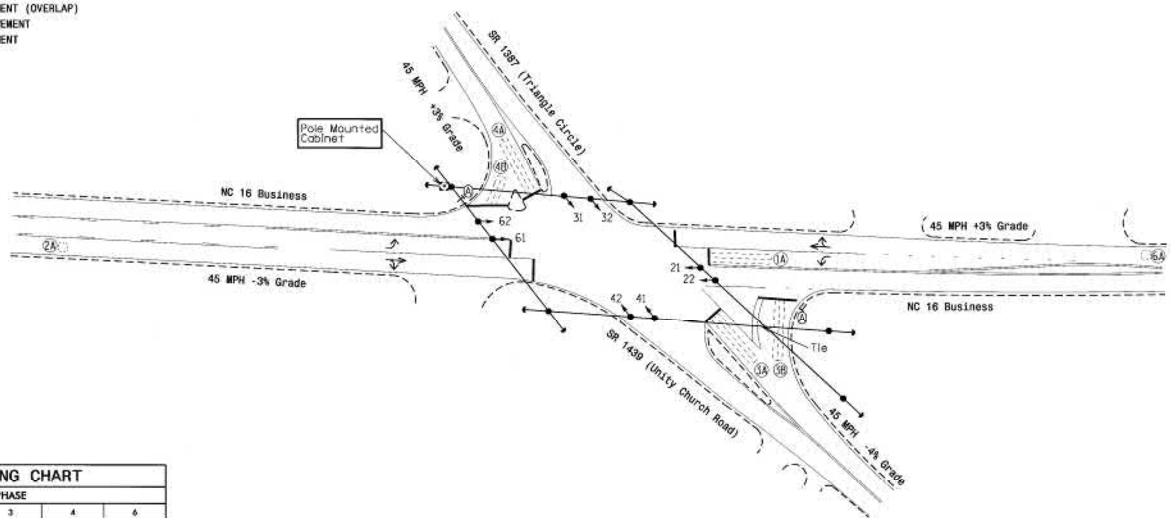
OASIS 2070L LOOP & DETECTOR INSTALLATION CHART

INDUCTIVE LOOPS: LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	DETECTOR PROGRAMMING: PHASE	CALLING	EXTENSION	FULL TIME DELAY	STRETCH TIME	DELAY TIME	SYSTEM LOOP	NEW CARD
1A	2X40	0	2-4-2	-	1	Y	Y	-	-	15	-	-
					6	Y	Y	Y	-	3	-	-
2A	6X6	300	5	-	2	Y	Y	-	-	-	-	-
3A, 3B	6X40	0	2-4-2	-	3	Y	Y	-	-	5	-	-
4A	6X40	0	2-4-2	-	4	Y	Y	-	-	5	-	-
4B	6X20	0	2-4-2	-								
6A	6X6	300	5	-	6	Y	Y	-	-	-	-	-

4 Phase
Fully Actuated
Isolated

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2012 and "Standard Specifications for Roads and Structures" dated January 2012.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. (Revision 1) Enable Backup Protect for phase 6 to allow the controller to clear from phase 2+6 to phase 1+6 by progressing through an all red display.
4. The order of phase 3 and phase 4 may be reversed.
5. Set all detector units to presence mode.
6. Pavement markings are existing.



LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
Ⓐ	"YIELD" Sign (R1-2)	Ⓐ

OASIS 2070L TIMING CHART

FEATURE	PHASE 1	2	3	4	6	
Min Green 1 *	7	12	7	7	12	
Extension 1 *	1.0	6.0	2.0	2.0	6.0	(Revision 1)
Max Green 1 *	15	90	30	30	90	(Revision 1)
Yellow Clearance	4.0	4.0	4.7	4.7	4.7	
Red Clearance	1.5	2.0	3.0	2.5	2.0	
Red Revert	2.0	2.0	2.0	2.0	5.0	(Revision 1)
Walk 1 *	-	-	-	-	-	
Don't Walk 1	-	-	-	-	-	
Seconds Per Actuation *	-	2.5	-	-	2.5	
Max Variable Initial *	-	34	-	-	34	
Time Before Reduction *	-	15	-	-	15	
Time To Reduce *	-	45	-	-	45	
Minimum Gap	-	3.0	-	-	3.0	
Recall Mode	-	MIN RECALL	-	-	MIN RECALL	
Vehicle Call Memory	-	YELLOW	-	-	YELLOW	
Dual Entry	-	-	-	-	-	
Simultaneous Gap	ON	ON	ON	ON	ON	

* These values may be field adjusted. Do not adjust Min Green and Extension times for phases 2 and 6 lower than what is shown. Min Green for all other phases should not be lower than 4 seconds.

Plan of Record

PREPARED BY: M. Mahbooba DATE: June 2013
REVIEWED BY: T. Williams DATE: June 2013
SIGNATURE: T. J. Will DATE: 6/10/13.

COMMENTS

Upgraded equipment to 2070.

This plan of record reflects existing field conditions as submitted by field personnel. This plan may have been modified from its original state.

Plan Of Record

REVISION (1) SEAL

NORTH CAROLINA PROFESSIONAL SEAL 24393 ENGINEER TIMOTHY J. WILLIAMS

T. J. Will 6/10/13
SIGNATURE DATE

Prepared in the Offices of: Transportation Mobility and Safety Division, Signal Design Section
750 N.Greenfield Pkwy,Garner,NC 27529

SCALE 0 40 1"=40'

NC 16 Business at SR 1387 (Triangle Circle) / SR 1439 (Unity Church Road)

Division 12 Lincoln County Triangle

PLAN DATE:	July 2002	REVIEWED BY:	Munther Mahboob
PREPARED BY:	L. Blount	REVISED BY:	1

REVISIONS	INIT.	DATE
(1) Add Red Revert for phase 6, revise Extend & Max Green times for phases 2 & 6	TJW	6/10/13

Not a certified document. This document originally issued and sealed by Boniface Maduobuchukwu, PE 25475 on 8/22/2002. This document shall not be considered a certified document.

SIG. INVENTORY NO. 12-0225

APPENDIX F

NC 16 BUSINESS AND UNITY CHURCH ROAD/ TRIANGLE CIRCLE

SYNCHRO REPORTS

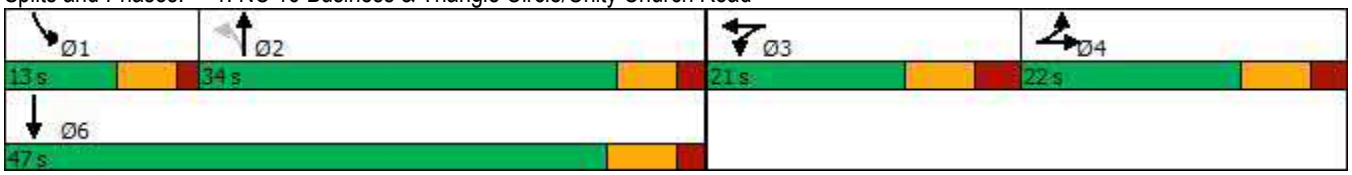
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	205	64	14	149	51	66	6	419	69	66	567	81
Future Volume (vph)	205	64	14	149	51	66	6	419	69	66	567	81
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	150		0	150		0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (ft)	25			25			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		0.993			0.967			0.979			0.981	
Flt Protected		0.965			0.973		0.950			0.950		
Satd. Flow (prot)	0	1785	0	0	1753	0	1770	1824	0	1770	1827	0
Flt Permitted		0.965			0.973		0.185			0.950		
Satd. Flow (perm)	0	1785	0	0	1753	0	345	1824	0	1770	1827	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		45			45			45			45	
Link Distance (ft)		845			913			3237			669	
Travel Time (s)		12.8			13.8			49.0			10.1	
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)	228	71	16	166	57	73	7	466	77	73	630	90
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	315	0	0	296	0	7	543	0	73	720	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								Yes				
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	Split	NA		Split	NA		Perm	NA		Prot	NA	
Protected Phases	4	4		3	3			2		1	6	
Permitted Phases							2					
Detector Phase	4	4		3	3		2	2		1	6	
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0		12.0	12.0		7.0	12.0	
Minimum Split (s)	15.0	15.0		15.0	15.0		18.0	18.0		13.0	19.0	
Total Split (s)	22.0	22.0		21.0	21.0		34.0	34.0		13.0	47.0	
Total Split (%)	24.4%	24.4%		23.3%	23.3%		37.8%	37.8%		14.4%	52.2%	
Maximum Green (s)	14.8	14.8		13.3	13.3		28.0	28.0		7.5	40.3	
Yellow Time (s)	4.7	4.7		4.7	4.7		4.0	4.0		4.0	4.7	
All-Red Time (s)	2.5	2.5		3.0	3.0		2.0	2.0		1.5	2.0	
Lost Time Adjust (s)		-2.2			-2.7		-1.0	-1.0		-0.5	-1.7	
Total Lost Time (s)		5.0			5.0		5.0	5.0		5.0	5.0	
Lead/Lag	Lag	Lag		Lead	Lead		Lag	Lag		Lead		
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	2.0		2.0	2.0		6.0	6.0		1.0	6.0	
Minimum Gap (s)	0.2	0.2		0.2	0.2		3.0	3.0		0.2	3.0	
Time Before Reduce (s)	0.0	0.0		0.0	0.0		15.0	15.0		0.0	15.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Time To Reduce (s)	0.0	0.0		0.0	0.0		45.0	45.0		0.0	45.0	
Recall Mode	None	None		None	None		Min	Min		None	Min	
Act Effct Green (s)		17.0			16.0		29.9	29.9		7.7	39.9	
Actuated g/C Ratio		0.19			0.18		0.34	0.34		0.09	0.45	
v/c Ratio		0.91			0.93		0.06	0.88		0.47	0.87	
Control Delay		68.0			73.3		23.0	46.1		49.7	34.7	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		68.0			73.3		23.0	46.1		49.7	34.7	
LOS		E			E		C	D		D	C	
Approach Delay		68.0			73.3			45.8			36.1	
Approach LOS		E			E			D			D	
Queue Length 50th (ft)		178			168		3	293		40	347	
Queue Length 95th (ft)		#336			#325		14	#494		84	#565	
Internal Link Dist (ft)		765			833			3157			589	
Turn Bay Length (ft)							150			150		
Base Capacity (vph)		345			319		117	619		161	873	
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		0.91			0.93		0.06	0.88		0.45	0.82	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 88
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.93
Intersection Signal Delay: 49.6 Intersection LOS: D
Intersection Capacity Utilization 78.4% ICU Level of Service D
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: NC 16 Business & Triangle Circle/Unity Church Road



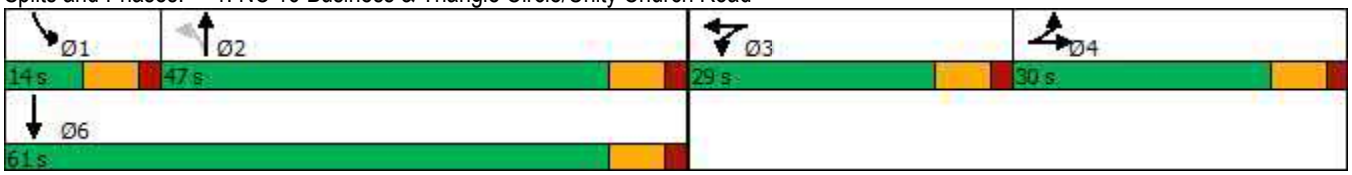
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	209	65	15	153	52	67	9	436	73	67	581	83
Future Volume (vph)	209	65	15	153	52	67	9	436	73	67	581	83
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	150		0	150		0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (ft)	25			25			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		0.993			0.967			0.978			0.981	
Flt Protected		0.965			0.973		0.950			0.950		
Satd. Flow (prot)	0	1785	0	0	1753	0	1770	1822	0	1770	1827	0
Flt Permitted		0.965			0.973		0.150			0.950		
Satd. Flow (perm)	0	1785	0	0	1753	0	279	1822	0	1770	1827	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		45			45			45			45	
Link Distance (ft)		845			913			3237			669	
Travel Time (s)		12.8			13.8			49.0			10.1	
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)	232	72	17	170	58	74	10	484	81	74	646	92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	321	0	0	302	0	10	565	0	74	738	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								Yes				
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	Split	NA		Split	NA		Perm	NA		Prot	NA	
Protected Phases	4	4		3	3			2		1	6	
Permitted Phases							2					
Detector Phase	4	4		3	3		2	2		1	6	
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0		12.0	12.0		7.0	12.0	
Minimum Split (s)	14.0	14.0		14.0	14.0		19.0	19.0		14.0	19.0	
Total Split (s)	30.0	30.0		29.0	29.0		47.0	47.0		14.0	61.0	
Total Split (%)	25.0%	25.0%		24.2%	24.2%		39.2%	39.2%		11.7%	50.8%	
Maximum Green (s)	23.0	23.0		22.0	22.0		40.0	40.0		7.0	54.0	
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	
Total Lost Time (s)		5.0			5.0		5.0	5.0		5.0	5.0	
Lead/Lag	Lag	Lag		Lead	Lead		Lag	Lag		Lead		
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	2.0		2.0	2.0		6.0	6.0		1.0	6.0	
Minimum Gap (s)	0.2	0.2		0.2	0.2		3.0	3.0		0.2	3.0	
Time Before Reduce (s)	0.0	0.0		0.0	0.0		15.0	15.0		0.0	15.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Time To Reduce (s)	0.0	0.0		0.0	0.0		45.0	45.0		0.0	45.0	
Recall Mode	None	None		None	None		Min	Min		None	Min	
Act Effct Green (s)		23.7			22.7		41.6	41.6		9.1	52.2	
Actuated g/C Ratio		0.21			0.20		0.37	0.37		0.08	0.46	
v/c Ratio		0.87			0.86		0.10	0.85		0.52	0.88	
Control Delay		68.3			69.5		29.7	48.6		67.4	41.9	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		68.3			69.5		29.7	48.6		67.4	41.9	
LOS		E			E		C	D		E	D	
Approach Delay		68.3			69.5			48.3			44.2	
Approach LOS		E			E			D			D	
Queue Length 50th (ft)		242			228		5	409		56	499	
Queue Length 95th (ft)		#400			#383		19	#616		#114	#739	
Internal Link Dist (ft)		765			833			3157			589	
Turn Bay Length (ft)							150			150		
Base Capacity (vph)		397			375		104	682		141	912	
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		0.81			0.81		0.10	0.83		0.52	0.81	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 113.8
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.88
Intersection Signal Delay: 53.0 Intersection LOS: D
Intersection Capacity Utilization 79.6% ICU Level of Service D
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: NC 16 Business & Triangle Circle/Unity Church Road



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	209	76	15	239	63	67	9	486	73	67	545	83
Future Volume (vph)	209	76	15	239	63	67	9	486	73	67	545	83
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	150		0	150		0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (ft)	25			25			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		0.993			0.976			0.980			0.980	
Flt Protected		0.966			0.969		0.950			0.950		
Satd. Flow (prot)	0	1787	0	0	1762	0	1770	1825	0	1770	1825	0
Flt Permitted		0.966			0.969		0.169			0.950		
Satd. Flow (perm)	0	1787	0	0	1762	0	315	1825	0	1770	1825	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		45			45			45			45	
Link Distance (ft)		845			521			3237			635	
Travel Time (s)		12.8			7.9			49.0			9.6	
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)	232	84	17	266	70	74	10	540	81	74	606	92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	333	0	0	410	0	10	621	0	74	698	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								Yes				
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	Split	NA		Split	NA		Perm	NA		Prot	NA	
Protected Phases	4	4		3	3			2		1	6	
Permitted Phases							2					
Detector Phase	4	4		3	3		2	2		1	6	
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0		12.0	12.0		7.0	12.0	
Minimum Split (s)	14.0	14.0		14.0	14.0		19.0	19.0		14.0	19.0	
Total Split (s)	27.0	27.0		33.0	33.0		46.0	46.0		14.0	60.0	
Total Split (%)	22.5%	22.5%		27.5%	27.5%		38.3%	38.3%		11.7%	50.0%	
Maximum Green (s)	20.0	20.0		26.0	26.0		39.0	39.0		7.0	53.0	
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	
Total Lost Time (s)		5.0			5.0		5.0	5.0		5.0	5.0	
Lead/Lag	Lag	Lag		Lead	Lead		Lag	Lag		Lead		
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	2.0		2.0	2.0		6.0	6.0		1.0	6.0	
Minimum Gap (s)	0.2	0.2		0.2	0.2		3.0	3.0		0.2	3.0	
Time Before Reduce (s)	0.0	0.0		0.0	0.0		15.0	15.0		0.0	15.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Time To Reduce (s)	0.0	0.0		0.0	0.0		45.0	45.0		0.0	45.0	
Recall Mode	None	None		None	None		Min	Min		None	Min	
Act Effct Green (s)		22.1			28.1		41.1	41.1		9.0	52.0	
Actuated g/C Ratio		0.19			0.24		0.35	0.35		0.08	0.44	
v/c Ratio		0.99			0.97		0.09	0.97		0.54	0.86	
Control Delay		95.9			82.8		29.8	68.0		69.0	41.6	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		95.9			82.8		29.8	68.0		69.0	41.6	
LOS		F			F		C	E		E	D	
Approach Delay		95.9			82.8			67.4			44.2	
Approach LOS		F			F			E			D	
Queue Length 50th (ft)		~267			319		5	477		56	463	
Queue Length 95th (ft)		#456			#528		19	#724		#114	#649	
Internal Link Dist (ft)		765			441			3157			555	
Turn Bay Length (ft)							150			150		
Base Capacity (vph)		336			422		110	639		136	858	
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		0.99			0.97		0.09	0.97		0.54	0.81	

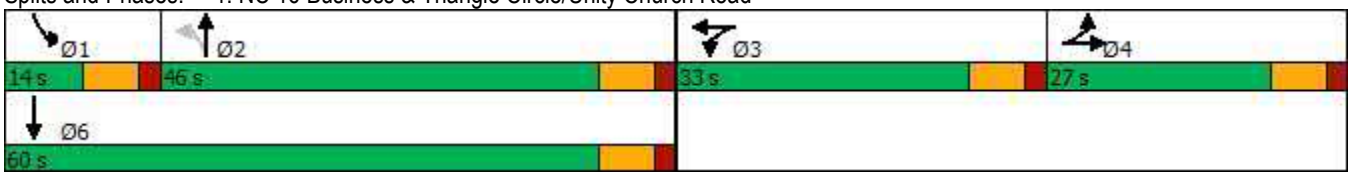
Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 117.2
Natural Cycle: 110
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.99
Intersection Signal Delay: 66.4 Intersection LOS: E
Intersection Capacity Utilization 79.4% ICU Level of Service D
Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: NC 16 Business & Triangle Circle/Unity Church Road



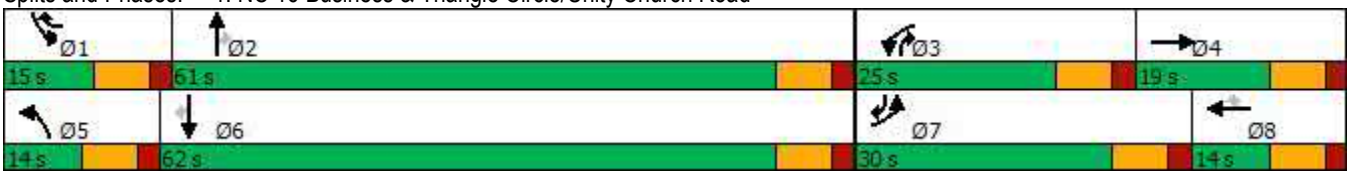
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	209	65	15	153	52	67	9	436	73	67	581	83
Future Volume (vph)	209	65	15	153	52	67	9	436	73	67	581	83
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	500		0	250		225	250		175	200		175
Storage Lanes	1		0	1		1	1		1	1		1
Taper Length (ft)	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		0.971				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1809	0	1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1770	1809	0	1770	1863	1583	1770	1863	1583	1770	1863	1583
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		45			45			45			45	
Link Distance (ft)		844			914			3237			669	
Travel Time (s)		12.8			13.8			49.0			10.1	
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)	232	72	17	170	58	74	10	484	81	74	646	92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	232	89	0	170	58	74	10	484	81	74	646	92
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			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane								Yes				
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	Prot	NA		Prot	NA	pm+ov	Prot	NA	pm+ov	Prot	NA	pm+ov
Protected Phases	7	4		3	8	1	5	2	3	1	6	7
Permitted Phases						8			2			6
Detector Phase	7	4		3	8	1	5	2	3	1	6	7
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0	7.0	7.0	12.0	7.0	7.0	12.0	7.0
Minimum Split (s)	14.0	15.0		14.0	14.0	14.0	14.0	19.0	14.0	14.0	19.0	14.0
Total Split (s)	30.0	19.0		25.0	14.0	15.0	14.0	61.0	25.0	15.0	62.0	30.0
Total Split (%)	25.0%	15.8%		20.8%	11.7%	12.5%	11.7%	50.8%	20.8%	12.5%	51.7%	25.0%
Maximum Green (s)	23.0	12.0		18.0	7.0	8.0	7.0	54.0	18.0	8.0	55.0	23.0
Yellow Time (s)	5.0	5.0		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	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
Total Lost Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead	Lag		Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead
Lead-Lag Optimize?							Yes				Yes	
Vehicle Extension (s)	2.0	2.0		2.0	2.0	1.0	2.0	6.0	2.0	1.0	6.0	2.0
Minimum Gap (s)	0.2	0.2		0.2	0.2	0.2	0.2	3.0	0.2	0.2	3.0	0.2
Time Before Reduce (s)	0.0	0.0		0.0	0.0	0.0	0.0	15.0	0.0	0.0	15.0	0.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Time To Reduce (s)	0.0	0.0		0.0	0.0	0.0	0.0	45.0	0.0	0.0	45.0	0.0
Recall Mode	None	None		None	None	None	None	Min	None	None	Min	None
Act Effct Green (s)	18.3	12.5		15.8	10.0	20.6	10.0	37.7	60.9	10.4	46.3	72.0
Actuated g/C Ratio	0.21	0.14		0.18	0.11	0.23	0.11	0.43	0.69	0.12	0.53	0.82
v/c Ratio	0.63	0.35		0.54	0.27	0.20	0.05	0.61	0.07	0.35	0.66	0.07
Control Delay	44.7	46.0		45.6	48.6	34.1	46.9	26.2	7.6	49.8	21.5	3.3
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	44.7	46.0		45.6	48.6	34.1	46.9	26.2	7.6	49.8	21.5	3.3
LOS	D	D		D	D	C	D	C	A	D	C	A
Approach Delay		45.0			43.4			23.9			22.0	
Approach LOS		D			D			C			C	
Queue Length 50th (ft)	124	47		91	32	33	5	231	18	41	251	9
Queue Length 95th (ft)	253	119		197	89	94	25	369	37	107	541	33
Internal Link Dist (ft)		764			834			3157			589	
Turn Bay Length (ft)	500			250		225	250		175	200		175
Base Capacity (vph)	558	319		446	212	383	200	1238	1147	223	1253	1367
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.42	0.28		0.38	0.27	0.19	0.05	0.39	0.07	0.33	0.52	0.07

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 87.9
Natural Cycle: 80
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.66
Intersection Signal Delay: 29.5 Intersection LOS: C
Intersection Capacity Utilization 67.2% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 1: NC 16 Business & Triangle Circle/Unity Church Road



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	209	76	15	239	63	67	9	486	73	67	545	83
Future Volume (vph)	209	76	15	239	63	67	9	486	73	67	545	83
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	500		0	250		225	250		175	200		175
Storage Lanes	1		0	1		1	1		1	1		1
Taper Length (ft)	100			180			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		0.975				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1816	0	1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1770	1816	0	1770	1863	1583	1770	1863	1583	1770	1863	1583
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		45			45			45			45	
Link Distance (ft)		844			520			3237			634	
Travel Time (s)		12.8			7.9			49.0			9.6	
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)	232	84	17	266	70	74	10	540	81	74	606	92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	232	101	0	266	70	74	10	540	81	74	606	92
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			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane								Yes				
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	Prot	NA		Prot	NA	pm+ov	Prot	NA	Perm	Prot	NA	pm+ov
Protected Phases	7	4		3	8	1	5	2		1	6	7
Permitted Phases						8			2			6
Detector Phase	7	4		3	8	1	5	2	2	1	6	7
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0	7.0	7.0	12.0	12.0	7.0	12.0	7.0
Minimum Split (s)	15.0	14.0		14.0	14.0	14.0	14.0	19.0	19.0	14.0	19.0	15.0
Total Split (s)	30.0	16.0		31.0	17.0	15.0	14.0	58.0	58.0	15.0	59.0	30.0
Total Split (%)	25.0%	13.3%		25.8%	14.2%	12.5%	11.7%	48.3%	48.3%	12.5%	49.2%	25.0%
Maximum Green (s)	23.0	9.0		24.0	10.0	8.0	7.0	51.0	51.0	8.0	52.0	23.0
Yellow Time (s)	5.0	5.0		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	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
Total Lost Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead	Lag		Lead	Lag	Lead	Lead	Lag	Lag	Lead	Lag	Lead
Lead-Lag Optimize?							Yes				Yes	
Vehicle Extension (s)	2.0	2.0		2.0	2.0	1.0	2.0	6.0	6.0	1.0	6.0	2.0
Minimum Gap (s)	0.2	0.2		0.2	0.2	0.2	0.2	3.0	3.0	0.2	3.0	0.2
Time Before Reduce (s)	0.0	0.0		0.0	0.0	0.0	0.0	15.0	15.0	0.0	15.0	0.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Time To Reduce (s)	0.0	0.0		0.0	0.0	0.0	0.0	45.0	45.0	0.0	45.0	0.0
Recall Mode	None	None		None	None	None	None	Min	Min	None	Min	None
Act Effct Green (s)	23.9	10.8		20.8	12.1	23.0	9.5	39.6	39.6	10.0	48.2	78.9
Actuated g/C Ratio	0.24	0.11		0.21	0.12	0.23	0.10	0.40	0.40	0.10	0.49	0.81
v/c Ratio	0.54	0.51		0.71	0.30	0.20	0.06	0.72	0.13	0.41	0.66	0.07
Control Delay	43.7	56.9		49.7	49.3	34.7	50.1	32.0	20.8	55.6	23.9	4.0
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	43.7	56.9		49.7	49.3	34.7	50.1	32.0	20.8	55.6	23.9	4.0
LOS	D	E		D	D	C	D	C	C	E	C	A
Approach Delay		47.7			46.9			30.8			24.5	
Approach LOS		D			D			C			C	
Queue Length 50th (ft)	142	63		162	42	37	6	299	34	46	260	11
Queue Length 95th (ft)	253	#145		288	100	91	25	447	68	107	517	37
Internal Link Dist (ft)		764			440			3157			554	
Turn Bay Length (ft)	500			250		225	250		175	200		175
Base Capacity (vph)	488	214		494	248	381	171	1061	902	190	1107	1326
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.48	0.47		0.54	0.28	0.19	0.06	0.51	0.09	0.39	0.55	0.07

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 97.9
Natural Cycle: 80
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.72
Intersection Signal Delay: 34.3 Intersection LOS: C
Intersection Capacity Utilization 66.9% 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: 1: NC 16 Business & Triangle Circle/Unity Church Road

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	209	76	15	239	63	67	9	486	73	67	545	83
Future Volume (vph)	209	76	15	239	63	67	9	486	73	67	545	83
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	500		0	300		225	250		175	200		175
Storage Lanes	1		0	1		1	1		1	1		1
Taper Length (ft)	100			180			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		0.975				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1816	0	1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1770	1816	0	1770	1863	1583	1770	1863	1583	1770	1863	1583
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		45			45			45			45	
Link Distance (ft)		844			635			3237			634	
Travel Time (s)		12.8			9.6			49.0			9.6	
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)	232	84	17	266	70	74	10	540	81	74	606	92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	232	101	0	266	70	74	10	540	81	74	606	92
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			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane								Yes				
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	Prot	NA		Prot	NA	pm+ov	Prot	NA	Perm	Prot	NA	pm+ov
Protected Phases	7	4		3	8	1	5	2		1	6	7
Permitted Phases						8			2			6
Detector Phase	7	4		3	8	1	5	2	2	1	6	7
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0	7.0	7.0	12.0	12.0	7.0	12.0	7.0
Minimum Split (s)	15.0	14.0		14.0	14.0	14.0	14.0	19.0	19.0	14.0	19.0	15.0
Total Split (s)	30.0	16.0		31.0	17.0	15.0	14.0	58.0	58.0	15.0	59.0	30.0
Total Split (%)	25.0%	13.3%		25.8%	14.2%	12.5%	11.7%	48.3%	48.3%	12.5%	49.2%	25.0%
Maximum Green (s)	23.0	9.0		24.0	10.0	8.0	7.0	51.0	51.0	8.0	52.0	23.0
Yellow Time (s)	5.0	5.0		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	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
Total Lost Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead	Lag		Lead	Lag	Lead	Lead	Lag	Lag	Lead	Lag	Lead
Lead-Lag Optimize?							Yes				Yes	
Vehicle Extension (s)	2.0	2.0		2.0	2.0	1.0	2.0	6.0	6.0	1.0	6.0	2.0
Minimum Gap (s)	0.2	0.2		0.2	0.2	0.2	0.2	3.0	3.0	0.2	3.0	0.2
Time Before Reduce (s)	0.0	0.0		0.0	0.0	0.0	0.0	15.0	15.0	0.0	15.0	0.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Time To Reduce (s)	0.0	0.0		0.0	0.0	0.0	0.0	45.0	45.0	0.0	45.0	0.0
Recall Mode	None	None		None	None	None	None	Min	Min	None	Min	None
Act Effct Green (s)	23.9	10.8		20.8	12.1	23.0	9.5	39.6	39.6	10.0	48.2	78.9
Actuated g/C Ratio	0.24	0.11		0.21	0.12	0.23	0.10	0.40	0.40	0.10	0.49	0.81
v/c Ratio	0.54	0.51		0.71	0.30	0.20	0.06	0.72	0.13	0.41	0.66	0.07
Control Delay	43.7	56.9		49.7	49.3	34.7	50.1	32.0	20.8	55.6	23.9	4.0
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	43.7	56.9		49.7	49.3	34.7	50.1	32.0	20.8	55.6	23.9	4.0
LOS	D	E		D	D	C	D	C	C	E	C	A
Approach Delay		47.7			46.9			30.8			24.5	
Approach LOS		D			D			C			C	
Queue Length 50th (ft)	142	63		162	42	37	6	299	34	46	260	11
Queue Length 95th (ft)	253	#145		288	100	91	25	447	68	107	517	37
Internal Link Dist (ft)		764			555			3157			554	
Turn Bay Length (ft)	500			300		225	250		175	200		175
Base Capacity (vph)	488	214		494	248	381	171	1061	902	190	1107	1326
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.48	0.47		0.54	0.28	0.19	0.06	0.51	0.09	0.39	0.55	0.07

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 97.9
Natural Cycle: 80
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.72
Intersection Signal Delay: 34.3 Intersection LOS: C
Intersection Capacity Utilization 66.9% 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: 1: NC 16 Business & Triangle Circle/Unity Church Road

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	252	94	6	119	23	83	4	536	139	81	600	69
Future Volume (vph)	252	94	6	119	23	83	4	536	139	81	600	69
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	150		0	150		0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (ft)	25			25			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		0.998			0.950			0.969			0.984	
Flt Protected		0.965			0.974		0.950			0.950		
Satd. Flow (prot)	0	1794	0	0	1724	0	1770	1805	0	1770	1833	0
Flt Permitted		0.965			0.974		0.212			0.950		
Satd. Flow (perm)	0	1794	0	0	1724	0	395	1805	0	1770	1833	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		45			45			45			45	
Link Distance (ft)		845			913			3237			669	
Travel Time (s)		12.8			13.8			49.0			10.1	
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)	280	104	7	132	26	92	4	596	154	90	667	77
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	391	0	0	250	0	4	750	0	90	744	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								Yes				
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	Split	NA		Split	NA		Perm	NA		Prot	NA	
Protected Phases	4	4		3	3			2		1	6	
Permitted Phases							2					
Detector Phase	4	4		3	3		2	2		1	6	
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0		12.0	12.0		7.0	12.0	
Minimum Split (s)	15.0	15.0		15.0	15.0		18.0	18.0		13.0	19.0	
Total Split (s)	30.0	30.0		22.0	22.0		55.0	55.0		13.0	68.0	
Total Split (%)	25.0%	25.0%		18.3%	18.3%		45.8%	45.8%		10.8%	56.7%	
Maximum Green (s)	22.8	22.8		14.3	14.3		49.0	49.0		7.5	61.3	
Yellow Time (s)	4.7	4.7		4.7	4.7		4.0	4.0		4.0	4.7	
All-Red Time (s)	2.5	2.5		3.0	3.0		2.0	2.0		1.5	2.0	
Lost Time Adjust (s)		-2.2			-2.7		-1.0	-1.0		-0.5	-1.7	
Total Lost Time (s)		5.0			5.0		5.0	5.0		5.0	5.0	
Lead/Lag	Lag	Lag		Lead	Lead		Lag	Lag		Lead		
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes		
Vehicle Extension (s)	2.0	2.0		2.0	2.0		6.0	6.0		1.0	6.0	
Minimum Gap (s)	0.2	0.2		0.2	0.2		3.0	3.0		0.2	3.0	
Time Before Reduce (s)	0.0	0.0		0.0	0.0		15.0	15.0		0.0	15.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Time To Reduce (s)	0.0	0.0		0.0	0.0		45.0	45.0		0.0	45.0	
Recall Mode	None	None		None	None		Min	Min		None	Min	
Act Effct Green (s)		25.0			17.0		50.0	50.0		7.9	62.9	
Actuated g/C Ratio		0.21			0.14		0.42	0.42		0.07	0.52	
v/c Ratio		1.05			1.02		0.02	1.00		0.77	0.77	
Control Delay		105.6			114.7		21.5	67.4		93.8	29.7	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		105.6			114.7		21.5	67.4		93.8	29.7	
LOS		F			F		C	E		F	C	
Approach Delay		105.6			114.7			67.2			36.6	
Approach LOS		F			F			E			D	
Queue Length 50th (ft)		~329			~206		2	571		70	444	
Queue Length 95th (ft)		#524			#372		9	#840		#160	615	
Internal Link Dist (ft)		765			833			3157			589	
Turn Bay Length (ft)							150			150		
Base Capacity (vph)		373			244		164	753		118	963	
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		1.05			1.02		0.02	1.00		0.76	0.77	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 119.9
Natural Cycle: 120
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.05
Intersection Signal Delay: 67.8 Intersection LOS: E
Intersection Capacity Utilization 84.2% ICU Level of Service E
Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: NC 16 Business & Triangle Circle/Unity Church Road

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	257	96	9	124	23	85	6	552	144	83	622	70
Future Volume (vph)	257	96	9	124	23	85	6	552	144	83	622	70
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	150		0	150		0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (ft)	25			25			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		0.997			0.951			0.969			0.985	
Flt Protected		0.966			0.974		0.950			0.950		
Satd. Flow (prot)	0	1794	0	0	1725	0	1770	1805	0	1770	1835	0
Flt Permitted		0.966			0.974		0.195			0.950		
Satd. Flow (perm)	0	1794	0	0	1725	0	363	1805	0	1770	1835	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		45			45			45			45	
Link Distance (ft)		845			913			3237			669	
Travel Time (s)		12.8			13.8			49.0			10.1	
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)	286	107	10	138	26	94	7	613	160	92	691	78
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	403	0	0	258	0	7	773	0	92	769	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								Yes				
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	Split	NA		Split	NA		Perm	NA		Prot	NA	
Protected Phases	4	4		3	3			2		1	6	
Permitted Phases							2					
Detector Phase	4	4		3	3		2	2		1	6	
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0		12.0	12.0		7.0	12.0	
Minimum Split (s)	14.0	14.0		14.0	14.0		19.0	19.0		14.0	19.0	
Total Split (s)	30.0	30.0		22.0	22.0		54.0	54.0		14.0	68.0	
Total Split (%)	25.0%	25.0%		18.3%	18.3%		45.0%	45.0%		11.7%	56.7%	
Maximum Green (s)	23.0	23.0		15.0	15.0		47.0	47.0		7.0	61.0	
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	
Total Lost Time (s)		5.0			5.0		5.0	5.0		5.0	5.0	
Lead/Lag	Lag	Lag		Lead	Lead		Lag	Lag		Lead		
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes		
Vehicle Extension (s)	2.0	2.0		2.0	2.0		6.0	6.0		1.0	6.0	
Minimum Gap (s)	0.2	0.2		0.2	0.2		3.0	3.0		0.2	3.0	
Time Before Reduce (s)	0.0	0.0		0.0	0.0		15.0	15.0		0.0	15.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Time To Reduce (s)	0.0	0.0		0.0	0.0		45.0	45.0		0.0	45.0	
Recall Mode	None	None		None	None		Min	Min		None	Min	
Act Effct Green (s)		25.0			17.0		49.0	49.0		9.0	63.0	
Actuated g/C Ratio		0.21			0.14		0.41	0.41		0.08	0.52	
v/c Ratio		1.08			1.06		0.05	1.05		0.70	0.80	
Control Delay		114.8			123.0		22.8	81.9		81.1	31.1	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		114.8			123.0		22.8	81.9		81.1	31.1	
LOS		F			F		C	F		F	C	
Approach Delay		114.8			123.0			81.4			36.4	
Approach LOS		F			F			F			D	
Queue Length 50th (ft)		~348			~219		3	~652		71	469	
Queue Length 95th (ft)		#547			#388		14	#892		#151	650	
Internal Link Dist (ft)		765			833			3157			589	
Turn Bay Length (ft)							150			150		
Base Capacity (vph)		373			244		148	737		132	963	
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		1.08			1.06		0.05	1.05		0.70	0.80	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Natural Cycle: 140
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.08
Intersection Signal Delay: 75.1 Intersection LOS: E
Intersection Capacity Utilization 86.0% ICU Level of Service E
Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: NC 16 Business & Triangle Circle/Unity Church Road

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	257	104	9	198	31	85	6	587	144	83	584	70
Future Volume (vph)	257	104	9	198	31	85	6	587	144	83	584	70
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	150		0	150		0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (ft)	25			25			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		0.997			0.964			0.970			0.984	
Flt Protected		0.966			0.969		0.950			0.950		
Satd. Flow (prot)	0	1794	0	0	1740	0	1770	1807	0	1770	1833	0
Flt Permitted		0.966			0.969		0.225			0.950		
Satd. Flow (perm)	0	1794	0	0	1740	0	419	1807	0	1770	1833	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		45			45			45			45	
Link Distance (ft)		845			521			3237			635	
Travel Time (s)		12.8			7.9			49.0			9.6	
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)	286	116	10	220	34	94	7	652	160	92	649	78
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	412	0	0	348	0	7	812	0	92	727	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								Yes				
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	Split	NA		Split	NA		Perm	NA		Prot	NA	
Protected Phases	4	4		3	3			2		1	6	
Permitted Phases							2					
Detector Phase	4	4		3	3		2	2		1	6	
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0		12.0	12.0		7.0	12.0	
Minimum Split (s)	14.0	14.0		14.0	14.0		19.0	19.0		14.0	19.0	
Total Split (s)	28.0	28.0		25.0	25.0		53.0	53.0		14.0	67.0	
Total Split (%)	23.3%	23.3%		20.8%	20.8%		44.2%	44.2%		11.7%	55.8%	
Maximum Green (s)	21.0	21.0		18.0	18.0		46.0	46.0		7.0	60.0	
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	
Total Lost Time (s)		5.0			5.0		5.0	5.0		5.0	5.0	
Lead/Lag	Lag	Lag		Lead	Lead		Lag	Lag		Lead		
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	2.0		2.0	2.0		6.0	6.0		1.0	6.0	
Minimum Gap (s)	0.2	0.2		0.2	0.2		3.0	3.0		0.2	3.0	
Time Before Reduce (s)	0.0	0.0		0.0	0.0		15.0	15.0		0.0	15.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Time To Reduce (s)	0.0	0.0		0.0	0.0		45.0	45.0		0.0	45.0	
Recall Mode	None	None		None	None		Min	Min		None	Min	
Act Effct Green (s)		23.0			20.0		48.0	48.0		9.0	62.0	
Actuated g/C Ratio		0.19			0.17		0.40	0.40		0.08	0.52	
v/c Ratio		1.20			1.20		0.04	1.12		0.70	0.77	
Control Delay		157.2			161.5		23.2	107.8		81.1	30.0	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		157.2			161.5		23.2	107.8		81.1	30.0	
LOS		F			F		C	F		F	C	
Approach Delay		157.2			161.5			107.1			35.7	
Approach LOS		F			F			F			D	
Queue Length 50th (ft)		~387			~327		3	~726		71	435	
Queue Length 95th (ft)		#587			#514		14	#968		#151	602	
Internal Link Dist (ft)		765			441			3157			555	
Turn Bay Length (ft)							150			150		
Base Capacity (vph)		343			290		167	722		132	947	
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		1.20			1.20		0.04	1.12		0.70	0.77	

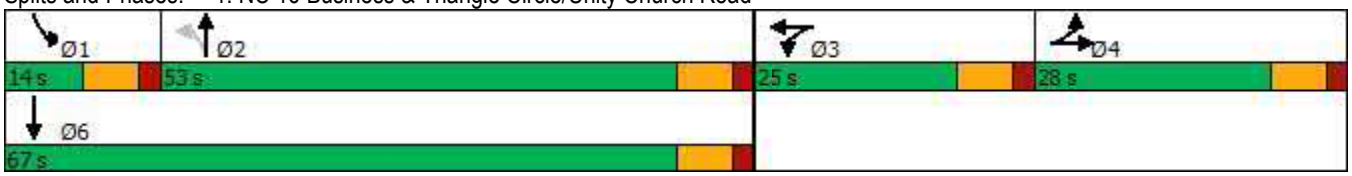
Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Natural Cycle: 150
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.20
Intersection Signal Delay: 99.2 Intersection LOS: F
Intersection Capacity Utilization 82.8% ICU Level of Service E
Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: NC 16 Business & Triangle Circle/Unity Church Road



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	257	96	9	124	23	85	6	552	144	83	622	70
Future Volume (vph)	257	96	9	124	23	85	6	552	144	83	622	70
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	500		0	250		225	250		175	200		175
Storage Lanes	1		0	1		1	1		1	1		1
Taper Length (ft)	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		0.987				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1839	0	1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1770	1839	0	1770	1863	1583	1770	1863	1583	1770	1863	1583
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		45			45			45			45	
Link Distance (ft)		844			914			3237			669	
Travel Time (s)		12.8			13.8			49.0			10.1	
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)	286	107	10	138	26	94	7	613	160	92	691	78
Shared Lane Traffic (%)												
Lane Group Flow (vph)	286	117	0	138	26	94	7	613	160	92	691	78
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			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane								Yes				
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	Prot	NA		Prot	NA	pm+ov	Prot	NA	pm+ov	Prot	NA	pm+ov
Protected Phases	7	4		3	8	1	5	2	3	1	6	7
Permitted Phases						8			2			6
Detector Phase	7	4		3	8	1	5	2	3	1	6	7
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0	7.0	7.0	12.0	7.0	7.0	12.0	7.0
Minimum Split (s)	14.0	14.0		14.0	19.0	14.0	14.0	19.0	14.0	14.0	19.0	14.0
Total Split (s)	29.0	26.0		22.0	19.0	14.0	14.0	58.0	22.0	14.0	58.0	29.0
Total Split (%)	24.2%	21.7%		18.3%	15.8%	11.7%	11.7%	48.3%	18.3%	11.7%	48.3%	24.2%
Maximum Green (s)	22.0	19.0		15.0	12.0	7.0	7.0	51.0	15.0	7.0	51.0	22.0
Yellow Time (s)	5.0	5.0		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	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
Total Lost Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead	Lag		Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead
Lead-Lag Optimize?							Yes				Yes	
Vehicle Extension (s)	2.0	2.0		2.0	2.0	1.0	2.0	6.0	2.0	1.0	6.0	2.0
Minimum Gap (s)	0.2	0.2		0.2	0.2	0.2	0.2	3.0	0.2	0.2	3.0	0.2
Time Before Reduce (s)	0.0	0.0		0.0	0.0	0.0	0.0	15.0	0.0	0.0	15.0	0.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Time To Reduce (s)	0.0	0.0		0.0	0.0	0.0	0.0	45.0	0.0	0.0	45.0	0.0
Recall Mode	None	None		None	None	None	None	Min	None	None	Min	None
Act Effct Green (s)	25.2	14.3		13.7	9.7	17.2	9.3	41.5	60.4	9.3	53.6	86.4
Actuated g/C Ratio	0.25	0.14		0.14	0.10	0.17	0.09	0.42	0.61	0.09	0.54	0.87
v/c Ratio	0.64	0.44		0.57	0.14	0.34	0.04	0.79	0.17	0.56	0.69	0.06
Control Delay	44.6	47.5		52.6	49.0	41.1	49.5	33.9	9.0	62.2	23.4	3.2
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	44.6	47.5		52.6	49.0	41.1	49.5	33.9	9.0	62.2	23.4	3.2
LOS	D	D		D	D	D	D	C	A	E	C	A
Approach Delay		45.4			48.1			28.9			25.7	
Approach LOS		D			D			C			C	
Queue Length 50th (ft)	180	71		89	17	54	4	356	45	61	321	7
Queue Length 95th (ft)	#340	140		166	47	109	20	516	75	#147	619	32
Internal Link Dist (ft)		764			834			3157			589	
Turn Bay Length (ft)	500			250		225	250		175	200		175
Base Capacity (vph)	454	399		311	269	273	165	1022	1022	165	1077	1359
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.63	0.29		0.44	0.10	0.34	0.04	0.60	0.16	0.56	0.64	0.06

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 99.4
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.79
Intersection Signal Delay: 32.7 Intersection LOS: C
Intersection Capacity Utilization 72.0% 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: 1: NC 16 Business & Triangle Circle/Unity Church Road

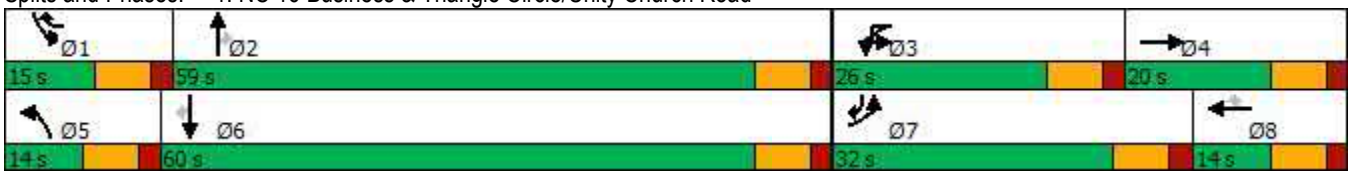
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	257	104	9	198	31	85	6	587	144	83	584	70
Future Volume (vph)	257	104	9	198	31	85	6	587	144	83	584	70
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	500		0	250		225	250		175	200		175
Storage Lanes	1		0	1		1	1		1	1		1
Taper Length (ft)	100			180			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		0.988				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1840	0	1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1770	1840	0	1770	1863	1583	1770	1863	1583	1770	1863	1583
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		45			45			45			45	
Link Distance (ft)		844			520			3237			640	
Travel Time (s)		12.8			7.9			49.0			9.7	
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)	286	116	10	220	34	94	7	652	160	92	649	78
Shared Lane Traffic (%)												
Lane Group Flow (vph)	286	126	0	220	34	94	7	652	160	92	649	78
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			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane								Yes				
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	Prot	NA		Prot	NA	pm+ov	Prot	NA	Perm	Prot	NA	pm+ov
Protected Phases	7	4		3	8	1	5	2		1	6	7
Permitted Phases						8			2			6
Detector Phase	7	4		3	8	1	5	2	2	1	6	7
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0	7.0	7.0	12.0	12.0	7.0	12.0	7.0
Minimum Split (s)	15.0	14.0		14.0	14.0	14.0	14.0	19.0	19.0	14.0	19.0	15.0
Total Split (s)	32.0	20.0		26.0	14.0	15.0	14.0	59.0	59.0	15.0	60.0	32.0
Total Split (%)	26.7%	16.7%		21.7%	11.7%	12.5%	11.7%	49.2%	49.2%	12.5%	50.0%	26.7%
Maximum Green (s)	25.0	13.0		19.0	7.0	8.0	7.0	52.0	52.0	8.0	53.0	25.0
Yellow Time (s)	5.0	5.0		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	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
Total Lost Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead	Lag		Lead	Lag	Lead	Lead	Lag	Lag	Lead	Lag	Lead
Lead-Lag Optimize?							Yes				Yes	
Vehicle Extension (s)	2.0	2.0		2.0	2.0	1.0	2.0	6.0	6.0	1.0	6.0	2.0
Minimum Gap (s)	0.2	0.2		0.2	0.2	0.2	0.2	3.0	3.0	0.2	3.0	0.2
Time Before Reduce (s)	0.0	0.0		0.0	0.0	0.0	0.0	15.0	15.0	0.0	15.0	0.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Time To Reduce (s)	0.0	0.0		0.0	0.0	0.0	0.0	45.0	45.0	0.0	45.0	0.0
Recall Mode	None	None		None	None	None	None	Min	Min	None	Min	None
Act Effct Green (s)	28.4	12.9		18.2	9.4	17.7	9.2	45.8	45.8	9.9	58.3	94.2
Actuated g/C Ratio	0.26	0.12		0.17	0.09	0.17	0.09	0.43	0.43	0.09	0.54	0.88
v/c Ratio	0.61	0.57		0.73	0.21	0.36	0.05	0.82	0.24	0.56	0.64	0.06
Control Delay	44.8	58.1		59.4	54.1	44.8	52.2	37.2	21.0	65.0	22.5	2.8
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	44.8	58.1		59.4	54.1	44.8	52.2	37.2	21.0	65.0	22.5	2.8
LOS	D	E		E	D	D	D	D	C	E	C	A
Approach Delay		48.9			54.9			34.2			25.4	
Approach LOS		D			D			C			C	
Queue Length 50th (ft)	200	89		154	24	58	5	411	73	67	304	8
Queue Length 95th (ft)	306	158		#265	59	114	21	577	122	#139	563	29
Internal Link Dist (ft)		764			440			3157			560	
Turn Bay Length (ft)	500			250		225	250		175	200		175
Base Capacity (vph)	478	263		354	163	266	151	959	815	168	1054	1380
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.60	0.48		0.62	0.21	0.35	0.05	0.68	0.20	0.55	0.62	0.06

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 107.2			
Natural Cycle: 90			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.82			
Intersection Signal Delay: 36.7		Intersection LOS: D	
Intersection Capacity Utilization 70.1%		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: 1: NC 16 Business & Triangle Circle/Unity Church Road



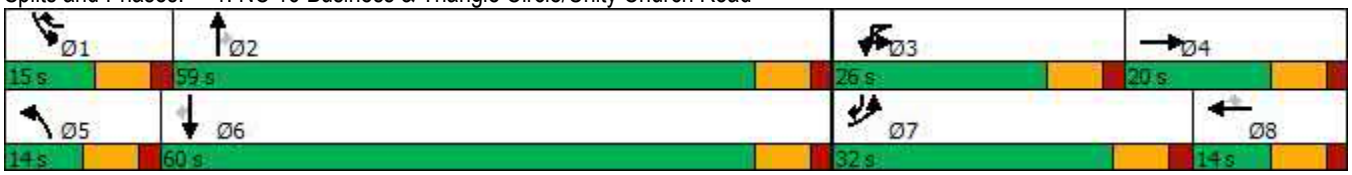
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	257	104	9	198	31	85	6	587	144	83	584	70
Future Volume (vph)	257	104	9	198	31	85	6	587	144	83	584	70
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	500		0	300		225	250		175	200		175
Storage Lanes	1		0	1		1	1		1	1		1
Taper Length (ft)	100			180			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		0.988				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1840	0	1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1770	1840	0	1770	1863	1583	1770	1863	1583	1770	1863	1583
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		45			45			45			45	
Link Distance (ft)		844			635			3237			640	
Travel Time (s)		12.8			9.6			49.0			9.7	
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)	286	116	10	220	34	94	7	652	160	92	649	78
Shared Lane Traffic (%)												
Lane Group Flow (vph)	286	126	0	220	34	94	7	652	160	92	649	78
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			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane								Yes				
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	Prot	NA		Prot	NA	pm+ov	Prot	NA	Perm	Prot	NA	pm+ov
Protected Phases	7	4		3	8	1	5	2		1	6	7
Permitted Phases						8			2			6
Detector Phase	7	4		3	8	1	5	2	2	1	6	7
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0	7.0	7.0	12.0	12.0	7.0	12.0	7.0
Minimum Split (s)	15.0	14.0		14.0	14.0	14.0	14.0	19.0	19.0	14.0	19.0	15.0
Total Split (s)	32.0	20.0		26.0	14.0	15.0	14.0	59.0	59.0	15.0	60.0	32.0
Total Split (%)	26.7%	16.7%		21.7%	11.7%	12.5%	11.7%	49.2%	49.2%	12.5%	50.0%	26.7%
Maximum Green (s)	25.0	13.0		19.0	7.0	8.0	7.0	52.0	52.0	8.0	53.0	25.0
Yellow Time (s)	5.0	5.0		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	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
Total Lost Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead	Lag		Lead	Lag	Lead	Lead	Lag	Lag	Lead	Lag	Lead
Lead-Lag Optimize?							Yes				Yes	
Vehicle Extension (s)	2.0	2.0		2.0	2.0	1.0	2.0	6.0	6.0	1.0	6.0	2.0
Minimum Gap (s)	0.2	0.2		0.2	0.2	0.2	0.2	3.0	3.0	0.2	3.0	0.2
Time Before Reduce (s)	0.0	0.0		0.0	0.0	0.0	0.0	15.0	15.0	0.0	15.0	0.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Time To Reduce (s)	0.0	0.0		0.0	0.0	0.0	0.0	45.0	45.0	0.0	45.0	0.0
Recall Mode	None	None		None	None	None	None	Min	Min	None	Min	None
Act Effct Green (s)	28.4	12.9		18.2	9.4	17.7	9.2	45.8	45.8	9.9	58.3	94.2
Actuated g/C Ratio	0.26	0.12		0.17	0.09	0.17	0.09	0.43	0.43	0.09	0.54	0.88
v/c Ratio	0.61	0.57		0.73	0.21	0.36	0.05	0.82	0.24	0.56	0.64	0.06
Control Delay	44.8	58.1		59.4	54.1	44.8	52.2	37.2	21.0	65.0	22.5	2.8
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	44.8	58.1		59.4	54.1	44.8	52.2	37.2	21.0	65.0	22.5	2.8
LOS	D	E		E	D	D	D	D	C	E	C	A
Approach Delay		48.9			54.9			34.2			25.4	
Approach LOS		D			D			C			C	
Queue Length 50th (ft)	200	89		154	24	58	5	411	73	67	304	8
Queue Length 95th (ft)	306	158		#265	59	114	21	577	122	#139	563	29
Internal Link Dist (ft)		764			555			3157			560	
Turn Bay Length (ft)	500			300		225	250		175	200		175
Base Capacity (vph)	478	263		354	163	266	151	959	815	168	1054	1380
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.60	0.48		0.62	0.21	0.35	0.05	0.68	0.20	0.55	0.62	0.06

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 107.2
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.82
Intersection Signal Delay: 36.7 Intersection LOS: D
Intersection Capacity Utilization 70.1% 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: 1: NC 16 Business & Triangle Circle/Unity Church Road



APPENDIX G

NC 16 BUSINESS AND TRIANGLE CIRCLE

SYNCHRO REPORTS

Intersection	
Int Delay, s/veh	3.8

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	4	168	62	464	813	4
Future Vol, veh/h	4	168	62	464	813	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	350	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	4	187	69	516	903	4

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1559	905	907	0	-	0
Stage 1	905	-	-	-	-	-
Stage 2	654	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	124	335	750	-	-	-
Stage 1	395	-	-	-	-	-
Stage 2	517	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	113	335	750	-	-	-
Mov Cap-2 Maneuver	243	-	-	-	-	-
Stage 1	359	-	-	-	-	-
Stage 2	517	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	29.6	1.2	0
HCM LOS	D		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	750	-	332	-	-
HCM Lane V/C Ratio	0.092	-	0.576	-	-
HCM Control Delay (s)	10.3	-	29.6	-	-
HCM Lane LOS	B	-	D	-	-
HCM 95th %tile Q(veh)	0.3	-	3.4	-	-

Intersection	
Int Delay, s/veh	4.8

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	4	184	111	488	834	4
Future Vol, veh/h	4	184	111	488	834	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	350	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	4	204	123	542	927	4

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1717	929	931	0	-	0
Stage 1	929	-	-	-	-	-
Stage 2	788	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	99	324	735	-	-	-
Stage 1	385	-	-	-	-	-
Stage 2	448	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	82	324	735	-	-	-
Mov Cap-2 Maneuver	207	-	-	-	-	-
Stage 1	321	-	-	-	-	-
Stage 2	448	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	35.1	2	0
HCM LOS	E		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	735	-	320	-	-
HCM Lane V/C Ratio	0.168	-	0.653	-	-
HCM Control Delay (s)	10.9	-	35.1	-	-
HCM Lane LOS	B	-	E	-	-
HCM 95th %tile Q(veh)	0.6	-	4.3	-	-

Intersection	
Int Delay, s/veh	5.2

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	4	184	111	538	884	4
Future Vol, veh/h	4	184	111	538	884	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	350	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	4	204	123	598	982	4

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1828	984	986	0	-	0
Stage 1	984	-	-	-	-	-
Stage 2	844	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	84	301	701	-	-	-
Stage 1	362	-	-	-	-	-
Stage 2	422	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	69	301	701	-	-	-
Mov Cap-2 Maneuver	190	-	-	-	-	-
Stage 1	299	-	-	-	-	-
Stage 2	422	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	41.4	1.9	0
HCM LOS	E		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	701	-	297	-	-
HCM Lane V/C Ratio	0.176	-	0.703	-	-
HCM Control Delay (s)	11.2	-	41.4	-	-
HCM Lane LOS	B	-	E	-	-
HCM 95th %tile Q(veh)	0.6	-	4.9	-	-

Intersection	
Int Delay, s/veh	2.7

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	4	125	193	654	689	4
Future Vol, veh/h	4	125	193	654	689	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	350	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	4	139	214	727	766	4

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1923	768	770	0	-	0
Stage 1	768	-	-	-	-	-
Stage 2	1155	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	74	402	844	-	-	-
Stage 1	458	-	-	-	-	-
Stage 2	300	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	55	402	844	-	-	-
Mov Cap-2 Maneuver	171	-	-	-	-	-
Stage 1	342	-	-	-	-	-
Stage 2	300	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	19.7	2.4	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	844	-	386	-	-
HCM Lane V/C Ratio	0.254	-	0.371	-	-
HCM Control Delay (s)	10.7	-	19.7	-	-
HCM Lane LOS	B	-	C	-	-
HCM 95th %tile Q(veh)	1	-	1.7	-	-

Intersection	
Int Delay, s/veh	4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	4	178	224	676	719	4
Future Vol, veh/h	4	178	224	676	719	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	350	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	4	198	249	751	799	4

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	2050	801	803	0	-	0
Stage 1	801	-	-	-	-	-
Stage 2	1249	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	61	384	821	-	-	-
Stage 1	442	-	-	-	-	-
Stage 2	270	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	43	384	821	-	-	-
Mov Cap-2 Maneuver	151	-	-	-	-	-
Stage 1	308	-	-	-	-	-
Stage 2	270	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	25.7	2.8	0
HCM LOS	D		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	821	-	371	-	-
HCM Lane V/C Ratio	0.303	-	0.545	-	-
HCM Control Delay (s)	11.3	-	25.7	-	-
HCM Lane LOS	B	-	D	-	-
HCM 95th %tile Q(veh)	1.3	-	3.1	-	-

Intersection	
Int Delay, s/veh	4.1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	4	178	224	711	755	4
Future Vol, veh/h	4	178	224	711	755	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	350	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	4	198	249	790	839	4

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	2129	841	843	0	-	0
Stage 1	841	-	-	-	-	-
Stage 2	1288	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	55	365	793	-	-	-
Stage 1	423	-	-	-	-	-
Stage 2	259	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	38	365	793	-	-	-
Mov Cap-2 Maneuver	142	-	-	-	-	-
Stage 1	290	-	-	-	-	-
Stage 2	259	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	28	2.8	0
HCM LOS	D		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	793	-	353	-	-
HCM Lane V/C Ratio	0.314	-	0.573	-	-
HCM Control Delay (s)	11.6	-	28	-	-
HCM Lane LOS	B	-	D	-	-
HCM 95th %tile Q(veh)	1.3	-	3.4	-	-

APPENDIX H

NC 16 BUSINESS AND ACCESS A

SYNCHRO REPORTS & TURN LANE WARRANTS

Intersection	
Int Delay, s/veh	1.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	75	678	85	75	695
Future Vol, veh/h	0	75	678	85	75	695
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	Free	-	None
Storage Length	-	0	-	-	100	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	83	753	94	83	772

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	-	753	0	-	753	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.22	-	-	4.12	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	0	410	-	0	857	-
Stage 1	0	-	-	0	-	-
Stage 2	0	-	-	0	-	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	-	410	-	-	857	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	16	0	0.9
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	WBLn1	SBL	SBT
Capacity (veh/h)	-	410	857	-
HCM Lane V/C Ratio	-	0.203	0.097	-
HCM Control Delay (s)	-	16	9.7	-
HCM Lane LOS	-	C	A	-
HCM 95th %tile Q(veh)	-	0.8	0.3	-

Intersection	
Int Delay, s/veh	1.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	75	678	85	75	695
Future Vol, veh/h	0	75	678	85	75	695
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	Free	-	None
Storage Length	-	0	-	100	100	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	83	753	94	83	772

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	-	753	0	-	753	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.22	-	-	4.12	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	0	410	-	0	857	-
Stage 1	0	-	-	0	-	-
Stage 2	0	-	-	0	-	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	-	410	-	-	857	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	16	0	0.9
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	WBLn1	SBL	SBT
Capacity (veh/h)	-	410	857	-
HCM Lane V/C Ratio	-	0.203	0.097	-
HCM Control Delay (s)	-	16	9.7	-
HCM Lane LOS	-	C	A	-
HCM 95th %tile Q(veh)	-	0.8	0.3	-

Intersection	
Int Delay, s/veh	1.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	71	849	79	66	737
Future Vol, veh/h	0	71	849	79	66	737
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	Free	-	None
Storage Length	-	0	-	-	100	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	79	943	88	73	819

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	-	943	0	-	943	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.22	-	-	4.12	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	0	318	-	0	727	-
Stage 1	0	-	-	0	-	-
Stage 2	0	-	-	0	-	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	-	318	-	-	727	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	20	0	0.9
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	WBLn1	SBL	SBT
Capacity (veh/h)	-	318	727	-
HCM Lane V/C Ratio	-	0.248	0.101	-
HCM Control Delay (s)	-	20	10.5	-
HCM Lane LOS	-	C	B	-
HCM 95th %tile Q(veh)	-	1	0.3	-

Intersection	
Int Delay, s/veh	1.2

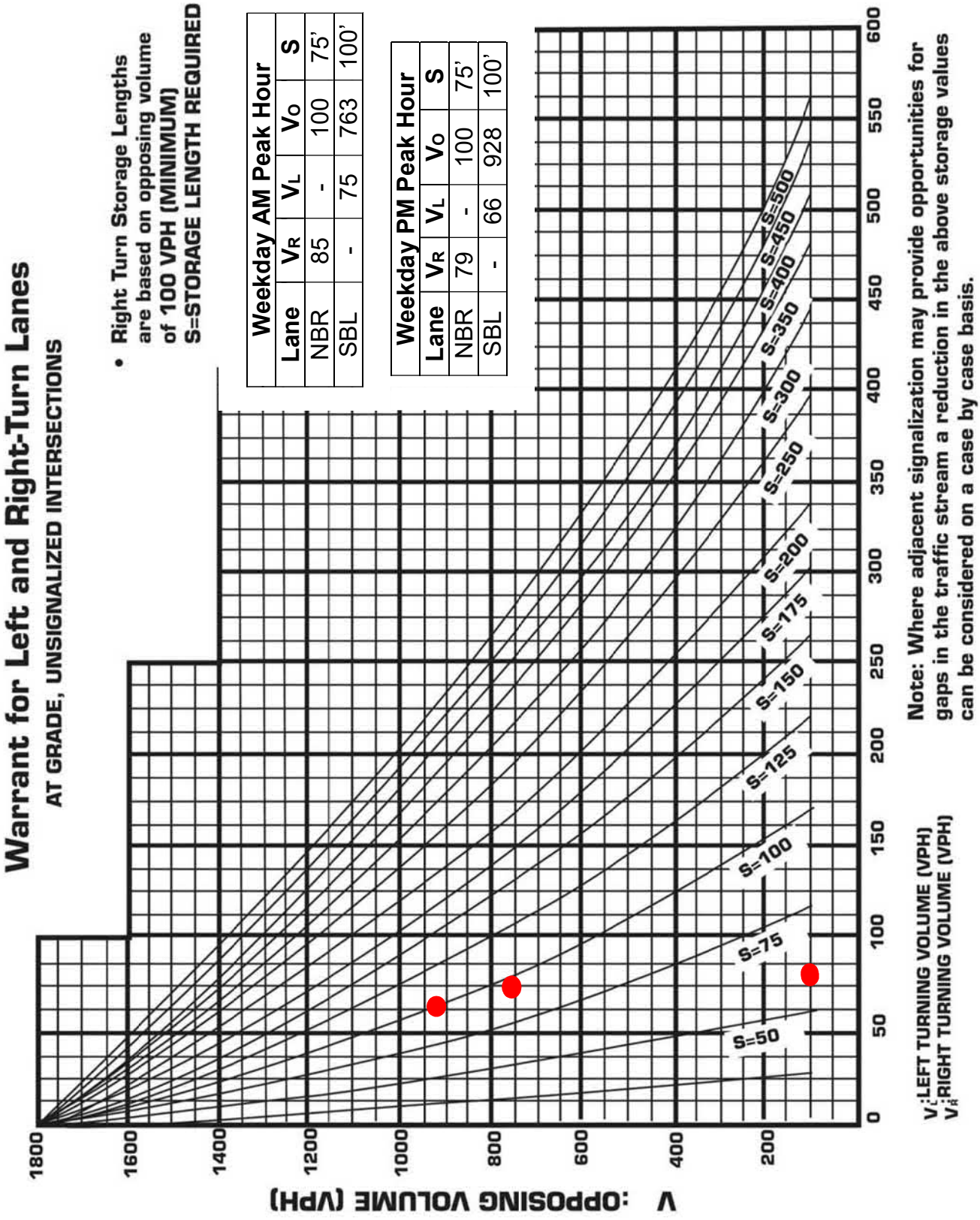
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	71	849	79	66	737
Future Vol, veh/h	0	71	849	79	66	737
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	Free	-	None
Storage Length	-	0	-	100	100	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	79	943	88	73	819

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	-	943	0	-	943	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.22	-	-	4.12	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	0	318	-	0	727	-
Stage 1	0	-	-	0	-	-
Stage 2	0	-	-	0	-	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	-	318	-	-	727	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	20	0	0.9
HCM LOS	C		

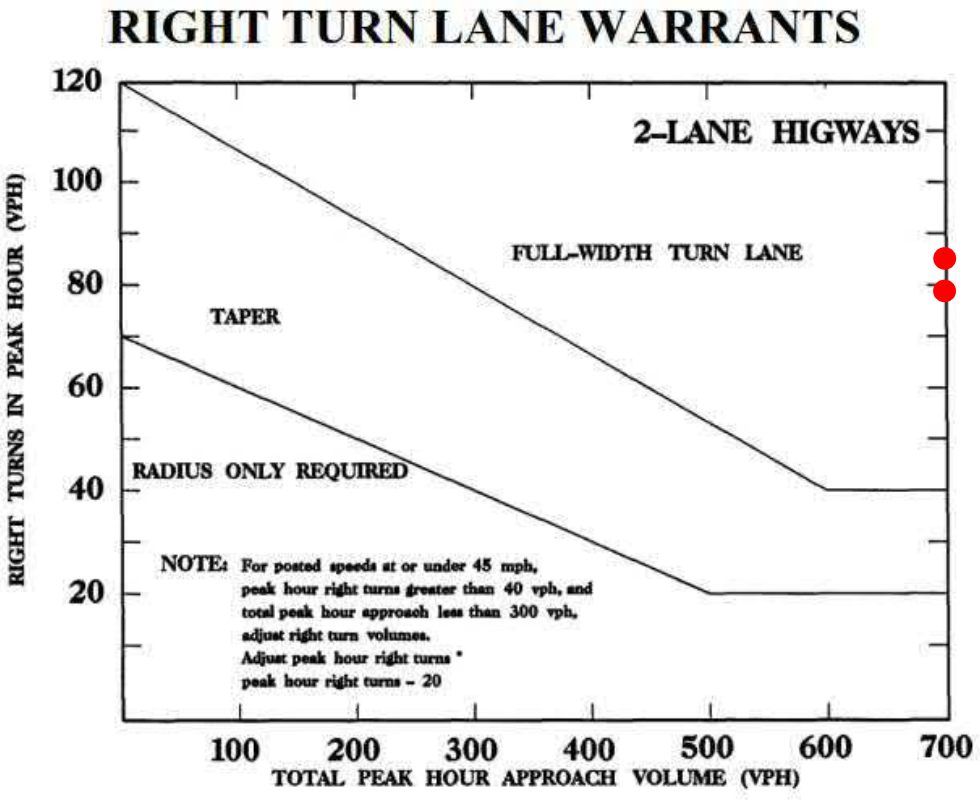
Minor Lane/Major Mvmt	NBT	WBLn1	SBL	SBT
Capacity (veh/h)	-	318	727	-
HCM Lane V/C Ratio	-	0.248	0.101	-
HCM Control Delay (s)	-	20	10.5	-
HCM Lane LOS	-	C	B	-
HCM 95th %tile Q(veh)	-	1	0.3	-

NC 16 and Access A
2020 Build



NC 16 and Access A

2020 Build				
Peak Hour	**Approach**	**Right Turn Volume**	**Approach Volume**	**Warranted?**
Weekday AM	Northbound	85	763	Yes
Weekday PM	Northbound	79	928	Yes



APPENDIX I

UNITY CHURCH ROAD AND ACCESS B

SYNCHRO REPORTS & TURN LANE WARRANTS

Intersection	
Int Delay, s/veh	0.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	217	334	6	0	35
Future Vol, veh/h	0	217	334	6	0	35
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	Free	-	Stop
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	241	371	7	0	39

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	-	0	-	0	-	371
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.318
Pot Cap-1 Maneuver	0	-	-	0	0	675
Stage 1	0	-	-	0	0	-
Stage 2	0	-	-	0	0	-
Platoon blocked, %		-	-			
Mov Cap-1 Maneuver	-	-	-	-	-	675
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	10.7
HCM LOS			B

Minor Lane/Major Mvmt	EBT	WBT	SBLn1
Capacity (veh/h)	-	-	675
HCM Lane V/C Ratio	-	-	0.058
HCM Control Delay (s)	-	-	10.7
HCM Lane LOS	-	-	B
HCM 95th %tile Q(veh)	-	-	0.2

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	330	288	4	0	27
Future Vol, veh/h	0	330	288	4	0	27
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	Free	-	Stop
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	367	320	4	0	30

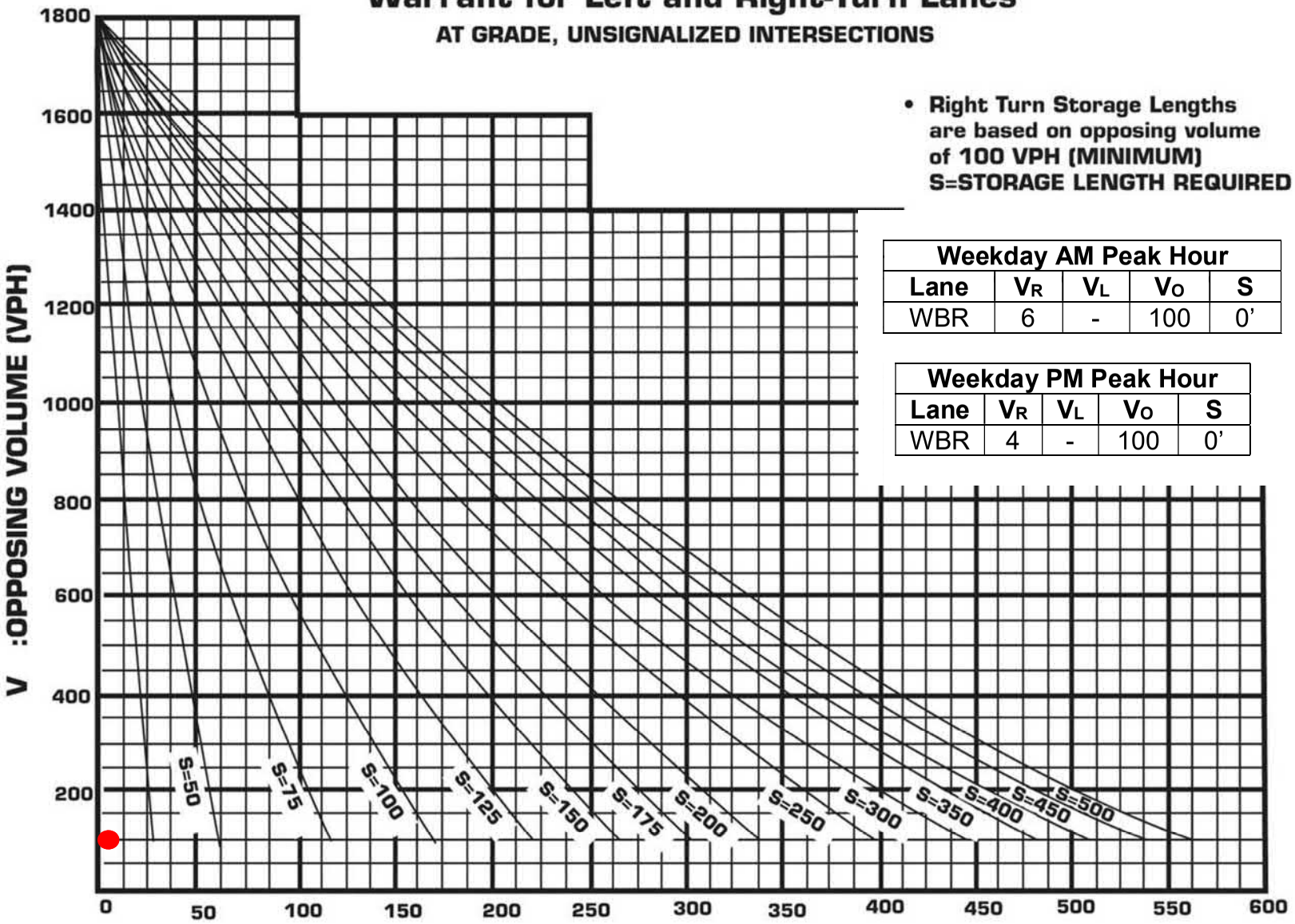
Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	-	0	-	0	-	320
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.318
Pot Cap-1 Maneuver	0	-	-	0	0	721
Stage 1	0	-	-	0	0	-
Stage 2	0	-	-	0	0	-
Platoon blocked, %		-	-			
Mov Cap-1 Maneuver	-	-	-	-	-	721
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	10.2
HCM LOS			B

Minor Lane/Major Mvmt	EBT	WBT	SBLn1
Capacity (veh/h)	-	-	721
HCM Lane V/C Ratio	-	-	0.042
HCM Control Delay (s)	-	-	10.2
HCM Lane LOS	-	-	B
HCM 95th %tile Q(veh)	-	-	0.1

Warrant for Left and Right-Turn Lanes

AT GRADE, UNSIGNALIZED INTERSECTIONS



- Right Turn Storage Lengths are based on opposing volume of 100 VPH (MINIMUM)
  S=STORAGE LENGTH REQUIRED

Weekday AM Peak Hour				
Lane	V_R	V_L	V_O	S
WBR	6	-	100	0’

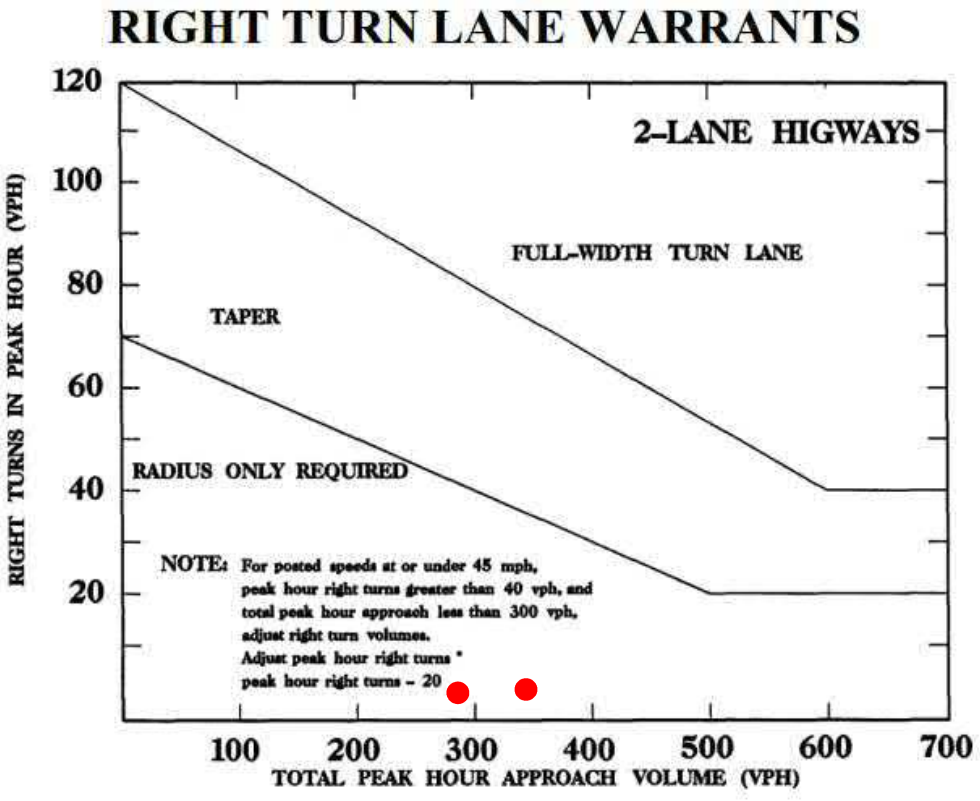
Weekday PM Peak Hour				
Lane	V_R	V_L	V_O	S
WBR	4	-	100	0’

V_L :LEFT TURNING VOLUME (VPH)
V_R :RIGHT TURNING VOLUME (VPH)

Note: Where adjacent signalization may provide opportunities for gaps in the traffic stream a reduction in the above storage values can be considered on a case by case basis.

Unity Church Road and Access B

2020 Build				
Peak Hour	**Approach**	**Right Turn Volume**	**Approach Volume**	**Warranted?**
Weekday AM	Westbound	6	340	No
Weekday PM	Westbound	4	292	No



APPENDIX J

UNITY CHURCH ROAD AND ACCESS C

SYNCHRO REPORTS & TURN LANE WARRANTS

Intersection	
Int Delay, s/veh	2.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	31	186	265	19	31	75
Future Vol, veh/h	31	186	265	19	31	75
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	34	207	294	21	34	83

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	315	0	-	0	580	305
Stage 1	-	-	-	-	305	-
Stage 2	-	-	-	-	275	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1245	-	-	-	477	735
Stage 1	-	-	-	-	748	-
Stage 2	-	-	-	-	771	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1245	-	-	-	462	735
Mov Cap-2 Maneuver	-	-	-	-	462	-
Stage 1	-	-	-	-	725	-
Stage 2	-	-	-	-	771	-

Approach	EB	WB	SB
HCM Control Delay, s	1.1	0	11.3
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1245	-	-	-	462	735
HCM Lane V/C Ratio	0.028	-	-	-	0.075	0.113
HCM Control Delay (s)	8	0	-	-	13.4	10.5
HCM Lane LOS	A	A	-	-	B	B
HCM 95th %tile Q(veh)	0.1	-	-	-	0.2	0.4

Intersection	
Int Delay, s/veh	1.6

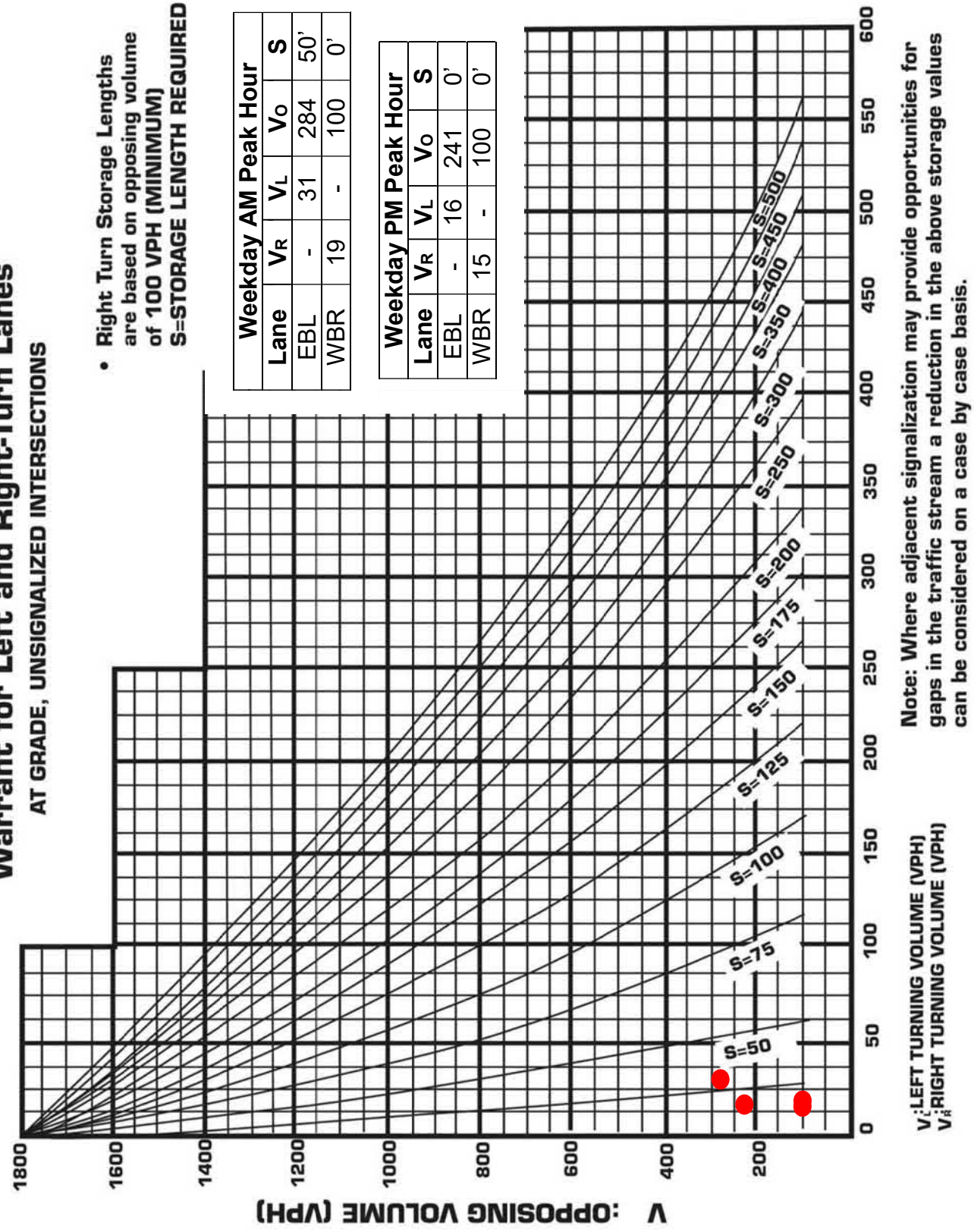
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	16	314	226	15	16	66
Future Vol, veh/h	16	314	226	15	16	66
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	18	349	251	17	18	73

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	268	0	-	0	645	260
Stage 1	-	-	-	-	260	-
Stage 2	-	-	-	-	385	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1296	-	-	-	437	779
Stage 1	-	-	-	-	783	-
Stage 2	-	-	-	-	688	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1296	-	-	-	430	779
Mov Cap-2 Maneuver	-	-	-	-	430	-
Stage 1	-	-	-	-	770	-
Stage 2	-	-	-	-	688	-

Approach	EB	WB	SB
HCM Control Delay, s	0.4	0	10.8
HCM LOS			B

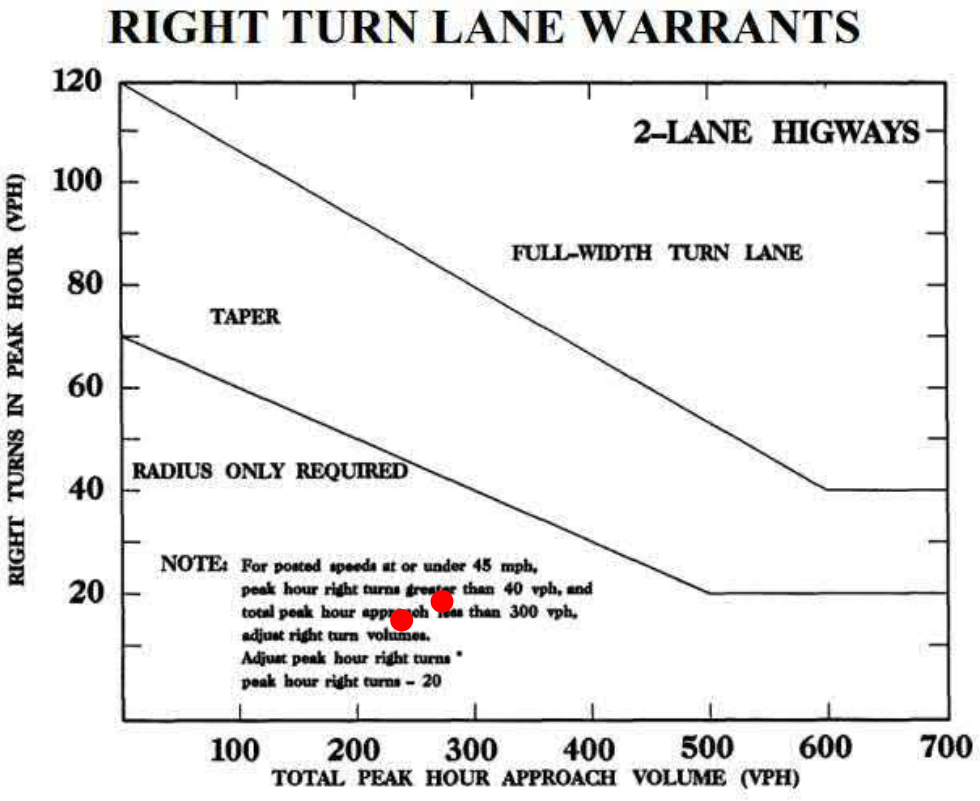
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1296	-	-	-	430	779
HCM Lane V/C Ratio	0.014	-	-	-	0.041	0.094
HCM Control Delay (s)	7.8	0	-	-	13.7	10.1
HCM Lane LOS	A	A	-	-	B	B
HCM 95th %tile Q(veh)	0	-	-	-	0.1	0.3

Unity Church Road and Access C
2020 Build



Unity Church Road and Access C

2020 Build				
Peak Hour	**Approach**	**Right Turn Volume**	**Approach Volume**	**Warranted?**
Weekday AM	Westbound	19	284	No
Weekday PM	Westbound	15	241	No



APPENDIX K

SIMTRAFFIC REPORTS

Intersection: 1: NC 16 Business & Triangle Circle/Unity Church Road

Movement	EB	WB	NB	NB	SB	SB
Directions Served	LTR	LTR	L	TR	L	TR
Maximum Queue (ft)	316	261	77	409	215	496
Average Queue (ft)	164	143	8	195	53	229
95th Queue (ft)	271	249	46	322	157	399
Link Distance (ft)	793	850		3160		610
Upstream Blk Time (%)						0
Queuing Penalty (veh)						0
Storage Bay Dist (ft)			150		150	
Storage Blk Time (%)				18		20
Queuing Penalty (veh)				1		13

Intersection: 2: NC 16 Business & Triangle Circle

Movement	EB	NB	SB
Directions Served	LR	L	TR
Maximum Queue (ft)	156	61	4
Average Queue (ft)	59	25	0
95th Queue (ft)	132	53	3
Link Distance (ft)	1571		699
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)		350	
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 15

Intersection: 1: NC 16 Business & Triangle Circle/Unity Church Road

Movement	EB	WB	NB	NB	SB	SB
Directions Served	LTR	LTR	L	TR	L	TR
Maximum Queue (ft)	294	320	119	433	249	530
Average Queue (ft)	182	162	9	215	74	261
95th Queue (ft)	286	280	57	356	199	450
Link Distance (ft)	793	850		3160		610
Upstream Blk Time (%)						0
Queuing Penalty (veh)						0
Storage Bay Dist (ft)			150		150	
Storage Blk Time (%)				21	0	22
Queuing Penalty (veh)				2	1	15

Intersection: 2: NC 16 Business & Triangle Circle

Movement	EB	NB	SB
Directions Served	LR	L	TR
Maximum Queue (ft)	232	96	4
Average Queue (ft)	79	41	0
95th Queue (ft)	202	77	3
Link Distance (ft)	1571		699
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)		350	
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 18

Intersection: 1: NC 16 Business & Triangle Circle/Unity Church Road

Movement	EB	WB	NB	NB	SB	SB
Directions Served	LTR	LTR	L	TR	L	TR
Maximum Queue (ft)	499	497	119	771	250	506
Average Queue (ft)	273	368	12	431	74	261
95th Queue (ft)	479	554	79	752	209	445
Link Distance (ft)	793	438		3160		545
Upstream Blk Time (%)		29				0
Queuing Penalty (veh)		108				1
Storage Bay Dist (ft)			150		150	
Storage Blk Time (%)				49		24
Queuing Penalty (veh)				4		16

Intersection: 2: NC 16 Business & Triangle Circle

Movement	EB	NB
Directions Served	LR	L
Maximum Queue (ft)	174	112
Average Queue (ft)	70	48
95th Queue (ft)	147	87
Link Distance (ft)	1571	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		350
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 3: Access A & NC 16 Business

Movement	WB	NB	SB	SB
Directions Served	R	TR	L	T
Maximum Queue (ft)	78	131	65	54
Average Queue (ft)	9	20	26	3
95th Queue (ft)	45	80	57	32
Link Distance (ft)	214	545		501
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)			100	
Storage Blk Time (%)				0
Queuing Penalty (veh)				0

Intersection: 4: Unity Church Road & Access B

Movement	WB
Directions Served	TR
Maximum Queue (ft)	238
Average Queue (ft)	83
95th Queue (ft)	265
Link Distance (ft)	344
Upstream Blk Time (%)	1
Queuing Penalty (veh)	3
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 5: Unity Church Road & Access C

Movement	EB	WB	SB	SB
Directions Served	LT	TR	L	R
Maximum Queue (ft)	57	24	43	65
Average Queue (ft)	9	2	20	33
95th Queue (ft)	36	20	44	55
Link Distance (ft)	344	373	234	234
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Network Summary

Network wide Queuing Penalty: 132

Intersection: 1: NC 16 Business & Triangle Circle/Unity Church Road

Movement	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	T	R	L	T	R	L	T	R
Maximum Queue (ft)	205	118	158	88	95	26	272	77	140	310	138
Average Queue (ft)	103	54	77	31	39	4	126	5	38	145	6
95th Queue (ft)	177	101	140	72	83	16	217	43	96	263	59
Link Distance (ft)		775		837			3137			584	
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	500		250		225	250		175	200		175
Storage Blk Time (%)							3			5	
Queuing Penalty (veh)							3			8	

Intersection: 2: NC 16 Business & Triangle Circle

Movement	EB	NB	SB
Directions Served	LR	L	TR
Maximum Queue (ft)	213	91	19
Average Queue (ft)	64	37	1
95th Queue (ft)	165	71	11
Link Distance (ft)	1571		699
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)		350	
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 10

Intersection: 1: NC 16 Business & Triangle Circle/Unity Church Road

Movement	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	UL	T	R	L	T	R	L	T	R
Maximum Queue (ft)	243	133	243	133	105	88	363	226	130	357	220
Average Queue (ft)	120	61	127	37	37	6	175	18	33	150	14
95th Queue (ft)	208	115	214	90	81	55	302	107	96	294	110
Link Distance (ft)		775		413			3137			508	
Upstream Blk Time (%)										0	
Queuing Penalty (veh)										0	
Storage Bay Dist (ft)	500		250		225	250		175	200		175
Storage Blk Time (%)			1	0			9			5	
Queuing Penalty (veh)			1	0			7			8	

Intersection: 2: NC 16 Business & Triangle Circle

Movement	EB	NB
Directions Served	LR	L
Maximum Queue (ft)	204	106
Average Queue (ft)	74	45
95th Queue (ft)	167	87
Link Distance (ft)	1571	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		350
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 3: Access A & NC 16 Business

Movement	WB	NB	SB	SB
Directions Served	R	TR	L	T
Maximum Queue (ft)	70	116	61	47
Average Queue (ft)	9	20	25	2
95th Queue (ft)	45	80	54	22
Link Distance (ft)	214	508		501
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)			100	
Storage Blk Time (%)				0
Queuing Penalty (veh)				0

Intersection: 4: Unity Church Road & Access B

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 5: Unity Church Road & Access C

Movement	EB	SB	SB
Directions Served	LT	L	R
Maximum Queue (ft)	52	43	61
Average Queue (ft)	7	20	33
95th Queue (ft)	30	44	54
Link Distance (ft)	344	234	234
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 16

Intersection: 1: NC 16 Business & Triangle Circle/Unity Church Road

Movement	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	UL	T	R	L	T	R	L	T	R
Maximum Queue (ft)	238	134	263	131	101	88	379	223	130	364	273
Average Queue (ft)	119	61	129	37	38	7	178	15	31	146	17
95th Queue (ft)	204	118	221	89	80	55	304	96	85	292	124
Link Distance (ft)		775		528			3137			507	
Upstream Blk Time (%)										0	
Queuing Penalty (veh)										0	
Storage Bay Dist (ft)	500		300		225	250		175	200		175
Storage Blk Time (%)			0	0			8			6	
Queuing Penalty (veh)			0	0			7			8	

Intersection: 2: NC 16 Business & Triangle Circle

Movement	EB	NB	SB
Directions Served	LR	L	TR
Maximum Queue (ft)	215	106	4
Average Queue (ft)	73	46	0
95th Queue (ft)	167	84	3
Link Distance (ft)	1571		699
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)		350	
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 3: Access A & NC 16 Business

Movement	WB	NB	SB	SB
Directions Served	R	R	L	T
Maximum Queue (ft)	60	11	57	11
Average Queue (ft)	5	1	21	1
95th Queue (ft)	34	11	50	9
Link Distance (ft)	172			501
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)		100	100	
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 4: Unity Church Road & Access B

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 5: Unity Church Road & Access C

Movement	EB	SB	SB
Directions Served	LT	L	R
Maximum Queue (ft)	61	42	61
Average Queue (ft)	8	20	33
95th Queue (ft)	33	43	54
Link Distance (ft)	344	232	232
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 16

Intersection: 1: NC 16 Business & Triangle Circle/Unity Church Road

Movement	EB	WB	NB	NB	SB	SB
Directions Served	LTR	LTR	L	TR	L	TR
Maximum Queue (ft)	577	267	17	970	200	431
Average Queue (ft)	358	133	2	588	78	226
95th Queue (ft)	617	237	10	1120	192	378
Link Distance (ft)	793	850		3160		610
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)			150		150	
Storage Blk Time (%)				48	2	18
Queuing Penalty (veh)				2	14	14

Intersection: 2: NC 16 Business & Triangle Circle

Movement	EB	NB
Directions Served	LR	L
Maximum Queue (ft)	87	134
Average Queue (ft)	25	54
95th Queue (ft)	67	97
Link Distance (ft)	1571	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		350
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 31

Intersection: 1: NC 16 Business & Triangle Circle/Unity Church Road

Movement	EB	WB	NB	NB	B7	SB	SB
Directions Served	LTR	LTR	L	TR	T	L	TR
Maximum Queue (ft)	549	303	203	2103	4	249	476
Average Queue (ft)	335	160	13	1266	0	73	233
95th Queue (ft)	595	298	100	2422	2	179	413
Link Distance (ft)	793	850		3160	699		610
Upstream Blk Time (%)	0			1			
Queuing Penalty (veh)	0			4			
Storage Bay Dist (ft)			150			150	
Storage Blk Time (%)				60		1	17
Queuing Penalty (veh)				4		8	14

Intersection: 2: NC 16 Business & Triangle Circle

Movement	EB	NB	SB
Directions Served	LR	L	TR
Maximum Queue (ft)	128	156	19
Average Queue (ft)	43	69	1
95th Queue (ft)	100	128	7
Link Distance (ft)	1571		699
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)		350	
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 30

Intersection: 1: NC 16 Business & Triangle Circle/Unity Church Road

Movement	EB	WB	NB	NB	B7	SB	SB
Directions Served	LTR	LTR	L	TR	T	L	TR
Maximum Queue (ft)	832	492	203	2686	138	249	484
Average Queue (ft)	754	388	13	1755	20	81	263
95th Queue (ft)	951	582	99	2954	183	202	422
Link Distance (ft)	793	438		3160	699		545
Upstream Blk Time (%)	65	35		6	0		0
Queuing Penalty (veh)	0	110		43	0		0
Storage Bay Dist (ft)			150			150	
Storage Blk Time (%)				63		1	22
Queuing Penalty (veh)				4		5	18

Intersection: 2: NC 16 Business & Triangle Circle

Movement	EB	NB	NB	SB
Directions Served	LR	L	T	TR
Maximum Queue (ft)	195	155	25	4
Average Queue (ft)	53	77	1	0
95th Queue (ft)	131	134	18	3
Link Distance (ft)	1571		978	699
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)		350		
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 3: Access A

Movement	WB	NB	SB	SB
Directions Served	R	TR	L	T
Maximum Queue (ft)	56	129	66	15
Average Queue (ft)	7	14	27	0
95th Queue (ft)	36	72	57	11
Link Distance (ft)	214	545		501
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)			100	
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 4: Unity Church Road & Access B

Movement	WB	SB
Directions Served	TR	R
Maximum Queue (ft)	221	23
Average Queue (ft)	86	1
95th Queue (ft)	261	16
Link Distance (ft)	344	261
Upstream Blk Time (%)	2	
Queuing Penalty (veh)	5	
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 5: Unity Church Road & Access C

Movement	EB	WB	SB	SB
Directions Served	LT	TR	L	R
Maximum Queue (ft)	32	40	38	94
Average Queue (ft)	4	5	13	32
95th Queue (ft)	20	44	39	70
Link Distance (ft)	344	373	234	234
Upstream Blk Time (%)				0
Queuing Penalty (veh)				0
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Network Summary

Network wide Queuing Penalty: 185

Intersection: 1: NC 16 Business & Triangle Circle/Unity Church Road

Movement	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	T	R	L	T	R	L	T	R
Maximum Queue (ft)	238	140	155	52	151	21	458	230	158	286	57
Average Queue (ft)	122	64	65	11	59	2	194	34	49	130	2
95th Queue (ft)	205	116	129	36	117	11	354	163	111	240	39
Link Distance (ft)		775		837			3137			584	
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	500		250		225	250		175	200		175
Storage Blk Time (%)					0		10			3	
Queuing Penalty (veh)					0		16			5	

Intersection: 2: NC 16 Business & Triangle Circle

Movement	EB	NB	SB
Directions Served	LR	L	TR
Maximum Queue (ft)	148	154	4
Average Queue (ft)	47	68	0
95th Queue (ft)	113	122	3
Link Distance (ft)	1571		699
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)		350	
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 21

Intersection: 1: NC 16 Business & Triangle Circle/Unity Church Road

Movement	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	UL	T	R	L	T	R	L	T	R
Maximum Queue (ft)	240	199	239	93	150	25	411	275	251	357	273
Average Queue (ft)	141	82	108	19	61	3	222	70	58	158	15
95th Queue (ft)	227	154	192	55	121	14	358	228	150	299	116
Link Distance (ft)		775		413			3137			513	
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	500		250		225	250		175	200		175
Storage Blk Time (%)			1				14	0	0	6	
Queuing Penalty (veh)			1				22	0	1	9	

Intersection: 2: NC 16 Business & Triangle Circle

Movement	EB	NB	SB
Directions Served	LR	L	TR
Maximum Queue (ft)	240	158	4
Average Queue (ft)	79	72	0
95th Queue (ft)	210	126	3
Link Distance (ft)	1571		699
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)		350	
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 3: Access A & NC 16 Business

Movement	WB	NB	SB	SB
Directions Served	R	TR	L	T
Maximum Queue (ft)	76	173	80	70
Average Queue (ft)	15	26	31	3
95th Queue (ft)	57	105	65	32
Link Distance (ft)	213	513		501
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)			100	
Storage Blk Time (%)			0	0
Queuing Penalty (veh)			0	0

Intersection: 4: Unity Church Road & Access B

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 5: Unity Church Road & Access C

Movement	EB	SB	SB
Directions Served	LT	L	R
Maximum Queue (ft)	47	30	60
Average Queue (ft)	3	10	31
95th Queue (ft)	21	33	54
Link Distance (ft)	344	234	234
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 33

Intersection: 1: NC 16 Business & Triangle Circle/Unity Church Road

Movement	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	UL	T	R	L	T	R	L	T	R
Maximum Queue (ft)	257	168	219	75	136	26	408	275	162	346	119
Average Queue (ft)	133	76	103	19	54	3	225	62	58	154	8
95th Queue (ft)	221	135	184	55	111	16	363	213	132	290	81
Link Distance (ft)		775		528			3137			512	
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	500		300		225	250		175	200		175
Storage Blk Time (%)							17		0	6	
Queuing Penalty (veh)							25		1	9	

Intersection: 2: NC 16 Business & Triangle Circle

Movement	EB	NB	SB
Directions Served	LR	L	TR
Maximum Queue (ft)	223	144	4
Average Queue (ft)	74	72	0
95th Queue (ft)	186	121	3
Link Distance (ft)	1571		699
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)		350	
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 3: Access A & NC 16 Business

Movement	WB	NB	NB	SB
Directions Served	R	T	R	L
Maximum Queue (ft)	70	4	11	66
Average Queue (ft)	8	0	0	24
95th Queue (ft)	42	3	8	51
Link Distance (ft)	171	512		
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)			100	100
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 4: Unity Church Road & Access B

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 5: Unity Church Road & Access C

Movement	EB	SB	SB
Directions Served	LT	L	R
Maximum Queue (ft)	47	37	71
Average Queue (ft)	3	12	29
95th Queue (ft)	21	35	54
Link Distance (ft)	344	232	232
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 36

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