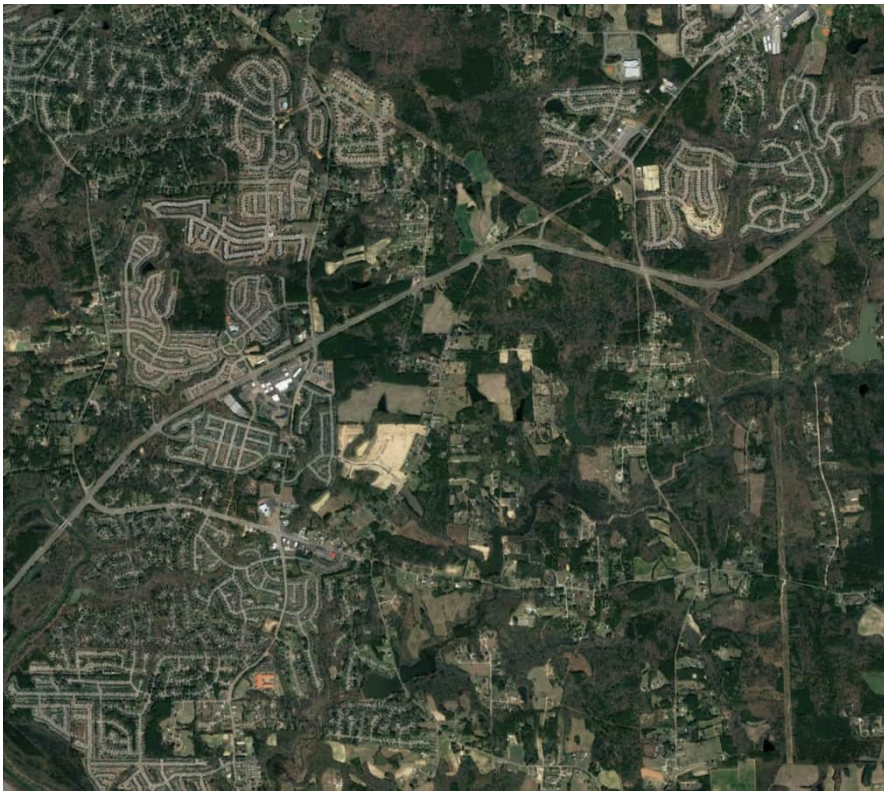
V4 - MA 22-08
Harris Creek Farms

RAMEY KEMP ASSOCIATES
TOGETHER WE ARE LIMITLESS



Harris Creek Farm
Traffic Impact Analysis
Rolesville, North Carolina

RKA rameykemp.com

TRAFFIC IMPACT ANALYSIS

FOR

HARRIS CREEK FARM

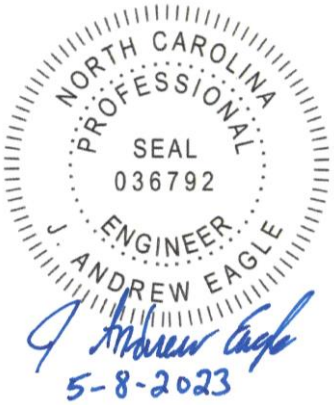
LOCATED

IN

ROLESVILLE, NORTH CAROLINA

Prepared For:
Town of Rolesville
502 Southtown Circle
Rolesville, NC 27571

Prepared By:
Infrastructure Consulting Services, Inc.
dba
Ramey Kemp Associates
5808 Faringdon Place
Raleigh, NC 27609
License #F-1489



MAY 2023

RKA Project No. 20498 - 009

Prepared By: DAR

Reviewed By: JAE

TRAFFIC IMPACT ANALYSIS
HARRIS CREEK FARM
ROLESVILLE, NORTH CAROLINA

EXECUTIVE SUMMARY

1. Development Overview

A Traffic Impact Analysis (TIA) was conducted for the proposed Harris Creek Farm development in accordance with the Town of Rolesville (Town) Land Development Ordinance (LDO) and North Carolina Department of Transportation (NCDOT) capacity analysis guidelines. The proposed development, anticipated to be completed in 2027, is to be located on the west side of Jonesville Road near Universal Drive in Rolesville, NC. The proposed development is expected to consist of 68 single-family homes and 81 townhomes. Site access is proposed via two (2) full-movement driveway connections: one on Universal Drive and one on Jonesville Road approximately 700 feet south of Universal Drive.

The study analyzes traffic conditions during the weekday AM and PM peak hours for the following scenarios:

- 2022 Existing Traffic Conditions
- 2027 No-Build Traffic Conditions
- 2027 Build Traffic Conditions
- 2027 Build-Improved Traffic Conditions

2. Existing Traffic Conditions

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

- US 401 Bypass and Jonesville Road
- US 401 Bypass and Eastern U-Turn Location
- Mitchell Mill Road and Jonesville Road / Peebles Road
- Jonesville Road and Universal Drive

Existing peak hour traffic volumes were determined based on traffic counts conducted at the study intersections listed above except for Jonesville Road and Universal Drive, in November of 2021 during typical weekday AM (7:00 AM – 9:00 AM) and PM (4:00 PM – 6:00 PM) peak periods, while schools were in session for in-person learning.

Existing peak hour turning movement volumes at the intersection of Jonesville Road and Universal Drive were estimated by generating and assigning trips for the nine (9) homes that are accessed via Universal Drive. It was estimated that there will be 8 AM trips: 2 enter 6 exit and 10 PM trips: 7 enter 3 exit. The trips were distributed to the north and south along Jonesville Road the same as site trips. Through traffic volumes were balanced from the Mitchell Mill Road/Jonesville Road intersection.

Previously collected counts from the year 2021 were projected to the 2022 existing analysis year using a compounded annual growth rate of 2%. Weekday AM and PM traffic volumes were balanced between study intersections, where appropriate.

3. Site Trip Generation

The proposed development is assumed to consist of 68 single-family homes and 81 townhomes,. Average weekday daily, AM peak hour, and PM peak hour trips for the proposed development were estimated using methodology contained within the ITE *Trip Generation Manual*, 11th Edition. Table E-1 provides a summary of the trip generation potential for the site.

Table E-1: Site Trip Generation

Land Use (ITE Code)	Intensity	Daily Traffic (vpd)	Weekday AM Peak Hour Trips (vph)			Weekday PM Peak Hour Trips (vph)		
			Enter	Exit	Total	Enter	Exit	Total
Single-Family Home (210)	68 DU	708	13	39	52	44	25	69
Single Family Attached (215)	81 DU	568	9	27	36	26	19	45
Total Primary Trips		**1,276**	**22**	**66**	**88**	**70**	**44**	**114**

4. Future Traffic Conditions

Through coordination with the Town and NCDOT, it was determined that an annual growth rate of 0% would be used to generate 2027 projected weekday AM and PM peak hour traffic volumes. A growth rate of 0% was used due to the number of developments included in the background traffic and the proximity of some of these developments to the proposed development. The following adjacent developments were identified to be considered under future conditions:

- Cobblestone Crossing Mixed-Use (Cobblestone)
- Young Street PUD (The Point)
- Wheeler Tract (Rolesville Crossing)
- Louisbury Road Assemblage
- Kalas / Watkins Family Property (Kalas Falls)
- 5109 Mitchell Mill
- Hills at Harris Creek

5. Capacity Analysis Summary

The analysis considered weekday AM and PM peak hour traffic for 2022 existing, 2027 no-build, 2027 build, and 2027 build-improved conditions. Refer to Section 7 of the TIA for the capacity analysis summary performed at each study intersection.

6. Recommendations

Based on the findings of this study, specific geometric and traffic control improvements have been identified at study intersections. The improvements are summarized below and are illustrated in Figure E-1.

Recommended Improvements by Developer

<u>US 401 Bypass and Jonesville Road</u>

- Conduct a full signal warrant analysis prior to full build-out of the proposed development and install a traffic signal if warranted and approved by the Town and NCDOT.

US 401 Bypass and Eastern U-Turn Location

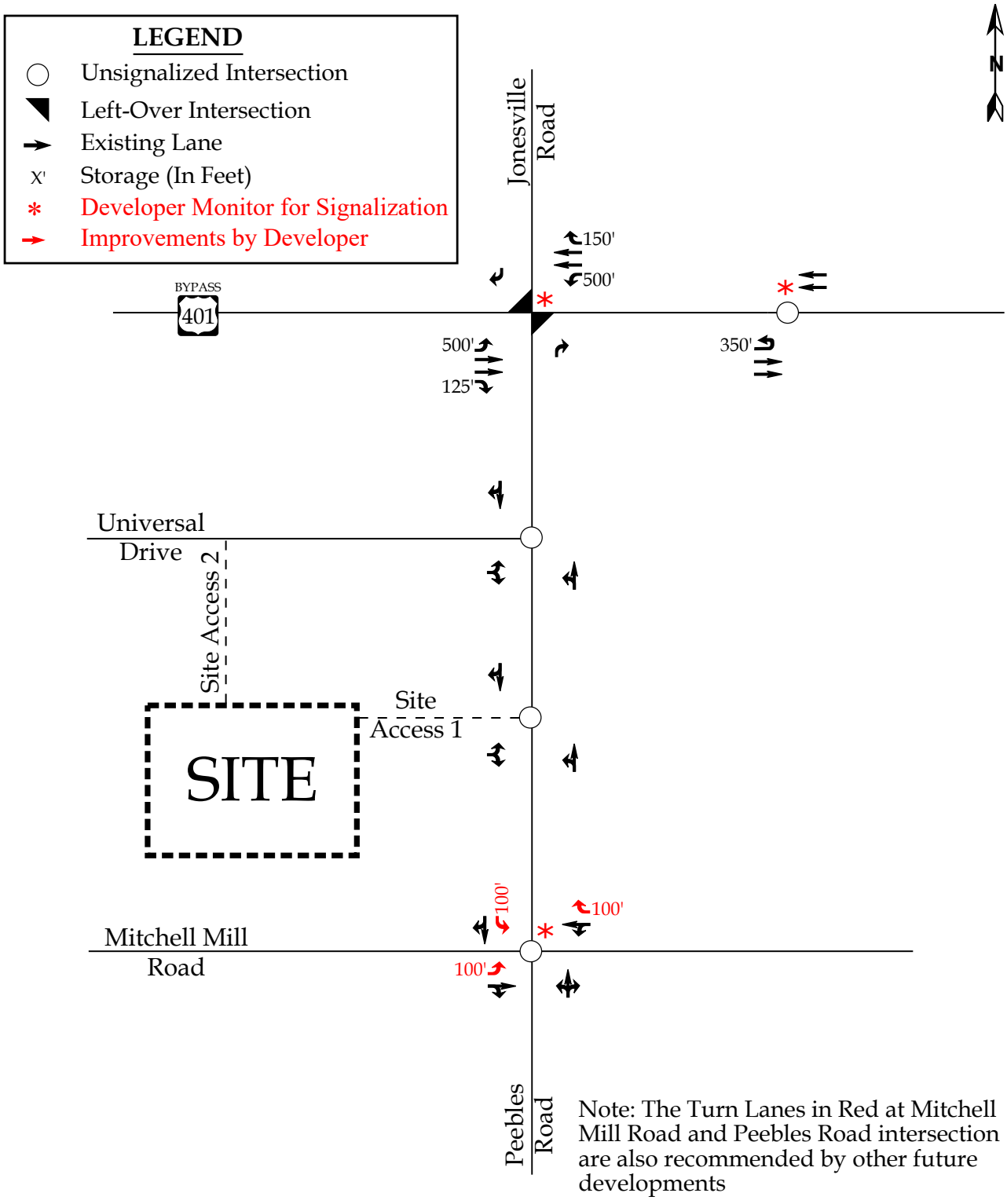
- Conduct a full signal warrant analysis prior to full build-out of the proposed development and install a traffic signal if warranted and approved by the Town and NCDOT.

Mitchell Mill Road and Jonesville Road / Peebles Road

- Construct a southbound (Jonesville Road) left-turn lane with at least 100 feet of storage and appropriate decel and taper.
    - It should be noted that this improvement was also identified by the 5109 Mitchell Mill Road TIA and Hills at Harris Creek TIA
- Construct a westbound (Mitchell Mill Road) right-turn lane with at least 100 feet of storage and appropriate decel and taper.
    - It should be noted that this improvement was also identified by the Hills at Harris Creek TIA
- Construct an eastbound (Mitchell Mill Road) left-turn lane with at least 100 feet of storage and appropriate decel and taper.
    - It should be noted that this improvement was also identified by the 5109 Mitchell Mill Road TIA
- Conduct a full signal warrant analysis prior to full build-out of the proposed development and install a traffic signal if warranted and approved by the Town and NCDOT.

Jonesville Road and Site Drive

- Construct the eastbound approach (Site Drive) with one ingress lane and one egress lane.
- Provide stop-control for the eastbound approach (Site Drive).



RAMEY KEMP ASSOCIATES

Harris Creek Farm
Rolesville, NC

Recommended Lane Configurations

Scale: Not to Scale | Figure E-1

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

TECHNICAL APPENDIX

TRAFFIC IMPACT ANALYSIS
HARRIS CREEK FARM
ROLESVILLE, NORTH CAROLINA

1. INTRODUCTION

The contents of this report present the findings of the Traffic Impact Analysis (TIA) conducted for the proposed Harris Creek Farm development in Rolesville, North Carolina. The proposed development, anticipated to be completed in 2027, is to be located on the west side of Jonesville Road near Universal Drive in Rolesville, NC. The proposed development is expected to consist of 68 single-family homes and 81 townhomes. The purpose of this study is to determine the potential impacts to the surrounding transportation system created by traffic generated by the proposed development, as well as recommend improvements to mitigate the impacts.

The study analyzes traffic conditions during the weekday AM and PM peak hours for the following scenarios:

- 2022 Existing Traffic Conditions
- 2027 No-Build Traffic Conditions
- 2027 Build Traffic Conditions

1.1. Site Location and Study Area

The proposed development is to be located on the west side of Jonesville Road near Universal Drive in Rolesville, NC. Refer to Figure 1 for the site location map. The study area for the TIA was determined through coordination with the North Carolina Department of Transportation (NCDOT) and the Town of Rolesville (Town) and consists of the following existing intersections:

- US 401 Bypass and Jonesville Road
- US 401 Bypass and Eastern U-Turn Location
- Jonesville Road and Universal Drive
- Mitchell Mill Road and Jonesville Road / Peebles Road

Refer to Appendix A for the approved scoping documentation.

1.2. Proposed Land Use and Site Access

The site is to be located on the west side of Jonesville Road near Universal Drive. The proposed development is anticipated to be completed in 2027, and is assumed to consist of the following uses:

- 68 single-family homes
- 81 townhomes

Site access to the proposed development is expected to be provided via two (2) full-movement driveway connections: one on Universal Drive and one on Jonesville Road approximately 700 feet south of Universal Drive. Refer to Figure 2 for a copy of the preliminary site plan.

1.3. Adjacent Land Uses

The proposed development is located in an area consisting primarily of undeveloped land and residential development.

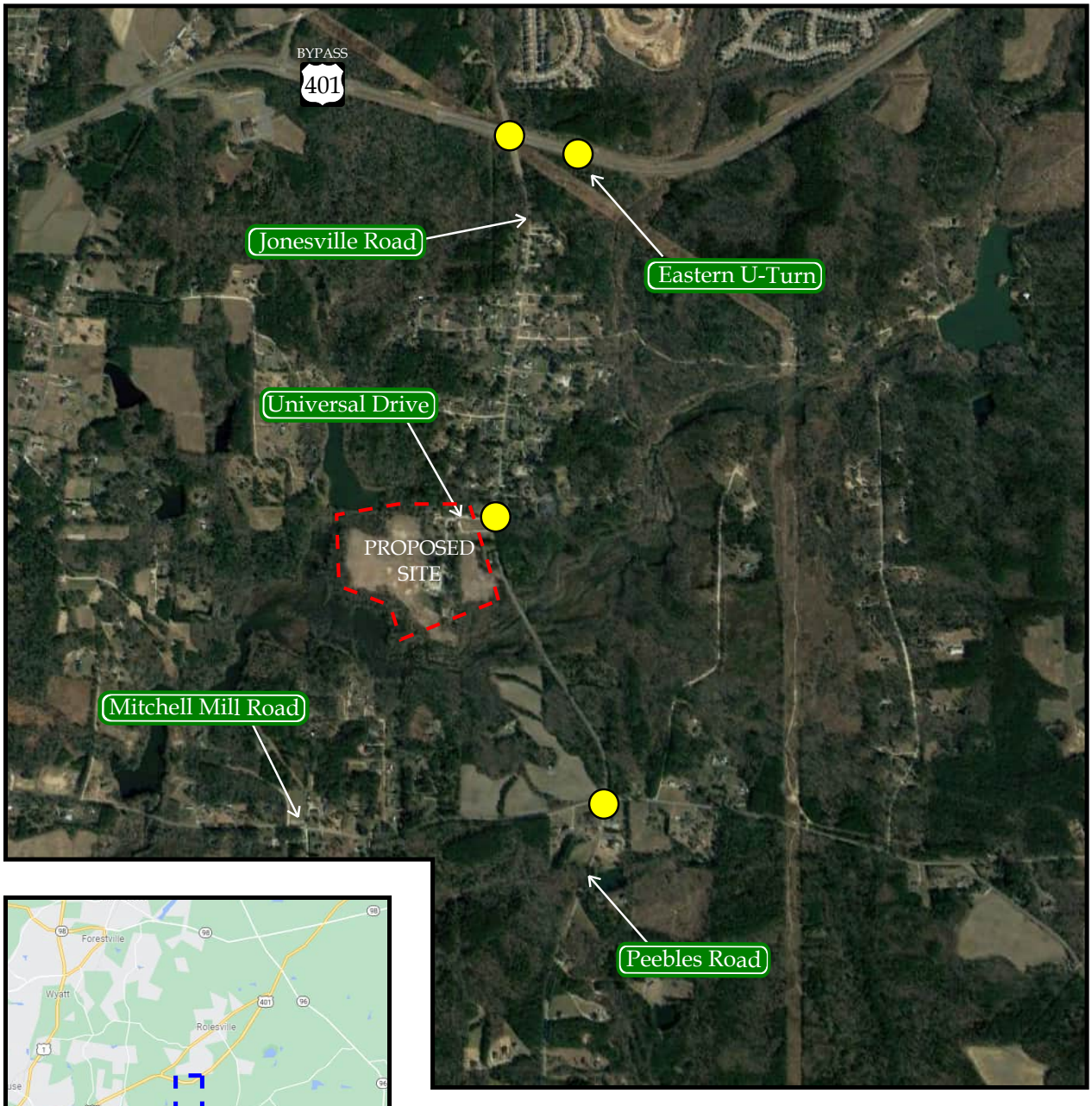
1.4. Existing Roadways

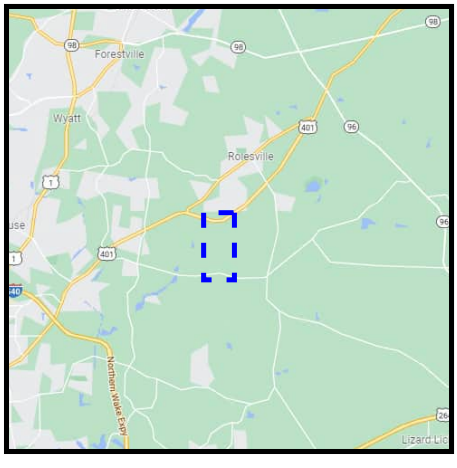
Existing lane configurations (number of traffic lanes on each intersection approach), storage capacities, and other intersection and roadway information within the study area are shown in Figure 3. Table 1 provides a summary of this information, as well.

Table 1: Existing Roadway Inventory

Road Name	Route Number	Typical Cross-Section	Speed Limit	Maintained By	2019 AADT (vpd)
US 401 Bypass		4-lane divided	55 mph	NCDOT	17,500
Jonesville Road	SR 2226	2-lane undivided	35 mph / 45 mph	NCDOT	2,210*
Mitchell Mill Road	SR 2224	2-lane undivided	45 mph	NCDOT	4,000
Peebles Road	SR 2929	2-lane undivided	45 mph	NCDOT	1,700*

*ADT based on 2022 existing traffic volumes and assuming the weekday PM peak hour volume is 10% of the average daily traffic.





N

LEGEND

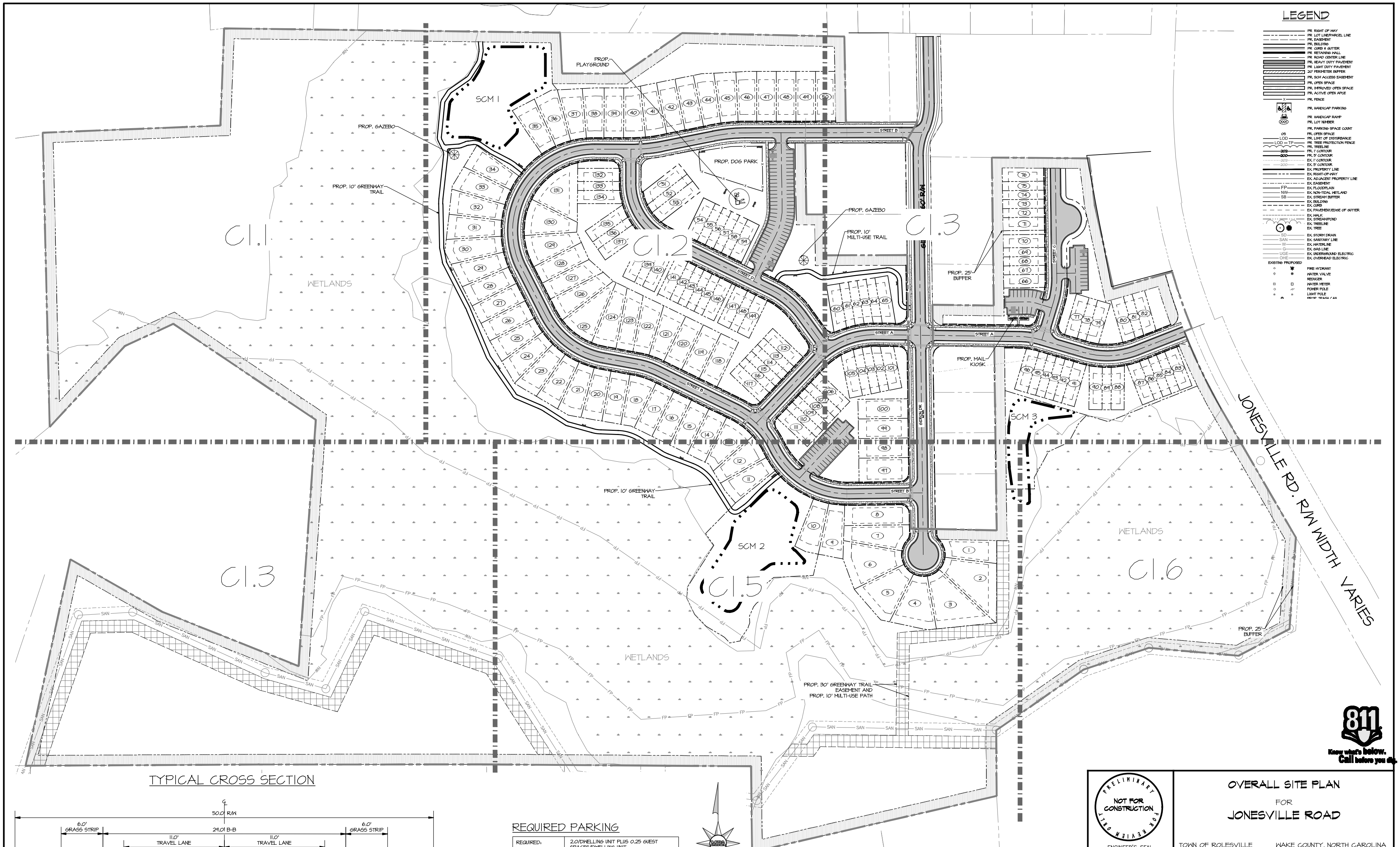
- Proposed Site Location
- Existing Study Intersection
- Study Area

RKA
RAMEY KEMP ASSOCIATES

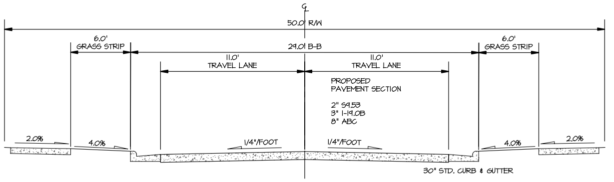
Harris Creek Farm
Rolesville, NC

Site Location Map

Scale: Not to Scale | Figure 1



TYPICAL CROSS SECTION



N.T.S.

REQUIRED PARKING

REQUIRED:	2.0/DWELLING UNIT PLUS 0.25 GUEST SPACES/DWELLING UNIT 81 UNITS X 2.25 = 183 SPOTS REQUIRED
PROVIDED	81 UNITS X 1 (DRIVEWAY) = 81 SPOTS PARKING LOTS = 116 SPOTS (7 HANDICAP) TOTAL PROVIDED = 197 SPOTS

NORTH NAD83

Scale :1 inch = 100 ft.

PRELIMINARY NOT FOR CONSTRUCTION FOR REVIEW ONLY

ENGINEER'S SEAL

OVERALL SITE PLAN FOR JONESVILLE ROAD

TOWN OF ROLESVILLE WAKE COUNTY, NORTH CAROLINA

No.	DATE	REVISIONS
A	9/30/2022	REVISED PER TOWN OF ROLESVILLE COMMENTS

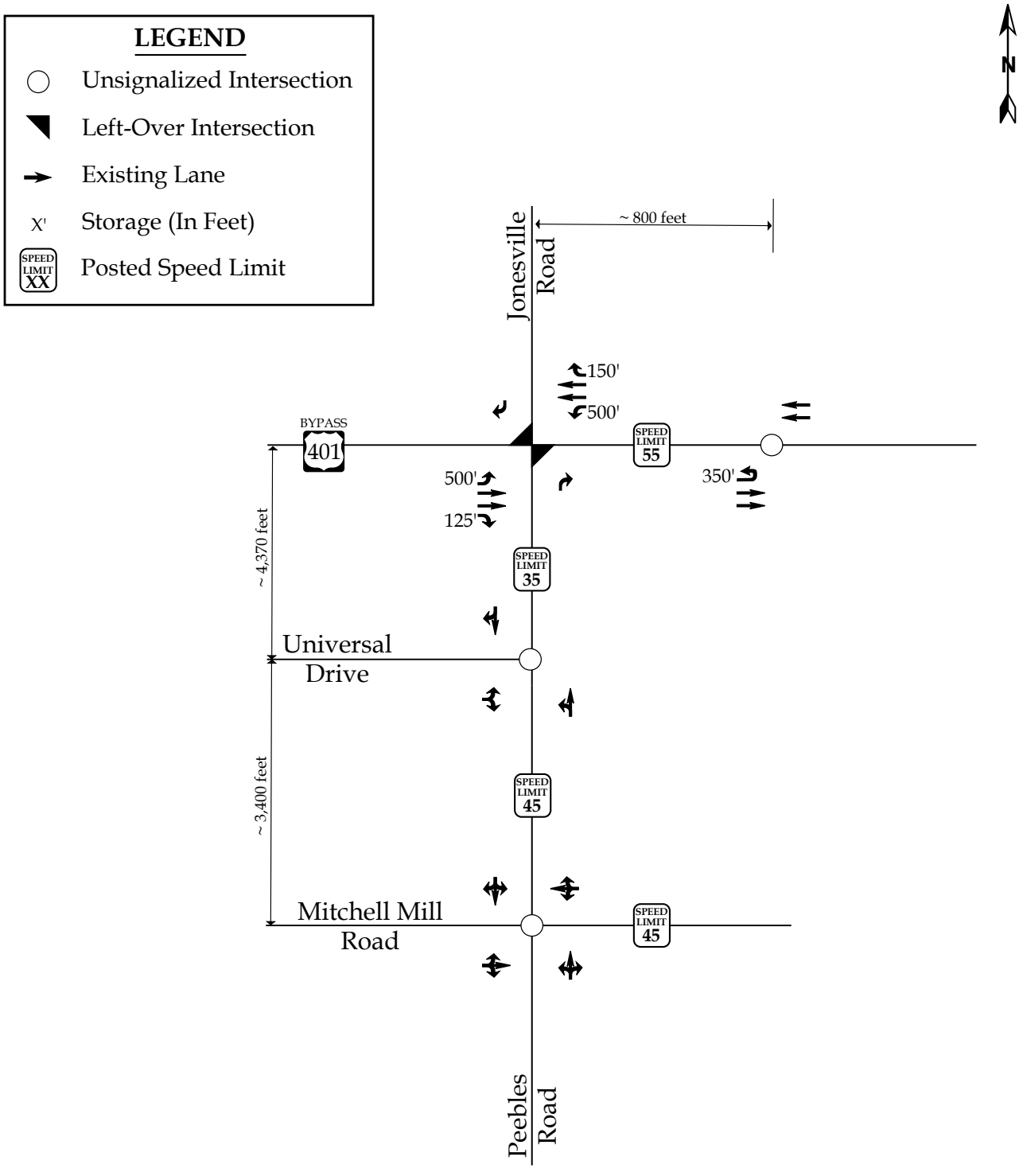
JOB NO.: 21790
SCALE: AS SHOWN
DATE: 6/1/2022
ENGINEER: JMK
DRAWN BY: ER/JM
DESIGN BY: DC
REVIEW BY: JMK

MORRIS & RITCHIE ASSOCIATES OF NC, PC
ENGINEERS, ARCHITECTS, PLANNERS, SURVEYORS AND LANDSCAPE ARCHITECTS
5605 CHAPEL HILL RD, STE 112
RALEIGH, NC 27607
(984) 200-2103
LICENSE # C-4182
WWW.MRAGTA.COM

STATUS: PRELIMINARY NOT FOR CONSTRUCTION

REVISION: A

SHEET: C1.0



RKA RAMEY KEMP ASSOCIATES	Harris Creek Farm Rolesville, NC	2022 Existing Lane Configurations Scale: Not to Scale | Figure 3

2. 2022 EXISTING PEAK HOUR CONDITIONS

2.1. 2022 Existing Peak Hour Traffic Volumes

Existing peak hour traffic volumes were determined based on previously collected traffic counts conducted at the study intersections listed below, in November of 2021 during typical weekday AM (7:00 AM – 9:00 AM) and PM (4:00 PM – 6:00 PM) peak periods, while schools were in session for in-person learning:

- US 401 Bypass and Jonesville Road
- US 401 Bypass and Eastern U-Turn Location
- Mitchell Mill Road and Jonesville Road / Peebles Road

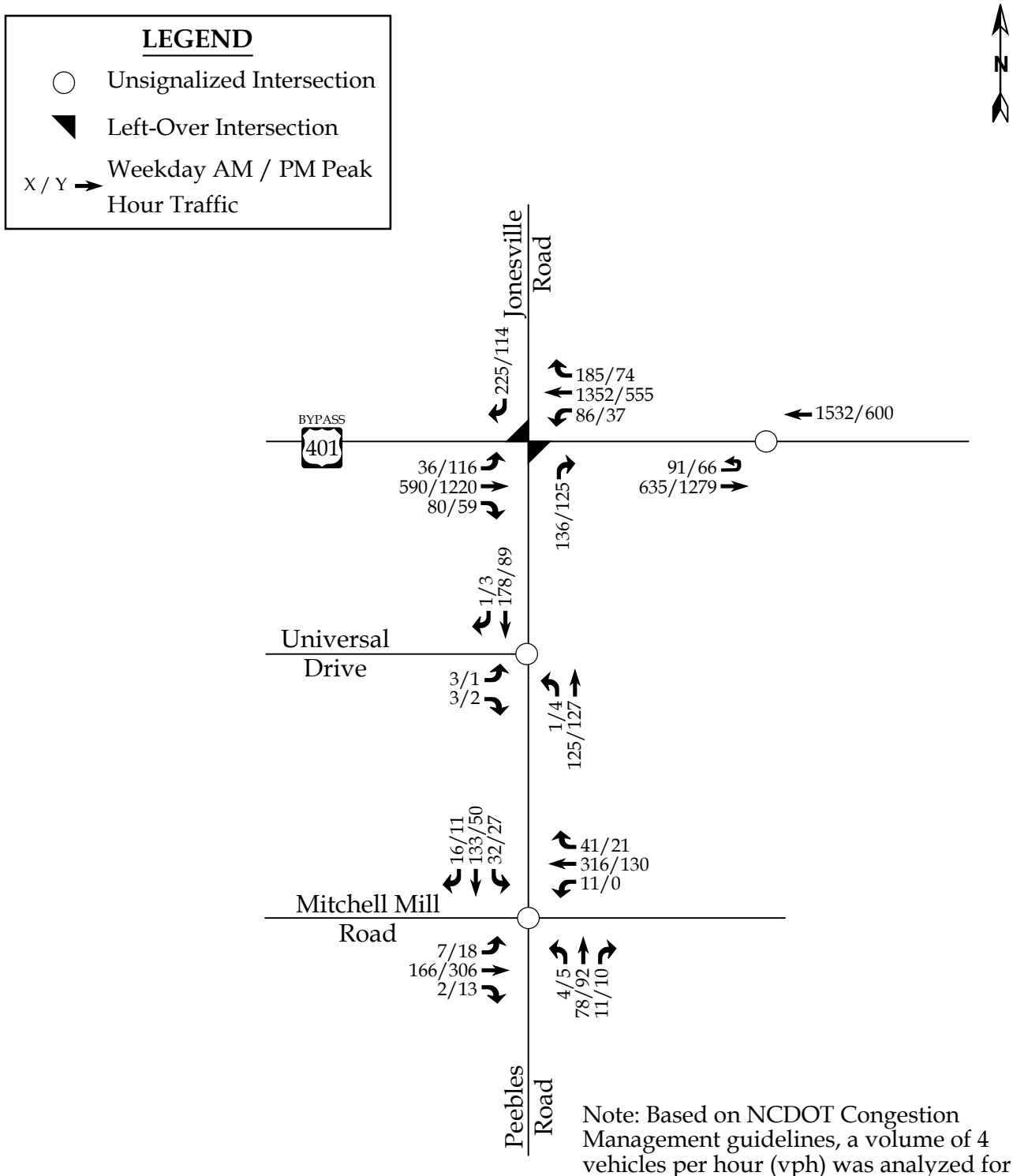
Previously collected counts from the year 2021 were projected to the 2022 existing analysis year using a compounded annual growth rate of 2%.

Existing peak hour turning movement volumes at the intersection of Jonesville Road and Universal Drive were estimated by generating and assigning trips for the nine (9) homes that are accessed via Universal Drive. It was estimated that there will be 8 AM trips: 2 enter 6 exit and 10 PM trips: 7 enter 3 exit. The trips were distributed to the north and south along Jonesville Road the same as site trips. Through traffic volumes were balanced from the Mitchell Mill Road/Jonesville Road intersection.

Weekday AM and PM traffic volumes were balanced between study intersections, where appropriate. Refer to Figure 4 for 2022 existing weekday AM and PM peak hour traffic volumes. A copy of the count data is located in Appendix B of this report.

2.2. Analysis of 2022 Existing Peak Hour Traffic Conditions

The 2022 existing weekday AM and PM peak hour traffic volumes were analyzed to determine the current levels of service at the study intersections under existing roadway conditions. The results of the analysis are presented in Section 7 of this report.



Note: Based on NCDOT Congestion Management guidelines, a volume of 4 vehicles per hour (vph) was analyzed for any movement with less than 4 vph.

RAMEY KEMP ASSOCIATES	Harris Creek Farm Rolesville, NC	2022 Existing Peak Hour Traffic	
		Scale: Not to Scale	Figure 4

3. 2027 NO-BUILD PEAK HOUR CONDITIONS

In order to account for growth of traffic and subsequent traffic conditions at a future year, no-build traffic projections are needed. No-build traffic is the component of traffic due to the growth of the community and surrounding area that is anticipated to occur regardless of whether or not the proposed development is constructed. No-build traffic is comprised of existing traffic growth within the study area and additional traffic created as a result of adjacent approved developments.

3.1. Ambient Traffic Growth

Through coordination with NCDOT and the Town, it was determined that an annual growth rate of 0% would be used to generate 2027 projected weekday AM and PM peak hour traffic volumes. A growth rate of 0% was used due to the number of developments included in the background traffic and the proximity of some of these developments to the proposed development. Refer to Figure 5 for 2027 projected peak hour traffic.

3.2. Adjacent Development Traffic

Through coordination with NCDOT and the Town, the following adjacent developments were identified to be included in this study:

- Cobblestone Crossing Mixed-Use (Cobblestone)
- Young Street PUD (The Point)
- Wheeler Tract (Rolesville Crossing)
- Louisbury Road Assemblage
- Kalas / Watkins Family Property (Kalas Falls)
- 5109 Mitchell Mill
- Hills at Harris Creek

Table 2, on the following page, provides a summary of the adjacent developments. Adjacent development trips are shown in Figure 6. Adjacent development information can be found in Appendix C.

Table 2: Adjacent Development Information

Development Name	Location	Build-Out Year	Land Use / Intensity	TIA Performed
Cobblestone Crossing Mixed-Use	Northwest quadrant of the intersection of Main Street and Young Street	2023	180 multi-family homes 18,200 sq. ft. municipal flex space 50,000 sq. ft. general retail	March 2021 by RKA
Young Street PUD	Along both sides of US 401 Bypass west of Young Street	2025	96 single-family homes 525 single-family homes 320 multi-family homes 122,800 sq. ft. general retail	June 2019 by Kimley Horn
Wheeler Tract	Northeast quadrant of the intersection of Rolesville Road and Mitchell Mill Road	2026	233 single-family homes 125 multi-family homes	June 2019 by RKA
Louisbury Road Assemblage	West of Louisbury Road and south of Stells Road	2025	152 single-family homes	May 2020 by RKA
Kalas / Watkins Family Property	Along the west side of Rolesville Road, north of Mitchell Mill Road	2025	439 single-family homes 96 multi-family homes	August 2019 by Stantec
5109 Mitchell Mill	Along both sides of Jonesville Road north of Mitchell Mill Road	2028	69 single-family homes 195 single-family homes 129 multi-family homes 50,000 sq. ft. shopping center	August 2022 by RKA
Hills at Harris Creek	North of Mitchell Mill Road, west of Manly Farm Road and east of Gro Peg Lane	2027	211 single-family homes 109 multi-family homes 25,400 sq. ft. general retail	May 2022 by RKA

3.3. Future Roadway Improvements

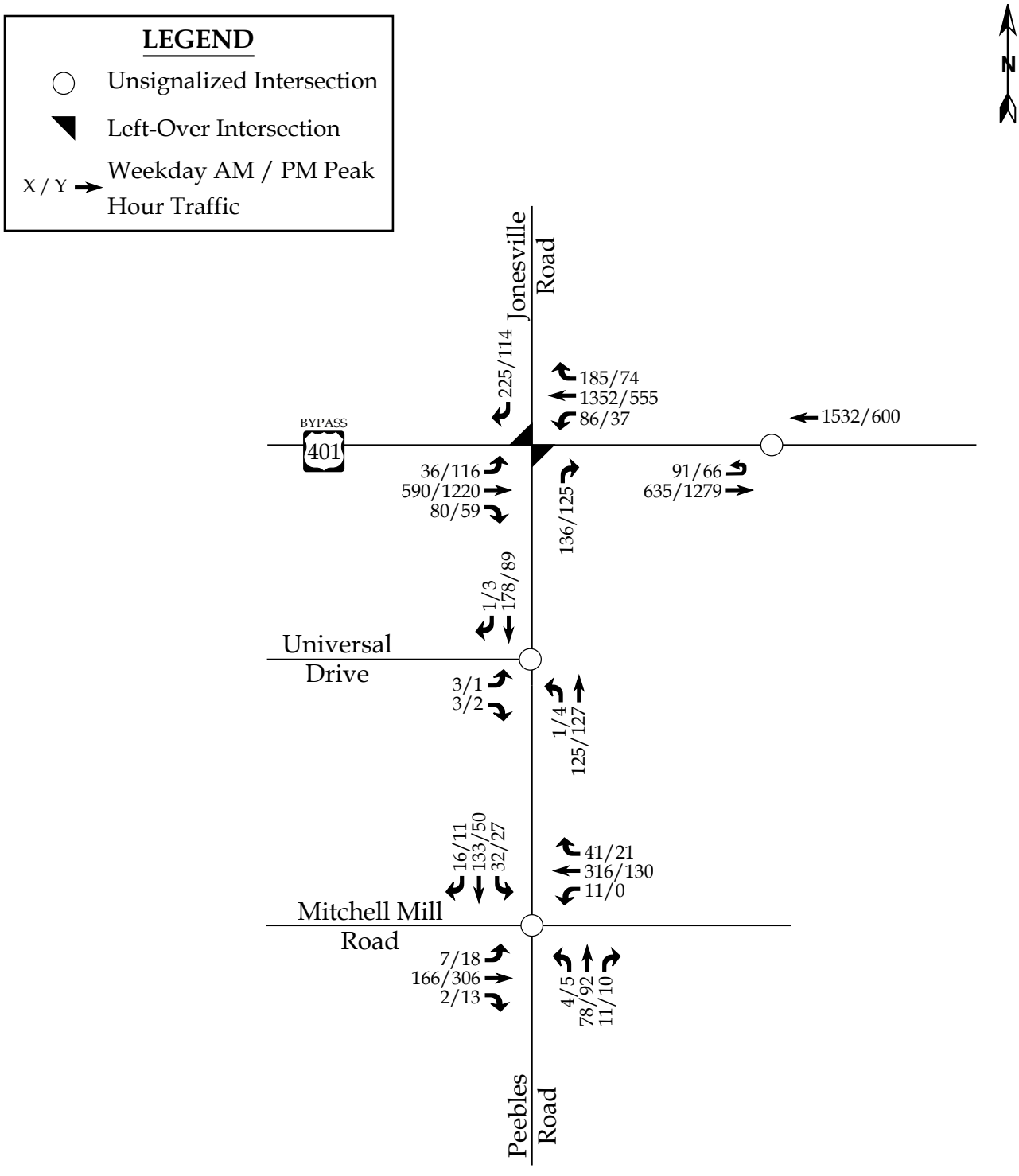
Based on coordination with NCDOT and the Town, it was determined there were two previously approved TIA's that recommended roadway improvements that were considered under future conditions with this study. Both developments are to construct improvements at the intersection of Jonesville Road and Mitchell Mill Road. An exclusive eastbound left-turn lane was identified in the 5109 Mitchell Mill Road TIA. An exclusive westbound right-turn lane was identified in the Hills at Harris Creek TIA. In both the 5109 Mitchell Mill Road TIA and the Hills at Harris Creek TIA an exclusive southbound left-turn lane improvement was identified. It should be noted that per the Rolesville Community Transportation Plan (dated May 2022), the ultimate cross-section of Jonesville Road is identified as a 2-lane roadway with a center two-way-left-turn-lane (TWLTL) and Mitchell Mill Road is identified as a 4-lane median-divided roadway.

3.4. 2027 No-Build Peak Hour Traffic Volumes

The 2027 no-build traffic volumes were determined by projecting the 2022 existing peak hour traffic to the year 2027 and adding the adjacent development trips. Refer to Figure 7 for an illustration of the 2027 no-build peak hour traffic volumes at the study intersections.

3.5. Analysis of 2027 No-Build Peak Hour Traffic Conditions

The 2027 no-build AM and PM peak hour traffic volumes at the study intersections were analyzed with existing geometric roadway conditions and traffic control. The analysis results are presented in Section 7 of this report.

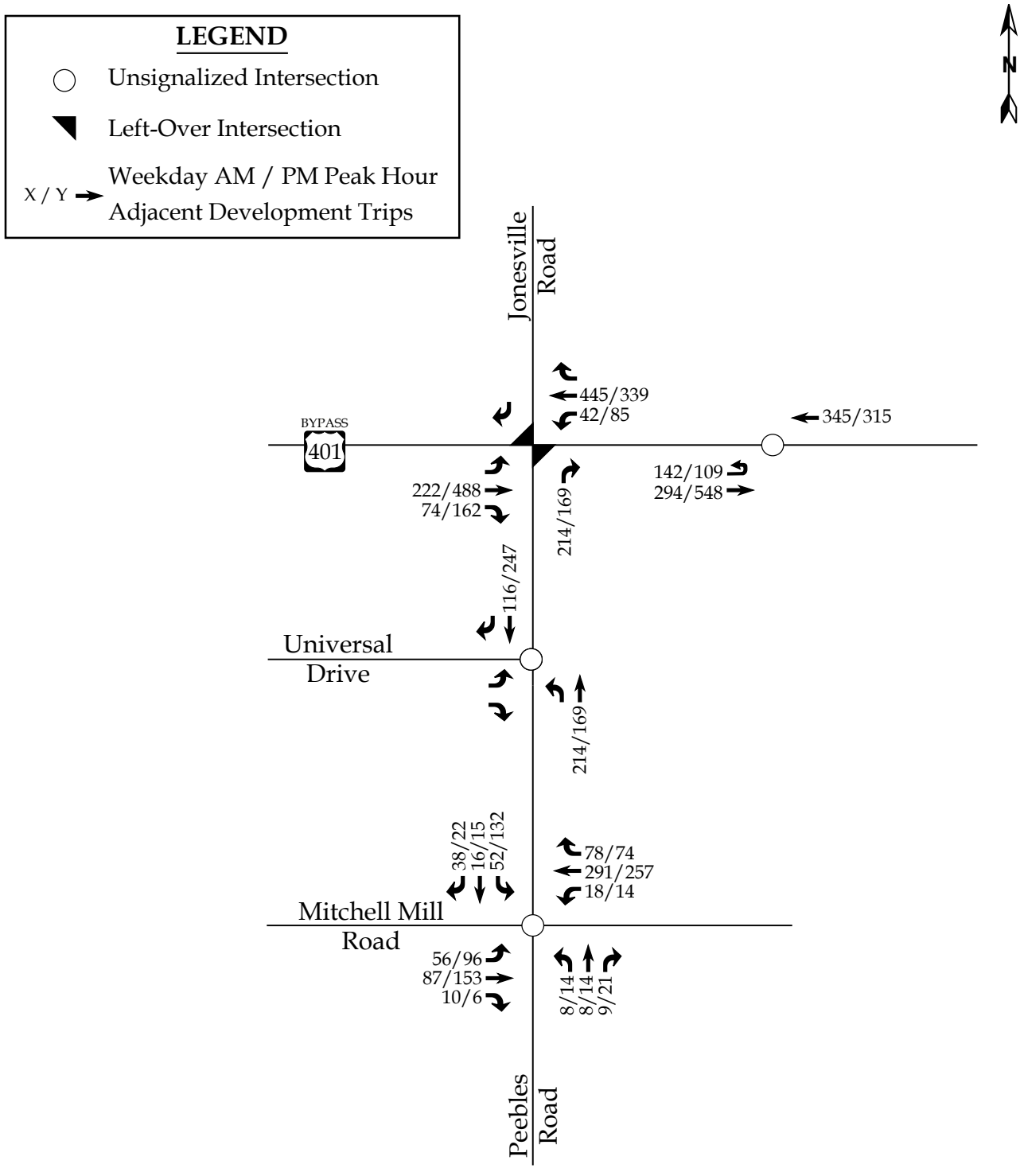


RAMEY KEMP ASSOCIATES

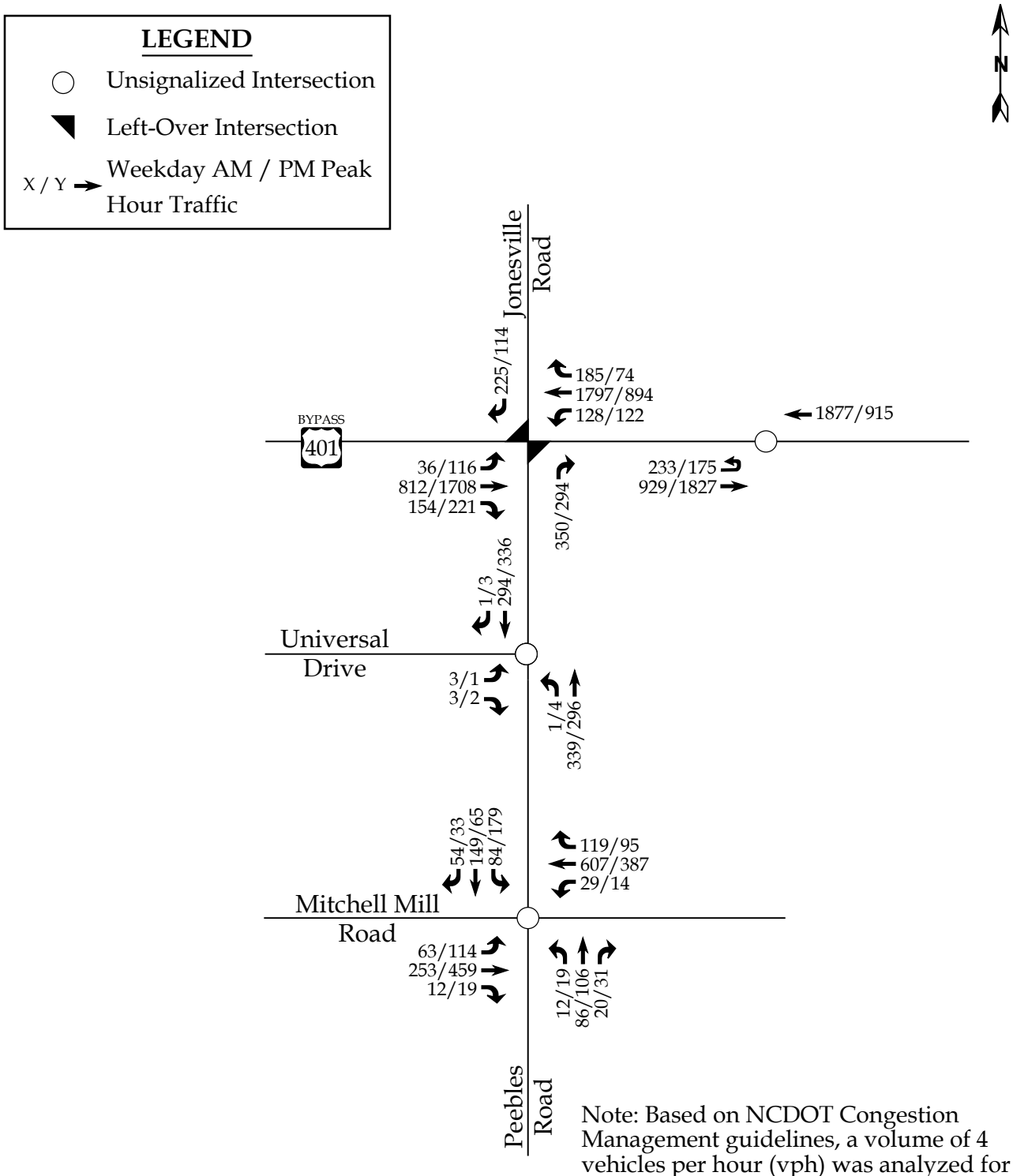
Harris Creek Farm
Rolesville, NC

2027 Projected Peak Hour Traffic

Scale: Not to Scale | Figure 5



RAMEY KEMP ASSOCIATES	Harris Creek Farm Rolesville, NC	Peak Hour Adjacent Developement Trips	
		Scale: Not to Scale	Figure 6



Note: Based on NCDOT Congestion Management guidelines, a volume of 4 vehicles per hour (vph) was analyzed for any movement with less than 4 vph.

RAMEY KEMP ASSOCIATES	Harris Creek Farm Rolesville, NC	2027 No-Build Peak Hour Traffic	
		Scale: Not to Scale	Figure 7

4. SITE TRIP GENERATION AND DISTRIBUTION

4.1. Trip Generation

The proposed development is assumed to consist of 68 single-family homes and 81 townhomes. Average weekday daily, AM peak hour, and PM peak hour trips for the proposed development were estimated using methodology contained within the ITE *Trip Generation Manual*, 11th Edition. Table 3 provides a summary of the trip generation potential for the site.

Table 3: Trip Generation Summary

Land Use (ITE Code)	Intensity	Daily Traffic (vpd)	Weekday AM Peak Hour Trips (vph)			Weekday PM Peak Hour Trips (vph)		
			Enter	Exit	Total	Enter	Exit	Total
Single-Family Home (210)	68 DU	708	13	39	52	44	25	69
Single Family Attached (215)	81 DU	568	9	27	36	26	19	45
Total Primary Trips		**1,276**	**22**	**66**	**88**	**70**	**44**	**114**

It is estimated that the proposed development will generate approximately 1,276 total site trips on the roadway network during a typical 24-hour weekday period. Of the daily traffic volume, it is anticipated that 88 trips (22 entering and 66 exiting) will occur during the weekday AM peak hour and 114 trips (70 entering and 44 exiting) will occur during the weekday PM peak hour.

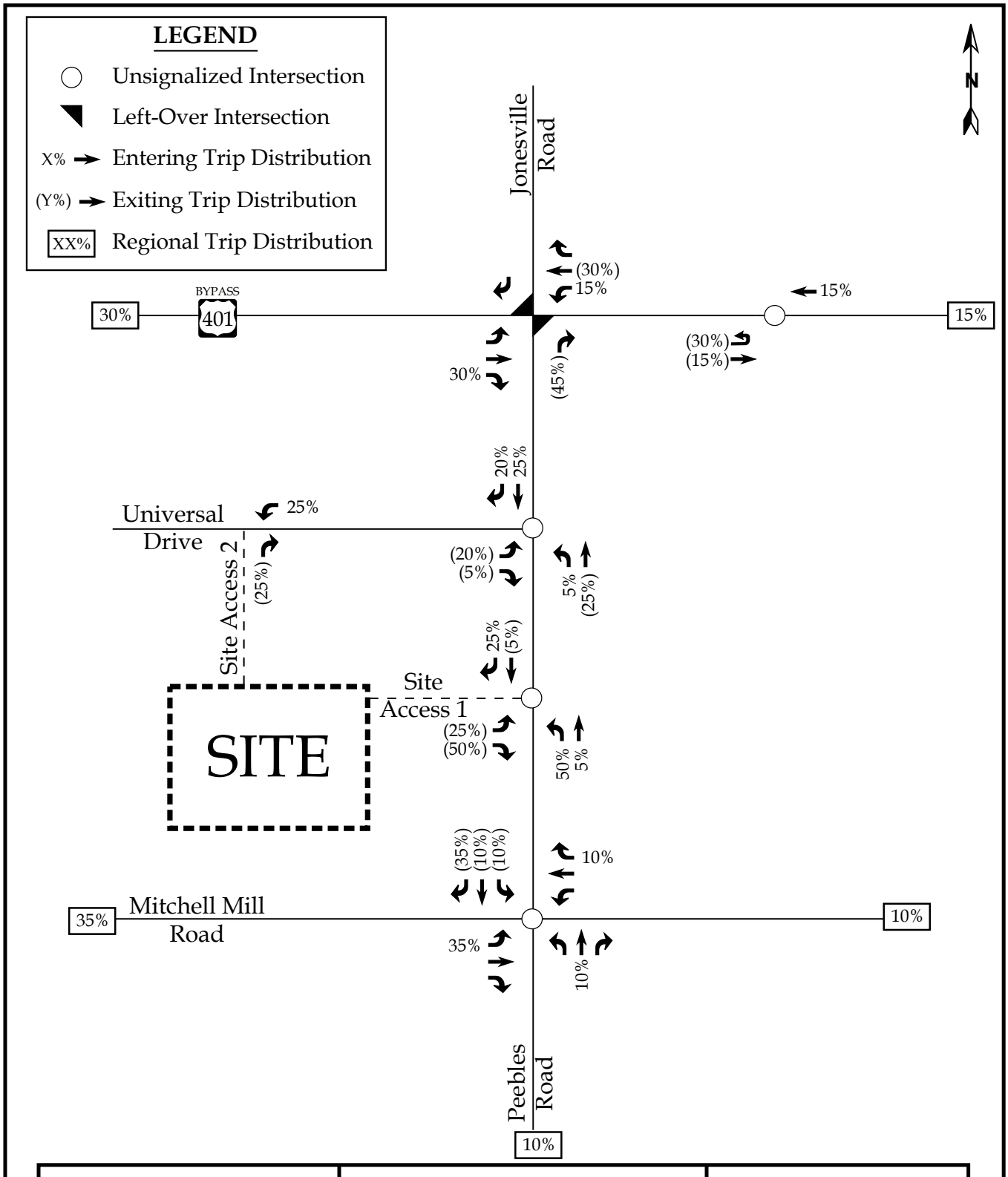
4.2. Site Trip Distribution and Assignment

Trip distribution percentages used in assigning site trips for this development were approved during the scoping process and were estimated based on a combination of existing traffic patterns, population centers adjacent to the study area, and engineering judgment.

It is estimated that the residential site trips will be regionally distributed as follows:

- 35% to/from the west via Mitchell Mill Road
- 30% to/from the west via US 401 Bypass
- 15% to/from the east via US 401 Bypass
- 10% to/from the south via Peebles Road
- 10% to/from the east via Mitchell Mill Road

The site trip distribution is shown in Figure 8 and the peak hour site trip assignment is shown in Figure 9.

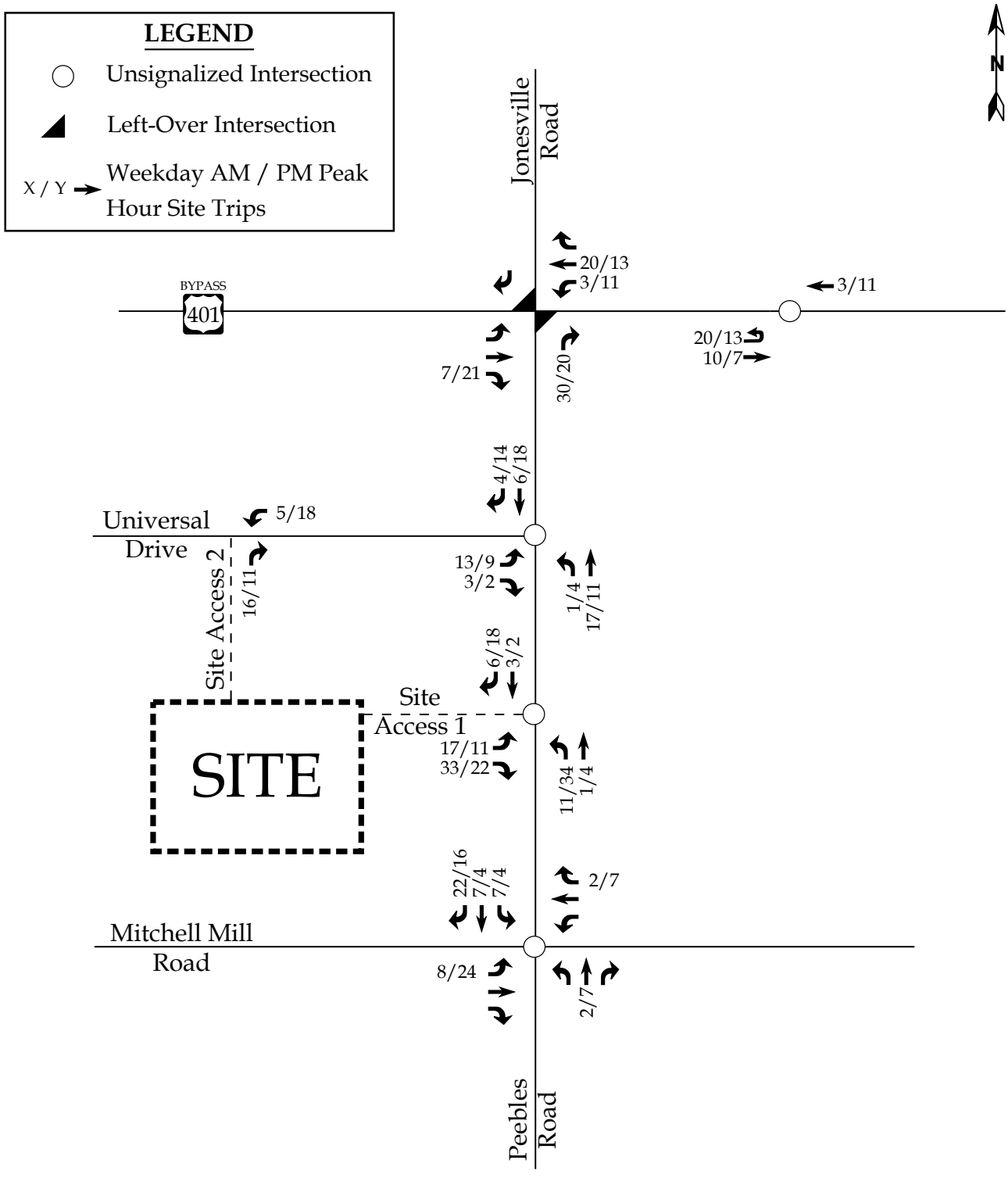


RAMEY KEMP ASSOCIATES

Harris Creek Farm
Rolesville, NC

Site Trip Distribution

Scale: Not to Scale | Figure 8



RAMEY KEMP ASSOCIATES	Harris Creek Farm Rolesville, NC	Site Trip Assignment	
		Scale: Not to Scale	Figure 9

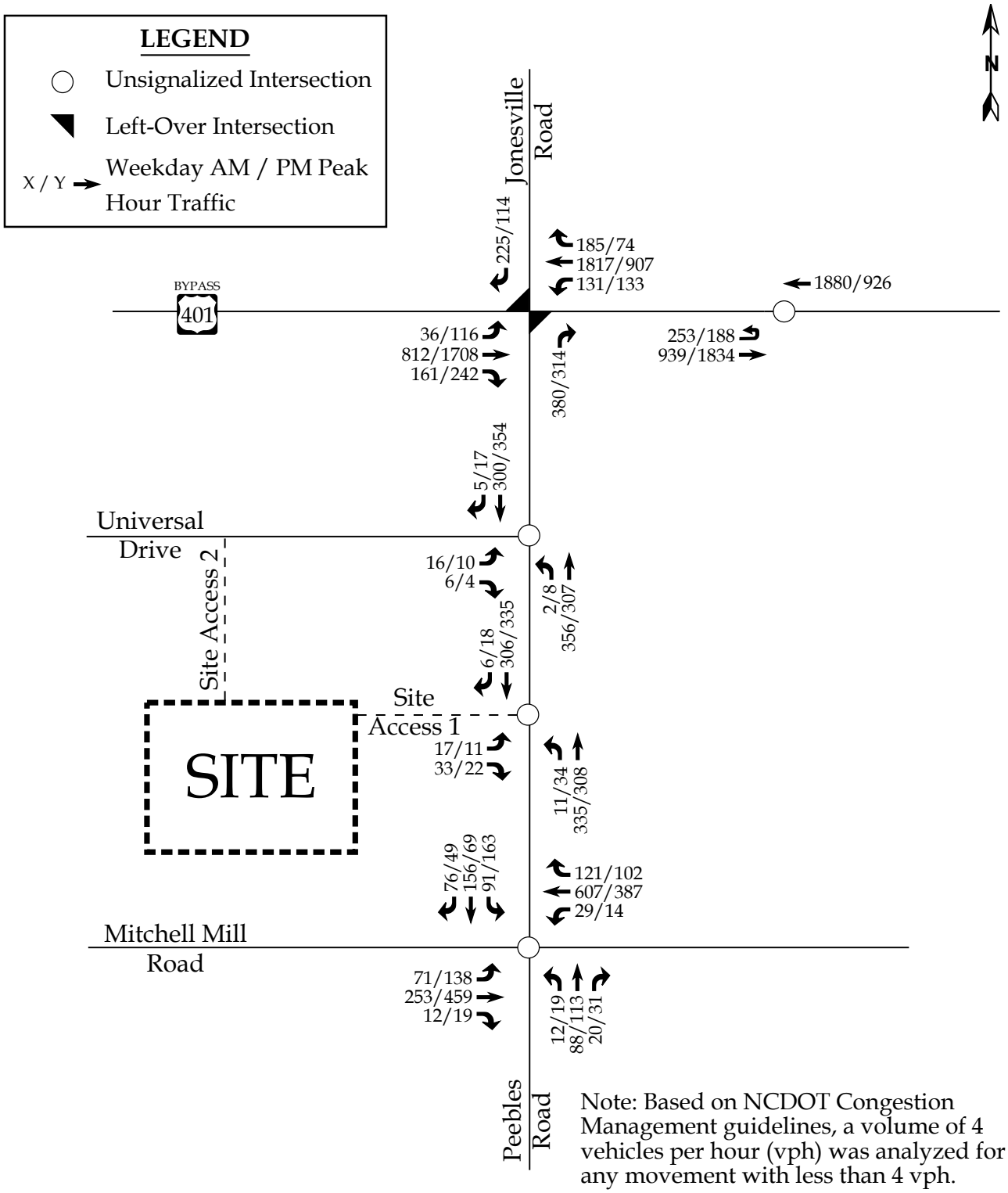
5. 2027 BUILD TRAFFIC CONDITIONS

5.1. 2027 Build Peak Hour Traffic Volumes

To estimate traffic conditions with the site fully built-out, the total site trips were added to the 2027 no-build traffic volumes to determine the 2027 build traffic volumes. Refer to Figure 10 for an illustration of the 2027 build peak hour traffic volumes with the proposed site fully developed.

5.2. Analysis of 2027 Build Peak Hour Traffic Conditions

Study intersections were analyzed with the 2027 build traffic volumes using the same methodology previously discussed for existing and no-build traffic conditions. Intersections were analyzed with improvements necessary to accommodate future traffic volumes. The results of the capacity analysis for each intersection are presented in Section 7 of this report.



Note: Based on NCDOT Congestion Management guidelines, a volume of 4 vehicles per hour (vph) was analyzed for any movement with less than 4 vph.

RKA RAMEY KEMP ASSOCIATES	Harris Creek Farm Rolesville, NC	2027 Build Peak Hour Traffic
		Scale: Not to Scale | Figure 10

6. TRAFFIC ANALYSIS PROCEDURE

Study intersections were analyzed using the methodology outlined in the *Highway Capacity Manual* (HCM), 6th Edition published by the Transportation Research Board. Capacity and level of service are the design criteria for this traffic study. A computer software package, Synchro (Version 11), was used to complete the analyses for most of the study area intersections. Please note that the unsignalized capacity analysis does not provide an overall level of service for an intersection; only delay for an approach with a conflicting movement.

The HCM defines capacity as "the maximum hourly rate at which persons or vehicles can reasonably be expected to traverse a point or uniform section of a lane or roadway during a given time period under prevailing roadway, traffic, and control conditions." Level of service (LOS) is a term used to represent different driving conditions, and is defined as a "qualitative measure describing operational conditions within a traffic stream, and their perception by motorists and/or passengers." Level of service varies from Level "A" representing free flow, to Level "F" where breakdown conditions are evident. Refer to Table 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." An average control delay of 50 seconds at a signalized intersection results in LOS "D" operation at the intersection.

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

6.1. Adjustments to Analysis Guidelines

Capacity analysis at all study intersections was completed according to Town LDO and NCDOT Congestions Management Guidelines.

7. CAPACITY ANALYSIS

7.1. US 401 Bypass and Jonesville Road

The existing unsignalized intersection of US 401 Bypass Road and Jonesville Road was analyzed under 2022 existing, 2027 no-build, and 2027 build traffic conditions with the lane configurations and traffic control shown in Table 5. Refer to Table 5 for a summary of the analysis results. Refer to Appendix D for the Synchro capacity analysis reports.

Table 5: Analysis Summary of US 401 Bypass and Jonesville Road

ANALYSIS SCENARIO	APPROACH	LANE CONFIGURATIONS	WEEKDAY AM PEAK HOUR LEVEL OF SERVICE		WEEKDAY PM PEAK HOUR LEVEL OF SERVICE	
			Approach	Overall (seconds)	Approach	Overall (seconds)
2022 Existing	EB WB* NB	2 TH, 1 RT 1 LT 1 RT	-- C[1] B[2]	N/A	-- E[1] C[2]	N/A
	EB** WB SB	1 LT 2 TH, 1 RT 1 RT	F[1] -- E[2]	N/A	C[1] -- B[2]	N/A
2027 No-Build	EB WB* NB	2 TH, 1 RT 1 LT 1 RT	-- D[1] D[2]	N/A	-- F[1] F[2]	N/A
	EB** WB SB	1 LT 2 TH, 1 RT 1 RT	F[1] -- F[2]	N/A	E[1] -- B[2]	N/A
2027 Build	EB WB* NB	2 TH, 1 RT 1 LT 1 RT	-- D[1] D[2]	N/A	-- F[1] F[2]	N/A
	EB** WB SB	1 LT 2 TH, 1 RT 1 RT	F[1] -- F[2]	N/A	E[1] -- B[2]	N/A
2027 Build-Improved	EB WB* NB	2 TH, 1 RT 1 LT 1 RT	B B B	B (16)	B D C	C (23)
	EB** WB SB	1 LT 2 TH, 1 RT 1 RT	F[1] -- F[2]	N/A	E[1] -- B[2]	N/A

*Synchro analyzed the WB left-turns as SB through movements due to the nature of the superstreet and synchro limitations.
**Synchro analyzed the EB left-turns as NB through movements due to the nature of the superstreet and synchro limitations.
1. Level of service for major-street left-turn movement.
2. Level of service for minor-street approach.

Capacity analysis of 2022 existing traffic conditions indicates that the major-street left-turn movements and minor-street approaches are expected to operate at LOS D or better with the exception of the eastbound left-turn movement during the weekday AM peak hour (LOS F), the westbound left-turn movement during the weekday PM peak hour (LOS E), and the southbound minor-street approach during the weekday AM peak hour (LOS E).

Under 2027 no-build and 2027 build traffic conditions, the major-street left-turn movements are expected to operate at LOS E/F during the weekday AM and PM peak hours with the exception of the westbound left-turn movement during the weekday AM peak hour (LOS D) under 2027 no-build and 2027 build traffic conditions. The minor-street approaches are expected to operate at LOS E/F during the weekday AM and PM peak hours with the exception of the northbound approach during the weekday AM peak hour (LOS D) and the southbound approach during the weekday PM peak hour (LOS B) under 2027 no-build and 2027 build traffic conditions. It should be noted that the proposed development is expected to account for approximately 2% of the overall traffic at this intersection during the weekday AM and PM peak hours. The proposed development is expected to account for 8% and 6% of the northbound right movements during the AM and PM peak hours, respectively.

Due to the poor levels-of-service expected at this intersection, a traffic signal was considered under 2027 build traffic conditions to achieve acceptable levels of service. Weekday AM and PM peak hour traffic volumes were utilized in evaluating the potential need for signalization based on the guidelines contained within the *Manual on Uniform Traffic Control Devices* (MUTCD) and within the *Guidelines for Signalization of Intersections with Two or Three Approaches Final Report*, published by ITRE. Based on a review of the peak hour signal warrant at this intersection, the intersection is expected to meet the peak hour warrant for both the weekday AM and PM peak hours under 2027 no-build and 2027 build traffic conditions. It is not expected that this intersection would satisfy the MUTCD 8-hour (warrant 1) or 4-hour (warrant 2) warrants, which NCDOT favors for installation of a traffic signal. These longer period warrants are not typically met for residential areas due to the distinct peak traffic periods for these types of development. Based on a review of ITRE 95th percentile queue length calculations, the northbound right-turn movement demand is expected to be over 85%

capacity during the weekday AM peak hour and exceed capacity during the weekday PM peak hour under 2027 no-build and 2027 build traffic conditions. Refer to Appendix J for a copy of the MUTCD warrants and the ITRE 95th percentile queue length calculations.

Based on the Town's LDO, improvements must be identified to maintain no-build levels-of-service under build traffic conditions or to limit the degradation to less than a five percent increase in total delay on any approach for those operating at failing levels-of-service under no-build traffic conditions. Therefore, additional turn-lanes were considered for the northbound right-turn and westbound left-turn movements at this intersection to achieve acceptable operation per the Town's LDO. However, additional turn-lanes are not a realistic or practical improvement at an unsignalized intersection operating with superstreet configurations.

Based on the Town's LDO, it is recommended that this intersection be monitored for signalization and a full signal warrant analysis be conducted prior to the full build-out of the proposed development and install a traffic signal if warranted and approved by the Town and NCDOT. With signalization, it is expected that this intersection will operate at acceptable levels-of-service during the weekday AM and PM peak hours.

7.2. US 401 Bypass and Eastern U-Turn Location

The existing unsignalized intersection of US 401 Bypass and Eastern U-Turn Location was analyzed under 2022 existing, 2027 no-build, and 2027 build traffic conditions with the lane configurations and traffic control shown in Table 6. Refer to Table 6 for a summary of the analysis results. Refer to Appendix E for the Synchro capacity analysis reports.

Table 6: Analysis Summary of US 401 Bypass and Eastern U-Turn Location

ANALYSIS SCENARIO	APPROACH	LANE CONFIGURATIONS	WEEKDAY AM PEAK HOUR LEVEL OF SERVICE		WEEKDAY PM PEAK HOUR LEVEL OF SERVICE	
			Approach	Overall (seconds)	Approach	Overall (seconds)
2022 Existing	EB* WB	1 UT 2 TH	C[1] --	N/A	B[1] --	N/A
2027 No-Build	EB* WB	1 UT 2 TH	F[1] --	N/A	C[1] --	N/A
2027 Build	EB* WB	1 UT 2 TH	F[1] --	N/A	C[1] --	N/A
2027 Build – Improved	EB* WB	1 UT 2 TH	D B	C (21)	B A	B (11)

*Synchro analyzed the EB u-turn as a NB left-turn movement due to the nature of the superstreet and synchro limitations.

1. Level of service for major-street u-turn movement.

Capacity analysis of 2022 existing and 2027 no-build traffic conditions indicates that the major-street u-turn movement is expected to operate at LOS C or better during the weekday AM and PM peak hours, with the exception of the weekday AM peak hour under 2027 no-build conditions (LOS F).

Under 2027 build traffic conditions, the major-street u-turn movement is expected to operate at LOS F during the weekday AM peak hour and at LOS C during the weekday PM peak hour. It should be noted that the proposed development is expected to account for approximately 1% of the overall traffic at this intersection during the weekday AM and PM peak hours. The proposed development is expected to account for approximately 8% and 7%

of the overall eastbound u-turn movements at this intersection during the weekday AM and PM peak hours, respectively.

Due to the poor levels-of-service expected at this intersection, a traffic signal was considered under 2027 build traffic conditions to achieve acceptable levels of service. Weekday AM and PM peak hour traffic volumes were utilized in evaluating the potential need for signalization based on the guidelines contained within the *Manual on Uniform Traffic Control Devices* (MUTCD) and within the *Guidelines for Signalization of Intersections with Two or Three Approaches Final Report*, published by ITRE. Based on a review of signal warrants at this intersection, the peak hour warrant (warrant 3) from the MUTCD is expected to be met for the weekday AM peak hour under 2027 no-build and build traffic conditions. It is not expected that this intersection would satisfy the MUTCD 8-hour (warrant 1) or 4-hour (warrant 2) warrants, which NCDOT favors for installation of a traffic signal. These longer period warrants are not typically met for residential areas due to the distinct peak traffic periods for these types of development. Based on a review of ITRE 95th percentile queue length calculations, the eastbound u-turn movement demand is expected to exceed capacity during the weekday AM peak hour under 2027 no-build and 2027 build traffic conditions. Refer to Appendix J for a copy of the MUTCD warrants and the ITRE 95th percentile queue length calculations.

Based on the Town's LDO, improvements must be identified to maintain no-build levels-of-service under build traffic conditions or to limit the degradation to less than a five percent increase in total delay on any approach for those operating at failing levels-of-service under no-build traffic conditions. Therefore, additional turn-lanes were considered for the eastbound u-turn movement at this intersection to achieve acceptable operation per the Town's LDO. However, additional turn-lanes are not a realistic or practical improvement at an unsignalized intersection operating with superstreet configurations.

Based on the Town's LDO, it is recommended that this intersection be monitored for signalization and a full signal warrant analysis be conducted prior to the full build-out of the proposed development and install a traffic signal if warranted and approved by the Town

and NCDOT. With signalization, it is expected that this intersection will operate at acceptable levels-of-service during the weekday AM and PM peak hours.

7.3. Mitchell Mill Road and Jonesville Road / Peebles Road

The existing unsignalized four-way stop intersection of Mitchell Mill Road and Jonesville Road / Peebles Road was analyzed under 2022 existing, 2027 no-build, and 2027 build traffic conditions with the lane configurations and traffic control shown in Table 7. Refer to Table 7 for a summary of the analysis results. Refer to Appendix F for the Synchro capacity analysis reports.

Table 7: Analysis Summary of Mitchell Mill Road and Jonesville Road / Peebles Road

ANALYSIS SCENARIO	APPROACH	LANE CONFIGURATIONS	WEEKDAY AM PEAK HOUR LEVEL OF SERVICE		WEEKDAY PM PEAK HOUR LEVEL OF SERVICE	
			Approach	Overall (seconds)	Approach	Overall (seconds)
2022 Existing	EB WB NB SB	1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT	B[1] B[1] B[1] B[1]	B (13)	B[1] A[1] A[1] A[1]	B (11)
2027 No-Build	EB WB NB SB	1 LT, 1 TH-RT 1 LT-TH, 1 RT 1 LT-TH-RT 1 LT, 1 TH-RT	C[1] F[1] C[1] C[1]	F (95)	F[1] E[1] C[1] C[1]	F (57)
2027 Build	EB WB NB SB	1 LT, 1 TH-RT 1 LT-TH, 1 RT 1 LT-TH-RT 1 LT, 1 TH-RT	C[1] F[1] C[1] C[1]	F (104)	F[1] F[1] C[1] C[1]	F (61)
2027 Build - Improved	EB WB NB SB	1 LT, 1 TH-RT 1 LT-TH, 1 RT 1 LT-TH-RT 1 LT, 1 TH-RT	A B B C	B (14)	B B B B	B (13)

1. Level of service for all-way stop controlled approach.

Capacity analysis of 2022 existing indicates that the intersection is expected to operate at an overall LOS B or better during the weekday AM and PM peak hours. Under 2027 no-build and 2027 build traffic conditions, this intersection is expected to operate at an overall LOS F during the weekday AM and PM peak hours. It should be noted that the proposed development is expected to account for approximately 3% and 4% of the overall traffic at this

intersection during the weekday AM and PM peak hours, respectively. The proposed development is expected to account for approximately 11% and 17% of the eastbound left movement and 17% and 7% of the westbound right movements during the weekday AM and PM peak hours, respectively.

Several turn lanes expected to be constructed by adjacent developments were included in the 2027 no-build and 2027 build scenarios. An exclusive eastbound left-turn lane was identified in the 5109 Mitchell Mill Road TIA. An exclusive westbound right-turn lane was identified in the Hills at Harris Creek TIA. In both the 5109 Mitchell Mill Road TIA and the Hills at Harris Creek TIA an exclusive southbound left-turn lane improvement was identified.

Due to the poor levels-of-service expected at this intersection, a traffic signal was considered under 2027 build traffic conditions to achieve acceptable levels-of-service. The peak hour warrant (warrant 3) from the *Manual on Uniform Traffic Control Devices* (MUTCD) was considered. Based on a review of the peak hour signal warrant at this intersection, the intersection is expected to meet the peak hour warrant for both the weekday AM and PM peak hours under 2027 no-build and 2027 build traffic conditions. It is not expected that this intersection would satisfy the MUTCD 8-hour (warrant 1) or 4-hour (warrant 2) warrants, which NCDOT favors for installation of a traffic signal. These longer period warrants are not typically met for residential areas due to the distinct peak traffic periods for these types of development. Refer to Appendix J for a copy of the MUTCD warrants.

Based on the Town's LDO, it is recommended that this intersection be monitored for signalization and a full signal warrant analysis be conducted prior to the full build-out of the proposed development and install a traffic signal if warranted and approved by the Town and NCDOT. With signalization, it is expected that this intersection will operate at acceptable levels-of-service during the weekday AM and PM peak hours.

7.4. Jonesville Road and Universal Drive

The existing unsignalized intersection of Jonesville Road and Universal Drive was analyzed under 2027 build traffic conditions with the lane configurations and traffic control shown in Table 8. Refer to Table 8 for a summary of the analysis results. Refer to Appendix G for the synchro capacity analysis reports.

Table 8: Analysis Summary of Jonesville Road and Universal Drive

ANALYSIS SCENARIO	APPROACH	LANE CONFIGURATIONS	WEEKDAY AM PEAK HOUR LEVEL OF SERVICE		WEEKDAY PM PEAK HOUR LEVEL OF SERVICE	
			Approach	Overall (seconds)	Approach	Overall (seconds)
2022 Existing	EB NB SB	1 LT-RT 1 LT-TH 1 TH-RT	A[2] A[1] --	N/A	A[2] A[1] --	N/A
2027 No-Build	EB NB SB	1 LT-RT 1 LT-TH 1 TH-RT	B[2] A[1] --	N/A	B[2] A[1] --	N/A
2027 Build	EB NB SB	1 LT-RT 1 LT-TH 1 TH-RT	B[2] A[1] --	N/A	B[2] A[1] --	N/A

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

Capacity analysis of 2027 build traffic conditions indicates that the major-street left-turn movement is expected to operate at LOS A during the weekday AM and PM peak hours. The minor-street approach is expected to operate at LOS B or better during the weekday AM and PM peak hours.

Right and left-turn lanes were considered based on the NCDOT *Policy on Street and Driveway Access to North Carolina Highways*. Based on the estimated low volume of right-turn and left-turn movements into the proposed development at this intersection, exclusive right-turn and left-turn lanes are not recommended. Refer to Appendix I for a copy of the turn lane warrants. No improvements are recommended by the developer.

7.5. Jonesville Road and Site Drive

The proposed intersection of Jonesville Road and Site Drive was analyzed under 2027 build traffic conditions with the lane configurations and traffic control shown in Table 9. Refer to Table 9 for a summary of the analysis results. Refer to Appendix H for the synchro capacity analysis reports.

Table 9: Analysis Summary of Jonesville Road and Site Drive

ANALYSIS SCENARIO	APPROACH	LANE CONFIGURATIONS	WEEKDAY AM PEAK HOUR LEVEL OF SERVICE		WEEKDAY PM PEAK HOUR LEVEL OF SERVICE	
			Approach	Overall (seconds)	Approach	Overall (seconds)
2027 Build	EB	1 LT-RT	B[2]	N/A	B[2]	N/A
	NB	1 LT-TH	A[1]		A[1]	
	SB	1 TH-RT	--		--	

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

Capacity analysis of 2027 build traffic conditions indicates that the major-street left-turn movement is expected to operate at LOS A during the weekday AM and PM peak hours. The minor-street approach is expected to operate at LOS B or better during the weekday AM and PM peak hours.

Right and left-turn lanes were considered based on the NCDOT *Policy on Street and Driveway Access to North Carolina Highways*. Based on the estimated low volume of right-turn and left-turn movements into the proposed development at this intersection, exclusive right-turn and left-turn lanes are not recommended. Refer to Appendix I for a copy of the turn lane warrants. No improvements are recommended by the developer.

8. CONCLUSIONS

This Traffic Impact Analysis was conducted to determine the potential traffic impacts of the proposed Harris Creek Farm development to be located on the west side of Jonesville Road near Universal Drive in Rolesville, North Carolina. The development is expected to consist of 68 single-family homes and 81 townhomes and to be built-out in 2027. Site access is proposed via two (2) full-movement driveway connections: one on Universal Drive and one on Jonesville Road approximately 700 feet south of Universal Drive.

The study analyzes traffic conditions during the weekday AM and PM peak hours for the following scenarios:

- 2022 Existing Traffic Conditions
- 2027 No-Build Traffic Conditions
- 2027 Build Traffic Conditions

Trip Generation

It is estimated that the proposed development will generate approximately 1,276 site trips on the roadway network during a typical 24-hour weekday period. Of the daily traffic volume, it is anticipated that 88 trips (22 entering and 66 exiting) will occur during the weekday AM peak hour and 114 trips (70 entering and 44 exiting) will occur during the weekday PM peak hour.

Adjustments to Analysis Guidelines

Capacity analysis at all study intersections was completed according to NCDOT Congestion Management Guidelines. Refer to section 6.1 of this report for a detailed description of any adjustments to these guidelines made throughout the analysis.

Intersection Capacity Analysis Summary

All the study area intersections (including the proposed site driveways) are expected to operate at acceptable levels-of-service under existing and future year conditions with the exception of those identified in Section 7 of this report.

9. RECOMMENDATIONS

Based on the findings of this study, specific geometric improvements have been identified and are recommended to accommodate future traffic conditions. See a more detailed description of the recommended improvements below. Refer to Figure 11 for an illustration of the recommended lane configurations for the proposed development.

Recommended Improvements by Developer

US 401 Bypass and Jonesville Road

- Conduct a full signal warrant analysis prior to full build-out of the proposed development and install a traffic signal if warranted and approved by the Town and NCDOT.

US 401 Bypass and Eastern U-Turn Location

- Conduct a full signal warrant analysis prior to full build-out of the proposed development and install a traffic signal if warranted and approved by the Town and NCDOT.

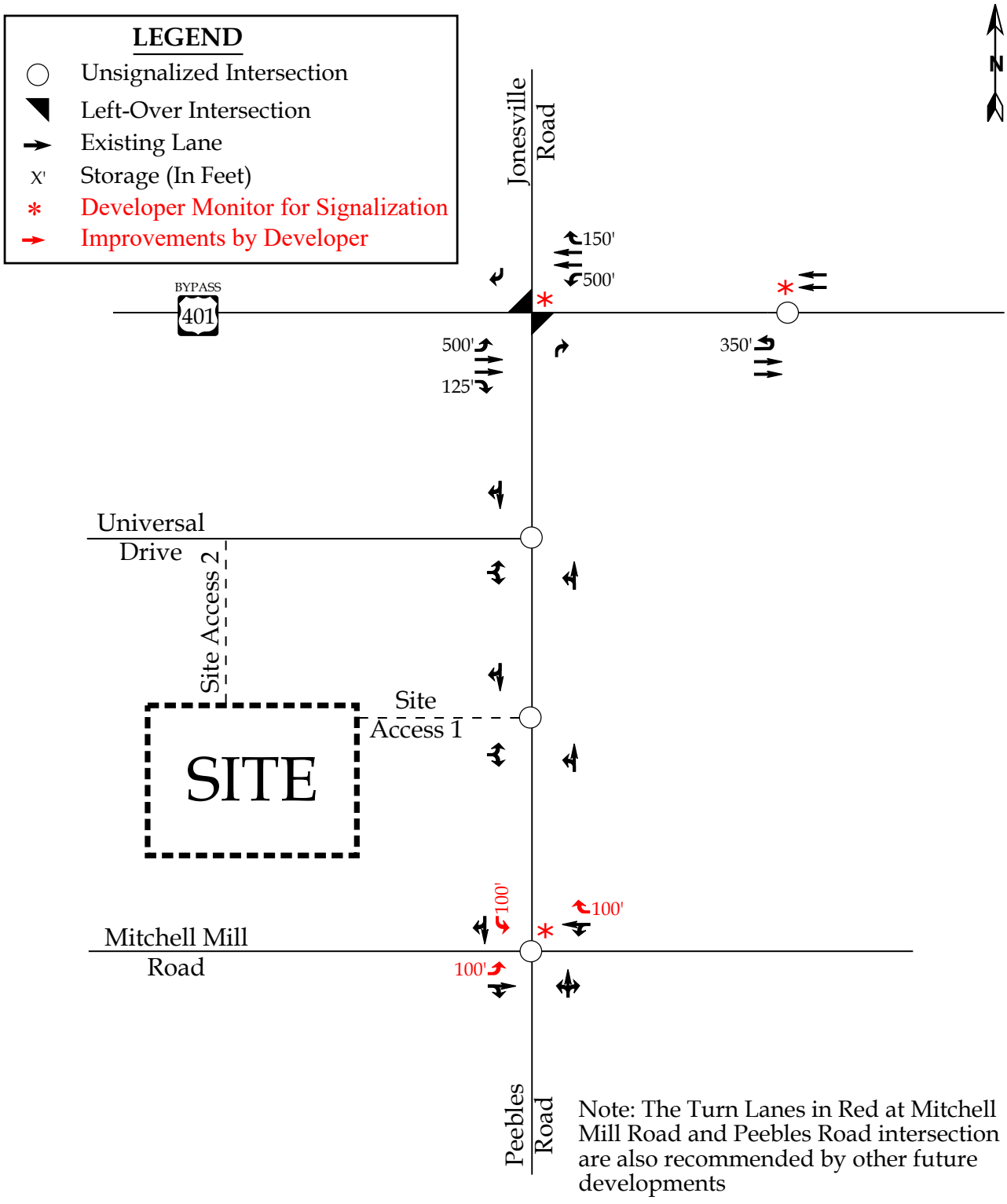
Mitchell Mill Road and Jonesville Road / Peebles Road

- Construct a southbound (Jonesville Road) left-turn lane with at least 100 feet of storage and appropriate decel and taper.
    - It should be noted that this improvement was also identified by the 5109 Mitchell Mill Road TIA and Hills at Harris Creek TIA
- Construct a westbound (Mitchell Mill Road) right-turn lane with at least 100 feet of storage and appropriate decel and taper.
    - It should be noted that this improvement was also identified by the Hills at Harris Creek TIA
- Construct an eastbound (Mitchell Mill Road) left-turn lane with at least 100 feet of storage and appropriate decel and taper.
    - It should be noted that this improvement was also identified by the 5109 Mitchell Mill Road TIA

- Conduct a full signal warrant analysis prior to full build-out of the proposed development and install a traffic signal if warranted and approved by the Town and NCDOT.

Jonesville Road and Site Drive

- Construct the eastbound approach (Site Drive) with one ingress lane and one egress lane.
- Provide stop-control for the eastbound approach (Site Drive).



RAMEY KEMP ASSOCIATES

Harris Creek Farm
Rolesville, NC

Recommended Lane Configurations

Scale: Not to Scale | Figure 11

TECHNICAL APPENDIX

APPENDIX A

SCOPING DOCUMENTATION

RAMEY KEMP ASSOCIATES
TOGETHER WE ARE LIMITLESS

T 919 872 5115
5808 Faringdon Pl,
Raleigh, NC 27609

March 17, 2023

Jeremy L. Warren, PE
NCDOT District 1 Engineer
4009 District Drive
Raleigh, NC 27507
jlwarren@ncdot.gov
[Sent via Email]

Reference: Harris Creek Farm
Rolesville, North Carolina

Subject: Memorandum of Understanding for TIA Report

Dear Mr. Warren:

The following is a Memorandum of Understanding (MOU) outlining the proposed scope of work and assumptions related to the Traffic Impact Analysis (TIA) for the proposed Harris Creek Farm development in Rolesville, North Carolina. The proposed development is to be located on the west side of Jonesville Road near Universal Drive in Rolesville, NC. The development is expected to consist of 68 single-family homes and 81 townhomes and is anticipated to be built out by 2027. Refer to the attached site location map. Site access to the proposed development is expected to be provided via two (2) full-movement driveway connections: one on Jonesville Road and one on Universal Drive. Refer to the attachments for a copy of the preliminary site plan.

Study Area

The study area is proposed to consist of the following intersections:

- Mitchell Mill Road & Jonesville Road / Peebles Road (unsignalized)
- US 401 Bypass and Jonesville Road (unsignalized)
- US 401 Bypass and Eastern U-Turn Location (unsignalized)
- Jonesville Road and Universal Drive (unsignalized)
- Jonesville Road and Site Driveway (unsignalized)

Existing Traffic Volumes

Existing peak hour traffic volumes will be determined based on previously collected traffic counts at the study intersections below, in November 2021 during typical weekday AM (7:00 AM – 9:00 AM) and PM (4:00 PM – 6:00 PM) peak periods, while schools were in session for in-person learning:

- Mitchell Mill Road & Jonesville Road / Peebles Road
- US 401 Bypass and Jonesville Road
- US 401 Bypass and Eastern U-Turn Location

These previously collected counts will be projected to the year 2022 using a compounded annual growth rate of 2%.

Existing peak hour turning movement volumes at the intersection of Jonesville Road and Universal Drive will be estimated by generating and assigning trips for the nine (9) homes that are accessed via Universal Drive (AM trips: 2 enter 6 exit and PM trips: 7 enter 3 exit, distributed to the north and south along Jonesville Road the same as site trips). Through traffic volumes will be balanced from the Mitchell Mill Road / Jonesville Road intersection.

Refer to the attachments for an illustration of 2022 existing peak hour traffic volumes.

Background Traffic Volumes

Background traffic volumes will be determined by projecting 2022 existing traffic volumes to the year 2027 using a 0% annual growth rate. A growth rate of 0% will be used due to the number of developments included in the background traffic and the proximity of some of these developments to the proposed development. It is assumed that the following adjacent developments are to be included in this study:

- Cobblestone Crossing Mixed-Use (Cobblestone)
- Young Street PUD (The Point)
- Wheeler Tract (Rolesville Crossing)
- Louisbury Road Assemblage
- Kalas / Watkins Family Property (Kalas Falls)
- 5109 Mitchell Mill
- Hills at Harris Creek

Future Roadway Improvements

There are no future roadway improvements within the study area to consider under future traffic conditions.

Trip Generation

Average weekday daily, AM peak hour, and PM peak hour trips for the proposed development were estimated using methodology contained within the ITE *Trip Generation Manual*, 11th Edition. Refer to Table 1, on the following page, for a summary of the proposed site trip generation for full buildout of the proposed development.

Table 1: Trip Generation Summary

Land Use (ITE Code)	Intensity	Daily Traffic (vpd)	Weekday AM Peak Hour Trips (vph)			Weekday PM Peak Hour Trips (vph)		
			Enter	Exit	Total	Enter	Exit	Total
Single-Family Home (210)	68 DU	710	13	39	52	44	25	69
Multi-Family Home (Low-Rise) (220)	81 DU	568	9	27	36	26	19	45
Total Trips		1,268	22	66	88	70	44	114

It is estimated that the proposed development will generate approximately 1,268 site trips on the roadway network during a typical 24-hour weekday period. Of the daily traffic volume, it is anticipated that 88 trips (22 entering and 66 exiting) will occur during the weekday AM peak hour and 114 trips (70 entering and 44 exiting) will occur during the weekday PM peak hour.

Trip Distribution and Assignment

Site trips are distributed based on the locations of existing traffic patterns, population centers adjacent to the study area, and engineering judgment. A summary of the overall distributions is below.

Residential

- 30% to / from the west via US 401 Bypass
- 15% to / from the east via US 401 Bypass
- 10% to / from the south via Peebles Road
- 35% to / from the west via Mitchell Mill Road
- 10% to / from the east via Mitchell Mill Road

Refer to the attached site trip distribution figure.

Analysis Scenarios

All capacity analyses will be performed utilizing Synchro (Version 11). All study intersections will be analyzed during the weekday AM and PM peak hours under the following proposed traffic scenarios:

- 2022 Existing Traffic Conditions
- 2027 No-Build Traffic Conditions
- 2027 Build Traffic Conditions

Report

The TIA report will be prepared based on the Town and NCDOT requirements.

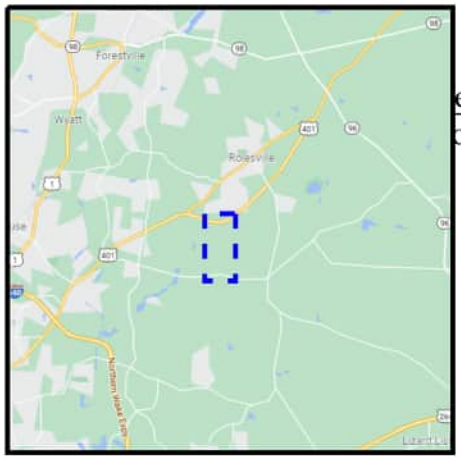
If you find this memorandum of understanding acceptable, please let me know so that we may include it in the TIA report. If you have any questions or concerns, please do not hesitate to contact me.

Sincerely,
Ramey Kemp Associates,

J. Andrew Eagle, PE, PTOE
Senior Traffic Engineering Project Manager

Attachments: Site Location Map
Site Plan
2022 Existing Traffic Volumes Figure
Proposed Site Trip Distribution Figure

cc: Matthew J. Nolfo, NCDOT
Holt Willis, NCDOT
Clarence Bunting, NCDOT
Nicholas Lineberger, NCDOT
Daniel Collins, NCDOT
Meredith Gruber, Town of Rolesville
Michael Elabarger, Town of Rolesville



Peebles Road

N

LEGEND

- Proposed Site Location
- Existing Study Intersection
- Study Area

RAMEY KEMP ASSOCIATES

Harris Creek Farm
Rolesville, NC

Site Location Map

Scale: Not to Scale | Figure 1

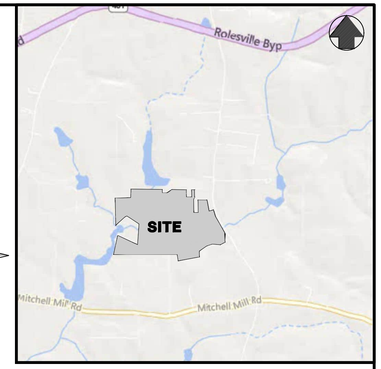
REZONING AND ANNEXATION

FOR

JONESVILLE ROAD

ROLESVILLE, NORTH CAROLINA

CASE NUMBER: MA 22-08



VICINITY MAP
SCALE: 1"=2000'

AGENCY CONTACTS

A. Town of Rolesville
Planning Department
502 Southtown Circle
Rolesville, NC 27571

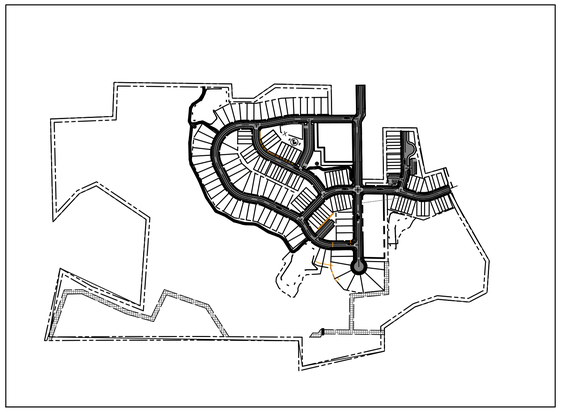
B. Wake County
Watershed Management
Waverly F. Akins Building
337 S. Salisbury St
Raleigh, NC 27601
Contact: Karyn Pageau
Phone: (919)-796-8769
Email: karyn.pageau@wakegov.com

C. City of Raleigh Public Utilities Department
One Exchange Plaza
Suite 620
Raleigh, NC 27601
P.O.Box 590
Raleigh, NC 27602
Phone: 919-996-3245
Email: publicutilityinfo@raleighnc.gov

D. NCDOT
Division 5, District 1 Office
4009 District Drive
Raleigh, NC 27607
Contact: Amy Neldringhaus, District Engineer
Phone: 919-733-3213
Email: anneldringhaus@ncdot.gov

Sheet List Table

Sheet Number	Sheet Title	Date	Revised Date
C0.0	COVER - REZONING	8/1/2022	9/30/2022
C0.1	EXISTING CONDITIONS	8/1/2022	9/30/2022
C1.0	OVERALL SITE PLAN	8/1/2022	9/30/2022
C1.1	SITE PLAN - SHEET 1 OF 6	8/01/2022	9/30/2022
C1.2	SITE PLAN - SHEET 2 OF 6	8/1/2022	9/30/2022
C1.3	SITE PLAN - SHEET 3 OF 6	8/1/2022	9/30/2022
C1.4	SITE PLAN - SHEET 4 OF 6	8/1/2022	9/30/2022
C1.5	SITE PLAN - SHEET 5 OF 6	8/1/2022	9/30/2022
C1.6	SITE PLAN - SHEET 6 OF 6	8/1/2022	9/30/2022
C1.7	OVERALL ZONING PLAN	8/1/2022	9/30/2022



KEY MAP
SCALE: 1" = 500'

500 0 500 1000 1500

SCALE 1" = 500

SITE DATA

OWNER	CHEN, PING 10030 GREEN LEVEL CHURCH RD STE 802 CARY NC 27519
SITE ADDRESS	4428 UNIVERSAL DR WAKE FOREST NC 27587-6356
PIN	1751271811, 1751375216, 1751315365, 1751375464, 1751375575, 1751375665, 1751375765, 1751375865, 1751375975, 1751385064, 1751384512, 1751383572, 1751368816, 1751378013, 1751378104, 1751378303, 1751377490, 1751471554, 1751385344
DEED BOOK/PAGE/MAP	018453/00623/1751 01, 018453/00592/1751 01
CURRENT ZONING	R30
PROPOSED ZONING	RM, RH
MIN. LOT SIZE	5000 SQ FT (SINGLE FAMILY CLUSTER) 2000 SQ FT (TOWNHOMES)
LAND USE	RESIDENTIAL
PROPOSED DEVELOPMENT	149 UNITS 68 SINGLE FAMILY UNITS 81 TOWNHOUSE UNITS
TOTAL SITE AREA	93.23 ACRES
RESIDENTIAL HIGH DENSITY	32.15 ACRES (14.02 AC. + 18.12 AC (ADDITIONAL OPEN SPACE)
RESIDENTIAL MEDIUM DENSITY	61.08 ACRES
PROPOSED DENSITY	TOWNHOMES (RH) 9.0 UNITS/AC(MAX) 81/14.02 = 5.77 UNITS/AC (PROVIDED) SINGLE FAMILY (RM) (CLUSTER) 5.0 UNITS/AC (MAX) 68/61.08 = 1.11 UNITS/AC (PROVIDED)
FLOOD PLAIN/ZONE	ZONE AE/ZONE X
FIRM PANEL NO	3720175700J
WATERSHED PROTECTION	NONE
MINIMUM LOT WIDTH	20' TOWNHOMES 40' SINGLE FAMILY (CLUSTER)
OPEN SPACE	RESIDENTIAL HIGH DENSITY PASSIVE: 2.10 (REQUIRED) 19.95 (PROVIDED) RESIDENTIAL MEDIUM DENSITY PASSIVE: 9.70 (REQUIRED) 44.09 (PROVIDED) IMPROVED OPEN SPACES: REQUIRED: SMALL: 1 MEDIUM: 2 LARGE: 0 SMALL: 1 0.73 AC (TOTAL PROVIDED) MEDIUM: 1 1.01 AC (TOTAL PROVIDED) LARGE: 1 13.74 AC (TOTAL PROVIDED)
PARKING	REQUIRED: 2.0/DWELLING UNIT PLUS 0.25 GUEST SPACES/DWELLING UNIT 81 UNITS X 2.25 = 183 SPOTS PROVIDED: 81 UNITS X 1 (DRIVEWAY) = 81 SPOTS PARKING LOTS = 116 SPOTS TOTAL PROVIDED = 197 SPOTS
SETBACKS	TOWNHOMES: FRONT: 20' SIDE: 10' REAR: 15' CORNER: 15' MIN. WIDTH BETWEEN STRUCTURES: 30' SINGLE FAMILY: (CLUSTER) FRONT: 20' SIDE: 5' REAR: 20' CORNER: 10' (CLUSTER)

STREET DATA

STREET A	1,200 LF
STREET B	2,368 LF
STREET C	450 LF
STREET D	743 LF

PROJECT TEAM

DEVELOPER/ OWNER:	THE CSC GROUP LLC 10030 GREEN LEVEL CHURCH RD STE 802 CARY NC 27519 ATTN: PING CHENG 919-748-0424
LAND PLANNERS, CIVIL ENGINEER:	MORRIS & RITCHIE ASSOCIATES OF NC, PC 5605 CHAPEL HILL ROAD, SUITE 112 RALEIGH, NC 27607 ATTN: MR. JEREMY M KEENY, PE, PLS
SURVEYOR:	MORRIS & RITCHIE ASSOCIATES OF NC, PC. 5605 CHAPEL HILL ROAD, SUITE 112 RALEIGH, NC 27607 ATTN: MR. JEREMY M KEENY, PE, PLS
ENVIRON. CONSULTANT:	MORRIS & RITCHIE ASSOCIATES OF NC, PC. 5605 CHAPEL HILL ROAD, SUITE 112 RALEIGH, NC 27607 ATTN: MR. JAMIE B. GUERRERO, PE, CPSWQ

FOR SITE PLAN REVIEW ONLY
NOT FOR CONSTRUCTION
PLAN IS SUBJECT TO REVISIONS DURING THE CONSTRUCTION APPROVAL PROCESS

PRELIMINARY NOT FOR CONSTRUCTION FOR REVIEW ONLY
ENGINEER'S SEAL

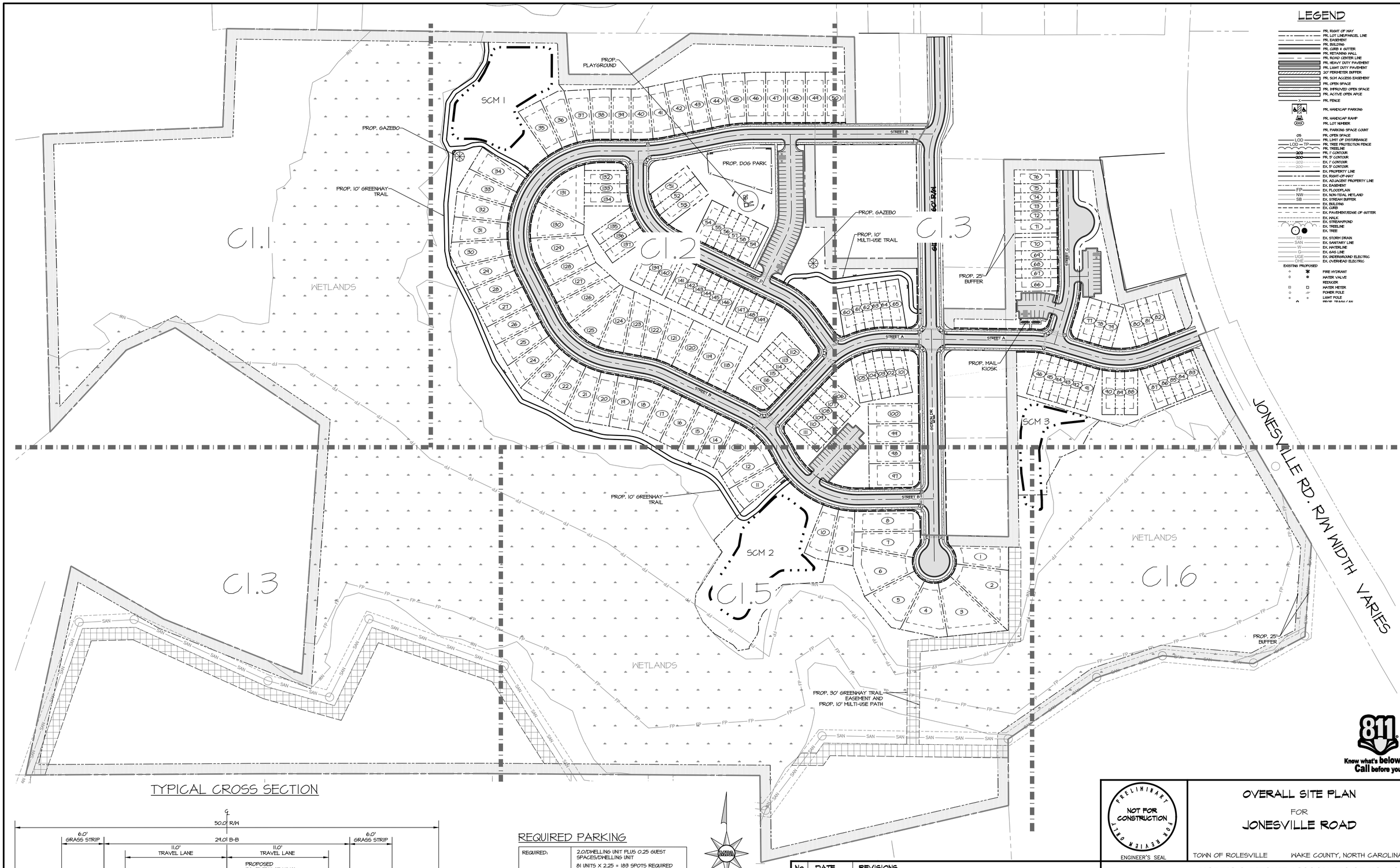
COVER - REZONING
FOR
JONESVILLE ROAD
TOWN OF ROLESVILLE WAKE COUNTY, NORTH CAROLINA

No.	DATE	REVISIONS
A	9/30/2022	REVISED PER TOWN OF ROLESVILLE COMMENTS

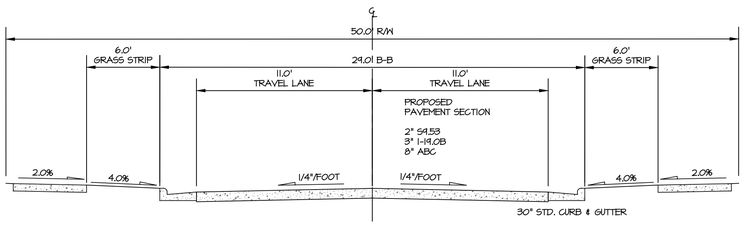
JOB NO.: 21790
SCALE: AS SHOWN
DATE: 6/1/2022
ENGINEER: JMK
DRAWN BY: ER/JM
DESIGN BY: DC
REVIEW BY: JMK

MORRIS & RITCHIE ASSOCIATES OF NC, PC
ENGINEERS, ARCHITECTS, PLANNERS, SURVEYORS AND LANDSCAPE ARCHITECTS
5605 CHAPEL HILL RD, STE 112
RALEIGH, NC 27607
(984) 200-2103
LICENSE # C-4182
WWW.MRAGTA.COM

STATUS: PRELIMINARY NOT FOR CONSTRUCTION | REVISION A | SHEET: C0.0



TYPICAL CROSS SECTION



N.T.S.

REQUIRED PARKING

REQUIRED:	2.0/DWELLING UNIT PLUS 0.25 GUEST SPACES/DWELLING UNIT 81 UNITS X 2.25 = 183 SPOTS REQUIRED
PROVIDED	81 UNITS X 1 (DRIVEWAY) = 81 SPOTS PARKING LOTS = 116 SPOTS (7 HANDICAP) TOTAL PROVIDED = 197 SPOTS

NORTH

100' 0 50' 100' 200' 400'

Scale : 1 Inch = 100 ft.

811 Know what's below. Call before you dig.

PRELIMINARY NOT FOR CONSTRUCTION FOR REVIEW ONLY

ENGINEER'S SEAL

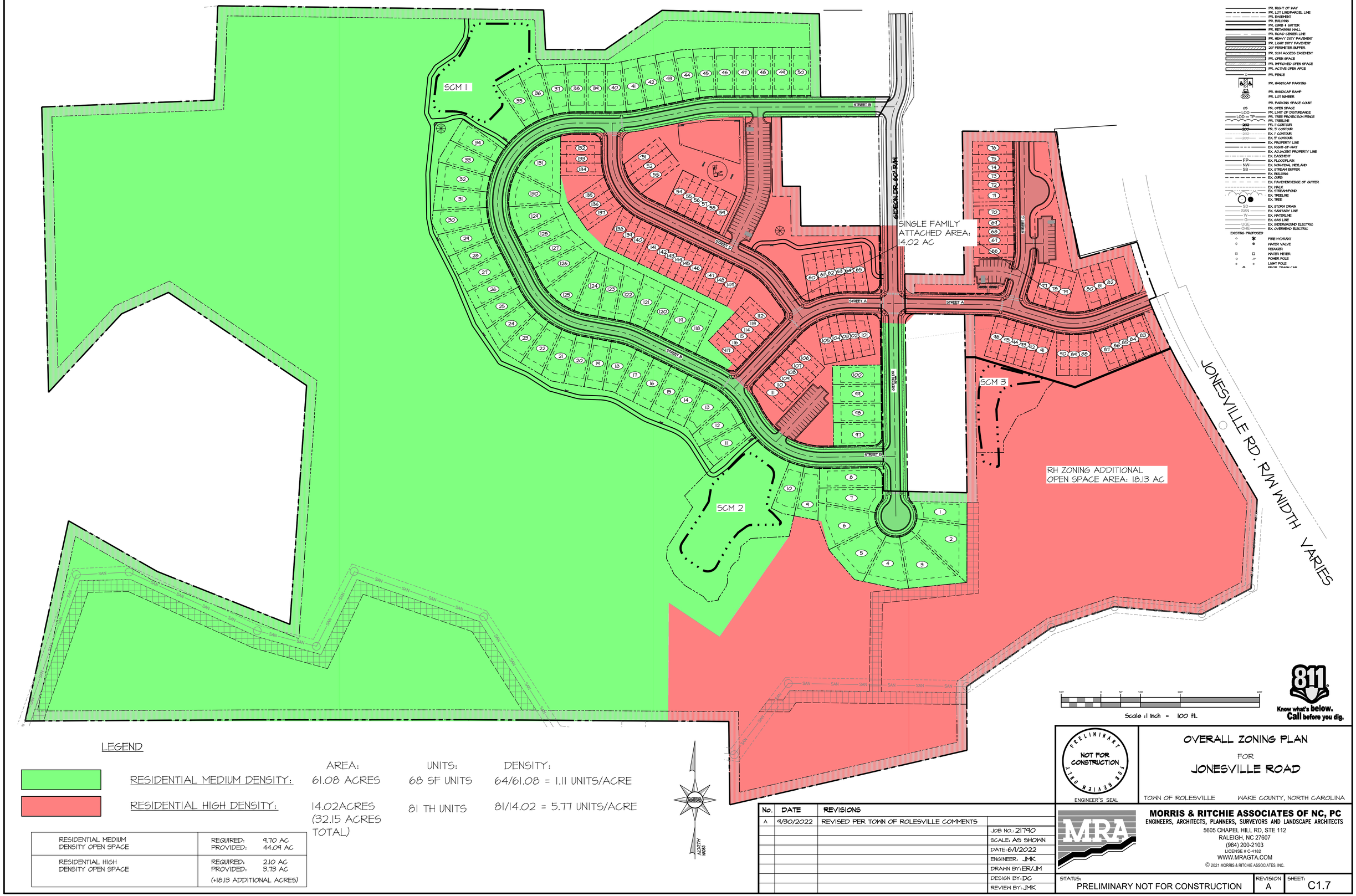
OVERALL SITE PLAN
FOR
JONESVILLE ROAD

TOWN OF ROLESVILLE WAKE COUNTY, NORTH CAROLINA

No.	DATE	REVISIONS	
A	9/30/2022	REVISED PER TOWN OF ROLESVILLE COMMENTS	
			JOB NO.: 21790
			SCALE: AS SHOWN
			DATE: 6/1/2022
			ENGINEER: JMK
			DRAWN BY: ER/JM
			DESIGN BY: DG
			REVIEW BY: JMK

MORRIS & RITCHIE ASSOCIATES OF NC, PC
ENGINEERS, ARCHITECTS, PLANNERS, SURVEYORS AND LANDSCAPE ARCHITECTS
5605 CHAPEL HILL RD, STE 112
RALEIGH, NC 27607
(984) 200-2103
LICENSE # C-4182
WWW.MRAGTA.COM

STATUS: PRELIMINARY NOT FOR CONSTRUCTION | REVISION: A | SHEET: C1.0



Scale 1 inch = 100 ft.

Know what's below. Call before you dig.

LEGEND

	AREA:	UNITS:	DENSITY:
RESIDENTIAL MEDIUM DENSITY:	61.08 ACRES	68 SF UNITS	64/61.08 = 1.11 UNITS/ACRE
RESIDENTIAL HIGH DENSITY:	14.02ACRES (32.15 ACRES TOTAL)	81 TH UNITS	81/14.02 = 5.77 UNITS/ACRE

RESIDENTIAL MEDIUM DENSITY OPEN SPACE	REQUIRED: 9.70 AC PROVIDED: 44.09 AC
RESIDENTIAL HIGH DENSITY OPEN SPACE	REQUIRED: 2.10 AC PROVIDED: 3.13 AC (18.13 ADDITIONAL ACRES)

PRELIMINARY NOT FOR CONSTRUCTION FOR REVIEW ONLY

ENGINEER'S SEAL

OVERALL ZONING PLAN
FOR
JONESVILLE ROAD

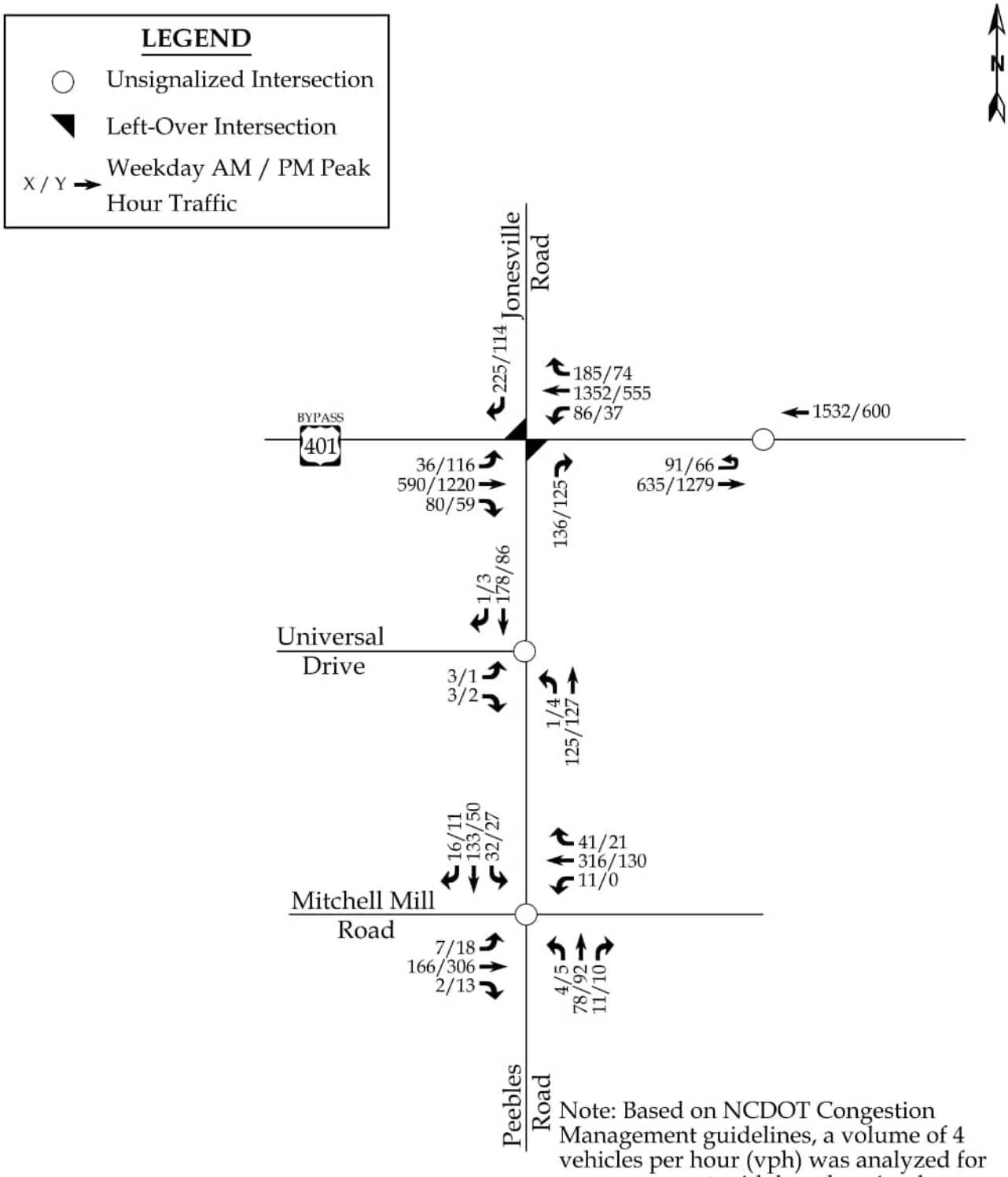
TOWN OF ROLESVILLE WAKE COUNTY, NORTH CAROLINA

No.	DATE	REVISIONS
A	9/30/2022	REVISED PER TOWN OF ROLESVILLE COMMENTS

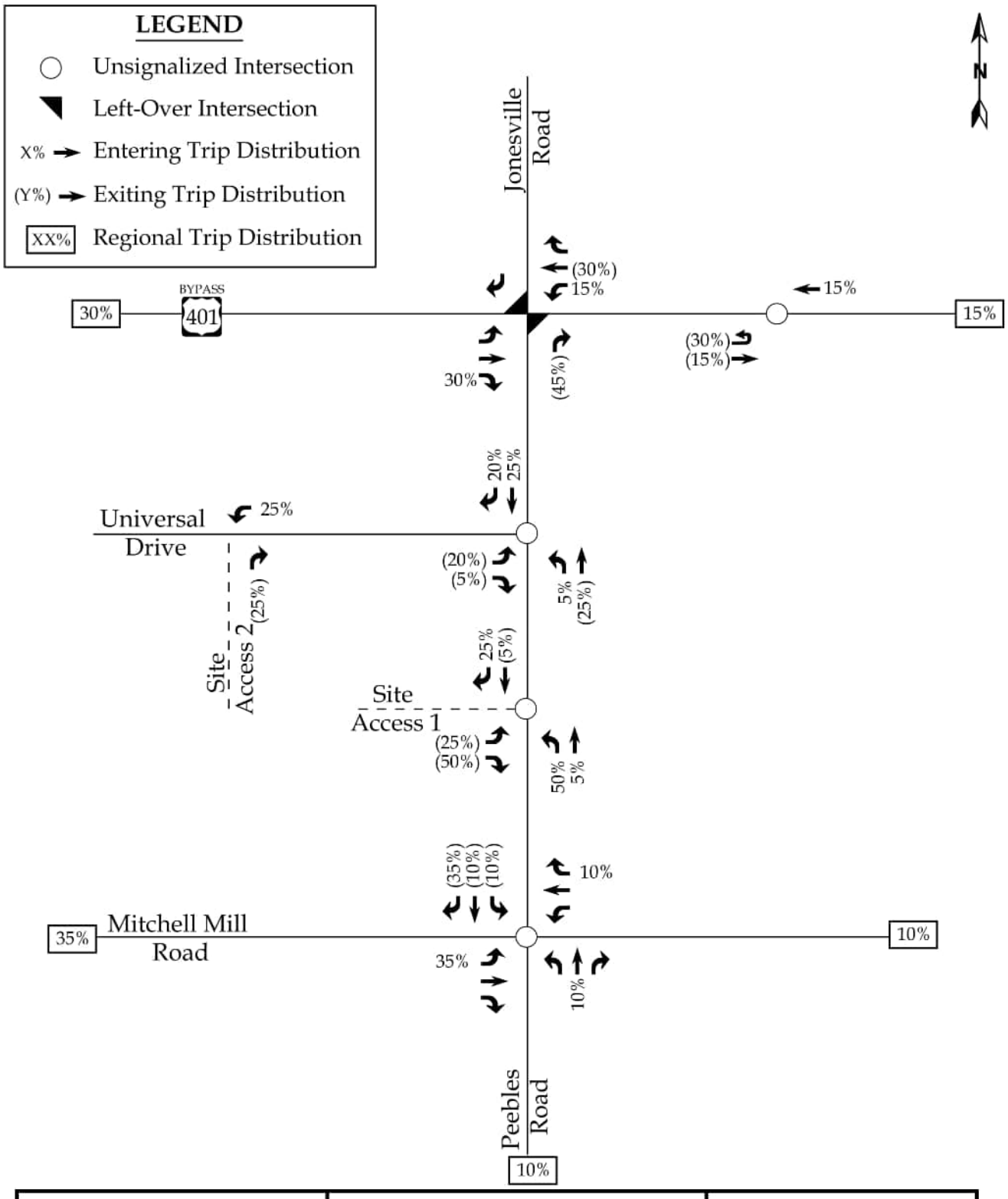
JOB NO.: 21790
SCALE: AS SHOWN
DATE: 6/1/2022
ENGINEER: JMK
DRAWN BY: ER/JM
DESIGN BY: DC
REVIEW BY: JMK

MORRIS & RITCHIE ASSOCIATES OF NC, PC
ENGINEERS, ARCHITECTS, PLANNERS, SURVEYORS AND LANDSCAPE ARCHITECTS
5605 CHAPEL HILL RD, STE 112
RALEIGH, NC 27607
(984) 200-2103
LICENSE # C-4182
WWW.MRAGTA.COM

STATUS: PRELIMINARY NOT FOR CONSTRUCTION | REVISION: A | SHEET: C1.7



RKA RAMEY KEMP ASSOCIATES	Harris Creek Farm Rolesville, NC	2022 Existing Peak Hour Traffic Scale: Not to Scale | Figure 4



RAMEY KEMP ASSOCIATES	Harris Creek Farm Rolesville, NC	Site Trip Distribution Scale: Not to Scale | Figure 8

APPENDIX B

TRAFFIC COUNTS

TRAFFIC DATA COLLECTION

File Name : Rolesville(US 401 and Jonesville)AM Peak
Site Code :
Start Date : 11/9/2021
Page No : 1

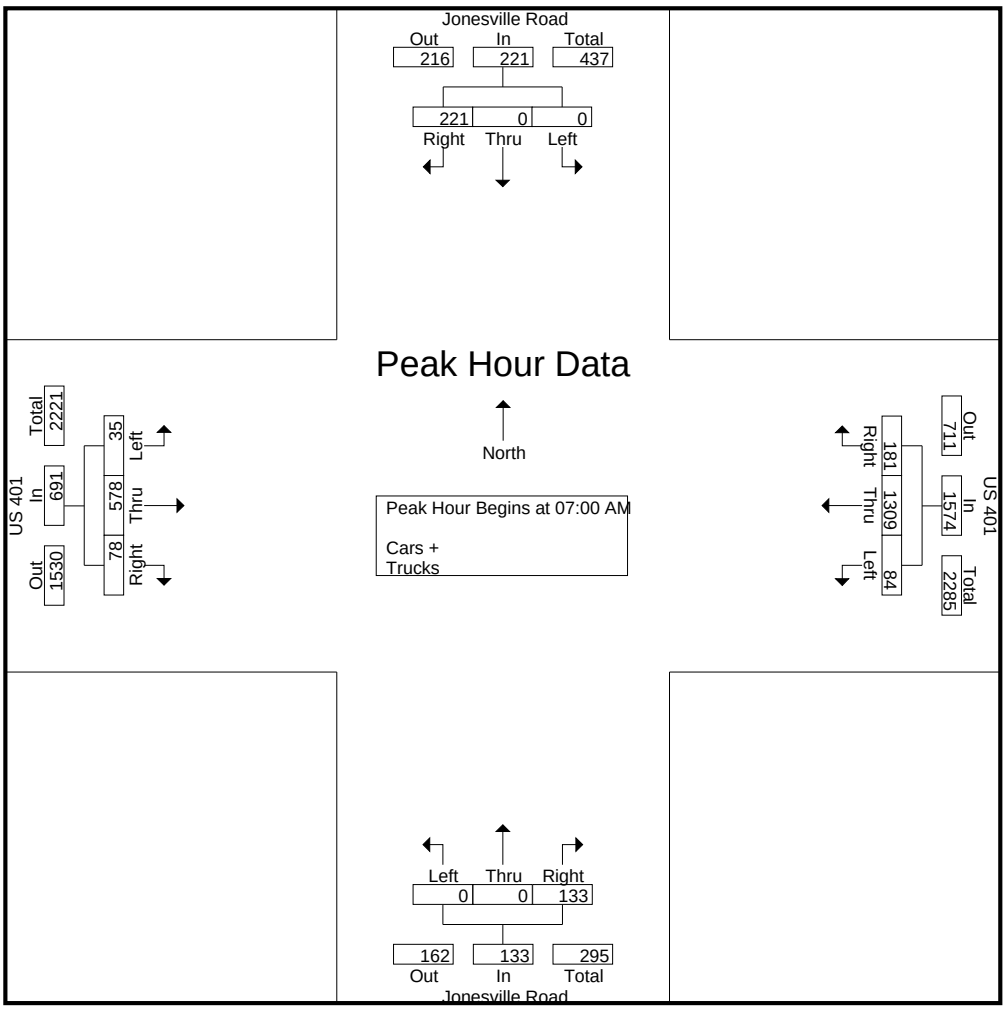
Groups Printed- Cars + - Trucks

	Jonesville Road Southbound				US 401 Westbound				Jonesville Road Northbound				US 401 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	63	0	0	63	24	380	21	425	23	0	0	23	18	182	3	203	714
07:15 AM	42	0	0	42	39	362	24	425	37	0	0	37	11	125	7	143	647
07:30 AM	51	0	0	51	80	318	23	421	48	0	0	48	24	136	15	175	695
07:45 AM	65	0	0	65	38	249	16	303	25	0	0	25	25	135	10	170	563
Total	221	0	0	221	181	1309	84	1574	133	0	0	133	78	578	35	691	2619
08:00 AM	61	0	0	61	26	236	13	275	23	0	0	23	30	120	10	160	519
08:15 AM	36	0	0	36	12	233	9	254	16	0	0	16	13	94	9	116	422
08:30 AM	24	0	0	24	10	213	5	228	9	0	0	9	6	91	3	100	361
08:45 AM	28	0	0	28	9	145	5	159	10	0	0	10	11	85	2	98	295
Total	149	0	0	149	57	827	32	916	58	0	0	58	60	390	24	474	1597
Grand Total	370	0	0	370	238	2136	116	2490	191	0	0	191	138	968	59	1165	4216
Apprch %	100	0	0		9.6	85.8	4.7		100	0	0		11.8	83.1	5.1		
Total %	8.8	0	0	8.8	5.6	50.7	2.8	59.1	4.5	0	0	4.5	3.3	23	1.4	27.6	
Cars +	366	0	0	366	233	2094	114	2441	188	0	0	188	135	916	57	1108	4103
% Cars +	98.9	0	0	98.9	97.9	98	98.3	98	98.4	0	0	98.4	97.8	94.6	96.6	95.1	97.3
Trucks	4	0	0	4	5	42	2	49	3	0	0	3	3	52	2	57	113
% Trucks	1.1	0	0	1.1	2.1	2	1.7	2	1.6	0	0	1.6	2.2	5.4	3.4	4.9	2.7

TRAFFIC DATA COLLECTION

File Name : Rolesville(US 401 and Jonesville)AM Peak
Site Code :
Start Date : 11/9/2021
Page No : 2

	Jonesville Road Southbound				US 401 Westbound				Jonesville Road Northbound				US 401 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 07:00 AM																	
07:00 AM	63	0	0	63	24	**380**	21	**425**	23	0	0	23	18	**182**	3	**203**	**714**
07:15 AM	42	0	0	42	39	362	**24**	425	37	0	0	37	11	125	7	143	647
07:30 AM	51	0	0	51	**80**	318	23	421	**48**	0	0	**48**	24	136	**15**	175	695
07:45 AM	**65**	0	0	**65**	38	249	16	303	25	0	0	25	**25**	135	10	170	563
Total Volume	221	0	0	221	181	1309	84	1574	133	0	0	133	78	578	35	691	2619
% App. Total	100	0	0		11.5	83.2	5.3		100	0	0		11.3	83.6	5.1		
PHF	.850	.000	.000	.850	.566	.861	.875	.926	.693	.000	.000	.693	.780	.794	.583	.851	.917



File Name : Rolesville(US 401 and Jonesville)PM Peak
Site Code :
Start Date : 11/9/2021
Page No : 1

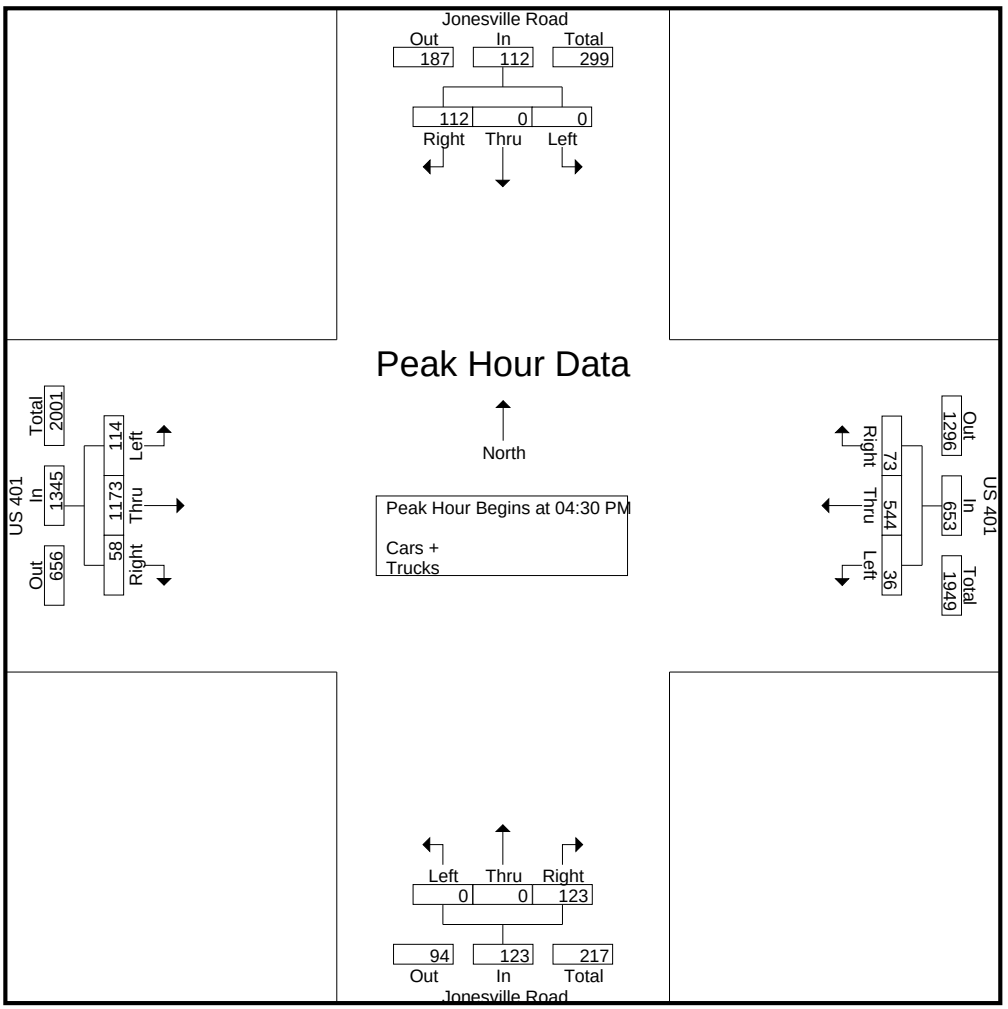
Groups Printed- Cars + - Trucks

	Jonesville Road Southbound				US 401 Westbound				Jonesville Road Northbound				US 401 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	47	0	0	47	13	124	6	143	21	0	0	21	37	217	22	276	487
04:15 PM	34	0	0	34	13	119	6	138	26	0	0	26	15	231	20	266	464
04:30 PM	30	0	0	30	19	118	12	149	32	0	0	32	12	291	28	331	542
04:45 PM	15	0	0	15	22	137	6	165	32	0	0	32	8	303	30	341	553
Total	126	0	0	126	67	498	30	595	111	0	0	111	72	1042	100	1214	2046
05:00 PM	37	0	0	37	10	143	7	160	23	0	0	23	23	322	30	375	595
05:15 PM	30	0	0	30	22	146	11	179	36	0	0	36	15	257	26	298	543
05:30 PM	39	0	0	39	20	145	3	168	34	0	0	34	23	262	14	299	540
05:45 PM	24	0	0	24	10	112	9	131	22	0	0	22	11	227	21	259	436
Total	130	0	0	130	62	546	30	638	115	0	0	115	72	1068	91	1231	2114
Grand Total	256	0	0	256	129	1044	60	1233	226	0	0	226	144	2110	191	2445	4160
Apprch %	100	0	0		10.5	84.7	4.9		100	0	0		5.9	86.3	7.8		
Total %	6.2	0	0	6.2	3.1	25.1	1.4	29.6	5.4	0	0	5.4	3.5	50.7	4.6	58.8	
Cars +	252	0	0	252	127	1020	60	1207	223	0	0	223	142	2051	191	2384	4066
% Cars +	98.4	0	0	98.4	98.4	97.7	100	97.9	98.7	0	0	98.7	98.6	97.2	100	97.5	97.7
Trucks	4	0	0	4	2	24	0	26	3	0	0	3	2	59	0	61	94
% Trucks	1.6	0	0	1.6	1.6	2.3	0	2.1	1.3	0	0	1.3	1.4	2.8	0	2.5	2.3

TRAFFIC DATA COLLECTION

File Name : Rolesville(US 401 and Jonesville)PM Peak
Site Code :
Start Date : 11/9/2021
Page No : 2

	Jonesville Road Southbound				US 401 Westbound				Jonesville Road Northbound				US 401 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 04:30 PM																	
04:30 PM	30	0	0	30	19	118	**12**	149	32	0	0	32	12	291	28	331	542
04:45 PM	15	0	0	15	**22**	137	6	165	32	0	0	32	8	303	**30**	341	553
05:00 PM	**37**	0	0	**37**	10	143	7	160	23	0	0	23	**23**	**322**	30	**375**	**595**
05:15 PM	30	0	0	30	22	**146**	11	**179**	**36**	0	0	**36**	15	257	26	298	543
Total Volume	112	0	0	112	73	544	36	653	123	0	0	123	58	1173	114	1345	2233
% App. Total	100	0	0		11.2	83.3	5.5		100	0	0		4.3	87.2	8.5		
PHF	.757	.000	.000	.757	.830	.932	.750	.912	.854	.000	.000	.854	.630	.911	.950	.897	.938



TRAFFIC DATA COLLECTION

File Name : Rolesville(US 401 and Eastern U Turn)AM Peak
Site Code :
Start Date : 11/9/2021
Page No : 1

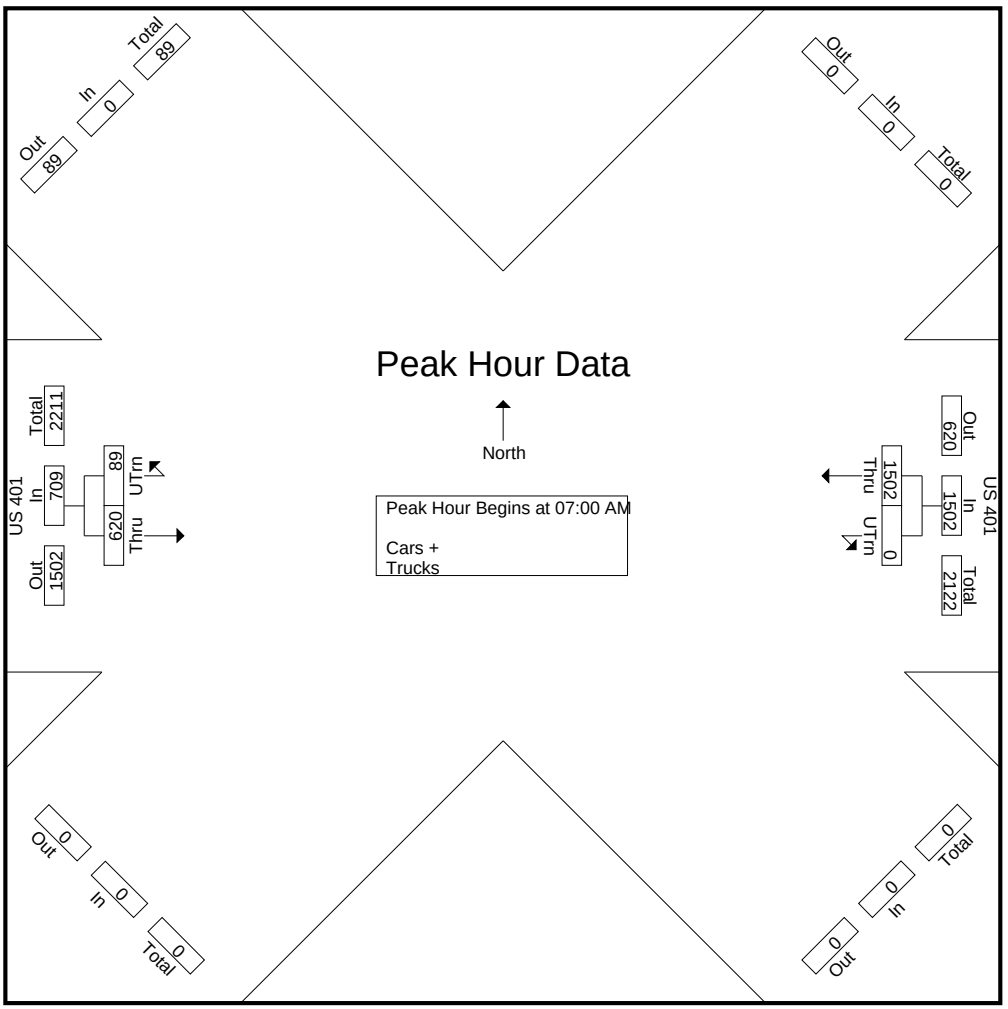
Groups Printed- Cars + - Trucks

	US 401 Westbound			US 401 Eastbound			
Start Time	Thru	UTrn	App. Total	Thru	UTrn	App. Total	Int. Total
07:00 AM	421	0	421	198	12	210	631
07:15 AM	410	0	410	136	24	160	570
07:30 AM	392	0	392	149	36	185	577
07:45 AM	279	0	279	137	17	154	433
Total	1502	0	1502	620	89	709	2211
08:00 AM	253	0	253	130	20	150	403
08:15 AM	243	0	243	98	13	111	354
08:30 AM	223	0	223	94	7	101	324
08:45 AM	147	0	147	85	9	94	241
Total	866	0	866	407	49	456	1322
Grand Total	2368	0	2368	1027	138	1165	3533
Apprch %	100	0		88.2	11.8		
Total %	67	0	67	29.1	3.9	33	
Cars +	2318	0	2318	973	136	1109	3427
% Cars +	97.9	0	97.9	94.7	98.6	95.2	97
Trucks	50	0	50	54	2	56	106
% Trucks	2.1	0	2.1	5.3	1.4	4.8	3

TRAFFIC DATA COLLECTION

File Name : Rolesville(US 401 and Eastern U Turn)AM Peak
Site Code :
Start Date : 11/9/2021
Page No : 2

	US 401 Westbound			US 401 Eastbound			
Start Time	Thru	UTrn	App. Total	Thru	UTrn	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	**421**	0	**421**	**198**	12	**210**	**631**
07:15 AM	410	0	410	136	24	160	570
07:30 AM	392	0	392	149	**36**	185	577
07:45 AM	279	0	279	137	17	154	433
Total Volume	1502	0	1502	620	89	709	2211
% App. Total	100	0		87.4	12.6		
PHF	.892	.000	.892	.783	.618	.844	.876



TRAFFIC DATA COLLECTION

File Name : Rolesville(US 401 and Eastern U Turn)PM Peak
Site Code :
Start Date : 11/9/2021
Page No : 1

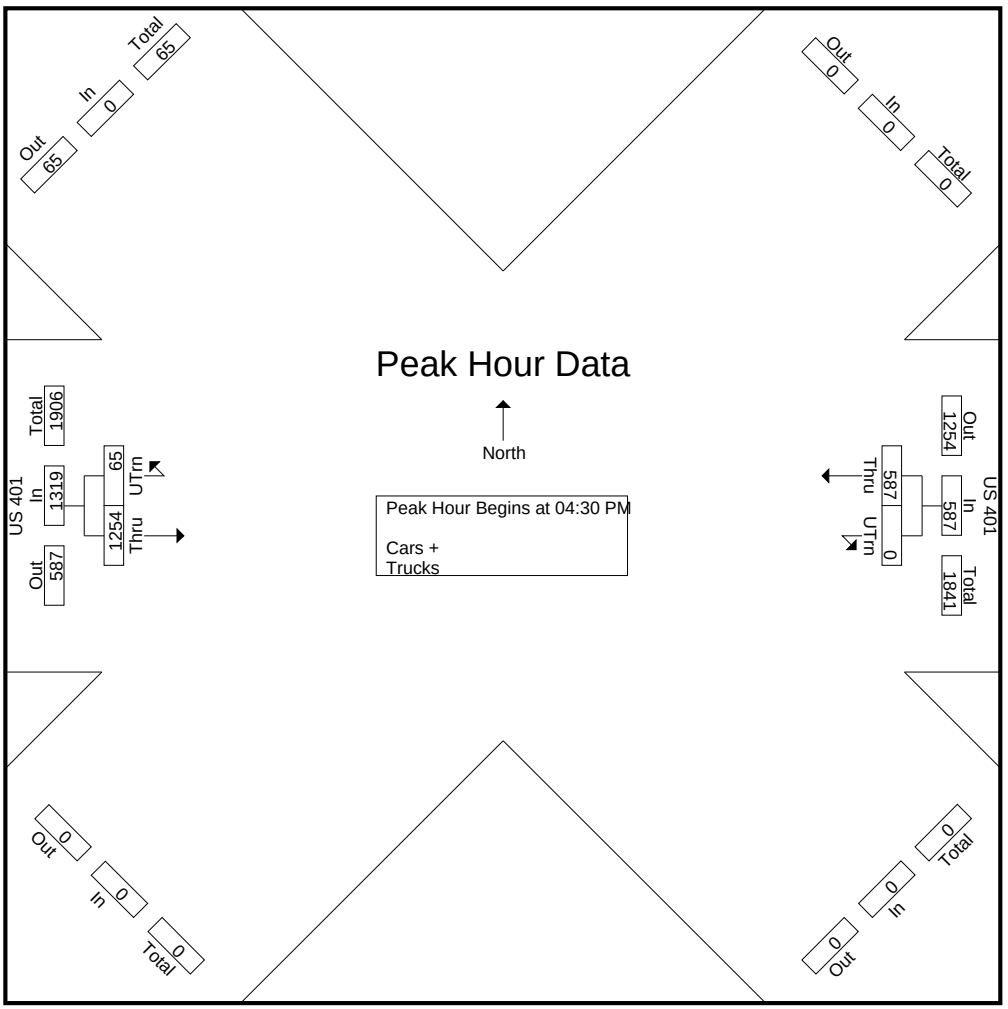
Groups Printed- Cars + - Trucks

	US 401 Westbound			US 401 Eastbound			
Start Time	Thru	UTrn	App. Total	Thru	UTrn	App. Total	Int. Total
04:00 PM	130	0	130	240	12	252	382
04:15 PM	128	0	128	237	15	252	380
04:30 PM	129	0	129	311	19	330	459
04:45 PM	149	0	149	317	19	336	485
Total	536	0	536	1105	65	1170	1706
05:00 PM	149	0	149	342	8	350	499
05:15 PM	160	0	160	284	19	303	463
05:30 PM	161	0	161	273	22	295	456
05:45 PM	120	0	120	235	12	247	367
Total	590	0	590	1134	61	1195	1785
Grand Total	1126	0	1126	2239	126	2365	3491
Apprch %	100	0		94.7	5.3		
Total %	32.3	0	32.3	64.1	3.6	67.7	
Cars +	1101	0	1101	2175	125	2300	3401
% Cars +	97.8	0	97.8	97.1	99.2	97.3	97.4
Trucks	25	0	25	64	1	65	90
% Trucks	2.2	0	2.2	2.9	0.8	2.7	2.6

TRAFFIC DATA COLLECTION

File Name : Rolesville(US 401 and Eastern U Turn)PM Peak
Site Code :
Start Date : 11/9/2021
Page No : 2

	US 401 Westbound			US 401 Eastbound			
Start Time	Thru	UTrn	App. Total	Thru	UTrn	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	129	0	129	311	**19**	330	459
04:45 PM	149	0	149	317	19	336	485
05:00 PM	149	0	149	**342**	8	**350**	**499**
05:15 PM	**160**	0	**160**	284	19	303	463
Total Volume	587	0	587	1254	65	1319	1906
% App. Total	100	0		95.1	4.9		
PHF	.917	.000	.917	.917	.855	.942	.955



TRAFFIC DATA COLLECTION

File Name : Rolesville(Jonesville and Mitchell Mill)AM Peak
Site Code :
Start Date : 11/30/2021
Page No : 1

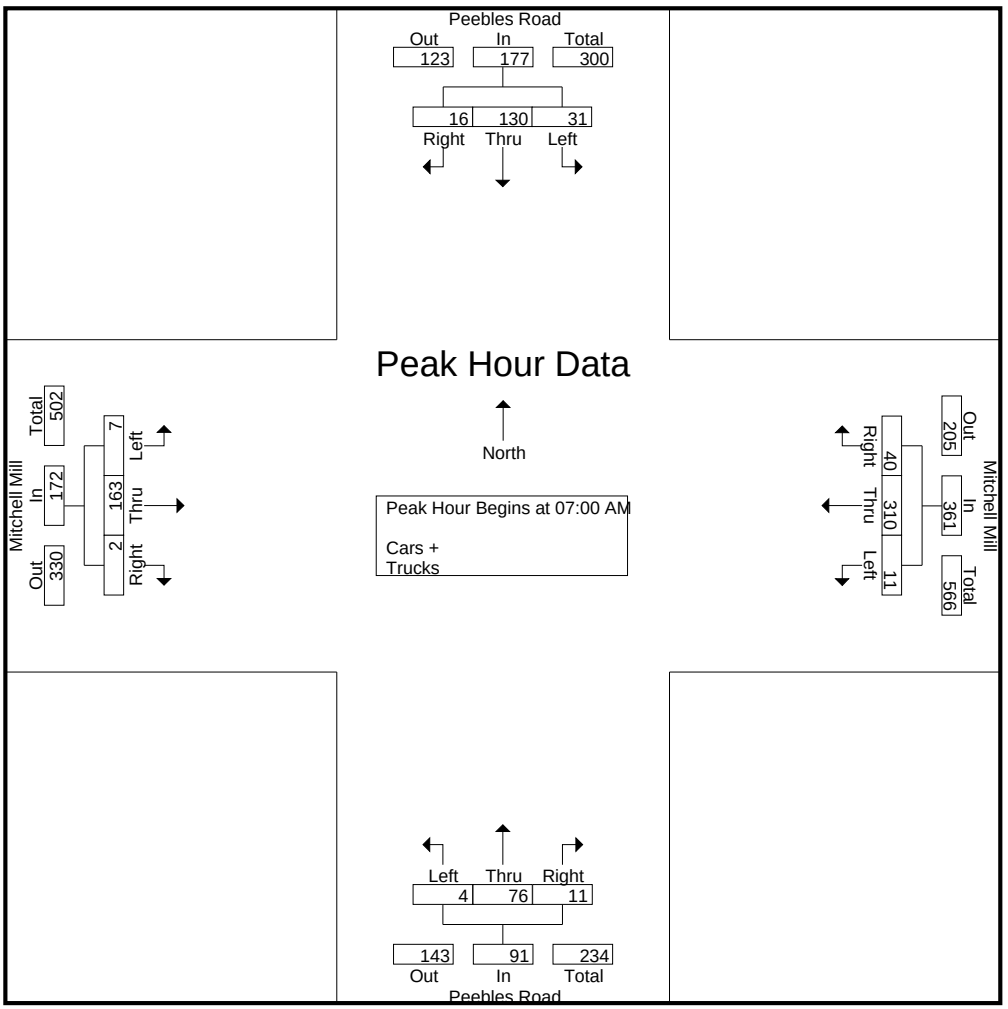
Groups Printed- Cars + - Trucks

	Peebles Road Southbound				Mitchell Mill Westbound				Peebles Road Northbound				Mitchell Mill 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	4	17	13	34	8	73	5	86	6	11	3	20	0	74	1	75	215
07:15 AM	4	36	7	47	8	101	2	111	3	26	1	30	0	32	1	33	221
07:30 AM	6	34	5	45	16	87	3	106	0	24	0	24	1	33	1	35	210
07:45 AM	2	43	6	51	8	49	1	58	2	15	0	17	1	24	4	29	155
Total	16	130	31	177	40	310	11	361	11	76	4	91	2	163	7	172	801
08:00 AM	7	31	12	50	4	53	1	58	1	8	2	11	0	28	3	31	150
08:15 AM	12	17	3	32	1	37	1	39	1	7	0	8	1	24	1	26	105
08:30 AM	6	4	2	12	3	49	2	54	1	4	2	7	0	19	0	19	92
08:45 AM	1	13	3	17	4	32	1	37	1	3	1	5	1	18	2	21	80
Total	26	65	20	111	12	171	5	188	4	22	5	31	2	89	6	97	427
Grand Total	42	195	51	288	52	481	16	549	15	98	9	122	4	252	13	269	1228
Apprch %	14.6	67.7	17.7		9.5	87.6	2.9		12.3	80.3	7.4		1.5	93.7	4.8		
Total %	3.4	15.9	4.2	23.5	4.2	39.2	1.3	44.7	1.2	8	0.7	9.9	0.3	20.5	1.1	21.9	
Cars +	42	195	50	287	52	479	16	547	15	98	9	122	4	249	13	266	1222
% Cars +	100	100	98	99.7	100	99.6	100	99.6	100	100	100	100	100	98.8	100	98.9	99.5
Trucks	0	0	1	1	0	2	0	2	0	0	0	0	0	3	0	3	6
% Trucks	0	0	2	0.3	0	0.4	0	0.4	0	0	0	0	0	1.2	0	1.1	0.5

TRAFFIC DATA COLLECTION

File Name : Rolesville(Jonesville and Mitchell Mill)AM Peak
Site Code :
Start Date : 11/30/2021
Page No : 2

	Peebles Road Southbound				Mitchell Mill Westbound				Peebles Road Northbound				Mitchell Mill 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 07:00 AM																	
07:00 AM	4	17	**13**	34	8	73	**5**	86	**6**	11	**3**	20	0	**74**	1	**75**	215
07:15 AM	4	36	7	47	8	**101**	2	**111**	3	**26**	1	**30**	0	32	1	33	**221**
07:30 AM	**6**	34	5	45	**16**	87	3	106	0	24	0	24	**1**	33	1	35	210
07:45 AM	2	**43**	6	**51**	8	49	1	58	2	15	0	17	1	24	**4**	29	155
Total Volume	16	130	31	177	40	310	11	361	11	76	4	91	2	163	7	172	801
% App. Total	9	73.4	17.5		11.1	85.9	3		12.1	83.5	4.4		1.2	94.8	4.1		
PHF	.667	.756	.596	.868	.625	.767	.550	.813	.458	.731	.333	.758	.500	.551	.438	.573	.906



File Name : Rolesville(Jonesville and Mitchell Mill)PM Peak
Site Code :
Start Date : 11/30/2021
Page No : 1

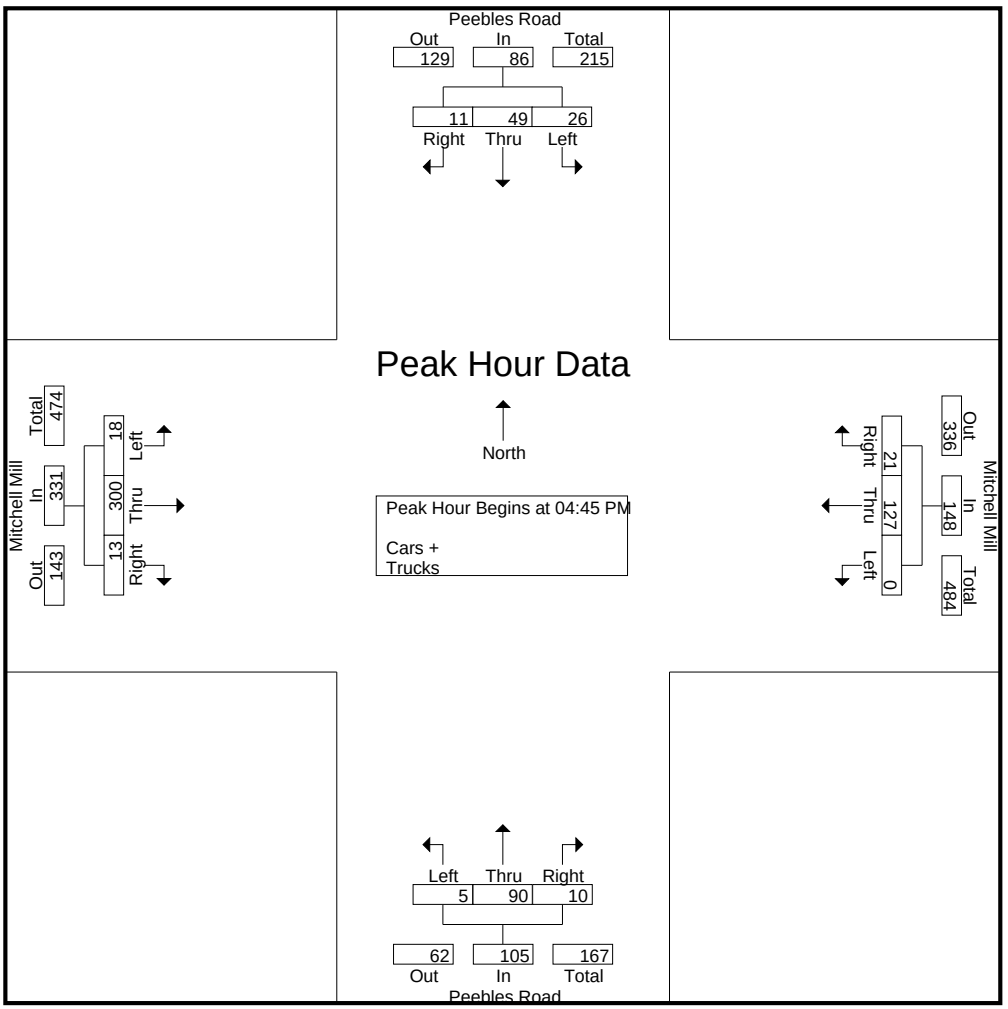
Groups Printed- Cars + - Trucks

	Peebles Road Southbound				Mitchell Mill Westbound				Peebles Road Northbound				Mitchell Mill 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	7	11	13	31	6	25	1	32	1	14	1	16	2	44	6	52	131
04:15 PM	6	11	4	21	2	27	2	31	1	17	3	21	1	62	4	67	140
04:30 PM	3	13	3	19	4	30	2	36	0	27	1	28	3	64	3	70	153
04:45 PM	2	8	5	15	4	37	0	41	3	18	0	21	3	71	3	77	154
Total	18	43	25	86	16	119	5	140	5	76	5	86	9	241	16	266	578
05:00 PM	1	15	6	22	5	31	0	36	3	19	2	24	1	78	5	84	166
05:15 PM	3	15	6	24	4	23	0	27	3	26	1	30	4	89	7	100	181
05:30 PM	5	11	9	25	8	36	0	44	1	27	2	30	5	62	3	70	169
05:45 PM	1	7	4	12	2	21	1	24	2	13	2	17	4	55	6	65	118
Total	10	48	25	83	19	111	1	131	9	85	7	101	14	284	21	319	634
Grand Total	28	91	50	169	35	230	6	271	14	161	12	187	23	525	37	585	1212
Apprch %	16.6	53.8	29.6		12.9	84.9	2.2		7.5	86.1	6.4		3.9	89.7	6.3		
Total %	2.3	7.5	4.1	13.9	2.9	19	0.5	22.4	1.2	13.3	1	15.4	1.9	43.3	3.1	48.3	
Cars +	28	91	50	169	35	229	6	270	14	161	12	187	23	524	37	584	1210
% Cars +	100	100	100	100	100	99.6	100	99.6	100	100	100	100	100	99.8	100	99.8	99.8
Trucks	0	0	0	0	0	1	0	1	0	0	0	0	0	1	0	1	2
% Trucks	0	0	0	0	0	0.4	0	0.4	0	0	0	0	0	0.2	0	0.2	0.2

TRAFFIC DATA COLLECTION

File Name : Rolesville(Jonesville and Mitchell Mill)PM Peak
Site Code :
Start Date : 11/30/2021
Page No : 2

	Peebles Road Southbound				Mitchell Mill Westbound				Peebles Road Northbound				Mitchell Mill 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	2	8	5	15	4	**37**	0	41	**3**	18	0	21	3	71	3	77	154
05:00 PM	1	**15**	6	22	5	31	0	36	3	19	**2**	24	1	78	5	84	166
05:15 PM	3	15	6	24	4	23	0	27	3	26	1	**30**	4	**89**	**7**	**100**	**181**
05:30 PM	**5**	11	**9**	**25**	**8**	36	0	**44**	1	**27**	2	30	**5**	62	3	70	169
Total Volume	11	49	26	86	21	127	0	148	10	90	5	105	13	300	18	331	670
% App. Total	12.8	57	30.2		14.2	85.8	0		9.5	85.7	4.8		3.9	90.6	5.4		
PHF	.550	.817	.722	.860	.656	.858	.000	.841	.833	.833	.625	.875	.650	.843	.643	.828	.925



APPENDIX C

ADJACENT DEVELOPMENT INFORMATION

TRAFFIC IMPACT ANALYSIS

FOR

COBBLESTONE CROSSING MIXED-USE

LOCATED

IN

ROLESVILLE, NORTH CAROLINA

Prepared For:
Town of Rolesville
502 Southtown Circle
Rolesville, NC 27571

3-15-2021

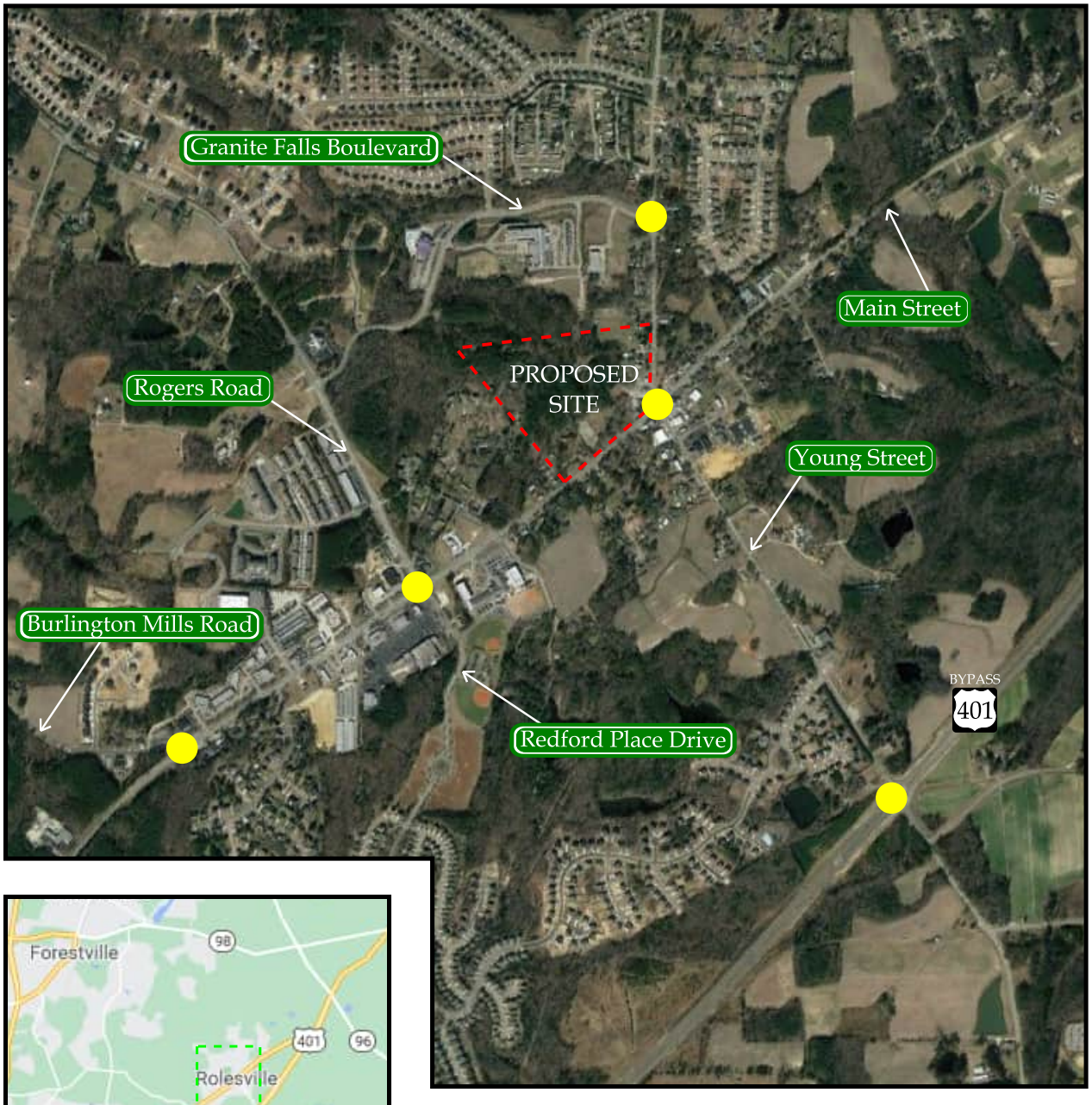
Prepared By:
Ramey Kemp & Associates, Inc.
5808 Faringdon Place, Suite 100
Raleigh, NC 27609
License #C-0910

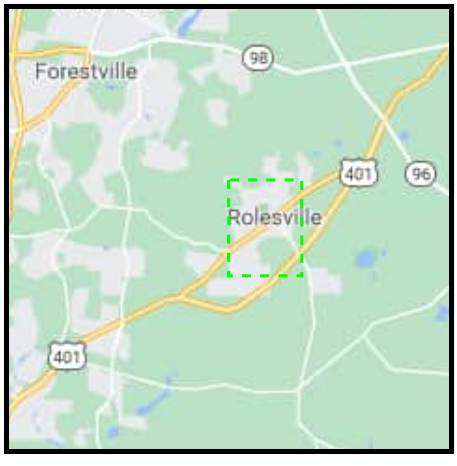
MARCH 2021

RKA Project No. 20498

Prepared By: TF

Reviewed By: MK



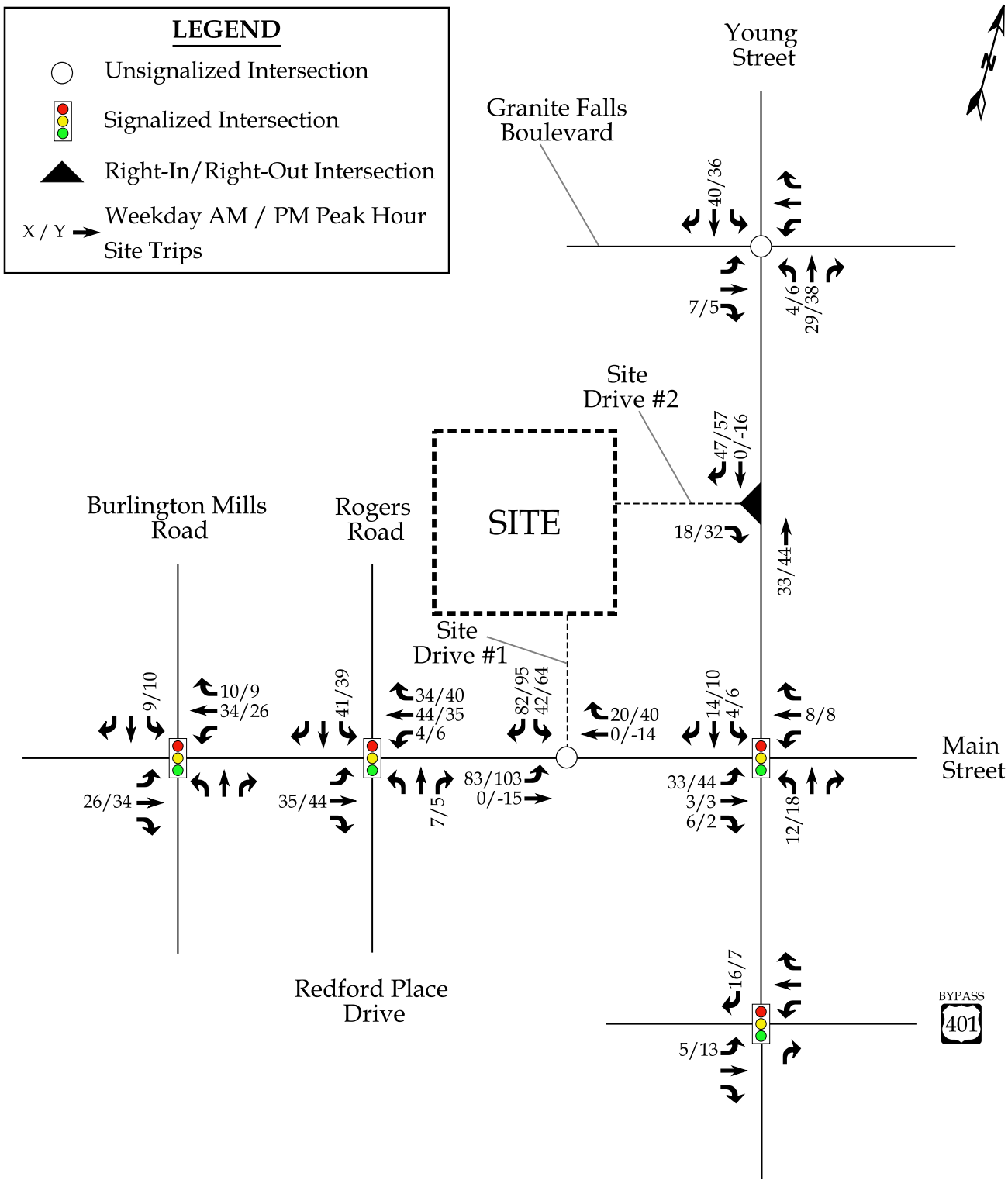


N

LEGEND

- Proposed Site Location
- Study Intersection
- Study Area

Moving forward. RKA RAMEY KEMP ASSOCIATES	Cobblestone Crossing Mixed-Use Rolesville, NC	Site Location Map
		Scale: Not to Scale | Figure 1



RAMEY KEMP ASSOCIATES	Cobblestone Crossing Mixed-Use Rolesville, NC	Total Site Trip Assignment Scale: Not to Scale | Figure 12

9. RECOMMENDATIONS

Based on the findings of this study, specific geometric improvements have been identified and are recommended to accommodate future traffic conditions. See a more detailed description of the recommended improvements below. Refer to Figure 14 for an illustration of the recommended lane configuration for the proposed development.

Improvements by STIP U-6241

STIP U-6241 is expected to realign Burlington Mills Road and install a traffic signal at the relocated intersection on Main Street. STIP U-6241 is also expected to provide improvements to the pedestrian and bike facilities along Main Street and add a concrete median island along Main Street west of Rogers Road. These improvements associated with STIP U-6241 will alter the existing lane configurations at the study intersections along Main Street.

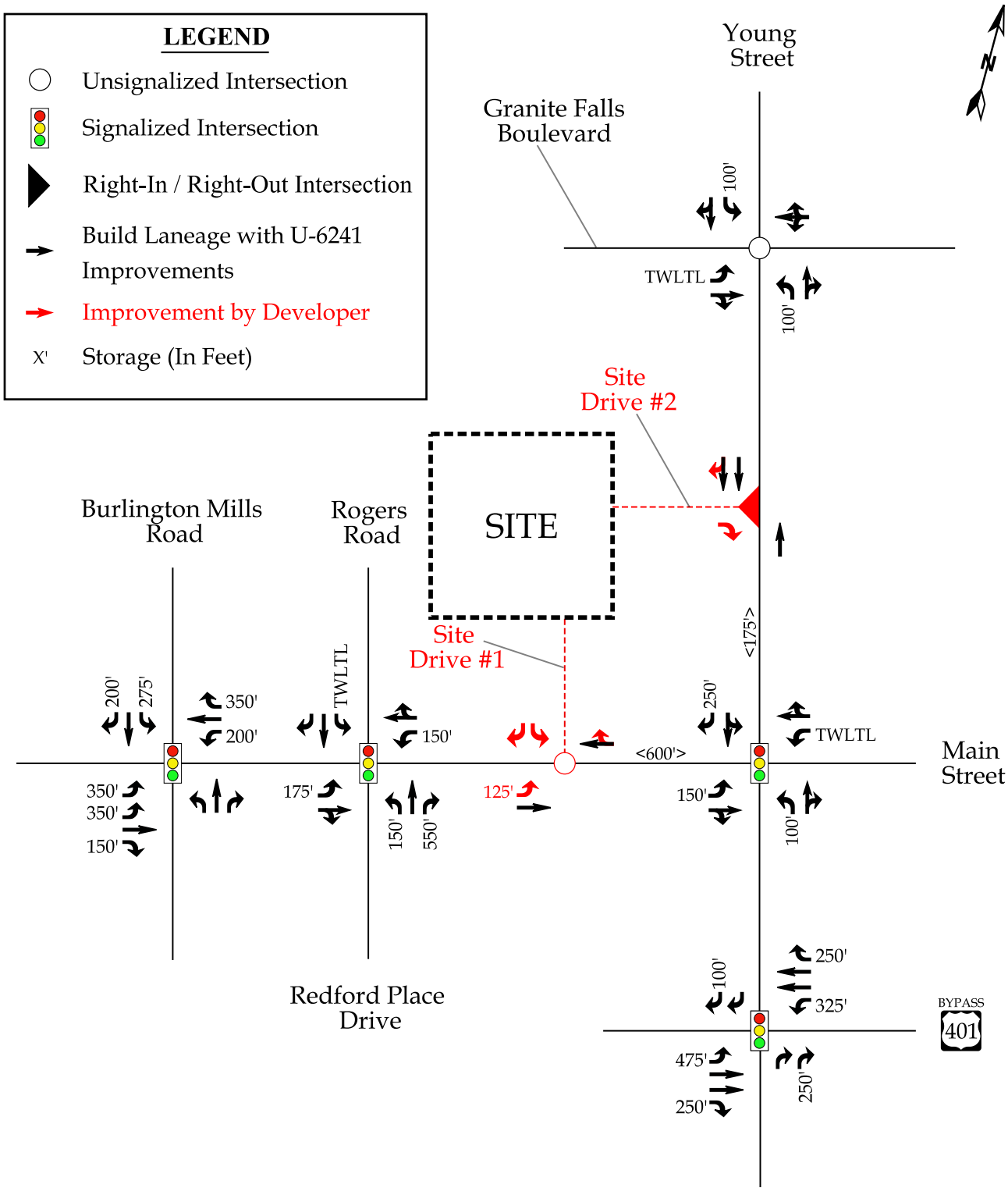
Recommended Improvements by Developer

Main Street and Site Drive 1

- Construct the southbound approach with one ingress and two egress lanes.
- Provide stop control for the southbound approach.
- Install an eastbound left-turn lane with at least 125 feet of storage and appropriate decel and taper.

Young Street and Site Drive 2

- Construct the eastbound approach with one ingress and egress lane.
- Provide stop control for the eastbound approach.



Moving forward. RKA RAMEY KEMP ASSOCIATES	Cobblestone Crossing Mixed-Use Rolesville, NC	Recommended Lane Configurations Scale: Not to Scale | Figure 14

Revised Traffic Impact Analysis for

Young Street PUD

Rolesville, North Carolina

Prepared for:

Ashton Woods
Raleigh, North Carolina

Prepared by:

Kimley-Horn and Associates, Inc.
NC License #F-0102
421 Fayetteville Street, Suite 600
Raleigh, NC 27601
(919) 677-2000

June 2019

015956012

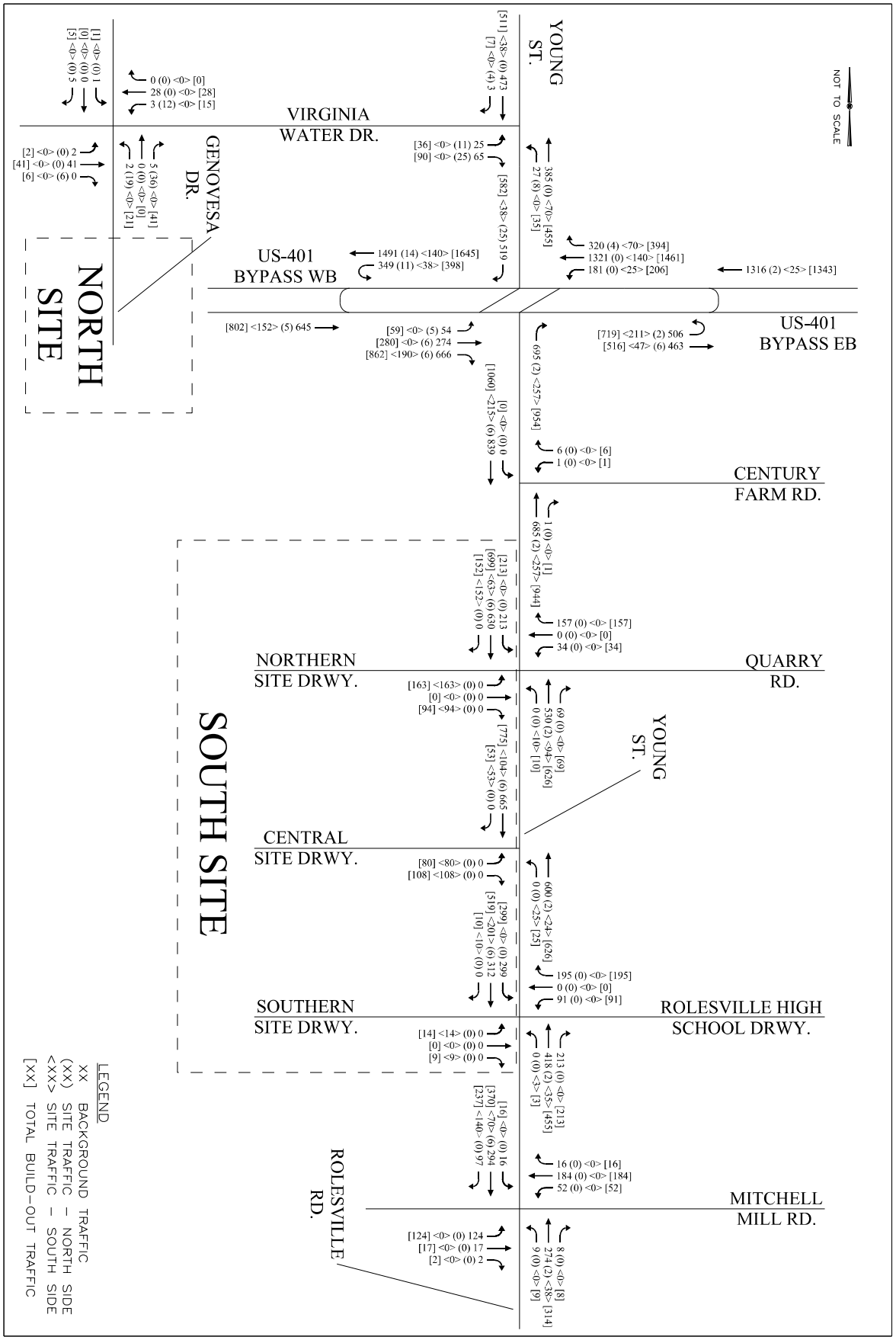
6/13/2019

Kimley»Horn

YOUNG STREET PUD
ROLESVILLE, NC
TRAFFIC IMPACT ANALYSIS

SITE LOCATION

FIGURE
1

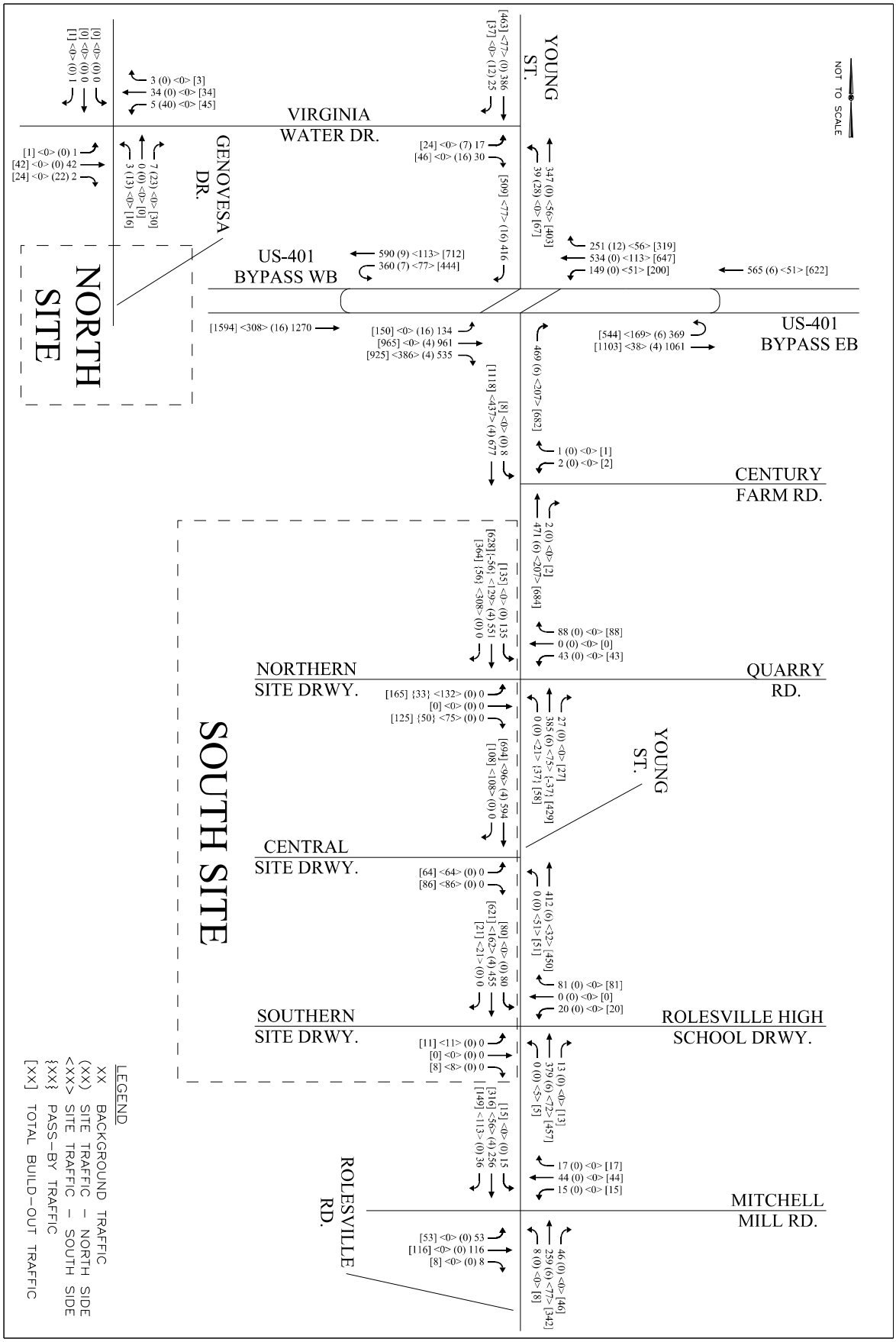


Kimley»Horn

YOUNG STREET PUD
ROLESVILLE, NC
TRAFFIC IMPACT ANALYSIS

PROJECTED (2025)
BUILD-OUT AM PEAK HOUR
TRAFFIC VOLUMES -
COMMERCIAL BUILD-OUT

FIGURE
14



Kimley»Horn	YOUNG STREET PUD ROLESVILLE, NC TRAFFIC IMPACT ANALYSIS	PROJECTED (2025) BUILD-OUT PM PEAK HOUR TRAFFIC VOLUMES - COMMERCIAL BUILD-OUT	FIGURE 16

7.0 Recommendations

Residential Build-out

The following improvements are recommended to be performed to accommodate projected site traffic volumes at build-out of the residential portion of the development:

US 401 Bypass:

- Coordinate the traffic signals at the intersections of US 401 at Young Street and the Superstreet U-turns

Young Street at Quarry Road/North Site Driveway:

- Construct a northbound left-turn lane on Young Street with 100 feet of storage and appropriate tapers
- Construct a southbound right-turn lane on Young Street with 100 feet of storage and appropriate tapers
- Restripe the existing westbound left-turn lane on Quarry Road to a shared left/through lane
- Provide an exclusive left-turn lane with 275 feet of storage and appropriate tapers and a shared through/right lane on the North Site Driveway
- Install a traffic signal when warranted

Young Street at Central Site Driveway:

- Construct a northbound left-turn lane on Young Street with 100 feet of storage and appropriate tapers
- Construct a southbound right-turn lane on Young Street with 100 feet of storage and appropriate tapers
- Provide exclusive left and right-turn lanes on the Central Site Driveway with 125 feet of storage and appropriate tapers for the left-turn lane

Young Street at Rolesville High School Driveway/South Site Driveway:

- Construct a northbound left-turn lane on Young Street with 50 feet of storage and appropriate tapers
- Provide one egress lane on the South Site Driveway

Rolesville Road at Mitchell Mill Road:

- Install a traffic signal when warranted

Analyses indicate that with the recommended improvements in place, all of the study intersections except for Young Street at Century Farm Road and Young Street at Rolesville High School Driveway/South Site Driveway are expected to operate at an acceptable LOS at build-out of the residential-only phase of the development.

Analyses indicate that the intersection of Young Street at Century Farm Road is expected to operate with long delays on the minor street approach (Century Farm Road) in the AM peak hour at project build-out. However, it is typical for stop sign controlled side streets and driveways intersecting major streets to experience long delays during peak hours while the majority of the traffic moving through the intersection on the major street experiences little or no delay. SimTraffic traffic simulations indicate that no queuing issues are expected at this intersection.

Analyses indicate that the intersection of Young Street at the Rolesville High School Driveway/South Site Driveway is expected to operate with long delays on the minor street approach (Rolesville High School Driveway) in the AM peak hour and school PM peak hour with or without the proposed project in place in the study year 2025. SimTraffic traffic simulations also indicate the possibility of long queues on the westbound left-turn movement at this intersection in the AM peak hour and school PM peak hour. However, it is typical for stop sign controlled side streets and driveways intersecting major streets to experience long delays during peak hours, while the majority of the traffic moving through the intersection on the major street experiences little or no delay. This intersection is not expected to meet 4-hour or 8-hour MUTCD traffic signal warrants.

Commercial Build-out

The following additional improvements are recommended to be performed in addition to those recommended above for the residential phase to accommodate projected site traffic volumes when the retail portion of the site is developed:

US 401 Bypass Eastbound at Young Street:

- Extend the storage of the existing eastbound right-turn lane on US 401 Bypass by approximately 175 feet to provide 400 feet of storage and appropriate tapers

Young Street at Quarry Road/North Site Driveway:

- Construct a northbound right-turn lane on Young Street with 100 feet of storage and appropriate tapers
- Modify the traffic signal to accommodate the additional laneage

Analyses indicate that with the recommended improvements in place, all of the study intersections except for Young Street at Century Farm Road, Young Street at the Central Site Driveway, and Young Street at Rolesville High School Driveway/South Site Driveway are expected to operate at acceptable LOS at commercial build-out of the development.

Analyses indicate that the intersection of Young Street at Century Farm Road is expected to operate with long delays on the minor street approach (Century Farm Road) in the AM peak hour at project build-out. It is typical for stop sign controlled side streets and driveways intersecting major streets to experience long delays during peak hours, while the majority of the traffic moving through the intersection on the major street experiences little or no delay. SimTraffic

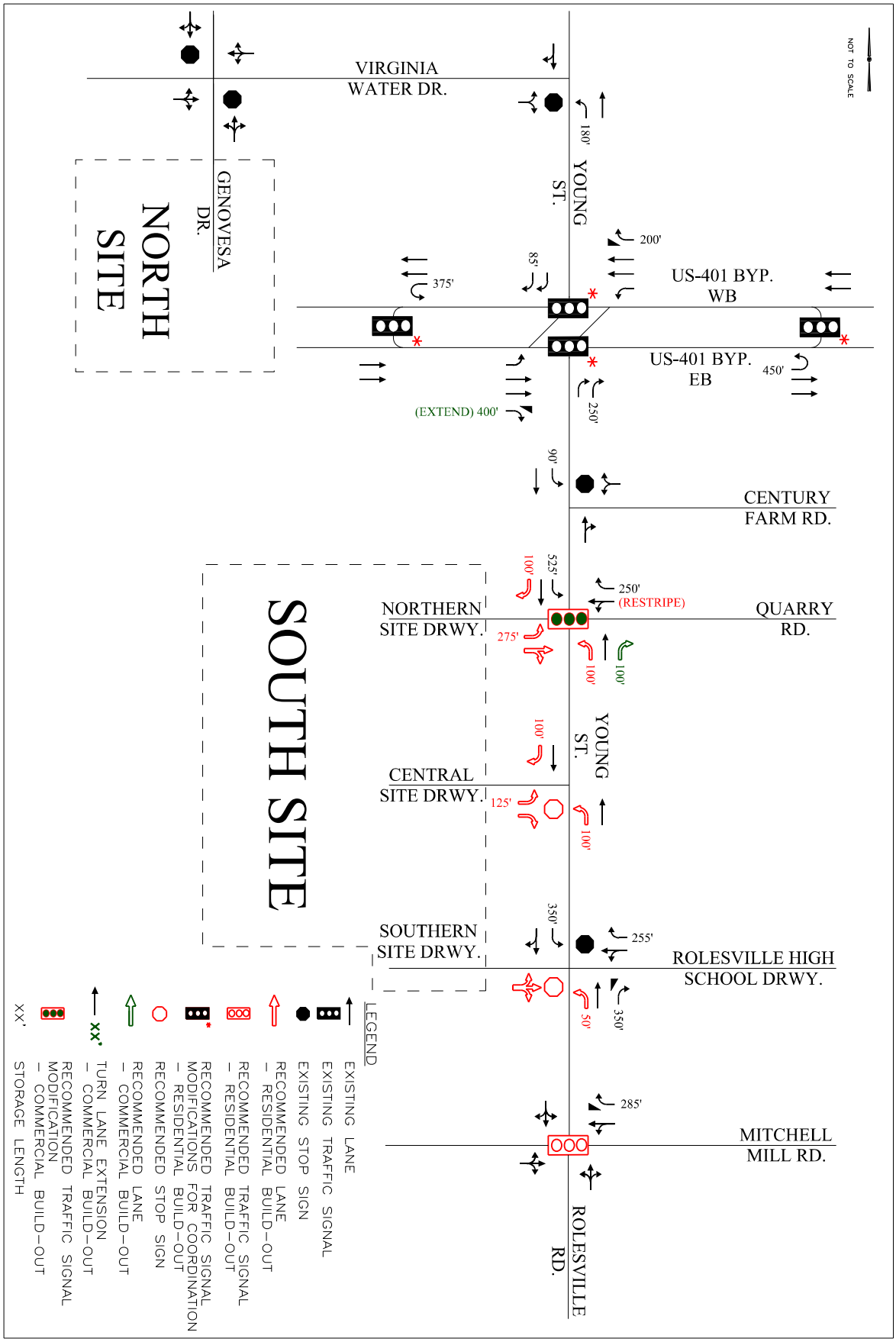
traffic simulations indicate that short queues are likely on the minor street approach in the AM peak hour at commercial build-out.

Analyses indicate that the intersection of Young Street at the Central Site Driveway is expected to operate with long delays on the minor street approach (Central Site Driveway) in the AM peak hour in the commercial build-out traffic condition. It is typical for stop sign controlled side streets and driveways intersecting major streets to experience long delays during peak hours, while the majority of the traffic moving through the intersection on the major street experiences little or no delay. SimTraffic traffic simulations indicate the possibility of long queues on the eastbound left-turn movement at this intersection in the AM peak hour in the commercial build-out condition.

Analyses indicate that the intersection of Young Street at the Rolesville High School Driveway/South Site Driveway is expected to operate with long delays on the minor street approach (Rolesville High School Driveway) in the AM peak hour and school PM peak hour with or without the proposed project in place in the study year 2025. SimTraffic traffic simulations also indicate the possibility of long queues on the westbound left-turn movement at this intersection in the AM peak hour and school PM peak hour. However, it is typical for stop sign controlled side streets and driveways intersecting major streets to experience long delays during peak hours, while the majority of the traffic moving through the intersection on the major street experiences little or no delay. This intersection is not expected to meet 4-hour or 8-hour MUTCD traffic signal warrants.

As shown in the analysis, the impact of site traffic associated with the commercial build-out of this proposed PUD is generally consistent with the currently-approved PUD for the site. The proposed PUD is expected to generate no more than 50 additional peak hour trips in each of the studied peak hours compared to the approved PUD, and delays at commercial build-out of both plans are generally consistent at each of the study intersections.

The recommended laneage for the development is shown on **Figure 17**.



Kimley»Horn	YOUNG STREET PUD ROLESVILLE, NC TRAFFIC IMPACT ANALYSIS	RECOMMENDED ROADWAY LANEAGE	FIGURE 17

TRAFFIC IMPACT ANALYSIS

FOR

WHEELER TRACT

LOCATED

IN

ROLESVILLE, NC

Prepared For:
Hopper Communities
173 Paraggi Court
Clayton, NC 27527

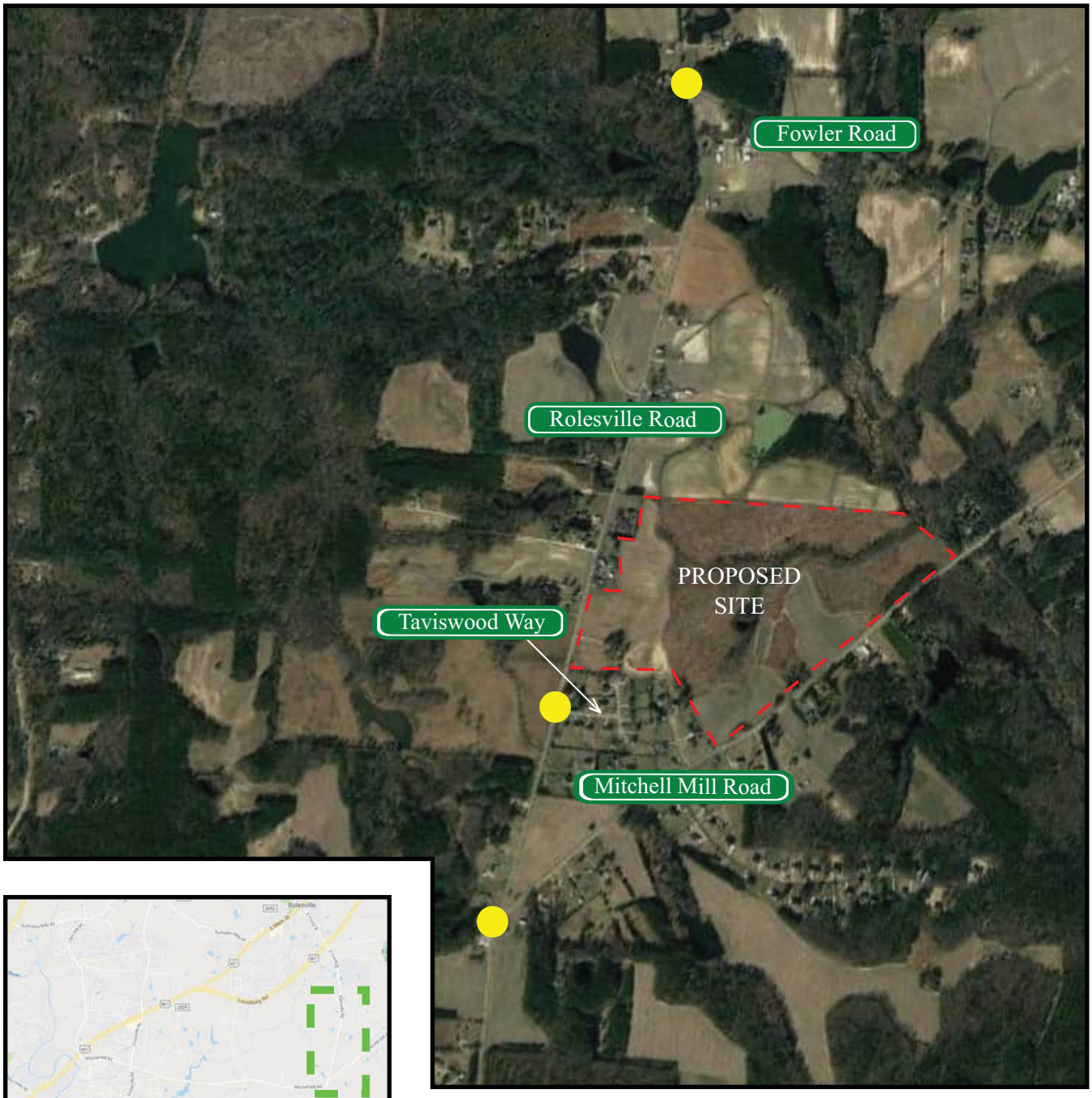
Prepared By:
Ramey Kemp & Associates, Inc.
5808 Faringdon Place, Suite 100
Raleigh, NC 27609
License #C-0910

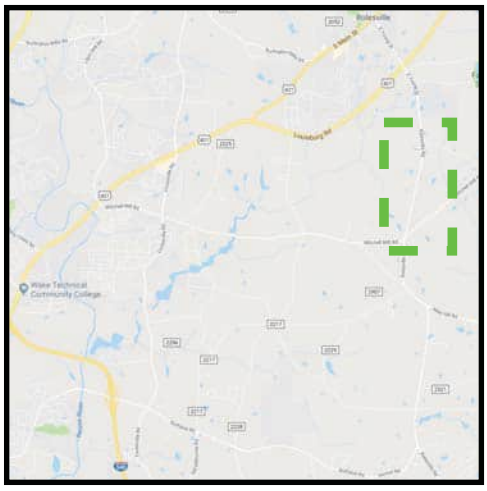
June 2019

RKA Project No. 19045

Prepared By: CAB

Reviewed By: JTR



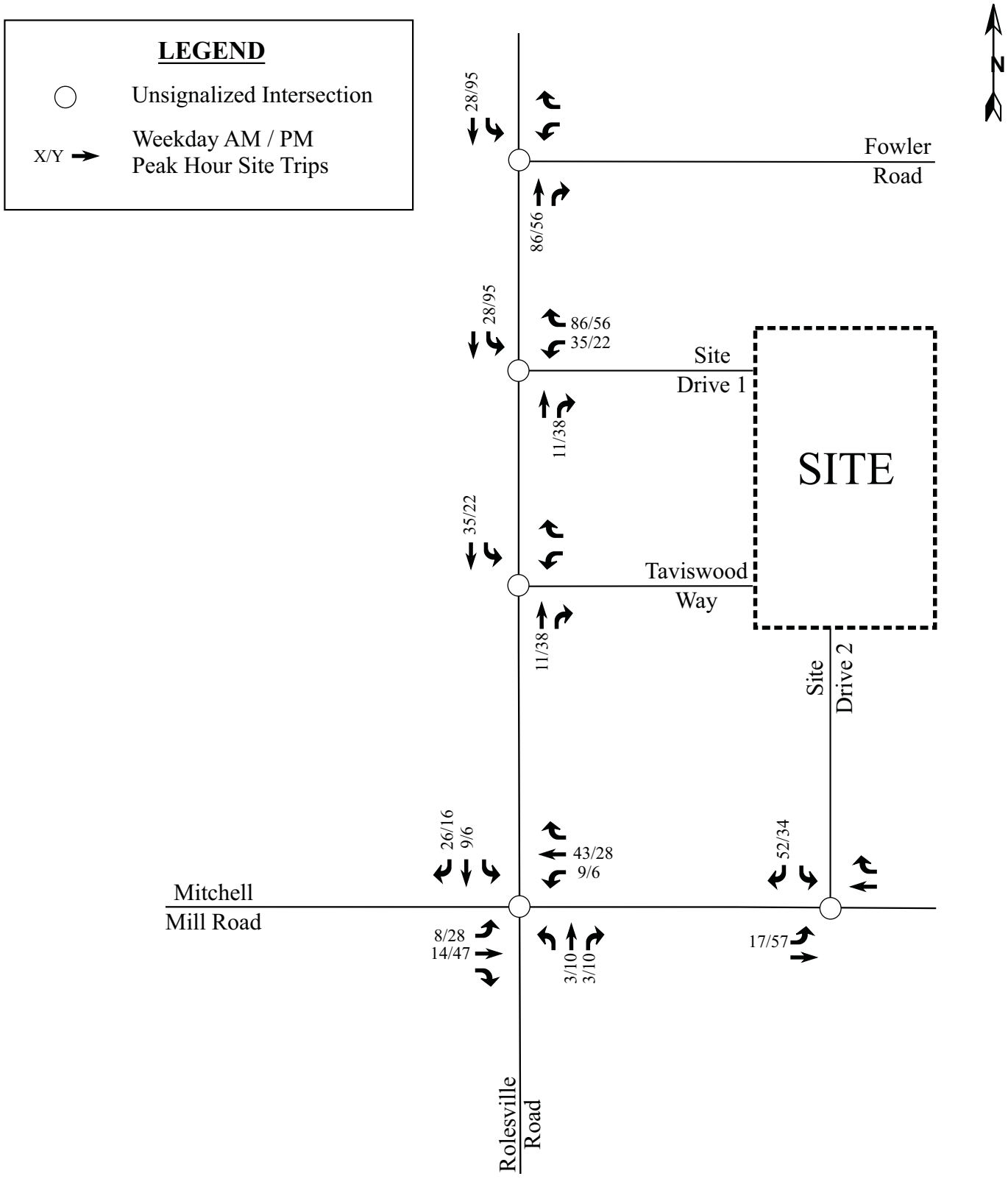


N

LEGEND

- Proposed Site Location
- Study Intersection
- Study Area

RAMEY KEMP & ASSOCIATES TRANSPORTATION ENGINEERS	Wheeler Tract Rolesville, NC	Site Location Map Scale: Not to Scale — Figure 1



RAMEY KEMP & ASSOCIATES
TRANSPORTATION ENGINEERS

Wheeler Tract
Rolesville, NC

Site
Trip Assignment

Scale: Not to Scale

Figure 9

9. RECOMMENDATIONS

Based on the findings of this study, specific geometric improvements have been identified and are recommended to accommodate future traffic conditions. See a more detailed description of the recommended improvements below. Refer to Figure 11 for an illustration of the recommended lane configuration for the proposed development.

Recommended Improvements by Developer

Rolesville Road and Mitchell Mill Road

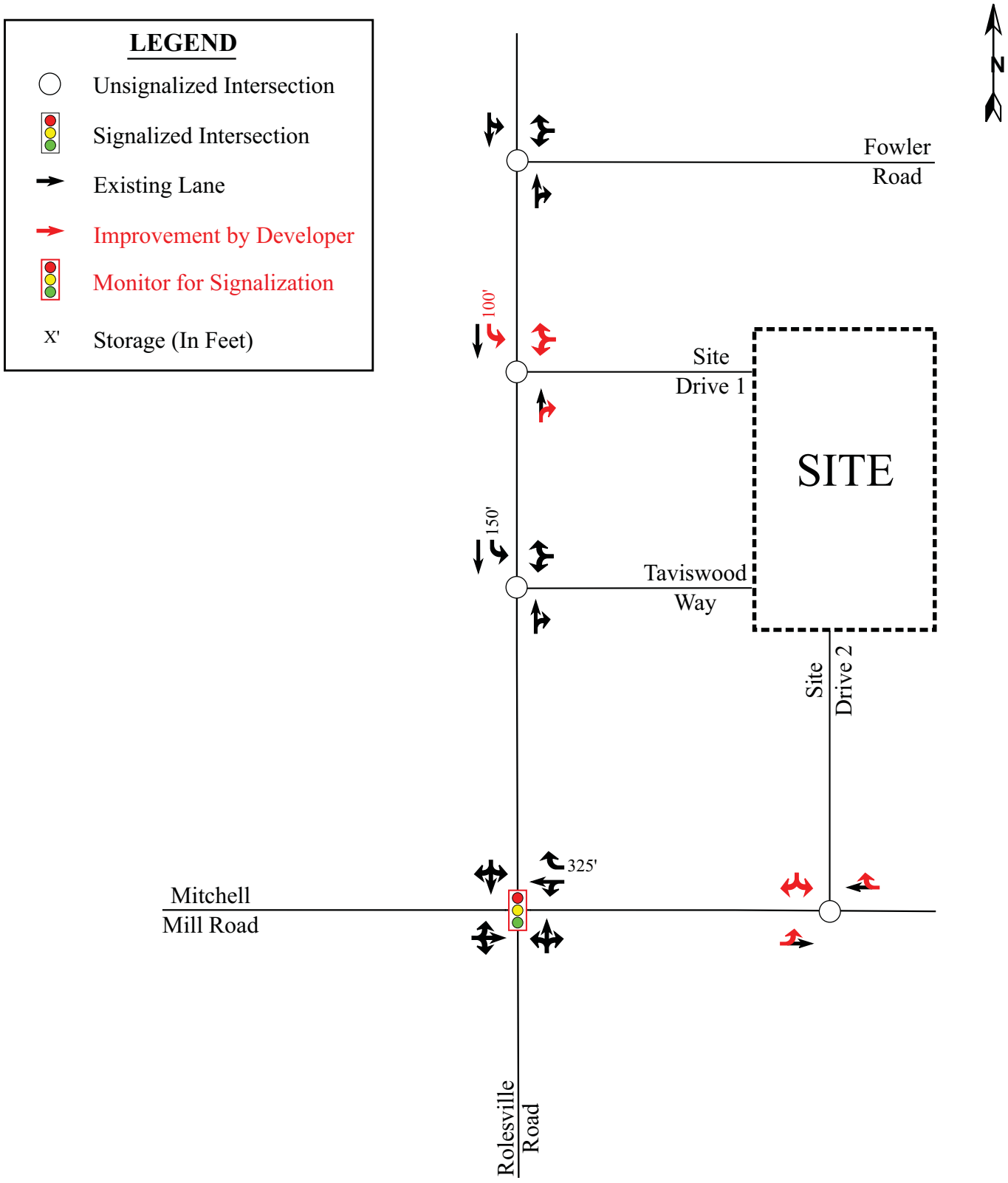
- Monitor intersection for signalization.

Rolesville Road and Site Drive 1

- Provide site access via a full movement intersection with one ingress lane and one egress lane.
- Provide stop control for westbound Site Drive 1 approach.
- Provide a designated southbound left-turn lane with at least 100 feet of storage and appropriate deceleration and taper.

Mitchell Mill Road and Site Drive 2

- Provide site access via a full movement intersection with one ingress lane and one egress lane.
- Provide stop control for southbound Site Drive 2 approach.



RAMEY KEMP & ASSOCIATES TRANSPORTATION ENGINEERS	Wheeler Tract Rolesville, NC	Recommended Lane Configurations Scale: Not to Scale | Figure 11

TRAFFIC IMPACT ANALYSIS

FOR

LOUISBURY ROAD ASSEMBLAGE

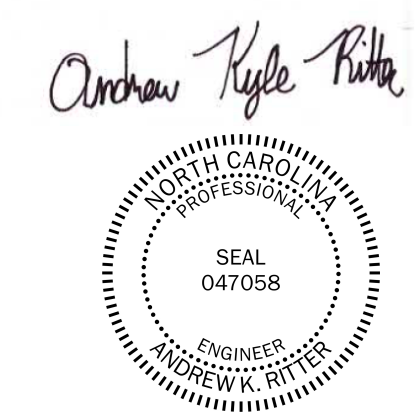
LOCATED

IN

RALEIGH, NC

Prepared For:
McAdams Company
2905 Meridian Parkway
Durham, NC 27713

Prepared By:
Ramey Kemp & Associates, Inc.
5808 Faringdon Place, Suite 100
Raleigh, NC 27609
License #C-0910



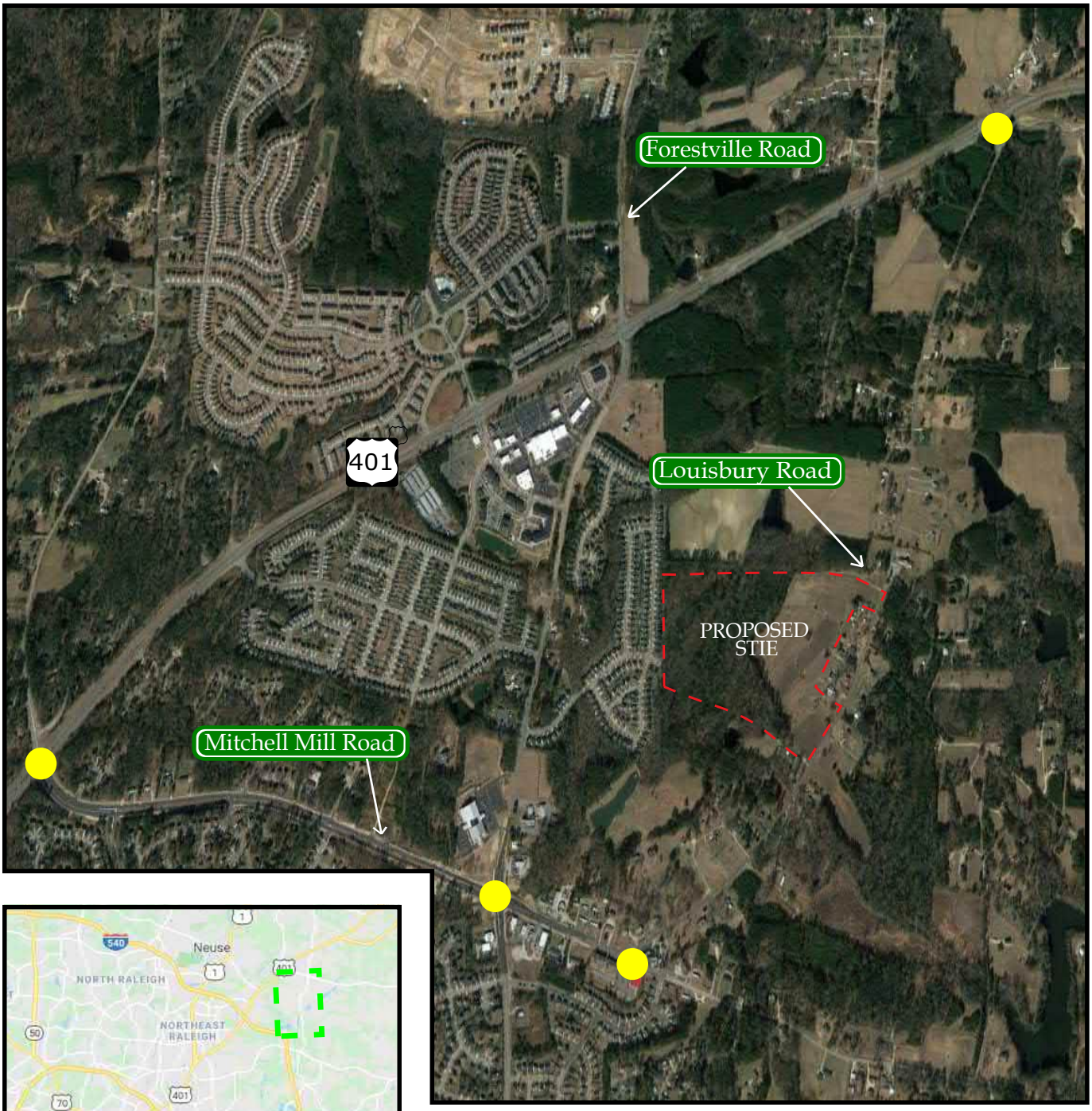
5/8/2020

May 2020

RKA Project No. 19418

Prepared By: DT

Reviewed By: DR



N

LEGEND

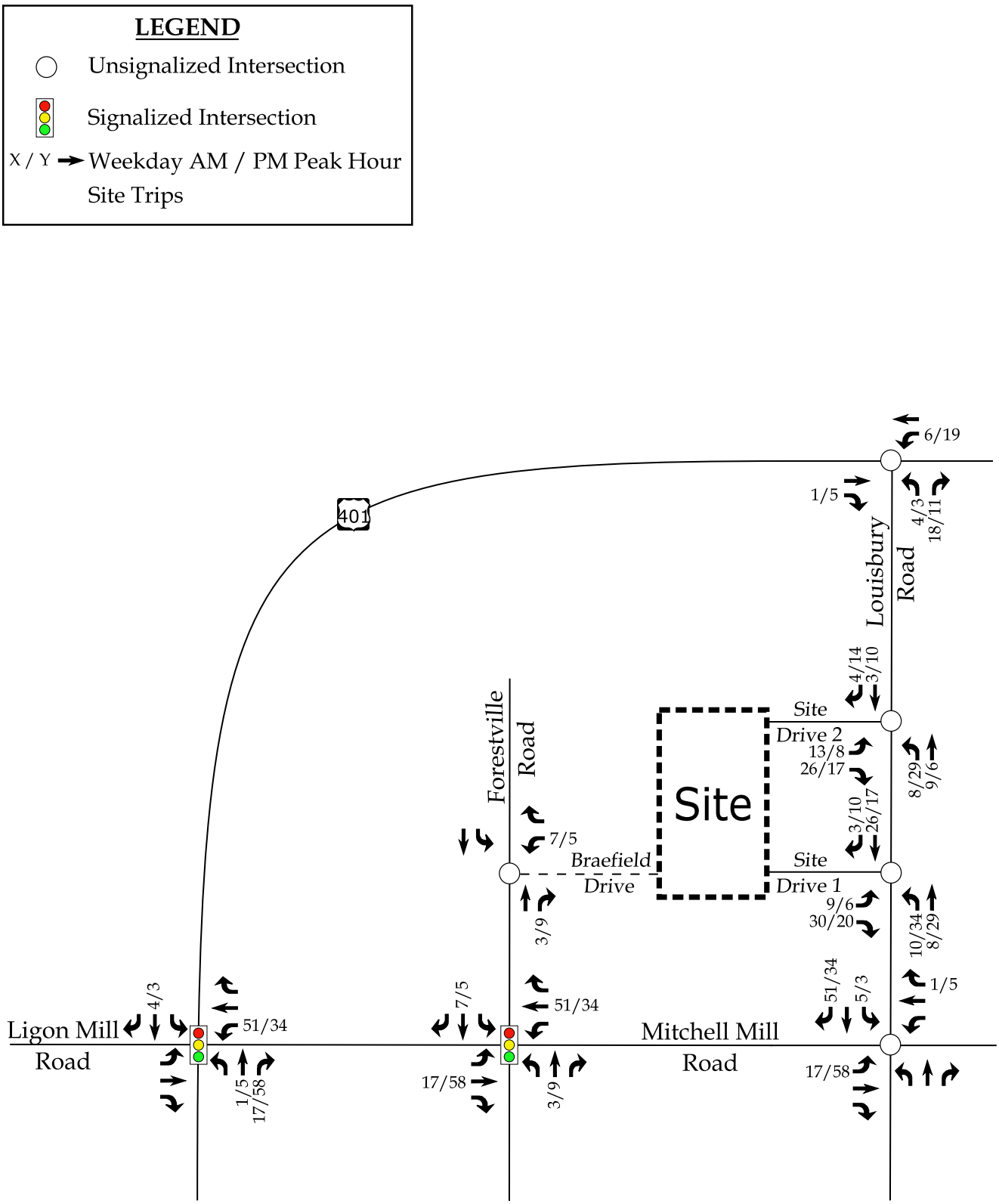
- Proposed Site Location
- Study Intersection
- Study Area

Moving forward.

RKA

RAMEY KEMP ASSOCIATES

Louisbury Road Assemblage Raleigh, NC	Site Location Map	
	Scale: Not to Scale	Figure 1



Moving forward. RKA RAMEY KEMP ASSOCIATES	Louisbury Road Assemblage Raleigh, NC	Site Trip Assignment Scale: Not to Scale | Figure 7

12. RECOMMENDATIONS

Based on the findings of this study, specific geometric improvements have been identified and are recommended to accommodate future traffic conditions. See a more detailed description of the recommended improvements below. Refer to Figure 9 for an illustration of the recommended lane configuration for the proposed development.

Recommended Improvements by Developer

Mitchell Mill Road and Louisbury Road

- Monitor for signalization after site is constructed.

US 401 and Louisbury Road

- Per NCDOT, extend northbound left turn lane to 175' of storage.
- Monitor for signalization after site is constructed.

Louisbury Road and Site Drive 1

- Provide site access via full movement intersection with one (1) ingress lane and one (1) egress lane.
- Per NCDOT, provide northbound left turn lane with 100' of storage.
- Provide stop control for eastbound approach.

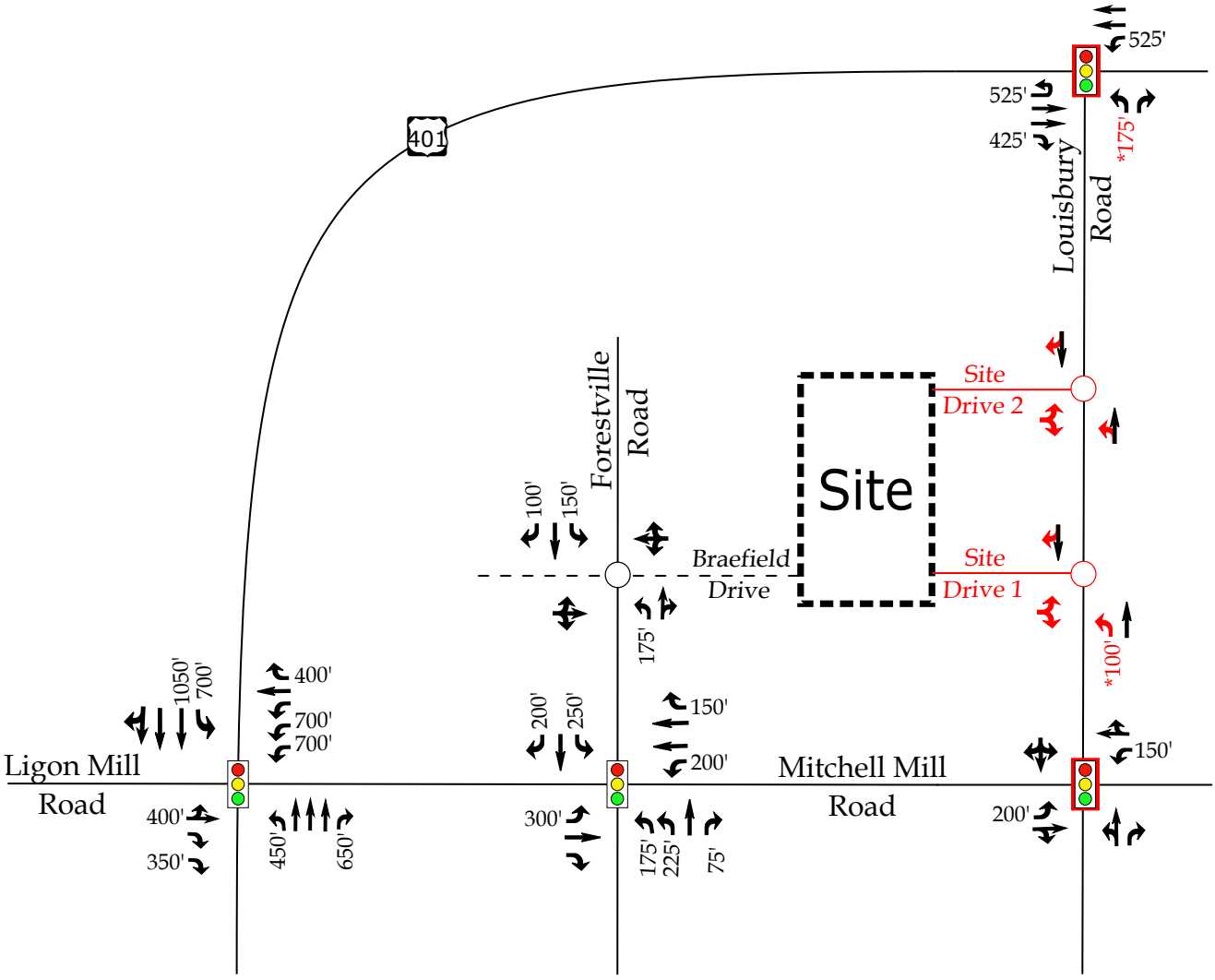
Louisbury Road and Site Drive 2

- Provide site access via full movement intersection with one (1) ingress lane and one (1) egress lane.
- Provide stop control for eastbound approach.

LEGEND

- Unsignalized Intersection
- Signalized Intersection
- Monitor for Signalization at Full Build-Out
- Existing Lane
- Improvement by Developer
- X' Storage (In Feet)

*Based on NCDOT Review



Moving forward.
RKA
RAMEY KEMP ASSOCIATES

Louisbury Road Assemblage
Raleigh, NC

Recommended Lane Configurations

Scale: Not to Scale | Figure 9

Kalas / Watkins Family Property
Traffic Impact Analysis

Rolesville Road, Rolesville, North Carolina

August 24, 2019

Prepared for:

Mitchell Mill Road Investors LLC
PO Box 3557
Cary, NC 27519

Prepared by:

Stantec Consulting Services Inc.

801 Jones Franklin Road
Suite 300
Raleigh, NC 27606

Sign-off Sheet

This document entitled Kalas / Watkins Family Property Traffic Impact Analysis was prepared by Stantec Consulting Services Inc. ("Stantec") for the account of Mitchell Mill Road Investors LLC (the "Client"). Any reliance on this document by any third party is strictly prohibited. The material in it reflects Stantec's professional judgment in light of the scope, schedule and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

Prepared by Maggie J Rogers

(signature)

Maggie Rogers

Reviewed by

(signature)

Matt Peach, PE, PTOE

Approved by Christa Greene

(signature)

Christa Greene, PE

NORTH CAROLINA PROFESSIONAL SEAL 039265 ENGINEER MATTHEW D. PEACH

8/24/2017

1.0 INTRODUCTION

The purpose of this report is to evaluate the transportation impacts of the proposed Kalas / Watkins Family Property development located on the west side of Rolesville Road just north of Mitchell Mill Road in Rolesville, NC. The project location is shown below in Figure 1.

Figure 1: Site Location

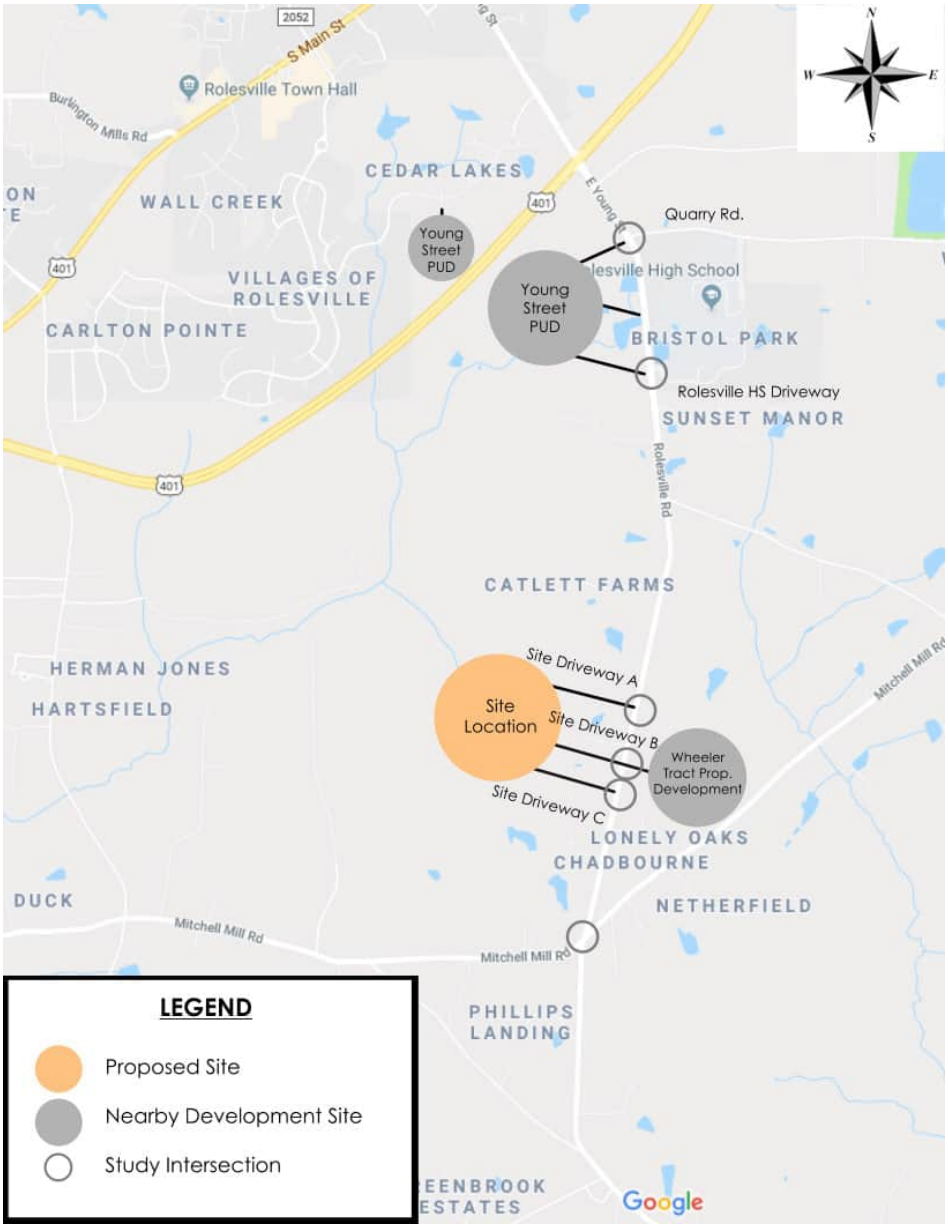
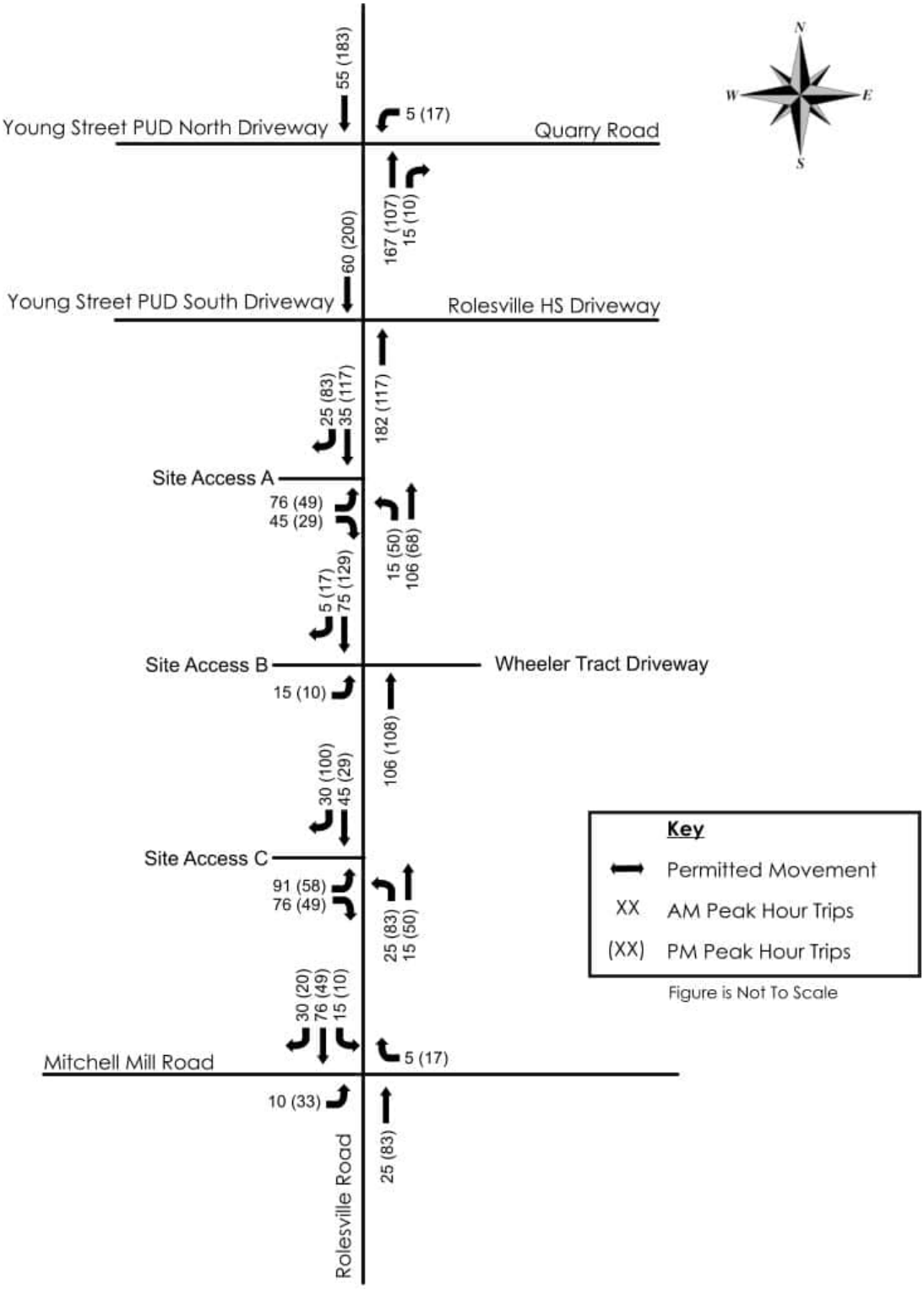


Figure 6: Site Trip Assignment



5.4 2025 BUILD WITH IMPROVEMENTS

Geometric improvements such as the installation of turn-lanes are recommended and therefore analyzed in this scenario. These items are listed below as well as in the recommendations section.

Rolesville Road at Site Driveway A

- Construct Driveway A as a full-movement access point onto Rolesville Road with one ingress lane and one egress lane.
- Construct an exclusive eastbound right-turn lane with 100 feet of full-width storage and appropriate taper on Driveway A.
- Construct an exclusive northbound left-turn lane with 100 feet of full-width storage and appropriate taper on Rolesville Road.
- Construct an exclusive southbound right-turn lane with 100 feet of full-width storage and appropriate taper on Rolesville Road.

Rolesville Road at Site Driveway B / Wheeler Tract Driveway

- Construct Driveway B as a full-movement access point onto Rolesville Road with one ingress lane and one egress lane.
- Construct an exclusive northbound left-turn lane with 100 feet of full-width storage and appropriate taper on Rolesville Road.
- Construct an exclusive southbound right-turn lane with 50 feet of full-width storage and appropriate taper on Rolesville Road.

Rolesville Road at Site Driveway C

- Construct Driveway C as a full-movement access point onto Rolesville Road with one ingress lane and one egress lane.
- Construct an exclusive eastbound right-turn lane with 100 feet of full-width storage and appropriate taper on Driveway C.
- Construct an exclusive northbound left-turn lane with 100 feet of full-width storage and appropriate taper on Rolesville Road.
- Construct an exclusive southbound right-turn lane with 100 feet of full-width storage and appropriate taper on Rolesville Road.

Accordingly, all study area intersections and approaches operate at acceptable levels of service with the following exceptions:

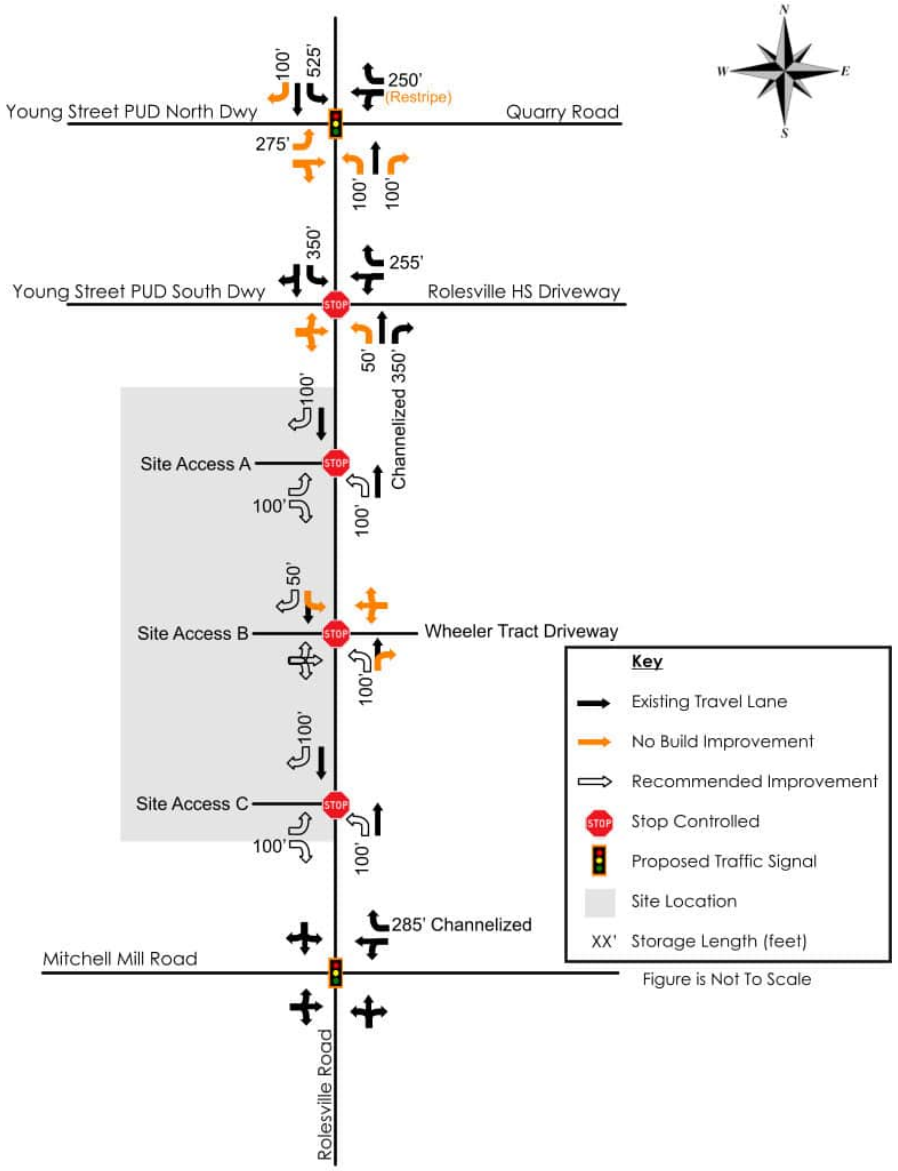
- The east and westbound approaches to the intersection of Rolesville Road at Rolesville High School Driveway / Young Street PUD Southern Driveway operates at LOS F in the AM peak hour. This causes high overall delays at the intersection. Furthermore, the eastbound approach operates at LOS F and westbound approach operates at LOS E in the PM peak hour.
- The east and westbound approaches at the intersection of Rolesville Road at Site Driveway B / Wheeler Tract Driveway operate at LOS E in the AM peak hour.

The east and westbound approaches to the intersection of Rolesville Road at Rolesville High School Driveway / Young Street PUD Southern Driveway performs unacceptably across analysis scenarios. These delays can be

attributed to both the Young Street PUD and High School traffic on the side street approaches. The Kalas / Watkins development is projected to only add through volumes to the intersection and are anticipated to have a minimal impact on overall delays at this intersection.

Delays on the eastbound approach of Site Driveway B at Rolesville Road can be attributed to high thru volumes on Rolesville Road during the AM peak hour. Traffic volumes using this approach are anticipated to be minor (i.e. 15 vehicles in the AM peak hour and 10 vehicles in the PM peak hour) and side street delays should dissipate after High School Traffic passes through the network. Table 8 lists the results of the capacity analysis under the 2025 build-improved traffic conditions. The recommended improvements are illustrated in figure 14.

Figure 14: Recommended Improvements



TRAFFIC IMPACT ANALYSIS

FOR

5109 MITCHELL MILL ROAD

LOCATED

IN

ROLESVILLE, NORTH CAROLINA

Prepared For:
Town of Rolesville
502 Southtown Circle
Rolesville, NC 27571

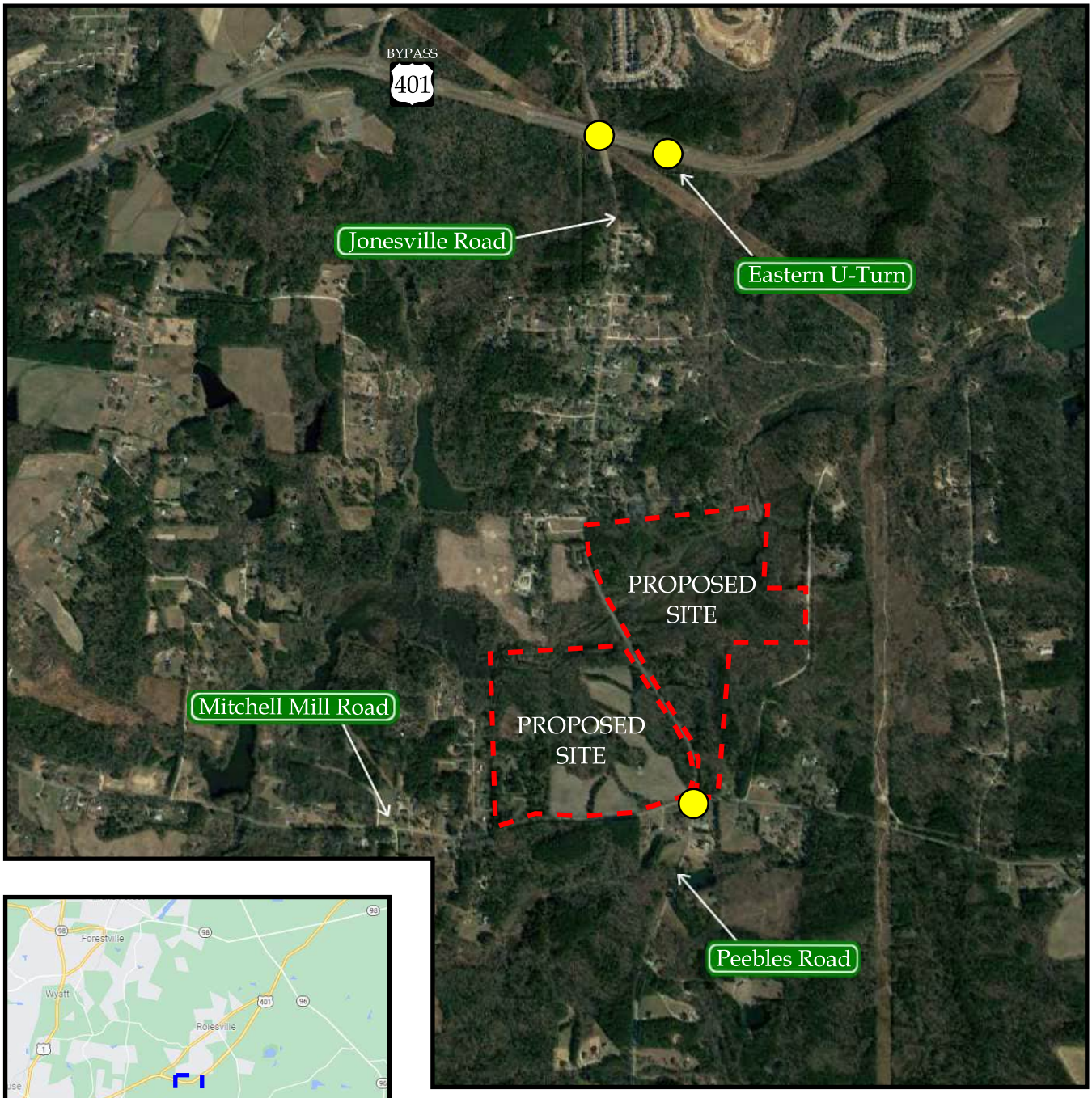
Prepared By:
Infrastructure Consulting Services, Inc.
dba
Ramey Kemp Associates
5808 Faringdon Place
Raleigh, NC 27609
License #F-1489

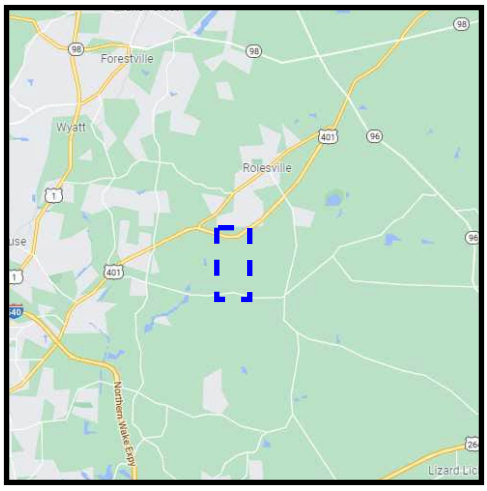
AUGUST 2022

RKA Project No. 20498 - 004

Prepared By: TF

Reviewed By: CH





N

LEGEND

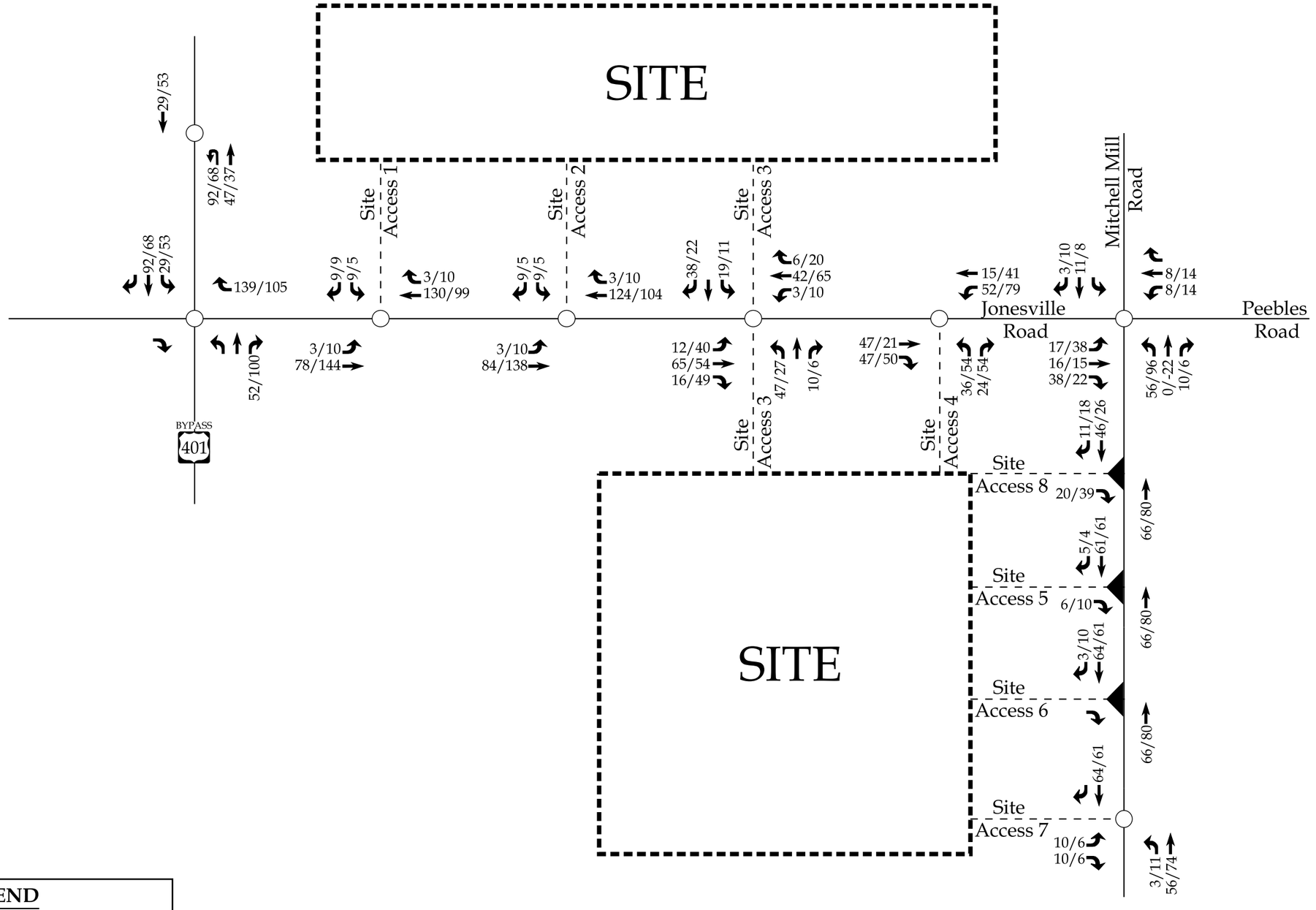
- Proposed Site Location
- Study Intersection
- Study Area

RAMEY KEMP ASSOCIATES

5109 Mitchell Mill Road
Rolesville, NC

Site Location Map

Scale: Not to Scale | Figure 1



LEGEND

- ○ Unsignalized Intersection
- ▲ Right-In/Right-Out Intersection
- X / Y → Weekday AM / PM Peak Hour Site Trips

RAMEY KEMP ASSOCIATES

5109 Mitchell Mill Road
Rolesville, NC

Total Site Trip Assignment

Scale: Not to Scale | Figure 12

9. RECOMMENDATIONS

Based on the findings of this study, specific geometric improvements have been identified and are recommended to accommodate future traffic conditions. See a more detailed description of the recommended improvements below. Refer to Figure 14 for an illustration of the recommended lane configurations for the proposed development.

Recommended Improvements by Developer

Required Frontage Improvements per Rolesville Community Transportation Plan

- Widen Jonesville Road along the site frontage between Site Access 1 and Mitchell Mill Road to this roadway's ultimate section (2-lane w/ TWLTL).
- Widen one-half section of Mitchell Mill Road along the site frontage to this roadway's ultimate section (4-lane median divided).

US 401 Bypass and Jonesville Road

- Conduct a full signal warrant analysis prior to full build-out of the proposed development and install a traffic signal if warranted and approved by the Town and NCDOT.

US 401 Bypass and Eastern U-Turn Location

- Conduct a full signal warrant analysis prior to full build-out of the proposed development and install a traffic signal if warranted and approved by the Town and NCDOT.

Mitchell Mill Road and Jonesville Road / Peebles Road

- Construct a southbound (Jonesville Road) left-turn lane with at least 100 feet of storage and appropriate decel and taper.
- Construct an eastbound (Mitchell Mill Road) left-turn lane with at least 100 feet of storage and appropriate decel and taper.
- Conduct a full signal warrant analysis prior to full build-out of the proposed development and install a traffic signal if warranted and approved by the Town and NCDOT.

Jonesville Road and Site Access 1

- Construct the westbound approach (Site Access 1) with one ingress lane and one egress lane.
- Provide stop-control for the westbound approach (Site Access 1).
- Construct a southbound (Jonesville Road) left-turn lane with at least 100 feet of storage and appropriate decel and taper.

Jonesville Road and Site Access 2

- Construct the westbound approach (Site Access 2) with one ingress lane and one egress lane.
- Provide stop-control for the westbound approach (Site Access 2).
- Construct a northbound (Jonesville Road) right-turn lane with at least 100 feet of storage and appropriate decel and taper.
- Construct a southbound (Jonesville Road) left-turn lane with at least 100 feet of storage and appropriate decel and taper.

Jonesville Road and Site Access 3

- Construct the eastbound and westbound approaches (Site Access 3) with one ingress lane and one egress lane.
- Provide stop-control for the eastbound and westbound approaches (Site Access 3).
- Construct a northbound (Jonesville Road) left-turn lane with at least 100 feet of storage and appropriate decel and taper.
- Construct a northbound (Jonesville Road) right-turn lane with at least 100 feet of storage and appropriate decel and taper.
- Construct a southbound (Jonesville Road) left-turn lane with at least 100 feet of storage and appropriate decel and taper.
- Construct a southbound (Jonesville Road) right-turn lane with at least 100 feet of storage and appropriate decel and taper.

Jonesville Road and Site Access 4

- Construct the eastbound approach (Site Access 4) with one ingress lane and one egress lane.
- Provide stop-control for the eastbound approach (Site Access 4).
- Construct a northbound (Jonesville Road) left-turn lane with at least 100 feet of storage and appropriate decel and taper.
- Construct a southbound (Jonesville Road) right-turn lane with at least 100 feet of storage and appropriate decel and taper.

Mitchell Mill Road and Site Access 5

- Construct the southbound approach (Site Access 5) with one ingress lane and one egress lane striped as an exclusive right-turn lane.
- Provide stop-control for the southbound approach (Site Access 5). This proposed intersection will be restricted to right-in/right-out operations.
- Construct an exclusive westbound (Mitchell Mill Road) right-turn lane with at least 100 feet of storage and appropriate decel and taper.

Mitchell Mill Road and Site Access 6

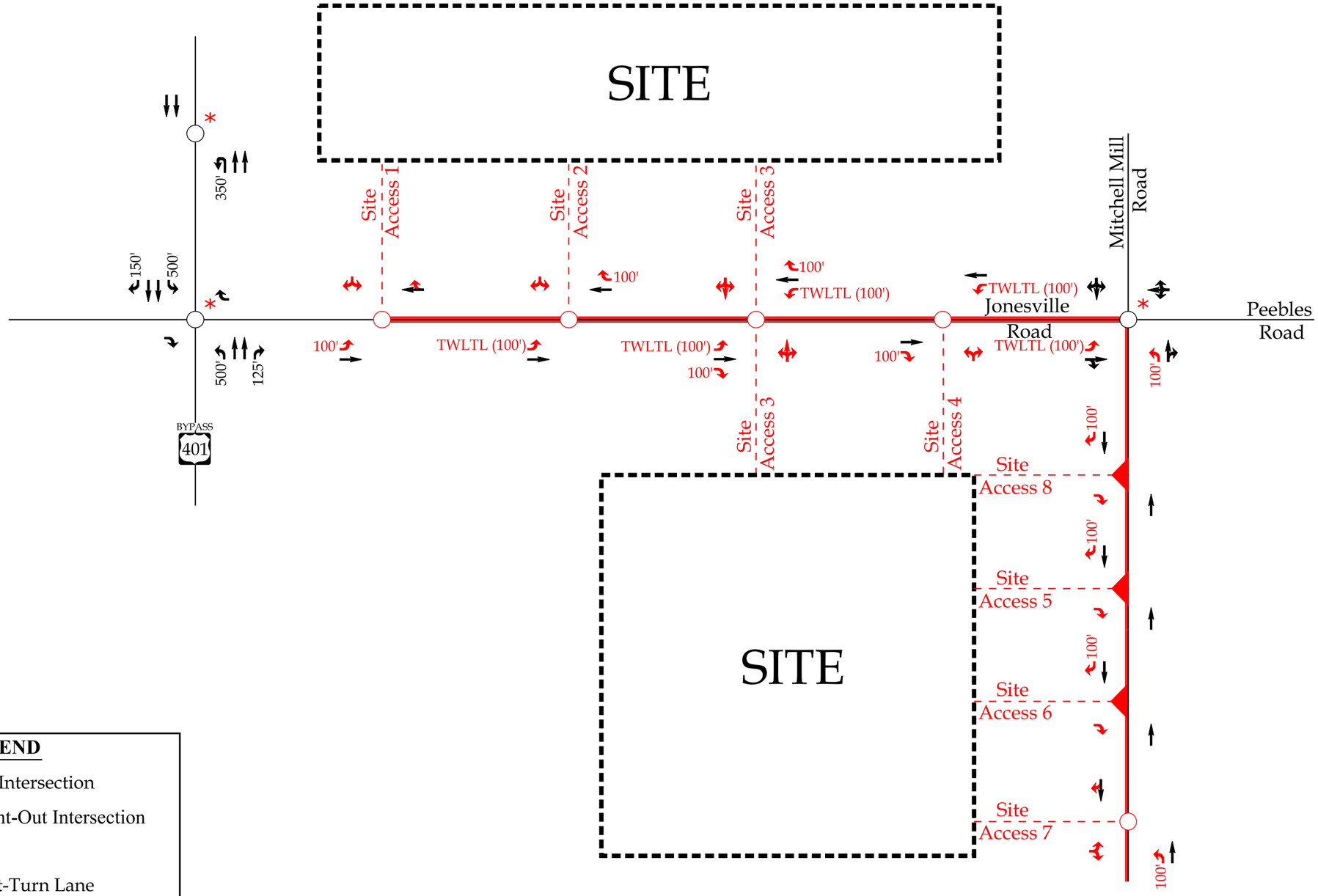
- Construct the southbound approach (Site Access 6) with one ingress lane and one egress lane striped as an exclusive right-turn lane.
- Provide stop-control for the southbound approach (Site Access 6). This proposed intersection will be restricted to right-in/right-out operations.
- Construct an exclusive westbound (Mitchell Mill Road) right-turn lane with at least 100 feet of storage and appropriate decel and taper.

Mitchell Mill Road and Site Access 7

- Construct the southbound approach (Site Access 7) with one ingress lane and one egress lane.
- Provide stop-control for the southbound approach (Site Access 7)
- Construct an exclusive eastbound (Mitchell Mill Road) left-turn lane with at least 100 feet of storage and appropriate decel and taper.

Mitchell Mill Road and Site Access 8

- Construct the southbound approach (Site Access 8) with one ingress lane and one egress lane striped as an exclusive right-turn lane.
- Provide stop-control for the southbound approach (Site Access 8). This proposed intersection will be restricted to right-in/right-out operations.
- Construct an exclusive westbound (Mitchell Mill Road) right-turn lane with at least 100 feet of storage and appropriate decel and taper.



LEGEND

- ○ Unsignalized Intersection
- ◢ Right-In / Right-Out Intersection
- → Existing Lane
- TWLTL Two-Way Left-Turn Lane
- * Developer Monitor for Signalization
- → Improvement by Developer
- — Frontage Widening Requirement**
- X' Storage (In Feet)

**Refer to Section 9 of the report for more information

RAMEY KEMP ASSOCIATES

5109 Mitchell Mill Road
Rolesville, NC

Recommended Lane Configurations

Scale: Not to Scale | Figure E-1

TRAFFIC IMPACT ANALYSIS

FOR

HILLS AT HARIS CREEK

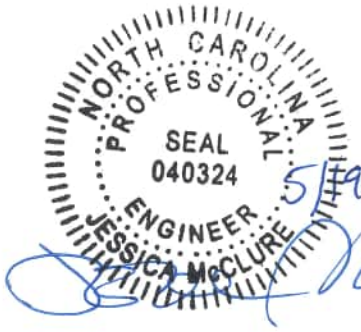
LOCATED

IN

ROLESVILLE, NORTH CAROLINA

Prepared For:
Town of Rolesville
502 Southtown Circle
Rolesville, NC 27571

Prepared By:
Ramey Kemp & Associates, Inc.
5808 Faringdon Place, Suite 100
Raleigh, NC 27609
License #C-0910

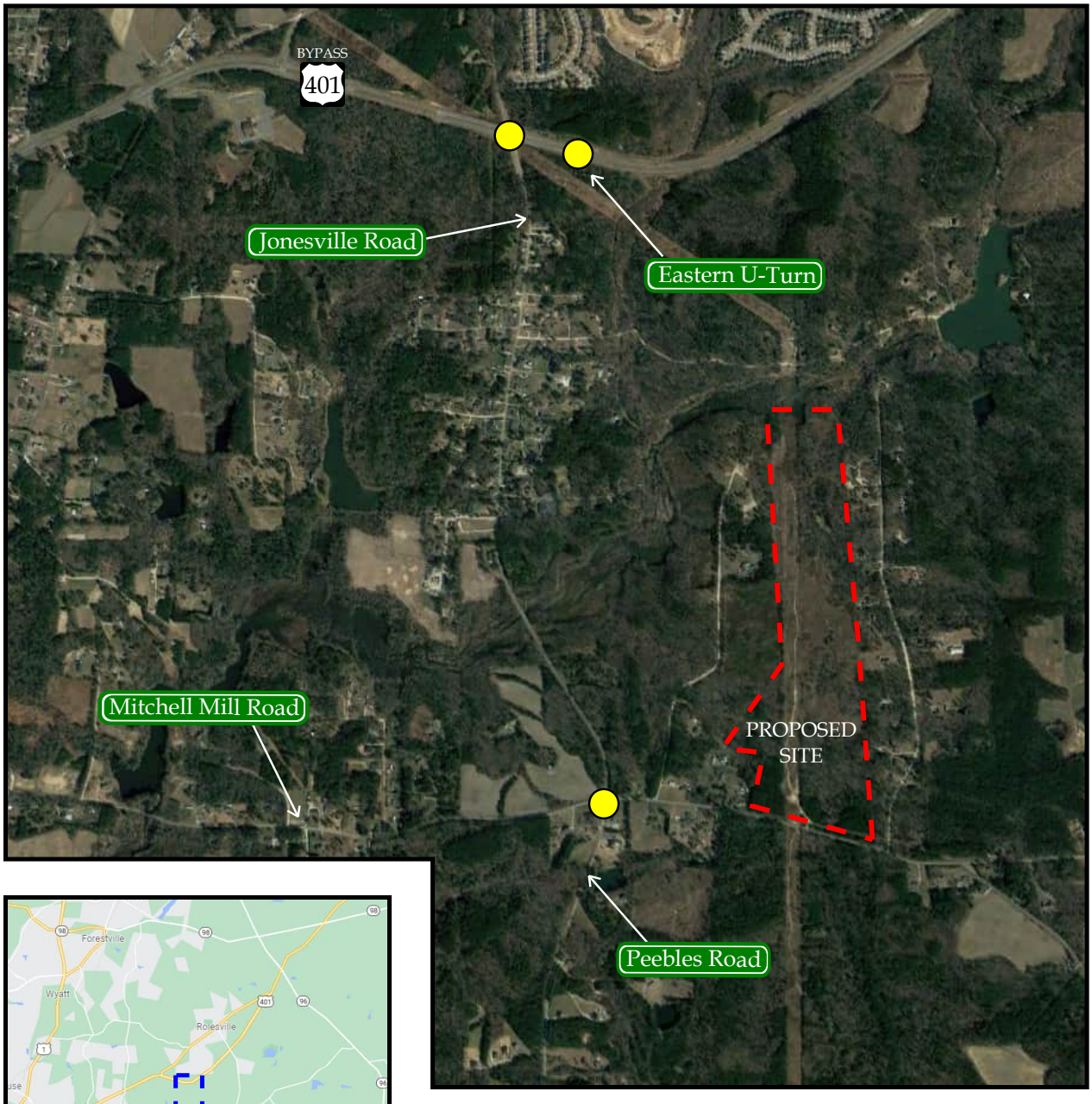


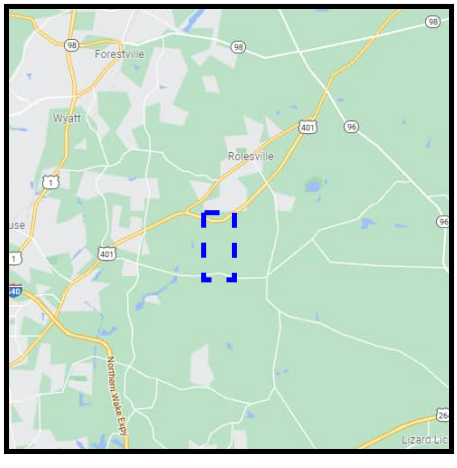
MAY 2022

RKA Project No. 20498 - 005

Prepared By: TF

Reviewed By: JMC





N

LEGEND

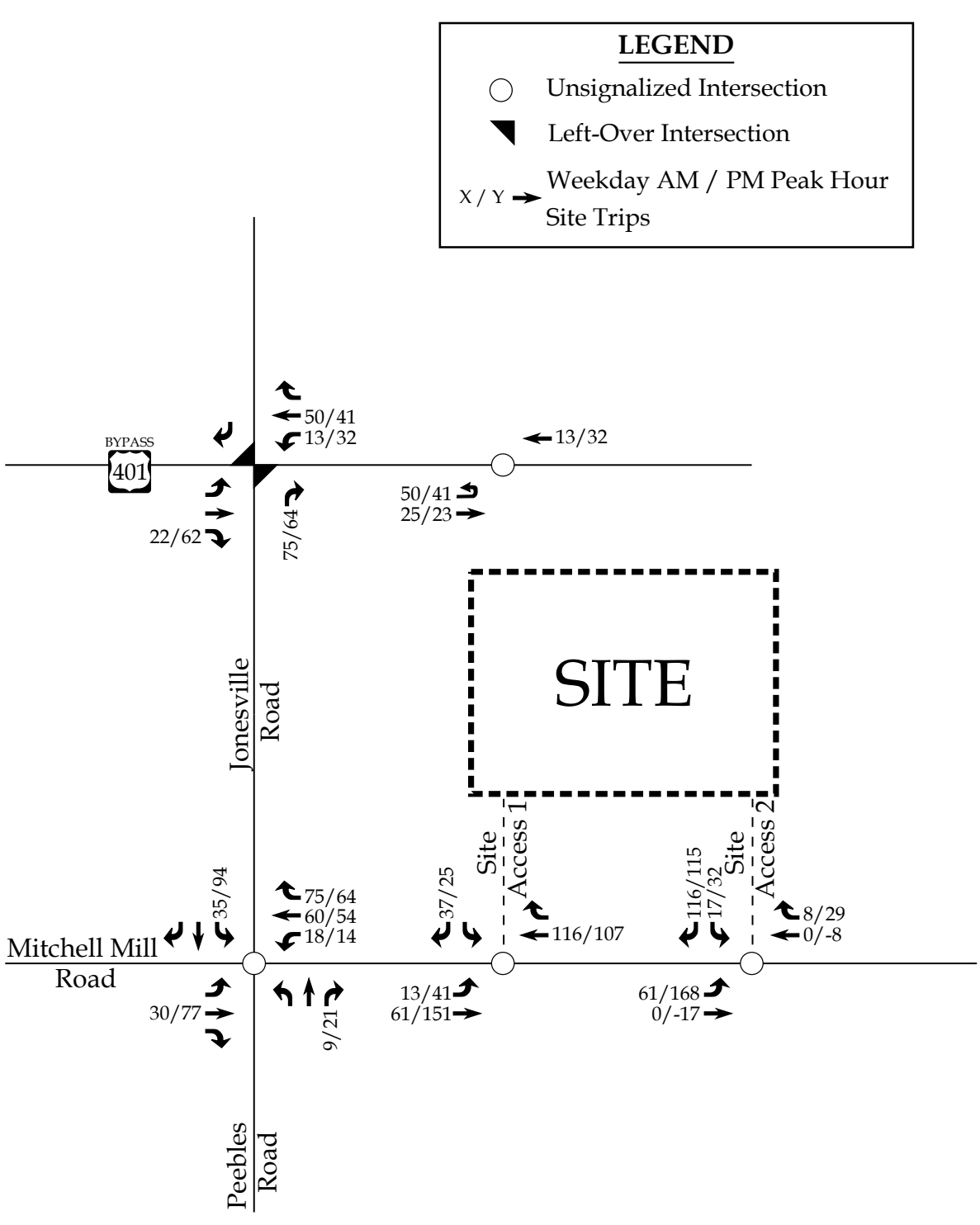
- Proposed Site Location
- Study Intersection
- Study Area

RAMEY KEMP ASSOCIATES

Hills at Harris Creek
Rolesville, NC

Site Location Map

Scale: Not to Scale | Figure 1



RKA RAMEY KEMP ASSOCIATES	Hills at Harris Creek Rolesville, NC	Total Site Trip Assignment	
		Scale: Not to Scale	Figure 12

9. RECOMMENDATIONS

Based on the findings of this study, specific geometric improvements have been identified and are recommended to accommodate future traffic conditions. See a more detailed description of the recommended improvements below. Refer to Figure 14 for an illustration of the recommended lane configurations for the proposed development.

Recommended Improvements by Developer

Required Frontage Improvements per Rolesville Community Transportation Plan

- Widen one-half section of Mitchell Mill Road along the site frontage to this roadway's ultimate section (4-lane median divided).

US 401 Bypass and Jonesville Road

- Conduct a full signal warrant analysis prior to full build-out of the proposed development and install a traffic signal if warranted and approved by the Town and NCDOT.

US 401 Bypass and Eastern U-Turn Location

- Conduct a full signal warrant analysis prior to full build-out of the proposed development and install a traffic signal if warranted and approved by the Town and NCDOT.

Mitchell Mill Road and Jonesville Road / Peebles Road

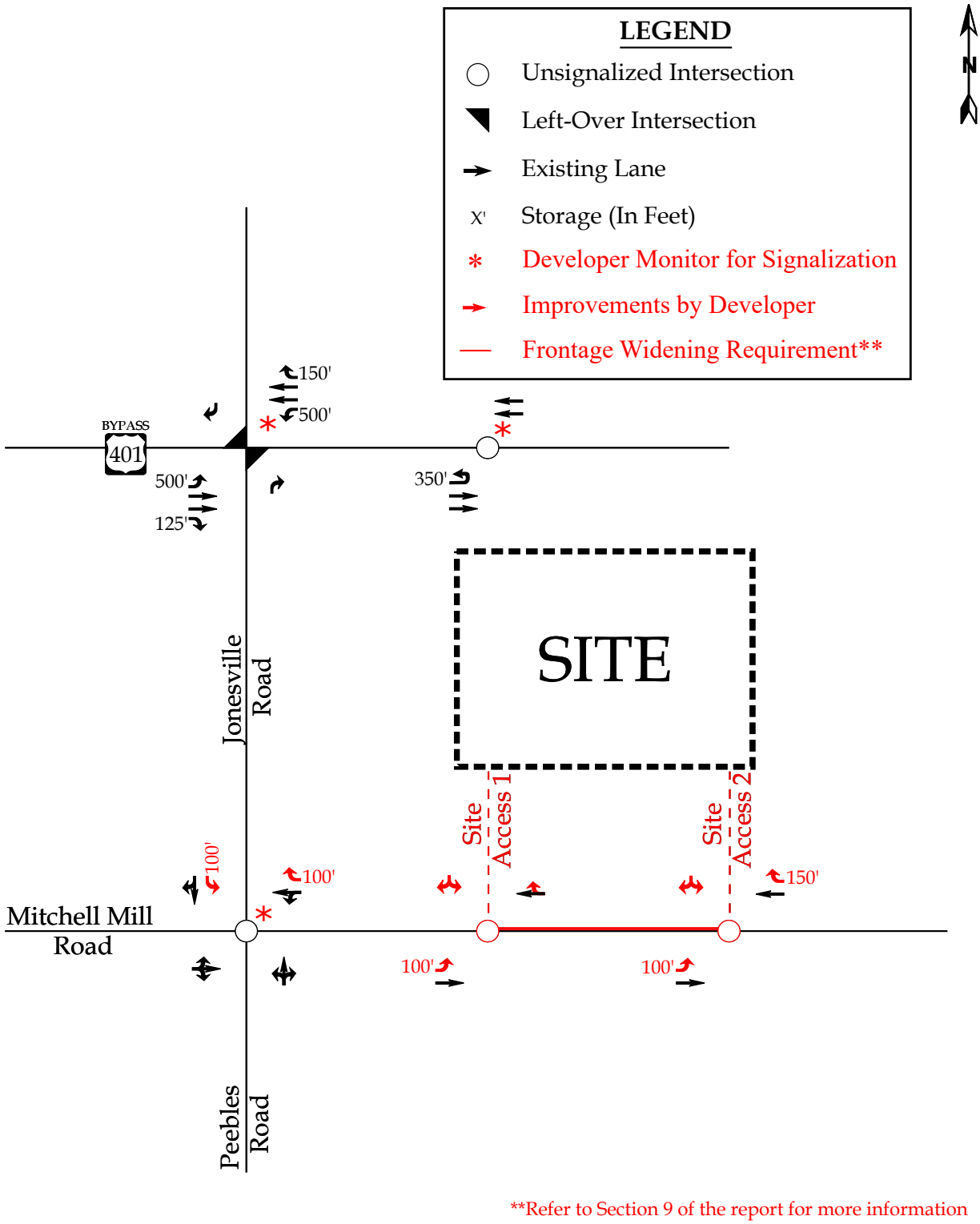
- Construct a southbound (Jonesville Road) left-turn lane with at least 100 feet of storage and appropriate decel and taper.
    - It should be noted that this improvement was also identified by the 5109 Mitchell Mill Road TIA.
- Construct a westbound (Mitchell Mill Road) right-turn lane with at least 100 feet of storage and appropriate decel and taper.
- Conduct a full signal warrant analysis prior to full build-out of the proposed development and install a traffic signal if warranted and approved by the Town and NCDOT.

Mitchell Mill Road and Site Access 1

- Construct the southbound approach (Site Access 1) with one ingress lane and one egress lane.
- Provide stop-control for the southbound approach (Site Access 1).
- Construct an eastbound (Mitchell Mill Road) left-turn lane with at least 100 feet of storage and appropriate decel and taper.

Mitchell Mill Road and Site Access 2

- Construct the southbound approach (Site Access 2) with one ingress lane and one egress lane.
- Provide stop-control for the southbound approach (Site Access 2).
- Construct an eastbound (Mitchell Mill Road) left-turn lane with at least 150 feet of storage and appropriate decel and taper.
- Construct a westbound (Mitchell Mill Road) right-turn lane with at least 100 feet of storage and appropriate decel and taper.



**Refer to Section 9 of the report for more information

RKA RAMEY KEMP ASSOCIATES	Hills at Harris Creek Rolesville, NC	Recommended Lane Configurations Scale: Not to Scale | Figure 14

APPENDIX D

CAPACITY ANALYSIS CALCULATIONS

US 401 BYPASS

&

JONESVILLE ROAD

Intersection	
Int Delay, s/veh	3.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	590	80	0	0	0	0	0	136	0	86	0
Future Vol, veh/h	0	590	80	0	0	0	0	0	136	0	86	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	None
Storage Length	-	-	125	-	-	-	-	-	0	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	656	89	0	0	0	0	0	151	0	96	0

Major/Minor	Major1			Minor1			Minor2		
Conflicting Flow All	-	0	0	-	-	328	-	656	-
Stage 1	-	-	-	-	-	-	-	0	-
Stage 2	-	-	-	-	-	-	-	656	-
Critical Hdwy	-	-	-	-	-	6.94	-	6.54	-
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	5.54	-
Follow-up Hdwy	-	-	-	-	-	3.32	-	4.02	-
Pot Cap-1 Maneuver	0	-	-	0	0	668	0	384	0
Stage 1	0	-	-	0	0	-	0	-	0
Stage 2	0	-	-	0	0	-	0	460	0
Platoon blocked, %		-	-						
Mov Cap-1 Maneuver	-	-	-	-	-	668	-	384	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	384	-
Stage 1	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	460	-

Approach	EB	NB	SB
HCM Control Delay, s	0	12	17.5
HCM LOS		B	C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	SBLn1
Capacity (veh/h)	668	-	-	384
HCM Lane V/C Ratio	0.226	-	-	0.249
HCM Control Delay (s)	12	-	-	17.5
HCM Lane LOS	B	-	-	C
HCM 95th %tile Q(veh)	0.9	-	-	1

Intersection	
Int Delay, s/veh	2.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↱						↱		↑	
Traffic Vol, veh/h	0	1220	59	0	0	0	0	0	125	0	37	0
Future Vol, veh/h	0	1220	59	0	0	0	0	0	125	0	37	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	None
Storage Length	-	-	125	-	-	-	-	-	0	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	1356	66	0	0	0	0	0	139	0	41	0

Major/Minor	Major1			Minor1			Minor2		
Conflicting Flow All	-	0	0	-	-	678	-	1356	-
Stage 1	-	-	-	-	-	-	-	0	-
Stage 2	-	-	-	-	-	-	-	1356	-
Critical Hdwy	-	-	-	-	-	6.94	-	6.54	-
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	5.54	-
Follow-up Hdwy	-	-	-	-	-	3.32	-	4.02	-
Pot Cap-1 Maneuver	0	-	-	0	0	395	0	148	0
Stage 1	0	-	-	0	0	-	0	-	0
Stage 2	0	-	-	0	0	-	0	216	0
Platoon blocked, %		-	-						
Mov Cap-1 Maneuver	-	-	-	-	-	395	-	148	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	148	-
Stage 1	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	216	-

Approach	EB	NB	SB
HCM Control Delay, s	0	19	38.4
HCM LOS		C	E

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	SBLn1
Capacity (veh/h)	395	-	-	148
HCM Lane V/C Ratio	0.352	-	-	0.278
HCM Control Delay (s)	19	-	-	38.4
HCM Lane LOS	C	-	-	E
HCM 95th %tile Q(veh)	1.6	-	-	1.1

Intersection	
Int Delay, s/veh	8.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	812	154	0	0	0	0	0	350	0	128	0
Future Vol, veh/h	0	812	154	0	0	0	0	0	350	0	128	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	None
Storage Length	-	-	125	-	-	-	-	-	0	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	902	171	0	0	0	0	0	389	0	142	0

Major/Minor	Major1			Minor1			Minor2		
Conflicting Flow All	-	0	0	-	-	451	-	902	-
Stage 1	-	-	-	-	-	-	-	0	-
Stage 2	-	-	-	-	-	-	-	902	-
Critical Hdwy	-	-	-	-	-	6.94	-	6.54	-
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	5.54	-
Follow-up Hdwy	-	-	-	-	-	3.32	-	4.02	-
Pot Cap-1 Maneuver	0	-	-	0	0	556	0	276	0
Stage 1	0	-	-	0	0	-	0	-	0
Stage 2	0	-	-	0	0	-	0	355	0
Platoon blocked, %		-	-						
Mov Cap-1 Maneuver	-	-	-	-	-	556	-	276	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	276	-
Stage 1	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	355	-

Approach	EB	NB	SB
HCM Control Delay, s	0	25.2	31.1
HCM LOS		D	D

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	SBLn1
Capacity (veh/h)	556	-	-	276
HCM Lane V/C Ratio	0.699	-	-	0.515
HCM Control Delay (s)	25.2	-	-	31.1
HCM Lane LOS	D	-	-	D
HCM 95th %tile Q(veh)	5.5	-	-	2.7

Intersection	
Int Delay, s/veh	52.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↱						↱		↑	
Traffic Vol, veh/h	0	1708	221	0	0	0	0	0	294	0	122	0
Future Vol, veh/h	0	1708	221	0	0	0	0	0	294	0	122	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	None
Storage Length	-	-	125	-	-	-	-	-	0	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	1898	246	0	0	0	0	0	327	0	136	0

Major/Minor	Major1			Minor1			Minor2		
Conflicting Flow All	-	0	0	-	-	949	-	1898	-
Stage 1	-	-	-	-	-	-	-	0	-
Stage 2	-	-	-	-	-	-	-	1898	-
Critical Hdwy	-	-	-	-	-	6.94	-	6.54	-
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	5.54	-
Follow-up Hdwy	-	-	-	-	-	3.32	-	4.02	-
Pot Cap-1 Maneuver	0	-	-	0	0	~ 261	0	~ 69	0
Stage 1	0	-	-	0	0	-	0	-	0
Stage 2	0	-	-	0	0	-	0	~ 116	0
Platoon blocked, %		-	-						
Mov Cap-1 Maneuver	-	-	-	-	-	~ 261	-	~ 69	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	~ 69	-
Stage 1	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	~ 116	-

Approach	EB	NB	SB
HCM Control Delay, s	0	180.2	$ 579.5
HCM LOS		F	F

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	SBLn1
Capacity (veh/h)	261	-	-	69
HCM Lane V/C Ratio	1.252	-	-	1.965
HCM Control Delay (s)	180.2	-	-	$ 579.5
HCM Lane LOS	F	-	-	F
HCM 95th %tile Q(veh)	15.9	-	-	12.4

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection	
Int Delay, s/veh	10.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	812	161	0	0	0	0	0	380	0	131	0
Future Vol, veh/h	0	812	161	0	0	0	0	0	380	0	131	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	None
Storage Length	-	-	125	-	-	-	-	-	0	-	-	-
Veh in Median Storage, #	-	0	-	-	-	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	902	179	0	0	0	0	0	422	0	146	0

Major/Minor	Major1			Minor1			Minor2		
Conflicting Flow All	-	0	0	-	-	451	-	902	-
Stage 1	-	-	-	-	-	-	-	0	-
Stage 2	-	-	-	-	-	-	-	902	-
Critical Hdwy	-	-	-	-	-	6.94	-	6.54	-
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	5.54	-
Follow-up Hdwy	-	-	-	-	-	3.32	-	4.02	-
Pot Cap-1 Maneuver	0	-	-	0	0	556	0	276	0
Stage 1	0	-	-	0	0	-	0	-	0
Stage 2	0	-	-	0	0	-	0	355	0
Platoon blocked, %		-	-						
Mov Cap-1 Maneuver	-	-	-	-	-	556	-	276	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	276	-
Stage 1	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	355	-

Approach	EB	NB	SB
HCM Control Delay, s	0	29.1	31.7
HCM LOS		D	D

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	SBLn1
Capacity (veh/h)	556	-	-	276
HCM Lane V/C Ratio	0.759	-	-	0.527
HCM Control Delay (s)	29.1	-	-	31.7
HCM Lane LOS	D	-	-	D
HCM 95th %tile Q(veh)	6.7	-	-	2.9

Intersection	
Int Delay, s/veh	64.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↱						↱		↑	
Traffic Vol, veh/h	0	1708	242	0	0	0	0	0	314	0	133	0
Future Vol, veh/h	0	1708	242	0	0	0	0	0	314	0	133	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	None
Storage Length	-	-	125	-	-	-	-	-	0	-	-	-
Veh in Median Storage, #	-	0	-	-	-	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	1898	269	0	0	0	0	0	349	0	148	0

Major/Minor	Major1			Minor1			Minor2		
Conflicting Flow All	-	0	0	-	-	949	-	1898	-
Stage 1	-	-	-	-	-	-	-	0	-
Stage 2	-	-	-	-	-	-	-	1898	-
Critical Hdwy	-	-	-	-	-	6.94	-	6.54	-
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	5.54	-
Follow-up Hdwy	-	-	-	-	-	3.32	-	4.02	-
Pot Cap-1 Maneuver	0	-	-	0	0	~ 261	0	~ 69	0
Stage 1	0	-	-	0	0	-	0	-	0
Stage 2	0	-	-	0	0	-	0	~ 116	0
Platoon blocked, %		-	-						
Mov Cap-1 Maneuver	-	-	-	-	-	~ 261	-	~ 69	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	~ 69	-
Stage 1	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	~ 116	-

Approach	EB	NB	SB
HCM Control Delay, s	0	213	$ 655
HCM LOS		F	F

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	SBLn1
Capacity (veh/h)	261	-	-	69
HCM Lane V/C Ratio	1.337	-	-	2.142
HCM Control Delay (s)	213	-	-	$ 655
HCM Lane LOS	F	-	-	F
HCM 95th %tile Q(veh)	18.2	-	-	13.8

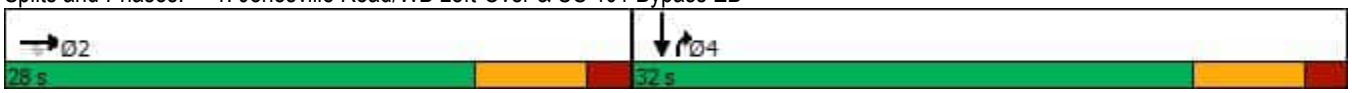
Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	812	161	0	0	0	0	0	380	0	131	0
Future Volume (vph)	0	812	161	0	0	0	0	0	380	0	131	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		125	0		0	0		0	0		0
Storage Lanes	0		1	0		0	0		1	0		0
Taper Length (ft)	100			100			100			100		
Lane Util. Factor	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850						0.865			
Flt Protected												
Satd. Flow (prot)	0	3539	1583	0	0	0	0	0	1611	0	1863	0
Flt Permitted												
Satd. Flow (perm)	0	3539	1583	0	0	0	0	0	1611	0	1863	0
Right Turn on Red			No			No			No	No		No
Satd. Flow (RTOR)												
Link Speed (mph)		55			55			35			45	
Link Distance (ft)		278			727			1295			275	
Travel Time (s)		3.4			9.0			25.2			4.2	
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)	0	902	179	0	0	0	0	0	422	0	146	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	902	179	0	0	0	0	0	422	0	146	0
Turn Type		NA	Perm						Prot		NA	
Protected Phases		2							4		4	
Permitted Phases			2									
Detector Phase		2	2						4		4	
Switch Phase												
Minimum Initial (s)		14.0	14.0						7.0		7.0	
Minimum Split (s)		21.0	21.0						14.0		14.0	
Total Split (s)		28.0	28.0						32.0		32.0	
Total Split (%)		46.7%	46.7%						53.3%		53.3%	
Maximum Green (s)		21.0	21.0						25.0		25.0	
Yellow Time (s)		5.0	5.0						5.0		5.0	
All-Red Time (s)		2.0	2.0						2.0		2.0	
Lost Time Adjust (s)		-2.0	-2.0						-2.0		-2.0	
Total Lost Time (s)		5.0	5.0						5.0		5.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)		3.0	3.0						3.0		3.0	
Recall Mode		None	None						Min		Min	
Act Effct Green (s)		20.8	20.8						20.4		20.4	
Actuated g/C Ratio		0.40	0.40						0.40		0.40	
v/c Ratio		0.63	0.28						0.66		0.20	
Control Delay		15.5	13.2						18.6		11.0	
Queue Delay		0.0	0.0						0.0		0.0	
Total Delay		15.5	13.2						18.6		11.0	
LOS		B	B						B		B	
Approach Delay		15.1						18.6			11.0	
Approach LOS		B						B			B	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 50th (ft)		114	36						107		30	
Queue Length 95th (ft)		194	84						187		59	
Internal Link Dist (ft)		198			647			1215			195	
Turn Bay Length (ft)			125									
Base Capacity (vph)		1629	728						870		1006	
Starvation Cap Reductn		0	0						0		0	
Spillback Cap Reductn		0	0						0		0	
Storage Cap Reductn		0	0						0		0	
Reduced v/c Ratio		0.55	0.25						0.49		0.15	

Intersection Summary			
Area Type:	Other		
Cycle Length: 60			
Actuated Cycle Length: 51.4			
Natural Cycle: 40			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.66			
Intersection Signal Delay: 15.6		Intersection LOS: B	
Intersection Capacity Utilization 58.7%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 1: Jonesville Road/WB Left-Over & US 401 Bypass EB



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1708	242	0	0	0	0	0	314	0	133	0
Future Volume (vph)	0	1708	242	0	0	0	0	0	314	0	133	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		125	0		0	0		0	0		0
Storage Lanes	0		1	0		0	0		1	0		0
Taper Length (ft)	100			100			100			100		
Lane Util. Factor	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850						0.865			
Flt Protected												
Satd. Flow (prot)	0	3539	1583	0	0	0	0	0	1611	0	1863	0
Flt Permitted												
Satd. Flow (perm)	0	3539	1583	0	0	0	0	0	1611	0	1863	0
Right Turn on Red			No			No			No	No		No
Satd. Flow (RTOR)												
Link Speed (mph)		55			55			35			45	
Link Distance (ft)		278			727			1295			275	
Travel Time (s)		3.4			9.0			25.2			4.2	
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)	0	1898	269	0	0	0	0	0	349	0	148	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1898	269	0	0	0	0	0	349	0	148	0
Turn Type		NA	Perm						Prot		NA	
Protected Phases		2							4		4	
Permitted Phases			2									
Detector Phase		2	2						4		4	
Switch Phase												
Minimum Initial (s)		14.0	14.0						7.0		7.0	
Minimum Split (s)		21.0	21.0						14.0		14.0	
Total Split (s)		40.0	40.0						20.0		20.0	
Total Split (%)		66.7%	66.7%						33.3%		33.3%	
Maximum Green (s)		33.0	33.0						13.0		13.0	
Yellow Time (s)		5.0	5.0						5.0		5.0	
All-Red Time (s)		2.0	2.0						2.0		2.0	
Lost Time Adjust (s)		-2.0	-2.0						-2.0		-2.0	
Total Lost Time (s)		5.0	5.0						5.0		5.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)		3.0	3.0						3.0		3.0	
Recall Mode		None	None						Min		Min	
Act Effct Green (s)		35.0	35.0						15.0		15.0	
Actuated g/C Ratio		0.58	0.58						0.25		0.25	
v/c Ratio		0.92	0.29						0.87		0.32	
Control Delay		20.8	7.3						46.6		20.6	
Queue Delay		0.0	0.0						0.0		0.0	
Total Delay		20.8	7.3						46.6		20.6	
LOS		C	A						D		C	
Approach Delay		19.1						46.6			20.6	
Approach LOS		B						D			C	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 50th (ft)		285	43						121		44	
Queue Length 95th (ft)		#481	78						#254		87	
Internal Link Dist (ft)		198			647			1215			195	
Turn Bay Length (ft)			125									
Base Capacity (vph)		2064	923						402		465	
Starvation Cap Reductn		0	0						0		0	
Spillback Cap Reductn		0	0						0		0	
Storage Cap Reductn		0	0						0		0	
Reduced v/c Ratio		0.92	0.29						0.87		0.32	

Intersection Summary			
Area Type:	Other		
Cycle Length: 60			
Actuated Cycle Length: 60			
Natural Cycle: 60			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.92			
Intersection Signal Delay: 22.8		Intersection LOS: C	
Intersection Capacity Utilization 75.0%		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: Jonesville Road/WB Left-Over & US 401 Bypass EB

Intersection	
Int Delay, s/veh	6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	0	1352	185	0	36	0	0	0	225
Future Vol, veh/h	0	0	0	0	1352	185	0	36	0	0	0	225
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	150	-	-	-	-	-	0
Veh in Median Storage, #	-	1	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	0	1502	206	0	40	0	0	0	250

Major/Minor	Major2			Minor1			Minor2			
Conflicting Flow All	-	-	0	-	1708	-	-	-	751	
Stage 1	-	-	-	-	0	-	-	-	-	
Stage 2	-	-	-	-	1708	-	-	-	-	
Critical Hdwy	-	-	-	-	6.54	-	-	-	6.94	
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	
Critical Hdwy Stg 2	-	-	-	-	5.54	-	-	-	-	
Follow-up Hdwy	-	-	-	-	4.02	-	-	-	3.32	
Pot Cap-1 Maneuver	0	-	-	0	90	0	0	0	353	
Stage 1	0	-	-	0	-	0	0	0	-	
Stage 2	0	-	-	0	145	0	0	0	-	
Platoon blocked, %		-	-							
Mov Cap-1 Maneuver	-	-	-	-	90	-	-	-	353	
Mov Cap-2 Maneuver	-	-	-	-	90	-	-	-	-	
Stage 1	-	-	-	-	-	-	-	-	-	
Stage 2	-	-	-	-	145	-	-	-	-	

Approach	WB	NB	SB
HCM Control Delay, s	0	73.7	36.5
HCM LOS		F	E

Minor Lane/Major Mvmt	NBLn1	WBT	WBR	SBLn1
Capacity (veh/h)	90	-	-	353
HCM Lane V/C Ratio	0.444	-	-	0.708
HCM Control Delay (s)	73.7	-	-	36.5
HCM Lane LOS	F	-	-	E
HCM 95th %tile Q(veh)	1.9	-	-	5.2

Intersection	
Int Delay, s/veh	4.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	0	555	74	0	116	0	0	0	114
Future Vol, veh/h	0	0	0	0	555	74	0	116	0	0	0	114
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	150	-	-	-	-	-	0
Veh in Median Storage, #	-	1	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	0	617	82	0	129	0	0	0	127

Major/Minor	Major2			Minor1			Minor2			
Conflicting Flow All	-	-	0	-	699	-	-	-	309	
Stage 1	-	-	-	-	0	-	-	-	-	
Stage 2	-	-	-	-	699	-	-	-	-	
Critical Hdwy	-	-	-	-	6.54	-	-	-	6.94	
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	
Critical Hdwy Stg 2	-	-	-	-	5.54	-	-	-	-	
Follow-up Hdwy	-	-	-	-	4.02	-	-	-	3.32	
Pot Cap-1 Maneuver	0	-	-	0	362	0	0	0	687	
Stage 1	0	-	-	0	-	0	0	0	-	
Stage 2	0	-	-	0	440	0	0	0	-	
Platoon blocked, %		-	-							
Mov Cap-1 Maneuver	-	-	-	-	362	-	-	-	687	
Mov Cap-2 Maneuver	-	-	-	-	362	-	-	-	-	
Stage 1	-	-	-	-	-	-	-	-	-	
Stage 2	-	-	-	-	440	-	-	-	-	

Approach	WB	NB	SB
HCM Control Delay, s	0	20.3	11.4
HCM LOS		C	B

Minor Lane/Major Mvmt	NBLn1	WBT	WBR	SBLn1
Capacity (veh/h)	362	-	-	687
HCM Lane V/C Ratio	0.356	-	-	0.184
HCM Control Delay (s)	20.3	-	-	11.4
HCM Lane LOS	C	-	-	B
HCM 95th %tile Q(veh)	1.6	-	-	0.7

Intersection	
Int Delay, s/veh	15.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	0	1797	185	0	36	0	0	0	225
Future Vol, veh/h	0	0	0	0	1797	185	0	36	0	0	0	225
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	150	-	-	-	-	-	0
Veh in Median Storage, #	-	1	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	0	1997	206	0	40	0	0	0	250

Major/Minor	Major2			Minor1			Minor2			
Conflicting Flow All	-	-	0	-	2203	-	-	-	999	
Stage 1	-	-	-	-	0	-	-	-	-	
Stage 2	-	-	-	-	2203	-	-	-	-	
Critical Hdwy	-	-	-	-	6.54	-	-	-	6.94	
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	
Critical Hdwy Stg 2	-	-	-	-	5.54	-	-	-	-	
Follow-up Hdwy	-	-	-	-	4.02	-	-	-	3.32	
Pot Cap-1 Maneuver	0	-	-	0	44	0	0	0	~ 242	
Stage 1	0	-	-	0	-	0	0	0	-	
Stage 2	0	-	-	0	81	0	0	0	-	
Platoon blocked, %		-	-							
Mov Cap-1 Maneuver	-	-	-	-	44	-	-	-	~ 242	
Mov Cap-2 Maneuver	-	-	-	-	44	-	-	-	-	
Stage 1	-	-	-	-	-	-	-	-	-	
Stage 2	-	-	-	-	81	-	-	-	-	

Approach	WB	NB	SB
HCM Control Delay, s	0	250.5	110.8
HCM LOS		F	F

Minor Lane/Major Mvmt	NBLn1	WBT	WBR	SBLn1
Capacity (veh/h)	44	-	-	242
HCM Lane V/C Ratio	0.909	-	-	1.033
HCM Control Delay (s)	250.5	-	-	110.8
HCM Lane LOS	F	-	-	F
HCM 95th %tile Q(veh)	3.6	-	-	10.2

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection	
Int Delay, s/veh	5.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	0	894	74	0	116	0	0	0	114
Future Vol, veh/h	0	0	0	0	894	74	0	116	0	0	0	114
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	150	-	-	-	-	-	0
Veh in Median Storage, #	-	1	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	0	993	82	0	129	0	0	0	127

Major/Minor	Major2			Minor1			Minor2			
Conflicting Flow All	-	-	0	-	1075	-	-	-	497	
Stage 1	-	-	-	-	0	-	-	-	-	
Stage 2	-	-	-	-	1075	-	-	-	-	
Critical Hdwy	-	-	-	-	6.54	-	-	-	6.94	
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	
Critical Hdwy Stg 2	-	-	-	-	5.54	-	-	-	-	
Follow-up Hdwy	-	-	-	-	4.02	-	-	-	3.32	
Pot Cap-1 Maneuver	0	-	-	0	218	0	0	0	519	
Stage 1	0	-	-	0	-	0	0	0	-	
Stage 2	0	-	-	0	294	0	0	0	-	
Platoon blocked, %		-	-							
Mov Cap-1 Maneuver	-	-	-	-	218	-	-	-	519	
Mov Cap-2 Maneuver	-	-	-	-	218	-	-	-	-	
Stage 1	-	-	-	-	-	-	-	-	-	
Stage 2	-	-	-	-	294	-	-	-	-	

Approach	WB	NB	SB
HCM Control Delay, s	0	42.9	14.2
HCM LOS		E	B

Minor Lane/Major Mvmt	NBLn1	WBT	WBR	SBLn1
Capacity (veh/h)	218	-	-	519
HCM Lane V/C Ratio	0.591	-	-	0.244
HCM Control Delay (s)	42.9	-	-	14.2
HCM Lane LOS	E	-	-	B
HCM 95th %tile Q(veh)	3.3	-	-	0.9

Intersection	
Int Delay, s/veh	15.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	0	1817	185	0	36	0	0	0	225
Future Vol, veh/h	0	0	0	0	1817	185	0	36	0	0	0	225
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	150	-	-	-	-	-	0
Veh in Median Storage, #	1	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	0	2019	206	0	40	0	0	0	250

Major/Minor	Major2			Minor1			Minor2			
Conflicting Flow All	-	-	0	-	2225	-	-	-	1010	
Stage 1	-	-	-	-	0	-	-	-	-	
Stage 2	-	-	-	-	2225	-	-	-	-	
Critical Hdwy	-	-	-	-	6.54	-	-	-	6.94	
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	
Critical Hdwy Stg 2	-	-	-	-	5.54	-	-	-	-	
Follow-up Hdwy	-	-	-	-	4.02	-	-	-	3.32	
Pot Cap-1 Maneuver	0	-	-	0	43	0	0	0	~ 238	
Stage 1	0	-	-	0	-	0	0	0	-	
Stage 2	0	-	-	0	79	0	0	0	-	
Platoon blocked, %		-	-							
Mov Cap-1 Maneuver	-	-	-	-	43	-	-	-	~ 238	
Mov Cap-2 Maneuver	-	-	-	-	43	-	-	-	-	
Stage 1	-	-	-	-	-	-	-	-	-	
Stage 2	-	-	-	-	79	-	-	-	-	

Approach	WB	NB	SB
HCM Control Delay, s	0	260.9	116.8
HCM LOS		F	F

Minor Lane/Major Mvmt	NBLn1	WBT	WBR	SBLn1
Capacity (veh/h)	43	-	-	238
HCM Lane V/C Ratio	0.93	-	-	1.05
HCM Control Delay (s)	260.9	-	-	116.8
HCM Lane LOS	F	-	-	F
HCM 95th %tile Q(veh)	3.7	-	-	10.5

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection	
Int Delay, s/veh	5.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	0	907	74	0	116	0	0	0	114
Future Vol, veh/h	0	0	0	0	907	74	0	116	0	0	0	114
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	150	-	-	-	-	-	0
Veh in Median Storage, #	7	471104	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	0	1008	82	0	129	0	0	0	127

Major/Minor	Major2			Minor1			Minor2			
Conflicting Flow All	-	-	0	-	1090	-	-	-	504	
Stage 1	-	-	-	-	0	-	-	-	-	
Stage 2	-	-	-	-	1090	-	-	-	-	
Critical Hdwy	-	-	-	-	6.54	-	-	-	6.94	
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	
Critical Hdwy Stg 2	-	-	-	-	5.54	-	-	-	-	
Follow-up Hdwy	-	-	-	-	4.02	-	-	-	3.32	
Pot Cap-1 Maneuver	0	-	-	0	214	0	0	0	513	
Stage 1	0	-	-	0	-	0	0	0	-	
Stage 2	0	-	-	0	289	0	0	0	-	
Platoon blocked, %		-	-							
Mov Cap-1 Maneuver	-	-	-	-	214	-	-	-	513	
Mov Cap-2 Maneuver	-	-	-	-	214	-	-	-	-	
Stage 1	-	-	-	-	-	-	-	-	-	
Stage 2	-	-	-	-	289	-	-	-	-	

Approach	WB	NB	SB
HCM Control Delay, s	0	44.4	14.3
HCM LOS		E	B

Minor Lane/Major Mvmt	NBLn1	WBT	WBR	SBLn1
Capacity (veh/h)	214	-	-	513
HCM Lane V/C Ratio	0.602	-	-	0.247
HCM Control Delay (s)	44.4	-	-	14.3
HCM Lane LOS	E	-	-	B
HCM 95th %tile Q(veh)	3.4	-	-	1

APPENDIX E

CAPACITY ANALYSIS CALCULATIONS

US 401 BYPASS

&

EASTERN U-TURN LOCATION

Intersection	
Int Delay, s/veh	1.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	0	0	0	1532	91	0
Future Vol, veh/h	0	0	0	1532	91	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	2	-	-	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	0	0	1702	101	0

Major/Minor	Major2		Minor1	
Conflicting Flow All	-	-	851	-
Stage 1	-	-	0	-
Stage 2	-	-	851	-
Critical Hdwy	-	-	6.84	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.84	-
Follow-up Hdwy	-	-	3.52	-
Pot Cap-1 Maneuver	0	-	299	0
Stage 1	0	-	-	0
Stage 2	0	-	379	0
Platoon blocked, %		-		
Mov Cap-1 Maneuver	-	-	299	-
Mov Cap-2 Maneuver	-	-	299	-
Stage 1	-	-	-	-
Stage 2	-	-	379	-

Approach	WB	NB
HCM Control Delay, s	0	23.1
HCM LOS		C

Minor Lane/Major Mvmt	NBLn1	WBT
Capacity (veh/h)	299	-
HCM Lane V/C Ratio	0.338	-
HCM Control Delay (s)	23.1	-
HCM Lane LOS	C	-
HCM 95th %tile Q(veh)	1.4	-

Intersection	
Int Delay, s/veh	1.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	0	0	0	600	66	0
Future Vol, veh/h	0	0	0	600	66	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	2	-	-	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	0	0	667	73	0

Major/Minor	Major2		Minor1	
Conflicting Flow All	-	-	334	-
Stage 1	-	-	0	-
Stage 2	-	-	334	-
Critical Hdwy	-	-	6.84	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.84	-
Follow-up Hdwy	-	-	3.52	-
Pot Cap-1 Maneuver	0	-	636	0
Stage 1	0	-	-	0
Stage 2	0	-	697	0
Platoon blocked, %		-		
Mov Cap-1 Maneuver	-	-	636	-
Mov Cap-2 Maneuver	-	-	636	-
Stage 1	-	-	-	-
Stage 2	-	-	697	-

Approach	WB	NB
HCM Control Delay, s	0	11.4
HCM LOS		B

Minor Lane/Major Mvmt	NBLn1	WBT
Capacity (veh/h)	636	-
HCM Lane V/C Ratio	0.115	-
HCM Control Delay (s)	11.4	-
HCM Lane LOS	B	-
HCM 95th %tile Q(veh)	0.4	-

Intersection	
Int Delay, s/veh	16.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations				↑↑	↰	
Traffic Vol, veh/h	0	0	0	1877	233	0
Future Vol, veh/h	0	0	0	1877	233	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	2	-	-	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	0	0	2086	259	0

Major/Minor	Major2		Minor1	
Conflicting Flow All	-	-	1043	-
Stage 1	-	-	0	-
Stage 2	-	-	1043	-
Critical Hdwy	-	-	6.84	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.84	-
Follow-up Hdwy	-	-	3.52	-
Pot Cap-1 Maneuver	0	-	~ 225	0
Stage 1	0	-	-	0
Stage 2	0	-	300	0
Platoon blocked, %		-		
Mov Cap-1 Maneuver	-	-	~ 225	-
Mov Cap-2 Maneuver	-	-	~ 225	-
Stage 1	-	-	-	-
Stage 2	-	-	300	-

Approach	WB	NB
HCM Control Delay, s	0	152
HCM LOS		F

Minor Lane/Major Mvmt	NBLn1	WBT
Capacity (veh/h)	225	-
HCM Lane V/C Ratio	1.151	-
HCM Control Delay (s)	152	-
HCM Lane LOS	F	-
HCM 95th %tile Q(veh)	12.2	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection	
Int Delay, s/veh	2.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	0	0	0	915	175	0
Future Vol, veh/h	0	0	0	915	175	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	2	-	-	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	0	0	1017	194	0

Major/Minor	Major2		Minor1	
Conflicting Flow All	-	-	509	-
Stage 1	-	-	0	-
Stage 2	-	-	509	-
Critical Hdwy	-	-	6.84	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.84	-
Follow-up Hdwy	-	-	3.52	-
Pot Cap-1 Maneuver	0	-	494	0
Stage 1	0	-	-	0
Stage 2	0	-	569	0
Platoon blocked, %		-		
Mov Cap-1 Maneuver	-	-	494	-
Mov Cap-2 Maneuver	-	-	494	-
Stage 1	-	-	-	-
Stage 2	-	-	569	-

Approach	WB	NB
HCM Control Delay, s	0	16.9
HCM LOS		C

Minor Lane/Major Mvmt	NBLn1	WBT
Capacity (veh/h)	494	-
HCM Lane V/C Ratio	0.394	-
HCM Control Delay (s)	16.9	-
HCM Lane LOS	C	-
HCM 95th %tile Q(veh)	1.9	-

Intersection	
Int Delay, s/veh	22.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations				↑↑	↰	
Traffic Vol, veh/h	0	0	0	1880	253	0
Future Vol, veh/h	0	0	0	1880	253	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	-	-	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	0	0	2089	281	0

Major/Minor	Major2		Minor1	
Conflicting Flow All	-	-	1045	-
Stage 1	-	-	0	-
Stage 2	-	-	1045	-
Critical Hdwy	-	-	6.84	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.84	-
Follow-up Hdwy	-	-	3.52	-
Pot Cap-1 Maneuver	0	-	~ 224	0
Stage 1	0	-	-	0
Stage 2	0	-	300	0
Platoon blocked, %		-		
Mov Cap-1 Maneuver	-	-	~ 224	-
Mov Cap-2 Maneuver	-	-	~ 224	-
Stage 1	-	-	-	-
Stage 2	-	-	300	-

Approach	WB	NB
HCM Control Delay, s	0	189.6
HCM LOS		F

Minor Lane/Major Mvmt	NBLn1	WBT
Capacity (veh/h)	224	-
HCM Lane V/C Ratio	1.255	-
HCM Control Delay (s)	189.6	-
HCM Lane LOS	F	-
HCM 95th %tile Q(veh)	14.4	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection	
Int Delay, s/veh	3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	0	0	0	926	188	0
Future Vol, veh/h	0	0	0	926	188	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	-	-	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	0	0	1029	209	0

Major/Minor	Major2		Minor1	
Conflicting Flow All	-	-	515	-
Stage 1	-	-	0	-
Stage 2	-	-	515	-
Critical Hdwy	-	-	6.84	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.84	-
Follow-up Hdwy	-	-	3.52	-
Pot Cap-1 Maneuver	0	-	489	0
Stage 1	0	-	-	0
Stage 2	0	-	565	0
Platoon blocked, %		-		
Mov Cap-1 Maneuver	-	-	489	-
Mov Cap-2 Maneuver	-	-	489	-
Stage 1	-	-	-	-
Stage 2	-	-	565	-

Approach	WB	NB
HCM Control Delay, s	0	17.7
HCM LOS		C

Minor Lane/Major Mvmt	NBLn1	WBT
Capacity (veh/h)	489	-
HCM Lane V/C Ratio	0.427	-
HCM Control Delay (s)	17.7	-
HCM Lane LOS	C	-
HCM 95th %tile Q(veh)	2.1	-

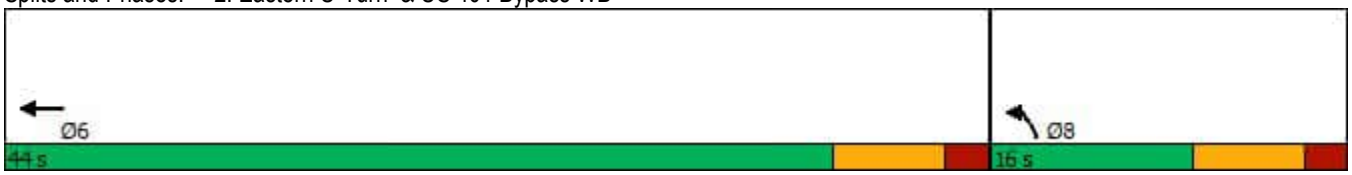
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	0	0	0	1880	253	0
Future Volume (vph)	0	0	0	1880	253	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	0.95	1.00	1.00
Frt						
Flt Protected					0.950	
Satd. Flow (prot)	0	0	0	3539	1770	0
Flt Permitted					0.950	
Satd. Flow (perm)	0	0	0	3539	1770	0
Right Turn on Red		No			No	No
Satd. Flow (RTOR)						
Link Speed (mph)	55			55	45	
Link Distance (ft)	520			1076	100	
Travel Time (s)	6.4			13.3	1.5	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	0	0	2089	281	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	0	2089	281	0
Turn Type				NA	Prot	
Protected Phases				6	8	
Permitted Phases						
Detector Phase				6	8	
Switch Phase						
Minimum Initial (s)				14.0	7.0	
Minimum Split (s)				21.0	14.0	
Total Split (s)				44.0	16.0	
Total Split (%)				73.3%	26.7%	
Maximum Green (s)				37.0	9.0	
Yellow Time (s)				5.0	5.0	
All-Red Time (s)				2.0	2.0	
Lost Time Adjust (s)				-2.0	-2.0	
Total Lost Time (s)				5.0	5.0	
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)				3.0	3.0	
Recall Mode				None	Min	
Act Effct Green (s)				39.0	11.0	
Actuated g/C Ratio				0.65	0.18	
v/c Ratio				0.91	0.87	
Control Delay				16.9	53.0	
Queue Delay				0.0	0.0	
Total Delay				16.9	53.0	
LOS				B	D	
Approach Delay				16.9	53.0	
Approach LOS				B	D	
Queue Length 50th (ft)				280	100	
Queue Length 95th (ft)				#513	#221	
Internal Link Dist (ft)	440			996	20	

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Turn Bay Length (ft)						
Base Capacity (vph)				2300	324	
Starvation Cap Reductn				0	0	
Spillback Cap Reductn				0	0	
Storage Cap Reductn				0	0	
Reduced v/c Ratio				0.91	0.87	

Intersection Summary			
Area Type:	Other		
Cycle Length: 60			
Actuated Cycle Length: 60			
Natural Cycle: 60			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.91			
Intersection Signal Delay: 21.2		Intersection LOS: C	
Intersection Capacity Utilization 74.3%		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: 2: Eastern U-Turn & US 401 Bypass WB

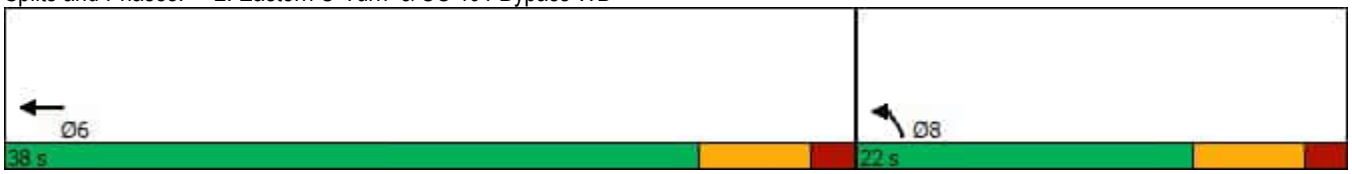


Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	0	0	0	926	188	0
Future Volume (vph)	0	0	0	926	188	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	0.95	1.00	1.00
Frt						
Flt Protected					0.950	
Satd. Flow (prot)	0	0	0	3539	1770	0
Flt Permitted					0.950	
Satd. Flow (perm)	0	0	0	3539	1770	0
Right Turn on Red		No			No	No
Satd. Flow (RTOR)						
Link Speed (mph)	55			55	45	
Link Distance (ft)	520			1076	100	
Travel Time (s)	6.4			13.3	1.5	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	0	0	1029	209	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	0	1029	209	0
Turn Type				NA	Prot	
Protected Phases				6	8	
Permitted Phases						
Detector Phase				6	8	
Switch Phase						
Minimum Initial (s)				14.0	7.0	
Minimum Split (s)				21.0	14.0	
Total Split (s)				38.0	22.0	
Total Split (%)				63.3%	36.7%	
Maximum Green (s)				31.0	15.0	
Yellow Time (s)				5.0	5.0	
All-Red Time (s)				2.0	2.0	
Lost Time Adjust (s)				-2.0	-2.0	
Total Lost Time (s)				5.0	5.0	
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)				3.0	3.0	
Recall Mode				None	Min	
Act Effct Green (s)				22.7	12.7	
Actuated g/C Ratio				0.50	0.28	
v/c Ratio				0.59	0.42	
Control Delay				9.9	17.9	
Queue Delay				0.0	0.0	
Total Delay				9.9	17.9	
LOS				A	B	
Approach Delay				9.9	17.9	
Approach LOS				A	B	
Queue Length 50th (ft)				87	43	
Queue Length 95th (ft)				157	111	
Internal Link Dist (ft)	440			996	20	

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Turn Bay Length (ft)						
Base Capacity (vph)				2642	680	
Starvation Cap Reductn				0	0	
Spillback Cap Reductn				0	0	
Storage Cap Reductn				0	0	
Reduced v/c Ratio				0.39	0.31	

Intersection Summary			
Area Type:	Other		
Cycle Length: 60			
Actuated Cycle Length: 45.7			
Natural Cycle: 40			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.59			
Intersection Signal Delay: 11.2		Intersection LOS: B	
Intersection Capacity Utilization 44.3%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 2: Eastern U-Turn & US 401 Bypass WB



APPENDIX F

CAPACITY ANALYSIS CALCULATIONS

MITCHELL MILL ROAD

&

JONESVILLE ROAD / PEEBLES ROAD

Intersection	
Intersection Delay, s/veh	12.7
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	7	166	2	11	316	41	4	78	11	32	133	16
Future Vol, veh/h	7	166	2	11	316	41	4	78	11	32	133	16
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
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	8	184	2	12	351	46	4	87	12	36	148	18
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	10.8	14.8	10.1	11.4
HCM LOS	B	B	B	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	4%	4%	3%	18%
Vol Thru, %	84%	95%	86%	73%
Vol Right, %	12%	1%	11%	9%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	93	175	368	181
LT Vol	4	7	11	32
Through Vol	78	166	316	133
RT Vol	11	2	41	16
Lane Flow Rate	103	194	409	201
Geometry Grp	1	1	1	1
Degree of Util (X)	0.168	0.294	0.576	0.318
Departure Headway (Hd)	5.843	5.438	5.074	5.691
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	612	659	711	631
Service Time	3.897	3.483	3.111	3.736
HCM Lane V/C Ratio	0.168	0.294	0.575	0.319
HCM Control Delay	10.1	10.8	14.8	11.4
HCM Lane LOS	B	B	B	B
HCM 95th-tile Q	0.6	1.2	3.7	1.4

Intersection	
Intersection Delay, s/veh	10.8
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	18	306	13	0	130	21	5	92	10	27	50	11
Future Vol, veh/h	18	306	13	0	130	21	5	92	10	27	50	11
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
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	20	340	14	0	144	23	6	102	11	30	56	12
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	12.2	9.4	9.5	9.4
HCM LOS	B	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	5%	5%	0%	31%
Vol Thru, %	86%	91%	86%	57%
Vol Right, %	9%	4%	14%	12%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	107	337	151	88
LT Vol	5	18	0	27
Through Vol	92	306	130	50
RT Vol	10	13	21	11
Lane Flow Rate	119	374	168	98
Geometry Grp	1	1	1	1
Degree of Util (X)	0.175	0.488	0.227	0.146
Departure Headway (Hd)	5.3	4.694	4.868	5.368
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	669	760	730	660
Service Time	3.395	2.76	2.948	3.464
HCM Lane V/C Ratio	0.178	0.492	0.23	0.148
HCM Control Delay	9.5	12.2	9.4	9.4
HCM Lane LOS	A	B	A	A
HCM 95th-tile Q	0.6	2.7	0.9	0.5

Intersection	
Intersection Delay, s/veh	95.4
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	63	253	12	29	607	119	12	86	20	84	149	54
Future Vol, veh/h	63	253	12	29	607	119	12	86	20	84	149	54
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
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	70	281	13	32	674	132	13	96	22	93	166	60
Number of Lanes	1	1	0	0	1	1	0	1	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	2	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	1	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	2	2	2
HCM Control Delay	19.9	170.3	16.1	17.2
HCM LOS	C	F	C	C

Lane	NBLn1	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	10%	100%	0%	5%	0%	100%	0%
Vol Thru, %	73%	0%	95%	95%	0%	0%	73%
Vol Right, %	17%	0%	5%	0%	100%	0%	27%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	118	63	265	636	119	84	203
LT Vol	12	63	0	29	0	84	0
Through Vol	86	0	253	607	0	0	149
RT Vol	20	0	12	0	119	0	54
Lane Flow Rate	131	70	294	707	132	93	226
Geometry Grp	6	7	7	7	7	7	7
Degree of Util (X)	0.302	0.152	0.597	1.372	0.229	0.215	0.476
Departure Headway (Hd)	9.162	8.438	7.887	6.988	6.248	9.036	8.326
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	395	428	462	516	570	399	435
Service Time	7.162	6.138	5.587	4.777	4.036	6.736	6.026
HCM Lane V/C Ratio	0.332	0.164	0.636	1.37	0.232	0.233	0.52
HCM Control Delay	16.1	12.6	21.6	200.1	10.9	14.2	18.4
HCM Lane LOS	C	B	C	F	B	B	C
HCM 95th-tile Q	1.3	0.5	3.8	31.9	0.9	0.8	2.5

Intersection	
Intersection Delay, s/veh	57.2
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	114	459	19	14	387	95	19	106	31	159	65	33
Future Vol, veh/h	114	459	19	14	387	95	19	106	31	159	65	33
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
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	127	510	21	16	430	106	21	118	34	177	72	37
Number of Lanes	1	1	0	0	1	1	0	1	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	2	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	1	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	2	2	2
HCM Control Delay	90.6	50	19.2	17.4
HCM LOS	F	E	C	C

Lane	NBLn1	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	12%	100%	0%	3%	0%	100%	0%
Vol Thru, %	68%	0%	96%	97%	0%	0%	66%
Vol Right, %	20%	0%	4%	0%	100%	0%	34%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	156	114	478	401	95	159	98
LT Vol	19	114	0	14	0	159	0
Through Vol	106	0	459	387	0	0	65
RT Vol	31	0	19	0	95	0	33
Lane Flow Rate	173	127	531	446	106	177	109
Geometry Grp	6	7	7	7	7	7	7
Degree of Util (X)	0.429	0.289	1.13	0.95	0.204	0.443	0.251
Departure Headway (Hd)	9.353	8.206	7.661	7.994	7.251	9.428	8.662
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	388	438	473	459	498	385	417
Service Time	7.353	5.959	5.414	5.694	4.951	7.128	6.362
HCM Lane V/C Ratio	0.446	0.29	1.123	0.972	0.213	0.46	0.261
HCM Control Delay	19.2	14.3	108.8	59	11.8	19.4	14.2
HCM Lane LOS	C	B	F	F	B	C	B
HCM 95th-tile Q	2.1	1.2	18.4	11.3	0.8	2.2	1

Intersection	
Intersection Delay, s/veh	104
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	71	253	12	29	607	121	12	88	20	91	156	76
Future Vol, veh/h	71	253	12	29	607	121	12	88	20	91	156	76
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
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	79	281	13	32	674	134	13	98	22	101	173	84
Number of Lanes	1	1	0	0	1	1	0	1	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	2	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	1	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	2	2	2
HCM Control Delay	20.8	191.1	16.7	19
HCM LOS	C	F	C	C

Lane	NBLn1	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	10%	100%	0%	5%	0%	100%	0%
Vol Thru, %	73%	0%	95%	95%	0%	0%	67%
Vol Right, %	17%	0%	5%	0%	100%	0%	33%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	120	71	265	636	121	91	232
LT Vol	12	71	0	29	0	91	0
Through Vol	88	0	253	607	0	0	156
RT Vol	20	0	12	0	121	0	76
Lane Flow Rate	133	79	294	707	134	101	258
Geometry Grp	6	7	7	7	7	7	7
Degree of Util (X)	0.313	0.176	0.611	1.43	0.244	0.234	0.545
Departure Headway (Hd)	9.455	8.699	8.147	7.283	6.541	9.17	8.414
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	383	415	448	502	553	394	430
Service Time	7.455	6.399	5.847	4.983	4.241	6.87	6.114
HCM Lane V/C Ratio	0.347	0.19	0.656	1.408	0.242	0.256	0.6
HCM Control Delay	16.7	13.2	22.8	225.3	11.3	14.6	20.7
HCM Lane LOS	C	B	C	F	B	B	C
HCM 95th-tile Q	1.3	0.6	4	34.3	1	0.9	3.2

Intersection	
Intersection Delay, s/veh	60.9
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	138	459	19	14	387	102	19	113	31	163	69	49
Future Vol, veh/h	138	459	19	14	387	102	19	113	31	163	69	49
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
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	153	510	21	16	430	113	21	126	34	181	77	54
Number of Lanes	1	1	0	0	1	1	0	1	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	2	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	1	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	2	2	2
HCM Control Delay	96.6	54.4	20.2	18
HCM LOS	F	F	C	C

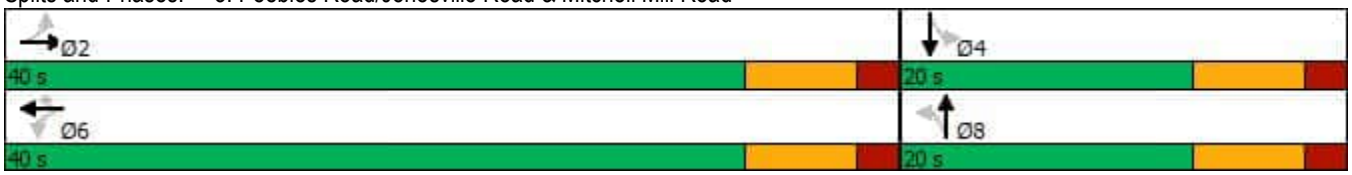
Lane	NBLn1	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	12%	100%	0%	3%	0%	100%	0%
Vol Thru, %	69%	0%	96%	97%	0%	0%	58%
Vol Right, %	19%	0%	4%	0%	100%	0%	42%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	163	138	478	401	102	163	118
LT Vol	19	138	0	14	0	163	0
Through Vol	113	0	459	387	0	0	69
RT Vol	31	0	19	0	102	0	49
Lane Flow Rate	181	153	531	446	113	181	131
Geometry Grp	6	7	7	7	7	7	7
Degree of Util (X)	0.455	0.358	1.159	0.973	0.225	0.459	0.304
Departure Headway (Hd)	9.533	8.403	7.857	8.211	7.466	9.559	8.735
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	380	428	462	446	484	379	414
Service Time	7.533	6.158	5.612	5.911	5.166	7.259	6.435
HCM Lane V/C Ratio	0.476	0.357	1.149	1	0.233	0.478	0.316
HCM Control Delay	20.2	15.8	119.9	65.1	12.3	20.1	15.2
HCM Lane LOS	C	C	F	F	B	C	C
HCM 95th-tile Q	2.3	1.6	19.3	11.9	0.9	2.3	1.3

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	71	253	12	29	607	121	12	88	20	91	156	76
Future Volume (vph)	71	253	12	29	607	121	12	88	20	91	156	76
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		0	0		100	0		0	100		0
Storage Lanes	1		0	0		1	0		0	1		0
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		0.993				0.850		0.978			0.951	
Flt Protected	0.950				0.998			0.995		0.950		
Satd. Flow (prot)	1770	1850	0	0	1859	1583	0	1813	0	1770	1771	0
Flt Permitted	0.247				0.976			0.946		0.785		
Satd. Flow (perm)	460	1850	0	0	1818	1583	0	1723	0	1462	1771	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		45			45			45			45	
Link Distance (ft)		1536			1126			1017			1092	
Travel Time (s)		23.3			17.1			15.4			16.5	
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)	79	281	13	32	674	134	13	98	22	101	173	84
Shared Lane Traffic (%)												
Lane Group Flow (vph)	79	294	0	0	706	134	0	133	0	101	257	0
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6		6	8			4		
Detector Phase	2	2		6	6	6	8	8		4	4	
Switch Phase												
Minimum Initial (s)	12.0	12.0		12.0	12.0	12.0	7.0	7.0		7.0	7.0	
Minimum Split (s)	19.0	19.0		19.0	19.0	19.0	14.0	14.0		14.0	14.0	
Total Split (s)	40.0	40.0		40.0	40.0	40.0	20.0	20.0		20.0	20.0	
Total Split (%)	66.7%	66.7%		66.7%	66.7%	66.7%	33.3%	33.3%		33.3%	33.3%	
Maximum Green (s)	33.0	33.0		33.0	33.0	33.0	13.0	13.0		13.0	13.0	
Yellow Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0		5.0	5.0	
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	-2.0	-2.0			-2.0	-2.0		-2.0		-2.0	-2.0	
Total Lost Time (s)	5.0	5.0			5.0	5.0		5.0		5.0	5.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None	None	Min	Min		Min	Min	
Act Effct Green (s)	26.5	26.5			26.5	26.5		13.3		13.3	13.3	
Actuated g/C Ratio	0.53	0.53			0.53	0.53		0.26		0.26	0.26	
v/c Ratio	0.33	0.30			0.74	0.16		0.29		0.26	0.55	
Control Delay	10.9	7.4			14.4	6.5		19.1		19.1	23.0	
Queue Delay	0.0	0.0			0.0	0.0		0.0		0.0	0.0	
Total Delay	10.9	7.4			14.4	6.5		19.1		19.1	23.0	
LOS	B	A			B	A		B		B	C	
Approach Delay		8.2			13.2			19.1			21.9	
Approach LOS		A			B			B			C	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 50th (ft)	12	45			150	19		32		24	67	
Queue Length 95th (ft)	37	81			258	40		80		65	147	
Internal Link Dist (ft)		1456			1046			937			1012	
Turn Bay Length (ft)	100					100				100		
Base Capacity (vph)	333	1342			1319	1148		536		455	552	
Starvation Cap Reductn	0	0			0	0		0		0	0	
Spillback Cap Reductn	0	0			0	0		0		0	0	
Storage Cap Reductn	0	0			0	0		0		0	0	
Reduced v/c Ratio	0.24	0.22			0.54	0.12		0.25		0.22	0.47	

Intersection Summary			
Area Type:	Other		
Cycle Length: 60			
Actuated Cycle Length: 50.2			
Natural Cycle: 50			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.74			
Intersection Signal Delay: 14.4		Intersection LOS: B	
Intersection Capacity Utilization 76.2%		ICU Level of Service D	
Analysis Period (min) 15			

Splits and Phases: 3: Peebles Road/Jonesville Road & Mitchell Mill Road

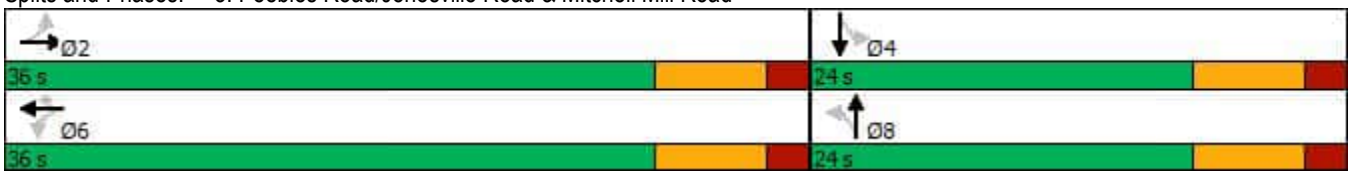


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	138	459	19	14	387	102	19	113	31	163	69	49
Future Volume (vph)	138	459	19	14	387	102	19	113	31	163	69	49
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		0	0		100	0		0	100		0
Storage Lanes	1		0	0		1	0		0	1		0
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		0.994				0.850		0.975			0.938	
Flt Protected	0.950				0.998			0.994		0.950		
Satd. Flow (prot)	1770	1852	0	0	1859	1583	0	1805	0	1770	1747	0
Flt Permitted	0.436				0.973			0.951		0.728		
Satd. Flow (perm)	812	1852	0	0	1812	1583	0	1727	0	1356	1747	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		45			45			45			45	
Link Distance (ft)		1536			1126			1017			1092	
Travel Time (s)		23.3			17.1			15.4			16.5	
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)	153	510	21	16	430	113	21	126	34	181	77	54
Shared Lane Traffic (%)												
Lane Group Flow (vph)	153	531	0	0	446	113	0	181	0	181	131	0
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6		6	8			4		
Detector Phase	2	2		6	6	6	8	8		4	4	
Switch Phase												
Minimum Initial (s)	12.0	12.0		12.0	12.0	12.0	7.0	7.0		7.0	7.0	
Minimum Split (s)	19.0	19.0		19.0	19.0	19.0	14.0	14.0		14.0	14.0	
Total Split (s)	36.0	36.0		36.0	36.0	36.0	24.0	24.0		24.0	24.0	
Total Split (%)	60.0%	60.0%		60.0%	60.0%	60.0%	40.0%	40.0%		40.0%	40.0%	
Maximum Green (s)	29.0	29.0		29.0	29.0	29.0	17.0	17.0		17.0	17.0	
Yellow Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0		5.0	5.0	
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	-2.0	-2.0			-2.0	-2.0		-2.0		-2.0	-2.0	
Total Lost Time (s)	5.0	5.0			5.0	5.0		5.0		5.0	5.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None	None	Min	Min		Min	Min	
Act Effct Green (s)	21.1	21.1			21.1	21.1		13.9		13.9	13.9	
Actuated g/C Ratio	0.46	0.46			0.46	0.46		0.31		0.31	0.31	
v/c Ratio	0.41	0.62			0.53	0.15		0.34		0.44	0.25	
Control Delay	12.4	13.1			11.6	8.0		15.8		18.1	14.8	
Queue Delay	0.0	0.0			0.0	0.0		0.0		0.0	0.0	
Total Delay	12.4	13.1			11.6	8.0		15.8		18.1	14.8	
LOS	B	B			B	A		B		B	B	
Approach Delay		12.9			10.9			15.8			16.7	
Approach LOS		B			B			B			B	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 50th (ft)	23	92			73	15		34		35	24	
Queue Length 95th (ft)	68	198			160	41		95		101	71	
Internal Link Dist (ft)		1456			1046			937			1012	
Turn Bay Length (ft)	100					100				100		
Base Capacity (vph)	581	1326			1297	1133		758		595	766	
Starvation Cap Reductn	0	0			0	0		0		0	0	
Spillback Cap Reductn	0	0			0	0		0		0	0	
Storage Cap Reductn	0	0			0	0		0		0	0	
Reduced v/c Ratio	0.26	0.40			0.34	0.10		0.24		0.30	0.17	

Intersection Summary			
Area Type:	Other		
Cycle Length: 60			
Actuated Cycle Length: 45.5			
Natural Cycle: 40			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.62			
Intersection Signal Delay: 13.2		Intersection LOS: B	
Intersection Capacity Utilization 81.0%		ICU Level of Service D	
Analysis Period (min) 15			

Splits and Phases: 3: Peebles Road/Jonesville Road & Mitchell Mill Road



APPENDIX G

CAPACITY ANALYSIS CALCULATIONS

Jonesville Road

&

Universal Drive

Intersection	
Int Delay, s/veh	0.2

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	3	3	1	125	178	1
Future Vol, veh/h	3	3	1	125	178	1
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	-	-	-	-	-
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	3	3	1	139	198	1

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	340	199	199	0	-	0
Stage 1	199	-	-	-	-	-
Stage 2	141	-	-	-	-	-
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	656	842	1373	-	-	-
Stage 1	835	-	-	-	-	-
Stage 2	886	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	655	842	1373	-	-	-
Mov Cap-2 Maneuver	655	-	-	-	-	-
Stage 1	834	-	-	-	-	-
Stage 2	886	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.9	0.1	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1373	-	737	-	-
HCM Lane V/C Ratio	0.001	-	0.009	-	-
HCM Control Delay (s)	7.6	0	9.9	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

Intersection	
Int Delay, s/veh	0.2

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	1	2	4	127	89	3
Future Vol, veh/h	1	2	4	127	89	3
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	-	-	-	-	-
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	1	2	4	141	99	3

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	250	101	102	0	-	0
Stage 1	101	-	-	-	-	-
Stage 2	149	-	-	-	-	-
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	739	954	1490	-	-	-
Stage 1	923	-	-	-	-	-
Stage 2	879	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	737	954	1490	-	-	-
Mov Cap-2 Maneuver	737	-	-	-	-	-
Stage 1	920	-	-	-	-	-
Stage 2	879	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.2	0.2	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1490	-	869	-	-
HCM Lane V/C Ratio	0.003	-	0.004	-	-
HCM Control Delay (s)	7.4	0	9.2	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

Intersection	
Int Delay, s/veh	0.1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	3	3	1	339	294	1
Future Vol, veh/h	3	3	1	339	294	1
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	-	-	-	-	-
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	3	3	1	377	327	1

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	707	328	328	0	-	0
Stage 1	328	-	-	-	-	-
Stage 2	379	-	-	-	-	-
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	402	713	1232	-	-	-
Stage 1	730	-	-	-	-	-
Stage 2	692	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	402	713	1232	-	-	-
Mov Cap-2 Maneuver	402	-	-	-	-	-
Stage 1	729	-	-	-	-	-
Stage 2	692	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	12.1	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1232	-	514	-	-
HCM Lane V/C Ratio	0.001	-	0.013	-	-
HCM Control Delay (s)	7.9	0	12.1	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

Intersection	
Int Delay, s/veh	0.1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	1	2	4	296	336	3
Future Vol, veh/h	1	2	4	296	336	3
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	-	-	-	-	-
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	1	2	4	329	373	3

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	712	375	376	0	-	0
Stage 1	375	-	-	-	-	-
Stage 2	337	-	-	-	-	-
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	399	671	1182	-	-	-
Stage 1	695	-	-	-	-	-
Stage 2	723	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	397	671	1182	-	-	-
Mov Cap-2 Maneuver	397	-	-	-	-	-
Stage 1	692	-	-	-	-	-
Stage 2	723	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	11.6	0.1	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1182	-	546	-	-
HCM Lane V/C Ratio	0.004	-	0.006	-	-
HCM Control Delay (s)	8.1	0	11.6	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	16	6	2	356	300	5
Future Vol, veh/h	16	6	2	356	300	5
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	-	-	-	-	-
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	7	2	396	333	6

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	736	336	339	0	-	0
Stage 1	336	-	-	-	-	-
Stage 2	400	-	-	-	-	-
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	386	706	1220	-	-	-
Stage 1	724	-	-	-	-	-
Stage 2	677	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	385	706	1220	-	-	-
Mov Cap-2 Maneuver	385	-	-	-	-	-
Stage 1	723	-	-	-	-	-
Stage 2	677	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	13.7	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1220	-	439	-	-
HCM Lane V/C Ratio	0.002	-	0.056	-	-
HCM Control Delay (s)	8	0	13.7	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0.2	-	-

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	10	4	8	307	354	17
Future Vol, veh/h	10	4	8	307	354	17
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	-	-	-	-	-
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	11	4	9	341	393	19

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	762	403	412	0	-	0
Stage 1	403	-	-	-	-	-
Stage 2	359	-	-	-	-	-
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	373	647	1147	-	-	-
Stage 1	675	-	-	-	-	-
Stage 2	707	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	369	647	1147	-	-	-
Mov Cap-2 Maneuver	369	-	-	-	-	-
Stage 1	668	-	-	-	-	-
Stage 2	707	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	13.9	0.2	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1147	-	421	-	-
HCM Lane V/C Ratio	0.008	-	0.037	-	-
HCM Control Delay (s)	8.2	0	13.9	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

APPENDIX H

CAPACITY ANALYSIS CALCULATIONS

Jonesville Road

&

Site Drive

Intersection	
Int Delay, s/veh	1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	17	33	11	335	306	6
Future Vol, veh/h	17	33	11	335	306	6
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	-	50	-	-	-
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	19	37	12	372	340	7

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	740	344	347	0	-	0
Stage 1	344	-	-	-	-	-
Stage 2	396	-	-	-	-	-
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	384	699	1212	-	-	-
Stage 1	718	-	-	-	-	-
Stage 2	680	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	380	699	1212	-	-	-
Mov Cap-2 Maneuver	380	-	-	-	-	-
Stage 1	711	-	-	-	-	-
Stage 2	680	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	12.4	0.3	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1212	-	544	-	-
HCM Lane V/C Ratio	0.01	-	0.102	-	-
HCM Control Delay (s)	8	-	12.4	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0	-	0.3	-	-

Intersection	
Int Delay, s/veh	1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	11	22	34	308	335	18
Future Vol, veh/h	11	22	34	308	335	18
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	-	50	-	-	-
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	12	24	38	342	372	20

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	800	382	392	0	-	0
Stage 1	382	-	-	-	-	-
Stage 2	418	-	-	-	-	-
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	354	665	1167	-	-	-
Stage 1	690	-	-	-	-	-
Stage 2	664	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	342	665	1167	-	-	-
Mov Cap-2 Maneuver	342	-	-	-	-	-
Stage 1	667	-	-	-	-	-
Stage 2	664	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	12.7	0.8	0
HCM LOS	B		

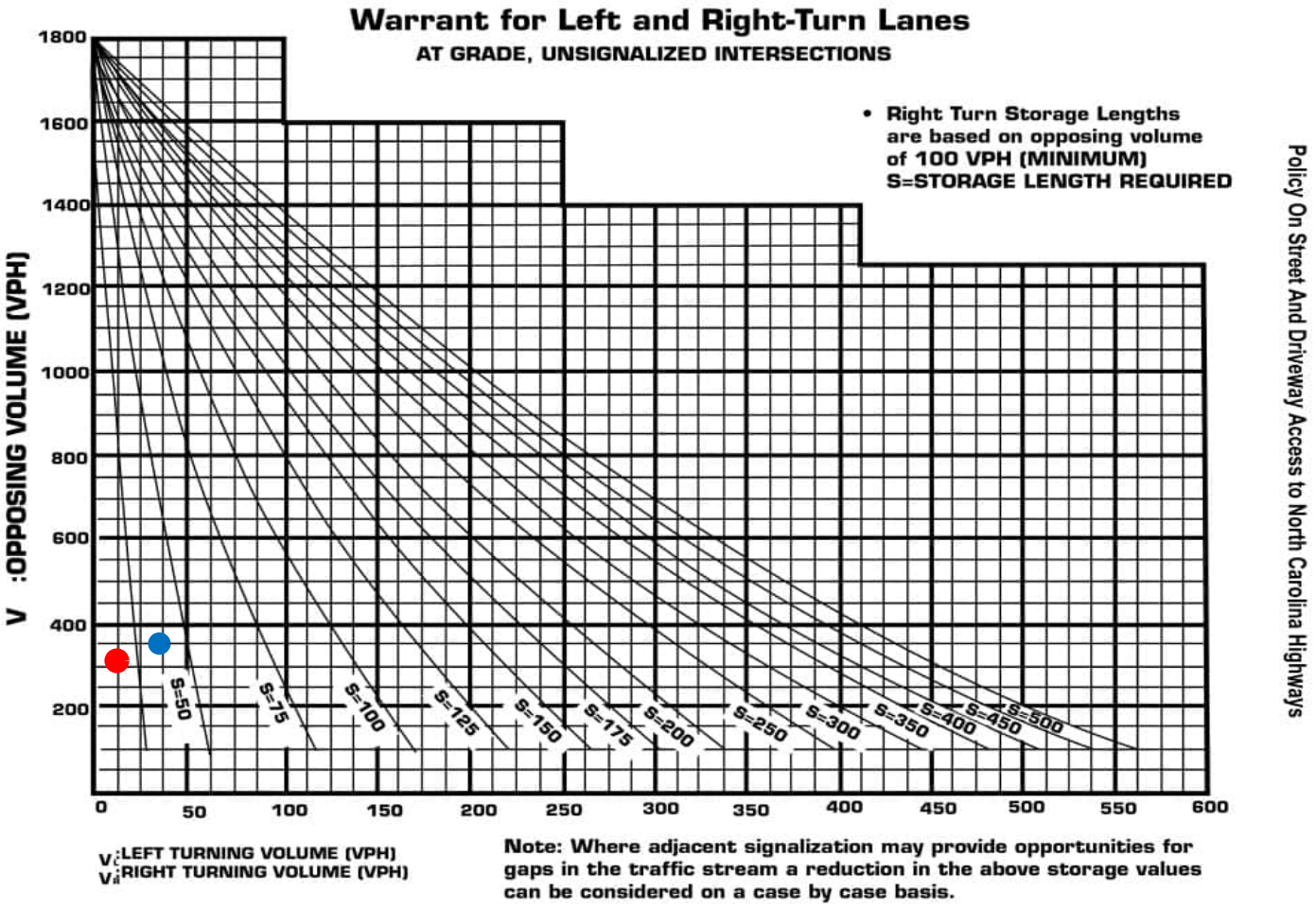
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1167	-	506	-	-
HCM Lane V/C Ratio	0.032	-	0.072	-	-
HCM Control Delay (s)	8.2	-	12.7	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0.1	-	0.2	-	-

APPENDIX I

TURN LANE WARRANTS

HARRIS CREEK FARM

TURN LANE STORAGE WARRANTS

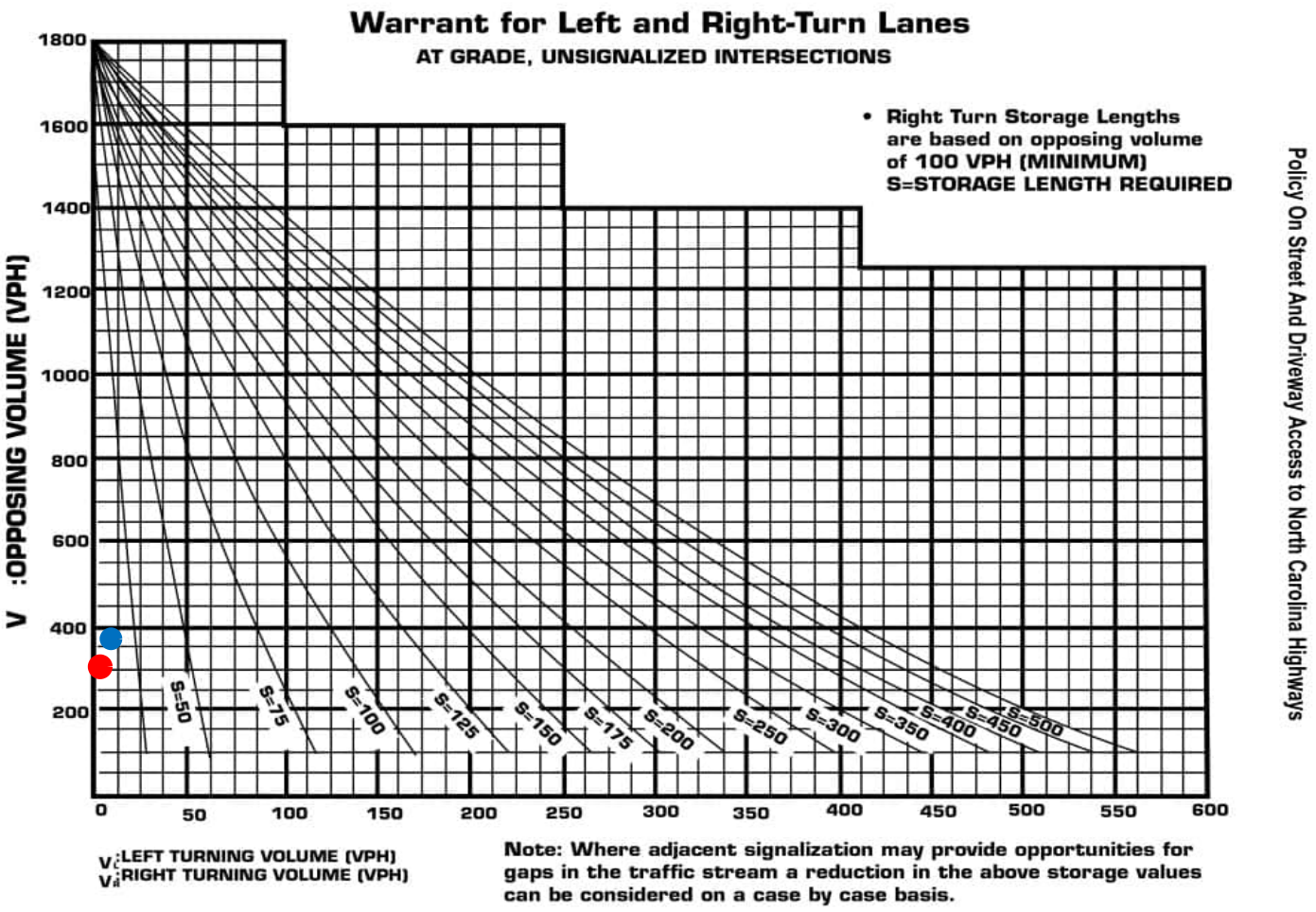


INTERSECTION: Jonesville Road & Site Drive

SCENARIO	Movement	Turn Lane	Turning Volume (V_R/V_L)	Approach / Opposing Volume (V_A/V_O)	Symbol
AM Build	NBL	Left	11	312	
PM Build	NBL	Left	34	353	

HARRIS CREEK FARM

TURN LANE STORAGE WARRANTS

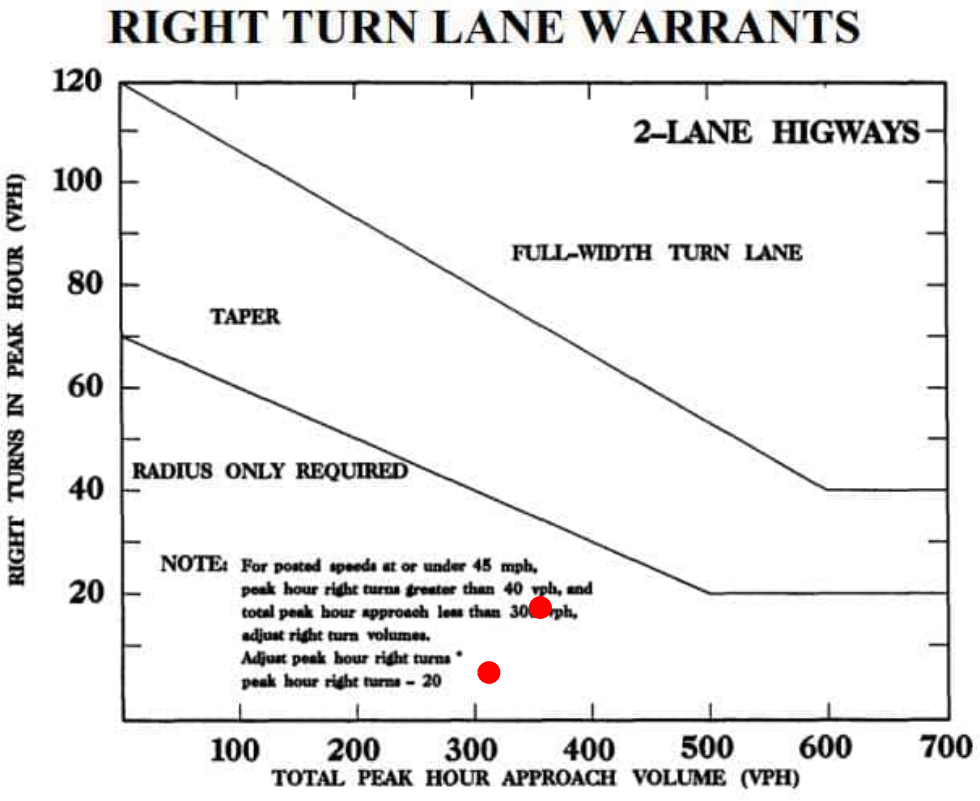


INTERSECTION: Jonesville Road & Univeral Drive

SCENARIO	Movement	Turn Lane	Turning Volume (V_R/V_L)	Approach / Opposing Volume (V_A/V_O)	Symbol
AM Build	NBL	Left	2	305	
PM Build	NBL	Left	8	371	

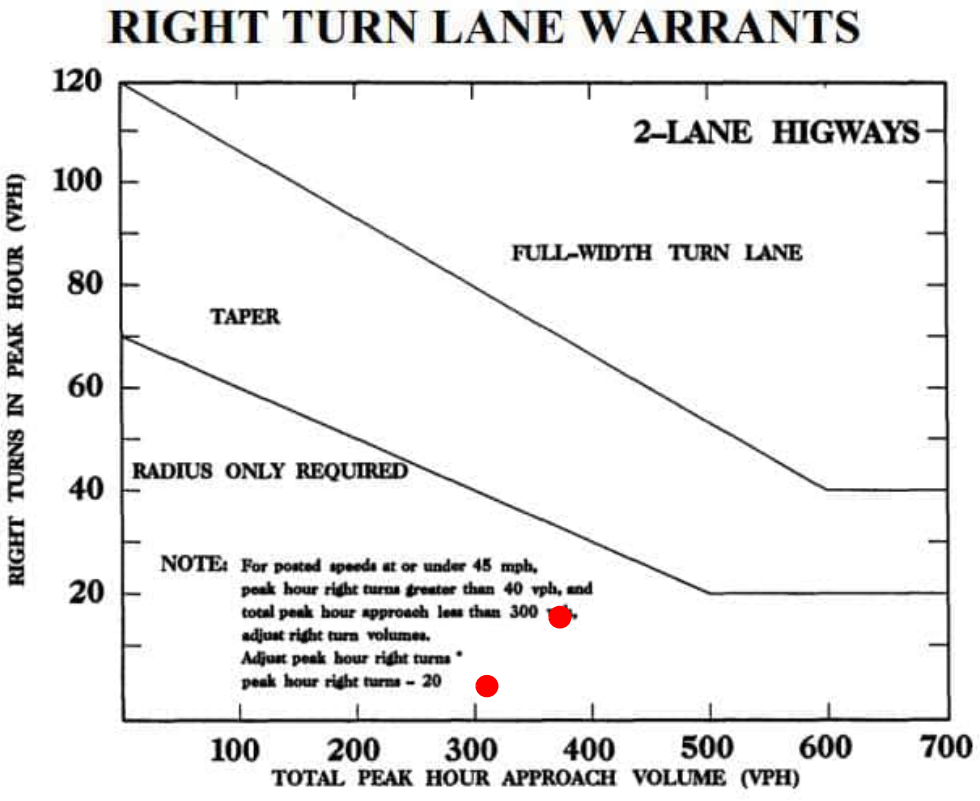
Jonesville Road and Site Drive

2027 Build				
Peak Hour	**Approach**	**Right Turn Volume**	**Approach Volume**	**Warranted?**
AM	Southbound	6	312	No
PM	Southbound	18	353	No



Jonesville Road and Universal Drive

2027 Build				
Peak Hour	**Approach**	**Right Turn Volume**	**Approach Volume**	**Warranted?**
AM	Southbound	5	305	No
PM	Southbound	17	371	No



APPENDIX J

MUTCD / ITRE

SIGNAL WARRANT ANALYSIS

Traffic Signal Warrant Analysis

Warrants 1 - 3 (Volume Warrants)

Project Name	Harris Creek Farm
Project/File #	20498 - 09
Scenario	2027 No-Build

Intersection Information			
Major Street (E/W Road)	US 401 Bypass	Minor Street (N/S Road)	Jonesville Road / WB Left-Over
Analyzed with	2 or more approach lanes	Analyzed with	1 Approach Lane
Total Approach Volume	2895 vehicles	Total Approach Volume	894 vehicles
Total Ped/Bike Volume	0 crossings	Total Ped/Bike Volume	0 crossings
Right turn reduction of	0 percent applied	Right turn reduction of	100 percent applied

No high speed or isolated community reduction applied to the Volume Warrant thresholds.

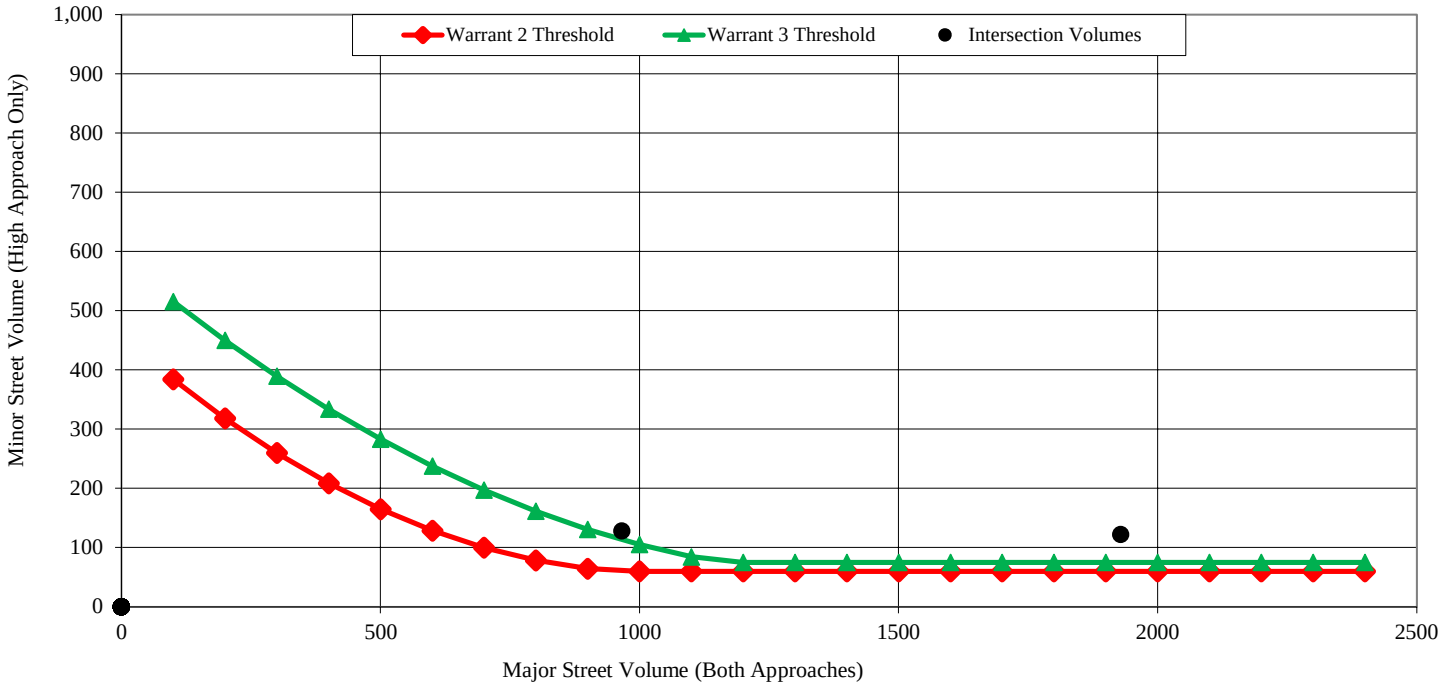
Warrant 1, Eight Hour Vehicular Volume			
	Condition A	Condition B	Condition A+B*
Condition Satisfied?	Not Satisfied	Not Satisfied	Not Satisfied
Required values reached for	2 hours	2 hours	2 (Cond. A) & 2 (Cond. B)
Criteria - Major Street (veh/hr)	420	630	336 (Cond. A) & 504 (Cond. B)
Criteria - Minor Street (veh/hr)	105	53	84 (Cond. A) & 42 (Cond. B)

* Should be applied only after an adequate trial of other alternatives that could cause less delay and inconvenience to traffic has failed to solve the traffic problems.

Warrant 2, Four Hour Vehicular Volume	
Condition Satisfied?	Not Satisfied
Required values reached for	2 hours
Criteria	See Figure Below

Warrant 3, Peak Hour Vehicular Volume		
	Condition A	Condition B
Condition Satisfied?	Not Satisfied	Satisfied
Required values reached for	2051 total, 122 minor, 0 delay	2 hours
Criteria - Total Approach Volume (veh in one hour)	800	See Figure Below
Criteria - Minor Street High Side Volume (veh in one hour)	100	
Criteria - Minor Street High Side Delay (veh-hrs)	4	

Figure 4C-2 (Warrant 2 - 70% Factor) & Figure 4C-4 (Warrant 3 - 70% Factor)



Traffic Signal Warrant Analysis

Warrants 1 - 3 (Volume Warrants)

Project Name	Harris Creek Farm
Project/File #	20498 - 09
Scenario	2027 Build

Intersection Information			
Major Street (E/W Road)	US 401 Bypass	Minor Street (N/S Road)	Jonesville Road / WB Left-Over
Analyzed with	2 or more approach lanes	Analyzed with	1 Approach Lane
Total Approach Volume	2923 vehicles	Total Approach Volume	958 vehicles
Total Ped/Bike Volume	0 crossings	Total Ped/Bike Volume	0 crossings
Right turn reduction of	0 percent applied	Right turn reduction of	100 percent applied

No high speed or isolated community reduction applied to the Volume Warrant thresholds.

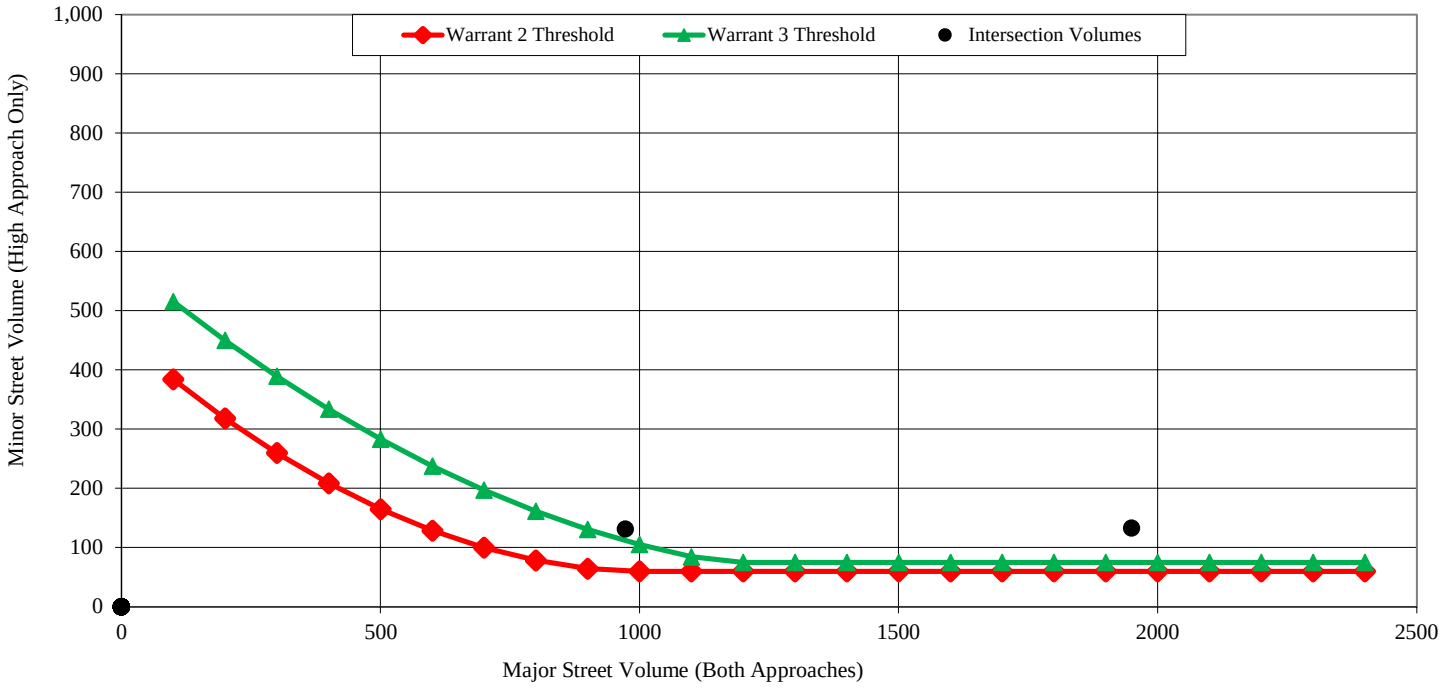
Warrant 1, Eight Hour Vehicular Volume			
	Condition A	Condition B	Condition A+B*
Condition Satisfied?	Not Satisfied	Not Satisfied	Not Satisfied
Required values reached for	2 hours	2 hours	2 (Cond. A) & 2 (Cond. B)
Criteria - Major Street (veh/hr)	420	630	336 (Cond. A) & 504 (Cond. B)
Criteria - Minor Street (veh/hr)	105	53	84 (Cond. A) & 42 (Cond. B)

* Should be applied only after an adequate trial of other alternatives that could cause less delay and inconvenience to traffic has failed to solve the traffic problems.

Warrant 2, Four Hour Vehicular Volume	
Condition Satisfied?	Not Satisfied
Required values reached for	2 hours
Criteria	See Figure Below

Warrant 3, Peak Hour Vehicular Volume		
	Condition A	Condition B
Condition Satisfied?	Not Satisfied	Satisfied
Required values reached for	2083 total, 133 minor, 0 delay	2 hours
Criteria - Total Approach Volume (veh in one hour)	800	See Figure Below
Criteria - Minor Street High Side Volume (veh in one hour)	100	
Criteria - Minor Street High Side Delay (veh-hrs)	4	

Figure 4C-2 (Warrant 2 - 70% Factor) & Figure 4C-4 (Warrant 3 - 70% Factor)



Traffic Signal Warrant Analysis

Warrants 1 - 3 (Volume Warrants)

Project Name	Harris Creek Farm
Project/File #	20498 - 09
Scenario	2022 Existing

Intersection Information			
Major Street (E/W Road)	US 401 Bypass	Minor Street (N/S Road)	Eastern U-Turn Location
Analyzed with	2 or more approach lanes	Analyzed with	1 Approach Lane
Total Approach Volume	2132 vehicles	Total Approach Volume	157 vehicles
Total Ped/Bike Volume	0 crossings	Total Ped/Bike Volume	0 crossings
Right turn reduction of	0 percent applied	Right turn reduction of	0 percent applied

No high speed or isolated community reduction applied to the Volume Warrant thresholds.

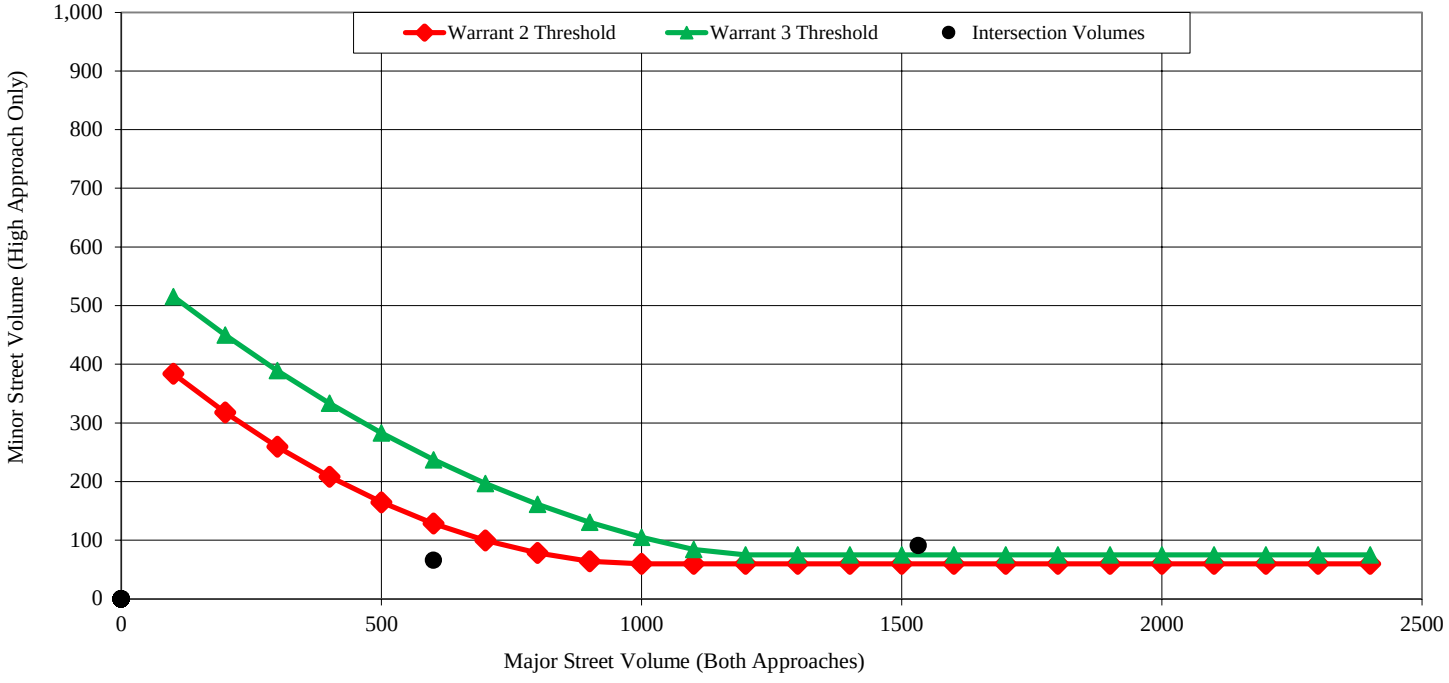
Warrant 1, Eight Hour Vehicular Volume			
	Condition A	Condition B	Condition A+B*
Condition Satisfied?	Not Satisfied	Not Satisfied	Not Satisfied
Required values reached for	0 hours	1 hour	1 (Cond. A) & 2 (Cond. B)
Criteria - Major Street (veh/hr)	420	630	336 (Cond. A) & 504 (Cond. B)
Criteria - Minor Street (veh/hr)	105	53	84 (Cond. A) & 42 (Cond. B)

* Should be applied only after an adequate trial of other alternatives that could cause less delay and inconvenience to traffic has failed to solve the traffic problems.

Warrant 2, Four Hour Vehicular Volume	
Condition Satisfied?	Not Satisfied
Required values reached for	1 hour
Criteria	See Figure Below

Warrant 3, Peak Hour Vehicular Volume		
	Condition A	Condition B
Condition Satisfied?	Not Satisfied	Satisfied
Required values reached for	1623 total, 91 minor, 0 delay	1 hour
Criteria - Total Approach Volume (veh in one hour)	650	See Figure Below
Criteria - Minor Street High Side Volume (veh in one hour)	100	
Criteria - Minor Street High Side Delay (veh-hrs)	4	

Figure 4C-2 (Warrant 2 - 70% Factor) & Figure 4C-4 (Warrant 3 - 70% Factor)



Traffic Signal Warrant Analysis

Warrants 1 - 3 (Volume Warrants)

Project Name	Harris Creek Farm
Project/File #	20498 - 09
Scenario	2027 No-Build

Intersection Information			
Major Street (E/W Road)	US 401 Bypass	Minor Street (N/S Road)	Eastern U-Turn Location
Analyzed with	2 or more approach lanes	Analyzed with	1 Approach Lane
Total Approach Volume	2792 vehicles	Total Approach Volume	408 vehicles
Total Ped/Bike Volume	0 crossings	Total Ped/Bike Volume	0 crossings
Right turn reduction of	0 percent applied	Right turn reduction of	0 percent applied

No high speed or isolated community reduction applied to the Volume Warrant thresholds.

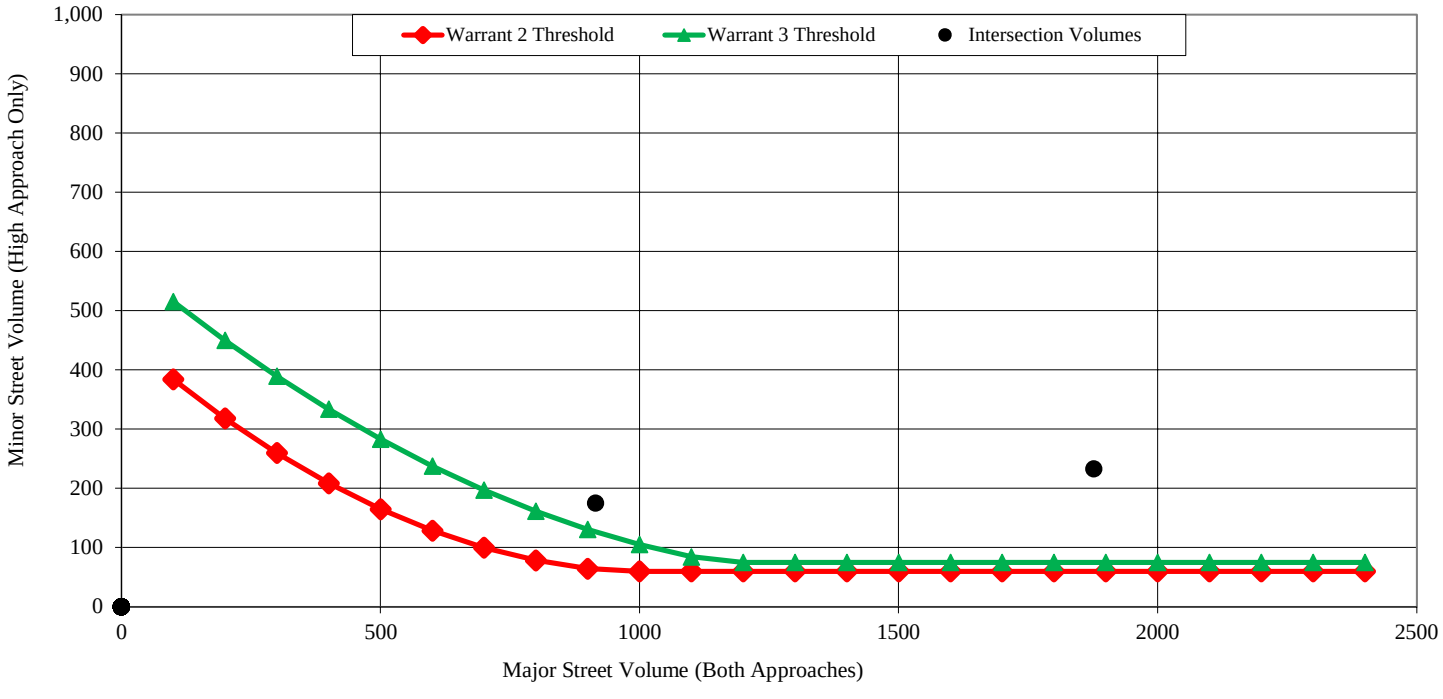
Warrant 1, Eight Hour Vehicular Volume			
	Condition A	Condition B	Condition A+B*
Condition Satisfied?	Not Satisfied	Not Satisfied	Not Satisfied
Required values reached for	2 hours	2 hours	2 (Cond. A) & 2 (Cond. B)
Criteria - Major Street (veh/hr)	420	630	336 (Cond. A) & 504 (Cond. B)
Criteria - Minor Street (veh/hr)	105	53	84 (Cond. A) & 42 (Cond. B)

* Should be applied only after an adequate trial of other alternatives that could cause less delay and inconvenience to traffic has failed to solve the traffic problems.

Warrant 2, Four Hour Vehicular Volume	
Condition Satisfied?	Not Satisfied
Required values reached for	2 hours
Criteria	See Figure Below

Warrant 3, Peak Hour Vehicular Volume		
	Condition A	Condition B
Condition Satisfied?	Not Satisfied	Satisfied
Required values reached for	2110 total, 233 minor, 0 delay	2 hours
Criteria - Total Approach Volume (veh in one hour)	650	See Figure Below
Criteria - Minor Street High Side Volume (veh in one hour)	100	
Criteria - Minor Street High Side Delay (veh-hrs)	4	

Figure 4C-2 (Warrant 2 - 70% Factor) & Figure 4C-4 (Warrant 3 - 70% Factor)



Traffic Signal Warrant Analysis

Warrants 1 - 3 (Volume Warrants)

Project Name	Harris Creek Farm
Project/File #	20498 - 09
Scenario	2027 Build

Intersection Information			
Major Street (E/W Road)	US 401 Bypass	Minor Street (N/S Road)	Eastern U-Turn Location
Analyzed with	2 or more approach lanes	Analyzed with	1 Approach Lane
Total Approach Volume	2806 vehicles	Total Approach Volume	441 vehicles
Total Ped/Bike Volume	0 crossings	Total Ped/Bike Volume	0 crossings
Right turn reduction of	0 percent applied	Right turn reduction of	0 percent applied

No high speed or isolated community reduction applied to the Volume Warrant thresholds.

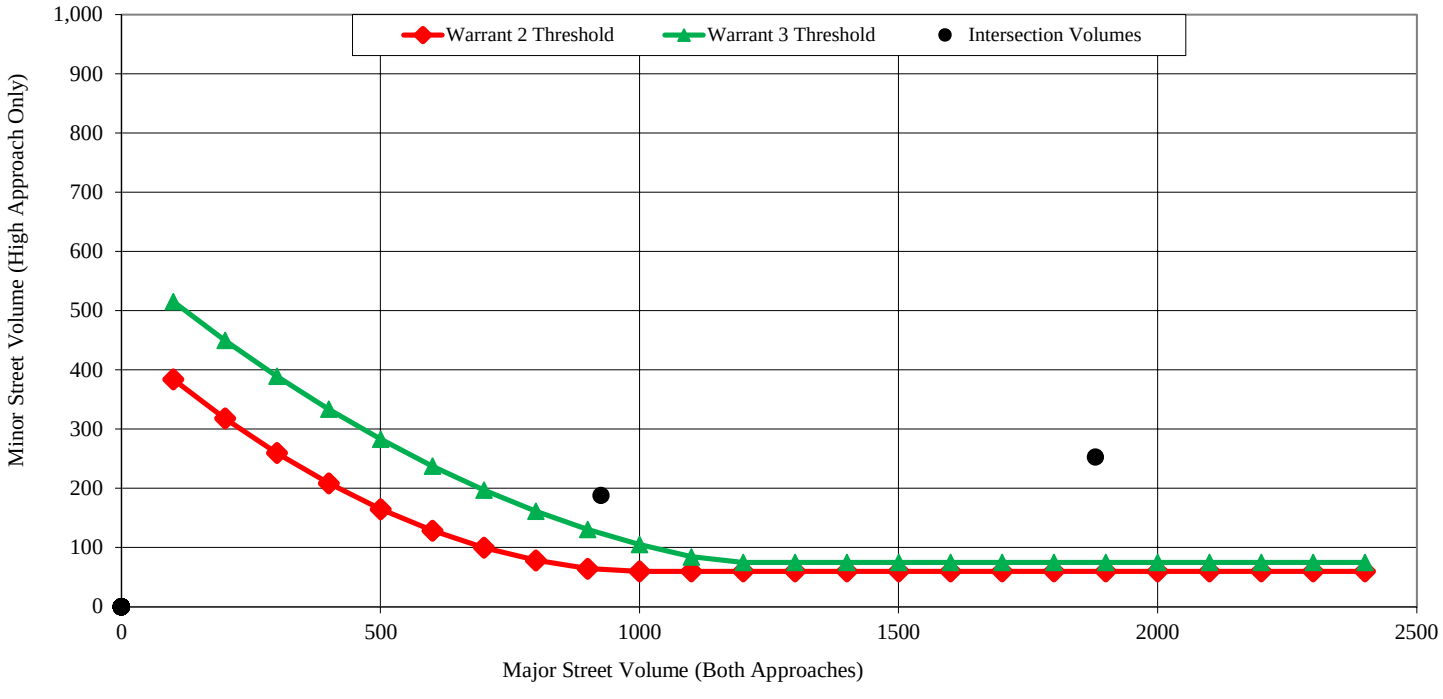
Warrant 1, Eight Hour Vehicular Volume			
	Condition A	Condition B	Condition A+B*
Condition Satisfied?	Not Satisfied	Not Satisfied	Not Satisfied
Required values reached for	2 hours	2 hours	2 (Cond. A) & 2 (Cond. B)
Criteria - Major Street (veh/hr)	420	630	336 (Cond. A) & 504 (Cond. B)
Criteria - Minor Street (veh/hr)	105	53	84 (Cond. A) & 42 (Cond. B)

* Should be applied only after an adequate trial of other alternatives that could cause less delay and inconvenience to traffic has failed to solve the traffic problems.

Warrant 2, Four Hour Vehicular Volume	
Condition Satisfied?	Not Satisfied
Required values reached for	2 hours
Criteria	See Figure Below

Warrant 3, Peak Hour Vehicular Volume		
	Condition A	Condition B
Condition Satisfied?	Not Satisfied	Satisfied
Required values reached for	2133 total, 253 minor, 0 delay	2 hours
Criteria - Total Approach Volume (veh in one hour)	650	See Figure Below
Criteria - Minor Street High Side Volume (veh in one hour)	100	
Criteria - Minor Street High Side Delay (veh-hrs)	4	

Figure 4C-2 (Warrant 2 - 70% Factor) & Figure 4C-4 (Warrant 3 - 70% Factor)



Traffic Signal Warrant Analysis

Warrants 1 - 3 (Volume Warrants)

Project Name	Harris Creek Farm
Project/File #	20498 - 09
Scenario	2022 Existing

Intersection Information			
Major Street (E/W Road)	Mitchell Mill Road	Minor Street (N/S Road)	Jonesville Road
Analyzed with	1 approach lane	Analyzed with	1 Approach Lane
Total Approach Volume	1031 vehicles	Total Approach Volume	469 vehicles
Total Ped/Bike Volume	0 crossings	Total Ped/Bike Volume	0 crossings
Right turn reduction of	0 percent applied	Right turn reduction of	0 percent applied

No high speed or isolated community reduction applied to the Volume Warrant thresholds.

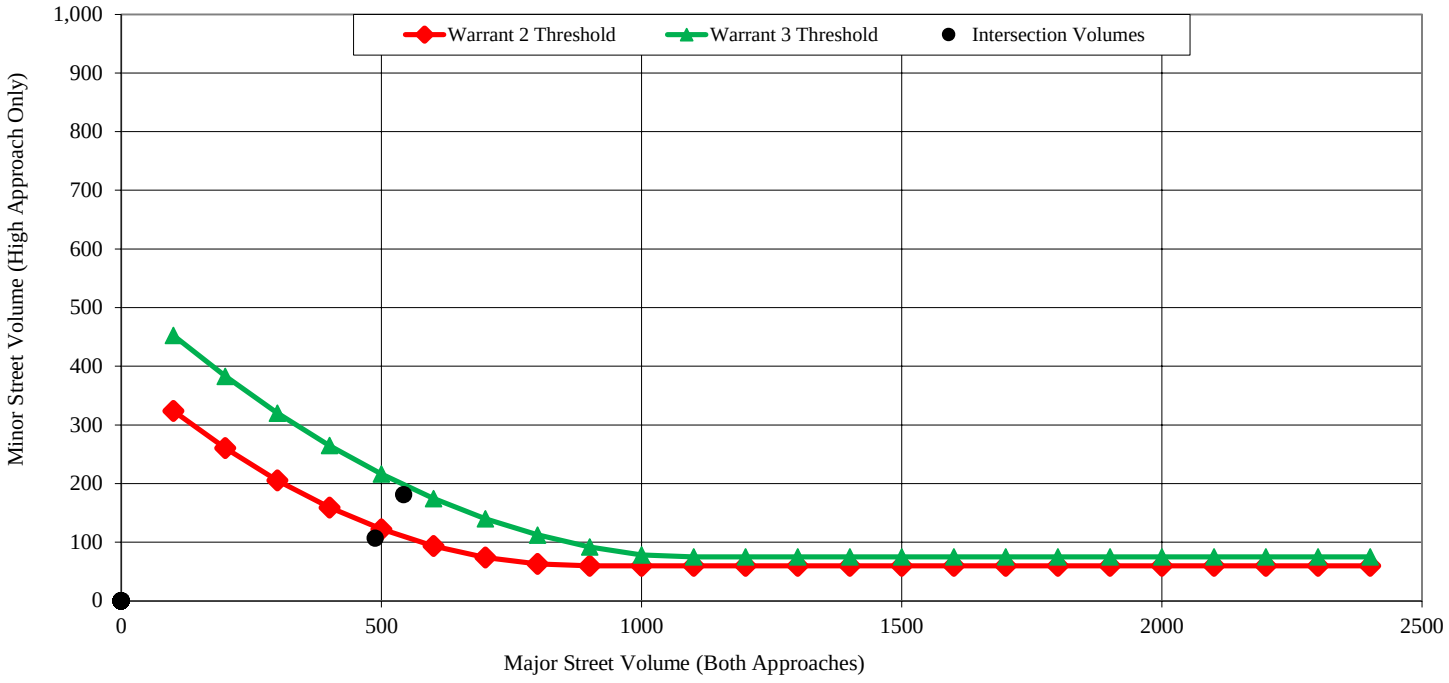
Warrant 1, Eight Hour Vehicular Volume			
	Condition A	Condition B	Condition A+B*
Condition Satisfied?	Not Satisfied	Not Satisfied	Not Satisfied
Required values reached for	2 hours	1 hour	2 (Cond. A) & 2 (Cond. B)
Criteria - Major Street (veh/hr)	350	525	280 (Cond. A) & 420 (Cond. B)
Criteria - Minor Street (veh/hr)	105	53	84 (Cond. A) & 42 (Cond. B)

* Should be applied only after an adequate trial of other alternatives that could cause less delay and inconvenience to traffic has failed to solve the traffic problems.

Warrant 2, Four Hour Vehicular Volume	
Condition Satisfied?	Not Satisfied
Required values reached for	1 hour
Criteria	See Figure Below

Warrant 3, Peak Hour Vehicular Volume		
	Condition A	Condition B
Condition Satisfied?	Not Satisfied	Not Satisfied
Required values reached for	817 total, 181 minor, 0 delay	0 hours
Criteria - Total Approach Volume (veh in one hour)	800	See Figure Below
Criteria - Minor Street High Side Volume (veh in one hour)	100	
Criteria - Minor Street High Side Delay (veh-hrs)	4	

Figure 4C-2 (Warrant 2 - 70% Factor) & Figure 4C-4 (Warrant 3 - 70% Factor)



Traffic Signal Warrant Analysis

Warrants 1 - 3 (Volume Warrants)

Project Name	Harris Creek Farm
Project/File #	20498 - 09
Scenario	2027 No-Build

Intersection Information			
Major Street (E/W Road)	Mitchell Mill Road	Minor Street (N/S Road)	Jonesville Road
Analyzed with	1 approach lane	Analyzed with	1 Approach Lane
Total Approach Volume	2171 vehicles	Total Approach Volume	818 vehicles
Total Ped/Bike Volume	0 crossings	Total Ped/Bike Volume	0 crossings
Right turn reduction of	0 percent applied	Right turn reduction of	0 percent applied

No high speed or isolated community reduction applied to the Volume Warrant thresholds.

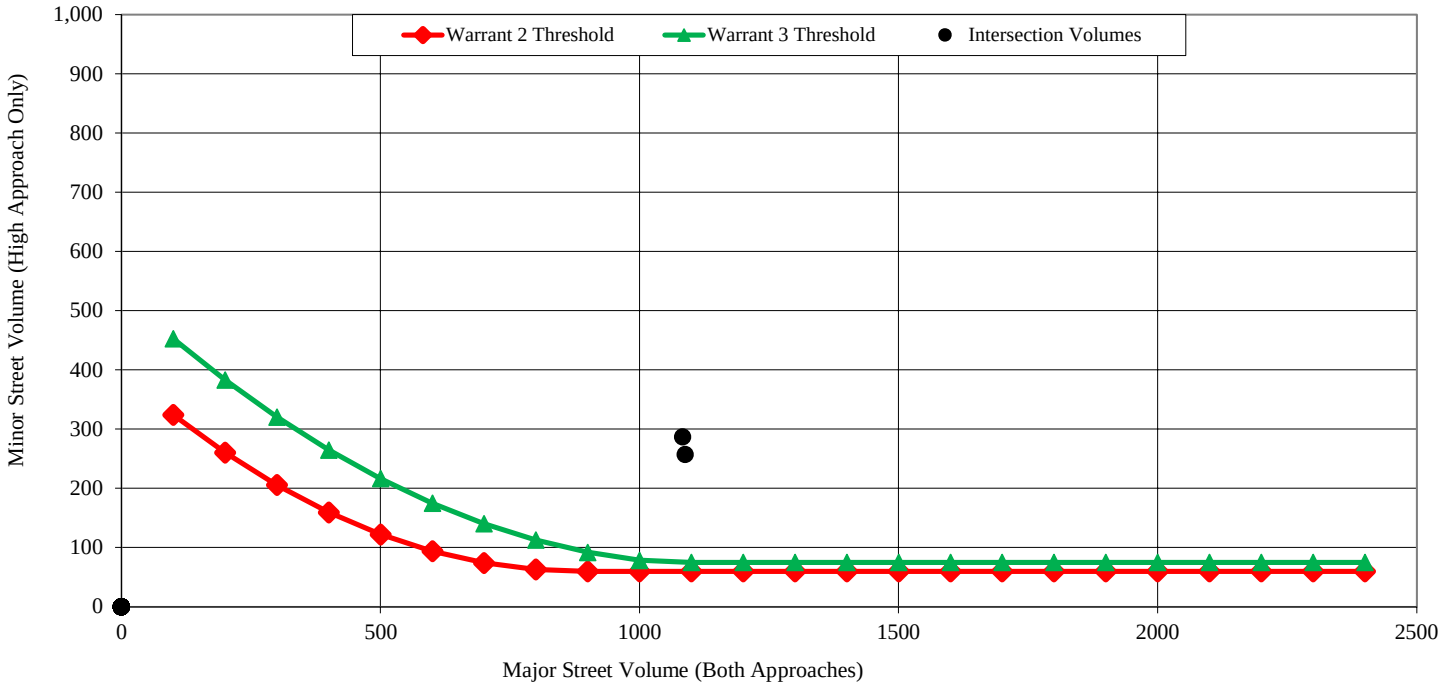
Warrant 1, Eight Hour Vehicular Volume			
	Condition A	Condition B	Condition A+B*
Condition Satisfied?	Not Satisfied	Not Satisfied	Not Satisfied
Required values reached for	2 hours	2 hours	2 (Cond. A) & 2 (Cond. B)
Criteria - Major Street (veh/hr)	350	525	280 (Cond. A) & 420 (Cond. B)
Criteria - Minor Street (veh/hr)	105	53	84 (Cond. A) & 42 (Cond. B)

* Should be applied only after an adequate trial of other alternatives that could cause less delay and inconvenience to traffic has failed to solve the traffic problems.

Warrant 2, Four Hour Vehicular Volume	
Condition Satisfied?	Not Satisfied
Required values reached for	2 hours
Criteria	See Figure Below

Warrant 3, Peak Hour Vehicular Volume		
	Condition A	Condition B
Condition Satisfied?	Not Satisfied	Satisfied
Required values reached for	1488 total, 287 minor, 0 delay	2 hours
Criteria - Total Approach Volume (veh in one hour)	800	See Figure Below
Criteria - Minor Street High Side Volume (veh in one hour)	100	
Criteria - Minor Street High Side Delay (veh-hrs)	4	

Figure 4C-2 (Warrant 2 - 70% Factor) & Figure 4C-4 (Warrant 3 - 70% Factor)



Traffic Signal Warrant Analysis

Warrants 1 - 3 (Volume Warrants)

Project Name	Harris Creek Farm
Project/File #	20498 - 09
Scenario	2027 Build

Intersection Information			
Major Street (E/W Road)	Mitchell Mill Road	Minor Street (N/S Road)	Jonesville Road
Analyzed with	1 approach lane	Analyzed with	1 Approach Lane
Total Approach Volume	2212 vehicles	Total Approach Volume	887 vehicles
Total Ped/Bike Volume	0 crossings	Total Ped/Bike Volume	0 crossings
Right turn reduction of	0 percent applied	Right turn reduction of	0 percent applied

No high speed or isolated community reduction applied to the Volume Warrant thresholds.

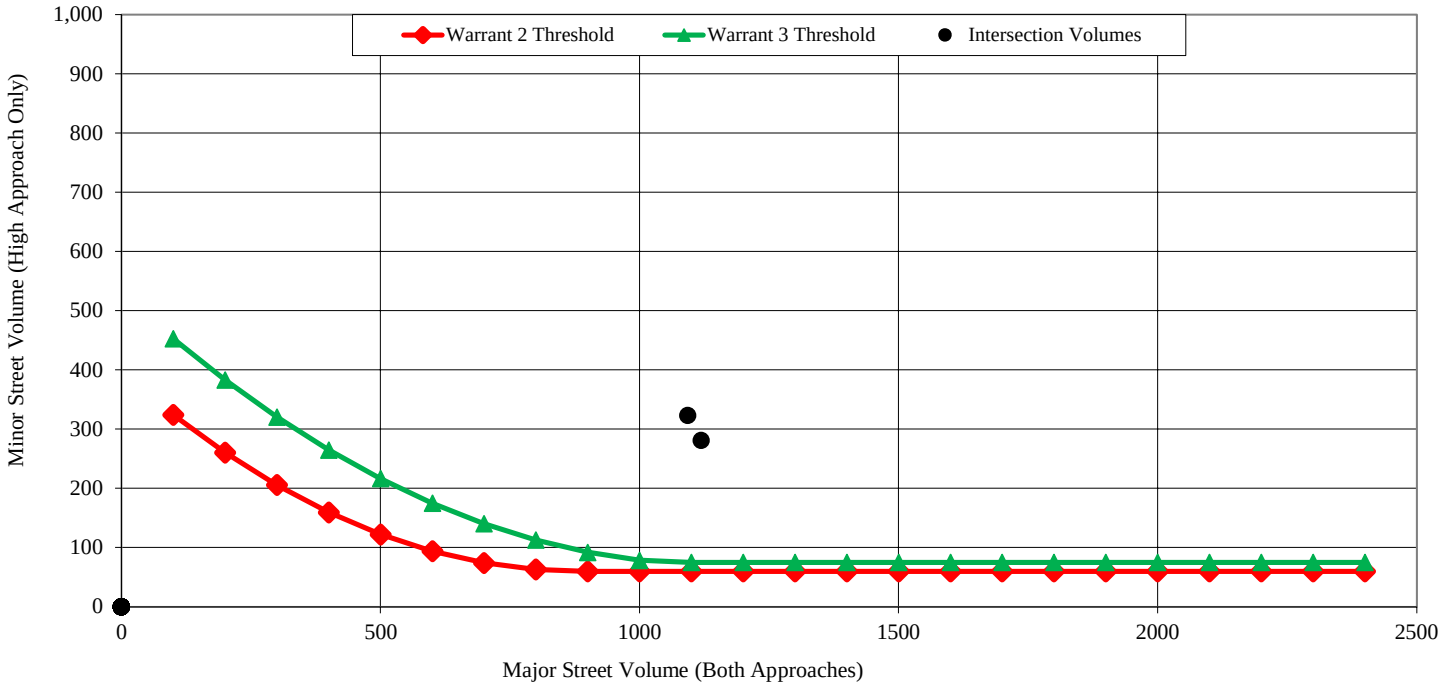
Warrant 1, Eight Hour Vehicular Volume			
	Condition A	Condition B	Condition A+B*
Condition Satisfied?	Not Satisfied	Not Satisfied	Not Satisfied
Required values reached for	2 hours	2 hours	2 (Cond. A) & 2 (Cond. B)
Criteria - Major Street (veh/hr)	350	525	280 (Cond. A) & 420 (Cond. B)
Criteria - Minor Street (veh/hr)	105	53	84 (Cond. A) & 42 (Cond. B)

* Should be applied only after an adequate trial of other alternatives that could cause less delay and inconvenience to traffic has failed to solve the traffic problems.

Warrant 2, Four Hour Vehicular Volume	
Condition Satisfied?	Not Satisfied
Required values reached for	2 hours
Criteria	See Figure Below

Warrant 3, Peak Hour Vehicular Volume		
	Condition A	Condition B
Condition Satisfied?	Not Satisfied	Satisfied
Required values reached for	1536 total, 323 minor, 0 delay	2 hours
Criteria - Total Approach Volume (veh in one hour)	800	See Figure Below
Criteria - Minor Street High Side Volume (veh in one hour)	100	
Criteria - Minor Street High Side Delay (veh-hrs)	4	

Figure 4C-2 (Warrant 2 - 70% Factor) & Figure 4C-4 (Warrant 3 - 70% Factor)



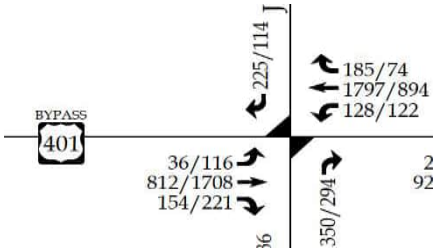
US 401 Bypass & Jonesville Road [Minor-Street Right-Turn] **[No-Build]**

AM Peak Hour				
vph	g/c	a	b	c
720	0.7	0.00004	0.0108	0.2587
812	0.7	3.5E-05	0.010033	0.310936
900	0.7	0.00003	0.0093	0.3609

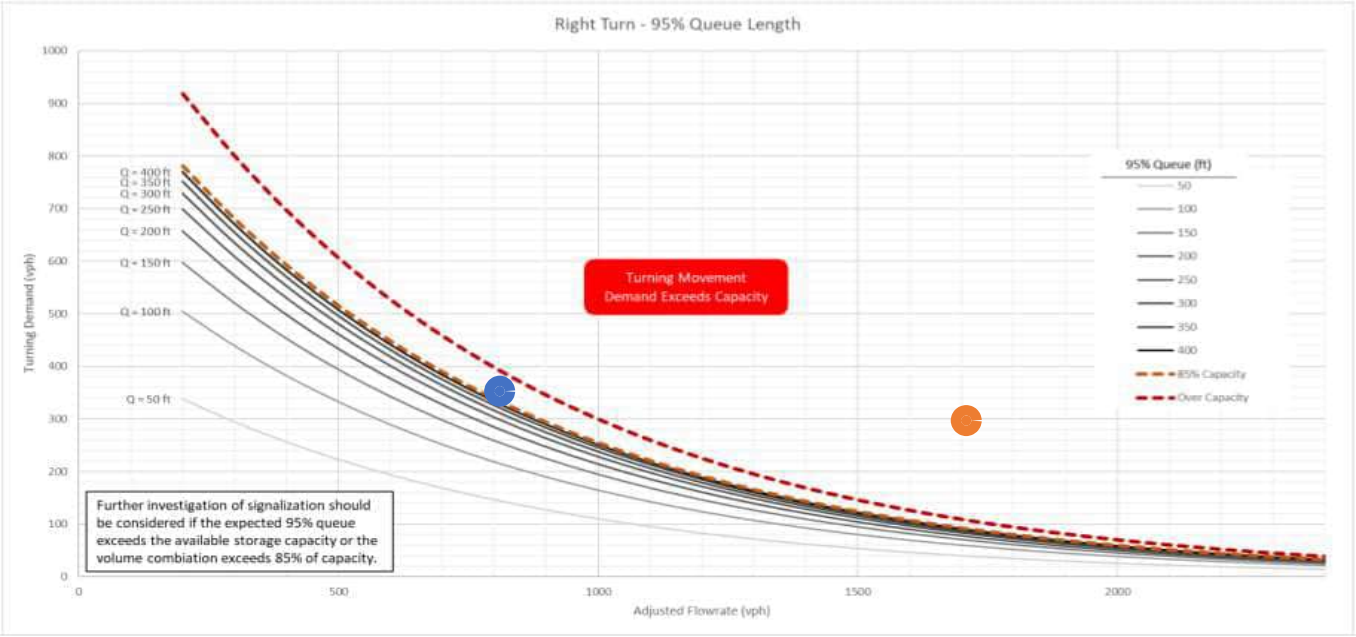
CVAF	1
Conflicting Volume (vph)	812
Adjusted Conflicting (vph)	812
Turning Volume (vph)	350

PM Peak Hour				
vph	g/c	a	b	c
1620	0.7	0.00004	0.0108	0.2587
1708	0.7	3.5E-05	0.010067	0.308664
1800	0.7	0.00003	0.0093	0.3609

CVAF	1
Conflicting Volume (vph)	1708
Adjusted Conflicting (vph)	1708
Turning Volume (vph)	294



Distance to Upstream Signal	8800	ft
Posted Speed Limit	55	mph
Travel Time	109.09	s



US 401 Bypass & Jonesville Road [Minor-Street Right-Turn] **[Build]**

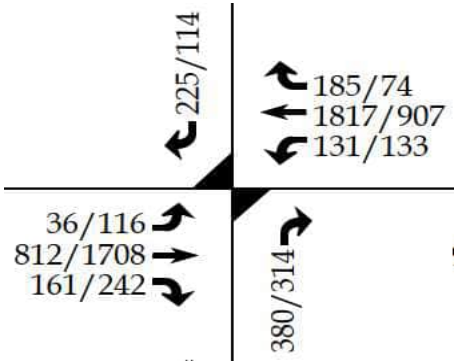
AM Peak Hour				
vph	g/c	a	b	c
720	0.7	0.00004	0.0108	0.2587
812	0.7	3.5E-05	0.010033	0.310936
900	0.7	0.00003	0.0093	0.3609

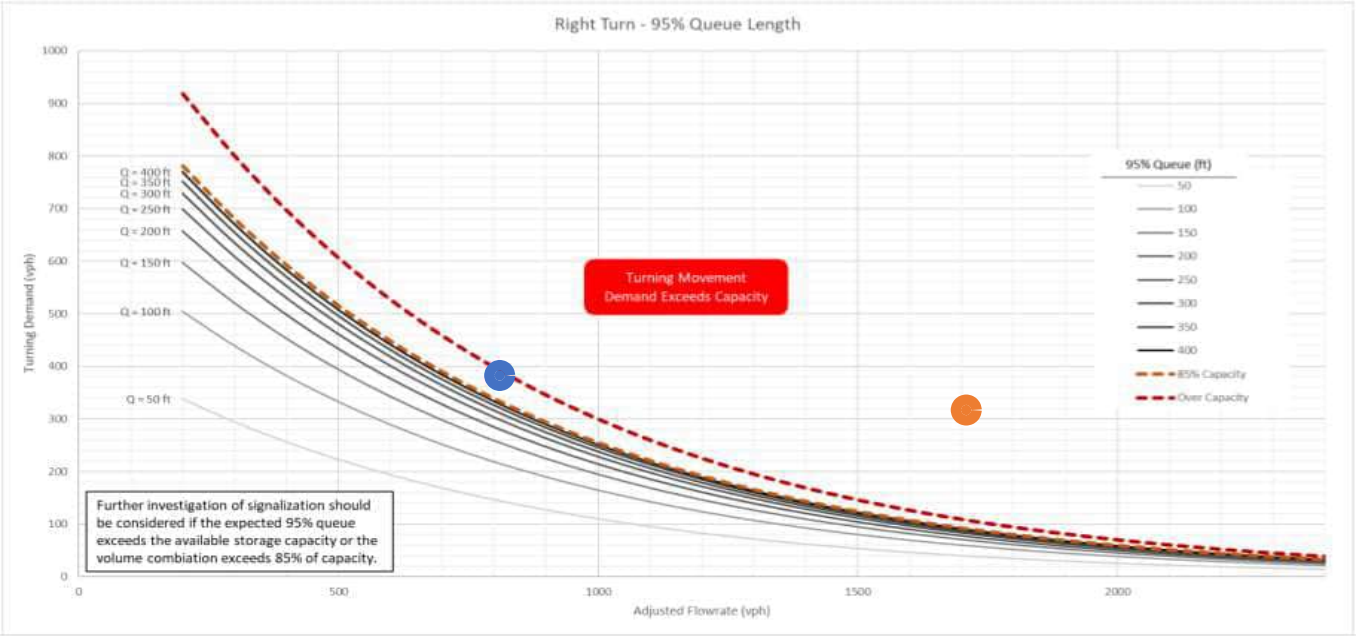
CVAF	1
Conflicting Volume (vph)	812
Adjusted Conflicting (vph)	812
Turning Volume (vph)	380

PM Peak Hour				
vph	g/c	a	b	c
1620	0.7	0.00004	0.0108	0.2587
1708	0.7	3.5E-05	0.010067	0.308664
1800	0.7	0.00003	0.0093	0.3609

CVAF	1
Conflicting Volume (vph)	1708
Adjusted Conflicting (vph)	1708
Turning Volume (vph)	314

Distance to Upstream Signal	8800	ft
Posted Speed Limit	55	mph
Travel Time	109.09	s





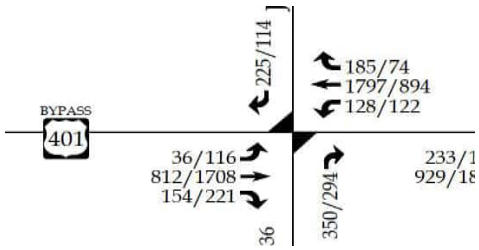
US 401 Bypass & Jonesville Road [Major-Street Left-Turn] **[No-Build]**

AM Peak Hour				
vph	g/c	a	b	c
900	0.7	0.00004	0.0097	0.4284
966	0.7	4.0E-05	0.00915	0.46261
1080	0.7	0.00004	0.0082	0.5217

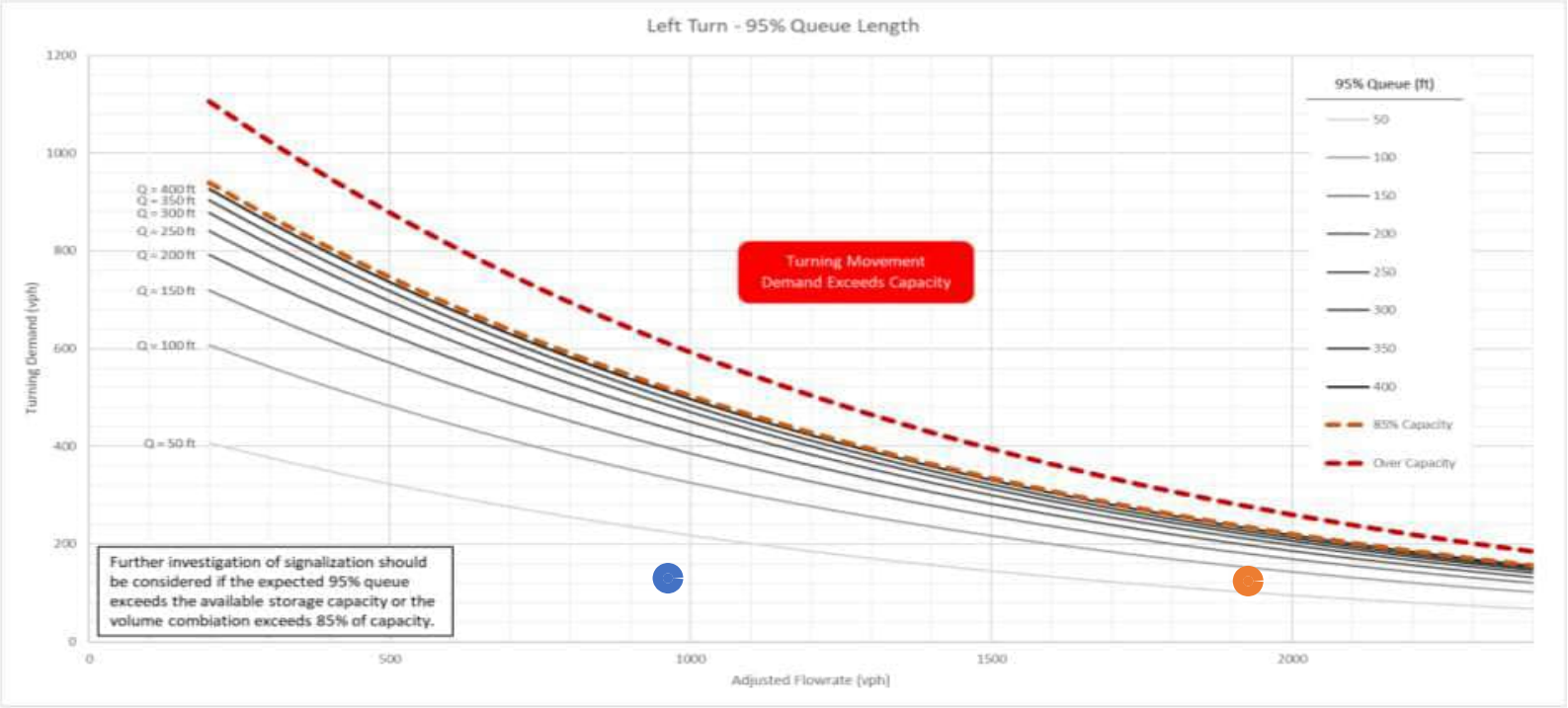
CVAF	1
Conflicting Volume (vph)	966
Adjusted Conflicting (vph)	966
Turning Volume (vph)	128

PM Peak Hour				
vph	g/c	a	b	c
1800	0.7	0.00004	0.0097	0.4284
1929	0.7	4.0E-05	0.008625	0.495265
1980	0.7	0.00004	0.0082	0.5217

CVAF	1
Conflicting Volume (vph)	1929
Adjusted Conflicting (vph)	1929
Turning Volume (vph)	122



Distance to Upstream Signal	8800	ft
Posted Speed Limit	55	mph
Travel Time	109.09	s



US 401 Bypass & Jonesville Road [Major-Street Left-Turn] **[Build]**

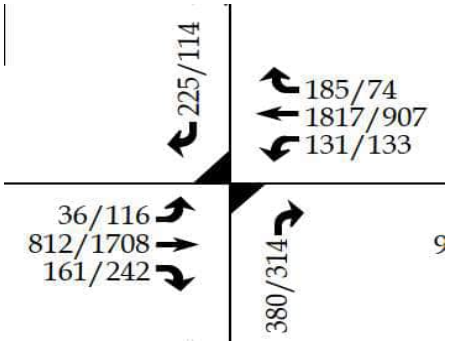
AM Peak Hour				
vph	g/c	a	b	c
900	0.7	0.00004	0.0097	0.4284
973	0.7	4.0E-05	0.009092	0.466238
1080	0.7	0.00004	0.0082	0.5217

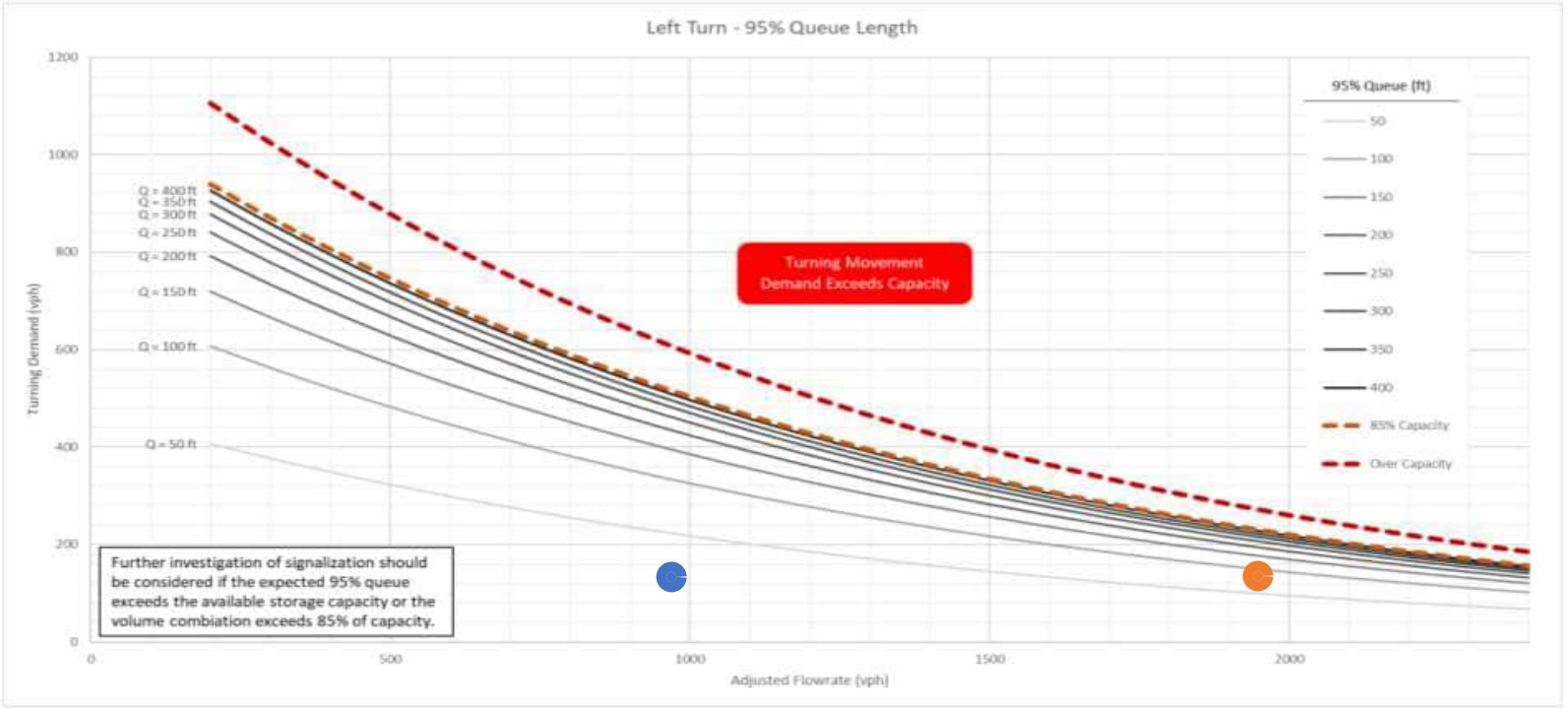
PM Peak Hour				
vph	g/c	a	b	c
1800	0.7	0.00004	0.0097	0.4284
1950	0.7	4.0E-05	0.00845	0.50615
1980	0.7	0.00004	0.0082	0.5217

Distance to Upstream Signal	8800	ft
Posted Speed Limit	55	mph
Travel Time	109.09	s

CVAF	1
Conflicting Volume (vph)	973
Adjusted Conflicting (vph)	973
Turning Volume (vph)	131

CVAF	1
Conflicting Volume (vph)	1950
Adjusted Conflicting (vph)	1950
Turning Volume (vph)	133





US 401 Bypass & Eastern U-Turn Location [Major-Street U-Turn] **[No-Build]**

AM Peak Hour				
vph	g/c	a	b	c
1800	0.7	0.00003	0.0072	0.5106
1877	0.7	3.0E-05	0.007114	0.522064
1980	0.7	0.00003	0.007	0.5374

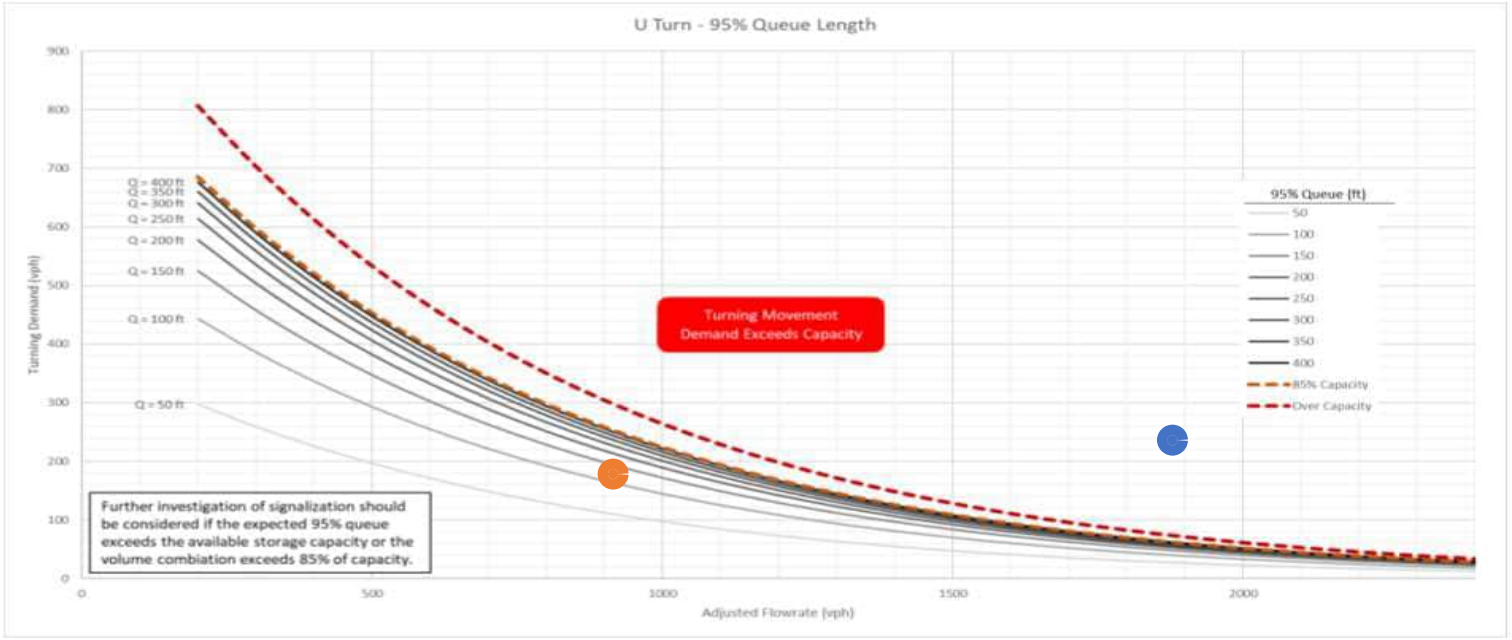
CVAF	1
Conflicting Volume (vph)	1877
Adjusted Conflicting (vph)	1877
Turning Volume (vph)	233

894
22
1877/915
233/175
929/1827

PM Peak Hour				
vph	g/c	a	b	c
900	0.7	0.00003	0.0072	0.5106
915	0.7	3.0E-05	0.007183	0.512833
1080	0.7	0.00003	0.007	0.5374

CVAF	1
Conflicting Volume (vph)	915
Adjusted Conflicting (vph)	915
Turning Volume (vph)	175

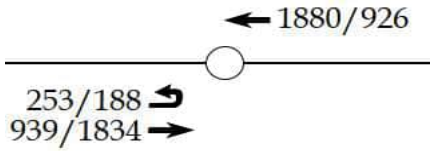
Distance to Upstream Signal	10000	ft
Posted Speed Limit	55	mph
Travel Time	123.97	s



US 401 Bypass & Eastern U-Turn Location [Major-Street U-Turn] **[Build]**

AM Peak Hour				
vph	g/c	a	b	c
1800	0.7	0.00003	0.0072	0.5106
1880	0.7	3.0E-05	0.007111	0.522511
1980	0.7	0.00003	0.007	0.5374

CVAF	1
Conflicting Volume (vph)	1880
Adjusted Conflicting (vph)	1880
Turning Volume (vph)	253



PM Peak Hour				
vph	g/c	a	b	c
900	0.7	0.00003	0.0072	0.5106
926	0.7	3.0E-05	0.007171	0.514471
1080	0.7	0.00003	0.007	0.5374

CVAF	1
Conflicting Volume (vph)	926
Adjusted Conflicting (vph)	926
Turning Volume (vph)	188

Distance to Upstream Signal	10000	ft
Posted Speed Limit	55	mph
Travel Time	123.97	s