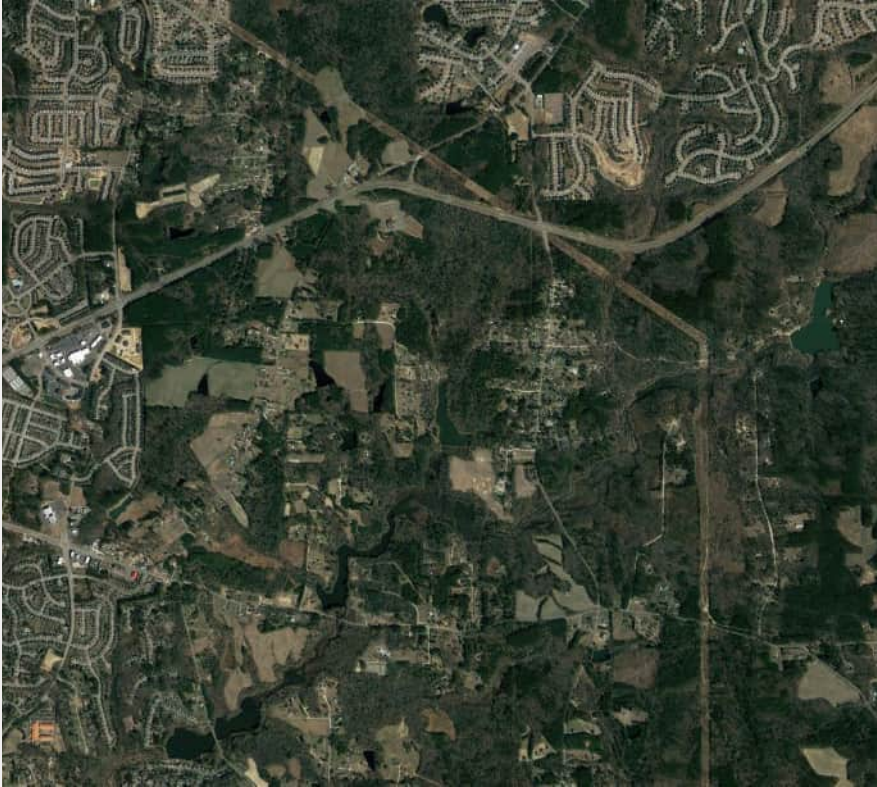


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Hills at Harris Creek
Traffic Impact Analysis
Rolesville, North Carolina

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



JUNE 2023

RKA Project No. 20498 - 005

Prepared By: DAR

Reviewed By: IAE

**TRAFFIC IMPACT ANALYSIS
HILLS AT HARRIS CREEK
ROLESVILLE, NORTH CAROLINA**

EXECUTIVE SUMMARY

1. Development Overview

A Traffic Impact Analysis (TIA) was conducted for the proposed Hills at Harris Creek 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 is to be located north of Mitchell Mill Road, west of Manly Farm Road, and east of Gro Peg Lane in Rolesville, North Carolina. This TIA is an update to the approved TIA that was sealed on May 19, 2022. This updated study reflects changes to the proposed land use types and densities and a change to the site access at the westernmost driveway from full-movement to right-in/right-out. No other scope changes were made from the previous TIA.

The proposed development is anticipated to be completed in 2027 and is expected to consist of 155 single-family homes, 115 townhomes, and a 12,000 sq. ft. day care center. Site access is proposed via one (1) full-movement and one (1) right-in/right-out (RIRO) driveway connection along Mitchell Mill Road.

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

2. Existing Traffic Conditions

The study area for the TIA was determined through coordination with NCDOT and the Town 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

Existing peak hour traffic volumes were determined based on traffic counts conducted at the study intersection listed above, 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.

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 155 single-family homes, 115 townhomes, and a 12,000 sq. ft. day care center. 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)	155 DU	1,510	28	83	111	95	55	150
Single-Family Attached Housing (220)	115 DU	812	14	45	59	44	26	70
Day Care Center (565)	12 KSF	572	70	62	132	63	70	133
Total Trips		2,894	112	190	302	202	151	353
<i>Pass-By Trips: Day Care Center (44% PM)</i>			-	-	-	-30	-30	-60
Total Primary Trips			112	190	302	172	121	293

4. Future Traffic Conditions

Through coordination with NCDOT and the Town, it was determined that an annual growth rate of 2% would be used to generate 2027 projected weekday AM and PM peak hour traffic volumes.

The following adjacent developments were identified to be considered under future conditions:

- Cobblestone Crossing Mixed-Use
- Young Street PUD
- Wheeler Tract
- Louisbury Road Assemblage
- Kalas / Watkins Family Property

5. Capacity Analysis Summary

The analysis considered weekday AM and PM peak hour traffic for 2022 existing, 2027 no-build, and 2027 build 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

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 NCDOT and the Town.

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 NCDOT and the Town.

Mitchell Mill Road and Jonesville Road / Peebles Road

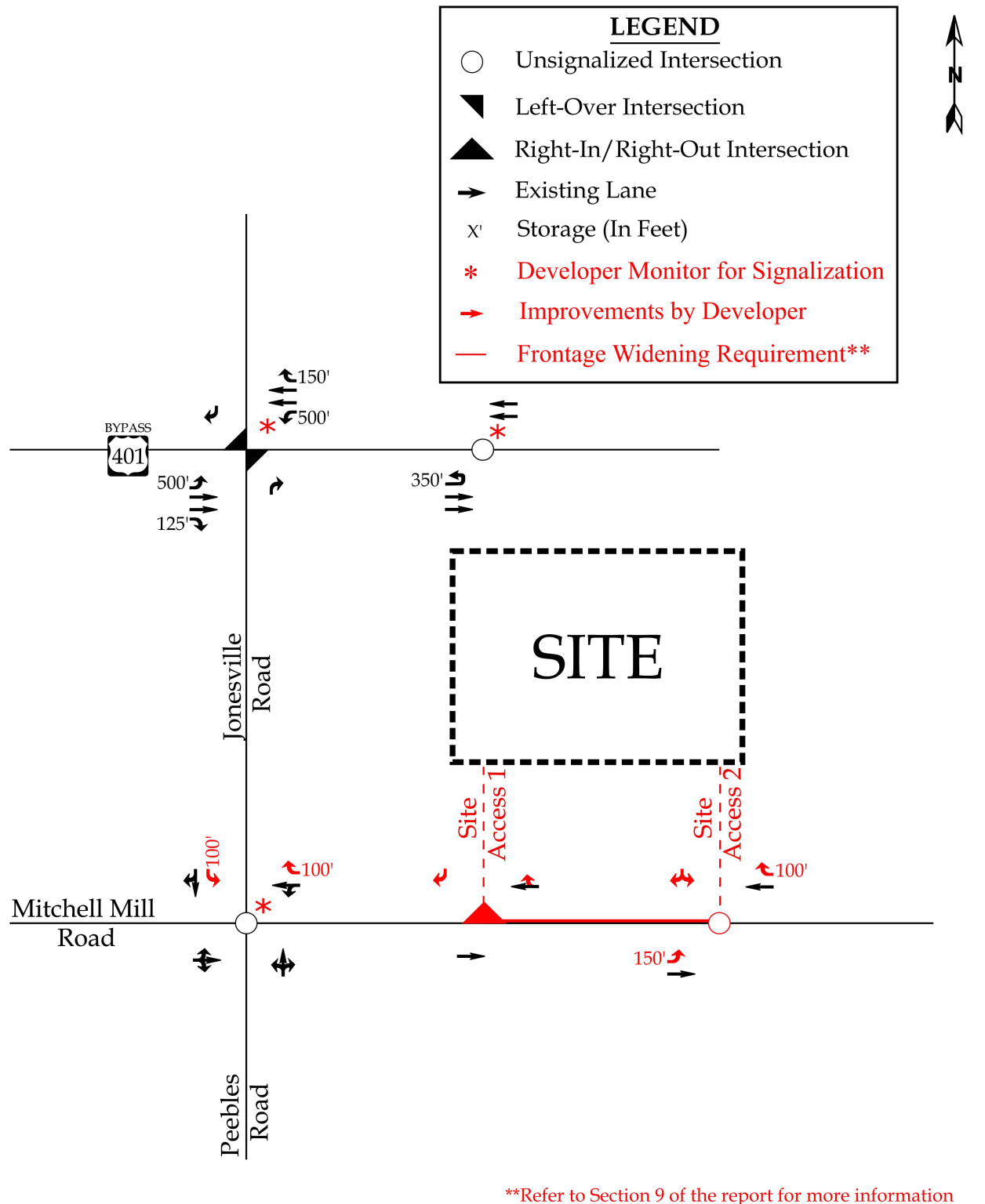
- Construct a southbound (Jonesville Road) left-turn lane with at least 100 feet of storage and appropriate decel and taper.
 - It should be noted that this improvement was also identified by the 5109 Mitchell Mill Road TIA.
- Construct a westbound (Mitchell Mill Road) right-turn lane with at least 100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

Mitchell Mill Road and Site Access 1

- Construct the southbound approach (Site Access 1) as a right-in/right-out with one ingress lane and one egress lane.
- Provide stop-control for the southbound approach (Site Access 1).
- Construct a concrete median on Mitchell Mill Road that restricts access to right-in/right-out.

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



Hills at Harris Creek
Rolesville, NC

Recommended Lane
Configurations

Scale: Not to Scale Figure E-1

TABLE OF CONTENTS

1. INTRODUCTION..... 1

1.1.Site Location and Study Area..... 2

1.2.Proposed Land Use and Site Access 2

1.3.Adjacent Land Uses 2

1.4.Existing Roadways..... 3

2. 2022 EXISTING PEAK HOUR CONDITIONS..... 7

2.1.2022 Existing Peak Hour Traffic Volumes..... 7

2.2.Analysis of 2022 Existing Peak Hour Traffic Conditions..... 7

3. 2027 NO-BUILD PEAK HOUR CONDITIONS 9

3.1.Ambient Traffic Growth..... 9

3.2.Adjacent Development Traffic..... 9

3.3.Future Roadway Improvements10

3.4.2027 No-Build Peak Hour Traffic Volumes.....11

3.5.Analysis of 2027 No-Build Peak Hour Traffic Conditions.....11

4. SITE TRIP GENERATION AND DISTRIBUTION..... 15

4.1.Trip Generation15

4.2.Site Trip Distribution and Assignment16

5. 2027 BUILD TRAFFIC CONDITIONS..... 24

5.1.2027 Build Peak Hour Traffic Volumes.....24

5.2.Analysis of 2027 Build Peak Hour Traffic Conditions.....24

6. TRAFFIC ANALYSIS PROCEDURE 26

6.1.Adjustments to Analysis Guidelines26

7. CAPACITY ANALYSIS 27

7.1.US 401 Bypass and Jonesville Road27

7.2.US 401 Bypass and Eastern U-Turn Location.....30

7.3.Mitchell Mill Road and Jonesville Road / Peebles Road.....32

7.4.Mitchell Mill Road and Site Access 135

7.5.Mitchell Mill Road and Site Access 2.....36

8. CONCLUSIONS..... 37

9. RECOMMENDATIONS 39

LIST OF FIGURES

Figure 1 – Site Location Map.....4

Figure 2 – Preliminary Site Plan.....5

Figure 3 – Existing Lane Configurations6

Figure 4 – 2022 Existing Peak Hour Traffic8

Figure 5 – 2027 Projected Peak Hour Traffic 12

Figure 6 – Adjacent Development Trips 13

Figure 7 – 2027 No-Build Peak Hour Traffic 14

Figure 8a – Residential Site Trip Distribution 17

Figure 8b – Day Care Center Site Trip Distribution..... 18

Figure 9a – Residential Site Trip Assignment 19

Figure 9b –Day Care Center Site Trip Assignment 20

Figure 10 – Pass-By Site Trip Distribution 21

Figure 11 – Pass-by Site Trip Assignment 22

Figure 12 – Total Site Trip Assignment 23

Figure 13 – 2027 Build Peak Hour Traffic 25

Figure 14 – Recommended Lane Configurations 41

LIST OF TABLES

Table 1: Existing Roadway Inventory 3

Table 2: Adjacent Development Information.....10

Table 3: Trip Generation Summary15

Table 4: Highway Capacity Manual – Levels-of-Service and Delay26

Table 5: Analysis Summary of US 401 Bypass and Jonesville Road.....27

Table 6: Analysis Summary of US 401 Bypass and Eastern U-Turn Location.....30

Table 7: Analysis Summary of Mitchell Mill Road and Jonesville Road / Peebles Road
.....32

Table 8: Analysis Summary of Mitchell Mill Road and Site Access 135

Table 9: Analysis Summary of Mitchell Mill Road and Site Access 236

TECHNICAL APPENDIX

Appendix A:	Scoping Documentation
Appendix B:	Traffic Counts
Appendix C:	Adjacent Development Information
Appendix D:	Capacity Calculations – US 401 Bypass & Jonesville Road
Appendix E:	Capacity Calculations – US 401 Bypass & Eastern U-Turn Location
Appendix F:	Capacity Calculations – Mitchell Mill Road & Jonesville Road / Peebles Road
Appendix G:	Capacity Calculations – Mitchell Mill Road & Site Access 1
Appendix H:	Capacity Calculations – Mitchell Mill Road & Site Access 2
Appendix I:	Turn Lane Warrants
Appendix J:	MUTCD / ITRE Signal Warrant Analysis

TRAFFIC IMPACT ANALYSIS
HILLS AT HARRIS CREEK
ROLESVILLE, NORTH CAROLINA

1. INTRODUCTION

The contents of this report present the findings of the Traffic Impact Analysis (TIA) conducted for the proposed Hills at Harris Creek development in Rolesville, North Carolina. The proposed development, anticipated to be completed in 2027, is located north of Mitchell Mill Road, west of Manly Farm Road, and east of Gro Peg Lane in Rolesville, North Carolina. 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.

This TIA is an update to the approved TIA that was sealed on May 19, 2022. This updated study reflects changes to the proposed land use types and densities and a change to the site access at the westernmost driveway from full-movement to right-in/right-out. No other scope changes were made from the previous TIA.

The proposed development is expected to consist of 155 single-family homes, 115 townhomes, and a 12,000 sq. ft. day care center.

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 located north of Mitchell Mill Road, west of Manly Farm Road, and east of Gro Peg Lane in Rolesville, North Carolina. 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
- 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 north of Mitchell Mill Road, west of Manly Farm Road, and east of Gro Peg Lane. The proposed development, anticipated to be completed in 2027, is assumed to consist of the following uses:

- 155 single-family homes
- 115 townhomes
- 12,000 sq. ft. day care center

Site access is proposed via one (1) full-movement and one (1) right-in/right-out (RIRO) driveway connection along Mitchell Mill Road. 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.

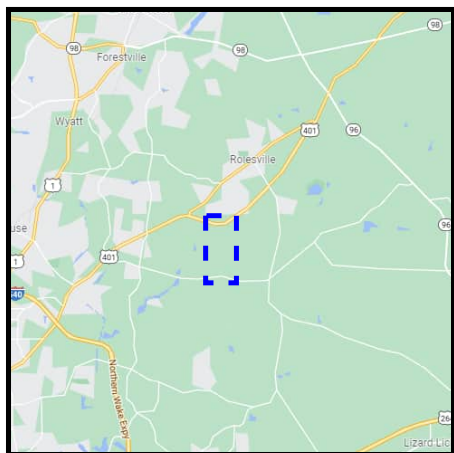
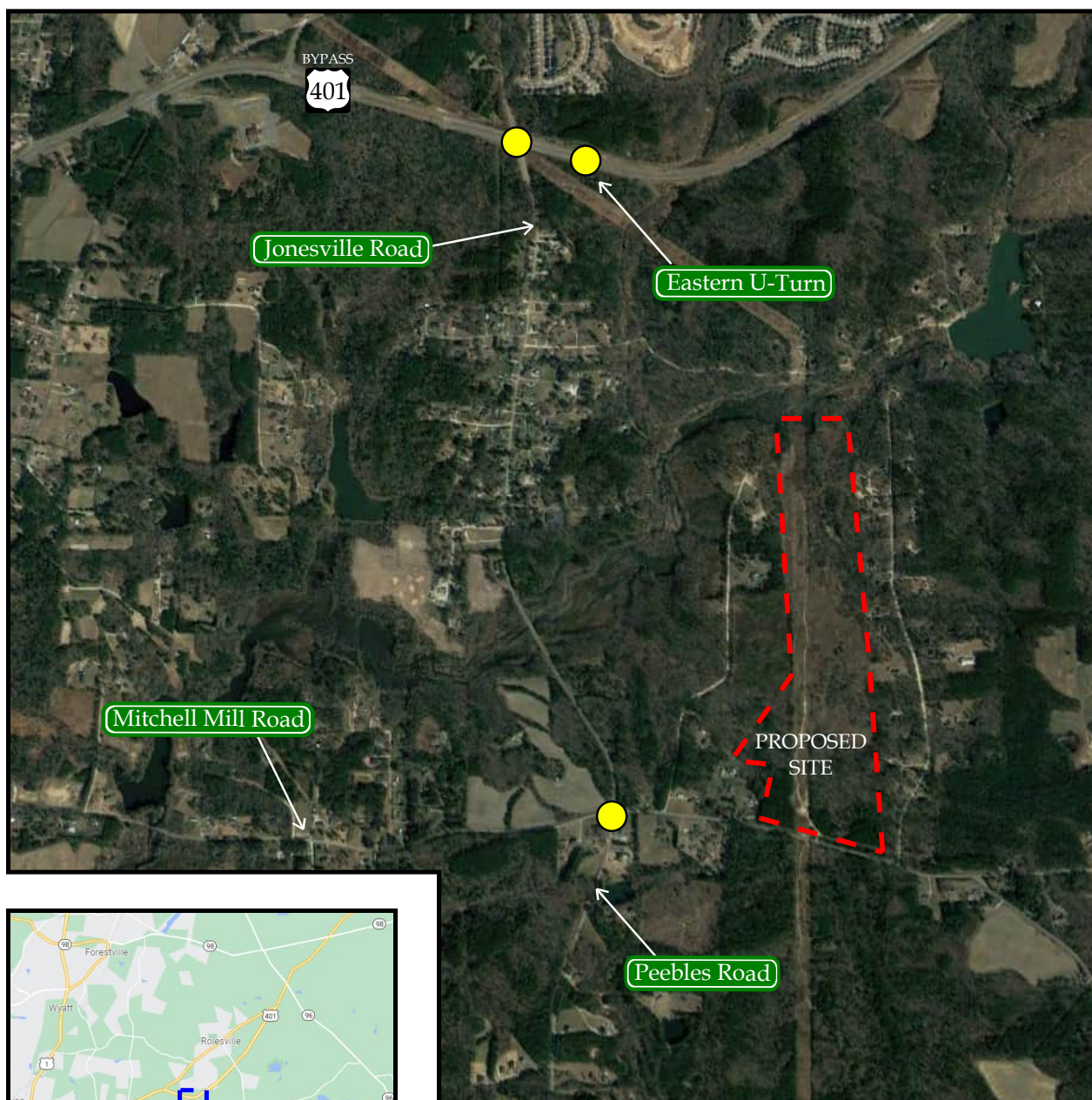
1.4. Existing Roadways

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.



LEGEND

- Proposed Site Location
- Study Intersection
- Study Area

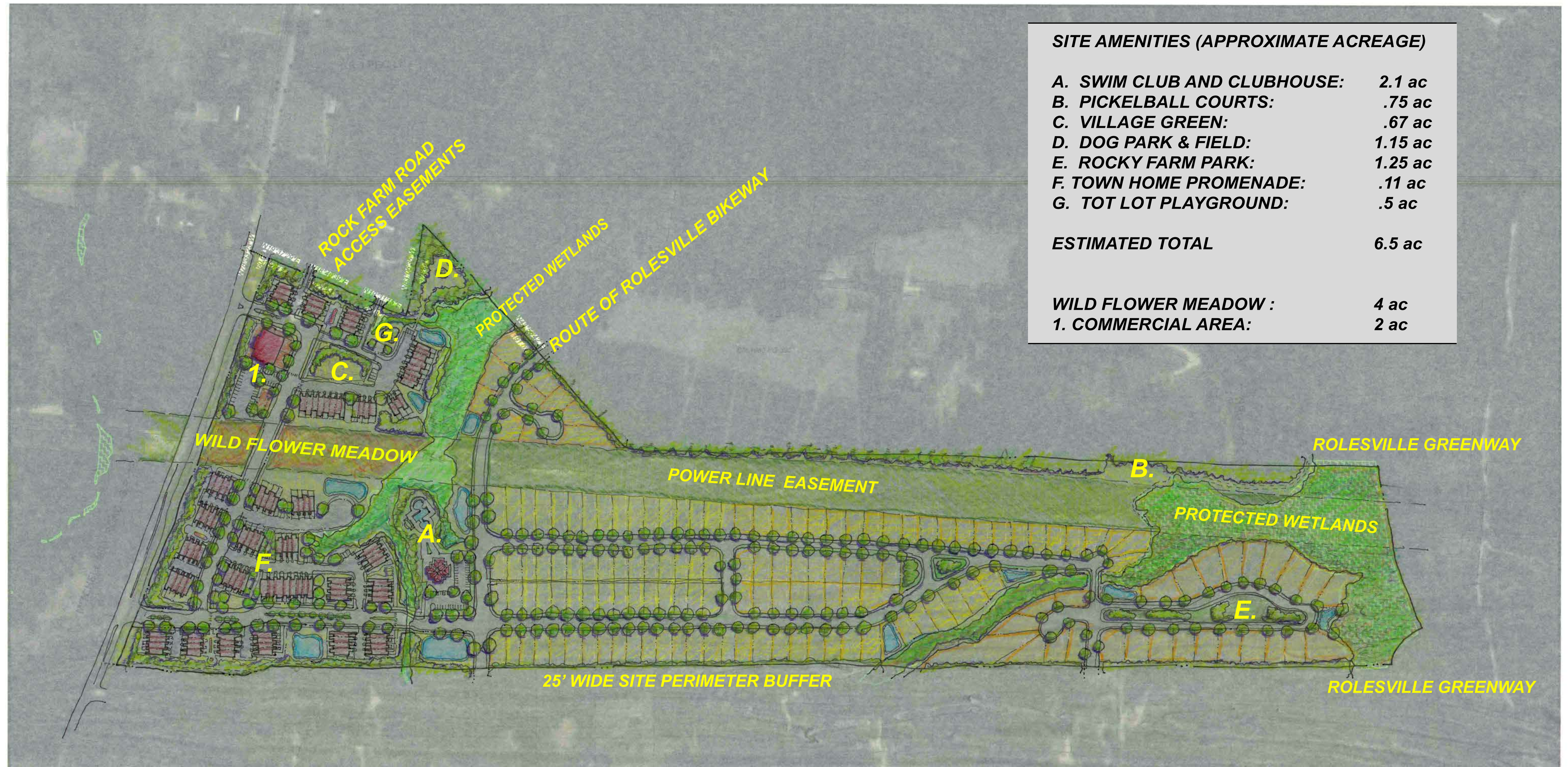


Hills at Harris Creek
Rolesville, NC


Site Location Map

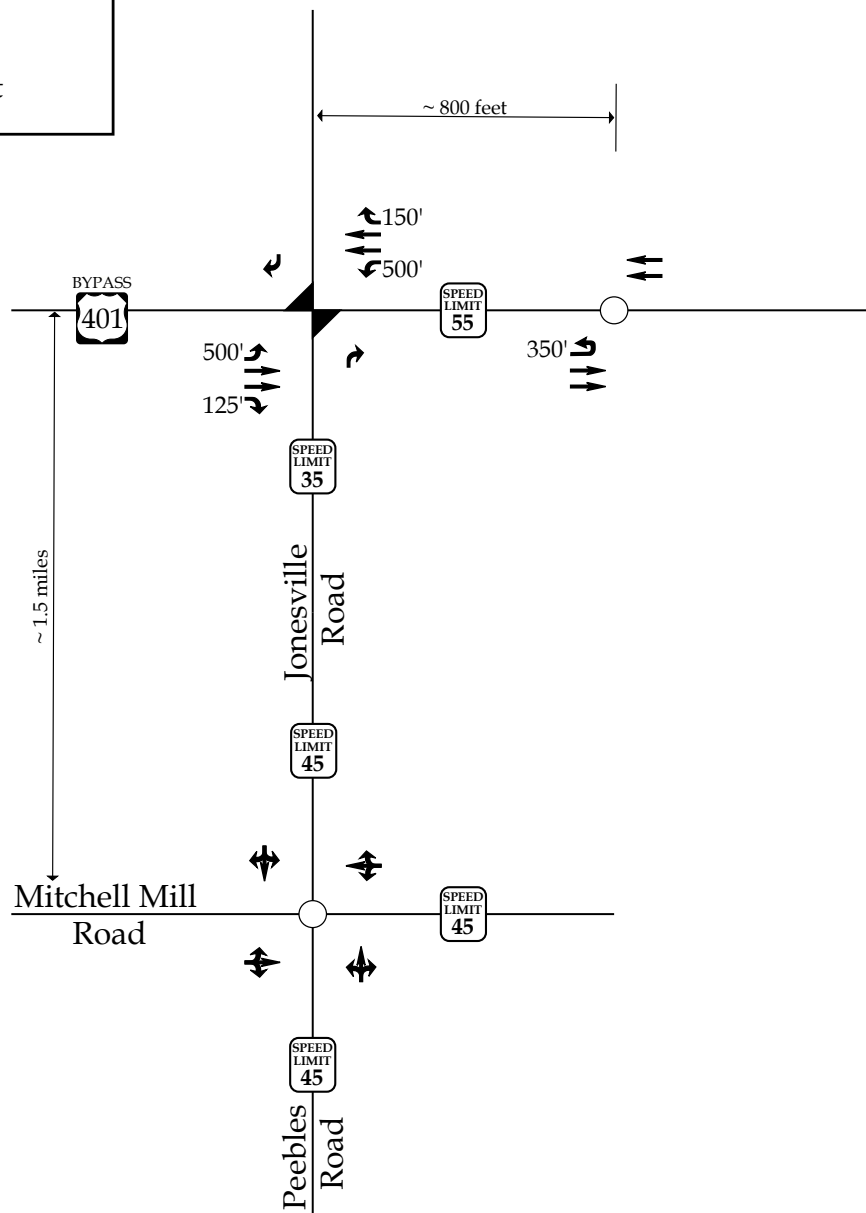
Scale: Not to Scale Figure 1

EXHIBIT ONE: CONCEPT PLAN (SKETCH PLAN)



LEGEND

- Unsignalized Intersection
- ◼ Left-Over Intersection
- ➔ Existing Lane
- X' Storage (In Feet)
-  Posted Speed Limit



Hills at Harris Creek
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%. 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.

LEGEND

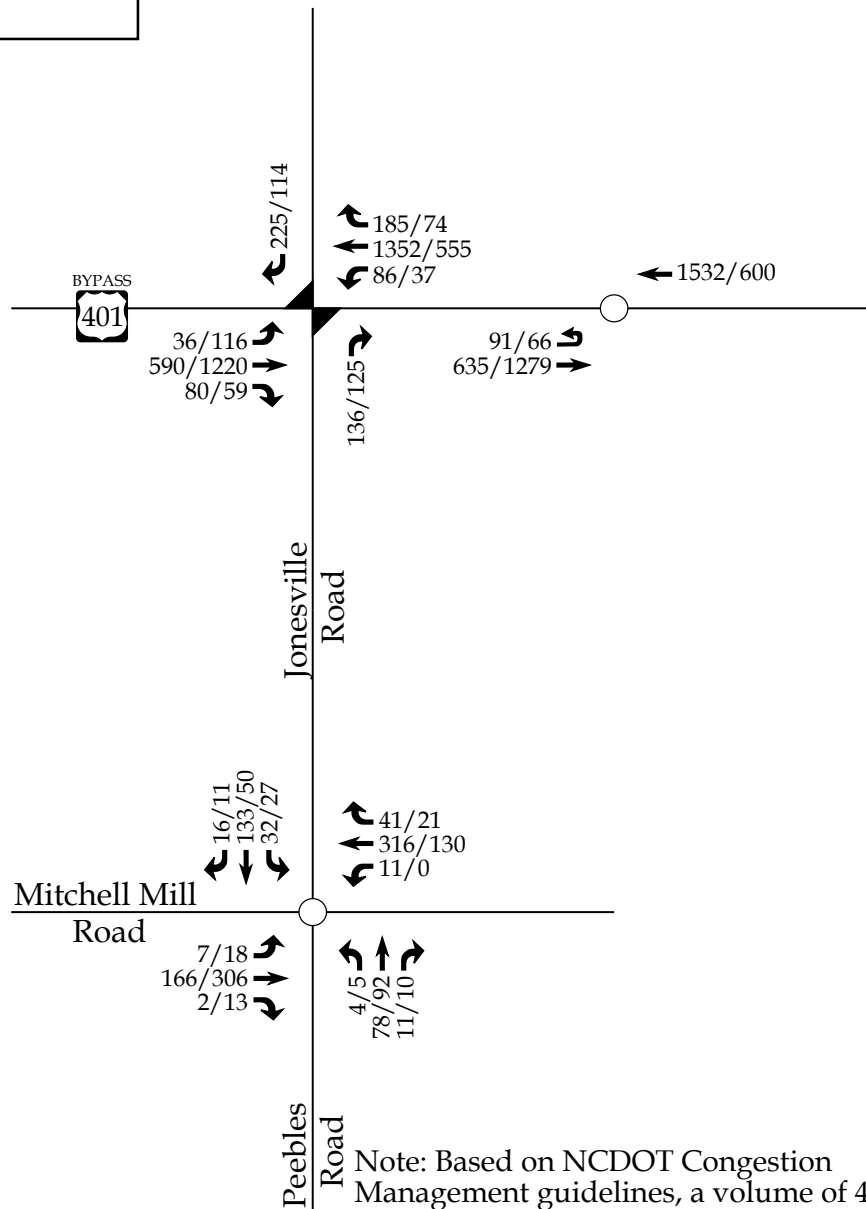


Unsignalized Intersection



Left-Over Intersection

X / Y → Weekday AM / PM Peak
Hour Traffic



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

Hills at Harris Creek
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 the 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 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 2% would be used to generate 2027 projected weekday AM and PM peak hour traffic volumes. 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 as an approved adjacent development in this study:

- Cobblestone Crossing Mixed-Use
- Young Street PUD
- Wheeler Tract
- Louisbury Road Assemblage
- Kalas / Watkins Family Property

Table 2, on the following page, provides a summary of the adjacent developments.

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

Adjacent development trips are shown in Figure 6. Adjacent development information can be found in Appendix C.

3.3. Future Roadway Improvements

Based on coordination with the NCDOT and the Town, it was determined there were no future roadway improvements to consider under future conditions with this study. 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

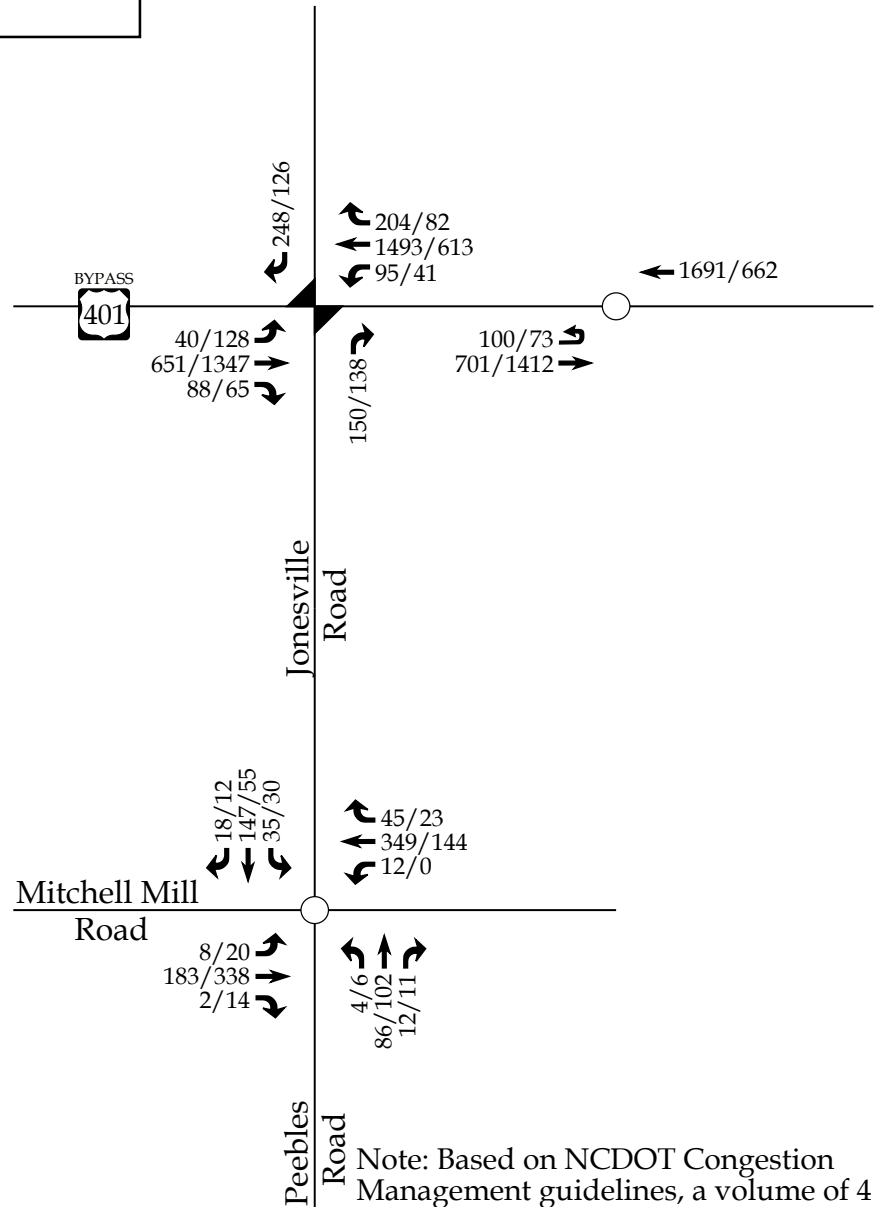
The 2027 no-build traffic volumes were determined by projecting the 2022 existing peak hour traffic to the year 2027 and adding the adjacent development trips. Refer to Figure 7 for an illustration of the 2027 no-build peak hour traffic volumes at the study intersections.

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.

LEGEND

- Unsignalized Intersection
- ◼ Left-Over Intersection
- X / Y → Weekday AM / PM Peak Hour Traffic



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.



Hills at Harris Creek
Rolesville, NC

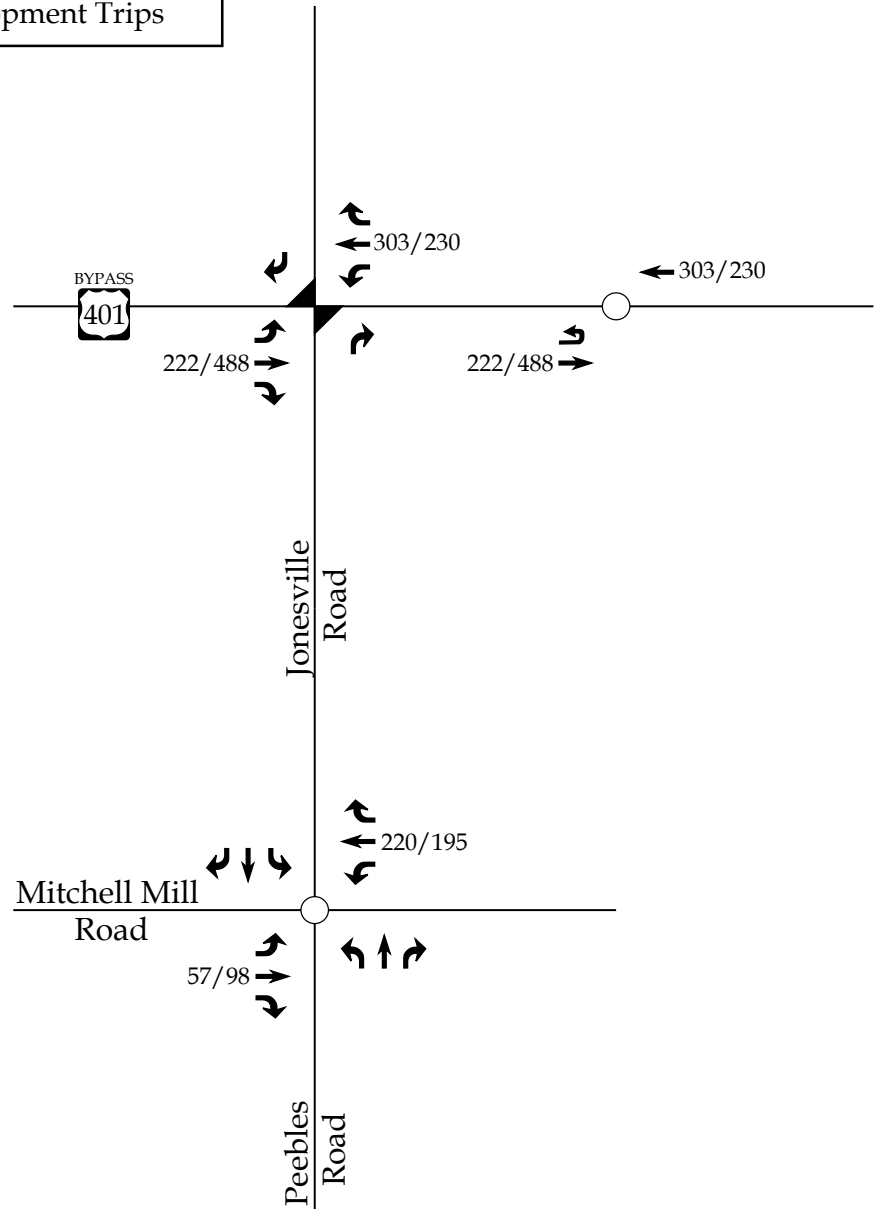
2027 Projected
Peak Hour Traffic

Scale: Not to Scale

Figure 5

LEGEND

- Unsignalized Intersection
- ◼ Left-Over Intersection
- X / Y → Weekday AM / PM Peak Hour Adjacent Development Trips



Hills at Harris Creek
Rolesville, NC

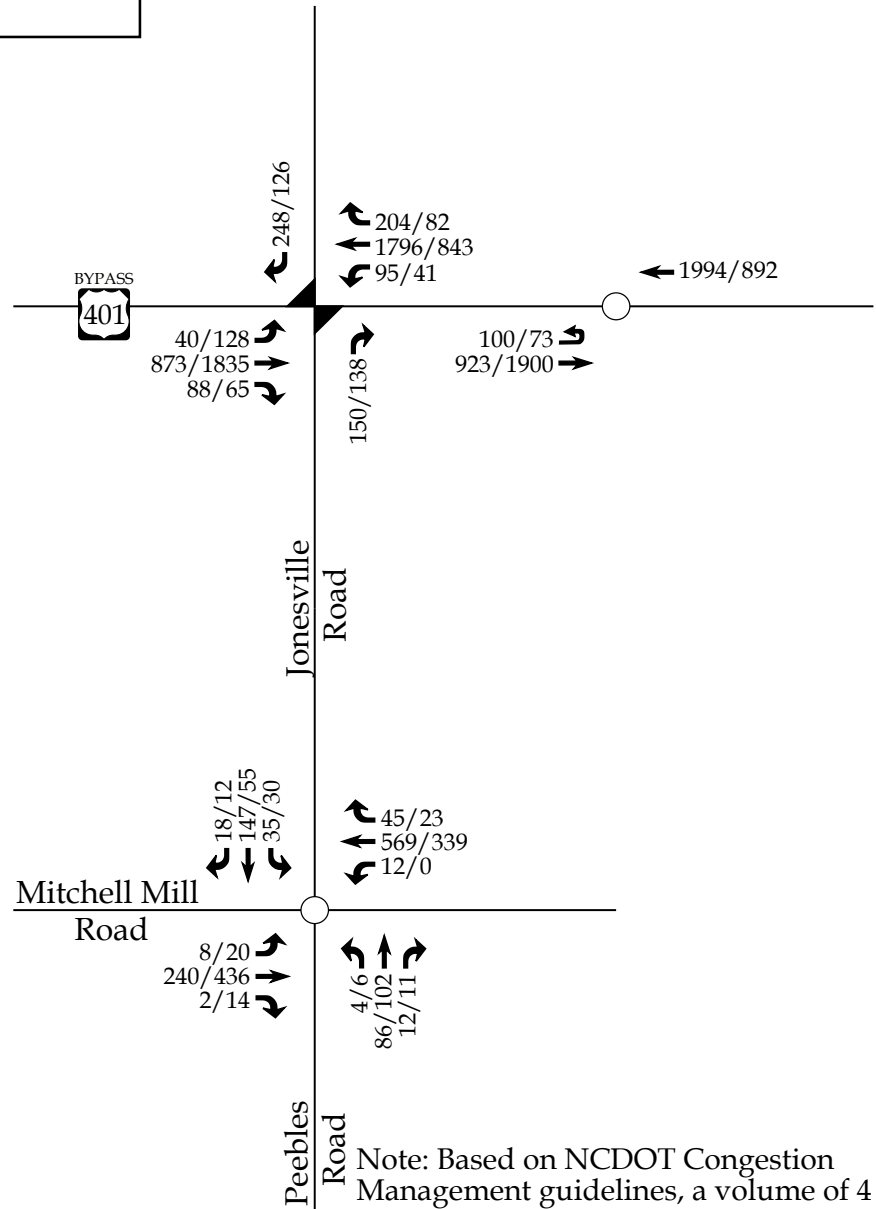
Peak Hour Adjacent
Development Trips

Scale: Not to Scale

Figure 6

LEGEND

- Unsignalized Intersection
- ◼ Left-Over Intersection
- X / Y → Weekday AM / PM Peak Hour Traffic



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.



Hills at Harris Creek
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 155 single-family homes, 115 townhomes, and a 12,000 sq. ft. day care center. 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)	155 DU	1,510	28	83	111	95	55	150
Single-Family Attached Housing (220)	115 DU	812	14	45	59	44	26	70
Day Care Center (565)	12 KSF	572	70	62	132	63	70	133
Total Trips		2,894	112	190	302	202	151	353
<i>Pass-By Trips: Day Care Center (44% PM)</i>			-	-	-	-30	-30	-60
Total Primary Trips			112	190	302	172	121	293

It is estimated that the proposed development will generate approximately 2,894 total site trips on the roadway network during a typical 24-hour weekday period. Of the daily traffic volume, it is anticipated that 302 trips (112 entering and 190 exiting) will occur during the weekday AM peak hour and 353 trips (202 entering and 151 exiting) will occur during the weekday PM peak hour.

Pass-by trips were also taken into consideration in this study. Pass-by trips are made by the traffic already using the adjacent roadway, entering the site as an intermediate stop on their way to another destination. Pass-by trips are expected to account for approximately 60 trips (30 entering and 30 exiting) during the weekday PM peak hour. It should be noted that the

pass-by trips were balanced, as it is likely that these trips would enter and exit in the same hour.

The total primary site trips are the calculated site trips after the reduction for pass-by trips. There are anticipated to be approximately 302 primary site trips (112 entering and 190 exiting) during the weekday AM peak hour and 293 primary site trips (172 entering and 121 exiting) during the weekday PM peak hour.

4.2. Site Trip Distribution and Assignment

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

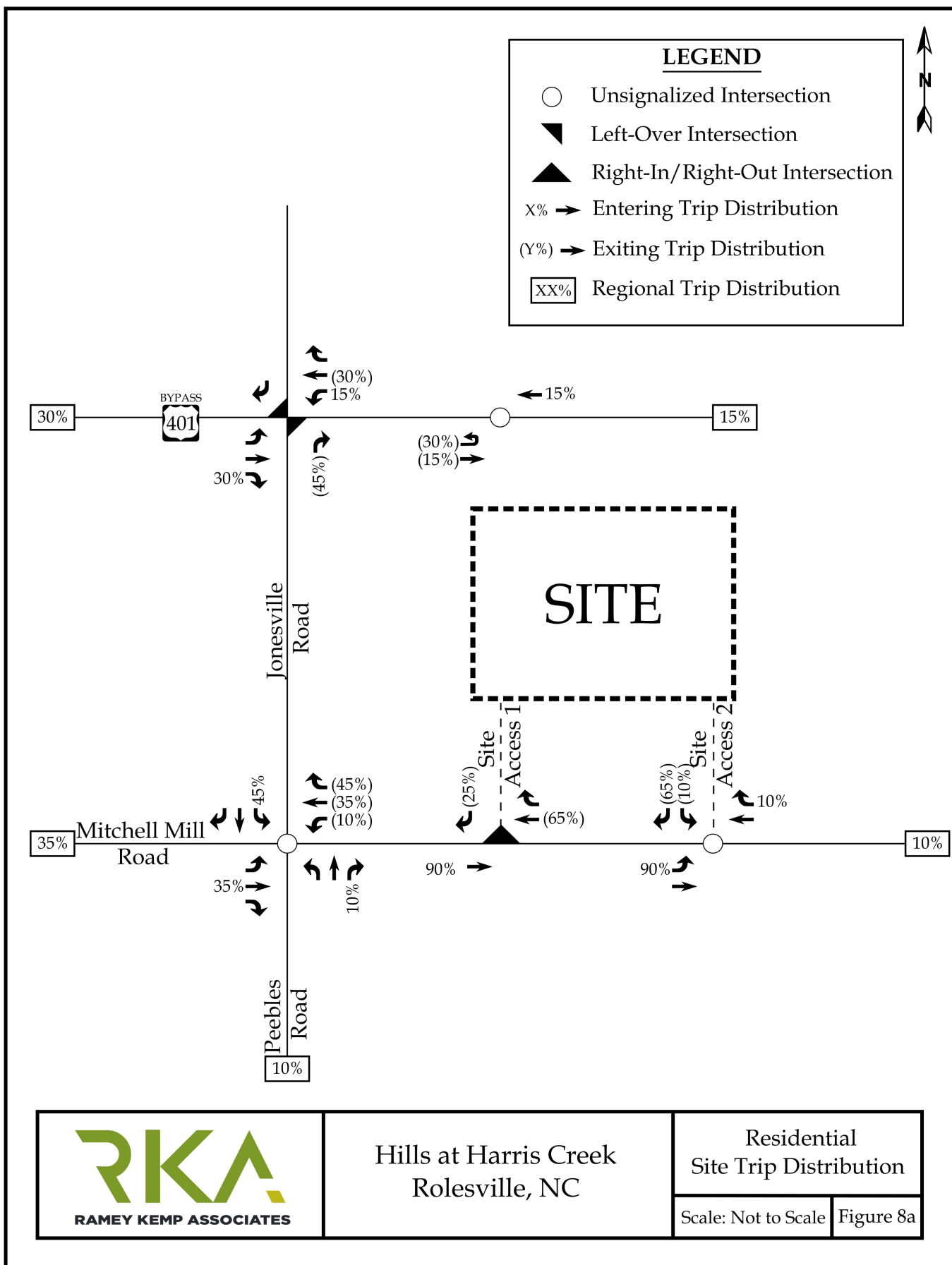
It is estimated that site trips will be regionally distributed as follows:

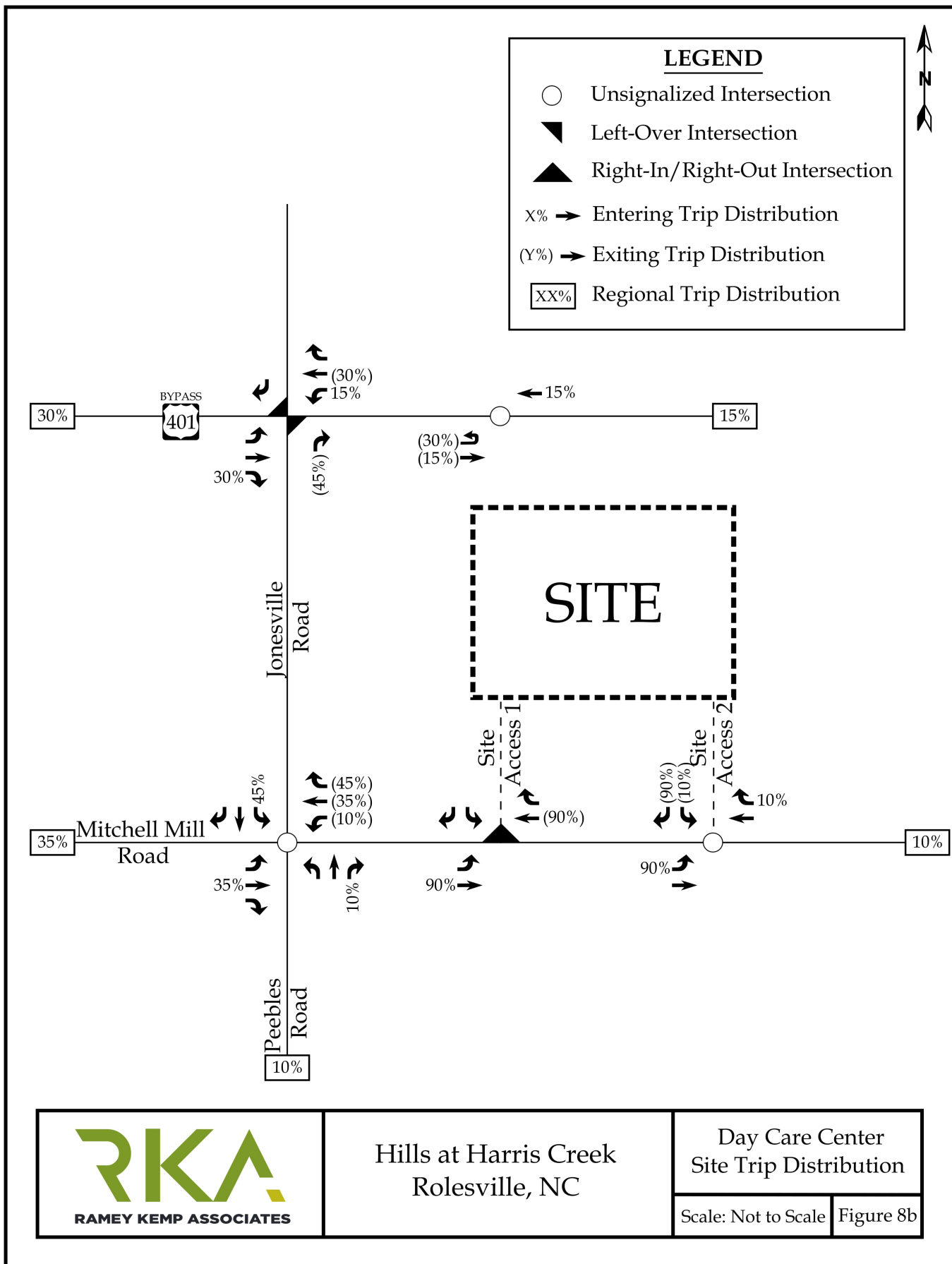
- 30% to/from the west via US 401 Bypass
- 15% to/from the east via US 401 Bypass
- 10% to/from the south via Peebles Road
- 35% to/from the west via Mitchell Mill Road
- 10% to/from the east via Mitchell Mill Road

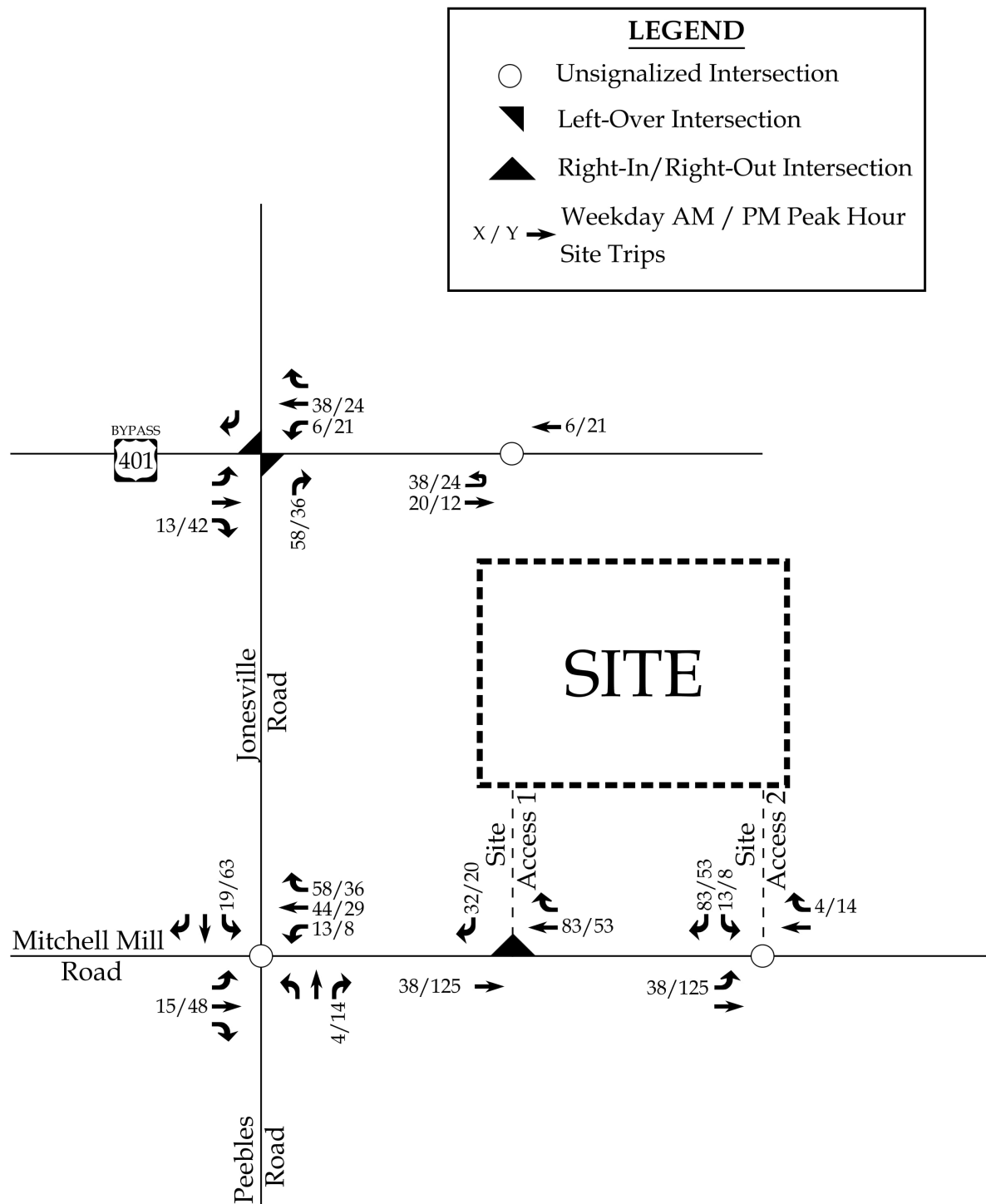
The residential site trip distribution is shown in Figure 8a and the day care center site trip distribution is shown in Figure 8b. Refer to Figures 9a and 9b for the residential site trip assignment and day care center site trip assignment, respectively.

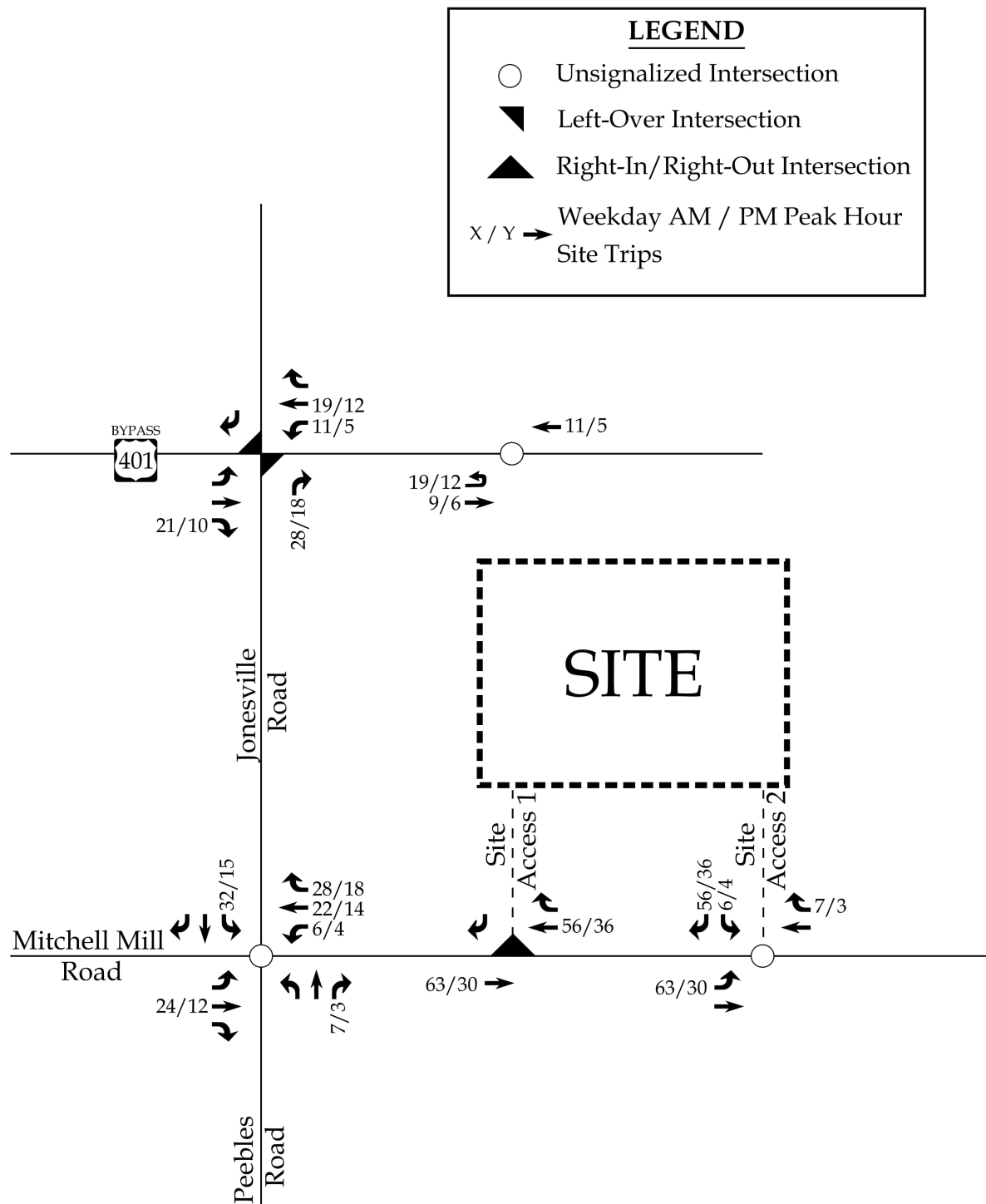
The pass-by site trips were distributed based on existing traffic patterns with consideration given to the proposed driveway access and site layout. Refer to Figure 10 for the pass-by site trip distribution. Pass-by site trips are shown in Figure 11.

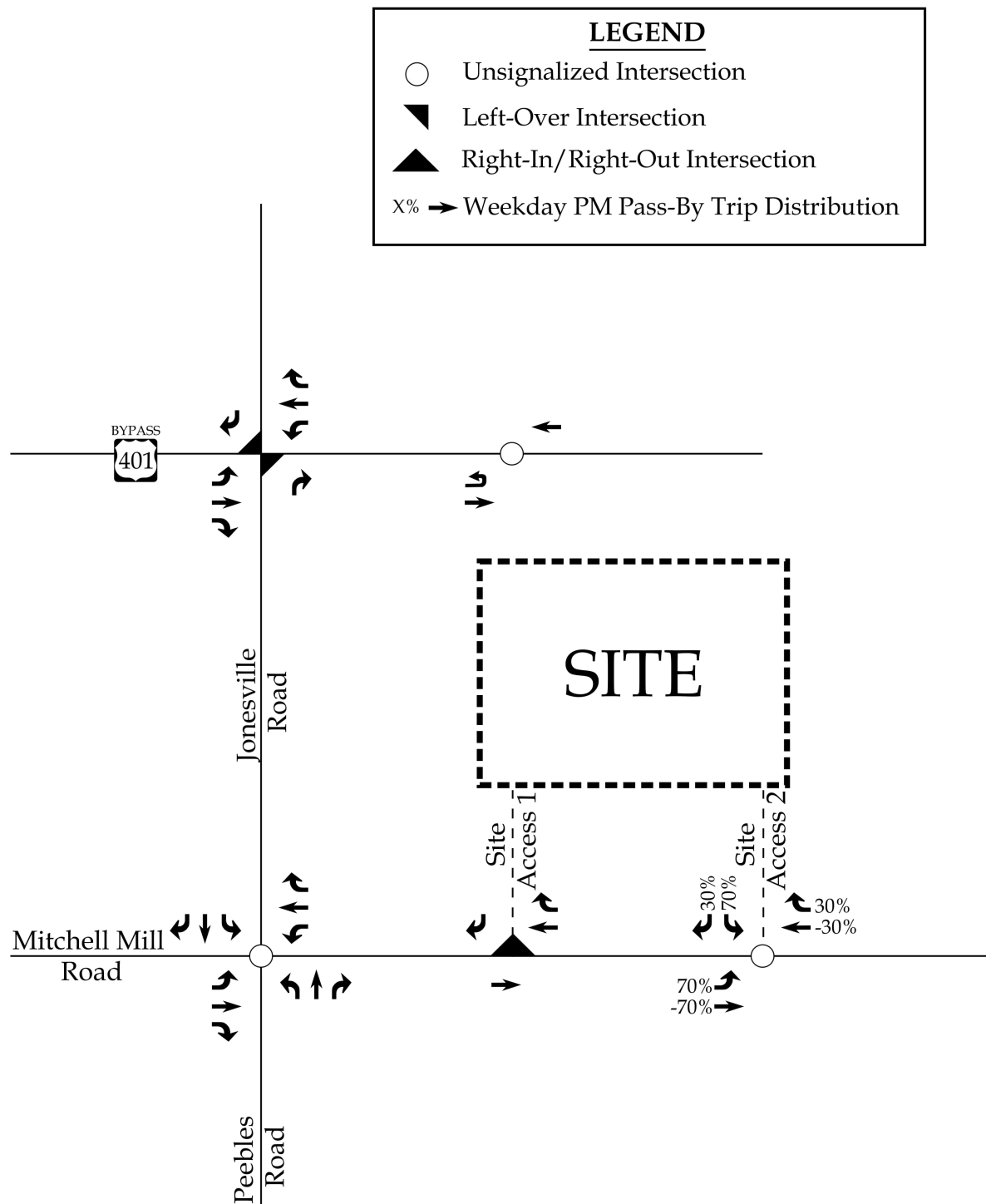
The total site trips were determined by adding the primary site trips and the pass-by site trips. Refer to Figure 12 for the total peak hour site trips at the study intersections.

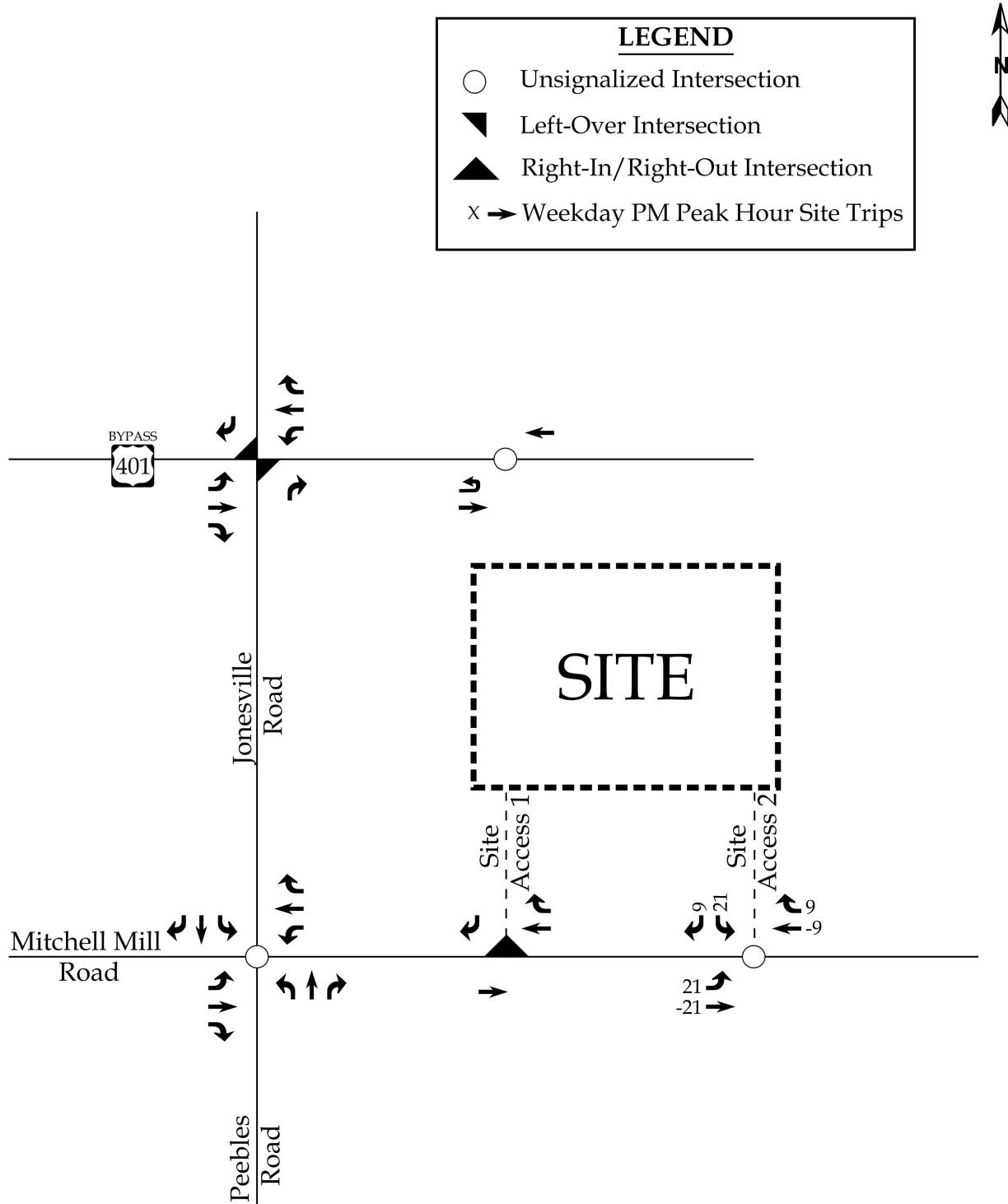








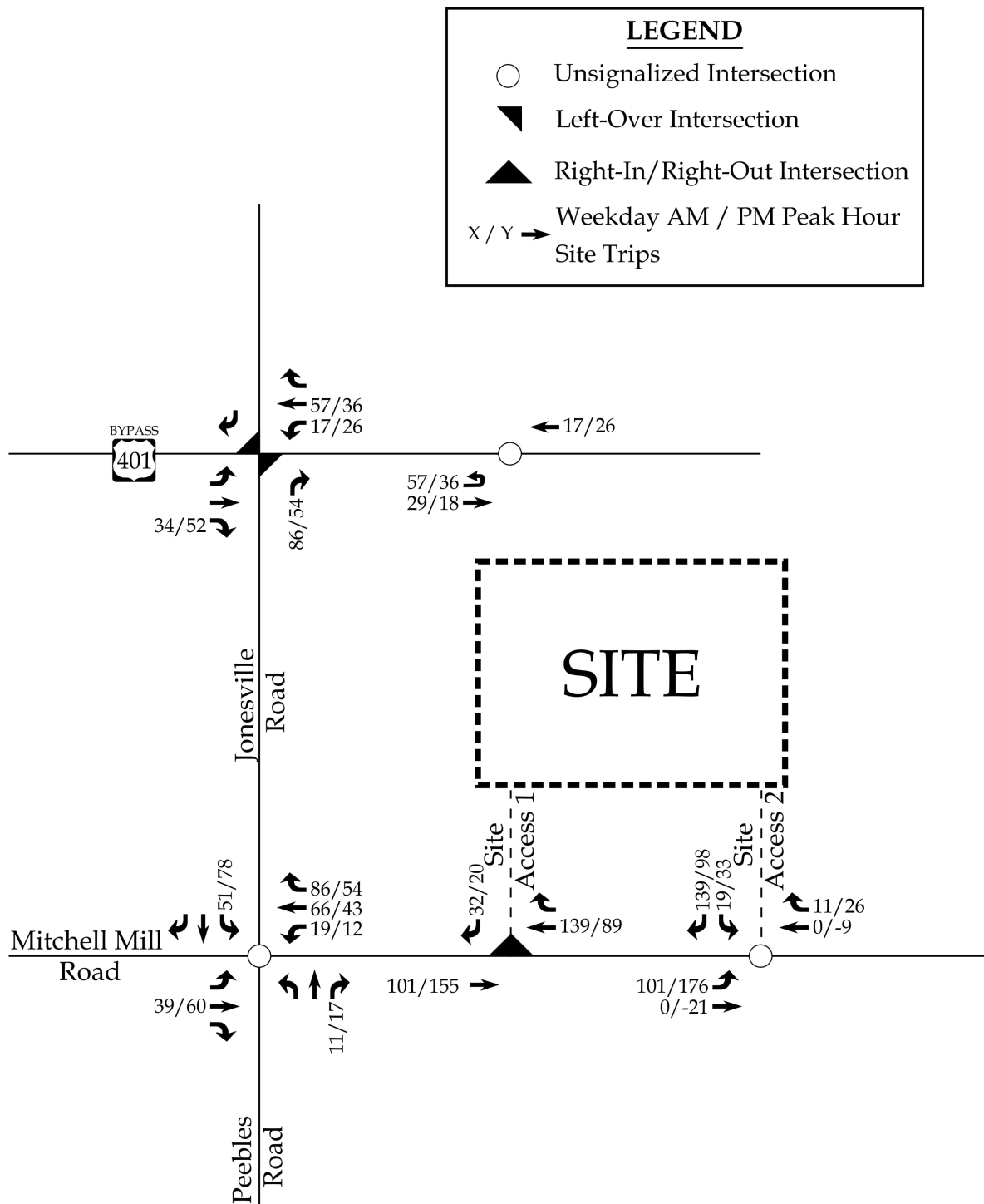




Hills at Harris Creek
Rolesville, NC

Pass-By Site
Trip Assignment

Scale: Not to Scale Figure 11



Hills at Harris Creek
Rolesville, NC

Total Site Trip
Assignment

Scale: Not to Scale Figure 12

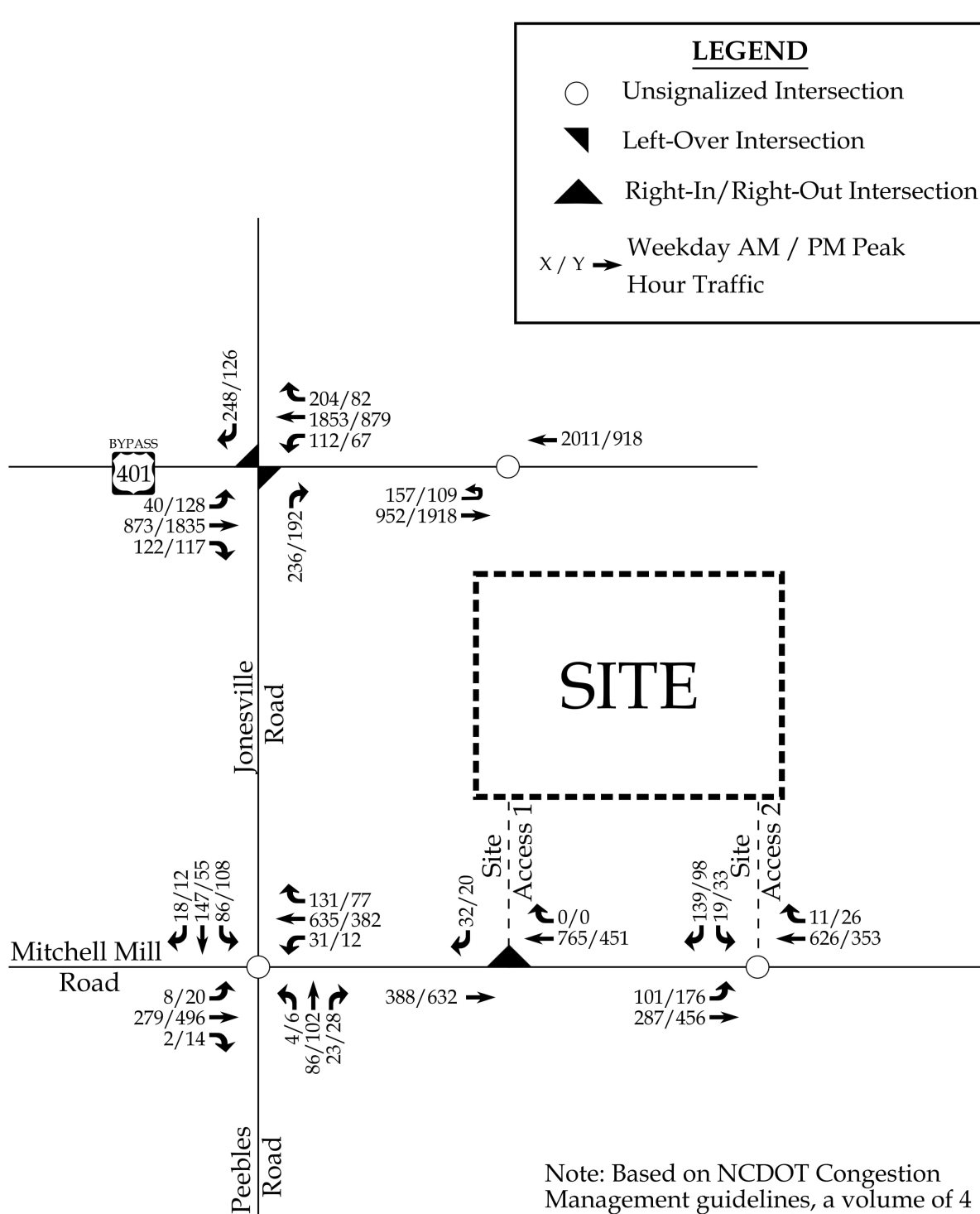
5. 2027 BUILD TRAFFIC CONDITIONS

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 13 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.



Hills at Harris Creek
Rolesville, NC

2027 Build
Peak Hour Traffic

Scale: Not to Scale Figure 13

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 B ²	N/A	-- F ¹ E 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 C 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

*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 B/C) 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 5% of the total traffic at this intersection during both the weekday AM and PM peak hours. The proposed development is expected to account for approximately 36% and 28% of the overall northbound approach traffic 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 both the weekday AM and PM peak hours 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 northbound right-turn movement demand is expected to 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	E ¹ --	N/A	B ¹ --	N/A
2027 Build	EB* WB	1 UT 2 TH	F ¹ --	N/A	B ¹ --	N/A

*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 E).

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 B during the weekday PM peak hour. It should be noted that the proposed development is expected to account for approximately 3% of the total traffic at this intersection during the weekday AM and PM peak hours. The proposed development is expected to account for approximately 36% and 33% of the overall northbound approach traffic 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 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 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 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-TH-RT 1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT	C ¹ F ¹ B ¹ B ¹	F (51)	C ¹ C ¹ B ¹ B ¹	C (19)
2027 Build	EB WB NB SB	1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT	C ¹ F ¹ B ¹ C ¹	F (142)	F ¹ E ¹ C ¹ C ¹	F (53)
2027 Build - Improved	EB WB NB SB	1 LT-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 (103)	F ¹ D ¹ C ¹ B ¹	F (61)

Improvements by the developer are shown in bold.

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

Capacity analysis of 2022 existing and 2027 no-build traffic conditions indicates that the intersection is expected to operate at an overall 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 traffic conditions (LOS F). Under 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 19% and 20% of the total traffic at this intersection during the weekday AM and PM peak hours, respectively. The proposed development is expected to account for approximately 13% and 11% of the overall eastbound approach traffic and 21% and 23% of the overall westbound approach at this intersection during the weekday AM and PM peak hours, respectively.

Turn lanes were considered at this intersection in order to mitigate the proportional impact that the proposed site traffic is expected to have at this intersection and to improve overall operations. An exclusive left-turn lane on the southbound approach (Jonesville Road) and right-turn lane on the westbound approach (Mitchell Mill Road) are recommended by the developer. It should be noted that an exclusive southbound left-turn lane was also identified in the 5109 Mitchell Mill Road TIA. With these improvements, the intersection is expected to continue operating at an overall LOS F during the weekday AM and PM peak hours.

It should be noted that the overall intersection delay is expected to increase during the weekday PM peak hour as a result of the recommended improvements to the southbound and westbound approaches. This increase in delay is attributable to minor increases in delays for all approaches caused by adding additional lanes to an all-way stop-controlled intersection. No feasible improvements other than signalization would be expected to decrease delays further at this intersection.

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 the weekday AM peak hour under 2027 no-build traffic conditions and both the weekday AM and PM peak hours under 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. Mitchell Mill Road and Site Access 1

The proposed intersection of Mitchell Mill Road and Site Access 1 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 Mitchell Mill Road and Site Access 1

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 WB SB	1 TH 1 TH-RT 1 RT	-- -- C ²	N/A	-- -- B ²	N/A

Improvements to lane configurations by the developer are shown in bold.

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 minor-street approach is expected to operate at LOS C or better during the weekday AM and PM peak hours.

Based on the estimated low volume of right-turn movements into the proposed development at this intersection, an exclusive right-turn lane is not recommended.

7.5. Mitchell Mill Road and Site Access 2

The proposed intersection of Mitchell Mill Road and Site Access 2 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 Mitchell Mill Road and Site Access 2

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 WB SB	1 LT, 1 TH 1 TH, 1 RT 1 LT-RT	A ¹ -- C ²	N/A	A ¹ -- C ²	N/A

Improvements to lane configurations by the developer are shown in bold.

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 C 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*. The policy states that turn lanes should be considered on roads that carry at least 4,000 vehicles per day. Mitchell Mill Road is expected to carry more than 4,000 vehicles per day. Based on previous coordination with NCDOT, an eastbound left turn lane and a westbound right turn lane is recommended to be constructed by the developer on Mitchell Mill Road at Site Access 2. Refer to Appendix I for a copy of the turn lane warrants.

8. CONCLUSIONS

This Traffic Impact Analysis was conducted to determine the potential traffic impacts of the proposed Hills at Harris Creek development located north of Mitchell Mill Road, west of Manly Farm Road, and east of Gro Peg Lane in Rolesville, North Carolina. The development is expected to consist of 155 single-family homes, 115 townhomes, and a 12,000 sq. ft. day care center and to be built-out in 2027. Site access is proposed via one (1) full-movement and one (1) right-in/right-out driveway connection along Mitchell Mill Road.

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 302 primary trips (112 entering and 190 exiting) during the weekday AM peak hour and 293 primary trips (172 entering and 121 exiting) during the weekday PM peak hour.

Rolesville Community Transportation Plan

Per the Rolesville Community Transportation Plan (CTP), the ultimate cross-section of Mitchell Mill Road is identified as a 4-lane median-divided roadway. It is recommended that the proposed development widen one-half section of Mitchell Mill Road along the site frontage in accordance with the Town's CTP.

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 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 NCDOT and the Town.

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 NCDOT and the Town.

Mitchell Mill Road and Jonesville Road / Peebles Road

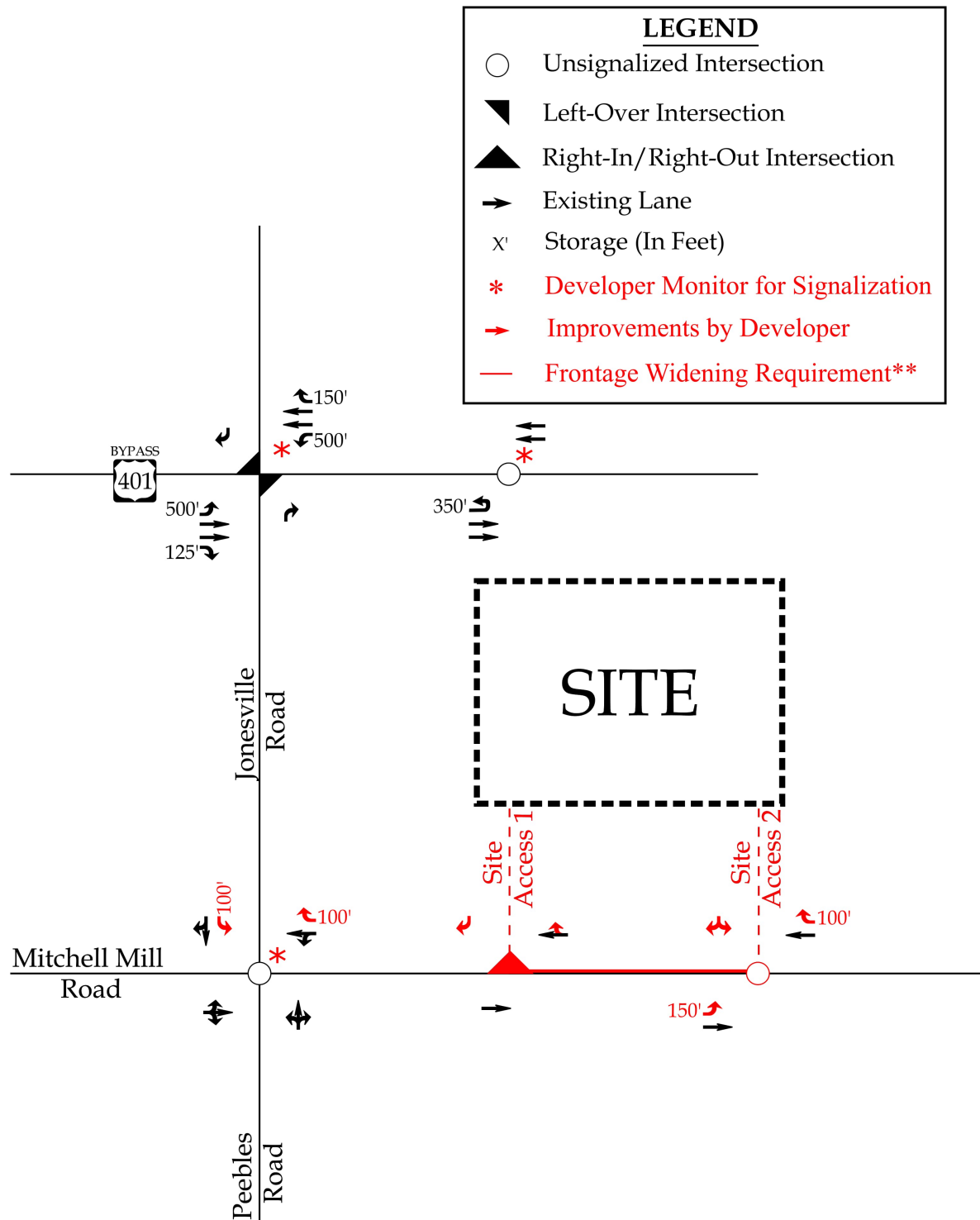
- Construct a southbound (Jonesville Road) left-turn lane with at least 100 feet of storage and appropriate decel and taper.
 - It should be noted that this improvement was also identified by the 5109 Mitchell Mill Road TIA.
- Construct a westbound (Mitchell Mill Road) right-turn lane with at least 100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

Mitchell Mill Road and Site Access 1

- Construct the southbound approach (Site Access 1) as a right-in/right-out with one ingress lane and one egress lane.
- Provide stop-control for the southbound approach (Site Access 1).
- Construct a concrete median on Mitchell Mill Road that restricts access to right-in/right-out.

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



Hills at Harris Creek
Rolesville, NC

Recommended Lane
Configurations

Scale: Not to Scale Figure 14

APPENDIX A

SCOPING DOCUMENTATION

Andrew Eagle

From: Warren, Jeremy L <jlwarren@ncdot.gov>
Sent: Tuesday, May 23, 2023 12:17 PM
To: Andrew Eagle; Nolfo, Matthew J
Cc: Jessica McClure; Daniel Reisfeld; Elabarger, Michael S; Gruber, Meredith; Jason Pfister; Lineberger, Nicholas C; Darnell, Trevor S
Subject: RE: [External] RE: Hills at Harris Creek

Andrew,
We would prefer to see an updated TIA with the new volumes and the RIRO.
Thanks,

Jeremy Warren, P.E.
Assistant Division Maintenance Engineer
Division 5
North Carolina Department of Transportation

jlwarren@ncdot.gov

4009 District Drive
Raleigh, NC 27607



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From: Andrew Eagle <AEagle@rameykemp.com>
Sent: Monday, May 22, 2023 9:34 AM
To: Warren, Jeremy L <jlwarren@ncdot.gov>; Nolfo, Matthew J <mjnolfo@ncdot.gov>
Cc: Jessica McClure <jmccclure@rameykemp.com>; Daniel Reisfeld <dreisfeld@rameykemp.com>; Elabarger, Michael S <michael.elabarger@rolesville.nc.gov>; Gruber, Meredith <meredith.gruber@rolesville.nc.gov>; Jason Pfister <jason@ellisdevgroup.com>
Subject: RE: [External] RE: Hills at Harris Creek

CAUTION: External email. Do not click links or open attachments unless verified. Report suspicious emails with the Report Message button located on your Outlook menu bar on the Home tab.

Jeremy/Matt,

It's my understanding NCDOT prefers Access A to be RIRO. We can update the TIA to match this configuration. Also, the developer now plans the commercial area to be 12,000 square feet of Day Care instead of 14,000 square feet of retail. This results in 30 more entering trips and 20 more exiting trips during the AM peak hour when compared to the original TIA. During the PM peak hour the Day Care scenario results in 11 fewer entering trips and 4 more exiting trips.

Does NCDOT want the TIA updated to reflect the Day Care trip generation as well as the RIRO?

Andrew Eagle, PE, PTOE
Senior Traffic Engineering Project Manager
D 704 220 6847 | C 704 467 0325



From: Andrew Eagle
Sent: Monday, May 8, 2023 2:59 PM
To: Warren, Jeremy L <jlwarren@ncdot.gov>; Nolfo, Matthew J <mjnolfo@ncdot.gov>
Cc: Jessica McClure <JMCClure@rameykemp.com>; Daniel Reisfeld <dreisfeld@rameykemp.com>; Elabarger, Michael S <michael.elabarger@rolesville.nc.gov>; Gruber, Meredith <meredith.gruber@rolesville.nc.gov>; Jason Pfister <jason@ellisdevgroup.com>
Subject: RE: [External] RE: Hills at Harris Creek

The link below can be used to download the TIA, site plan, and Synchro files. Please review and let me know if you have any questions/comments. Thank you!

☐ [20498-0005 - Hills at Harris Creek - 05-08-2023](#)

Andrew Eagle, PE, PTOE
Senior Traffic Engineering Project Manager
D 704 220 6847 | C 704 467 0325



From: Warren, Jeremy L <jlwarren@ncdot.gov>
Sent: Friday, April 14, 2023 8:53 AM
To: Andrew Eagle <AEagle@rameykemp.com>; Nolfo, Matthew J <mjnolfo@ncdot.gov>
Cc: Jessica McClure <JMCClure@rameykemp.com>; Daniel Reisfeld <dreisfeld@rameykemp.com>
Subject: RE: [External] RE: Hills at Harris Creek

The study area should be the same so an updated TIA with an explanation should suffice.

Jeremy Warren, P.E.
Assistant Division Maintenance Engineer
Division 5
North Carolina Department of Transportation

jlwarren@ncdot.gov

4009 District Drive
Raleigh, NC 27607



From: Andrew Eagle <AEagle@rameykemp.com>
Sent: Friday, April 14, 2023 8:37 AM
To: Warren, Jeremy L <jlwarren@ncdot.gov>; Nolfo, Matthew J <mjnolfo@ncdot.gov>
Cc: Jessica McClure <jmcclure@rameykemp.com>; Daniel Reisfeld <dreisfeld@rameykemp.com>
Subject: [External] RE: Hills at Harris Creek

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Jeremy,

NCDOT approved the Hills at Harris Creek TIA in June of last year. The site plan has been changed, resulting in less density and fewer trips. The Town of Rolesville wants the TIA updated to match the latest site plan. Do you want an updated MOU, or can we revise the TIA and submit it via email with an explanation of the changes?

...and a heads up due to the similar names, this is a different project from Harris Creek Farm. NCDOT recently approved the MOU for that one on April 3.

Thanks,

Andrew Eagle, PE, PTOE
Senior Traffic Engineering Project Manager
D 704 220 6847 | C 704 467 0325



From: Warren, Jeremy L <jlwarren@ncdot.gov>
Sent: Friday, June 17, 2022 1:47 PM
To: Tucker Fulle <tfulle@rameykemp.com>
Cc: Nolfo, Matthew J <mjnolfo@ncdot.gov>; Brennan, Sean P <spbrennan@ncdot.gov>
Subject: FW: Hills at Harris Creek

Please see congestions comments.

Jeremy Warren, P.E.
District Engineer
Division 5, District 1
North Carolina Department of Transportation

919 733 3213 office
jlwarren@ncdot.gov

4009 District Drive
Raleigh, NC 27607



Email correspondence to and from this address is subject to the North Carolina Public Records Law and may be disclosed to third parties.

From: Walker, Braden M <bmwalker1@ncdot.gov>

Sent: Thursday, June 16, 2022 9:32 AM

To: Warren, Jeremy L <jlwarren@ncdot.gov>

Cc: Lacy, Kevin <ijklacy1@ncdot.gov>; Brennan, Sean P <spbrennan@ncdot.gov>; Grant, John H <jhgrant@ncdot.gov>; Keilson, David P <dpkeilson@ncdot.gov>; Ishak, Doumit Y <dishak@ncdot.gov>; Bunting, Clarence B <cbunting@ncdot.gov>; Jones, Brandon H <bhjohnes@ncdot.gov>; Parrott, Tracy N <tnparrott@ncdot.gov>; Holmes, Benjamin W <bwholmes@ncdot.gov>; Mcneal, Douglas R <dmcneal@ncdot.gov>; Nolfo, Matthew J <mjnolfo@ncdot.gov>

Subject: Hills at Harris Creek

Attached is a PDF copy of our final review letter for Hills at Harris Creek. This letter is only being distributed electronically and should be considered as the official documentation. If you have any questions, please contact me or Clarence Bunting.

Thank you,

Braden M. Walker, PE.

Congestion Management Project Design Engineer
Traffic Management Unit
North Carolina Department of Transportation

919 814 5078 office
bmwalker1@ncdot.gov

750 N. Greenfield Parkway
Garner, NC 27529



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Email correspondence to and from this sender is subject to the N.C. Public Records Law and may be disclosed to third parties.

RAMEY KEMP ASSOCIATES

TOGETHER WE ARE LIMITLESS



T 919 872 5115

5808 Faringdon Pl,
Raleigh, NC 27609

March 24, 2022

Meredith Gruber, PLA, AICP
Town of Rolesville - Planning Director
PO Box 250
502 Southtown Circle
Rolesville, NC 27571
meredith.gruber@rolesville.nc.gov
[Sent via Email]

Reference: Hills at Harris Creek
Rolesville, North Carolina

Subject: Memorandum of Understanding for TIA Report

Dear Ms. Gruber:

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 Hills at Harris Creek development in Rolesville, North Carolina. The proposed development is to be located north of Mitchell Mill Road, west of Manly Farm Road, and east of Gro Peg Lane in Rolesville, NC. The development is expected to consist of 211 single-family homes, 109 townhomes, and 3.626 acres of commercial development. This MOU reflects the assumptions outlined during the initial coordination between Ramey Kemp Associates (RKA), the Town of Rolesville (Town), and the North Carolina Department of Transportation (NCDOT). 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 along Mitchell Mill Road. Refer to the attachments for a copy of the preliminary site plan.

The proposed development, anticipated to be completed in 2027, is expected to consist of 211 single-family homes, 109 townhomes, and 3.626 acres of commercial development. It should be noted that the commercial development land use(s) and intensity are not known at this time. Therefore, 7,000 square feet (sq. ft.) of general retail space per acre of land [approximately 25,400 sq. ft.] was assumed for the commercial development in this study. The proposed development is assumed to consist of the following land uses:

- 211 single-family homes
- 109 townhomes
- 25,400 sq. ft. of general retail



Study Area

Based on a coordination with NCDOT and Town staff, 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)
- Mitchell Mill Road and Site Driveways (2)

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

Background Traffic Volumes

Based on coordination with NCDOT and the Town, background traffic volumes will be determined by projecting 2022 existing traffic volumes to the year 2027 using a 2% annual growth rate. Additionally, it was determined that the following adjacent developments are to be included in this study:

- Cobblestone Crossing Mixed-Use
- Young Street PUD
- Wheeler Tract
- Louisbury Road Assemblage
- Kalas / Watkins Family Property

Future Roadway Improvements

Based on coordination with the Town and NCDOT, it was determined that 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)	211 DU	2,010	38	109	147	126	74	200
Multi-Family Home (Low-Rise) (220)	109 DU	770	14	43	57	42	25	67
Retail (<40 KSF) (822)	25.4* KSF	1,300	32	21	53	75	76	151
Total Trips		4,080	84	173	257	243	175	418
<i>Internal Capture (2% AM, 1% PM)**</i>			-2	-3	-5	-5	-3	-8
Total External Trips			82	170	252	238	172	410
<i>Pass-By Trips: Shopping Center (34% PM)</i>			-	-	-	-25	-25	-50
Total Primary Trips			82	170	252	213	147	360

*Since the commercial development is unknown at this time, 7,000 SF of general retail space per acre of land [3.626 acres in total] was assumed for this land use.

**Utilizing methodology contained in the NCHRP Report 684.

It is estimated that the proposed development will generate approximately 4,080 site trips on the roadway network during a typical 24-hour weekday period. Of the daily traffic volume, it is anticipated that 257 trips (84 entering and 173 exiting) will occur during the weekday AM peak hour and 418 trips (243 entering and 175 exiting) will occur during the weekday PM peak hour.

Internal capture of trips between the retail and residential land uses was considered in this study. Internal capture is the consideration for trips that will be made within the site between different land uses, so the vehicle technically never leaves the internal site but can still be considered as a trip to that specific land use. Based on NCHRP Report 684 methodology, weekday AM and PM peak hour internal capture rates of 2% and 1%, respectively, were applied to the trips generated from the development. The internal capture reductions are expected to account for approximately 5 trips (2 entering and 3 exiting) during the weekday AM peak hour and 8 trips (5 entering and 3 exiting) during the weekday PM peak hour. Refer to the attached NCHRP internal capture reports for reference.

Pass-by trips will also be taken into consideration in this study. Pass-by trips are made by the traffic already using the adjacent roadway, entering the site as an intermediate stop on their way to another destination. Pass-by percentages are applied to site trips after adjustments for internal capture. Pass-by trips are expected to account for approximately 50 trips (25 entering and 25 exiting) during the

weekday PM peak hour. It should be noted that the pass-by trips were balanced, as it is likely that these trips would enter and exit in the same hour.

The total primary trips are the calculated site trips after the reduction for internal capture and pass-by trips. Primary site traffic is expected to generate approximately 252 trips (82 entering and 170 exiting) during the weekday AM peak hour, and 360 trips (213 entering and 147 exiting) 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

Commercial

- 25% 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
- 40% to/from the west via Mitchell Mill Road
- 10% to/from the east via Mitchell Mill Road

Refer to the attached site trip distribution figures.

Analysis Scenarios

All capacity analyses will be performed utilizing Synchro (Version 10.3). 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.

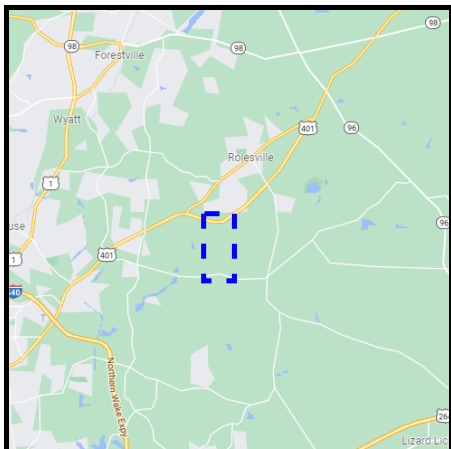
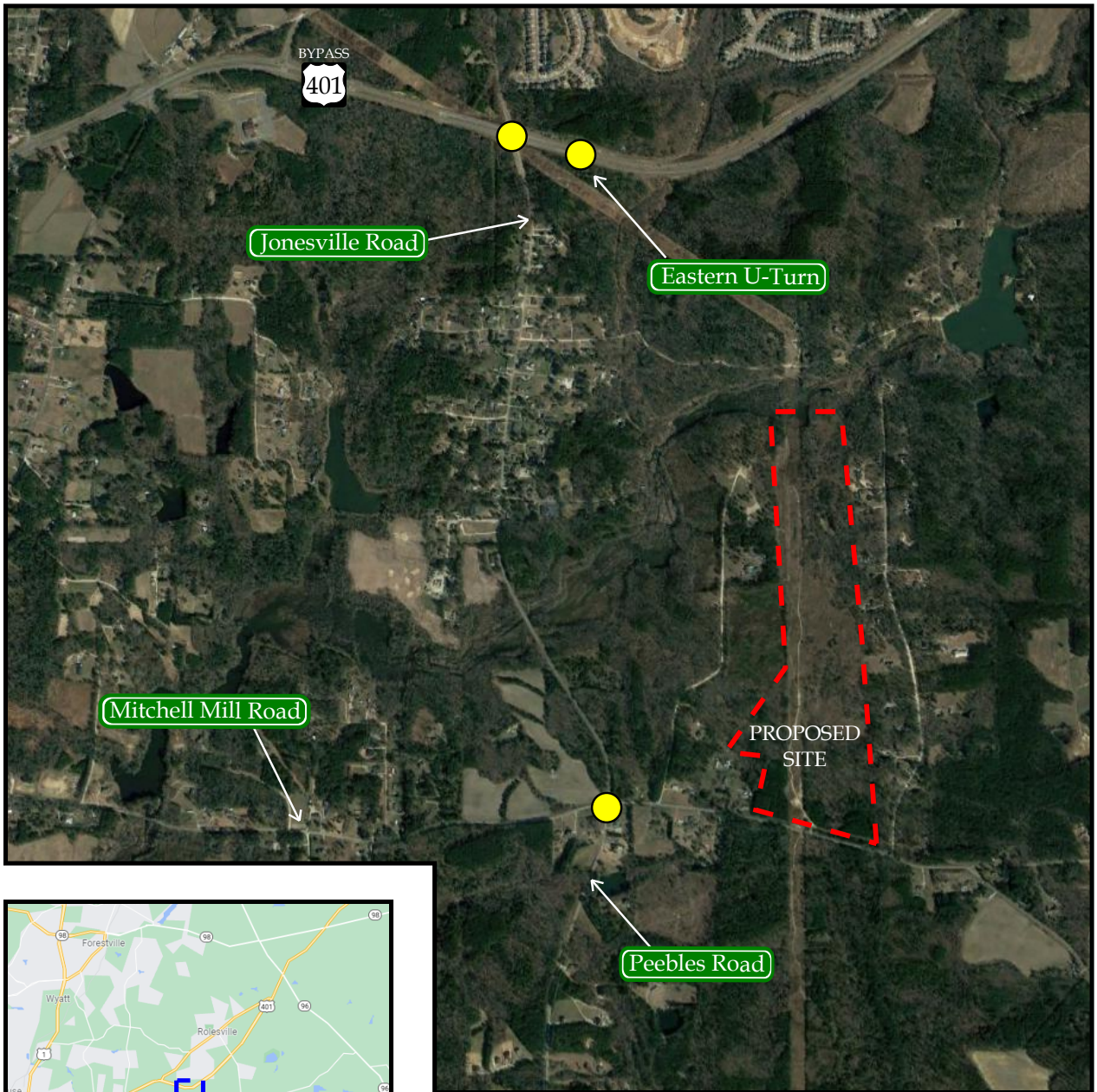
If you find this memorandum of understanding acceptable, please let me know so that we may include it in the TIA report. If you have any questions or concerns, please do not hesitate to contact me.

Sincerely,
Ramey Kemp Associates,



Michael Karpinski, P.E.
Traffic Engineering Project Manager

Attachments: Site Location Map
 Site Plan
 2022 Existing Traffic Volumes Figure
 NCHRP 684 Internal Capture Reports
 Proposed Site Trip Distribution Figures



LEGEND

- Proposed Site Location
- Study Intersection
- Study Area

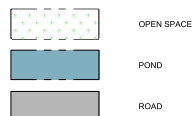


Hills at Harris Creek
Rolesville, NC

Site Location Map

Scale: Not to Scale

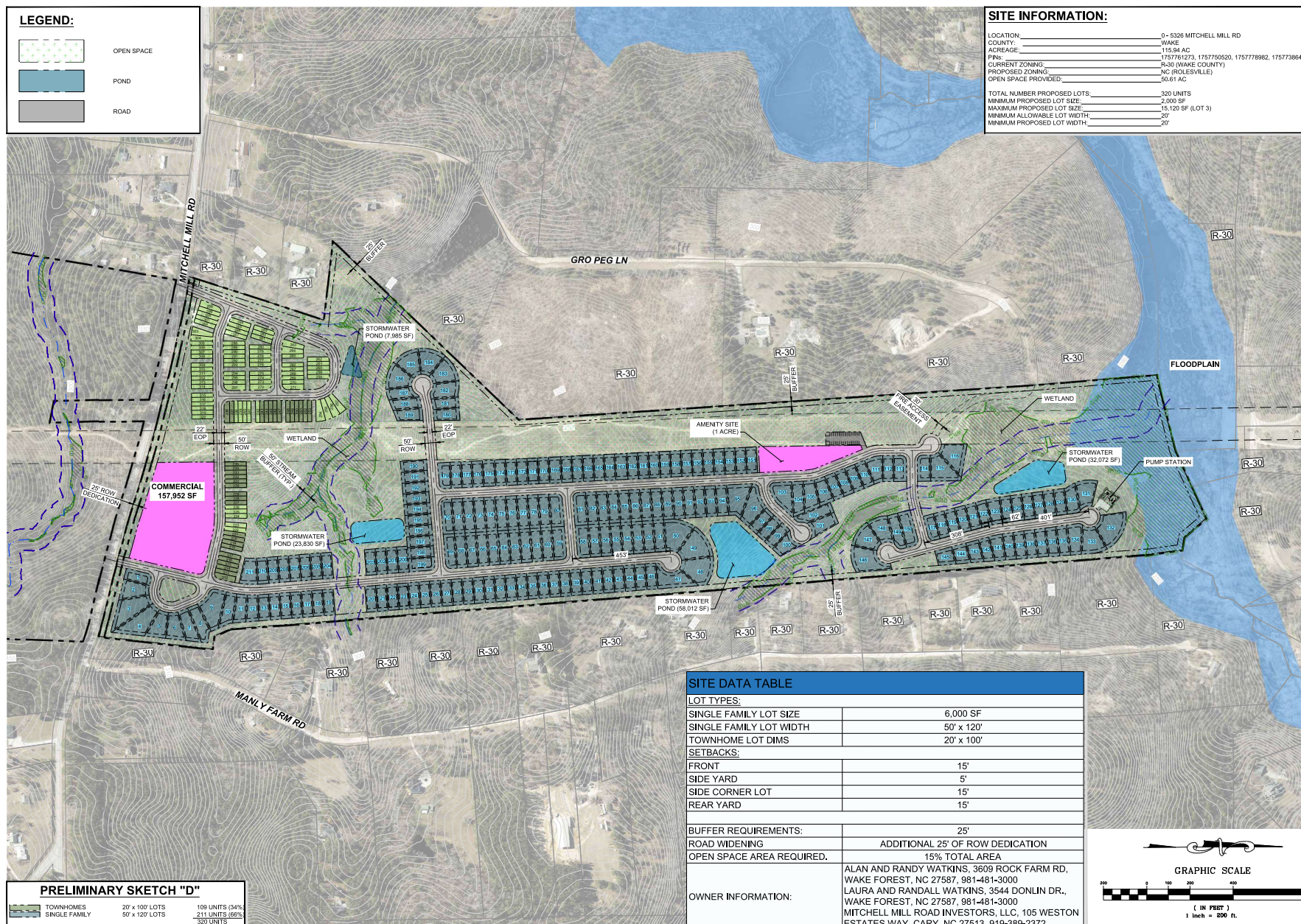
LEGEND:



OPEN SPACE
POND
ROAD

SITE INFORMATION:

LOCATION: 0-5326 MITCHELL MILL RD
COUNTY: WAKE
ACREAGE: 115.84 AC
PIN: 1757761273, 1757760520, 1757778982, 1757738648
CURRENT ZONING: R-30 (WAKE COUNTY)
PROPOSED ZONING: NC (ROLESVILLE)
OPEN SPACE PROVIDED: 50.61 AC
TOTAL NUMBER PROPOSED LOTS: 320 UNITS
MINIMUM PROPOSED LOT SIZE: 2,000 SF
MAXIMUM PROPOSED LOT SIZE: 15,120 SF (LOT 3)
MINIMUM ALLOWABLE LOT WIDTH: 20'
MINIMUM PROPOSED LOT WIDTH: 20'



PRELIMINARY SKETCH "D"

TOWNHOMES	20' x 100' LOTS	108 UNITS (34%)
SINGLE FAMILY	50' x 120' LOTS	211 UNITS (66%)
		320 UNITS

SITE DATA TABLE

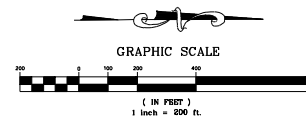
LOT TYPES:

SINGLE FAMILY LOT SIZE	6,000 SF
SINGLE FAMILY LOT WIDTH	50' x 120'
TOWNHOME LOT DIMS	20' x 100'
SETBACKS:	
FRONT	15'
SIDE YARD	5'
SIDE CORNER LOT	15'
REAR YARD	15'

BUFFER REQUIREMENTS:	25'
ROAD WIDENING	ADDITIONAL 25' OF ROW DEDICATION
OPEN SPACE AREA REQUIRED:	15% TOTAL AREA

OWNER INFORMATION:

ALAN AND RANDY WATKINS, 3609 ROCK FARM RD,
WAKE FOREST, NC 27587, 981-481-3000
LAURA AND RANDALL WATKINS, 3544 DONLIN DR.,
WAKE FOREST, NC 27587, 981-481-3000
MITCHELL MILL ROAD INVESTORS, LLC, 105 WESTON
ESTATES WAY, CARY, NC 27513, 919-389-2372



STRONGROCK
ENGINEERING GROUP
STRONG ROCK ENGINEERING GROUP, PLLC COMPANY LICENSE # P2/106
8801 FALLS OF NEUSE RD SUITE 100 RALEIGH, NC 27615 J.STRONG@STRONGENGINEERING.COM

STRONG ROCK PROJECT	DATE	AS SHOWN	DATE	AS SHOWN
SCALE	DATE	SCALE	DATE	SCALE
DESIGNED BY	DATE	DESIGNED BY	DATE	DESIGNED BY
DRAWN BY	DATE	DRAWN BY	DATE	DRAWN BY
CHECKED BY	DATE	CHECKED BY	DATE	CHECKED BY

ROLESVILLE - MITCHELL MILL - ELLIS
WAKE FOREST, WAKE COUNTY, NORTH CAROLINA
PRELIMINARY LAYOUT

DRAWING
SHEET

PROJECT NUMBER

LEGEND

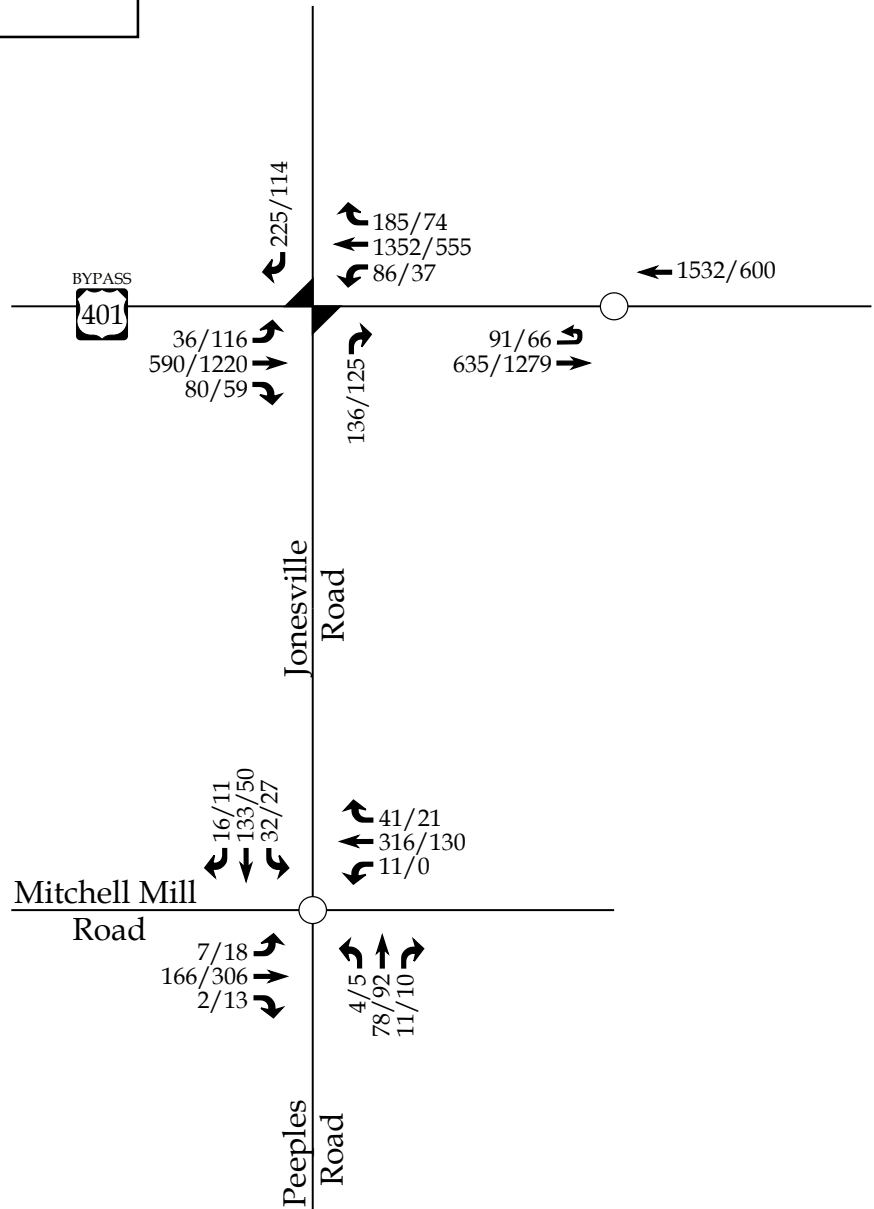


Unsignalized Intersection



Left-Over Intersection

X / Y → Weekday AM / PM Peak
Hour Traffic



RAMEY KEMP ASSOCIATES

Hills at Harris Creek
Rolesville, NC

2022 Existing
Peak Hour Traffic

Scale: Not to Scale

NCHRP 684 Internal Trip Capture Estimation Tool					
Project Name:	Hills at Harris Creek	Organization:	Ramey Kemp & Associates		
Project Location:	Rolesville, NC	Performed By:	TF		
Scenario Description:	AM Street Peak Hour	Date:	3/18/2022		
Analysis Year:	20xx Build	Checked By:			
Analysis Period:	AM Street Peak Hour	Date:			

Table 1-A: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips ³		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office						
Retail	822	25,400	sq.ft.		32	21
Restaurant						
Cinema/Entertainment						
Residential	210,220	211,109	units		52	152
Hotel						
All Other Land Uses ²						
				0	84	173

Table 2-A: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ. ⁴	% Transit	% Non-Motorized	Veh. Occ. ⁴	% Transit	% Non-Motorized
Office	1.10	0%	0%	1.10	0%	0%
Retail	1.10	0%	0%	1.10	0%	0%
Restaurant	1.10	0%	0%	1.10	0%	0%
Cinema/Entertainment	1.10	0%	0%	1.10	0%	0%
Residential	1.10	0%	0%	1.10	0%	0%
Hotel	1.10	0%	0%	1.10	0%	0%
All Other Land Uses ²	1.10	0%	0%	1.10	0%	0%

Table 3-A: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-A: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	0		0	0	1	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	2	0	0		0
Hotel	0	0	0	0	0	

Table 5-A: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	282	92	190
Internal Capture Percentage	2%	3%	2%
External Vehicle-Trips ⁵	251	81	170
External Transit-Trips ⁶	0	0	0
External Non-Motorized Trips ⁶	0	0	0

Table 6-A: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	N/A	N/A
Retail	6%	4%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	2%	1%
Hotel	N/A	N/A

¹ Land Use Codes (LUCs) from <i>Trip Generation Manual</i> , published by the Institute of Transportation Engineers.
² Total estimate for all other land uses at mixed-use development site is not subject to internal trip capture computations in this estimator.
³ Enter trips assuming no transit or non-motorized trips (as assumed in ITE <i>Trip Generation Manual</i>).
⁴ Enter vehicle occupancy assumed in Table 1-A vehicle trips. If vehicle occupancy changes for proposed mixed-use project, manual adjustments must be made to Tables 5-A, 9-A (O and D). Enter transit, non-motorized percentages that will result with proposed mixed-use project complete.
⁵ Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A.
⁶ Person-Trips
*Indicates computation that has been rounded to the nearest whole number.
Estimation Tool Developed by the Texas A&M Transportation Institute - Version 2013.1

Project Name:	Hills at Harris Creek
Analysis Period:	AM Street Peak Hour

Table 7-A: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-A (D): Entering Trips			Table 7-A (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.10	0	0	1.10	0	0
Retail	1.10	32	35	1.10	21	23
Restaurant	1.10	0	0	1.10	0	0
Cinema/Entertainment	1.10	0	0	1.10	0	0
Residential	1.10	52	57	1.10	152	167
Hotel	1.10	0	0	1.10	0	0

Table 8-A (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	7		3	0	3	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	3	2	33	0		0
Hotel	0	0	0	0	0	

Table 8-A (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		11	0	0	0	0
Retail	0		0	0	1	0
Restaurant	0	3		0	3	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	6	0	0		0
Hotel	0	1	0	0	0	

Table 9-A (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	0	0	0	0	0	0
Retail	2	33	35	30	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	1	56	57	51	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

Table 9-A (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	0	0	0	0	0	0
Retail	1	22	23	20	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	2	165	167	150	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

¹Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A

²Person-Trips

³Total estimate for all other land uses at mixed-use development site is not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

NCHRP 684 Internal Trip Capture Estimation Tool					
Project Name:	Hills at Harris Creek	Organization:	Ramey Kemp & Associates		
Project Location:	Rolesville, NC	Performed By:	TF		
Scenario Description:	AM Street Peak Hour	Date:	3/18/2022		
Analysis Year:	20xx Build	Checked By:			
Analysis Period:	PM Street Peak Hour	Date:			

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips ³		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office						
Retail	822	25,400	sq.ft.		75	76
Restaurant						
Cinema/Entertainment						
Residential	210,220	211,109	units		168	99
Hotel						
All Other Land Uses ²						
				0	243	175

Table 2-P: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ. ⁴	% Transit	% Non-Motorized	Veh. Occ. ⁴	% Transit	% Non-Motorized
Office	1.10	0%	0%	1.10	0%	0%
Retail	1.10	0%	0%	1.10	0%	0%
Restaurant	1.10	0%	0%	1.10	0%	0%
Cinema/Entertainment	1.10	0%	0%	1.10	0%	0%
Residential	1.10	0%	0%	1.10	0%	0%
Hotel	1.10	0%	0%	1.10	0%	0%
All Other Land Uses ²	1.10	0%	0%	1.10	0%	0%

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		4000	4000		4000	
Retail					4000	
Restaurant					4000	
Cinema/Entertainment					4000	
Residential		4000	4000			
Hotel					4000	

Table 4-P: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	0		0	0	2	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	1	0	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	461	268	193
Internal Capture Percentage	1%	1%	2%
External Vehicle-Trips ⁵	414	241	173
External Transit-Trips ⁶	0	0	0
External Non-Motorized Trips ⁶	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	N/A	N/A
Retail	1%	2%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	1%	1%
Hotel	N/A	N/A

¹ Land Use Codes (LUCs) from <i>Trip Generation Manual</i> , published by the Institute of Transportation Engineers.
² Total estimate for all other land uses at mixed-use development site is not subject to internal trip capture computations in this estimator.
³ Enter trips assuming no transit or non-motorized trips (as assumed in ITE <i>Trip Generation Manual</i>).
⁴ Enter vehicle occupancy assumed in Table 1-P vehicle trips. If vehicle occupancy changes for proposed mixed-use project, manual adjustments must be made.
⁵ Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P.
⁶ Person-Trips
*Indicates computation that has been rounded to the nearest whole number.
Estimation Tool Developed by the Texas A&M Transportation Institute - Version 2013.1

Project Name:	Hills at Harris Creek
Analysis Period:	PM Street Peak Hour

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-P (D): Entering Trips			Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.10	0	0	1.10	0	0
Retail	1.10	75	83	1.10	76	84
Restaurant	1.10	0	0	1.10	0	0
Cinema/Entertainment	1.10	0	0	1.10	0	0
Residential	1.10	168	185	1.10	99	109
Hotel	1.10	0	0	1.10	0	0

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	2		24	3	2	4
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	4	5	2	0		3
Hotel	0	0	0	0	0	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		1	0	0	7	0
Retail	0		0	0	85	0
Restaurant	0	42		0	30	0
Cinema/Entertainment	0	3	0		7	0
Residential	0	1	0	0		0
Hotel	0	2	0	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	0	0	0	0	0	0
Retail	1	82	83	75	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	2	183	185	166	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	0	0	0	0	0	0
Retail	2	82	84	75	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	1	108	109	98	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

¹Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

²Person-Trips

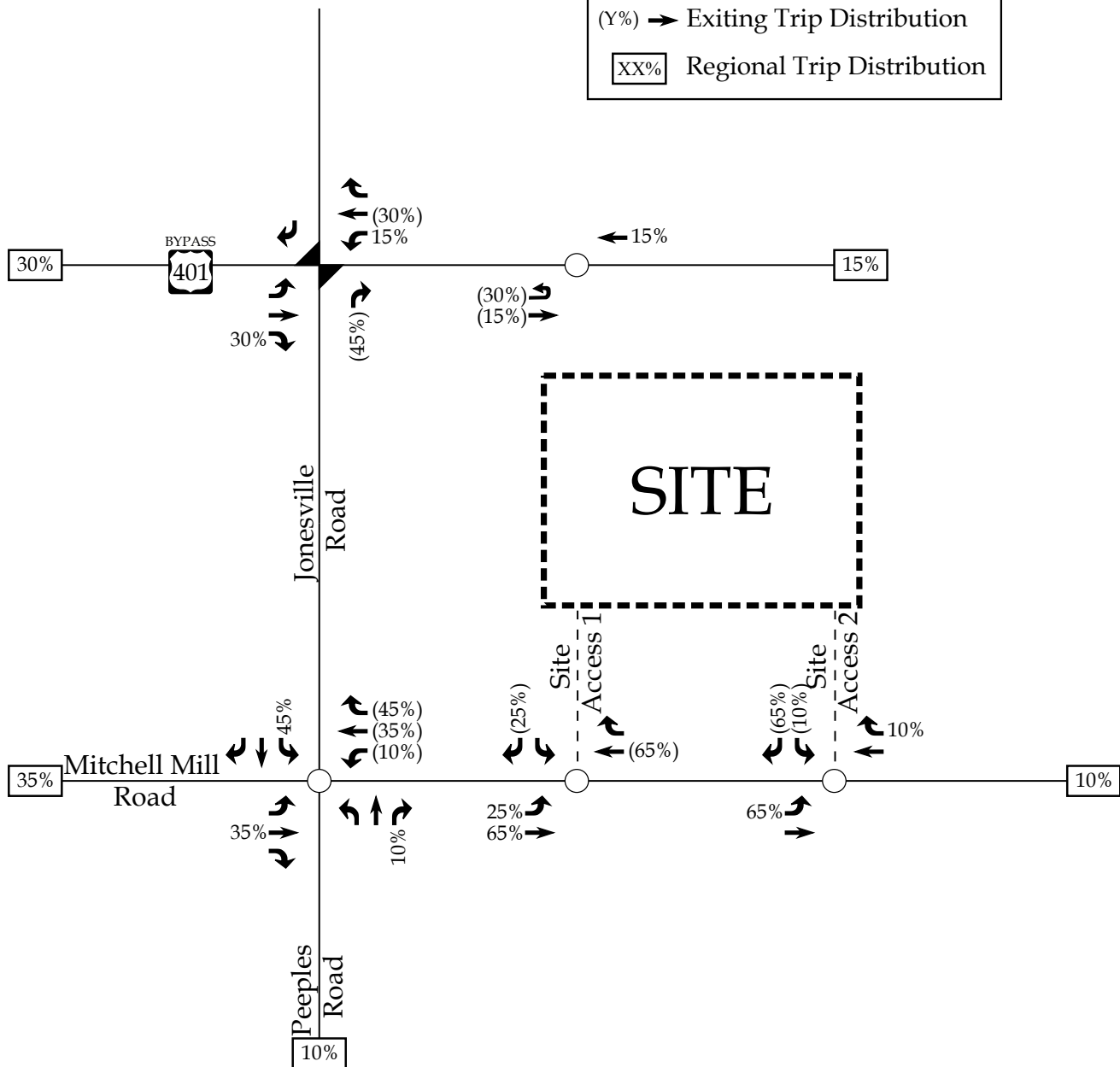
³Total estimate for all other land uses at mixed-use development site is not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.



LEGEND

- Unsignalized Intersection
- ◄ Left-Over Intersection
- X% → Entering Trip Distribution
- (Y%) → Exiting Trip Distribution
- XX% Regional Trip Distribution



Hills at Harris Creek
Rolesville, NC

Proposed Residential
Site Trip Distribution

Scale: Not to Scale

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

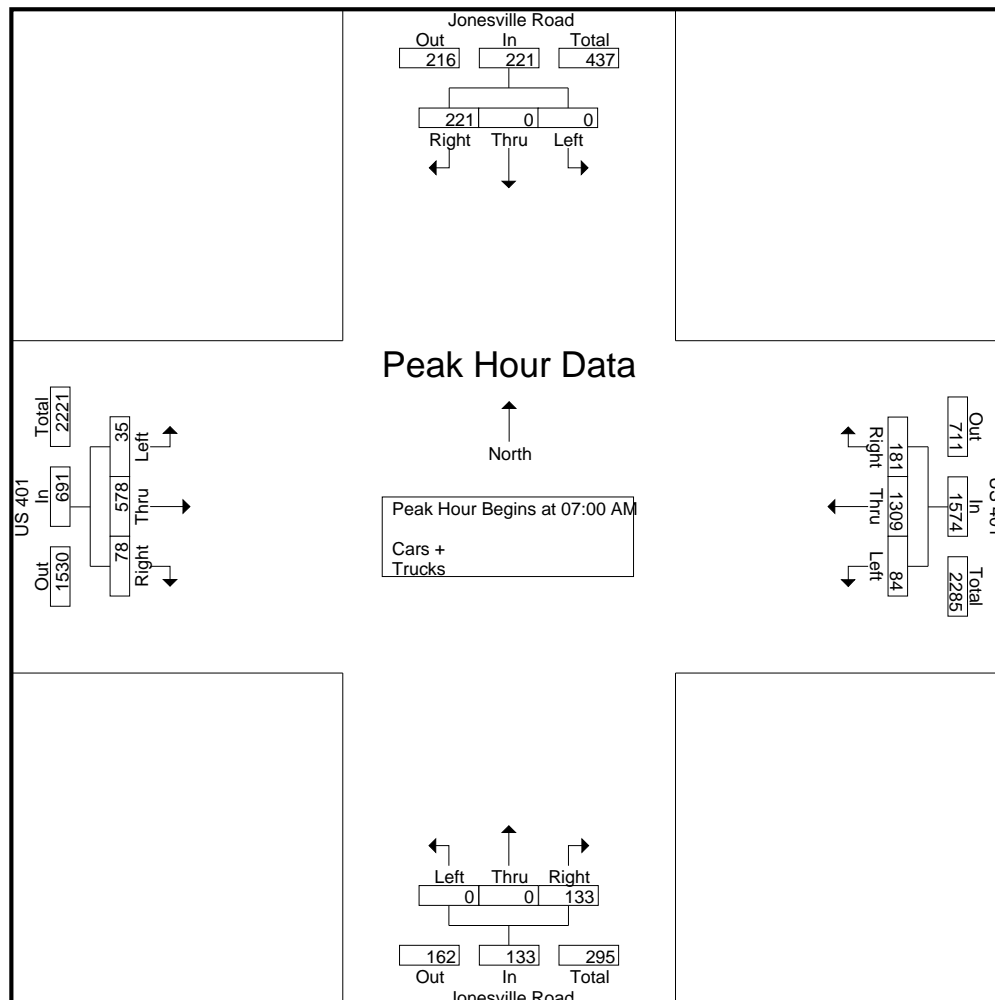
	Jonesville Road Southbound				US 401 Westbound				Jonesville Road Northbound				US 401 Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
07:00 AM	63	0	0	63	24	380	21	425	23	0	0	23	18	182	3	203	714
07:15 AM	42	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





TRAFFIC DATA COLLECTION

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

Groups Printed- Cars + - Trucks

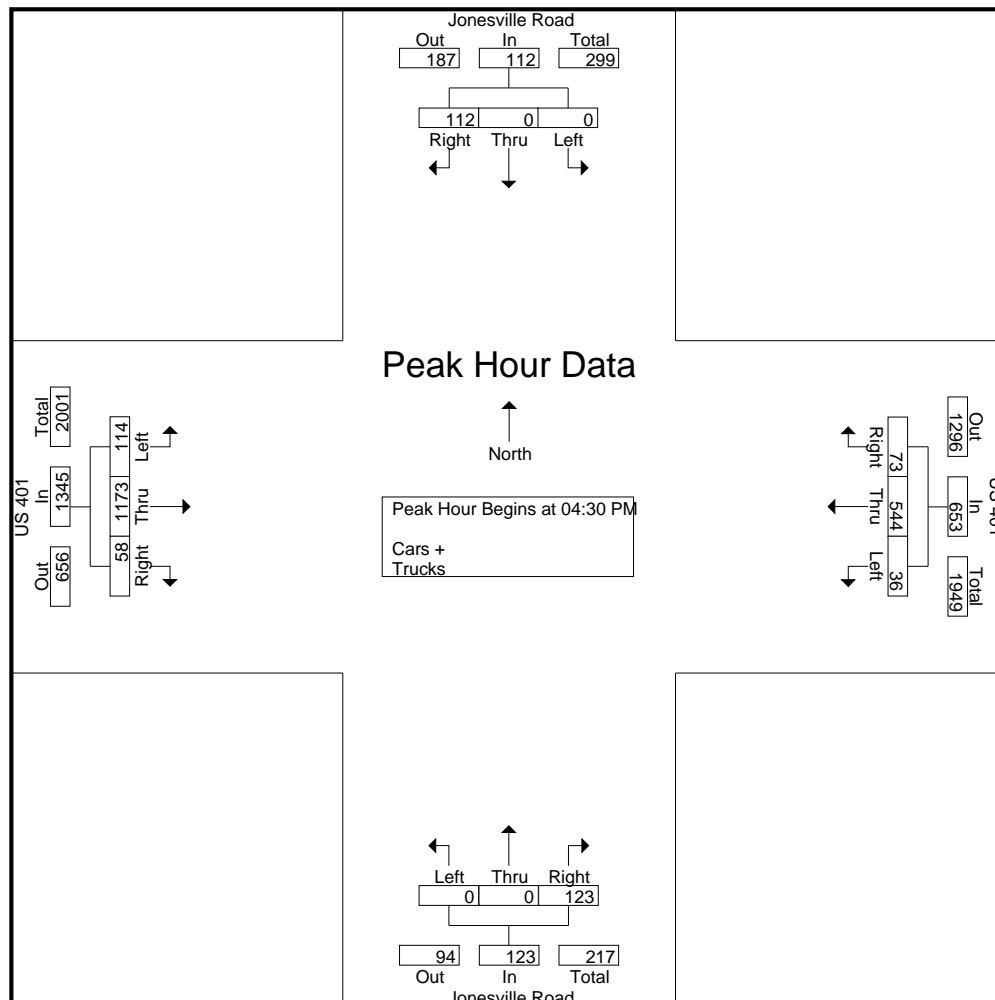
	Jonesville Road Southbound				US 401 Westbound				Jonesville Road Northbound				US 401 Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
04:00 PM	47	0	0	47	13	124	6	143	21	0	0	21	37	217	22	276	487
04:15 PM	34	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

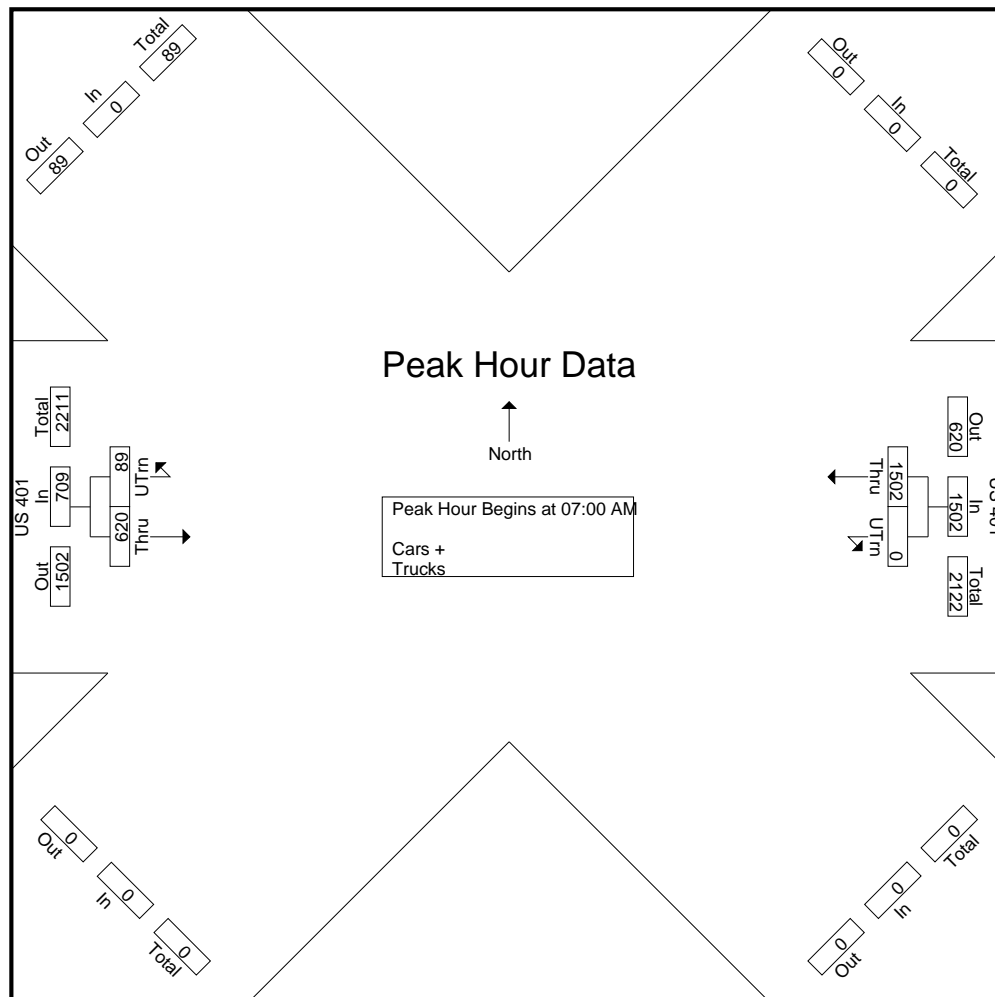
Start Time	US 401 Westbound			US 401 Eastbound			Int. Total
	Thru	UTrn	App. Total	Thru	UTrn	App. Total	
07:00 AM	421	0	421	198	12	210	631
07:15 AM	410	0	410	136	24	160	570
07:30 AM	392	0	392	149	36	185	577
07:45 AM	279	0	279	137	17	154	433
Total	1502	0	1502	620	89	709	2211
08:00 AM	253	0	253	130	20	150	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

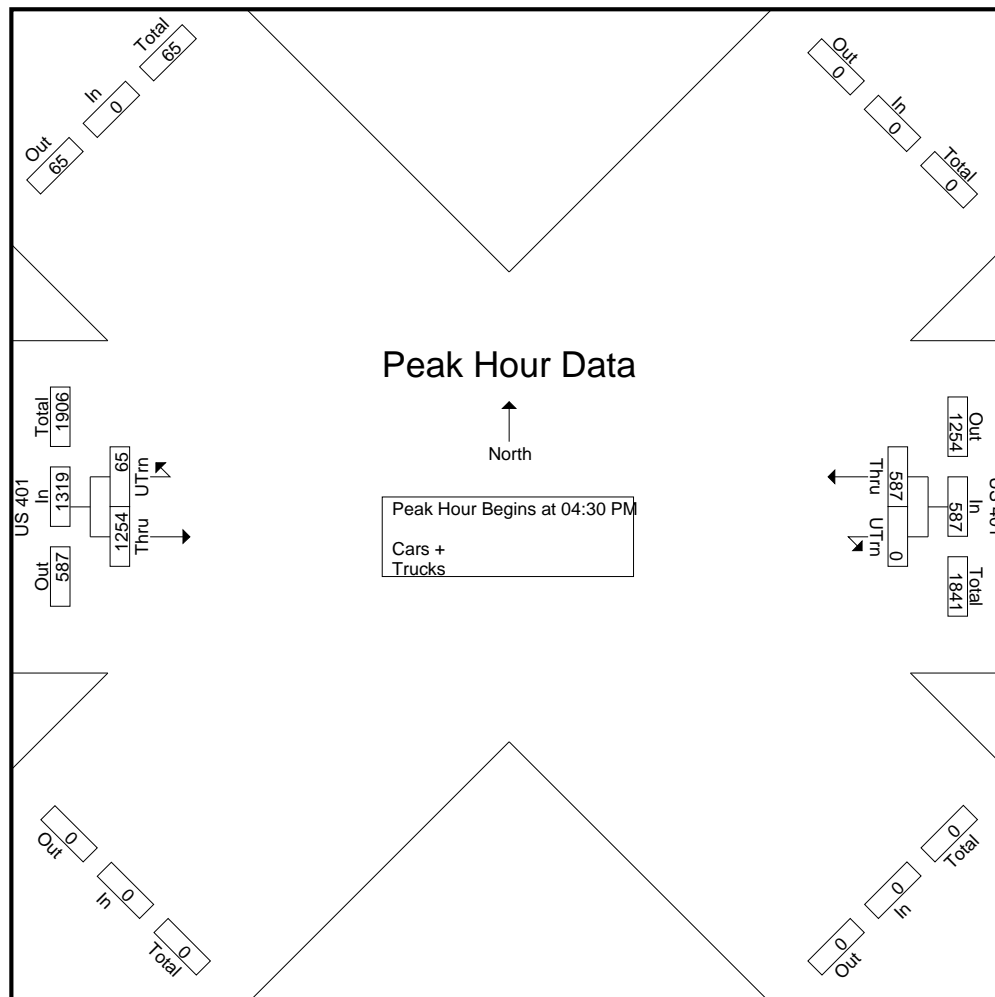
Start Time	US 401 Westbound			US 401 Eastbound			Int. Total
	Thru	UTrn	App. Total	Thru	UTrn	App. Total	
04:00 PM	130	0	130	240	12	252	382
04:15 PM	128	0	128	237	15	252	380
04:30 PM	129	0	129	311	19	330	459
04:45 PM	149	0	149	317	19	336	485
Total	536	0	536	1105	65	1170	1706
05:00 PM	149	0	149	342	8	350	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

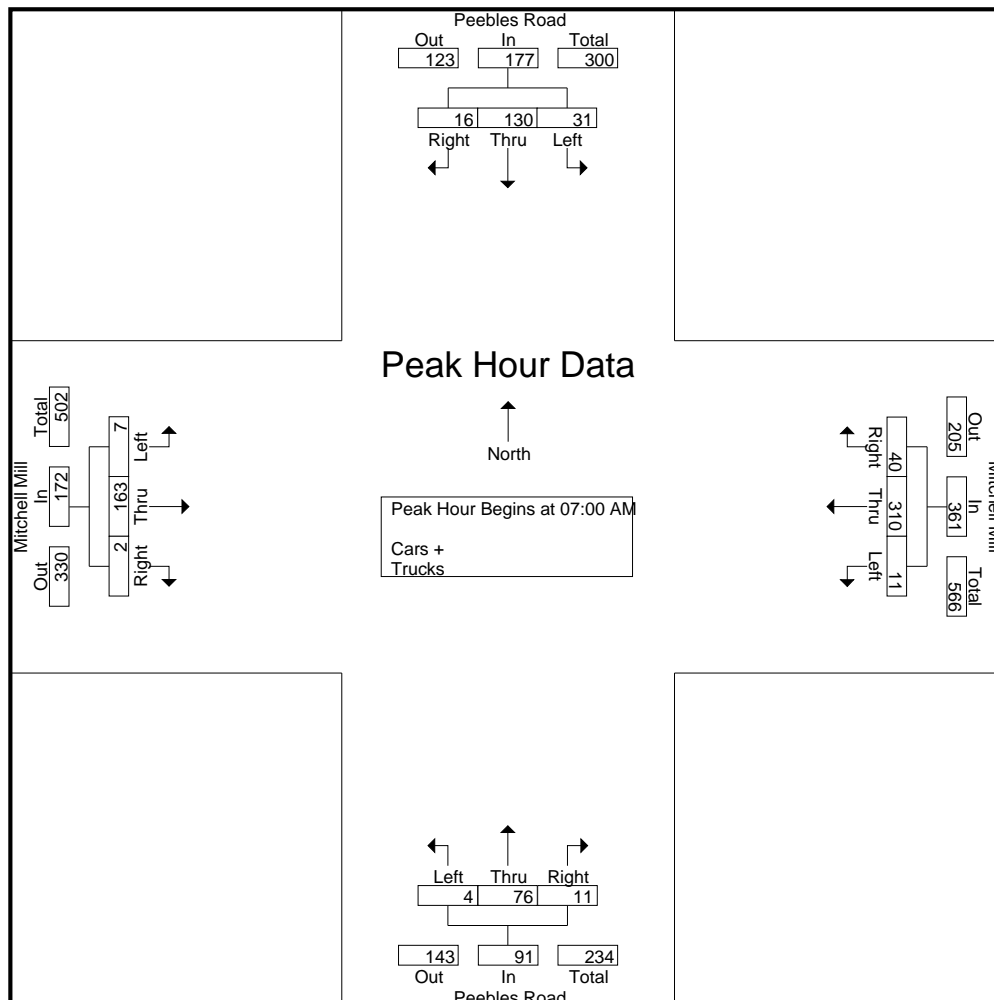
	Peebles Road Southbound				Mitchell Mill Westbound				Peebles Road Northbound				Mitchell Mill Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
07:00 AM	4	17	13	34	8	73	5	86	6	11	3	20	0	74	1	75	215
07:15 AM	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





TRAFFIC DATA COLLECTION

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

Groups Printed- Cars + - Trucks

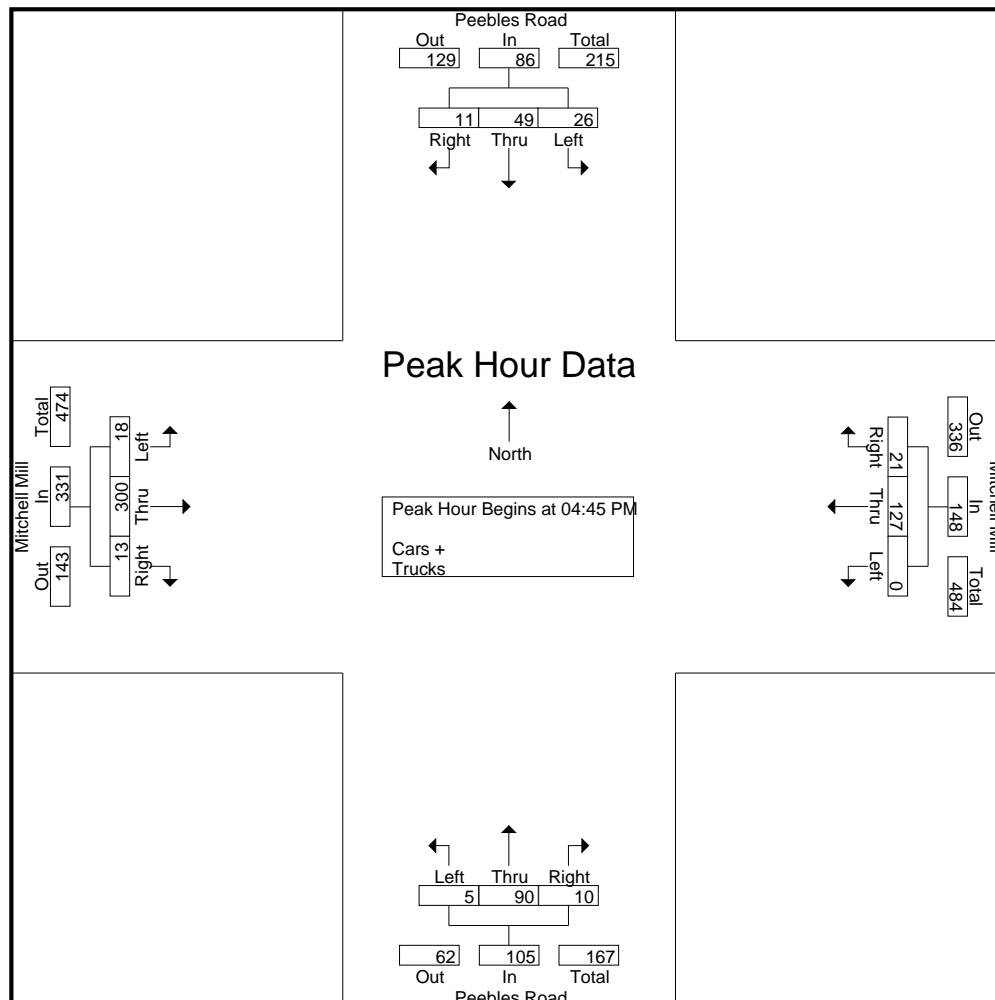
	Peebles Road Southbound				Mitchell Mill Westbound				Peebles Road Northbound				Mitchell Mill Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
04:00 PM	7	11	13	31	6	25	1	32	1	14	1	16	2	44	6	52	131
04:15 PM	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

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



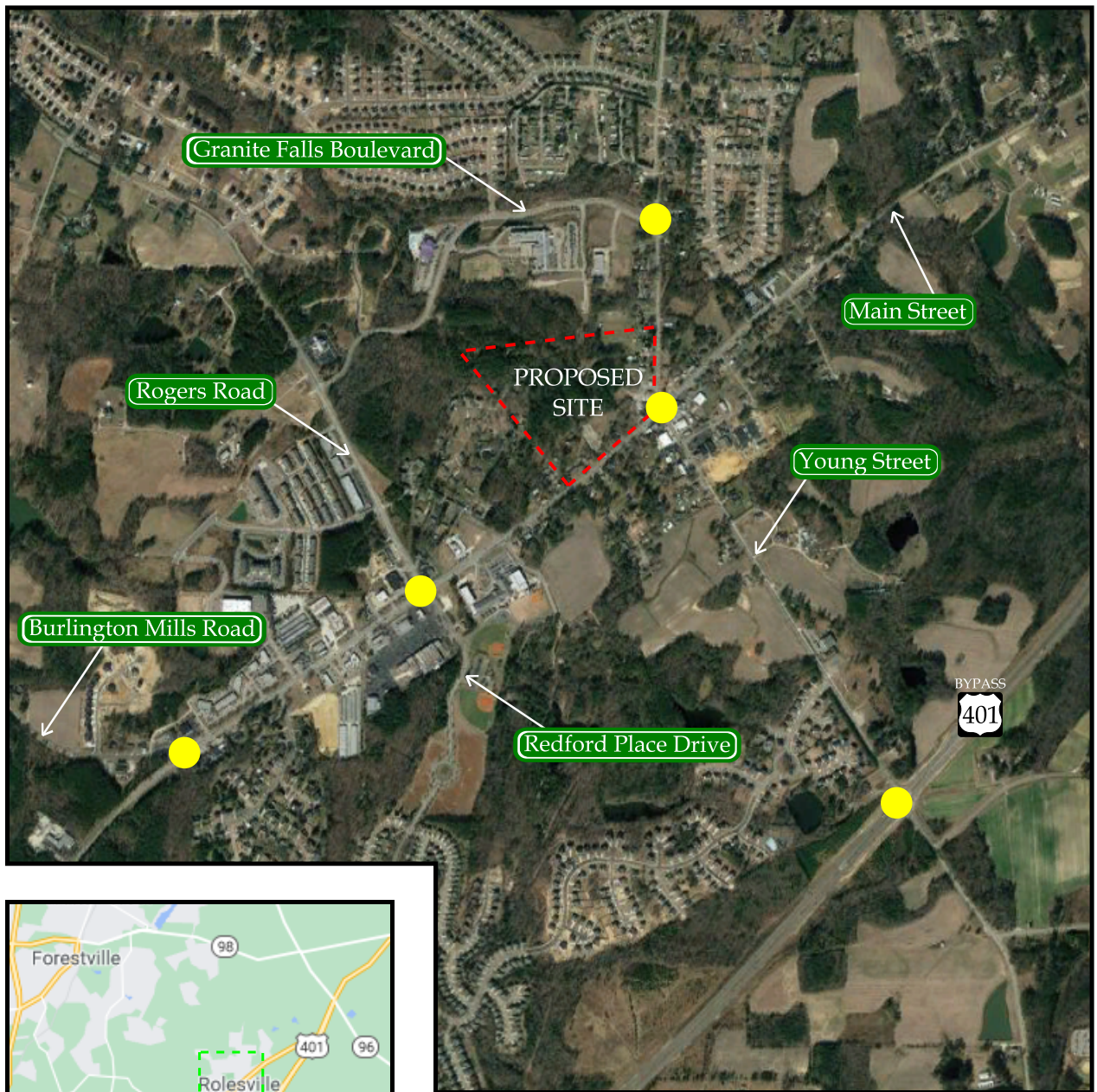
3-15-2021

MARCH 2021

RKA Project No. 20498

Prepared By: TF

Reviewed By: MK



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

LEGEND



Unsignalized Intersection



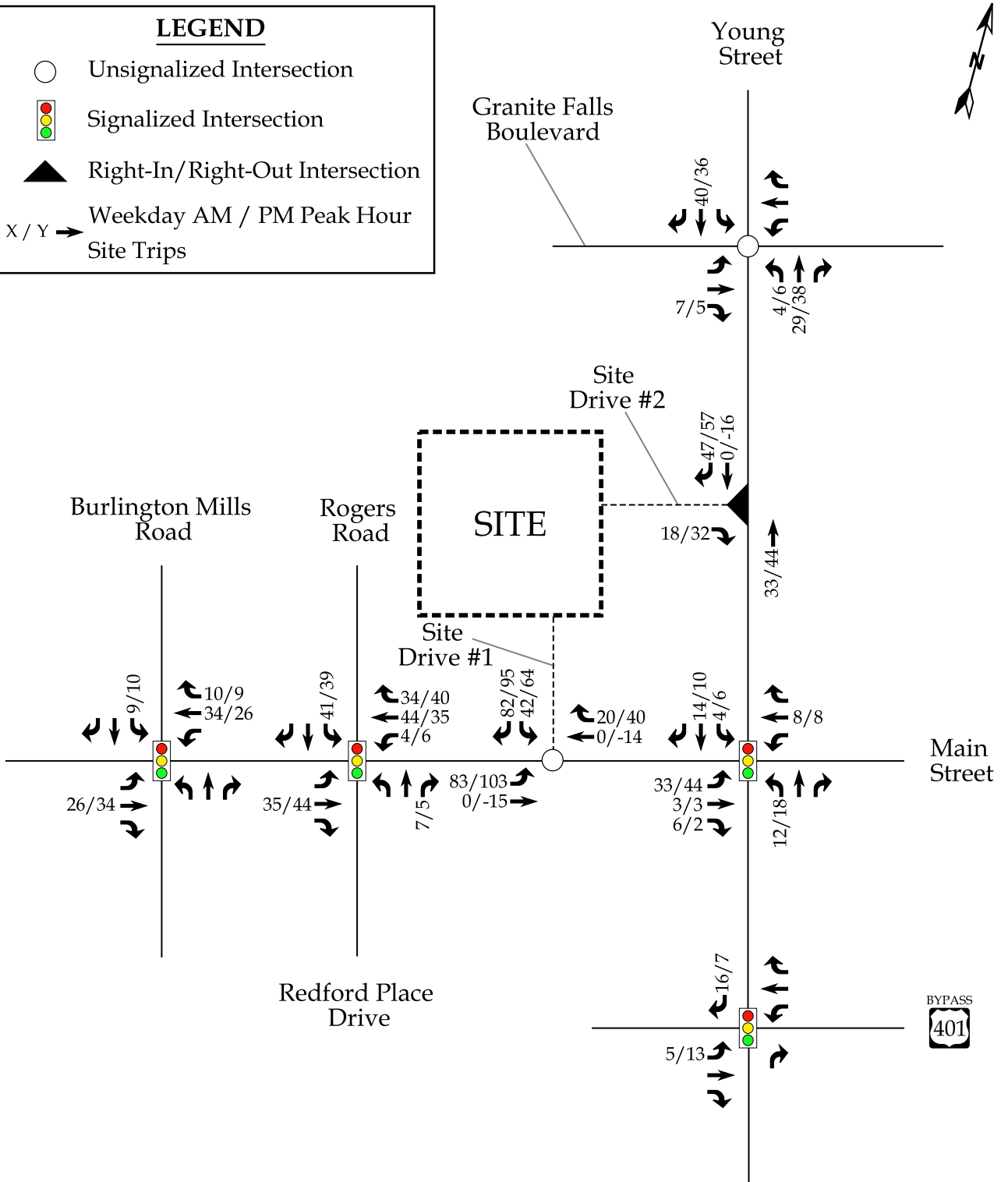
Signalized Intersection



Right-In/Right-Out Intersection

X / Y →

Weekday AM / PM Peak Hour
Site Trips



Moving forward.



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

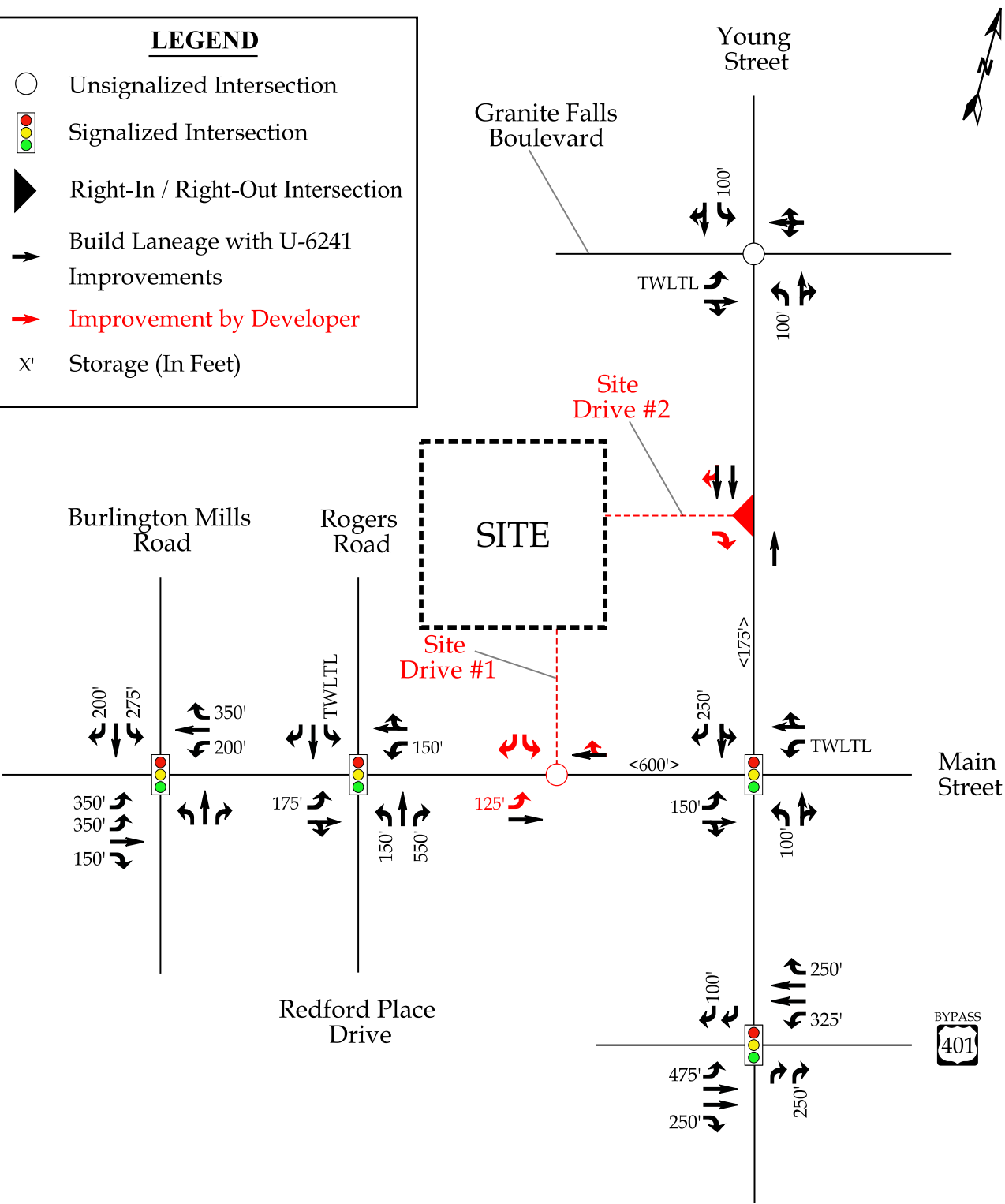
- Construct the southbound approach with one ingress and two egress lanes.
- Provide stop control for the southbound approach.
- Install an eastbound left-turn lane with at least 125 feet of storage and appropriate decel and taper.

Young Street and Site Drive 2

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

LEGEND

- Unsignalized Intersection
- ◫ Signalized Intersection
- ▶ Right-In / Right-Out Intersection
- Build Laneage with U-6241 Improvements
- Improvement by Developer
- X' Storage (In Feet)



Moving forward.



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:

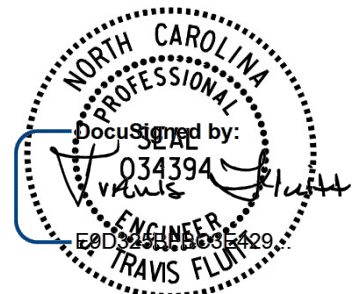
**Ashton Woods
Raleigh, North Carolina**

Prepared by:

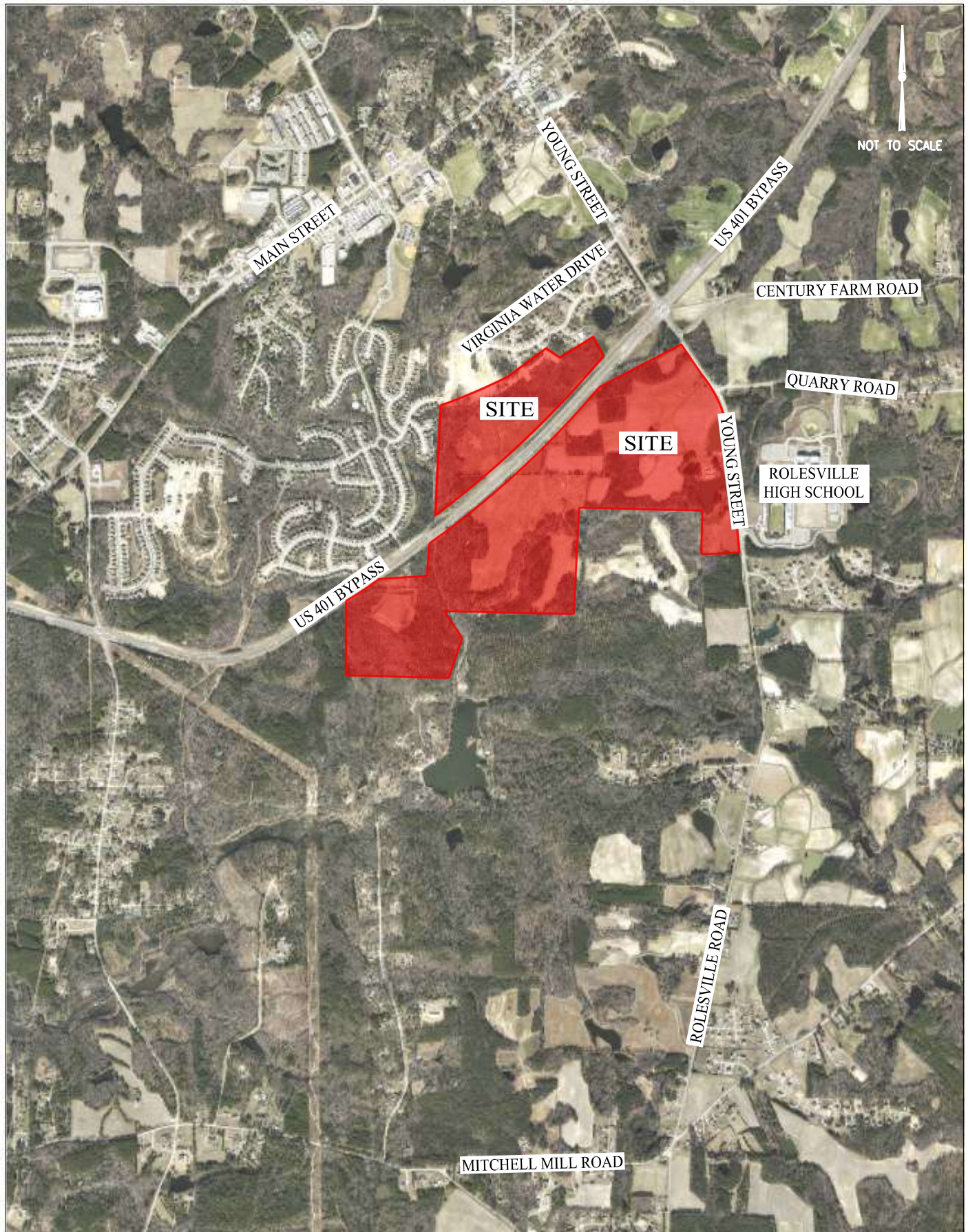
**Kimley-Horn and Associates, Inc.
NC License #F-0102
421 Fayetteville Street, Suite 600
Raleigh, NC 27601
(919) 677-2000**

June 2019

015956012



6/13/2019



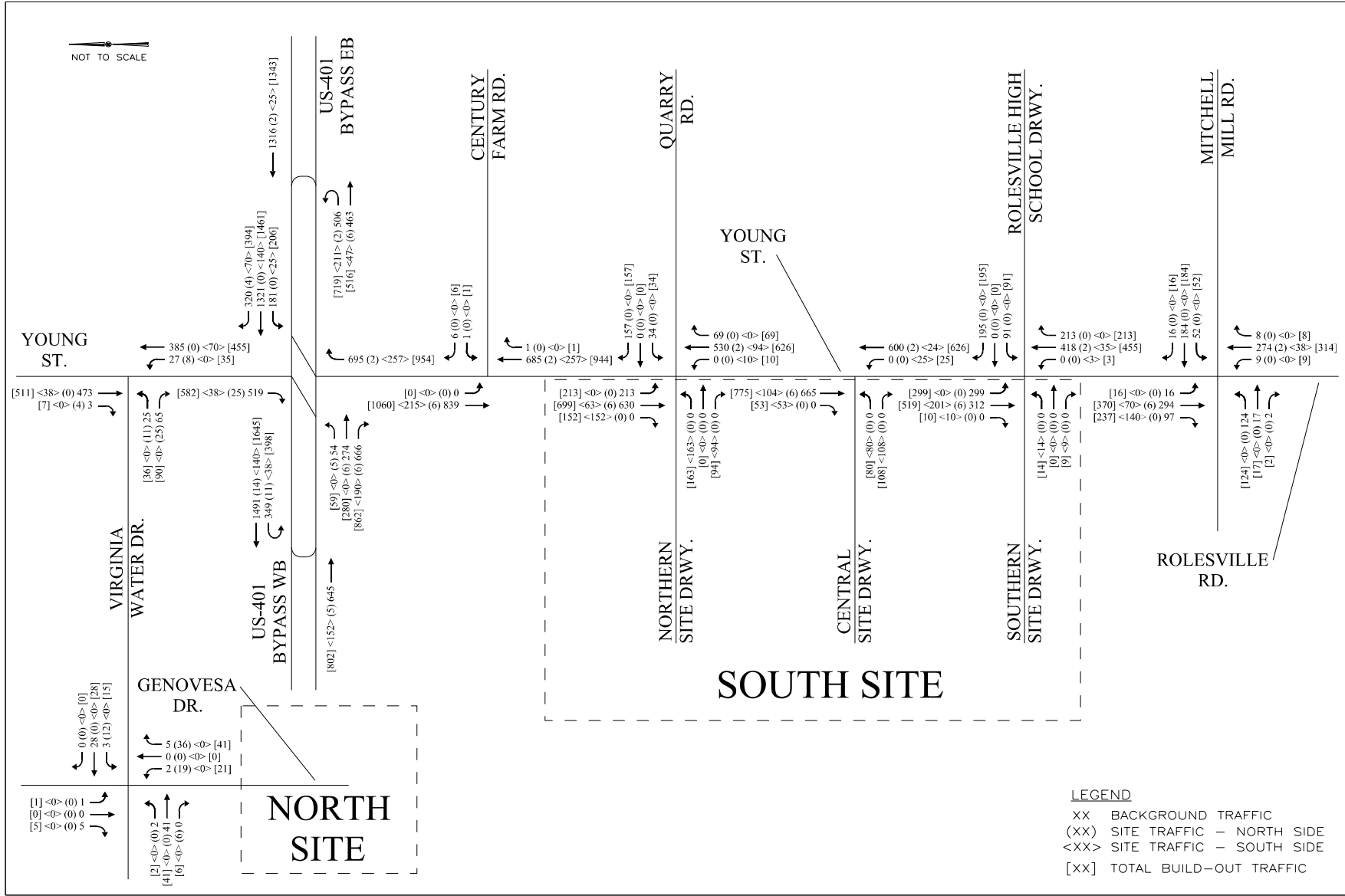
Kimley»Horn

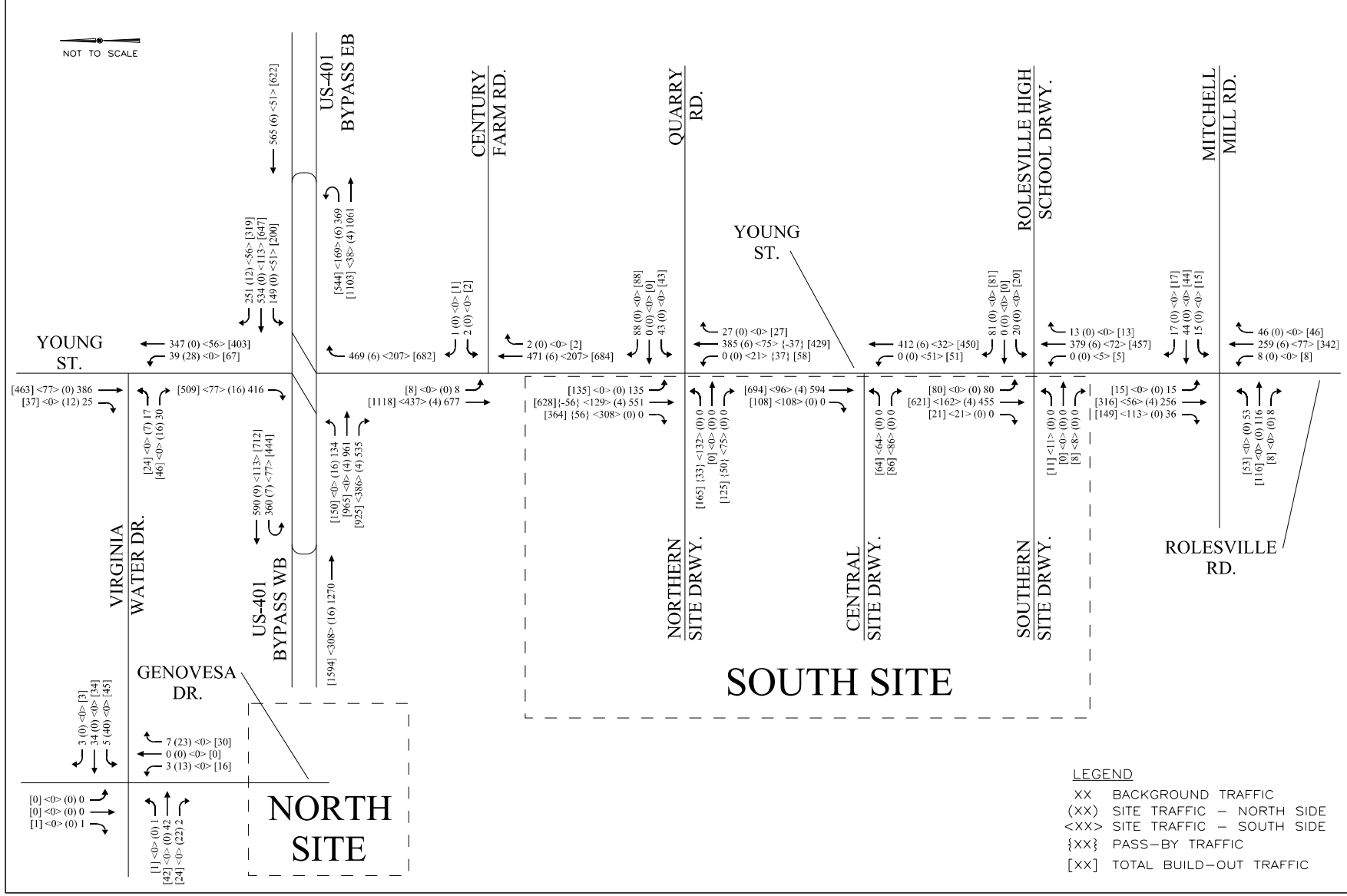
YOUNG STREET PUD
ROLESVILLE, NC
TRAFFIC IMPACT ANALYSIS

SITE LOCATION

FIGURE
1

THIS DOCUMENT, TOGETHER WITH THE CONCEPTS AND DESIGNS PRESENTED HEREIN, AS AN INSTRUMENT OF SERVICE, IS INTENDED ONLY FOR THE SPECIFIC PURPOSE AND CLIENT FOR WHICH IT WAS PREPARED. REUSE OF AND IMPROPER RELIANCE ON THIS DOCUMENT WITHOUT WRITTEN AUTHORIZATION AND ADAPTATION BY KIMLEY-HORN AND ASSOCIATES, INC. SHALL BE WITHOUT LIABILITY TO KIMLEY-HORN AND ASSOCIATES, INC.





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

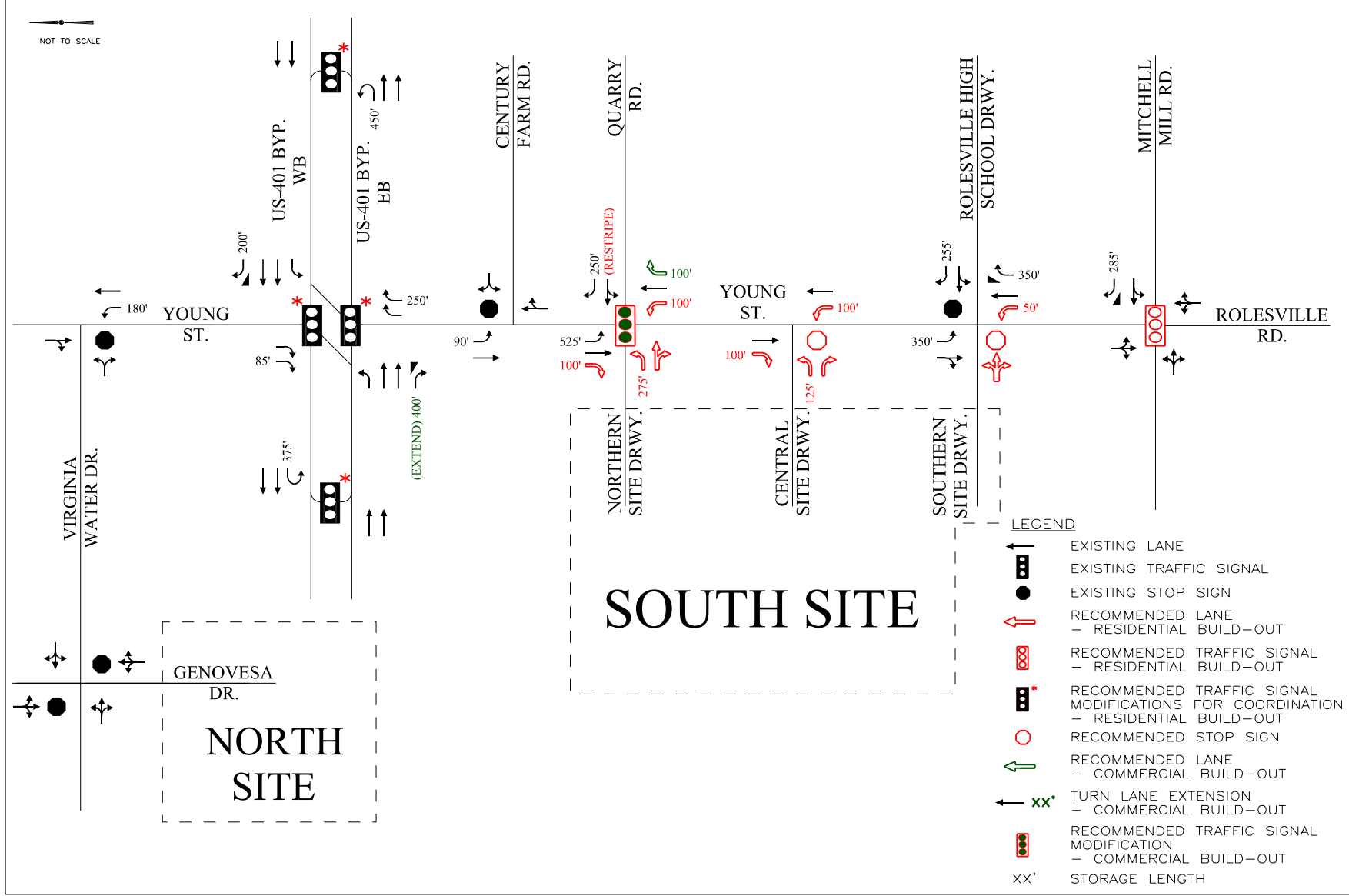
traffic simulations indicate that short queues are likely on the minor street approach in the AM peak hour at commercial build-out.

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**.



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

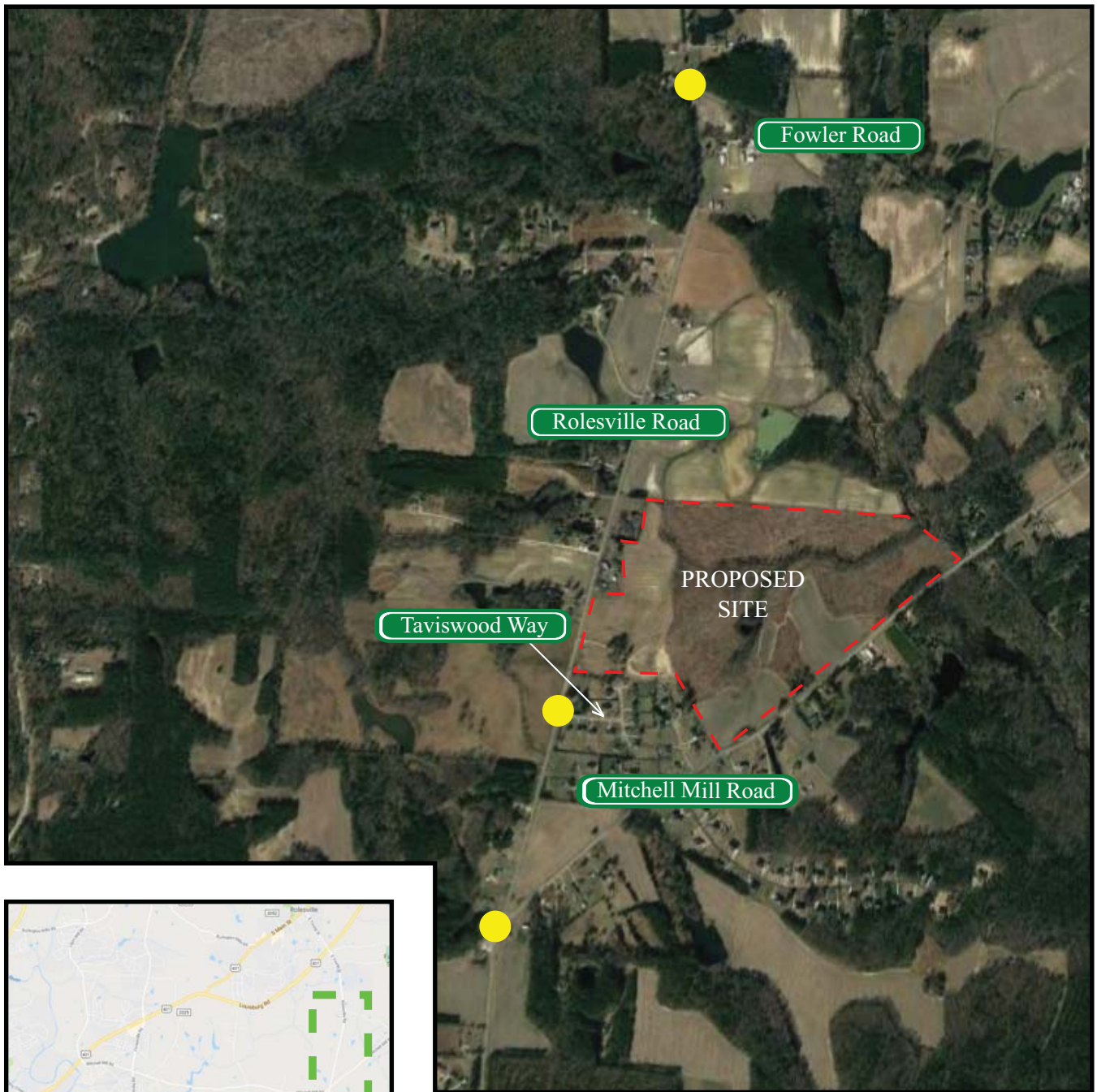
June 2019

RKA Project No. 19045



Prepared By: CAB

Reviewed By: JTR



LEGEND

- - - Proposed Site Location
- Study Intersection
- - - Study Area



Wheeler Tract
Rolesville, NC

Site Location Map

Scale: Not to Scale

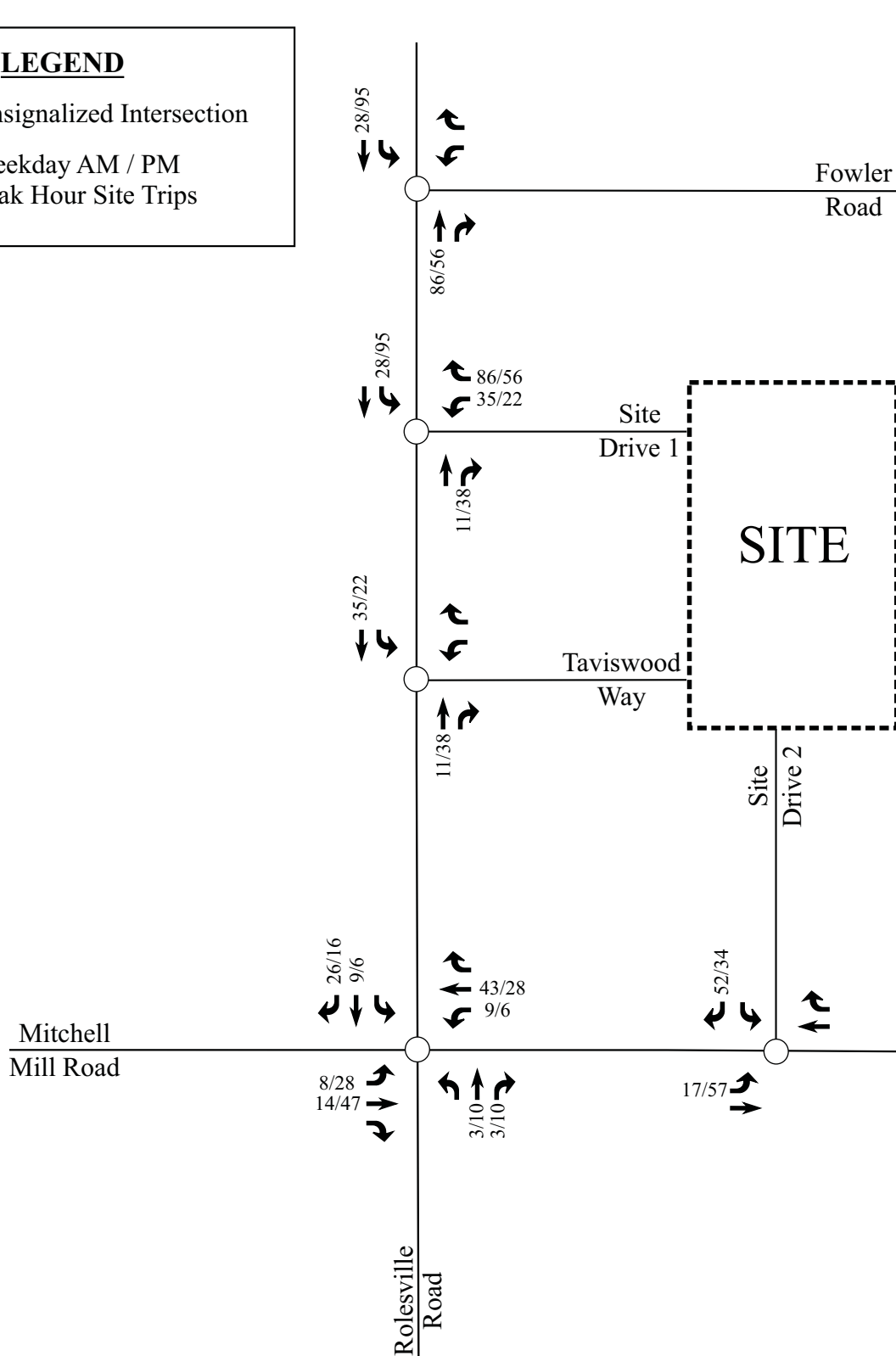
Figure 1


○

Unsignalized Intersection

X/Y →

Weekday AM / PM
Peak Hour Site Trips



 <div> <div>RAMEY KEMP</div> <div>&</div> <div>ASSOCIATES</div> <div>TRANSPORTATION ENGINEERS</div> </div>	<div>Wheeler Tract</div> <div>Rolesville, NC</div>	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

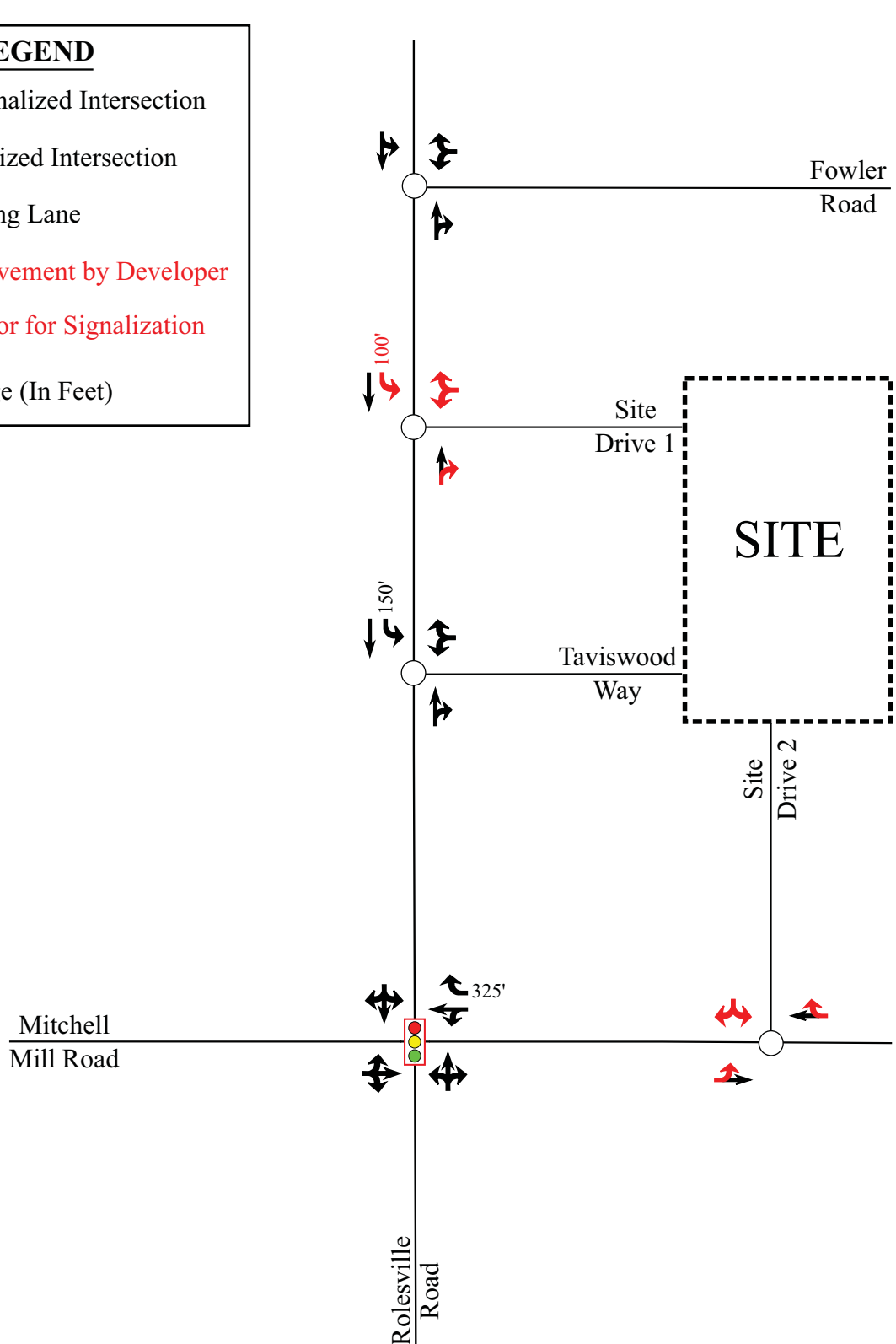
- Provide site access via a full movement intersection with one ingress lane and one egress lane.
- Provide stop control for westbound Site Drive 1 approach.
- Provide a designated southbound left-turn lane with at least 100 feet of storage and appropriate deceleration and taper.

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.

LEGEND

- Unsignalized Intersection
- 🚦 Signalized Intersection
- ➡ Existing Lane
- ➡ Improvement by Developer
- 🚦 Monitor for Signalization
- X' Storage (In Feet)



Wheeler Tract
Rolesville, NC

Recommended
Lane Configurations

Scale: Not to Scale

Figure 11

**TRAFFIC IMPACT
ANALYSIS**

FOR

LOUISBURY ROAD ASSEMBLAGE

LOCATED

IN

RALEIGH, NC

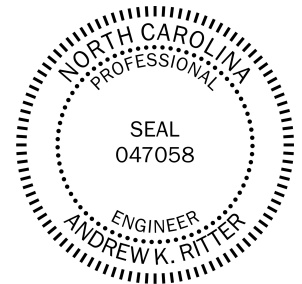
Prepared For:
McAdams Company
2905 Meridian Parkway
Durham, NC 27713

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

May 2020

RKA Project No. 19418

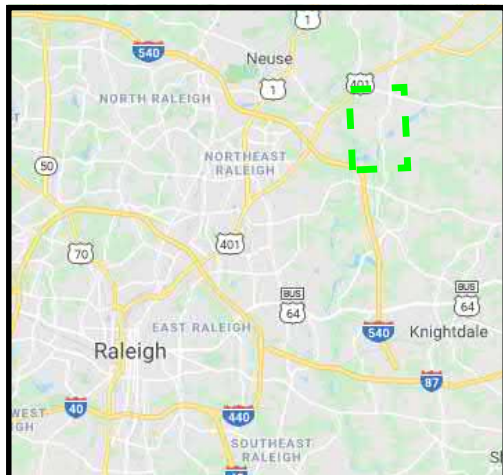
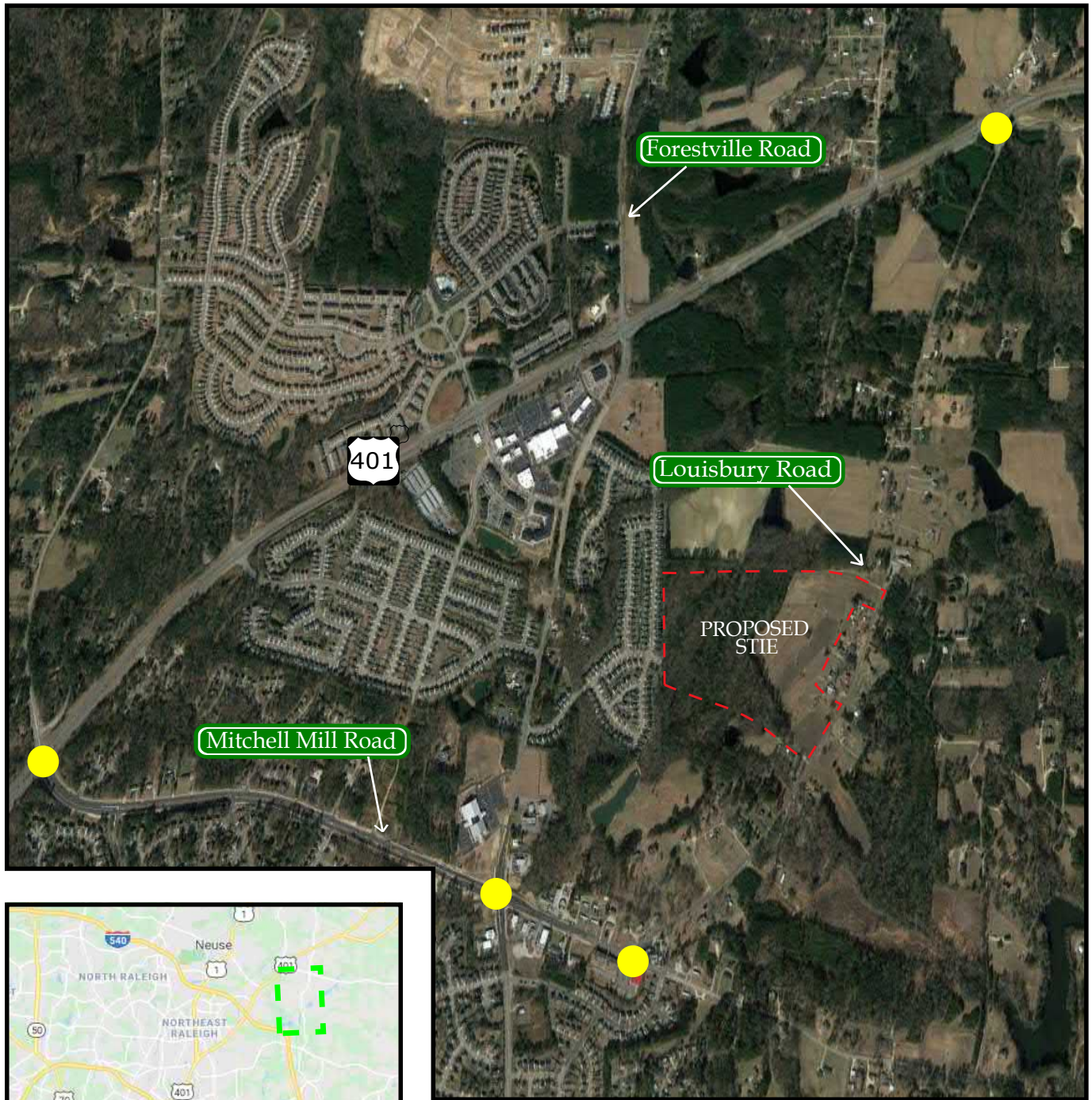
Andrew Kyle Ritter



5/8/2020

Prepared By: DT

Reviewed By: DR



LEGEND

- Proposed Site Location
- Study Intersection
- Study Area

Moving forward.



RAMEY KEMP ASSOCIATES

Louisbury Road Assemblage
Raleigh, NC

Site Location Map

Scale: Not to Scale

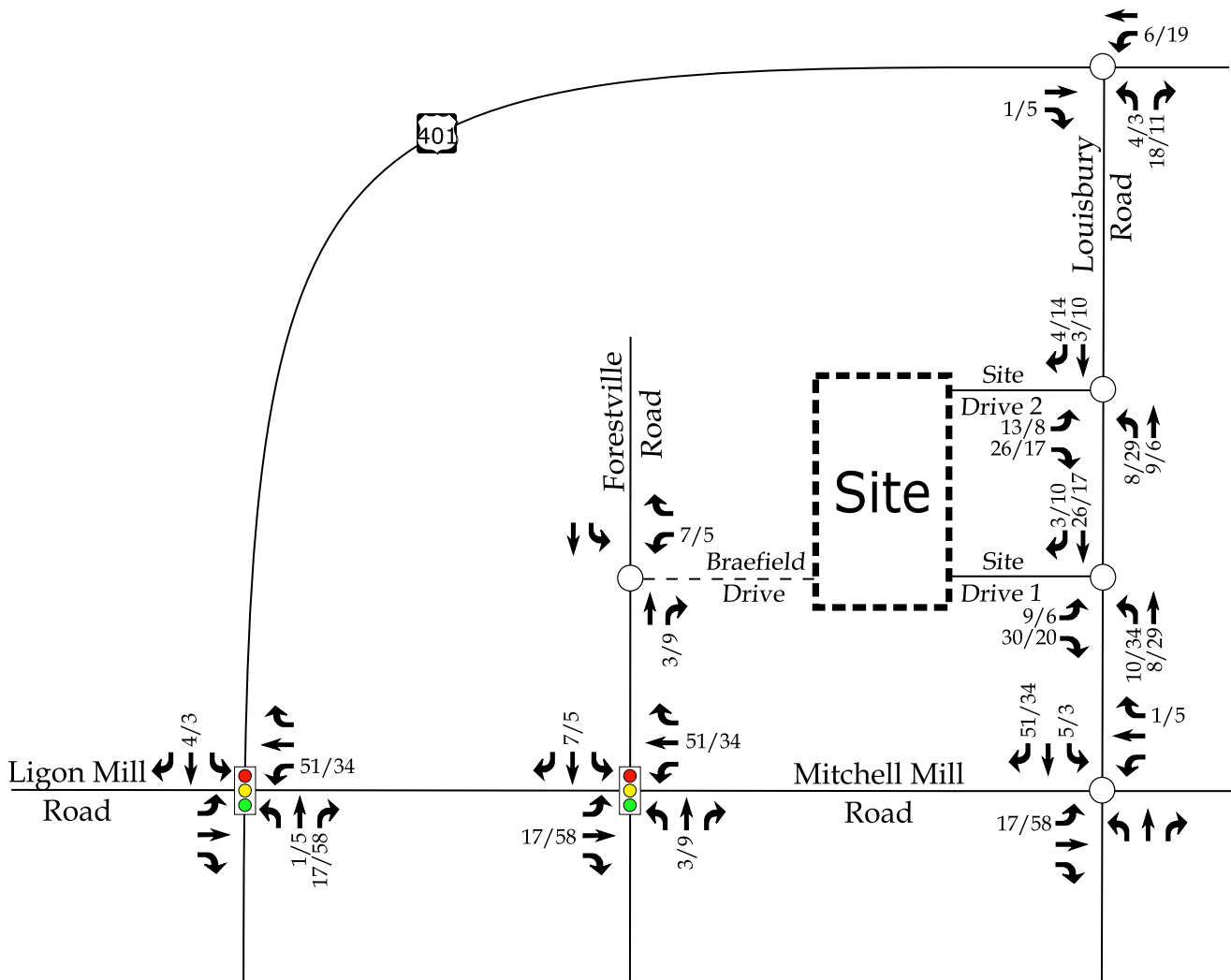
Figure 1

LEGEND

○ Unsignalized Intersection

◫ Signalized Intersection

X / Y → Weekday AM / PM Peak Hour
Site Trips



Moving forward.



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.

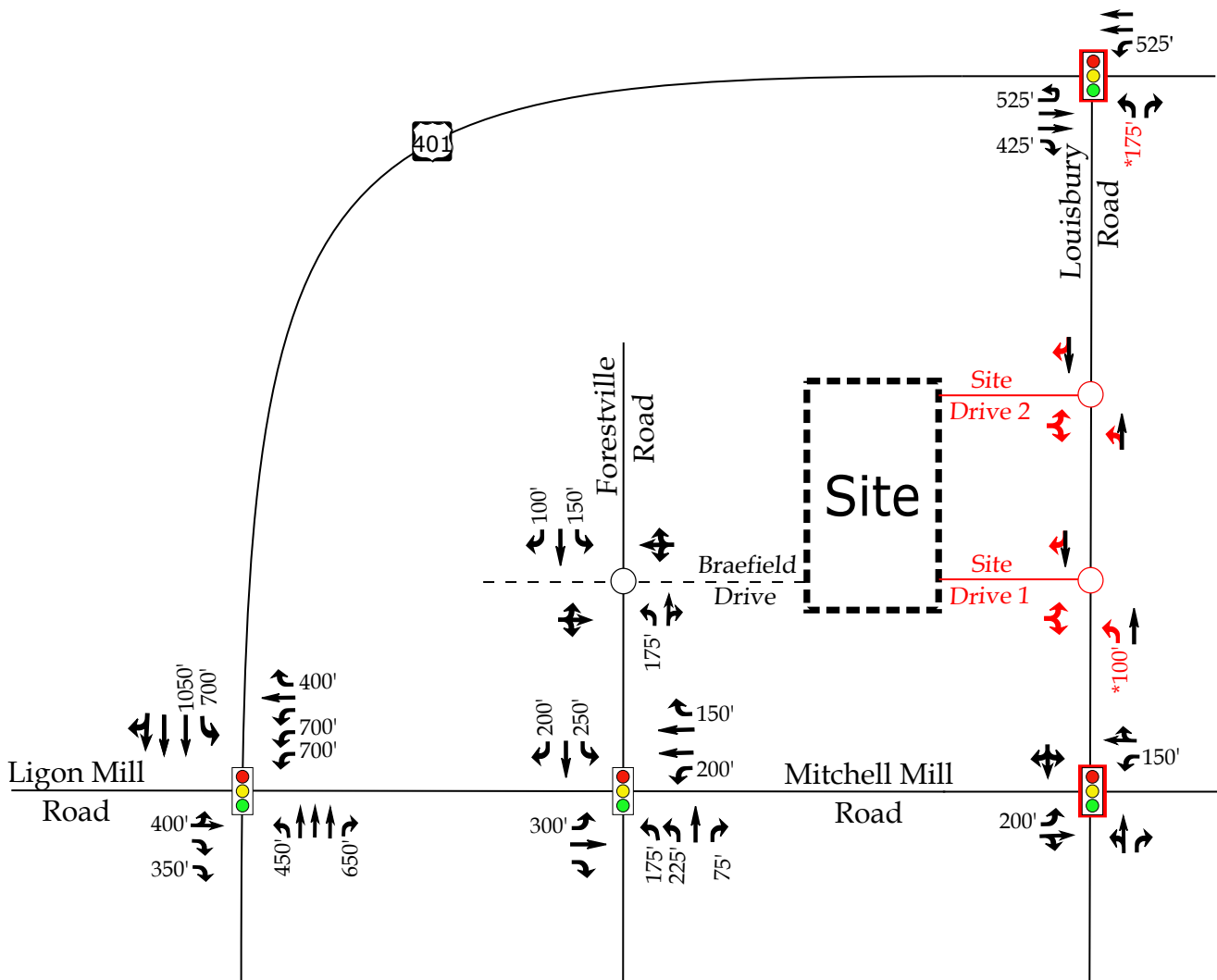
Louisbury Road and Site Drive 2

- 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.



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]
(signature)

Matt Peach, PE, PTOE

Approved by Christa Greene
(signature)

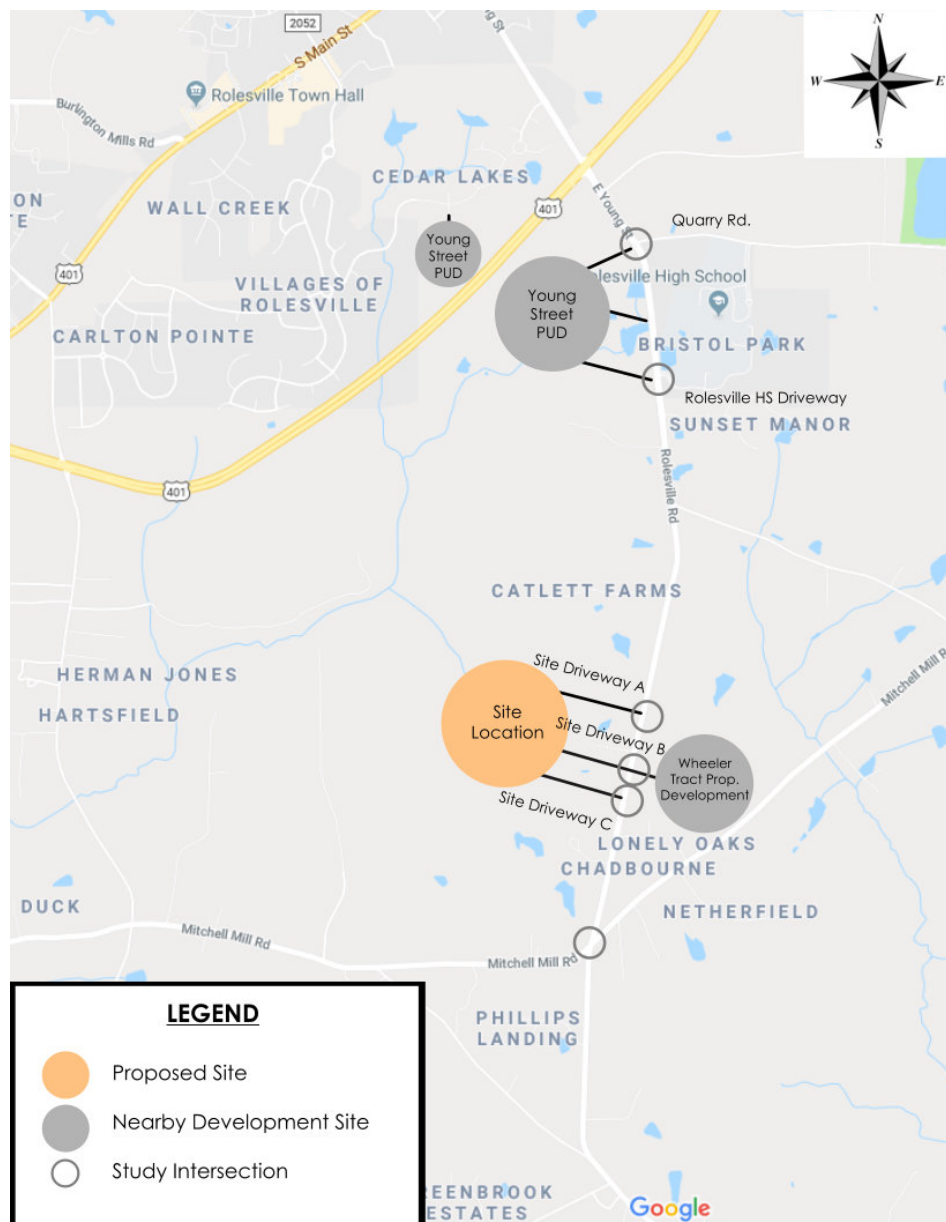
Christa Greene, PE



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.

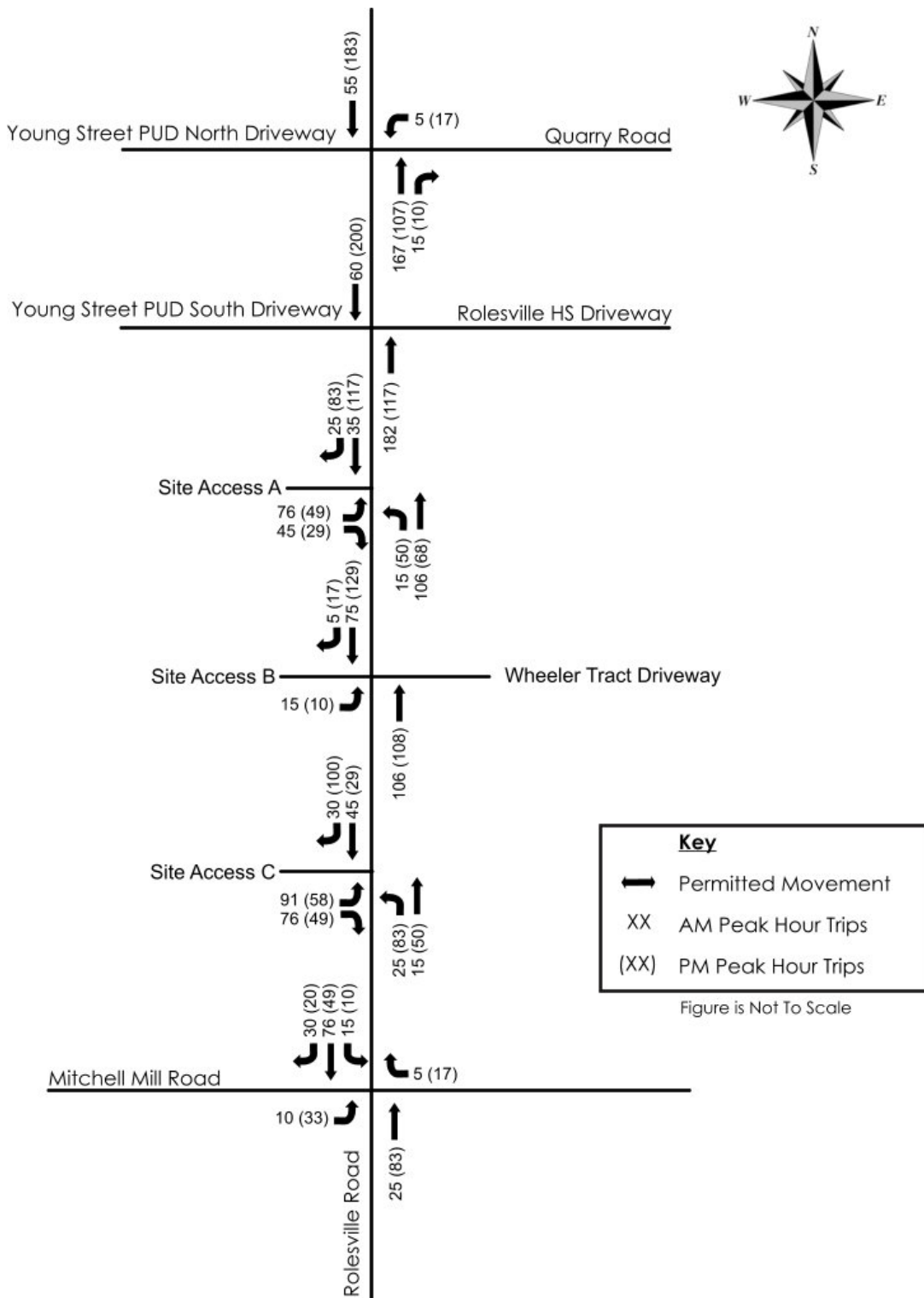
Figure 1: Site Location



KALAS / WATKINS FAMILY PROPERTY TRAFFIC IMPACT ANALYSIS

Trip Generation and Distribution
August 24, 2019

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



APPENDIX D

CAPACITY ANALYSIS CALCULATIONS

US 401 BYPASS

&

JONESVILLE ROAD

HCM 6th TWSC
1: Jonesville Road/WB Left-Over & US 401 Bypass EB

2022 Existing
Timing Plan: AM Peak Hour

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	-	-	16983	-	-	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

HCM 6th TWSC
1: Jonesville Road/WB Left-Over & US 401 Bypass EB

2027 No-Build
Timing Plan: AM Peak Hour

Intersection												
Int Delay, s/veh	4.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↗						↗		↑	
Traffic Vol, veh/h	0	873	88	0	0	0	0	0	150	0	95	0
Future Vol, veh/h	0	873	88	0	0	0	0	0	150	0	95	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	-	-	16983	-	-	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	970	98	0	0	0	0	0	167	0	106	0
Major/Minor	Major1						Minor1			Minor2		
Conflicting Flow All	-	0	0				-	-	485	-	970	-
Stage 1	-	-	-				-	-	-	-	0	-
Stage 2	-	-	-				-	-	-	-	970	-
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	528	0	252	0
Stage 1	0	-	-				0	0	-	0	-	0
Stage 2	0	-	-				0	0	-	0	330	0
Platoon blocked, %		-	-									
Mov Cap-1 Maneuver	-	-	-				-	-	528	-	252	-
Mov Cap-2 Maneuver	-	-	-				-	-	-	-	252	-
Stage 1	-	-	-				-	-	-	-	-	-
Stage 2	-	-	-				-	-	-	-	330	-
Approach	EB						NB			SB		
HCM Control Delay, s	0						14.9			29.2		
HCM LOS							B			D		
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	SBLn1								
Capacity (veh/h)	528	-	-	252								
HCM Lane V/C Ratio	0.316	-	-	0.419								
HCM Control Delay (s)	14.9	-	-	29.2								
HCM Lane LOS	B	-	-	D								
HCM 95th %tile Q(veh)	1.3	-	-	2								

Intersection

Int Delay, s/veh 5.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↑						↑		↑	
Traffic Vol, veh/h	0	873	122	0	0	0	0	0	236	0	112	0
Future Vol, veh/h	0	873	122	0	0	0	0	0	236	0	112	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	970	136	0	0	0	0	0	262	0	124	0

Major/Minor	Major1			Minor1			Minor2		
Conflicting Flow All	-	0	0	-	-	-	485	-	970
Stage 1	-	-	-	-	-	-	-	-	0
Stage 2	-	-	-	-	-	-	-	-	970
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	528	0	252	0
Stage 1	0	-	-	0	0	-	0	-	0
Stage 2	0	-	-	0	0	-	0	330	0
Platoon blocked, %	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	-	-	528	-	252	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	252	-
Stage 1	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	330	-

Approach	EB	NB	SB
HCM Control Delay, s	0	18.4	32.5
HCM LOS		C	D

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	SBLn1
Capacity (veh/h)	528	-	-	252
HCM Lane V/C Ratio	0.497	-	-	0.494
HCM Control Delay (s)	18.4	-	-	32.5
HCM Lane LOS	C	-	-	D
HCM 95th %tile Q(veh)	2.7	-	-	2.5

HCM 6th TWSC
1: Jonesville Road/WB Left-Over & US 401 Bypass EB

2022 Existing
Timing Plan: PM Peak Hour

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	-	-	16983	-	-	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

HCM 6th TWSC
1: Jonesville Road/WB Left-Over & US 401 Bypass EB

2027 No-Build
Timing Plan: PM Peak Hour

Intersection												
Int Delay, s/veh	6.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↗						↗		↑	
Traffic Vol, veh/h	0	1835	65	0	0	0	0	0	138	0	41	0
Future Vol, veh/h	0	1835	65	0	0	0	0	0	138	0	41	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	-	-	16983	-	-	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	2039	72	0	0	0	0	0	153	0	46	0
Major/Minor	Major1						Minor1			Minor2		
Conflicting Flow All	-	0	0				-	-	1020	-	2039	-
Stage 1	-	-	-				-	-	-	-	0	-
Stage 2	-	-	-				-	-	-	-	2039	-
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	234	0	56	0
Stage 1	0	-	-				0	0	-	0	-	0
Stage 2	0	-	-				0	0	-	0	99	0
Platoon blocked, %		-	-									
Mov Cap-1 Maneuver	-	-	-				-	-	234	-	56	-
Mov Cap-2 Maneuver	-	-	-				-	-	-	-	56	-
Stage 1	-	-	-				-	-	-	-	-	-
Stage 2	-	-	-				-	-	-	-	99	-
Approach	EB						NB			SB		
HCM Control Delay, s	0						45.5			186.4		
HCM LOS							E			F		
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	SBLn1								
Capacity (veh/h)	234	-	-	56								
HCM Lane V/C Ratio	0.655	-	-	0.813								
HCM Control Delay (s)	45.5	-	-	186.4								
HCM Lane LOS	E	-	-	F								
HCM 95th %tile Q(veh)	4.1	-	-	3.5								

Intersection

Int Delay, s/veh 17.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↑						↑		↑	
Traffic Vol, veh/h	0	1835	117	0	0	0	0	0	192	0	67	0
Future Vol, veh/h	0	1835	117	0	0	0	0	0	192	0	67	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	2039	130	0	0	0	0	0	213	0	74	0

Major/Minor	Major1			Minor1			Minor2		
Conflicting Flow All	-	0	0	-	-	1020	-	2039	-
Stage 1	-	-	-	-	-	-	-	0	-
Stage 2	-	-	-	-	-	-	-	2039	-
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	234	0	~ 56	0
Stage 1	0	-	-	0	0	-	0	-	0
Stage 2	0	-	-	0	0	-	0	99	0
Platoon blocked, %	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	-	-	234	-	~ 56	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	~ 56	-
Stage 1	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	99	-

Approach	EB	NB	SB
HCM Control Delay, s	0	82.4	\$ 353
HCM LOS		F	F

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	SBLn1
Capacity (veh/h)	234	-	-	56
HCM Lane V/C Ratio	0.912	-	-	1.329
HCM Control Delay (s)	82.4	-	-	\$ 353
HCM Lane LOS	F	-	-	F
HCM 95th %tile Q(veh)	7.7	-	-	6.6

Notes

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

HCM 6th TWSC
7: EB Left-Over/Jonesville Road & US 401 Bypass WB

2022 Existing
Timing Plan: AM Peak Hour

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, #	-	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	1502	206	0	40	0	0	0	250

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

HCM 6th TWSC
7: EB Left-Over/Jonesville Road & US 401 Bypass WB

2027 No-Build
Timing Plan: AM Peak Hour

Intersection												
Int Delay, s/veh	20.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↑↑	↑		↑				↑
Traffic Vol, veh/h	0	0	0	0	1796	204	0	40	0	0	0	248
Future Vol, veh/h	0	0	0	0	1796	204	0	40	0	0	0	248
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, #	-	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	1996	227	0	44	0	0	0	276

Major/Minor	Major2		Minor1		Minor2	
Conflicting Flow All	-	-	0	-	2223	-
Stage 1	-	-	-	-	0	-
Stage 2	-	-	-	-	2223	-
Critical Hdwy	-	-	-	-	6.54	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	5.54	-
Follow-up Hdwy	-	-	-	-	4.02	-
Pot Cap-1 Maneuver	0	-	-	0	~ 43	0
Stage 1	0	-	-	0	-	0
Stage 2	0	-	-	0	79	0
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	-	~ 43	-
Mov Cap-2 Maneuver	-	-	-	-	~ 43	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	79	-

Approach	WB	NB	SB
HCM Control Delay, s	0	293.8	143.8
HCM LOS		F	F

Minor Lane/Major Mvmt	NBLn1	WBT	WBR	SBLn1
Capacity (veh/h)	43	-	-	242
HCM Lane V/C Ratio	1.034	-	-	1.139
HCM Control Delay (s)	293.8	-	-	143.8
HCM Lane LOS	F	-	-	F
HCM 95th %tile Q(veh)	4.2	-	-	12.5

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

Intersection

Int Delay, s/veh 23.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↑↑	↑		↑				↑
Traffic Vol, veh/h	0	0	0	0	1853	204	0	40	0	0	0	248
Future Vol, veh/h	0	0	0	0	1853	204	0	40	0	0	0	248
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	2059	227	0	44	0	0	0	276

Major/Minor	Major2	Minor1	Minor2
Conflicting Flow All	-	0	2286
Stage 1	-	-	0
Stage 2	-	-	2286
Critical Hdwy	-	-	6.54
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	5.54
Follow-up Hdwy	-	-	4.02
Pot Cap-1 Maneuver	0	~ 39	0
Stage 1	0	0	0
Stage 2	0	74	0
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	~ 39	-
Mov Cap-2 Maneuver	-	~ 39	-
Stage 1	-	-	-
Stage 2	-	74	-

Approach	WB	NB	SB
HCM Control Delay, s	0	\$ 348.5	165.2
HCM LOS		F	F

Minor Lane/Major Mvmt	NBLn1	WBT	WBR	SBLn1
Capacity (veh/h)	39	-	-	231
HCM Lane V/C Ratio	1.14	-	-	1.193
HCM Control Delay (s)	\$ 348.5	-	-	165.2
HCM Lane LOS	F	-	-	F
HCM 95th %tile Q(veh)	4.4	-	-	13.3

Notes

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

HCM 6th TWSC
7: EB Left-Over/Jonesville Road & US 401 Bypass WB

2022 Existing
Timing Plan: PM Peak Hour

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, #	-	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	617	82	0	129	0	0	0	127

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

HCM 6th TWSC
7: EB Left-Over/Jonesville Road & US 401 Bypass WB

2027 No-Build
Timing Plan: PM Peak Hour

Intersection												
Int Delay, s/veh	6.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↑↑	↑		↑				↑
Traffic Vol, veh/h	0	0	0	0	843	82	0	128	0	0	0	126
Future Vol, veh/h	0	0	0	0	843	82	0	128	0	0	0	126
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, #	-	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	937	91	0	142	0	0	0	140

Major/Minor	Major2	Minor1	Minor2
Conflicting Flow All	-	0	1028
Stage 1	-	-	0
Stage 2	-	-	1028
Critical Hdwy	-	-	6.54
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	5.54
Follow-up Hdwy	-	-	4.02
Pot Cap-1 Maneuver	0	0	233
Stage 1	0	0	0
Stage 2	0	0	310
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	233
Mov Cap-2 Maneuver	-	-	233
Stage 1	-	-	-
Stage 2	-	-	310

Approach	WB	NB	SB
HCM Control Delay, s	0	42	14
HCM LOS		E	B

Minor Lane/Major Mvmt	NBLn1	WBT	WBR	SBLn1
Capacity (veh/h)	233	-	-	541
HCM Lane V/C Ratio	0.61	-	-	0.259
HCM Control Delay (s)	42	-	-	14
HCM Lane LOS	E	-	-	B
HCM 95th %tile Q(veh)	3.6	-	-	1

Intersection

Int Delay, s/veh 6.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↑↑	↑		↑				↑
Traffic Vol, veh/h	0	0	0	0	879	82	0	128	0	0	0	126
Future Vol, veh/h	0	0	0	0	879	82	0	128	0	0	0	126
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	977	91	0	142	0	0	0	140

Major/Minor	Major2	Minor1	Minor2
Conflicting Flow All	-	0	1068
Stage 1	-	-	0
Stage 2	-	-	1068
Critical Hdwy	-	-	6.54
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	5.54
Follow-up Hdwy	-	-	4.02
Pot Cap-1 Maneuver	0	0	220
Stage 1	0	0	0
Stage 2	0	0	296
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	220
Mov Cap-2 Maneuver	-	-	220
Stage 1	-	-	-
Stage 2	-	-	296

Approach	WB	NB	SB
HCM Control Delay, s	0	47.1	14.3
HCM LOS		E	B

Minor Lane/Major Mvmt	NBLn1	WBT	WBR	SBLn1
Capacity (veh/h)	220	-	-	525
HCM Lane V/C Ratio	0.646	-	-	0.267
HCM Control Delay (s)	47.1	-	-	14.3
HCM Lane LOS	E	-	-	B
HCM 95th %tile Q(veh)	3.9	-	-	1.1

APPENDIX E

CAPACITY ANALYSIS CALCULATIONS

US 401 BYPASS

&

EASTERN U-TURN LOCATION

HCM 6th TWSC
2: Eastern U-Turn & US 401 Bypass WB

2022 Existing
Timing Plan: AM Peak Hour

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, #	0	-	-	0	0	-	
Grade, %	0	-	-	0	0	-	
Peak Hour Factor	90	90	90	90	90	90	
Heavy Vehicles, %	2	2	2	2	2	2	
Mvmt Flow	0	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	-					

HCM 6th TWSC
2: Eastern U-Turn & US 401 Bypass WB

2027 No-Build
Timing Plan: AM Peak Hour

Intersection						
Int Delay, s/veh	2					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations				↑↑	↑	
Traffic Vol, veh/h	0	0	0	1994	100	0
Future Vol, veh/h	0	0	0	1994	100	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	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	2216	111	0
Major/Minor		Major2		Minor1		
Conflicting Flow All			-	-	1108	-
Stage 1			-	-	0	-
Stage 2			-	-	1108	-
Critical Hdwy			-	-	6.84	-
Critical Hdwy Stg 1			-	-	-	-
Critical Hdwy Stg 2			-	-	5.84	-
Follow-up Hdwy			-	-	3.52	-
Pot Cap-1 Maneuver			0	-	204	0
Stage 1			0	-	-	0
Stage 2			0	-	278	0
Platoon blocked, %				-		
Mov Cap-1 Maneuver			-	-	204	-
Mov Cap-2 Maneuver			-	-	204	-
Stage 1			-	-	-	-
Stage 2			-	-	278	-
Approach			WB		NB	
HCM Control Delay, s			0		41.9	
HCM LOS					E	
Minor Lane/Major Mvmt	NBLn1	WBT				
Capacity (veh/h)	204	-				
HCM Lane V/C Ratio	0.545	-				
HCM Control Delay (s)	41.9	-				
HCM Lane LOS	E	-				
HCM 95th %tile Q(veh)	2.9	-				

HCM 6th TWSC
2: Eastern U-Turn & US 401 Bypass WB

Hills at Harris Creek - Rolesville, NC
2027 Build AM Peak Hour

Intersection

Int Delay, s/veh 5.9

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations				↑↑	↑	
Traffic Vol, veh/h	0	0	0	2011	157	0
Future Vol, veh/h	0	0	0	2011	157	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	2234	174	0

Major/Minor	Major2	Minor1
Conflicting Flow All	-	1117
Stage 1	-	0
Stage 2	-	1117
Critical Hdwy	-	6.84
Critical Hdwy Stg 1	-	-
Critical Hdwy Stg 2	-	5.84
Follow-up Hdwy	-	3.52
Pot Cap-1 Maneuver	0	201
Stage 1	0	-
Stage 2	0	275
Platoon blocked, %	-	-
Mov Cap-1 Maneuver	-	201
Mov Cap-2 Maneuver	-	201
Stage 1	-	-
Stage 2	-	275

Approach	WB	NB
HCM Control Delay, s	0	81.9
HCM LOS		F

Minor Lane/Major Mvmt	NBLn1	WBT
Capacity (veh/h)	201	-
HCM Lane V/C Ratio	0.868	-
HCM Control Delay (s)	81.9	-
HCM Lane LOS	F	-
HCM 95th %tile Q(veh)	6.6	-

HCM 6th TWSC
2: Eastern U-Turn & US 401 Bypass WB

2022 Existing
Timing Plan: PM Peak Hour

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, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	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	-				

HCM 6th TWSC
2: Eastern U-Turn & US 401 Bypass WB

2027 No-Build
Timing Plan: PM Peak Hour

Intersection						
Int Delay, s/veh	1					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations				↑↑	↑	
Traffic Vol, veh/h	0	0	0	892	73	0
Future Vol, veh/h	0	0	0	892	73	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	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	991	81	0
Major/Minor		Major2		Minor1		
Conflicting Flow All			-	-	496	-
Stage 1			-	-	0	-
Stage 2			-	-	496	-
Critical Hdwy			-	-	6.84	-
Critical Hdwy Stg 1			-	-	-	-
Critical Hdwy Stg 2			-	-	5.84	-
Follow-up Hdwy			-	-	3.52	-
Pot Cap-1 Maneuver			0	-	503	0
Stage 1			0	-	-	0
Stage 2			0	-	577	0
Platoon blocked, %				-		
Mov Cap-1 Maneuver			-	-	503	-
Mov Cap-2 Maneuver			-	-	503	-
Stage 1			-	-	-	-
Stage 2			-	-	577	-
Approach			WB		NB	
HCM Control Delay, s			0		13.5	
HCM LOS					B	
Minor Lane/Major Mvmt	NBLn1	WBT				
Capacity (veh/h)	503	-				
HCM Lane V/C Ratio	0.161	-				
HCM Control Delay (s)	13.5	-				
HCM Lane LOS	B	-				
HCM 95th %tile Q(veh)	0.6	-				

HCM 6th TWSC
2: Eastern U-Turn & US 401 Bypass WB

Hills at Harris Creek - Rolesville, NC
2027 Build PM Peak Hour

Intersection

Int Delay, s/veh 1.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
----------	-----	-----	-----	-----	-----	-----

Lane Configurations				↑↑	↑	
Traffic Vol, veh/h	0	0	0	918	109	0
Future Vol, veh/h	0	0	0	918	109	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	1020	121	0

Major/Minor	Major2	Minor1
-------------	--------	--------

Conflicting Flow All	-	510
Stage 1	-	0
Stage 2	-	510
Critical Hdwy	-	6.84
Critical Hdwy Stg 1	-	-
Critical Hdwy Stg 2	-	5.84
Follow-up Hdwy	-	3.52
Pot Cap-1 Maneuver	0	493
Stage 1	0	-
Stage 2	0	568
Platoon blocked, %	-	-
Mov Cap-1 Maneuver	-	493
Mov Cap-2 Maneuver	-	493
Stage 1	-	-
Stage 2	-	568

Approach	WB	NB
----------	----	----

HCM Control Delay, s	0	14.7
HCM LOS		B

Minor Lane/Major Mvmt	NBLn1	WBT
-----------------------	-------	-----

Capacity (veh/h)	493	-
HCM Lane V/C Ratio	0.246	-
HCM Control Delay (s)	14.7	-
HCM Lane LOS	B	-
HCM 95th %tile Q(veh)	1	-

APPENDIX F

CAPACITY ANALYSIS CALCULATIONS

MITCHELL MILL ROAD





&

JONESVILLE ROAD / PEEBLES ROAD

HCM 6th AWSC
3: Peebles Road/Jonesville Road & Mitchell Mill Road

2022 Existing
Timing Plan: AM Peak Hour

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	4	11	316	41	4	78	11	32	133	16
Future Vol, veh/h	7	166	4	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	4	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	14.9	10.1	11.4
HCM LOS	B	B	B	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	4%	4%	3%	18%
Vol Thru, %	84%	94%	86%	73%
Vol Right, %	12%	2%	11%	9%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	93	177	368	181
LT Vol	4	7	11	32
Through Vol	78	166	316	133
RT Vol	11	4	41	16
Lane Flow Rate	103	197	409	201
Geometry Grp	1	1	1	1
Degree of Util (X)	0.168	0.297	0.577	0.318
Departure Headway (Hd)	5.85	5.433	5.079	5.696
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	612	661	711	629
Service Time	3.904	3.477	3.114	3.743
HCM Lane V/C Ratio	0.168	0.298	0.575	0.32
HCM Control Delay	10.1	10.8	14.9	11.4
HCM Lane LOS	B	B	B	B
HCM 95th-tile Q	0.6	1.2	3.7	1.4

HCM 6th AWSC
3: Peebles Road/Jonesville Road & Mitchell Mill Road

2027 No-Build
Timing Plan: AM Peak Hour

Intersection	
Intersection Delay, s/veh	50.6
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	8	240	4	12	569	45	4	86	12	35	147	18
Future Vol, veh/h	8	240	4	12	569	45	4	86	12	35	147	18
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	9	267	4	13	632	50	4	96	13	39	163	20
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	15.2	82.4	12.5	15
HCM LOS	C	F	B	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	4%	3%	2%	17%
Vol Thru, %	84%	95%	91%	73%
Vol Right, %	12%	2%	7%	9%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	102	252	626	200
LT Vol	4	8	12	35
Through Vol	86	240	569	147
RT Vol	12	4	45	18
Lane Flow Rate	113	280	696	222
Geometry Grp	1	1	1	1
Degree of Util (X)	0.223	0.481	1.081	0.417
Departure Headway (Hd)	7.412	6.42	5.595	7.067
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	487	566	647	513
Service Time	5.412	4.42	3.663	5.067
HCM Lane V/C Ratio	0.232	0.495	1.076	0.433
HCM Control Delay	12.5	15.2	82.4	15
HCM Lane LOS	B	C	F	B
HCM 95th-tile Q	0.8	2.6	19.6	2

Intersection

Intersection Delay, s/veh 142.1

Intersection LOS F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	8	279	4	31	635	131	4	86	23	86	147	18
Future Vol, veh/h	8	279	4	31	635	131	4	86	23	86	147	18
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	9	310	4	34	706	146	4	96	26	96	163	20
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	20.4	242.9	14.7	20.4
HCM LOS	C	F	B	C

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	4%	3%	4%	34%
Vol Thru, %	76%	96%	80%	59%
Vol Right, %	20%	1%	16%	7%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	113	291	797	251
LT Vol	4	8	31	86
Through Vol	86	279	635	147
RT Vol	23	4	131	18
Lane Flow Rate	126	323	886	279
Geometry Grp	1	1	1	1
Degree of Util (X)	0.26	0.59	1.481	0.545
Departure Headway (Hd)	8.674	7.367	6.021	8.087
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	417	495	602	449
Service Time	6.674	5.367	4.101	6.087
HCM Lane V/C Ratio	0.302	0.653	1.472	0.621
HCM Control Delay	14.7	20.4	242.9	20.4
HCM Lane LOS	B	C	F	C
HCM 95th-tile Q	1	3.8	43.1	3.2







HCM 6th AWSC
3: Peebles Road/Jonesville Road & Mitchell Mill Road

Hills at Harris Creek - Rolesville, NC

2027 Build - Improved AM Peak Hour

Intersection

Intersection Delay, s/veh 103.4
Intersection LOS F





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	8	279	4	31	635	131	4	86	23	86	147	18
Future Vol, veh/h	8	279	4	31	635	131	4	86	23	86	147	18
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	9	310	4	34	706	146	4	96	26	96	163	20
Number of Lanes	0	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			1			2			1		
Conflicting Approach Left	SB			NB			EB			WB		
Conflicting Lanes Left	2			1			1			2		
Conflicting Approach Right	NB			SB			WB			EB		
Conflicting Lanes Right	1			2			2			1		
HCM Control Delay	23.8			172.6			15.5			15.6		
HCM LOS	C			F			C			C		

Lane	NBLn1	EBLn1	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	4%	3%	5%	0%	100%	0%
Vol Thru, %	76%	96%	95%	0%	0%	89%
Vol Right, %	20%	1%	0%	100%	0%	11%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	113	291	666	131	86	165
LT Vol	4	8	31	0	86	0
Through Vol	86	279	635	0	0	147
RT Vol	23	4	0	131	0	18
Lane Flow Rate	126	323	740	146	96	183
Geometry Grp	6	6	7	7	7	7
Degree of Util (X)	0.283	0.645	1.385	0.243	0.218	0.39
Departure Headway (Hd)	8.975	7.746	6.739	6	8.989	8.391
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	403	469	540	595	402	433
Service Time	6.975	5.746	4.513	3.774	6.689	6.091
HCM Lane V/C Ratio	0.313	0.689	1.37	0.245	0.239	0.423
HCM Control Delay	15.5	23.8	204.5	10.7	14.2	16.4
HCM Lane LOS	C	C	F	B	B	C
HCM 95th-tile Q	1.1	4.5	33.6	0.9	0.8	1.8

HCM 6th AWSC
3: Peebles Road/Jonesville Road & Mitchell Mill Road

2022 Existing
Timing Plan: PM Peak Hour

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	4	130	21	5	92	10	27	50	11
Future Vol, veh/h	18	306	13	4	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	4	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	9.5	9.6	9.4
HCM LOS	B	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	5%	5%	3%	31%
Vol Thru, %	86%	91%	84%	57%
Vol Right, %	9%	4%	14%	12%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	107	337	155	88
LT Vol	5	18	4	27
Through Vol	92	306	130	50
RT Vol	10	13	21	11
Lane Flow Rate	119	374	172	98
Geometry Grp	1	1	1	1
Degree of Util (X)	0.175	0.489	0.233	0.146
Departure Headway (Hd)	5.312	4.702	4.878	5.379
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	668	760	728	659
Service Time	3.407	2.766	2.957	3.477
HCM Lane V/C Ratio	0.178	0.492	0.236	0.149
HCM Control Delay	9.6	12.2	9.5	9.4
HCM Lane LOS	A	B	A	A
HCM 95th-tile Q	0.6	2.7	0.9	0.5

HCM 6th AWSC
3: Peebles Road/Jonesville Road & Mitchell Mill Road

2027 No-Build
Timing Plan: PM Peak Hour

Intersection	
Intersection Delay, s/veh	19.4
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	20	436	14	4	339	23	6	102	11	30	55	12
Future Vol, veh/h	20	436	14	4	339	23	6	102	11	30	55	12
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	22	484	16	4	377	26	7	113	12	33	61	13
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	24.7	17.3	11.8	11.5
HCM LOS	C	C	B	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	5%	4%	1%	31%
Vol Thru, %	86%	93%	93%	57%
Vol Right, %	9%	3%	6%	12%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	119	470	366	97
LT Vol	6	20	4	30
Through Vol	102	436	339	55
RT Vol	11	14	23	12
Lane Flow Rate	132	522	407	108
Geometry Grp	1	1	1	1
Degree of Util (X)	0.245	0.777	0.621	0.203
Departure Headway (Hd)	6.682	5.357	5.493	6.79
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	541	668	651	531
Service Time	4.682	3.437	3.578	4.796
HCM Lane V/C Ratio	0.244	0.781	0.625	0.203
HCM Control Delay	11.8	24.7	17.3	11.5
HCM Lane LOS	B	C	C	B
HCM 95th-tile Q	1	7.4	4.3	0.8

Intersection

Intersection Delay, s/veh 53.1

Intersection LOS F







Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	20	496	14	12	382	77	6	102	28	108	55	12
Future Vol, veh/h	20	496	14	12	382	77	6	102	28	108	55	12
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	22	551	16	13	424	86	7	113	31	120	61	13
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	79.1	48.3	15.1	16.9
HCM LOS	F	E	C	C

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	4%	4%	3%	62%
Vol Thru, %	75%	94%	81%	31%
Vol Right, %	21%	3%	16%	7%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	136	530	471	175
LT Vol	6	20	12	108
Through Vol	102	496	382	55
RT Vol	28	14	77	12
Lane Flow Rate	151	589	523	194
Geometry Grp	1	1	1	1
Degree of Util (X)	0.329	1.056	0.928	0.422
Departure Headway (Hd)	8.141	6.455	6.582	8.1
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	444	565	555	447
Service Time	6.141	4.503	4.582	6.1
HCM Lane V/C Ratio	0.34	1.042	0.942	0.434
HCM Control Delay	15.1	79.1	48.3	16.9
HCM Lane LOS	C	F	E	C
HCM 95th-tile Q	1.4	16.9	11.6	2.1

Intersection

Intersection Delay, s/veh 60.7
Intersection LOS F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	20	496	14	12	382	77	6	102	28	108	55	12
Future Vol, veh/h	20	496	14	12	382	77	6	102	28	108	55	12
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	22	551	16	13	424	86	7	113	31	120	61	13
Number of Lanes	0	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			1			2			1		
Conflicting Approach Left	SB			NB			EB			WB		
Conflicting Lanes Left	2			1			1			2		
Conflicting Approach Right	NB			SB			WB			EB		
Conflicting Lanes Right	1			2			2			1		
HCM Control Delay	112.5			32.4			16.3			14.4		
HCM LOS	F			D			C			B		

Lane	NBLn1	EBLn1	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	4%	4%	3%	0%	100%	0%
Vol Thru, %	75%	94%	97%	0%	0%	82%
Vol Right, %	21%	3%	0%	100%	0%	18%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	136	530	394	77	108	67
LT Vol	6	20	12	0	108	0
Through Vol	102	496	382	0	0	55
RT Vol	28	14	0	77	0	12
Lane Flow Rate	151	589	438	86	120	74
Geometry Grp	6	6	7	7	7	7
Degree of Util (X)	0.345	1.149	0.835	0.146	0.286	0.165
Departure Headway (Hd)	8.785	7.023	7.215	6.48	9.089	8.439
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	413	524	503	557	398	428
Service Time	6.785	5.023	4.915	4.18	6.789	6.139
HCM Lane V/C Ratio	0.366	1.124	0.871	0.154	0.302	0.173
HCM Control Delay	16.3	112.5	36.7	10.3	15.4	12.8
HCM Lane LOS	C	F	E	B	C	B
HCM 95th-tile Q	1.5	20.4	8.4	0.5	1.2	0.6

APPENDIX G

CAPACITY ANALYSIS CALCULATIONS

MITCHELL MILL ROAD

&

SITE ACCESS 1

HCM 6th TWSC
8: Mitchell Mill Road & Site Access 1

Hills at Harris Creek - Rolesville, NC
2027 Build AM Peak Hour

Intersection

Int Delay, s/veh 0.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
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Lane Configurations

Traffic Vol, veh/h	0	388	765	4	0	32
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Future Vol, veh/h	0	388	765	4	0	32
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Conflicting Peds, #/hr	0	0	0	0	0	0
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Sign Control	Free	Free	Free	Free	Stop	Stop
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RT Channelized	-	None	-	None	-	None
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Storage Length	-	-	-	-	-	0
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Veh in Median Storage, #	-	0	0	-	0	-
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Grade, %	-	0	0	-	0	-
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Peak Hour Factor	90	90	90	90	90	90
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Heavy Vehicles, %	2	2	2	2	2	2
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Mvmt Flow	0	431	850	4	0	36
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Major/Minor	Major1	Major2	Minor2
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Conflicting Flow All	-	0	0	852
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Stage 1	-	-	-	-
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Stage 2	-	-	-	-
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Critical Hdwy	-	-	-	6.22
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Critical Hdwy Stg 1	-	-	-	-
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Critical Hdwy Stg 2	-	-	-	-
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Follow-up Hdwy	-	-	-	3.318
----------------	---	---	---	-------

Pot Cap-1 Maneuver	0	-	-	0	359
--------------------	---	---	---	---	-----

Stage 1	0	-	-	0	-
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Stage 2	0	-	-	0	-
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Platoon blocked, %	-	-	-	-
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Mov Cap-1 Maneuver	-	-	-	-	359
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Mov Cap-2 Maneuver	-	-	-	-	-
--------------------	---	---	---	---	---

Stage 1	-	-	-	-	-
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Stage 2	-	-	-	-	-
---------	---	---	---	---	---

Approach	EB	WB	SB
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HCM Control Delay, s	0	0	16.1
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HCM LOS			C
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Minor Lane/Major Mvmt	EBT	WBT	WBR	SBLn1
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Capacity (veh/h)	-	-	-	359
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HCM Lane V/C Ratio	-	-	-	0.099
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HCM Control Delay (s)	-	-	-	16.1
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HCM Lane LOS	-	-	-	C
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HCM 95th %tile Q(veh)	-	-	-	0.3
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HCM 6th TWSC
8: Mitchell Mill Road & Site Access 1

Hills at Harris Creek - Rolesville, NC
2027 Build PM Peak Hour

Intersection

Int Delay, s/veh 0.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
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Lane Configurations		↑	↑			↑
Traffic Vol, veh/h	0	632	451	4	0	20
Future Vol, veh/h	0	632	451	4	0	20
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	702	501	4	0	22

Major/Minor	Major1	Major2	Minor2
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Conflicting Flow All	-	0	0
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	6.22
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	3.318
Pot Cap-1 Maneuver	0	-	0
Stage 1	0	-	0
Stage 2	0	-	0
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	569
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

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

Minor Lane/Major Mvmt	EBT	WBT	WBR	SBLn1
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Capacity (veh/h)	-	-	-	569
HCM Lane V/C Ratio	-	-	-	0.039
HCM Control Delay (s)	-	-	-	11.6
HCM Lane LOS	-	-	-	B
HCM 95th %tile Q(veh)	-	-	-	0.1

APPENDIX H

CAPACITY ANALYSIS CALCULATIONS

MITCHELL MILL ROAD

&







SITE ACCESS 2

HCM 6th TWSC
9: Mitchell Mill Road & Site Access 2

Hills at Harris Creek - Rolesville, NC
2027 Build AM Peak Hour

Intersection

Int Delay, s/veh 3.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	101	287	626	11	19	139
Future Vol, veh/h	101	287	626	11	19	139
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	150	-	-	100	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	112	319	696	12	21	154

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	708	0	0 1239 696
Stage 1	-	-	- 696 -
Stage 2	-	-	- 543 -
Critical Hdwy	4.12	-	- 6.42 6.22
Critical Hdwy Stg 1	-	-	- 5.42 -
Critical Hdwy Stg 2	-	-	- 5.42 -
Follow-up Hdwy	2.218	-	- 3.518 3.318
Pot Cap-1 Maneuver	891	-	- 194 442
Stage 1	-	-	- 495 -
Stage 2	-	-	- 582 -
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	891	-	- 170 442
Mov Cap-2 Maneuver	-	-	- 170 -
Stage 1	-	-	- 433 -
Stage 2	-	-	- 582 -

Approach	EB	WB	SB
HCM Control Delay, s	2.5	0	23.1
HCM LOS			C







Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	891	-	-	-	371
HCM Lane V/C Ratio	0.126	-	-	-	0.473
HCM Control Delay (s)	9.6	-	-	-	23.1
HCM Lane LOS	A	-	-	-	C
HCM 95th %tile Q(veh)	0.4	-	-	-	2.4

HCM 6th TWSC
9: Mitchell Mill Road & Site Access 2

Hills at Harris Creek - Rolesville, NC
2027 Build PM Peak Hour

Intersection

Int Delay, s/veh 3.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	176	456	353	26	33	98
Future Vol, veh/h	176	456	353	26	33	98
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	150	-	-	100	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	196	507	392	29	37	109

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	421	0	0
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	4.12	-	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	2.218	-	-
Pot Cap-1 Maneuver	1138	-	-
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1138	-	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

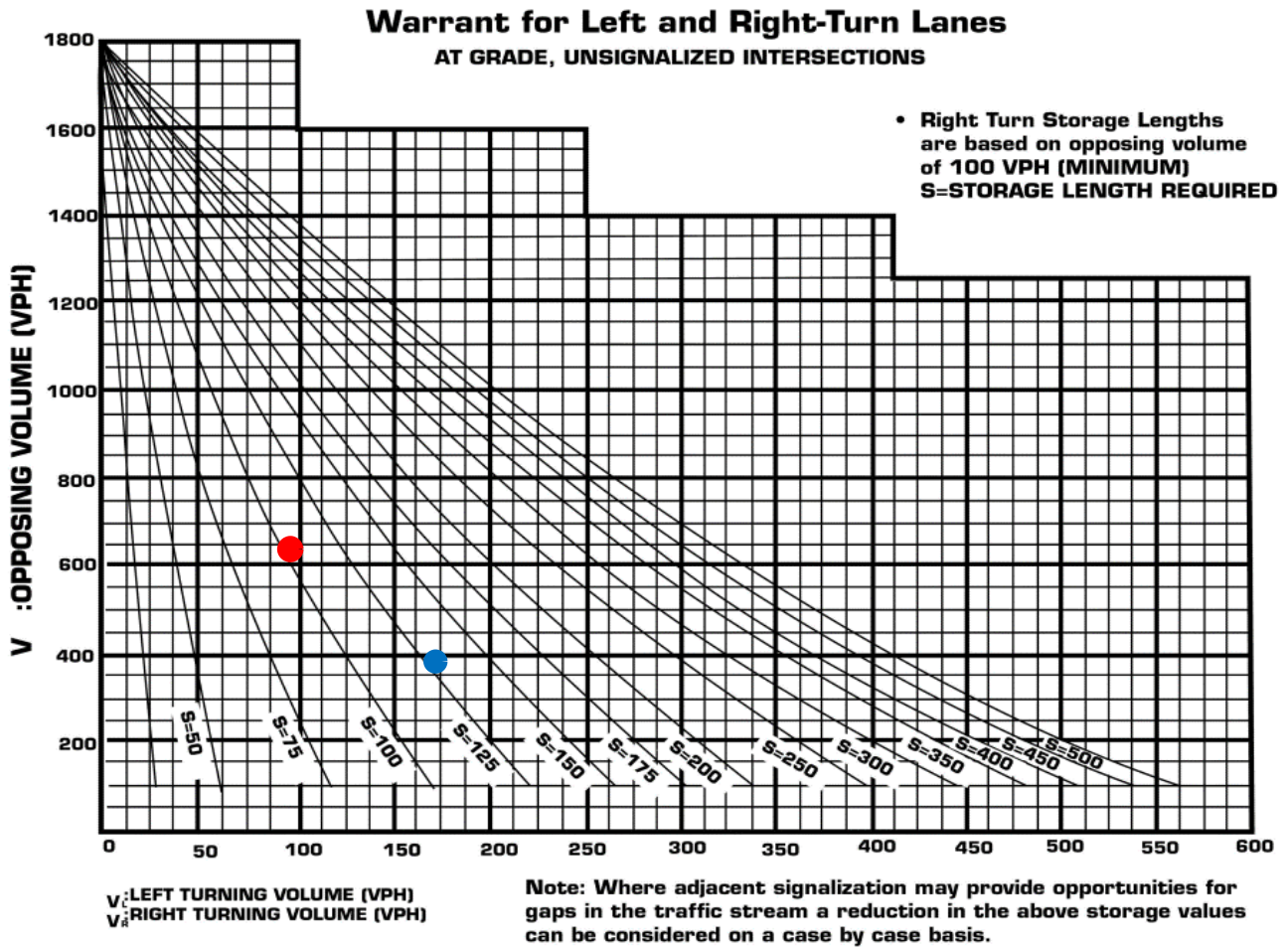
Approach	EB	WB	SB
HCM Control Delay, s	2.5	0	22.2
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1138	-	-	-	353
HCM Lane V/C Ratio	0.172	-	-	-	0.412
HCM Control Delay (s)	8.8	-	-	-	22.2
HCM Lane LOS	A	-	-	-	C
HCM 95th %tile Q(veh)	0.6	-	-	-	2

APPENDIX I

TURN LANE WARRANTS

HILLS AT HARRIS CREEK
TURN LANE STORAGE WARRANTS



Policy On Street And Driveway Access to North Carolina Highways

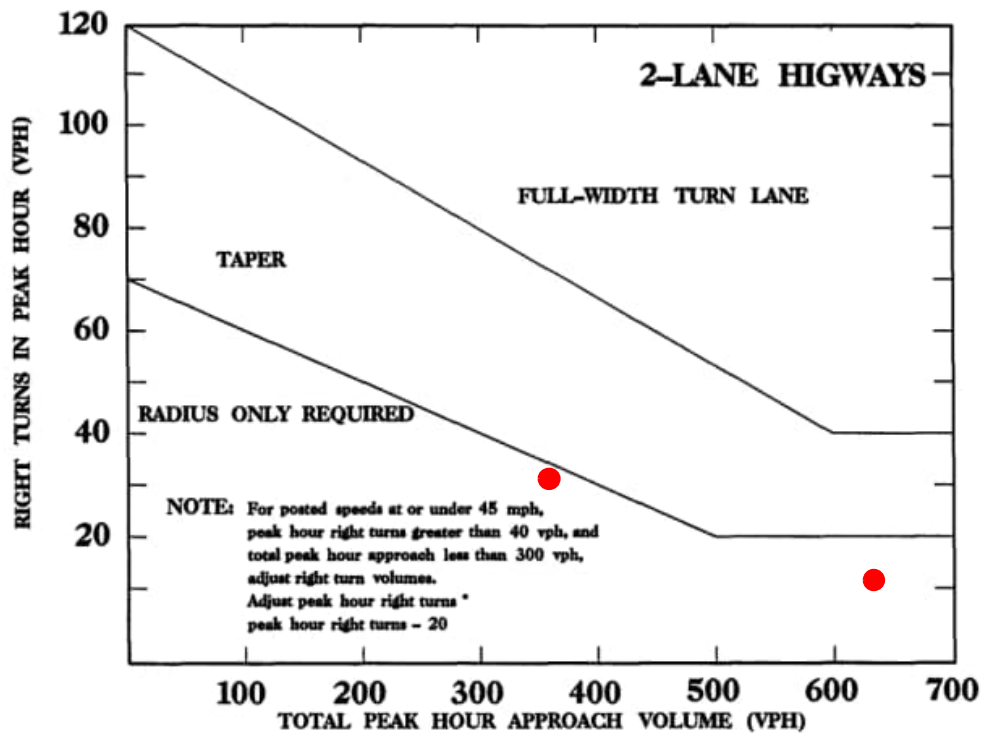
INTERSECTION: Mitchell Mill Road & Site Access 2

SCENARIO	Movement	Turn Lane	Turning Volume (V _R /V _L)	Approach / Opposing Volume (V _A /V _O)	Symbol
AM Build	EBL	Left	101	637	●
PM Build	EBL	Left	176	379	●
					●
					●

Mitchell Mill Road and Site Access 2

2027 Build				
Peak Hour	Approach	Right Turn Volume	Approach Volume	Warranted?
AM	Westbound	11	637	No
PM	Westbound	26	379	No

RIGHT TURN LANE WARRANTS



APPENDIX J

MUTCD / ITRE SIGNAL WARRANT ANALYSIS

Traffic Signal Warrant Analysis

Warrants 1 - 3 (Volume Warrants)

Project Name	Hills at Harris Creek
Project/File #	20498 - 05
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	2861 vehicles	Total Approach Volume	424 vehicles
Total Ped/Bike Volume	0 crossings	Total Ped/Bike Volume	0 crossings
Right turn reduction of	100 percent applied	Right turn reduction of	0 percent applied

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

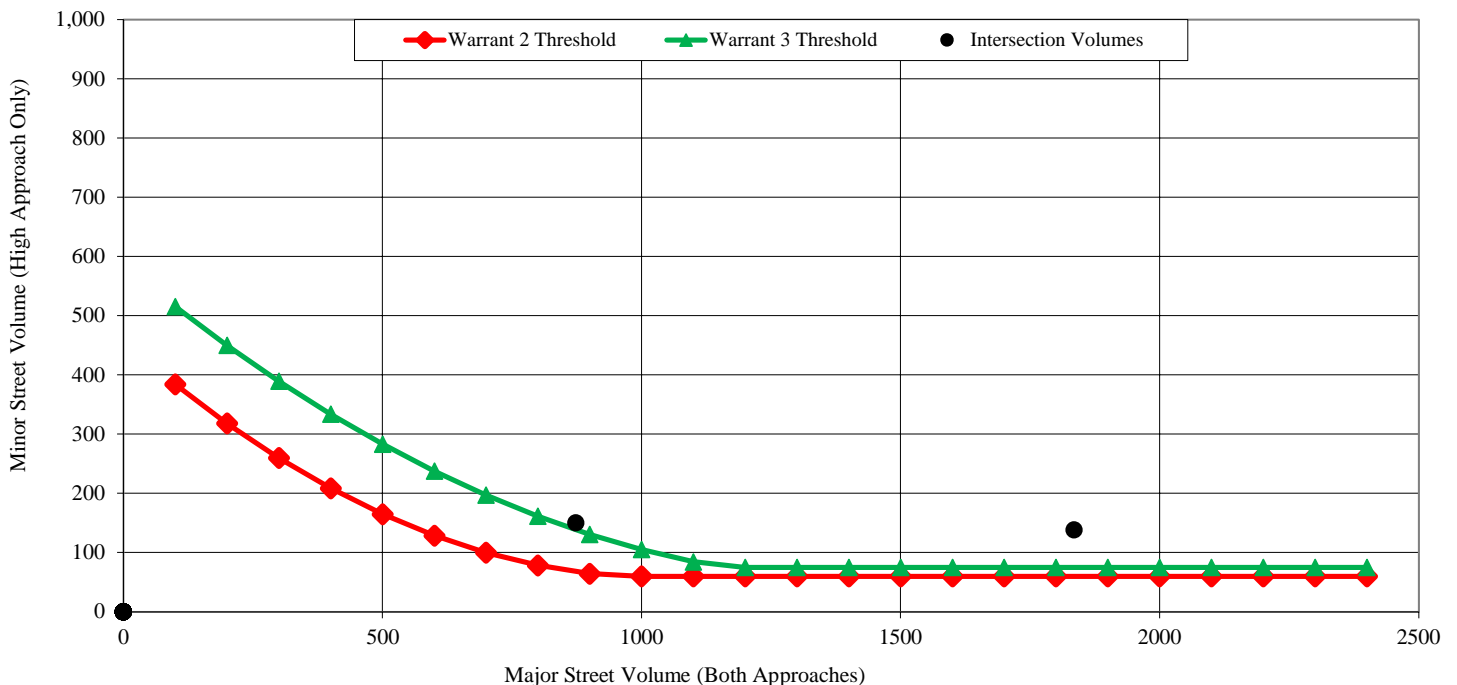
Warrant 1, Eight Hour Vehicular Volume			
	Condition A	Condition B	Condition A+B*
Condition Satisfied?	Not Satisfied	Not Satisfied	Not Satisfied
Required values reached for	2 hours	2 hours	2 (Cond. A) & 2 (Cond. B)
Criteria - Major Street (veh/hr)	420	630	336 (Cond. A) & 504 (Cond. B)
Criteria - Minor 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	1941 total, 41 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 [Major-Street Left-Turn] **[No-Build]**

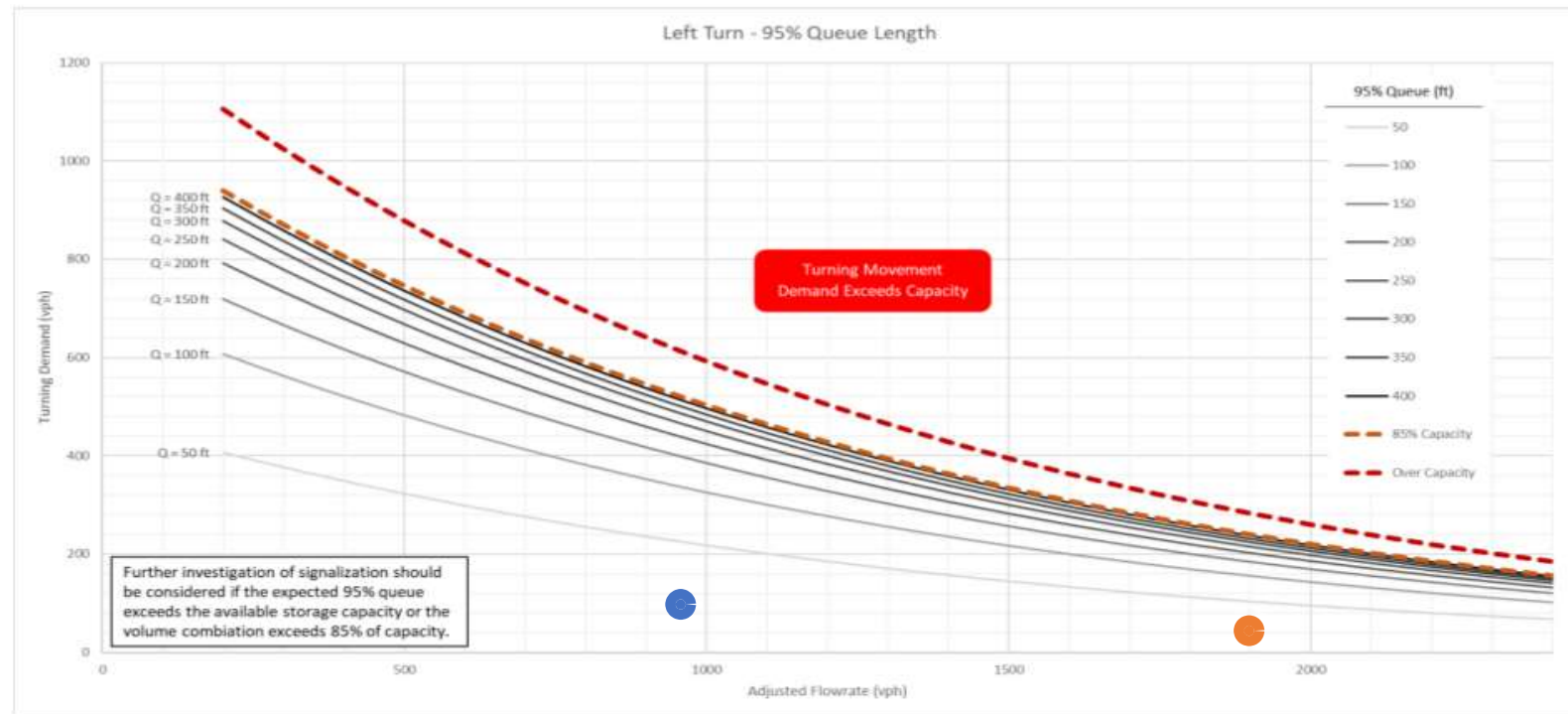
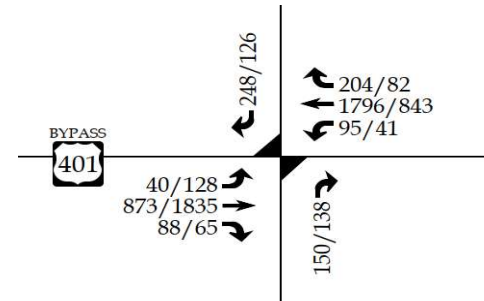
AM Peak Hour				
vph	g/c	a	b	c
900	0.7	0.00004	0.0097	0.4284
961	0.7	4.0E-05	0.009192	0.460018
1080	0.7	0.00004	0.0082	0.5217

PM Peak Hour				
vph	g/c	a	b	c
1800	0.7	0.00004	0.0097	0.4284
1900	0.7	4.0E-05	0.008867	0.480233
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)	961
Adjusted Conflicting (vph)	961
Turning Volume (vph)	95

CVAF	1
Conflicting Volume (vph)	1900
Adjusted Conflicting (vph)	1900
Turning Volume (vph)	41



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

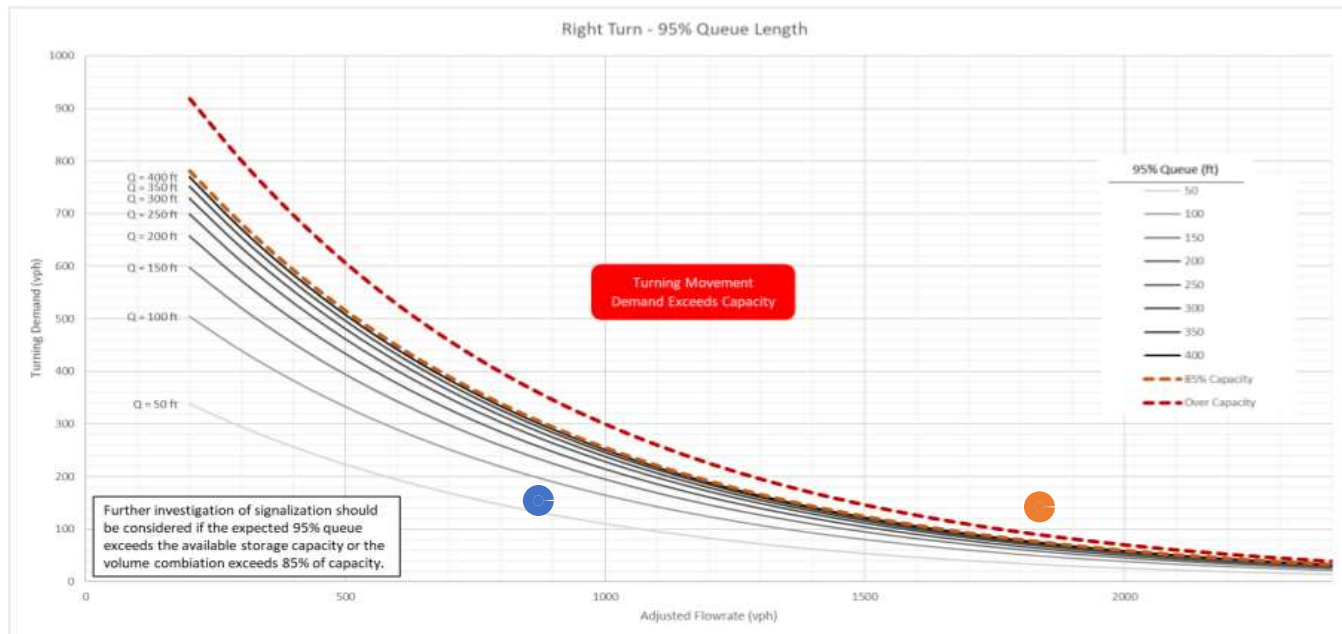
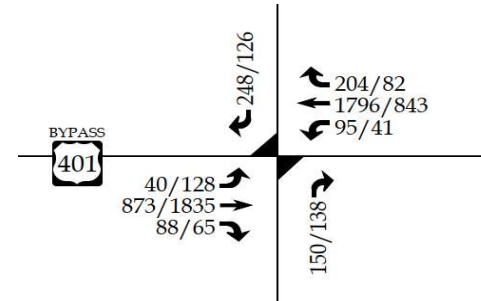
AM Peak Hour				
vph	g/c	a	b	c
720	0.7	0.00004	0.0108	0.2587
873	0.7	3.2E-05	0.009525	0.34557
900	0.7	0.00003	0.0093	0.3609

PM Peak Hour				
vph	g/c	a	b	c
1800	0.7	0.00004	0.0108	0.2587
1835	0.7	3.8E-05	0.010508	0.278572
1980	0.7	0.00003	0.0093	0.3609

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

CVAF	1
Conflicting Volume (vph)	873
Adjusted Conflicting (vph)	873
Turning Volume (vph)	150

CVAF	1
Conflicting Volume (vph)	1835
Adjusted Conflicting (vph)	1835
Turning Volume (vph)	138



Traffic Signal Warrant Analysis

Warrants 1 - 3 (Volume Warrants)

Project Name	Hills at Harris Creek
Project/File #	20498 - 05
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	2947 vehicles	Total Approach Volume	607 vehicles
Total Ped/Bike Volume	0 crossings	Total Ped/Bike Volume	0 crossings
Right turn reduction of	100 percent applied	Right turn reduction of	0 percent applied

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

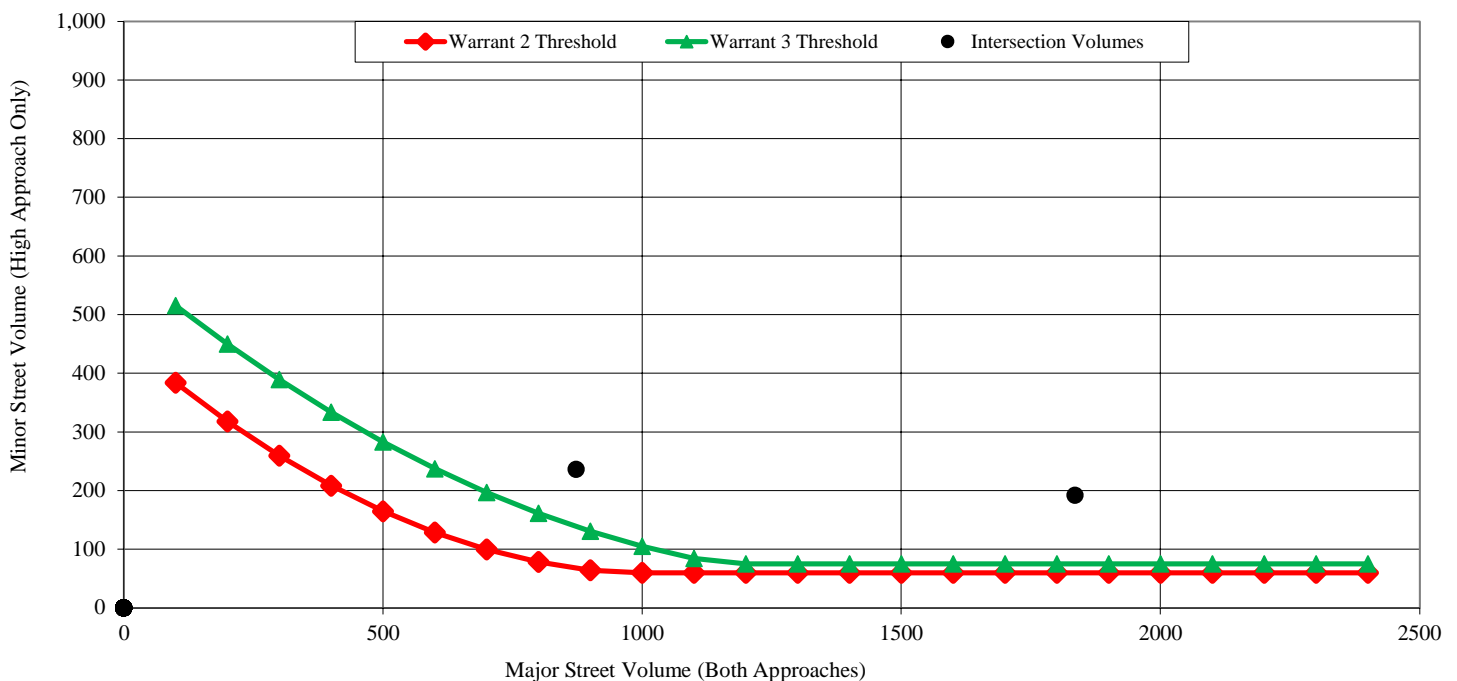
Warrant 1, Eight Hour Vehicular Volume			
	Condition A	Condition B	Condition A+B*
Condition Satisfied?	Not Satisfied	Not Satisfied	Not Satisfied
Required values reached for	2 hours	2 hours	2 (Cond. A) & 2 (Cond. B)
Criteria - Major Street (veh/hr)	420	630	336 (Cond. A) & 504 (Cond. B)
Criteria - Minor 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	2019 total, 67 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 [Major-Street Left-Turn] [Build]

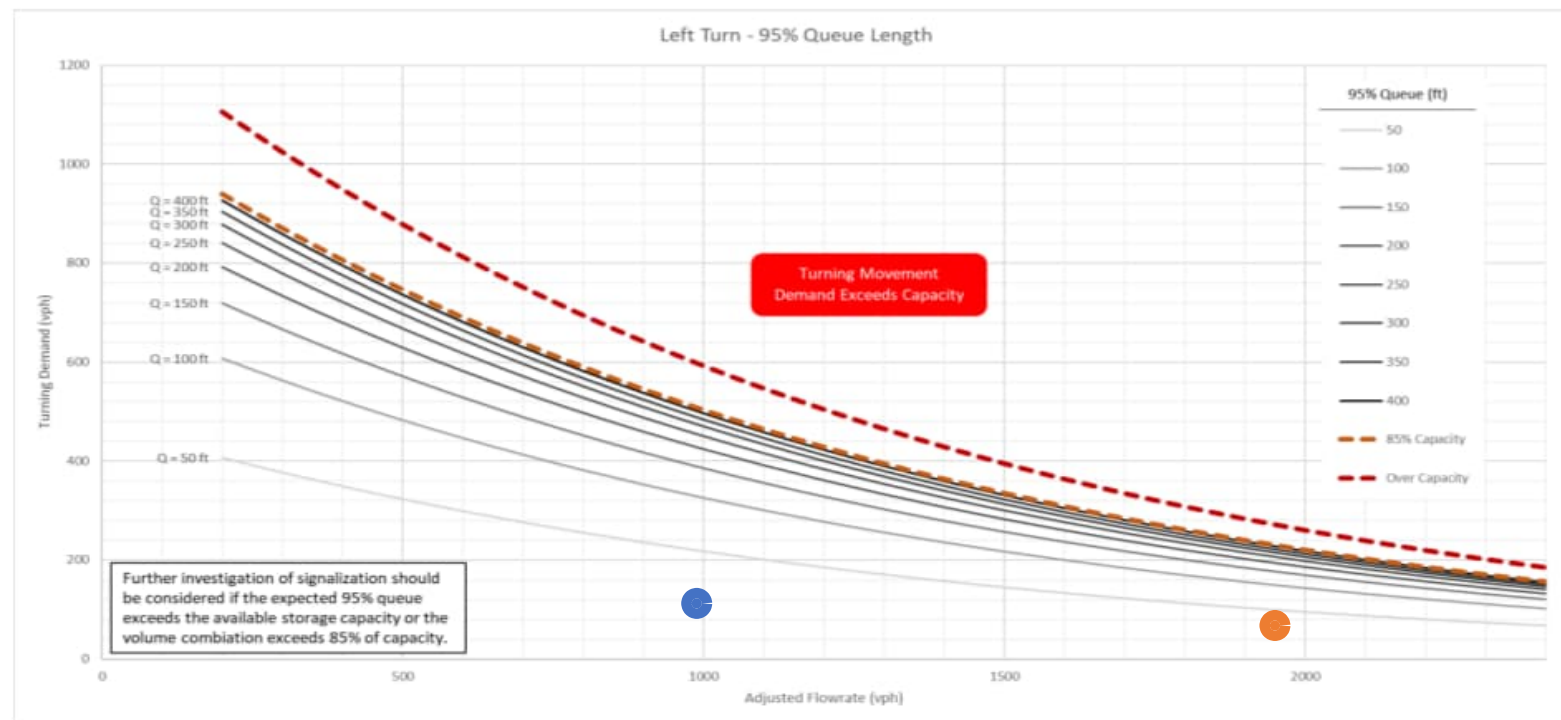
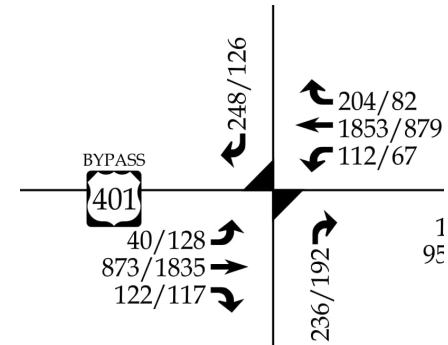
AM Peak Hour				
vph	g/c	a	b	c
900	0.7	0.00004	0.0097	0.4284
995	0.7	4.0E-05	0.008908	0.477642
1080	0.7	0.00004	0.0082	0.5217

PM Peak Hour				
vph	g/c	a	b	c
1800	0.7	0.00004	0.0097	0.4284
1952	0.7	4.0E-05	0.008433	0.507187
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)	995
Adjusted Conflicting (vph)	995
Turning Volume (vph)	112

CVAF	1
Conflicting Volume (vph)	1952
Adjusted Conflicting (vph)	1952
Turning Volume (vph)	67



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

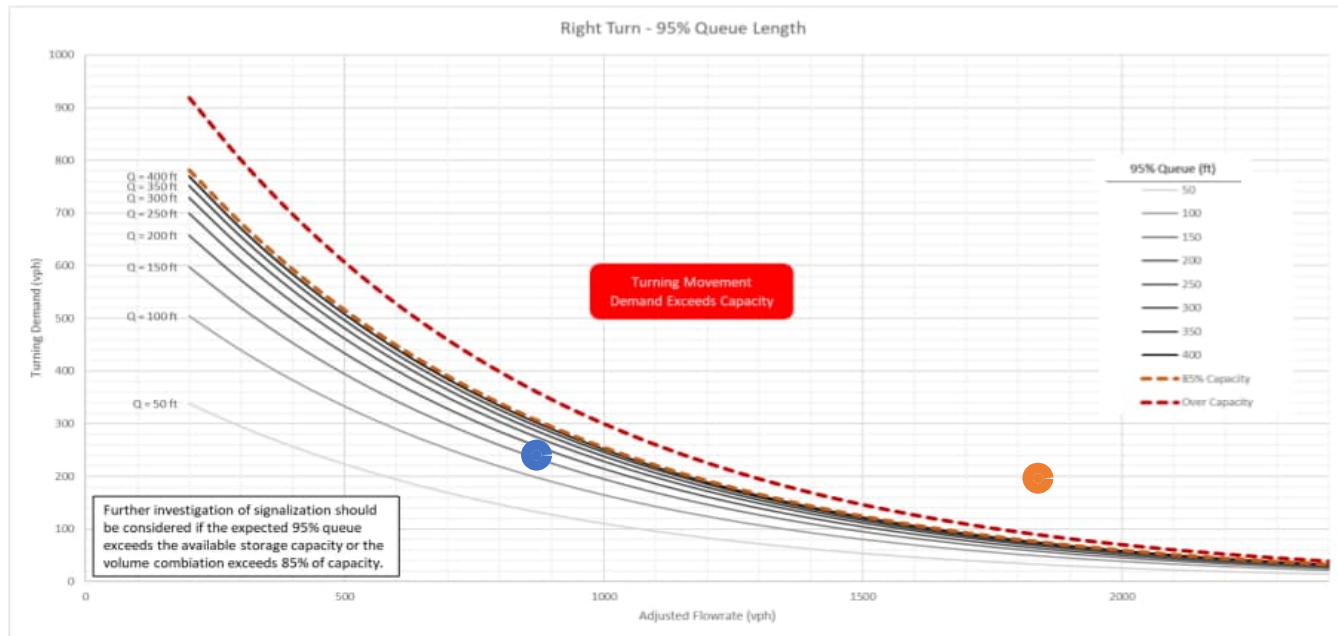
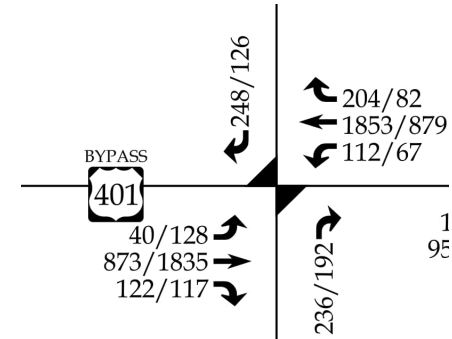
AM Peak Hour				
vph	g/c	a	b	c
720	0.7	0.00004	0.0108	0.2587
873	0.7	3.2E-05	0.009525	0.34557
900	0.7	0.00003	0.0093	0.3609

PM Peak Hour				
vph	g/c	a	b	c
1800	0.7	0.00004	0.0108	0.2587
1835	0.7	3.8E-05	0.010508	0.278572
1980	0.7	0.00003	0.0093	0.3609

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

CVAF	1
Conflicting Volume (vph)	873
Adjusted Conflicting (vph)	873
Turning Volume (vph)	236

CVAF	1
Conflicting Volume (vph)	1835
Adjusted Conflicting (vph)	1835
Turning Volume (vph)	192



Traffic Signal Warrant Analysis

Warrants 1 - 3 (Volume Warrants)

Project Name	Hills at Harris Creek
Project/File #	20498 - 05
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	2886 vehicles	Total Approach Volume	173 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.

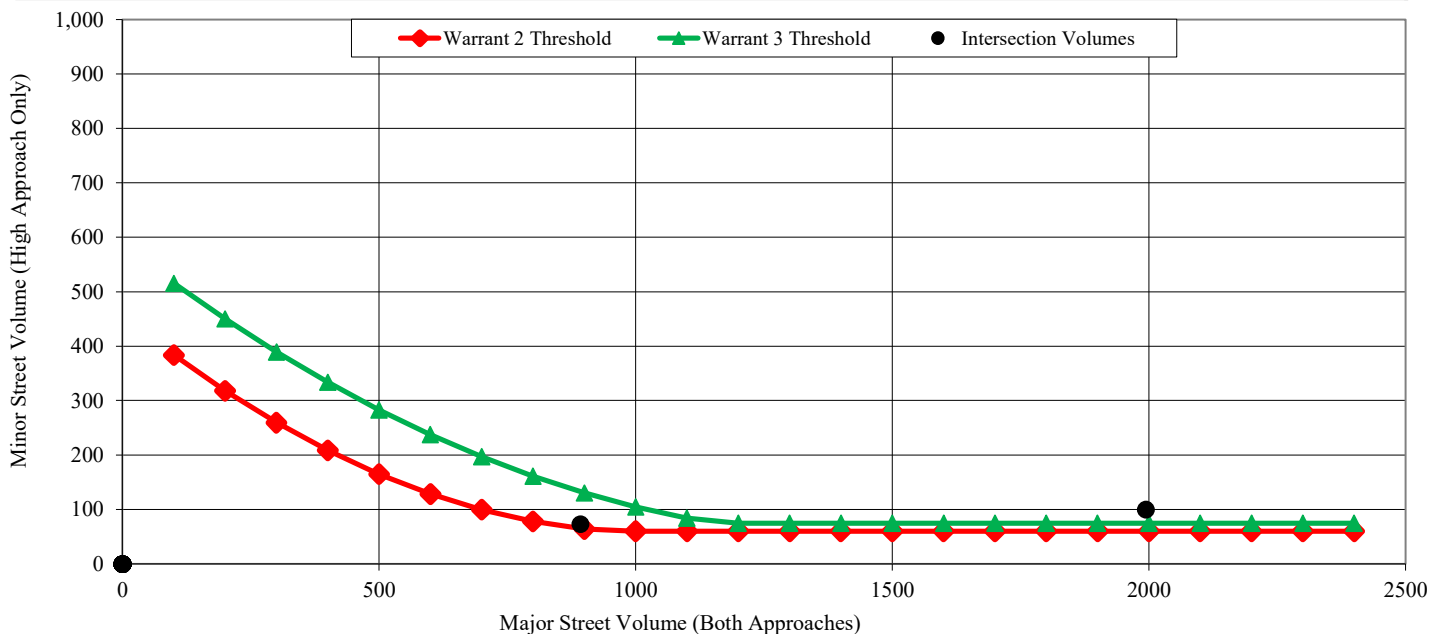
Warrant 1, Eight Hour Vehicular Volume			
	Condition A	Condition B	Condition A+B*
Condition Satisfied?	Not Satisfied	Not Satisfied	Not Satisfied
Required values reached for	0 hours	2 hours	1 (Cond. A) & 2 (Cond. B)
Criteria - Major Street (veh/hr)	420	630	336 (Cond. A) & 504 (Cond. B)
Criteria - Minor 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	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	2094 total, 100 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)



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

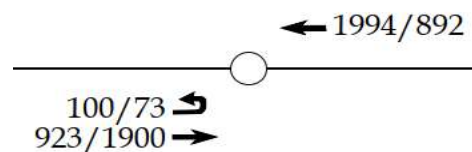
AM Peak Hour				
vph	g/c	a	b	c
1800	0.7	0.00003	0.0072	0.5106
1994	0.7	3.0E-05	0.006984	0.539484
1980	0.7	0.00003	0.007	0.5374

PM Peak Hour				
vph	g/c	a	b	c
720	0.7	0.00003	0.0072	0.5106
892	0.7	3.0E-05	0.007009	0.536209
900	0.7	0.00003	0.007	0.5374

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

CVAF	1
Conflicting Volume (vph)	1994
Adjusted Conflicting (vph)	1994
Turning Volume (vph)	100

CVAF	1
Conflicting Volume (vph)	892
Adjusted Conflicting (vph)	892
Turning Volume (vph)	73



Traffic Signal Warrant Analysis

Warrants 1 - 3 (Volume Warrants)

Project Name	Hills at Harris Creek
Project/File #	20498 - 05
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	2929 vehicles	Total Approach Volume	266 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.

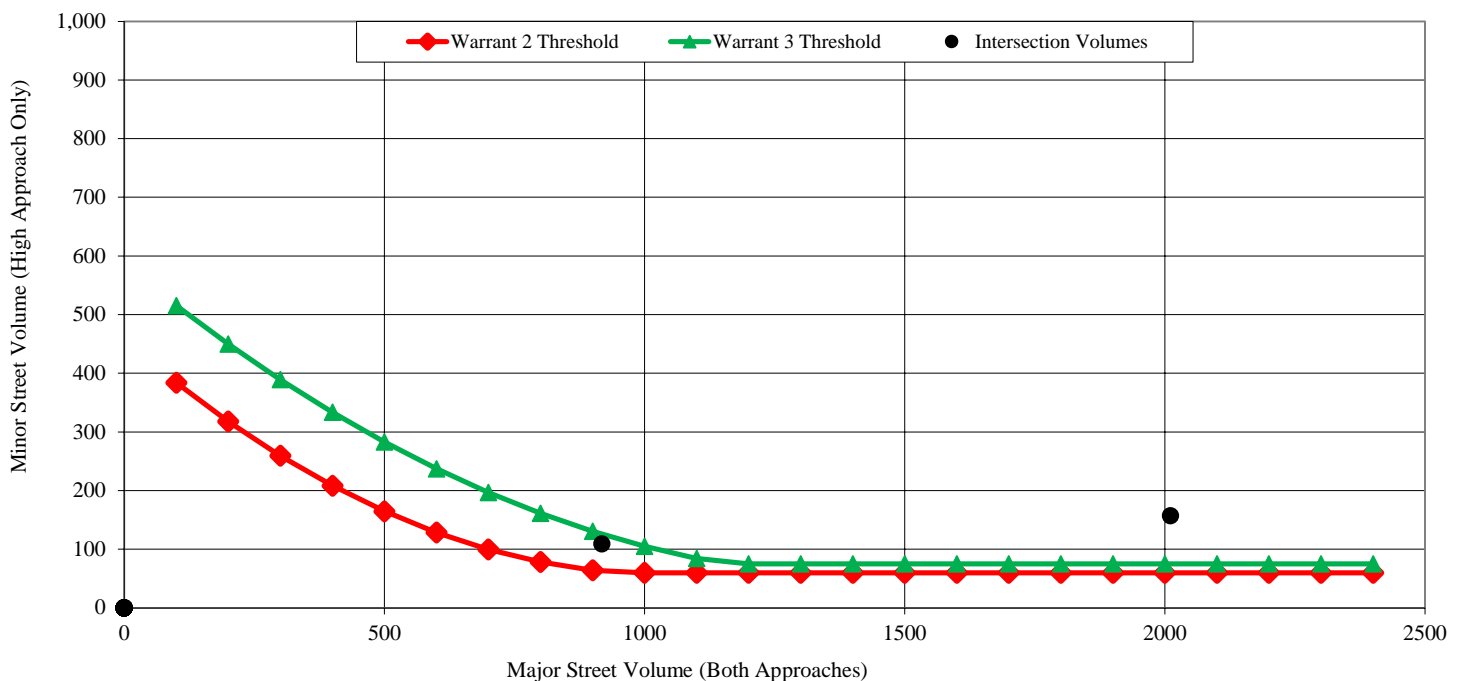
Warrant 1, Eight Hour Vehicular Volume			
	Condition A	Condition B	Condition A+B*
Condition Satisfied?	Not Satisfied	Not Satisfied	Not Satisfied
Required values reached for	2 hours	2 hours	2 (Cond. A) & 2 (Cond. B)
Criteria - Major Street (veh/hr)	420	630	336 (Cond. A) & 504 (Cond. B)
Criteria - Minor 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	2168 total, 157 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)



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

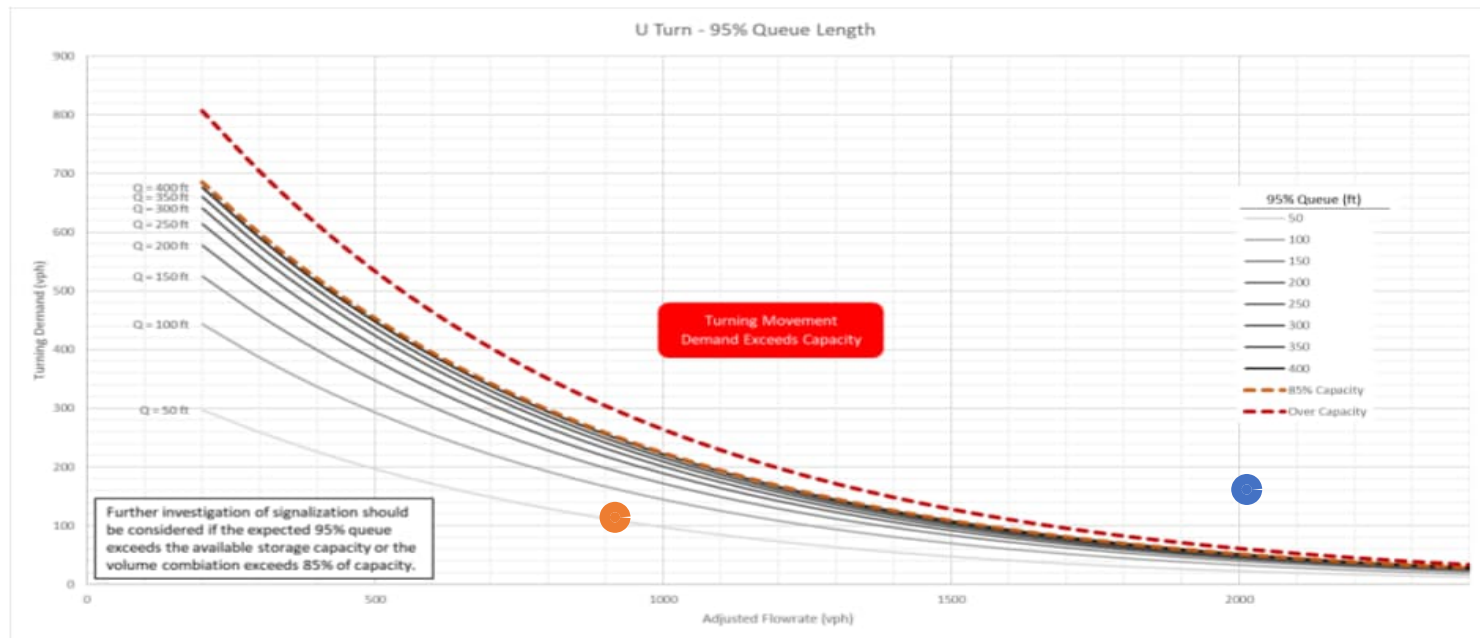
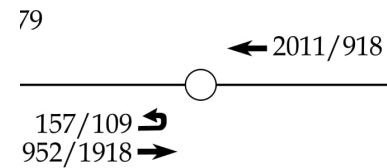
AM Peak Hour				
vph	g/c	a	b	c
1980	0.7	0.00003	0.007	0.5374
2011	0.7	3.0E-05	0.006966	0.544651
2160	0.7	0.00003	0.0068	0.5795

PM Peak Hour				
vph	g/c	a	b	c
900	0.7	0.00003	0.007	0.5374
918	0.7	3.0E-05	0.00698	0.54161
1080	0.7	0.00003	0.0068	0.5795

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

CVAF	1
Conflicting Volume (vph)	2011
Adjusted Conflicting (vph)	2011
Turning Volume (vph)	157

CVAF	1
Conflicting Volume (vph)	918
Adjusted Conflicting (vph)	918
Turning Volume (vph)	109



Traffic Signal Warrant Analysis

Warrants 1 - 3 (Volume Warrants)

Project Name	Hills at Harris Creek
Project/File #	20498 - 05
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	1708 vehicles	Total Approach Volume	518 vehicles
Total Ped/Bike Volume	0 crossings	Total Ped/Bike Volume	0 crossings
Right turn reduction of	100 percent applied	Right turn reduction of	100 percent applied

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

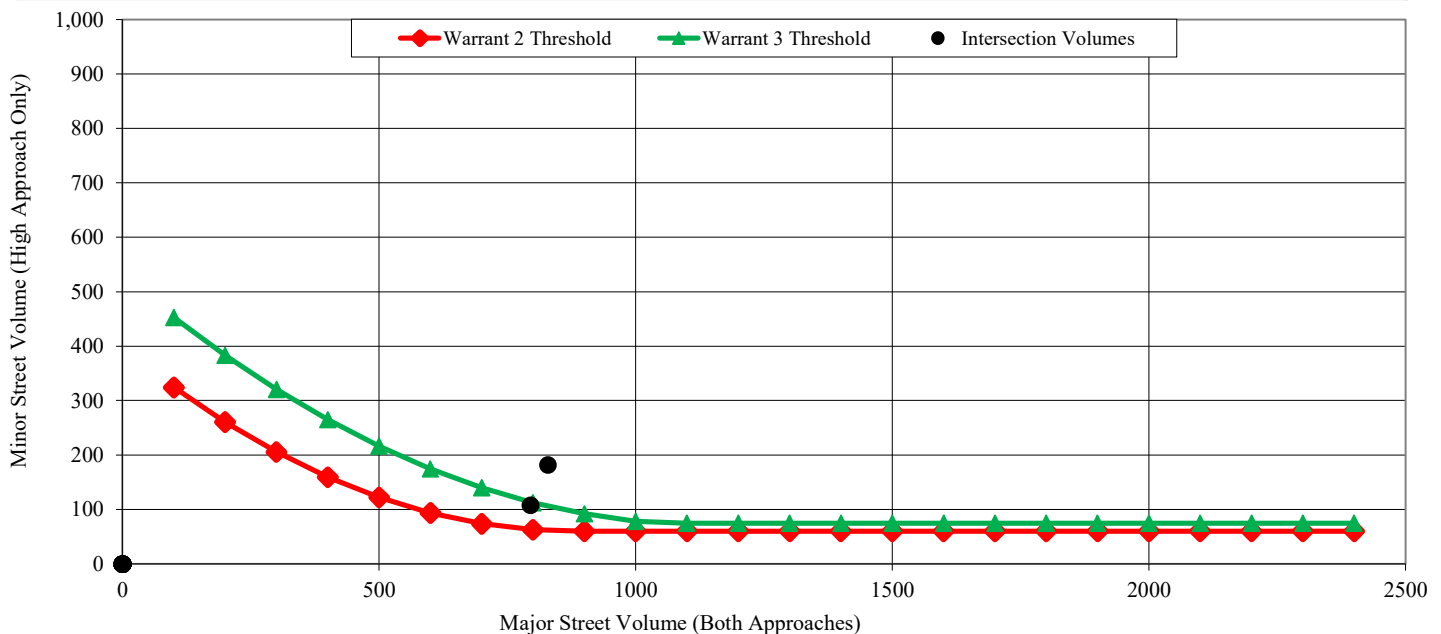
Warrant 1, Eight Hour Vehicular Volume			
	Condition A	Condition B	Condition A+B*
Condition Satisfied?	Not Satisfied	Not Satisfied	Not Satisfied
Required values reached for	2 hours	2 hours	2 (Cond. A) & 2 (Cond. B)
Criteria - Major Street (veh/hr)	350	525	280 (Cond. A) & 420 (Cond. B)
Criteria - Minor 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	1178 total, 200 minor, 0 delay	1 hour
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	Hills at Harris Creek
Project/File #	20498 - 05
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	2087 vehicles	Total Approach Volume	675 vehicles
Total Ped/Bike Volume	0 crossings	Total Ped/Bike Volume	0 crossings
Right turn reduction of	100 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)	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	1450 total, 251 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)

