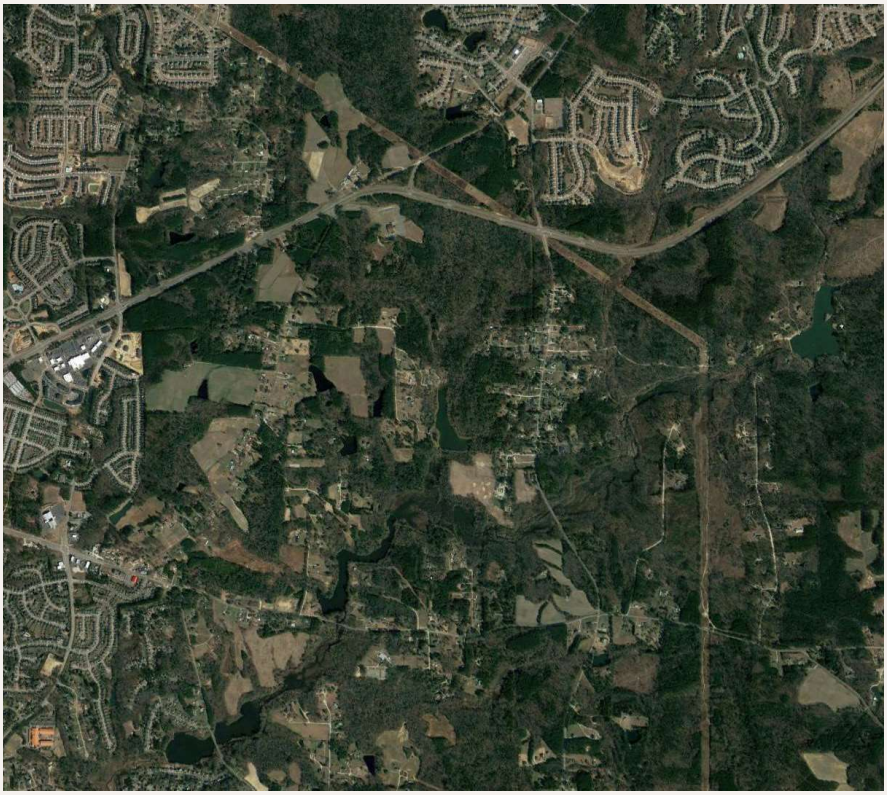
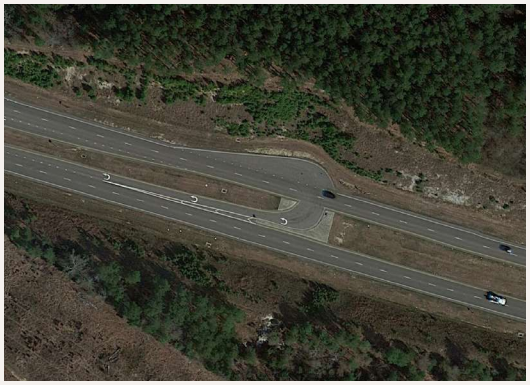
RAMEY KEMP ASSOCIATES

TOGETHER WE ARE LIMITLESS





5109 Mitchell Mill Road

Traffic Impact Analysis

Rolesville, North Carolina

RKA

rameykemp.com

TRAFFIC IMPACT ANALYSIS

FOR

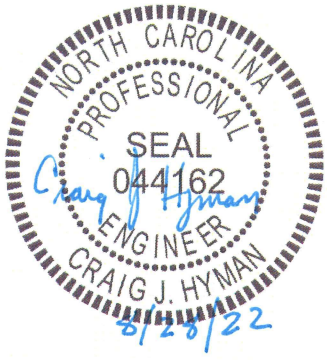
5109 MITCHELL MILL ROAD

LOCATED

IN

ROLESVILLE, NORTH CAROLINA

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



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AUGUST 2022

RKA Project No. 20498 - 004

Prepared By: TF

Reviewed By: CH

TRAFFIC IMPACT ANALYSIS
5109 MITCHELL MILL ROAD
ROLESVILLE, NORTH CAROLINA

EXECUTIVE SUMMARY

1. Development Overview

A Traffic Impact Analysis (TIA) was conducted for the proposed 5109 Mitchell Mill Road 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 expected to be completed in 2028 and is to be separated into two (2) tracts on both sides of Jonesville Road, north of Mitchell Mill Road in Rolesville, North Carolina. The eastern tract is expected to consist of 195 single-family homes and the western tract of development is expected to consist of 69 single-family homes, 129 townhomes, and 50,000 square feet (sq. ft.) of general retail space. Site access is proposed via four (4) full-movement driveway connections along Jonesville Road, three (3) right-in/right-out (RIRO) driveway connections along Mitchell Mill Road, and one (1) full-movement driveway connection along Mitchell Mill Road. One of the site driveway connections along Jonesville Road will be aligned to provide access to both the eastern and western tracts of the proposed development.

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

- 2021 Existing Traffic Conditions
- 2028 No-Build Traffic Conditions
- 2028 Build Traffic Conditions

2. Existing Traffic Conditions

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

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

Existing peak hour traffic volumes were determined based on traffic counts conducted at the study intersections 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:

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 264 single-family homes, 129 townhomes, and 50,000 sq. ft. of general retail space. 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*, 10th Edition. Table E-1, on the following page, 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)	264 DU	2,540	48	144	192	163	95	258
Multi-Family Home (Low-Rise) (220)	129 DU	934	14	47	61	47	27	74
Shopping Center (820)	50 KSF	3,752	110	67	177	156	169	325
Total Trips		**7,226**	**172**	**258**	**430**	**366**	**291**	**657**
*Internal Capture (1% AM, 15% PM)**			*-2*	*-2*	*-4*	*-35*	*-35*	*-70*
Total External Trips			**170**	**256**	**426**	**331**	**256**	**587**
Pass-By Trips: Shopping Center (34% PM)			-	-	-	*-47*	*-47*	*-94*
Total Primary Trips			**170**	**256**	**426**	**284**	**209**	**493**

**Utilizing methodology contained in the NCHRP Report 684.

4. Future Traffic Conditions

Through coordination with the Town and NCDOT, it was determined that an annual growth rate of 2% would be used to generate 2028 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 2021 existing, 2028 no-build, and 2028 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 the 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 Jonesville Road along the site frontage between Site Access 1 and Mitchell Mill Road to this roadway's ultimate section (2-lane w/ TWLTL).
- Widen one-half section of Mitchell Mill Road along the site frontage to this roadway's ultimate section (4-lane median divided).

US 401 Bypass and Jonesville Road

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

US 401 Bypass and Eastern U-Turn Location

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

Mitchell Mill Road and Jonesville Road / Peebles Road

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

Jonesville Road and Site Access 1

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

Jonesville Road and Site Access 2

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

Jonesville Road and Site Access 3

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

Jonesville Road and Site Access 4

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

Mitchell Mill Road and Site Access 5

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

Mitchell Mill Road and Site Access 6

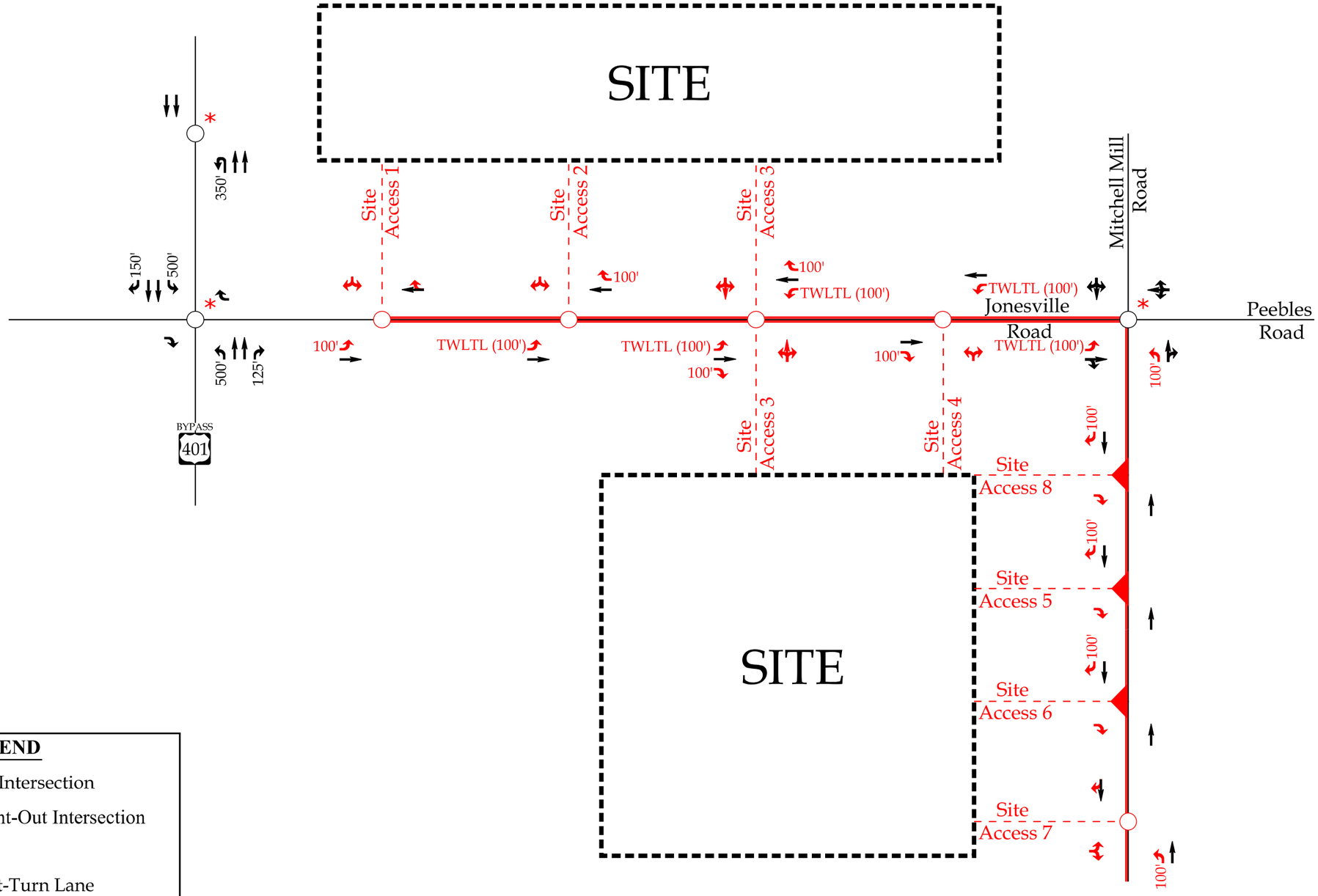
- Construct the southbound approach (Site Access 6) with one ingress lane and one egress lane striped as an exclusive right-turn lane.
- Provide stop-control for the southbound approach (Site Access 6). This proposed intersection will be restricted to right-in/right-out operations.
- Construct an exclusive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

Mitchell Mill Road and Site Access 7

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

Mitchell Mill Road and Site Access 8

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



LEGEND

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

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

RAMEY KEMP ASSOCIATES

5109 Mitchell Mill Road
Rolesville, NC

Recommended Lane Configurations

Scale: Not to Scale | Figure E-1

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TECHNICAL APPENDIX

TRAFFIC IMPACT ANALYSIS
5109 MITCHELL MILL ROAD
ROLESVILLE, NORTH CAROLINA

1. INTRODUCTION

The contents of this report present the findings of the Traffic Impact Analysis (TIA) conducted for the proposed 5109 Mitchell Mill Road development in Rolesville, North Carolina. The proposed development, anticipated to be completed in 2028, is separated into two (2) tracts on both sides of Jonesville Road, north of Mitchell Mill Road. The purpose of this study is to determine the potential impacts to the surrounding transportation system created by traffic generated by the proposed development, as well as recommend improvements to mitigate the impacts.

The eastern tract is expected to consist of 195 single-family homes and the western tract of development is expected to consist of 69 single-family homes, 129 townhomes, and 50,000 square feet (sq. ft.) of general retail.

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

- 2021 Existing Traffic Conditions
- 2028 No-Build Traffic Conditions
- 2028 Build Traffic Conditions

1.1. Site Location and Study Area

The development is proposed to be located along both sides of Jonesville Road, north of Mitchell Mill Road 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 along both sides of Jonesville Road, north of Mitchell Mill Road. The proposed development, anticipated to be completed in 2028, is assumed to consist of the following uses:

- 264 single-family homes
- 129 townhomes
- 50,000 sq. ft. of general retail

Site access is proposed via four (4) full-movement driveway connections along Jonesville Road, three (3) right-in/right-out (RIRO) driveway connections along Mitchell Mill Road, and one (1) full-movement driveway connection along Mitchell Mill Road. One of the site driveway connections along Jonesville Road will be aligned to provide access to both the eastern and western tracts of the proposed development. 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.

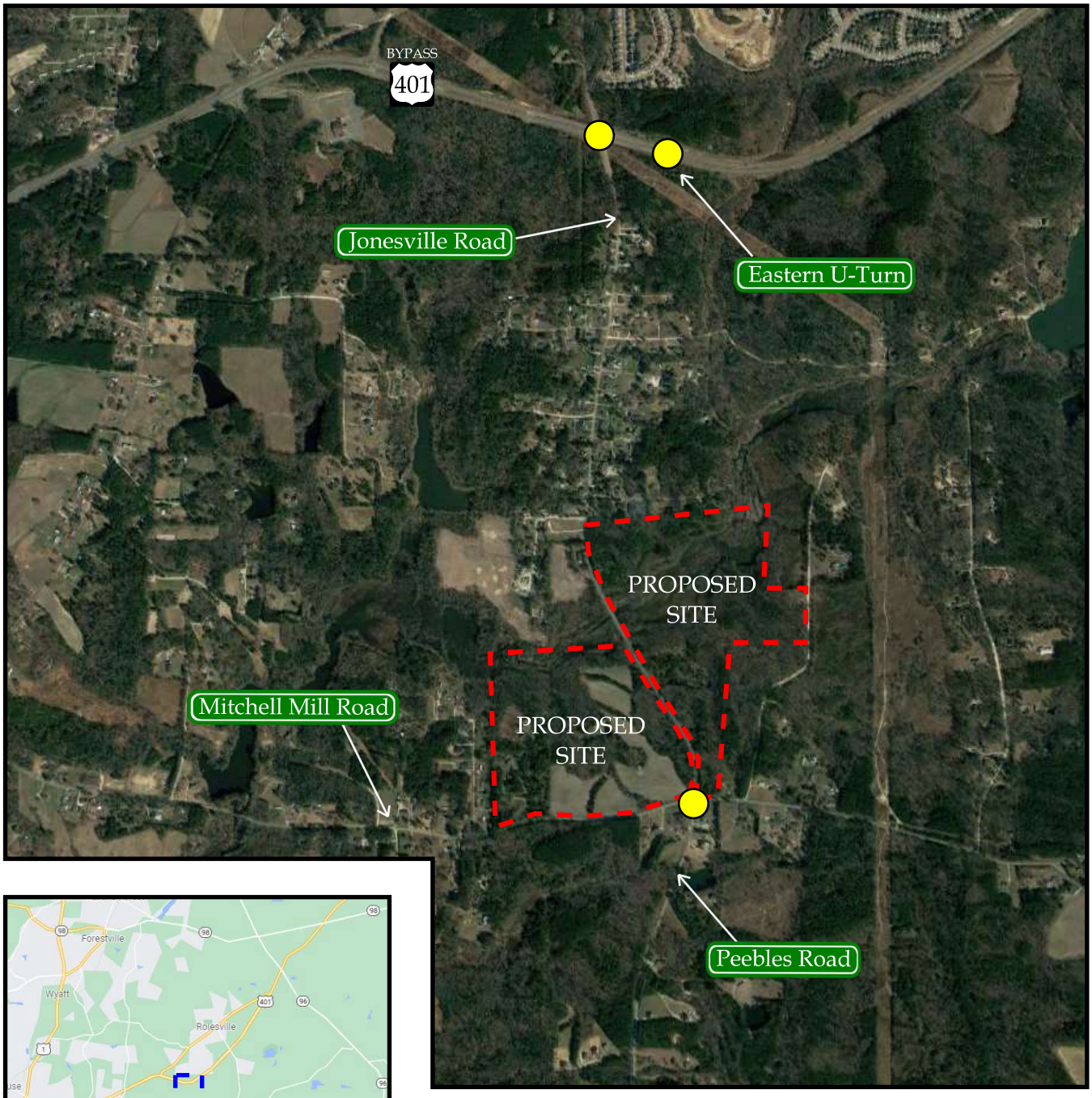
1.4. Existing Roadways

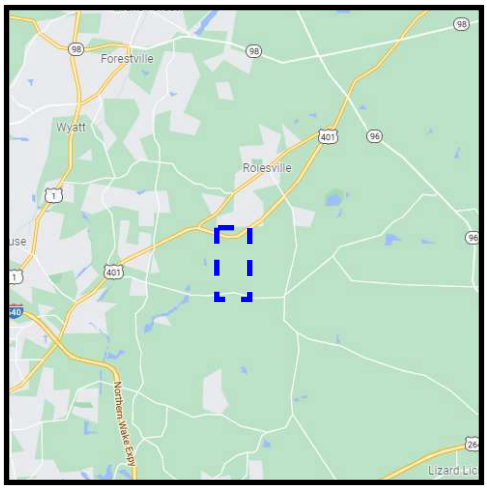
Existing lane configurations (number of traffic lanes on each intersection approach), lane widths, storage capacities, and other intersection and roadway information within the study area are shown in Figure 3. Table 1 provides a summary of this information, as well.

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	2,170*
Mitchell Mill Road	SR 2224	2-lane undivided	45 mph	NCDOT	4,000
Peebles Road	SR 2929	2-lane undivided	45 mph	NCDOT	1,670*

*ADT based on 2021 existing traffic volumes and assuming the weekday PM peak hour volume is 10% of the average daily traffic.





N

LEGEND

- Proposed Site Location
- Study Intersection
- Study Area

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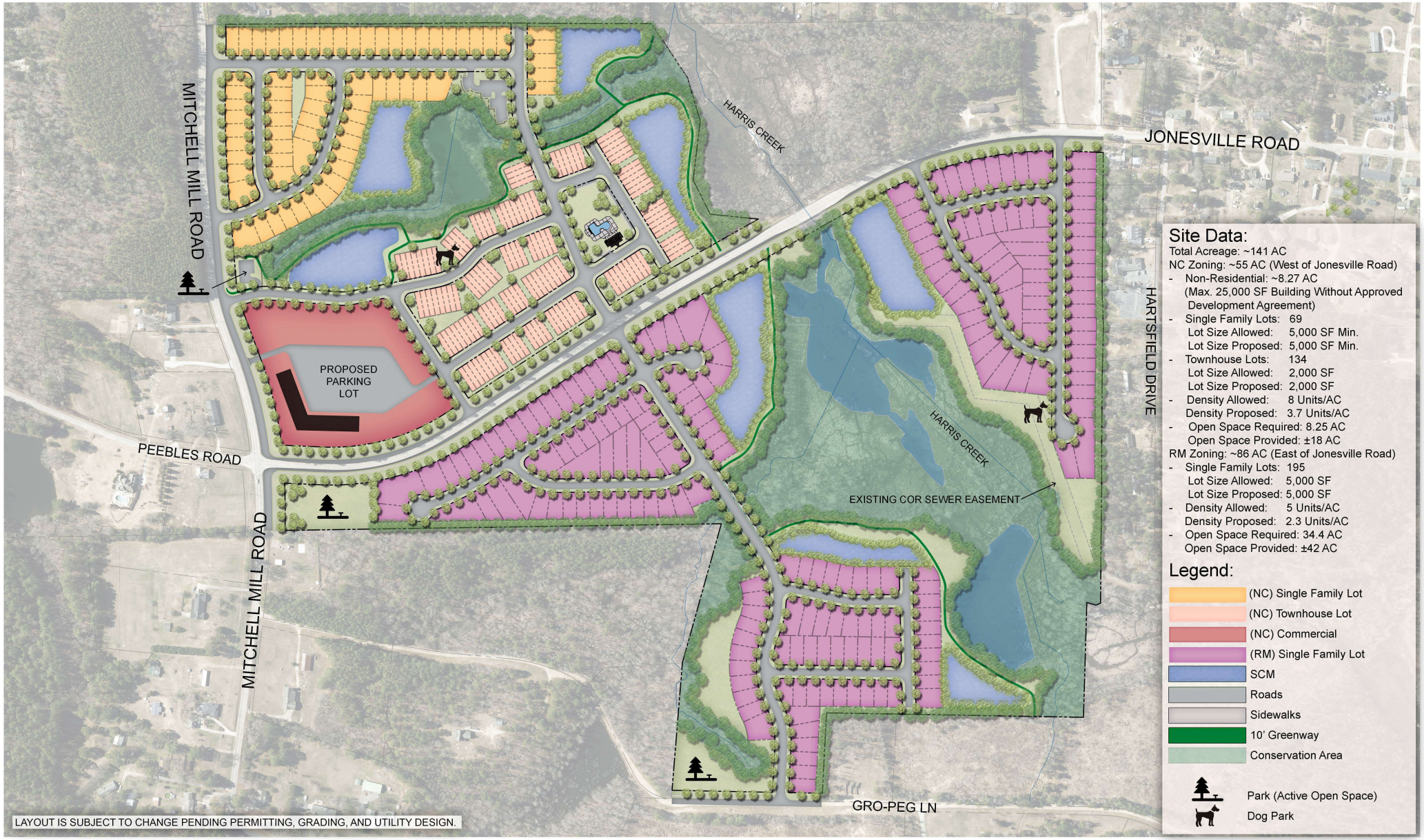
5109 Mitchell Mill Road
Rolesville, NC

Site Location Map

Scale: Not to Scale | Figure 1



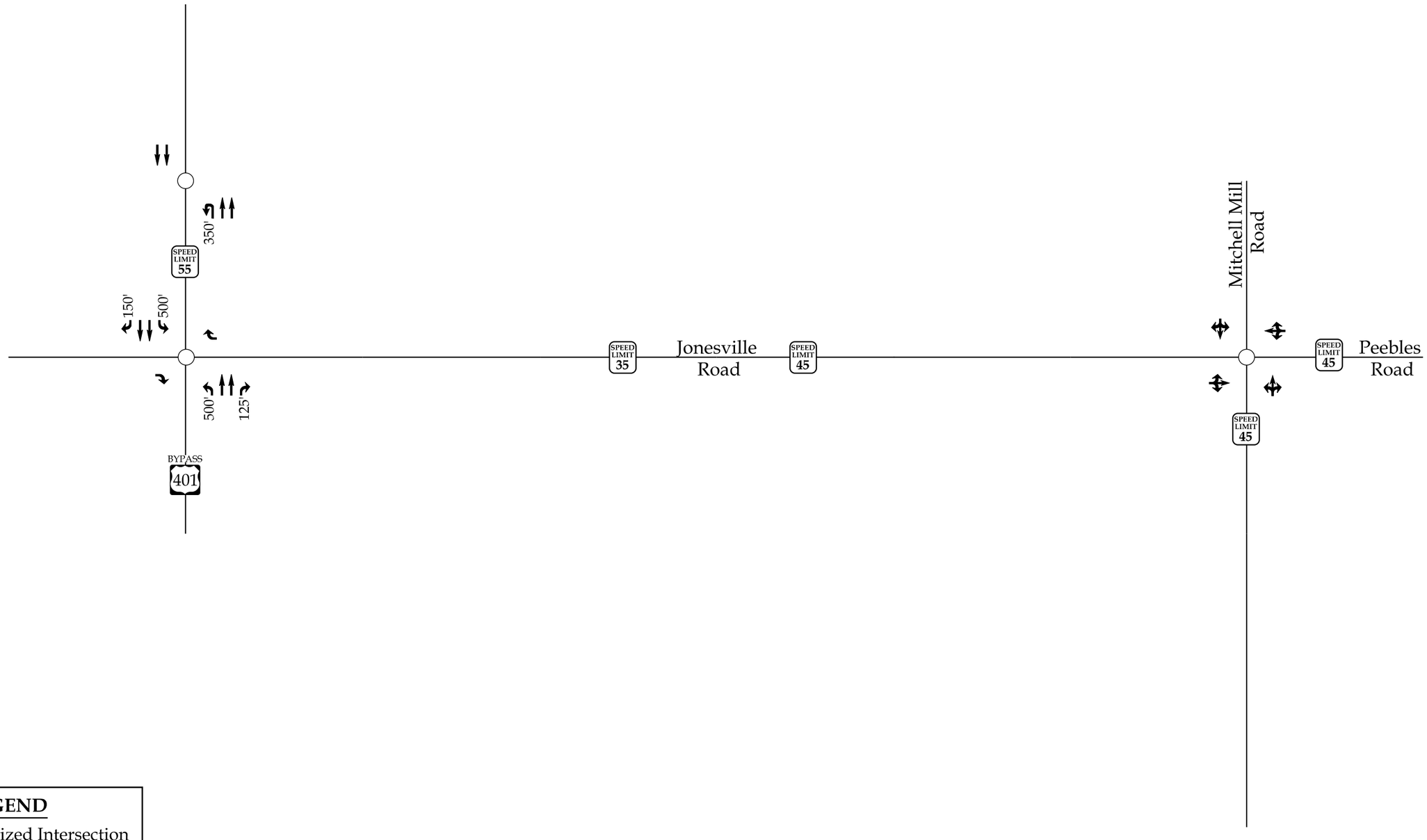
5109 MITCHELL MILL ROAD - ROLESVILLE, NC
Conceptual Master Plan - February 23, 2022

SCALE 1"=150'
0 150' 300'

HOPPER COMMUNITIES

TIMMONS GROUP
ENGINEERING | DESIGN | TECHNOLOGY

Figure 2



LEGEND

- Unsignalized Intersection
- Existing Lane
- X' Storage (In Feet)
- SPEED LIMIT XX Posted Speed Limit

RKA
RAMEY KEMP ASSOCIATES

5109 Mitchell Mill Road
Rolesville, NC

2021 Existing
Lane Configurations

Scale: Not to Scale | Figure 3

2. 2021 EXISTING PEAK HOUR CONDITIONS

2.1. 2021 Existing Peak Hour Traffic Volumes

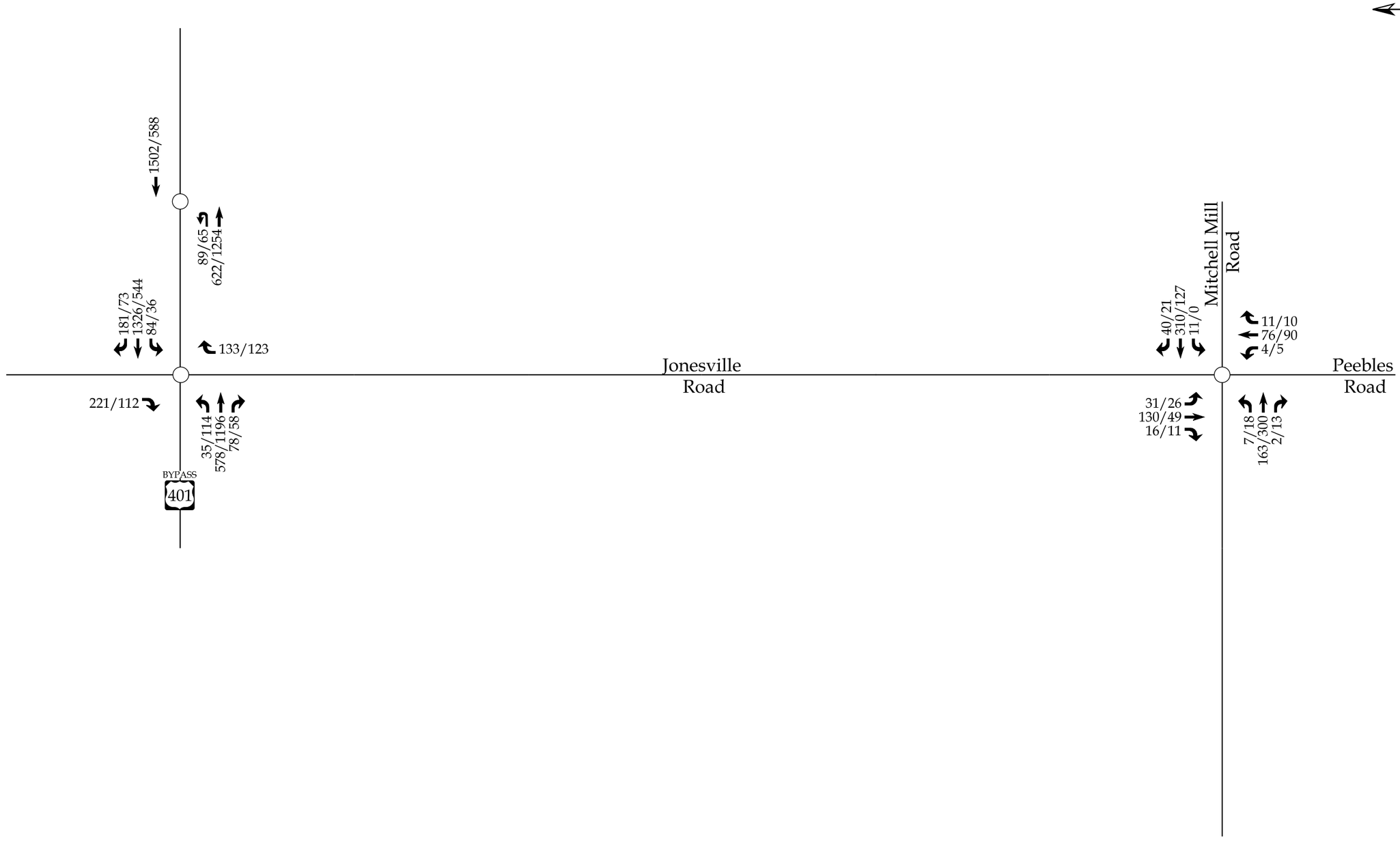
Existing peak hour traffic volumes were determined based on traffic counts conducted at the study intersections listed below, in November of 2021 during typical weekday AM (7:00 AM – 9:00 AM) and PM (4:00 PM – 6:00 PM) peak periods, while schools were in session for in-person learning:

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

Weekday AM and PM traffic volumes were balanced between study intersections, where appropriate. Refer to Figure 4 for 2021 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 2021 Existing Peak Hour Traffic Conditions

The 2021 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
- X / Y → Weekday AM / PM Peak Hour Traffic

RAMEY KEMP ASSOCIATES

5109 Mitchell Mill Road
Rolesville, NC

2021 Existing
Peak Hour Traffic

Scale: Not to Scale | Figure 4

3. 2028 NO-BUILD PEAK HOUR CONDITIONS

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

3.1. Ambient Traffic Growth

Through coordination with the Town and NCDOT, it was determined that an annual growth rate of 2% would be used to generate 2028 projected weekday AM and PM peak hour traffic volumes. Refer to Figure 5 for 2028 projected peak hour traffic.

3.2. Adjacent Development Traffic

Through coordination with the Town and NCDOT, 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

It should be noted that the adjacent developments were approved, during scoping, by the Town and NCDOT. Adjacent development trips are shown in Figure 6. Adjacent development information can be found in Appendix C.

3.3. Future Roadway Improvements

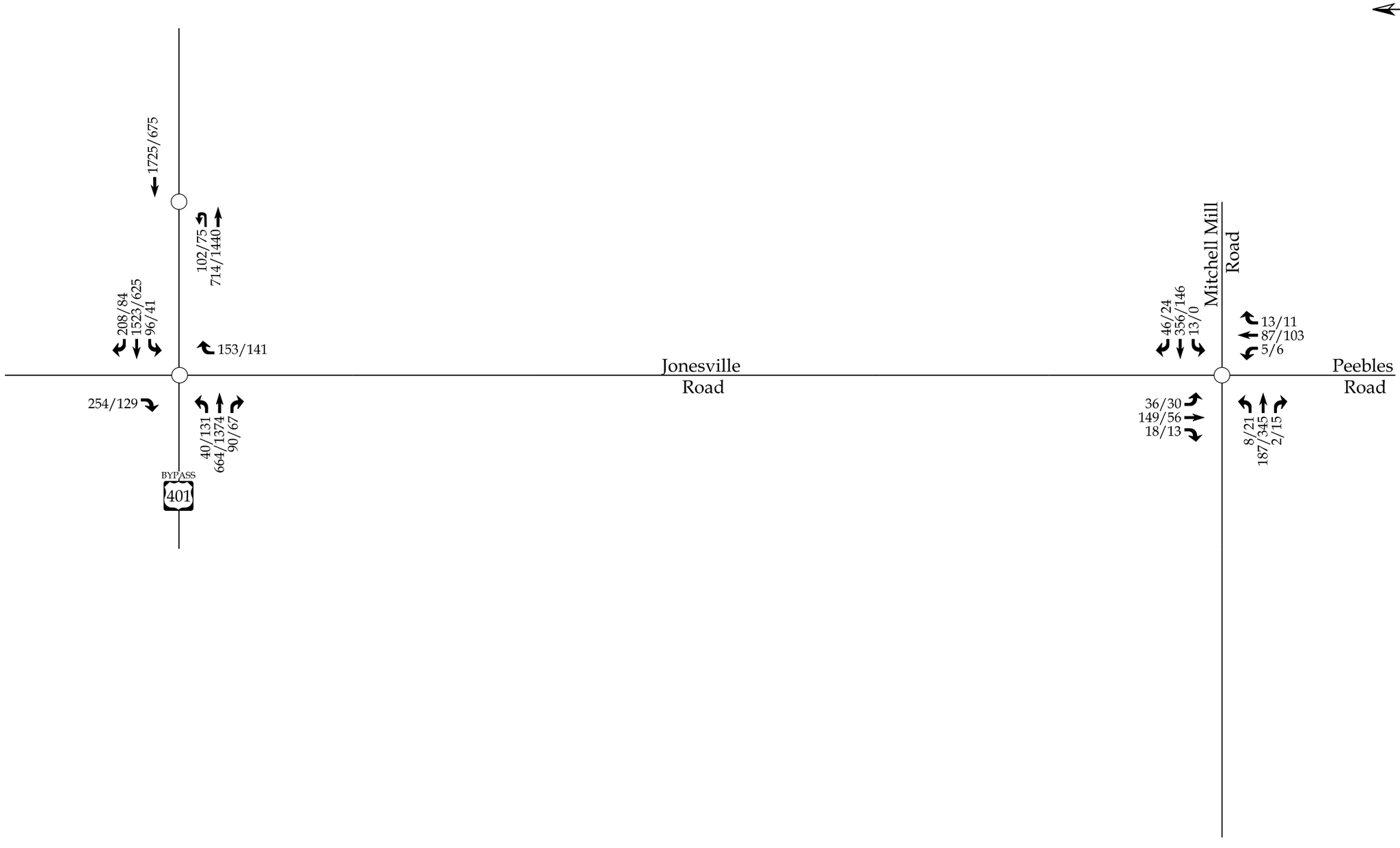
Based on coordination with the NCDOT and the Town, it was determined there were no future roadway improvements to consider under future conditions with this study. It should be noted that per the Rolesville Community Transportation Plan (dated May 2021), the ultimate cross-section of Jonesville Road 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. 2028 No-Build Peak Hour Traffic Volumes

The 2028 no-build traffic volumes were determined by projecting the 2021 existing peak hour traffic to the year 2028, and adding the adjacent development trips. Refer to Figure 7 for an illustration of the 2028 no-build peak hour traffic volumes at the study intersections.

3.5. Analysis of 2028 No-Build Peak Hour Traffic Conditions

The 2028 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

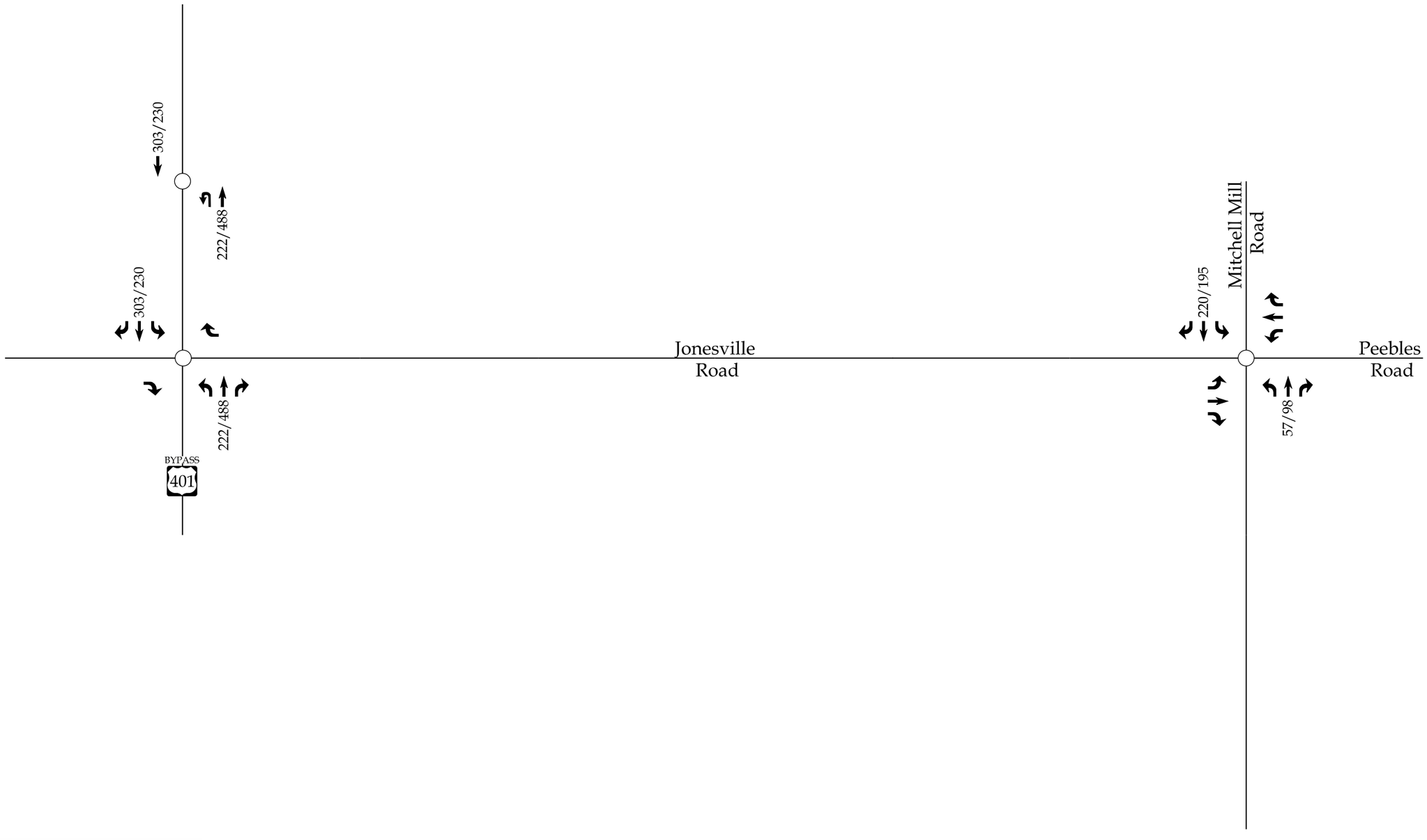
- ◯ Unsignalized Intersection
- X / Y → Weekday AM / PM Peak Hour Traffic

RAMEY KEMP ASSOCIATES

5109 Mitchell Mill Road
Rolesville, NC

2028 Projected
Peak Hour Traffic

Scale: Not to Scale | Figure 5



LEGEND

◯ Unsignalized Intersection

X / Y → Weekday AM / PM Peak Hour Adjacent Development Trips

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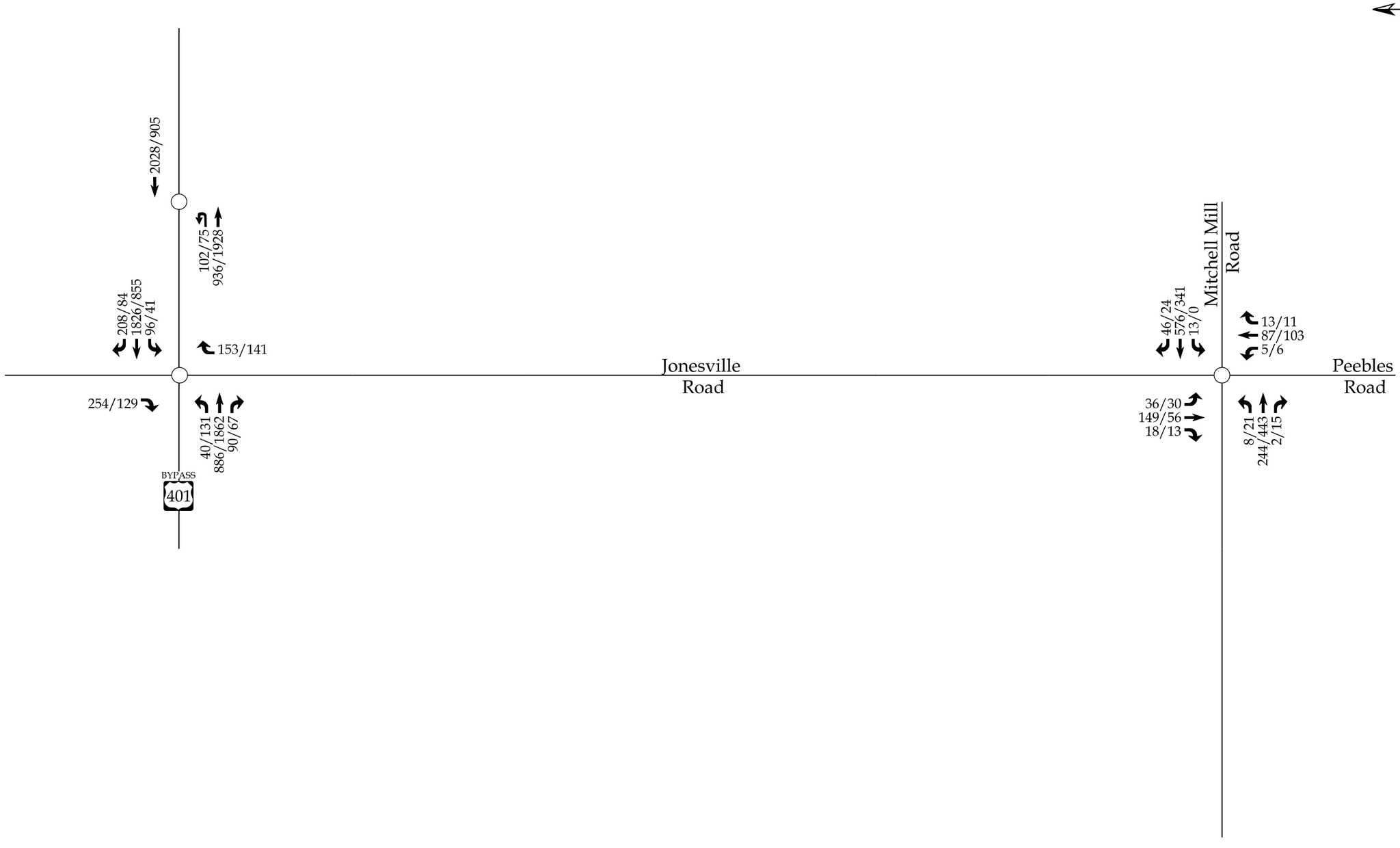
5109 Mitchell Mill Road
Rolesville, NC

Peak Hour Adjacent Development Trips

Scale: Not to Scale | Figure 6



LEGEND

- ◯ Unsignalized Intersection
- X / Y → Weekday AM / PM Peak Hour Traffic

RAMEY KEMP ASSOCIATES

5109 Mitchell Mill Road
Rolesville, NC

2028 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 264 single-family homes, 129 townhomes, and 50,000 sq. ft. of general retail space. 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*, 10th 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)	264 DU	2,540	48	144	192	163	95	258
Multi-Family Home (Low-Rise) (220)	129 DU	934	14	47	61	47	27	74
Shopping Center (820)	50 KSF	3,752	110	67	177	156	169	325
Total Trips		**7,226**	**172**	**258**	**430**	**366**	**291**	**657**
*Internal Capture (1% AM, 15% PM)**			*-2*	*-2*	*-4*	*-35*	*-35*	*-70*
Total External Trips			**170**	**256**	**426**	**331**	**256**	**587**
Pass-By Trips: Shopping Center (34% PM)			-	-	-	*-47*	*-47*	*-94*
Total Primary Trips			**170**	**256**	**426**	**284**	**209**	**493**

*Utilizing methodology contained in the NCHRP Report 684.

It is estimated that the proposed development will generate approximately 7,226 total site trips on the roadway network during a typical 24-hour weekday period. Of the daily traffic volume, it is anticipated that 430 trips (172 entering and 258 exiting) will occur during the weekday AM peak hour and 657 trips (366 entering and 291 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. However, since the site is split into two (2) tracts on either side of Jonesville Road, internal capture was only considered for the land uses in the western tract. Based on NCHRP Report 684 methodology, weekday AM and PM peak hour internal capture rates of 1% and 15%, respectively, were applied to the trips generated from the western tract only. The internal capture reductions are expected to account for approximately 4 trips (2 entering and 2 exiting) during the weekday AM peak hour and 70 trips (35 entering and 35 exiting) during the weekday PM peak hour.

Pass-by trips were 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 94 trips (47 entering and 47 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 internal capture and pass-by trips. Primary site trips are expected to generate approximately 426 trips (170 entering and 256 exiting) during the weekday AM peak hour and 493 trips (284 entering and 209 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 the residential site trips will be regionally distributed as follows:

- 40% to/from the west via US 401 Bypass
- 20% to/from the east via US 401 Bypass
- 10% to/from the south via Peebles Road

- 25% to/from the west via Mitchell Mill Road
- 5% to/from the east via Mitchell Mill Road

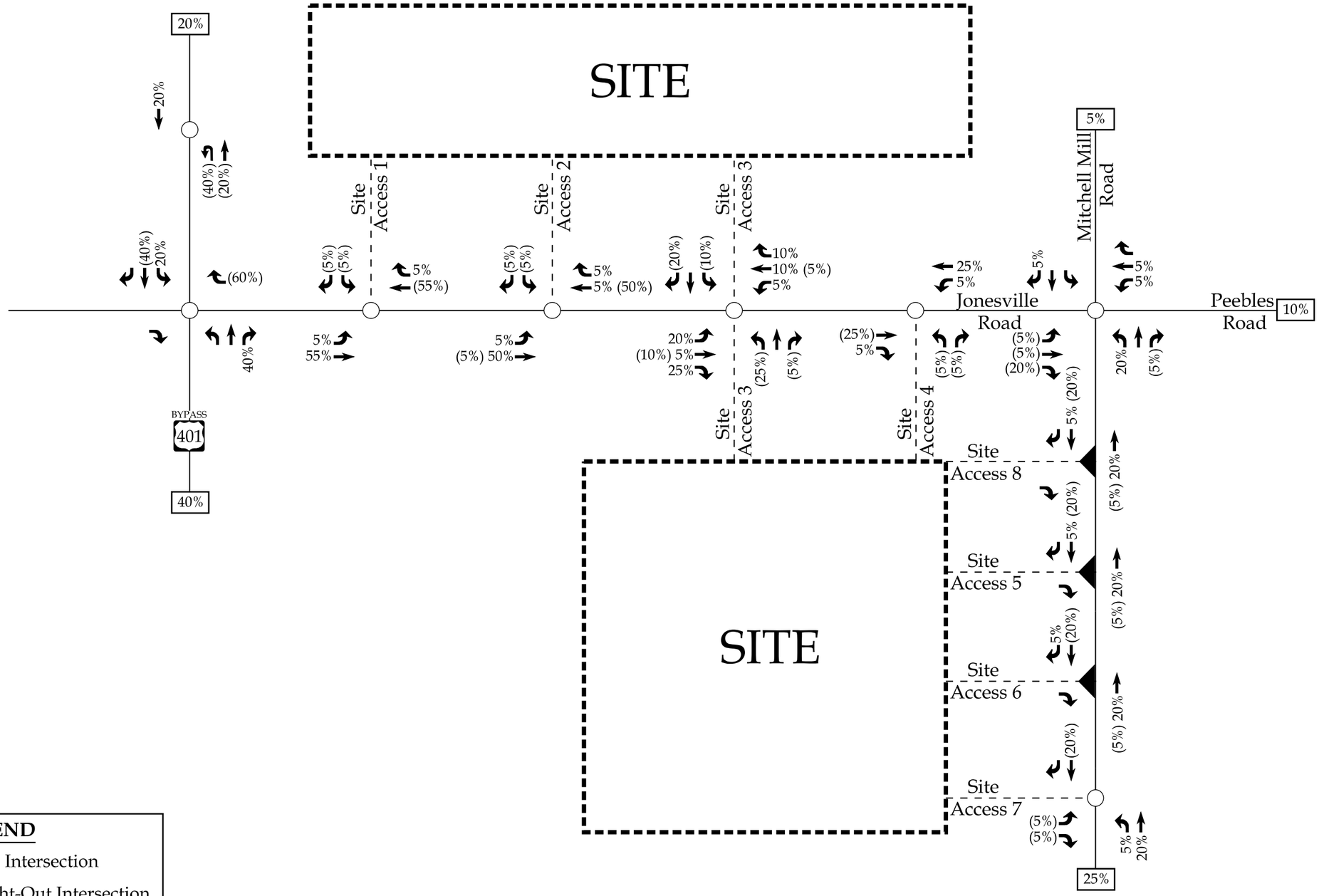
It is estimated that the commercial site trips will be regionally distributed as follows:

- 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

The residential site trip distribution is shown in Figure 8A and the commercial site trip distribution is shown in Figure 8B. Refer to Figures 9A and 9B for the residential site trip assignment and commercial 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.



LEGEND

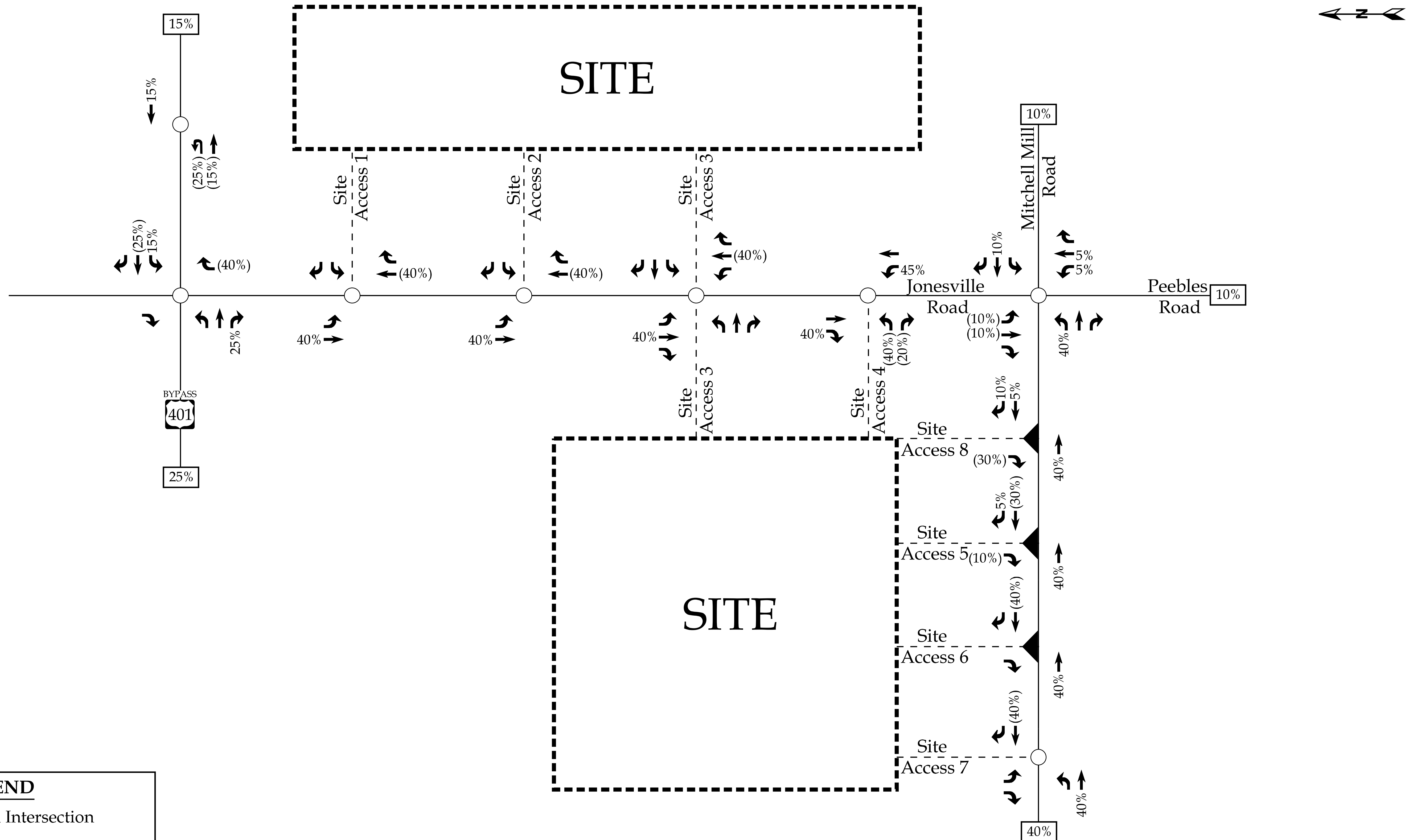
- ○ Unsignalized Intersection
- ▲ Right-In/Right-Out Intersection
- X% → Entering Trip Distribution
- (Y%) → Exiting Trip Distribution
- [XX%] Regional Trip Distribution

RKA
RAMEY KEMP ASSOCIATES

5109 Mitchell Mill Road
Rolesville, NC

Residential Site Trip Distribution

Scale: Not to Scale | Figure 8A



LEGEND

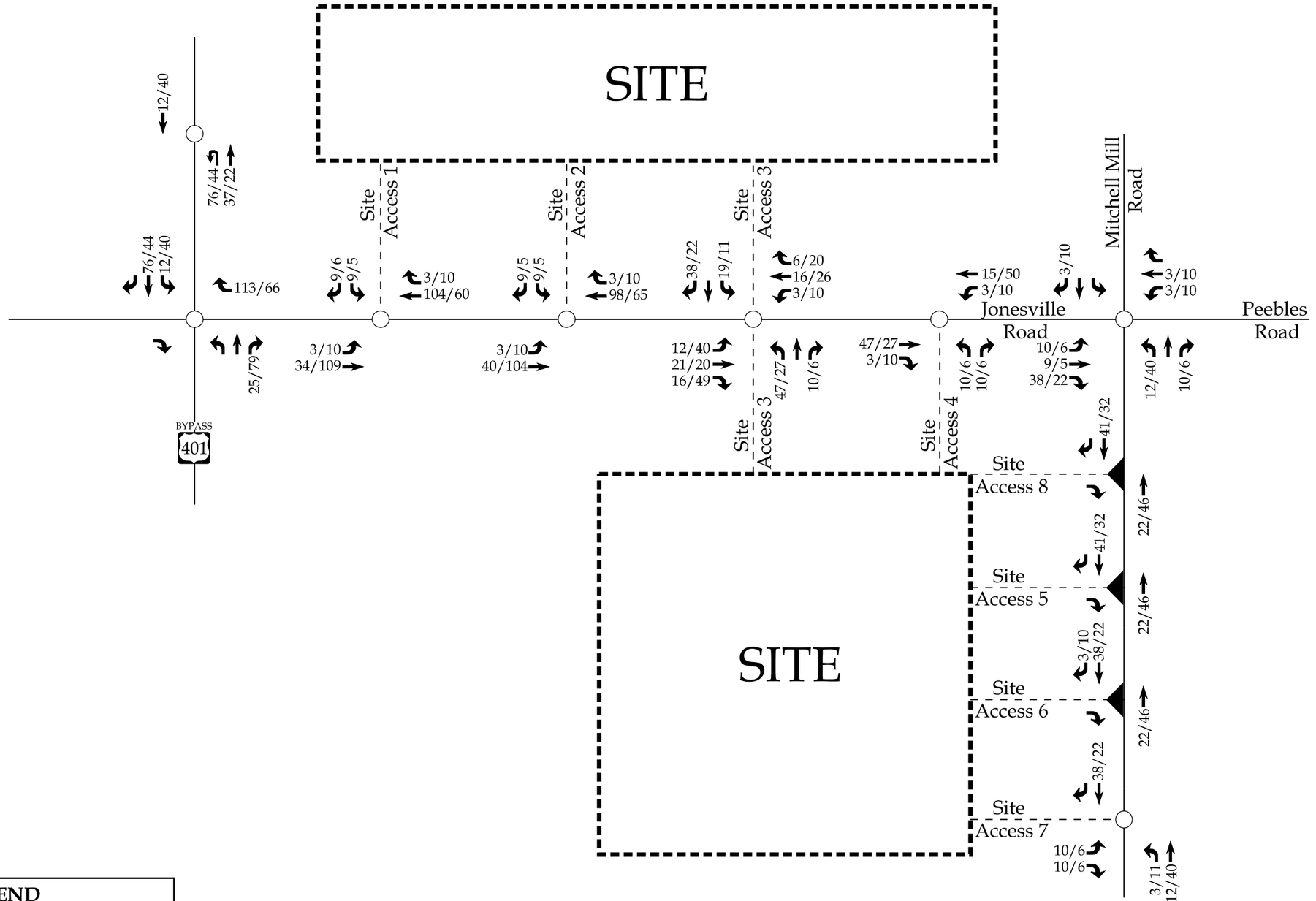
- Unsignalized Intersection
- Right-In/Right-Out Intersection
- X% → Entering Trip Distribution
- (Y%) → Exiting Trip Distribution
- XX% Regional Trip Distribution

RAMEY KEMP ASSOCIATES

5109 Mitchell Mill Road
Rolesville, NC

Commercial Site
Trip Distribution

Scale: Not to Scale | Figure 8B



LEGEND

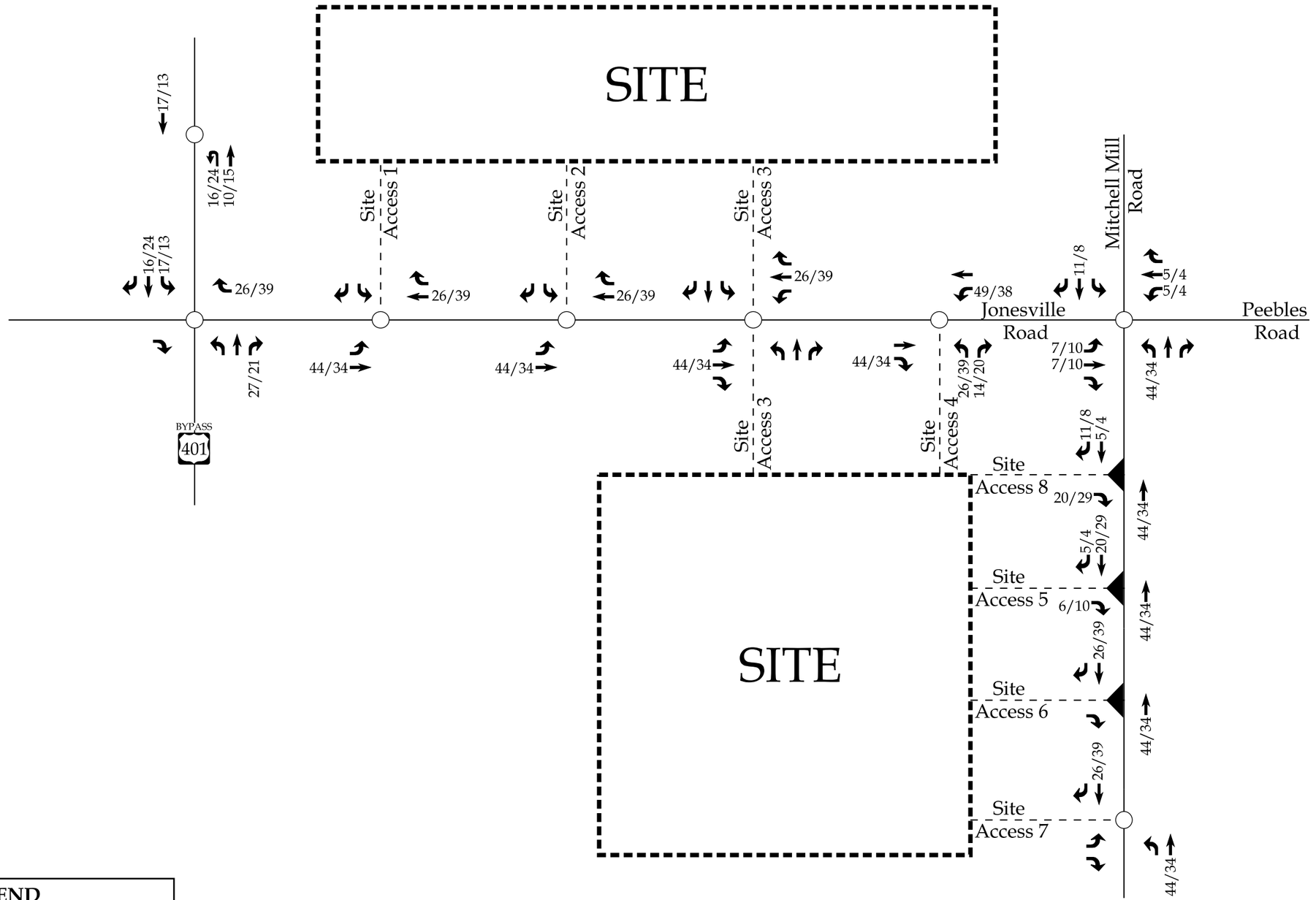
- ○ Unsignalized Intersection
- ▲ Right-In/Right-Out Intersection
- X / Y → Weekday AM / PM Peak Hour Site Trips

RAMEY KEMP ASSOCIATES

5109 Mitchell Mill Road
Rolesville, NC

Residential Site Trip Assignment

Scale: Not to Scale | Figure 9A



LEGEND

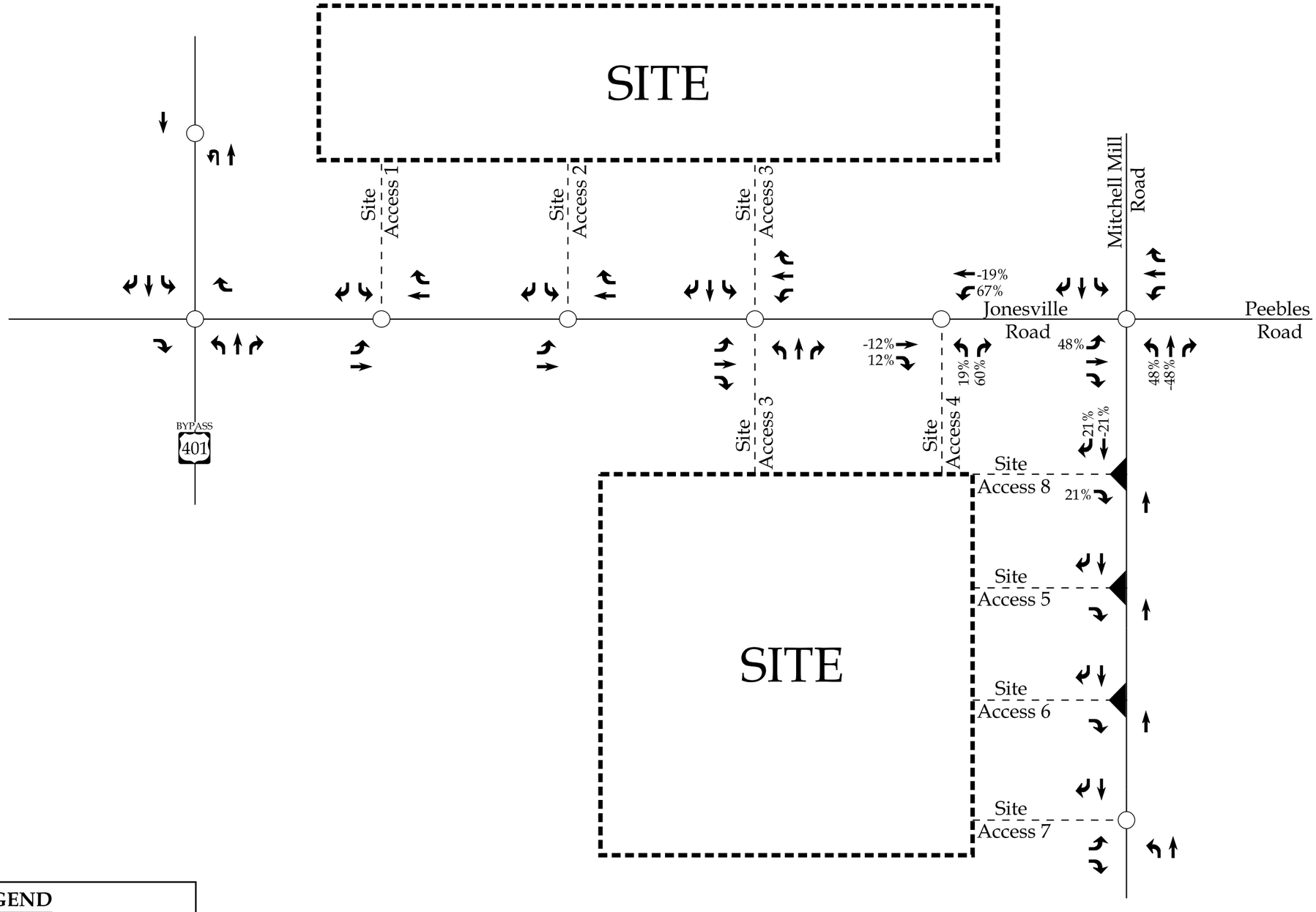
- ○ Unsignalized Intersection
- ▲ Right-In/Right-Out Intersection
- X / Y → Weekday AM / PM Peak Hour Site Trips

RAMEY KEMP ASSOCIATES

5109 Mitchell Mill Road
Rolesville, NC

Commercial Site Trip Assignment

Scale: Not to Scale | Figure 9B



LEGEND

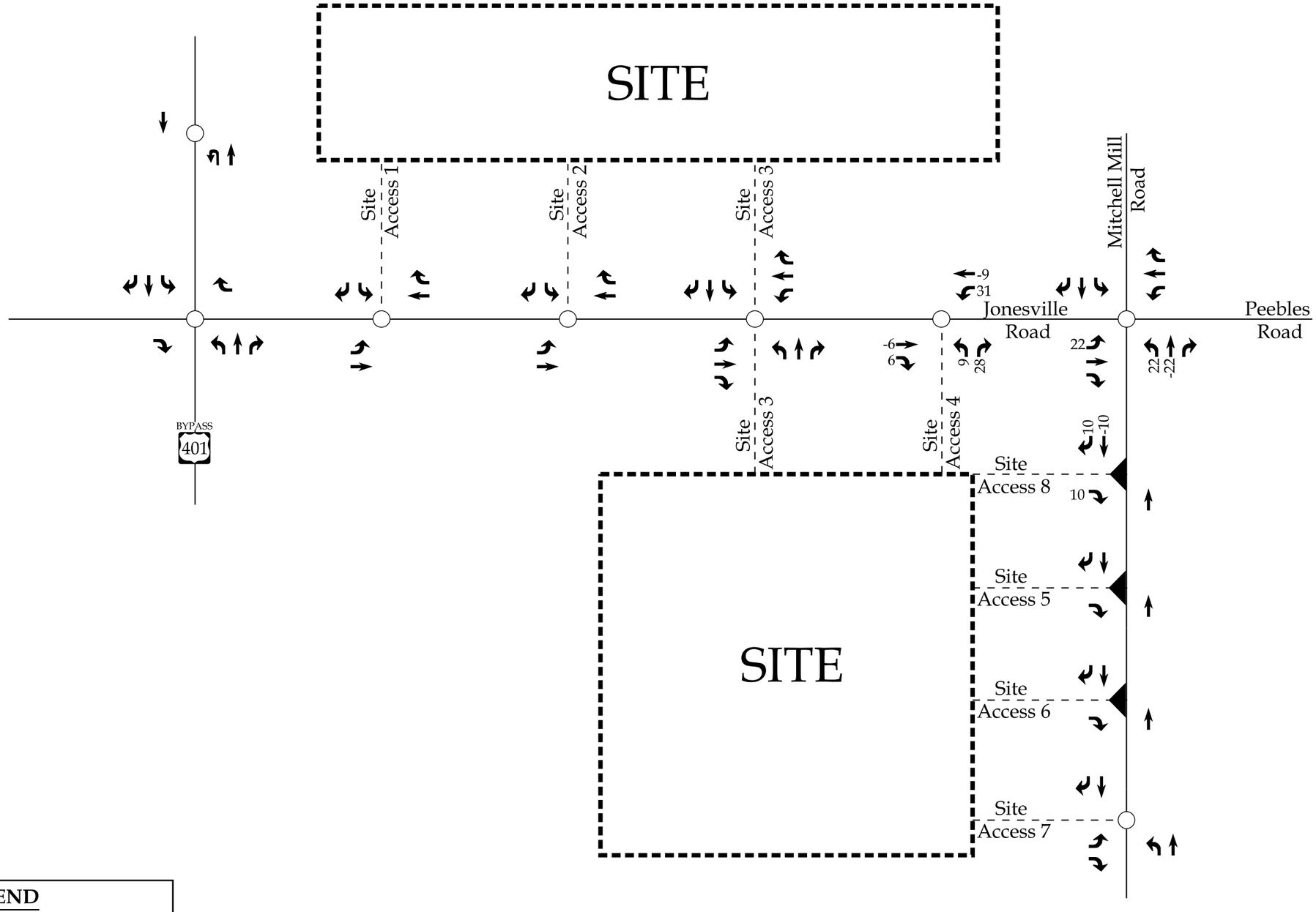
- Unsignalized Intersection
- Right-In/Right-Out Intersection
- X% → Weekday PM Pass-By Trip Distribution

RAMEY KEMP ASSOCIATES

5109 Mitchell Mill Road
Rolesville, NC

Pass-By Site
Trip Distribution

Scale: Not to Scale | Figure 10



LEGEND

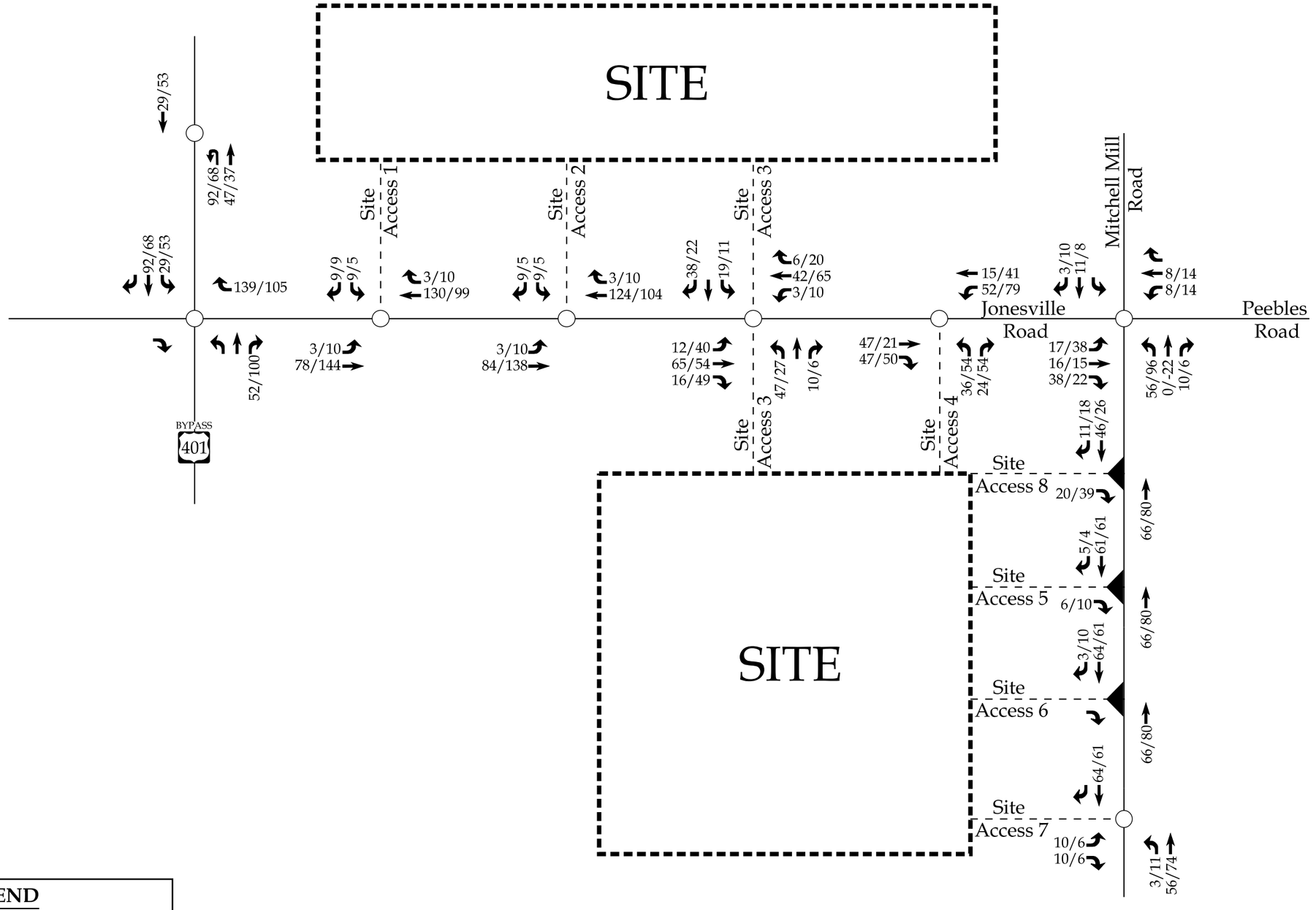
- ○ Unsignalized Intersection
- ▲ Right-In/Right-Out Intersection
- X / Y → Weekday PM Peak Hour Pass-By Trips

RAMEY KEMP ASSOCIATES

5109 Mitchell Mill Road
Rolesville, NC

Pass-By Site Trip Assignment

Scale: Not to Scale | Figure 11



LEGEND

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

RAMEY KEMP ASSOCIATES

5109 Mitchell Mill Road
Rolesville, NC

Total Site Trip Assignment

Scale: Not to Scale | Figure 12

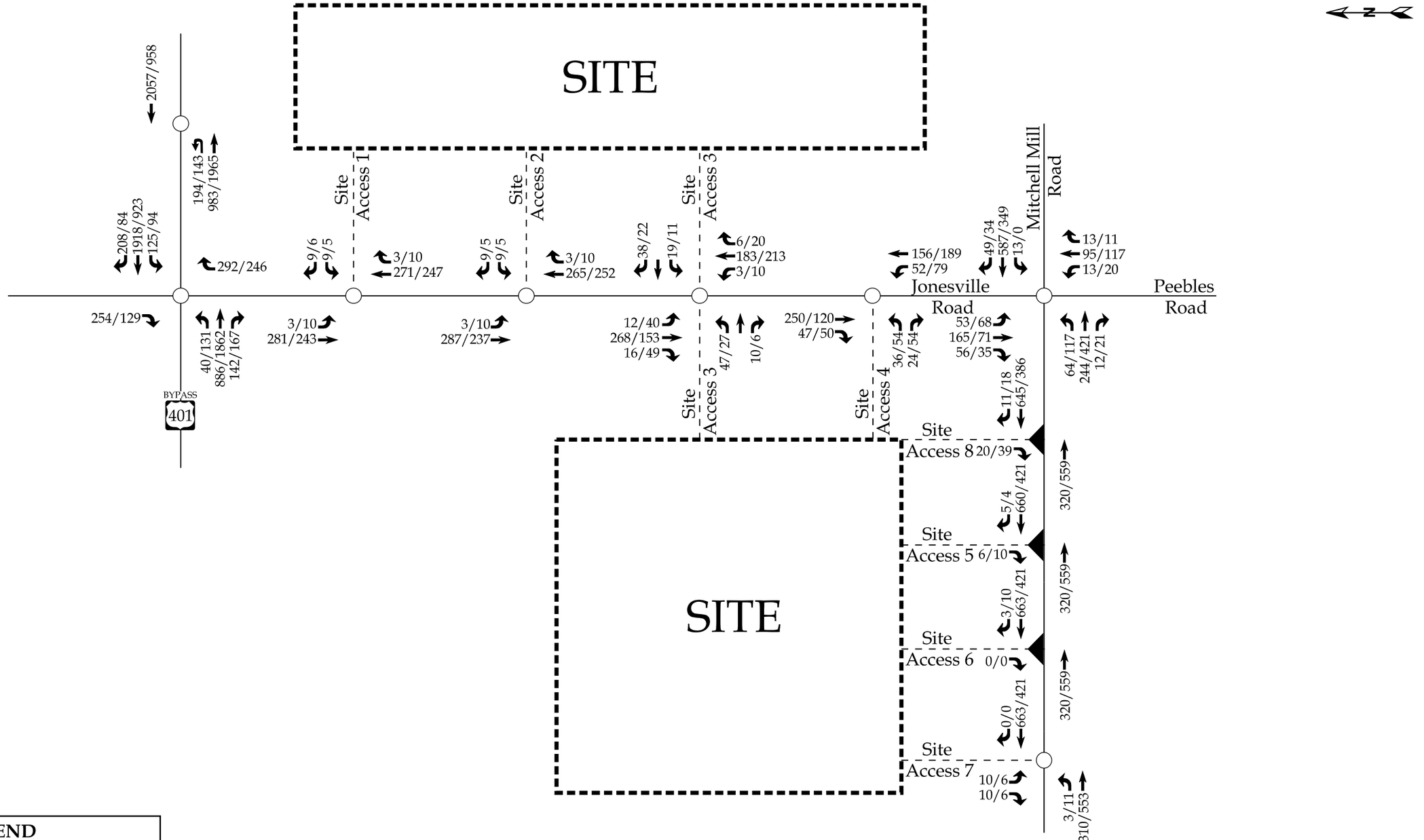
5. 2028 BUILD TRAFFIC CONDITIONS

5.1. 2028 Build Peak Hour Traffic Volumes

To estimate traffic conditions with the site fully built-out, the total site trips were added to the 2028 no-build traffic volumes to determine the 2028 build traffic volumes. Refer to Figure 13 for an illustration of the 2028 build peak hour traffic volumes with the proposed site fully developed.

5.2. Analysis of 2028 Build Peak Hour Traffic Conditions

Study intersections were analyzed with the 2028 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.



LEGEND

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

RAMEY KEMP ASSOCIATES

5109 Mitchell Mill Road
Rolesville, NC

2028 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 10.3), 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 2021 existing, 2028 no-build, and 2028 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)
2021 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] -- D[2]	N/A	C[1] -- B[2]	N/A
2028 No-Build	EB WB* NB	2 TH, 1 RT 1 LT 1 RT	-- D[1] C[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
2028 Build	EB WB* NB	2 TH, 1 RT 1 LT 1 RT	-- E[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	F[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 2021 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) and the westbound left-turn movement during the weekday PM peak hour (LOS E).

Under 2028 no-build and 2028 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 2028 no-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 C) and the southbound approach during the weekday PM peak hour (LOS B) under 2028 no-build and 2028 build traffic conditions. It should be noted that the proposed development is expected to account for approximately 15% and 11% of the overall traffic at the southern portion of 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 2028 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 2028 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 2028 no-build and 2028 build traffic conditions. Refer to Appendix P 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 2021 existing, 2028 no-build, and 2028 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)
2021 Existing	EB* WB	1 UT 2 TH	C[1] --	N/A	B[1] --	N/A
2028 No-Build	EB* WB	1 UT 2 TH	E[1] --	N/A	B[1] --	N/A
2028 Build	EB* WB	1 UT 2 TH	F[1] --	N/A	C[1] --	N/A

*Synchro analyzed the EB left-turns as NB left-turn movements due to the nature of the superstreet and synchro limitations.

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

Capacity analysis of 2021 existing and 2028 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 2028 no-build conditions (LOS E).

Under 2028 build traffic conditions, the major-street u-turn movement is expected to operate at LOS F during the weekday AM peak hour and at LOS C during the weekday PM peak hour. It should be noted that the proposed development is expected to account for approximately 5% and 11% of the overall traffic at this intersection during the weekday AM and PM peak hours, respectively. These levels-of-service are not uncommon for stop-controlled u-turn movements with heavy mainline traffic volumes.

Due to the poor levels-of-service expected at this intersection, a traffic signal was considered under 2028 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 2028 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 2028 no-build and 2028 build traffic conditions. Refer to Appendix P 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 2021 existing, 2028 no-build, and 2028 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)
2021 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] A[1] B[1]	B (12)	B[1] A[1] A[1] A[1]	B (11)
2028 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] C[1]	F (55)	D[1] C[1] B[1] B[1]	C (20)
2028 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] C[1] C[1]	F (86)	F[1] D[1] C[1] C[1]	F (52)
2028 Build - **Improved**	EB WB NB SB	**1 LT**, 1 TH-RT 1 LT-TH-RT 1 LT-TH-RT **1 LT**, 1 TH-RT	C[1] F[1] C[1] C[1]	F (107)	E[1] E[1] C[1] B[1]	D (35)

Improvements by the developer are shown in bold.

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

Capacity analysis of 2021 existing and 2028 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 2028 no-build traffic conditions (LOS F). Under 2028 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 12% and 16% of the overall traffic 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. Exclusive left-turn lanes are recommended by the developer on the eastbound and southbound approaches. With these improvements, the intersection is expected to operate at an overall LOS F during the weekday AM peak hour and at an overall LOS D during the weekday PM peak hour.

It should be noted that the westbound approach and overall intersection delays are expected to increase during the weekday AM peak hour as a result of the recommended improvements to the southbound and eastbound approaches. Mitigation was considered for the westbound approach due to the anticipated impact traffic on this approach is expected to have on the overall intersection operations under future traffic conditions. However, due to the vast majority of traffic on the westbound approach continuing through this intersection on Mitchell Mill Road, no feasible improvements other than signalization would be expected to decrease delays for the westbound approach.

Due to the poor levels-of-service expected at this intersection, a traffic signal was considered under 2028 build traffic conditions to achieve acceptable levels-of-service. The peak hour warrant (warrant 3) from the *Manual on Uniform Traffic Control Devices* (MUTCD) was considered. Based on a review of the peak hour signal warrant at this intersection, the intersection is expected to meet the peak hour warrant for both the weekday AM and PM peak hours under 2028 no-build and 2028 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 P for a copy of the MUTCD warrants.

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

7.4. Jonesville Road and Site Access 1

The proposed unsignalized intersection of Jonesville Road and Site Access 1 was analyzed under 2028 build traffic conditions with the lane configurations and traffic control shown in Table 8. Refer to Table 8 for a summary of the analysis results. Refer to Appendix G for the synchro capacity analysis reports.

Table 8: Analysis Summary of Jonesville Road and 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)
2028 Build	**WB**	**1 LT-RT**	B[2]	N/A	B[2]	N/A
	NB	1 TH-RT	--		--	
	SB	**1 LT**, 1 TH	A[1]		A[1]	

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 2028 build traffic conditions indicates that the major-street left-turn movement is expected to operate at LOS A during the weekday AM and PM peak hours. The minor-street approach is expected to operate at LOS B 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* and a left-turn lane is recommended on the southbound approach (Jonesville Road). 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. Refer to Appendix O for a copy of the turn lane warrants.

7.5. Jonesville Road and Site Access 2

The proposed unsignalized intersection of Jonesville Road and Site Access 2 was analyzed under 2028 build traffic conditions with the lane configurations and traffic control shown in Table 9. Refer to Table 9 for a summary of the analysis results. Refer to Appendix H for the synchro capacity analysis reports.

Table 9: Analysis Summary of Jonesville Road and Site 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)
2028 Build	**WB** NB SB	**1 LT-RT** 1 TH, **1 RT** **1 LT**, 1 TH	B[2] -- A[1]	N/A	B[2] -- A[1]	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 2028 build traffic conditions indicates that the major-street left-turn movement is expected to operate at LOS A during the weekday AM and PM peak hours. The minor-street approach is expected to operate at LOS B 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* and a left-turn lane is recommended on the southbound approach (Jonesville Road). Based on coordination with NCDOT a right-turn lane is also recommended on the northbound approach (Jonesville Road). Refer to Appendix O for a copy of the turn lane warrants.

7.6. Jonesville Road and Site Access 3

The proposed unsignalized intersection of Jonesville Road and Site Access 3 was analyzed under 2028 build traffic conditions with the lane configurations and traffic control shown in Table 10. Refer to Table 10 for a summary of the analysis results. Refer to Appendix I for the synchro capacity analysis reports.

Table 10: Analysis Summary of Jonesville Road and Site Access 3

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)
2028 Build	**EB**	**1 LT-TH-RT**	B[2]	N/A	B[2]	N/A
	WB	**1 LT-TH-RT**	B[2]		B[2]	
	NB	**1 LT**, 1 TH, **1 RT**	A[1]		A[1]	
	SB	**1 LT**, 1 TH, **1 RT**	A[1]		A[1]	

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 2028 build traffic conditions indicates that the major-street left-turn movements are expected to operate at LOS A during the weekday AM and PM peak hours. The minor-street approaches are expected to operate at LOS B 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* and both are recommended on the southbound and northbound approaches (Jonesville Road). Refer to Appendix O for a copy of the turn lane warrants.

7.7. Jonesville Road and Site Access 4

The proposed unsignalized intersection of Jonesville Road and Site Access 4 was analyzed under 2028 build traffic conditions with the lane configurations and traffic control shown in Table 11. Refer to Table 11 for a summary of the analysis results. Refer to Appendix J for the synchro capacity analysis reports.

Table 11: Analysis Summary of Jonesville Road and Site Access 4

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)
2028 Build	**EB**	**1 LT-RT**	B[2]	N/A	B[2]	N/A
	NB	**1 LT**, 1 TH	A[1]		A[1]	
	SB	1 TH, **1 RT**	--		--	

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 2028 build traffic conditions indicates that the major-street left-turn movement is expected to operate at LOS A during the weekday AM and PM peak hours. The minor-street approach is expected to operate at LOS B 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* and are recommended on the southbound and northbound approaches (Jonesville Road), respectively. Refer to Appendix O for a copy of the turn lane warrants.

7.8. Mitchell Mill Road and Site Access 5

The proposed unsignalized intersection of Mitchell Mill Road and Site Access 5 was analyzed under 2028 build traffic conditions with the lane configurations and traffic control shown in Table 12. Refer to Table 12 for a summary of the analysis results. Refer to Appendix K for the synchro capacity analysis reports.

Table 12: Analysis Summary of Mitchell Mill Road and Site Access 5

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)
2028 Build	EB	1 TH	--	N/A	--	N/A
	WB	1 TH, **1 RT**	--		--	
	SB	**1 RT**	B[1]		B[1]	

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

1. Level of service for minor-street approach.

Capacity analysis of 2028 build traffic conditions indicates that the minor-street approach is expected to operate at LOS B during the weekday AM and PM peak hours.

A right-turn lane was considered based on the NCDOT *Policy on Street and Driveway Access to North Carolina Highways* and is recommended on the westbound approach (Mitchell Mill Road). Refer to Appendix O for a copy of the turn lane warrants.

7.9. Mitchell Mill Road and Site Access 6

The proposed unsignalized intersection of Mitchell Mill Road and Site Access 6 was analyzed under 2028 build traffic conditions with the lane configurations and traffic control shown in Table 13. Refer to Table 13 for a summary of the analysis results. Refer to Appendix L for the synchro capacity analysis reports.

Table 13: Analysis Summary of Mitchell Mill Road and Site Access 6

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)
2028 Build	EB WB **SB**	1 TH 1 TH-**RT** **1 RT**	-- -- B[1]	N/A	-- -- B[1]	N/A

Improvements to lane configurations by the developer are shown in bold.
1. Level of service for minor-street approach.

Capacity analysis of 2028 build traffic conditions indicates that the minor-street approach is expected to operate at LOS B during the weekday AM and PM peak hours.

A right-turn lane was considered based on the NCDOT *Policy on Street and Driveway Access to North Carolina Highways*. Based on coordination with NCDOT, an exclusive right-turn lane is recommended on the westbound approach (Mitchell Mill Road). Refer to Appendix O for a copy of the turn lane warrants.

7.10. Mitchell Mill Road and Site Access 7

The proposed unsignalized intersection of Mitchell Mill Road and Site Access 7 was analyzed under 2028 build traffic conditions with the lane configurations and traffic control shown in Table 14. Refer to Table 14 for a summary of the analysis results. Refer to Appendix M for the synchro capacity analysis reports.

Table 14: Analysis Summary of Mitchell Mill Road and Site Access 7

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)
2028 Build	EB WB **SB**	**1 LT**, 1 TH 1 TH-**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 2028 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* and an exclusive left-turn lane is recommended on eastbound approach (Mitchell Mill Road). 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. Refer to Appendix O for a copy of the turn lane warrants.

7.11. Mitchell Mill Road and Site Access 8

The proposed unsignalized intersection of Mitchell Mill Road and Site Access 8 was analyzed under 2028 build traffic conditions with the lane configurations and traffic control shown in Table 15. Refer to Table 15 for a summary of the analysis results. Refer to Appendix N for the synchro capacity analysis reports.

Table 15: Analysis Summary of Jonesville Road and Site Access 8

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)
2028 Build	EB	1 TH	--	N/A	--	N/A
	WB	1 TH, **1 RT**	--		--	
	SB	**1 RT**	B[1]		B[1]	

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 2028 build traffic conditions indicates that the minor-street approach is expected to operate at LOS B during the weekday AM and PM peak hours.

A right-turn lane was considered based on the NCDOT *Policy on Street and Driveway Access to North Carolina Highways*. Based on coordination with NCDOT, an exclusive right-turn lane is recommended on the westbound approach (Mitchell Mill Road). Refer to Appendix O 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 5109 Mitchell Mill Road development located along both sides of Jonesville Road, north of Mitchell Mill Road in Rolesville, North Carolina. The proposed development is separated into two (2) tracts on both sides of Jonesville Road. The eastern tract is expected to consist of 195 single-family homes and the western tract of development is expected to consist of 69 single-family homes, 129 townhomes, and 50,000 square feet (sq. ft) of general retail. Site access is proposed via four (4) full-movement driveway connections along Jonesville Road, three (3) RIRO driveway connections along Mitchell Mill Road, and one (1) full-movement driveway connection along Mitchell Mill Road. One of the site driveway connections along Jonesville Road will be aligned to provide access to both the eastern and western tracts of the proposed development.

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

- 2021 Existing Traffic Conditions
- 2028 No-Build Traffic Conditions
- 2028 Build Traffic Conditions

Trip Generation

It is estimated that the proposed development will generate approximately 426 primary trips (170 entering and 256 exiting) during the weekday AM peak hour and 493 primary trips (284 entering and 209 exiting) during the weekday PM peak hour.

Rolesville Community Transportation Plan

Per the Rolesville Community Transportation Plan (CTP), 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. It is recommended that the proposed development widen Jonesville Road and 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 the intersections listed below. A summary of the study area intersections that are expected to need improvements are as follows:

US 401 Bypass and Jonesville Road

Under 2028 no-build and 2028 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 2028 no-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 C) and the southbound approach during the weekday PM peak hour (LOS B) under 2028 no-build and 2028 build traffic conditions. It should be noted that the proposed development is expected to account for approximately 15% and 11% of the overall traffic at the southern portion of 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 2028 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 2028 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 2028 no-build and 2028 build traffic conditions.

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.

US 401 Bypass and Eastern U-Turn Location

Under 2028 build traffic conditions, the major-street u-turn movement is expected to operate at LOS F during the weekday AM peak. It should be noted that the proposed development is expected to account for approximately 5% and 11% of the overall traffic at this intersection during the weekday AM and PM peak hours, respectively. These levels-of-service are not uncommon for stop-controlled u-turn movements with heavy mainline traffic volumes.

Due to the poor levels-of-service expected at this intersection, a traffic signal was considered under 2028 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 2028 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 2028 no-build and 2028 build traffic conditions.

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.

Mitchell Mill Road and Jonesville Road / Peebles Road

Under 2028 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 12% and 16% of the overall traffic 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. Exclusive left-turn lanes are recommended by the developer on the eastbound and southbound approaches. With these improvements, the intersection is expected to operate at an overall LOS F during the weekday AM peak hour and at an overall LOS D during the weekday PM peak hour.

It should be noted that the westbound approach and overall intersection delays are expected to increase during the weekday AM peak hour as a result of the recommended improvements to the southbound and eastbound approaches. Mitigation was considered for the westbound approach due to the anticipated impact traffic on this approach is expected to have on the overall intersection operations under future traffic conditions. However, due to the vast majority of traffic on the westbound approach continuing through this intersection on Mitchell Mill Road, no feasible improvements other than signalization would be expected to decrease delays for the westbound approach.

Due to the poor levels-of-service expected at this intersection, a traffic signal was considered under 2028 build traffic conditions to achieve acceptable levels-of-service. The peak hour warrant (warrant 3) from the *Manual on Uniform Traffic Control Devices* (MUTCD) was considered. Based on a review of the peak hour signal warrant at this intersection, the intersection is expected to meet the peak hour warrant for both the weekday AM and PM peak hours under 2028 no-build and 2028 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 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.

9. RECOMMENDATIONS

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

Recommended Improvements by Developer

Required Frontage Improvements per Rolesville Community Transportation Plan

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

US 401 Bypass and Jonesville Road

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

US 401 Bypass and Eastern U-Turn Location

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

Mitchell Mill Road and Jonesville Road / Peebles Road

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

Jonesville Road and Site Access 1

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

Jonesville Road and Site Access 2

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

Jonesville Road and Site Access 3

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

Jonesville Road and Site Access 4

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

Mitchell Mill Road and Site Access 5

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

Mitchell Mill Road and Site Access 6

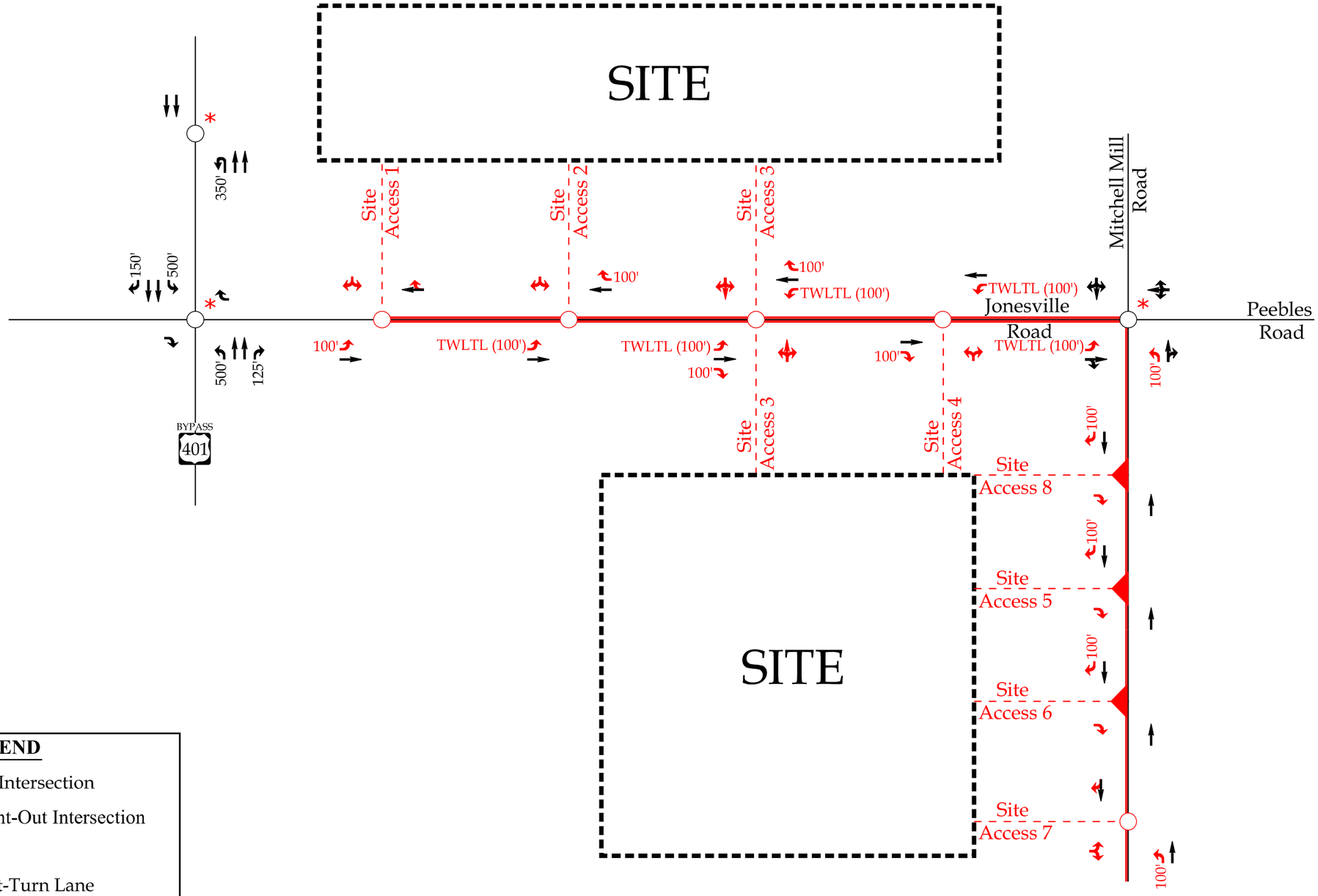
- Construct the southbound approach (Site Access 6) with one ingress lane and one egress lane striped as an exclusive right-turn lane.
- Provide stop-control for the southbound approach (Site Access 6). This proposed intersection will be restricted to right-in/right-out operations.
- Construct an exclusive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

Mitchell Mill Road and Site Access 7

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

Mitchell Mill Road and Site Access 8

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



LEGEND

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

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

RAMEY KEMP ASSOCIATES

5109 Mitchell Mill Road
Rolesville, NC

Recommended Lane Configurations

Scale: Not to Scale | Figure 14

TECHNICAL APPENDIX

APPENDIX A

SCOPING DOCUMENTATION

Tucker Fulle

From: Nolfo, Matthew J <mjnolfo@ncdot.gov>
Sent: Friday, June 24, 2022 2:51 PM
To: Jessica McClure; Beth Trahos; Craig Hyman; Tucker Fulle
Cc: Warren, Jeremy L; Elabarger, Michael S
Subject: RE: [External] RE: 5109 Mitchell Mill

Jessica,

The driveway for the commercial parcel would need to be studied, especially if it is desired for it to be a full access connection. The decision to do a phased TIA is up to the developer, but if it is not their intent to build all of the roadway improvements prior to the use of any section of the development, then a phased TIA would be required. Feel free to give me a call, but those are my initial thoughts.

Thanks,

Matthew Nolfo
Assistant District Engineer
Northern Wake County
Wake County District Office (Division 5 District 1)
North Carolina Department of Transportation

mjnolfo@ncdot.gov
(919)733-7759

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4009 District Drive
Raleigh, NC 27607

Mailing Address
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Raleigh, NC 27699-1575

From: Jessica McClure <JMCClure@rameykemp.com>
Sent: Thursday, June 23, 2022 5:04 PM
To: Beth Trahos <beth.trahos@nelsonmullins.com>; Nolfo, Matthew J <mjnolfo@ncdot.gov>; Craig Hyman <chyman@rameykemp.com>; Tucker Fulle <tfulle@rameykemp.com>
Cc: Warren, Jeremy L <jlwarren@ncdot.gov>; Elabarger, Michael S <michael.elabarger@rolesville.nc.gov>
Subject: [External] RE: 5109 Mitchell Mill

Hi Beth – thanks for circling up on this one.

The TIA was scoped with the access/site plan shown below (purple indicates driveways on Mitchell Mill Road). Not to speak for NCDOT, but if the developer is pursuing a fourth driveway for the non-residential use, I would assume a TIA Update would be needed to show the impacts of the additional driveway.

If we are updating the study for the additional driveway, I think it would be wise to decide if a phasing study is also appropriate and knock it all out at once, unless the developer is OK with providing all of the improvements required prior to final plats and/or CO per Matthew's email.

We'll give DOT a call tomorrow morning and get a path forward on this one.

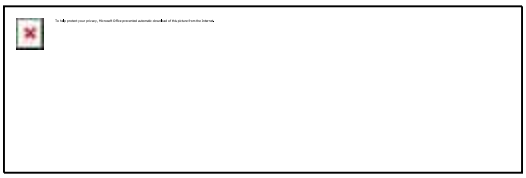
Jessica McClure, PE
State Traffic Engineering Lead
D 919 987 1283 | T 919 872 5115 | C 919 637 5553
RAMEY KEMP ASSOCIATES
TOGETHER WE ARE LIMITLESS

From: Beth Trahos <beth.trahos@nelsonmullins.com>
Sent: Thursday, June 23, 2022 4:39 PM
To: Nolfo, Matthew J <mjnolfo@ncdot.gov>; Jessica McClure <JMCClure@rameykemp.com>; Rynal Stephenson <rstephenson@rameykemp.com>
Cc: Warren, Jeremy L <jlwarren@ncdot.gov>; Elabarger, Michael S <michael.elabarger@rolesville.nc.gov>
Subject: RE: 5109 Mitchell Mill

Just wanted to touch base on this. How should we address it?

Thanks!

Beth



ELIZABETH C. TRAHOS PARTNER
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From: Nolfo, Matthew J <mjnolfo@ncdot.gov>
Sent: Friday, June 10, 2022 11:17 AM
To: Beth Trahos <beth.trahos@nelsonmullins.com>; jmcclure@rameykemp.com
Cc: Warren, Jeremy L <jlwarren@ncdot.gov>; Elabarger, Michael S <michael.elabarger@rolesville.nc.gov>
Subject: RE: 5109 Mitchell Mill

◄External Email► - From: mjnolfo@ncdot.gov

Jessica,

Michael's autoreply said he left Ramey Kemp on 5/5 and to direct emails towards you and Rynal. I am not sure what background you may have on 5109 Mitchell Mill, but I wanted to loop you into the conversation below.

Thanks,

Matthew Nolfo
Assistant District Engineer
Northern Wake County
Wake County District Office (Division 5 District 1)
North Carolina Department of Transportation

mjnolfo@ncdot.gov
(919)733-7759

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Mailing Address
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From: Nolfo, Matthew J
Sent: Friday, June 10, 2022 11:12 AM
To: beth.trahos@nelsonmullins.com; MKarpinski@rameykemp.com
Cc: Warren, Jeremy L <jlwarren@ncdot.gov>; Elabarger, Michael S <michael.elabarger@rolesville.nc.gov>
Subject: 5109 Mitchell Mill

Beth and Michael,

I am writing to follow up on some of the comments brought up in the Town of Rolesville meeting yesterday.

Currently, the TIA that has been submitted to NCDOT is unphased. There was a lot of discussion in the meeting yesterday about the possibility of 2 (or more) phases for this development. What this means is that prior to any residential units getting final plat approval, or any commercial building getting a CO, the expectation of the NCDOT is that all the non-frontage improvements on the TIA are constructed, as well as any frontage improvements for the site that is being approved for use.

Additionally, upon further review of the TIA, it only has 3 driveways along Mitchell Mill Road that are studied. When the distances of these driveways are compared with the TIA, it is evident that the missing driveway is the one into the proposed parking lot for the commercial unit (approximately 350 feet from the intersection of Mitchell Mill and Peebles. Currently, that TIA does not appear to study that connection, and I imagine the future tenant (grocery store?) would want that connection to exist. I have copied Michael Karpinski with Ramey Kemp who sealed the TIA, as he may be able to shed a bit of light on this as it was scoped and studied before I came into the picture at the District Office.

I think it is very important that we get this straightened out sooner rather than later to avoid unexpected problems in the future.

Thanks,

Matthew Nolfo
Assistant District Engineer
Northern Wake County
Wake County District Office (Division 5 District 1)
North Carolina Department of Transportation

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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.

Tucker Fulle

From: Walker, Braden M <bmwalker1@ncdot.gov>
Sent: Wednesday, January 5, 2022 3:19 PM
To: Michael Karpinski; Brennan, Sean P; Neidringhaus, Amy N
Cc: Winkler, Niklaus C; Wheeler, Millard S; Ishak, Doumit Y; Bunting, Clarence B; McFarland, Mical; Gruber, Meredith a; Carter, James E; Jessica McClure; Tucker Fulle
Subject: RE: [External] 5109 Mitchell Mill Road - TIA Scoping

Michael,

Congestion Management is ok with the MOU provided for the 5109 Mitchell Mill Road TIA.

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

From: Michael Karpinski <MKarpinski@rameykemp.com>
Sent: Monday, January 3, 2022 11:06 AM
To: Brennan, Sean P <spbrennan@ncdot.gov>; Walker, Braden M <bmwalker1@ncdot.gov>; Neidringhaus, Amy N <anneidringhaus@ncdot.gov>
Cc: Winkler, Niklaus C <ncwinkler@ncdot.gov>; Wheeler, Millard S <mswheeler1@ncdot.gov>; Ishak, Doumit Y <dishak@ncdot.gov>; Bunting, Clarence B <cbunting@ncdot.gov>; McFarland, Mical <mical.mcfarland@rolesville.nc.gov>; Gruber, Meredith a <meredith.gruber@rolesville.nc.gov>; Carter, James E <james.carter@rolesville.nc.gov>; Jessica McClure <JMCClure@rameykemp.com>; Tucker Fulle <tfulle@rameykemp.com>
Subject: RE: [External] 5109 Mitchell Mill Road - TIA Scoping

All,

Happy New Year! I am following up on my email below in regards to the attached MOU for the 5109 Mitchell Mill Road TIA in Rolesville. Let me know if you have any questions or need any additional information from us.

Regards,
Michael

Michael Karpinski, PE
Traffic Engineering Project Manager
D 919 987 1300 | T 919 872 5115
RAMEY KEMP ASSOCIATES
TOGETHER WE ARE LIMITLESS

From: Michael Karpinski
Sent: Monday, December 13, 2021 1:26 PM
To: Brennan, Sean P <spbrennan@ncdot.gov>; Walker, Braden M <bmwalker1@ncdot.gov>; Neidringhaus, Amy N <anneidringhaus@ncdot.gov>
Cc: Winkler, Niklaus C <ncwinkler@ncdot.gov>; Wheeler, Millard S <mswheeler1@ncdot.gov>; Ishak, Doumit Y <dishak@ncdot.gov>; Bunting, Clarence B <cbunting@ncdot.gov>; McFarland, Mical <mical.mcfarland@rolesville.nc.gov>; Gruber, Meredith a <meredith.gruber@rolesville.nc.gov>; Carter, James E <james.carter@rolesville.nc.gov>; Jessica McClure <JMCClure@rameykemp.com>; Tucker Fulle <tfulle@rameykemp.com>
Subject: RE: [External] 5109 Mitchell Mill Road - TIA Scoping

Good afternoon,

Please find the attached MOU for the 5109 Mitchell Mill Road TIA in Rolesville, North Carolina. Let me know your thoughts/comments on the attached or if you need anything else from me for your review, thanks!

Regards,
Michael

Michael Karpinski, PE
Traffic Engineering Project Manager
D 919 987 1300 | T 919 872 5115
RAMEY KEMP ASSOCIATES
TOGETHER WE ARE LIMITLESS

From: Brennan, Sean P <spbrennan@ncdot.gov>
Sent: Monday, October 18, 2021 3:01 PM
To: Walker, Braden M <bmwalker1@ncdot.gov>; Michael Karpinski <MKarpinski@rameykemp.com>; Neidringhaus, Amy N <anneidringhaus@ncdot.gov>
Cc: Winkler, Niklaus C <ncwinkler@ncdot.gov>; Wheeler, Millard S <mswheeler1@ncdot.gov>; Ishak, Doumit Y <dishak@ncdot.gov>; Bunting, Clarence B <cbunting@ncdot.gov>; McFarland, Mical <mical.mcfarland@rolesville.nc.gov>; Gruber, Meredith a <meredith.gruber@rolesville.nc.gov>; Carter, James E

<james.carter@rolesville.nc.gov>; Jessica McClure <JMCClure@rameykemp.com>
Subject: Re: [External] 5109 Mitchell Mill Road - TIA Scoping

Michael,

I don't have any additional comments.

Regards,
Sean Brennan, PE
Senior Assistant District Engineer
Division 5/District 1
Department of Transportation

919-733-3213 office
919-715-5778 fax
spbrennan@ncdot.gov

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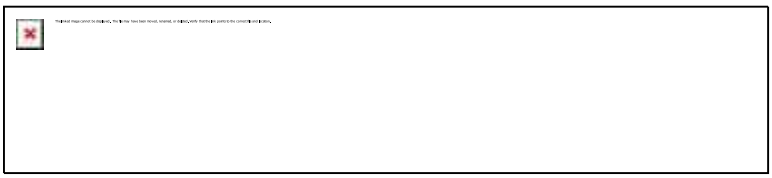


From: Walker, Braden M <bmwalker1@ncdot.gov>
Sent: Monday, October 18, 2021 1:13 PM
To: Michael Karpinski <MKarpinski@rameykemp.com>; Brennan, Sean P <spbrennan@ncdot.gov>; Neidringhaus, Amy N <anneidringhaus@ncdot.gov>
Cc: Winkler, Niklaus C <ncwinkler@ncdot.gov>; Wheeler, Millard S <mswheeler1@ncdot.gov>; Ishak, Doumit Y <dishak@ncdot.gov>; Bunting, Clarence B <cbunting@ncdot.gov>; McFarland, Mical <mical.mcfarland@rolesville.nc.gov>; Gruber, Meredith a <meredith.gruber@rolesville.nc.gov>; Carter, James E <james.carter@rolesville.nc.gov>; Jessica McClure <JMCClure@rameykemp.com>
Subject: RE: [External] 5109 Mitchell Mill Road - TIA Scoping

Michael,

Congestion Management has no additional comments.

I have attached the Town of Rolesville traffic analysis which should have traffic counts from 2016. The report also projected volumes for 2020 and 2025.

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

Nothing Compares

From: Michael Karpinski <MKarpinski@rameykemp.com>
Sent: Monday, October 11, 2021 12:17 PM
To: Brennan, Sean P <spbrennan@ncdot.gov>; Neidringhaus, Amy N <anneidringhaus@ncdot.gov>
Cc: Winkler, Niklaus C <ncwinkler@ncdot.gov>; Wheeler, Millard S <mswheeler1@ncdot.gov>; Ishak, Doumit Y <dishak@ncdot.gov>; Bunting, Clarence B <cbunting@ncdot.gov>; McFarland, Mical <mical.mcfarland@rolesville.nc.gov>; Gruber, Meredith a <meredith.gruber@rolesville.nc.gov>; Carter, James E <james.carter@rolesville.nc.gov>; Jessica McClure <JMCClure@rameykemp.com>; Walker, Braden M <bmwalker1@ncdot.gov>
Subject: RE: [External] 5109 Mitchell Mill Road - TIA Scoping

Thanks, Sean! Do you have any other comments regarding the proposed TIA scope outlined below?

Michael Karpinski, PE
Traffic Engineering Project Manager

D 919 987 1300 | T 919 872 5115

RAMEY KEMP ASSOCIATES
TOGETHER WE ARE LIMITLESS

From: Brennan, Sean P <spbrennan@ncdot.gov>
Sent: Friday, October 8, 2021 10:27 AM
To: Michael Karpinski <MKarpinski@rameykemp.com>; Neidringhaus, Amy N <anneidringhaus@ncdot.gov>
Cc: Winkler, Niklaus C <ncwinkler@ncdot.gov>; Wheeler, Millard S <mswheeler1@ncdot.gov>; Ishak, Doumit Y <dishak@ncdot.gov>; Bunting, Clarence B <cbunting@ncdot.gov>; McFarland, Mical <mical.mcfarland@rolesville.nc.gov>; Gruber, Meredith a <meredith.gruber@rolesville.nc.gov>; Carter, James E <james.carter@rolesville.nc.gov>; Jessica McClure <JMCClure@rameykemp.com>; Walker, Braden M <bmwalker1@ncdot.gov>
Subject: Re: [External] 5109 Mitchell Mill Road - TIA Scoping

Michael,

I'm okay with the driveways on Jonesville operating as full access assuming that they have adequate sight distance. Given the required cross section on Mitchell Mill Road, we will only support the western most access being studied as a full movement, the other two driveway will need to be restricted to right-in/right-out.

Regards,
Sean Brennan, PE
Senior Assistant District Engineer
Division 5/District 1
Department of Transportation

919-733-3213 office
919-715-5778 fax
spbrennan@ncdot.gov

4009 District Drive (Physical Address)
Raleigh, NC 27607

1575 Mail Service Center (Mailing Address)
Raleigh, NC 27699-1575

From: Michael Karpinski <MKarpinski@rameykemp.com>
Sent: Wednesday, October 6, 2021 12:06 PM
To: Brennan, Sean P <spbrennan@ncdot.gov>; Neidringhaus, Amy N <anneidringhaus@ncdot.gov>
Cc: Winkler, Niklaus C <ncwinkler@ncdot.gov>; Wheeler, Millard S <mswheeler1@ncdot.gov>; Ishak, Doumit Y <dishak@ncdot.gov>; Bunting, Clarence B <cbunting@ncdot.gov>; McFarland, Mical <mical.mcfarland@rolesville.nc.gov>; Gruber, Meredith a <meredith.gruber@rolesville.nc.gov>; Carter, James E <james.carter@rolesville.nc.gov>; Jessica McClure <JMCClure@rameykemp.com>; Walker, Braden M <bmwalker1@ncdot.gov>
Subject: RE: [External] 5109 Mitchell Mill Road - TIA Scoping

Hey Sean,

See below for answers to your questions:

- The developer would prefer full movement access for all of their proposed driveway connections.
- The Town's Community Transportation Plan shows the future cross section of Jonesville Road as a 2-lane roadway with a TWLTL and Mitchell Mill Road as a 4-lane median divided roadway. Based on my coordination with Town staff, with all the surrounding residential development coming in, road sizing and signalization on Mitchell Mill Road is something we will need to continue to evaluate and work closely with NCDOT. Kalas Falls (450+ homes) and Rolesville Crossing (formerly Hopper Communities, 300 homes) are being proposed near the

intersection Mitchell Mill Road and Rolesville Road. At a minimum, the Town is considering requiring ROW dedication and ultimate cross-section widening along this proposed development's frontage on Mitchell Mill Road and Jonesville Road.

Braden – any luck finding traffic count data at the US 401 Bypass / Jonesville Road intersection from the Bypass project?

Let me know if you have any questions. Thanks!

Michael Karpinski, PE
Traffic Engineering Project Manager
D 919 987 1300 | T 919 872 5115
RAMEY KEMP ASSOCIATES
TOGETHER WE ARE LIMITLESS

From: Brennan, Sean P <spbrennan@ncdot.gov>
Sent: Friday, September 24, 2021 10:45 AM
To: Michael Karpinski <MKarpinski@rameykemp.com>; Neidringhaus, Amy N <anneidringhaus@ncdot.gov>
Cc: Winkler, Niklaus C <ncwinkler@ncdot.gov>; Wheeler, Millard S <mwheeler@ncdot.gov>; Ishak, Doumit Y <dishak@ncdot.gov>; Bunting, Clarence B <cbunting@ncdot.gov>; McFarland, Mical <mical.mcfarland@rolesville.nc.gov>; Gruber, Meredith a <meredith.gruber@rolesville.nc.gov>; Carter, James E <james.carter@rolesville.nc.gov>; Jessica McClure <JMCClure@rameykemp.com>; Walker, Braden M <bmwalker1@ncdot.gov>
Subject: Re: [External] 5109 Mitchell Mill Road - TIA Scoping

Michael,

I have the following questions:

- What type of access is being proposed at each access location.
- What are the ultimate cross sections for Mitchell Mill Rd and Jonesville Rd, and what will the town require in terms of ultimate section widening?

Braden,

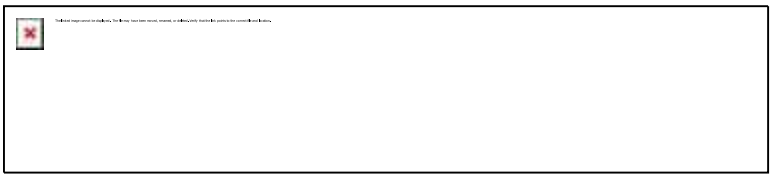
Do we have any traffic count data available at the US 401 Bypass / Jonesville Road intersection from the Bypass project?

Regards,
Sean Brennan, PE
Senior Assistant District Engineer
Division 5/District 1
Department of Transportation

919-733-3213 office
919-715-5778 fax
spbrennan@ncdot.gov

4009 District Drive (Physical Address)
Raleigh, NC 27607

1575 Mail Service Center (Mailing Address)
Raleigh, NC 27699-1575



From: Michael Karpinski <MKarpinski@rameykemp.com>
Sent: Tuesday, September 21, 2021 3:23 PM
To: Brennan, Sean P <spbrennan@ncdot.gov>; Neidringhaus, Amy N <anneidringhaus@ncdot.gov>
Cc: Winkler, Niklaus C <ncwinkler@ncdot.gov>; Wheeler, Millard S <mwheeler@ncdot.gov>; Ishak, Doumit Y <dishak@ncdot.gov>; Bunting, Clarence B <cbunting@ncdot.gov>; McFarland, Mical <mical.mcfarland@rolesville.nc.gov>; Gruber, Meredith a <meredith.gruber@rolesville.nc.gov>; Carter, James E <james.carter@rolesville.nc.gov>; Jessica McClure <JMCClure@rameykemp.com>
Subject: [External] 5109 Mitchell Mill Road - TIA Scoping

Good afternoon, Sean / Amy –

We are working with the Town of Rolesville on a TIA for the proposed development located at 5109 Mitchell Mill Road in Rolesville, NC. The proposed development is separated into two (2) tracts on both sides of Jonesville Road, north of Mitchell Mill Road. I have attached a preliminary site plan for reference. Let me know if you would like to have a meeting to discuss the scope of the TIA, if you need this information in the NCDOT TIA scoping checklist, and/or if you have any questions/comments on the scope. We will submit a formal MOU once the TIA is underway for confirmation of all scoping assumptions/methodology.

Existing Traffic Conditions:

Study Intersections

i. Mitchell Mill Road and Jonesville Road / Peebles Road (unsignalized)
ii. US 401 Bypass and Jonesville Road (unsignalized)
iii. US 401 Bypass and Eastern U-Turn Location (unsignalized)
iv. Mitchell Mill Road and Site Driveways (3 in total – all on west side)
v. Jonesville Road and Site Driveways (2 on west side, 3 on east side – only 1 will be aligned on both sides)

Traffic Counts

- Does NCDOT have any traffic count data available at the US 401 Bypass / Jonesville Road intersection from the Bypass project? I was not able to find count data from NCDOT's website at the existing study intersections noted above.
- Attached are turning movement counts at the intersection of US 401 Business (Louisburg Road) and Jonesville Road / Hampton Lakes Drive from March of 2019 (please note, NOT a study intersection for this TIA); if no other count data is available, we could collect new turning movement counts at this intersection to determine an

appropriate adjustment factor to account for COVID-19 to apply to new traffic counts at the existing study intersections.

Trip Generation:

- West Side:
  - 8.27 acres of non-residential use; assumed 57,890 sq. ft. of general retail (ITE LUC 820)
    - Exact land uses & intensity unknown at this time; therefore, we are assuming 7,000 square feet of general retail space per acre
    - 8.27 acres * 7,000 sq. ft. / acre = 57,890 sq. ft. of general retail (ITE LUC 820)
  - 69 Single Family Homes (ITE LUC 210)
  - 129 Townhomes (ITE LUC 220)
- East Side:
  - 195 Single Family Homes (ITE LUC 210)
- **Total Unadjusted Trip Generation: 7,500 ADT; 434 AM (174 Entering, 260 Exiting); 695 PM (384 Entering, 311 Exiting)**
  - Calculated utilized 264 Single Family Homes, 129 Townhomes, and 57,890 sq ft. of general retail.

Future Traffic Conditions:

- Build-out year: 2028
- Growth Rate: 2% (*consistent with previous studies in the area)*
- Adjacent Developments: *(Please advise if there are any we are missing)*
  - Cobblestone Crossing Mixed-Use
  - Kalas Falls
  - East Young Street PUD (The Point)
  - Rolesville Crossing (Formerly Hopper Communities)
  - Louisbury Road Assemblage
- Future Roadway Improvements: *(Please advise if there are any – nothing on STIP map)*

Let me know if you have any questions, thanks!

Michael

Michael Karpinski, PE
Traffic Engineering Project Manager
D 919 987 1300 | T 919 872 5115
RAMEY KEMP ASSOCIATES
TOGETHER WE ARE LIMITLESS

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RAMEY KEMP ASSOCIATES
TOGETHER WE ARE LIMITLESS

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

December 13, 2021

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: 5109 Mitchell Mill Road
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 5109 Mitchell Mill Road development in Rolesville, North Carolina. The proposed development is separated into two (2) tracts on both sides of Jonesville Road, north of Mitchell Mill Road. The eastern tract is expected to consist of 195 single-family homes and the western tract of development is expected to consist of 69 single-family homes, 129 townhomes, and 8.27 acres of commercial development. This MOU reflects the assumptions outlined during 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 four (4) full-movement driveway connections along Jonesville Road, two (2) right-in/right-out (RIRO) driveway connections along Mitchell Mill Road, and one (1) full-movement driveway connection along Mitchell Mill Road. One of the site driveway connections along Jonesville Road will be aligned to provide access to both the eastern and western tracts of the proposed development.

The proposed development, anticipated to be completed in 2028, is expected to consist of 264 single-family homes, 129 townhomes, and 8.27 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 57,890 sq. ft.] was assumed for the commercial development in this study. The proposed development is assumed to consist of the following land uses:

- 264 single-family homes
- 129 townhomes
- 57,890 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)
- Jonesville Road and Site Driveways (4)
- Mitchell Mill Road and Site Driveways (3)

Existing Traffic Volumes

Existing peak hour traffic volumes will be determined based on traffic counts conducted at the study intersections below, in November 2021 during a typical weekday AM (7:00 AM – 9:00 AM) and PM (4:00 PM – 6:00 PM) peak periods, while schools are 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

Background Traffic Volumes

Based on coordination with NCDOT and the Town, background traffic volumes will be determined by projecting 2021 existing traffic volumes to the year 2028 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*, 10th 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)	264 DU	2,540	48	144	192	163	95	258
Multi-Family Home (Low-Rise) (220)	129 DU	934	14	47	61	47	27	74
Shopping Center (820)	57.89* KSF	4,146	112	69	181	174	189	363
Total Trips		**7,620**	**174**	**260**	**434**	**384**	**311**	**695**
*Internal Capture (1% AM, 16% PM)***			*-2*	*-2*	*-4*	*-40*	*-41*	*-81*
Total External Trips			**172**	**258**	**430**	**344**	**270**	**614**
Pass-By Trips: Shopping Center (34% PM)			-	-	-	*-52*	*-52*	*-104*
Total Primary Trips			**172**	**258**	**430**	**292**	**218**	**510**

*Since the commercial development is unknown at this time, 7,000 SF of general retail space per acre of land [8.27 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 7,620 site trips on the roadway network during a typical 24-hour weekday period. Of the daily traffic volume, it is anticipated that 434 trips (174 entering and 260 exiting) will occur during the weekday AM peak hour and 695 trips (384 entering and 311 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. However, since the site is split into two (2) tracts on either side of Jonesville Road, internal capture was only considered for the land uses in the western tract. Based on NCHRP Report 684 methodology, weekday AM and PM peak hour internal capture rates of 1% and 16%, respectively, were applied to the trips generated from the western tract only. The internal capture reductions are expected to account for approximately 4 trips (2 entering and 2 exiting) during the weekday AM peak hour and 81 trips (40 entering and 41 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 104 trips (52 entering and 52 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 430 trips (172 entering and 258 exiting) during the weekday AM peak hour, and 510 trips (292 entering and 218 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

- 40% to/from the west via US 401 Bypass
- 20 % to/from the east via US 401 Bypass
- 10% to/from the south via Peebles Road
- 25% to/from the west via Mitchell Mill Road
- 5% 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:

- 2021 Existing Traffic Conditions
- 2028 No-Build Traffic Conditions
- 2028 Build Traffic Conditions

Report

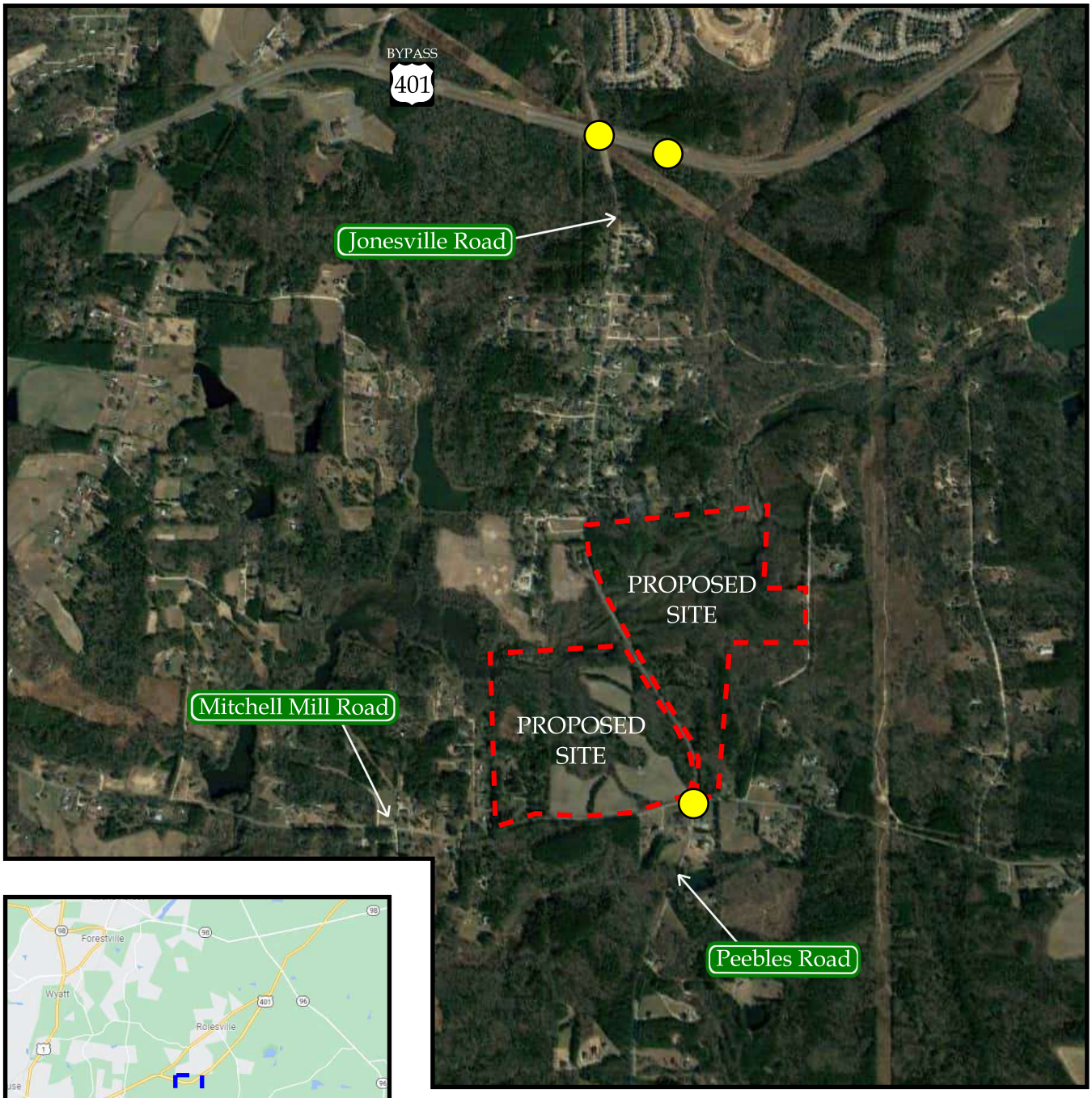
The TIA report will be prepared based on the Town and NCDOT requirements.

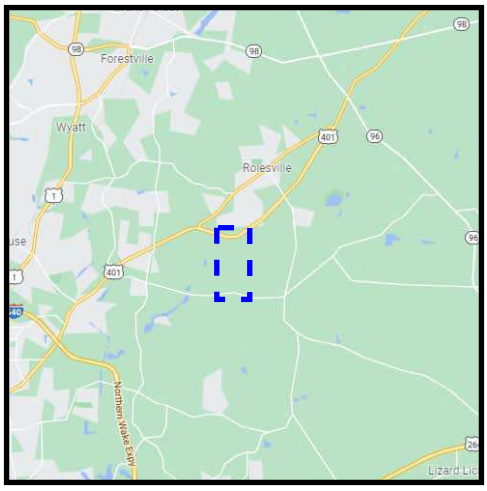
If you find this memorandum of understanding acceptable, please let me know so that we may include it in the TIA report. If you have any questions or concerns, please do not hesitate to contact me.

Sincerely,
Ramey Kemp Associates,

Michael Karpkinski, P.E.
Traffic Engineering Project Manager

Attachments:
Site Location Map
Site Plan
2021 Existing Traffic Volumes Figure
NCHRP 684 Internal Capture Reports
Proposed Site Trip Distribution Figures





N

LEGEND

- Proposed Site Location
- Study Intersection
- Study Area

RKA
RAMEY KEMP ASSOCIATES

5109 Mitchell Mill Road
Rolesville, NC

Site Location Map

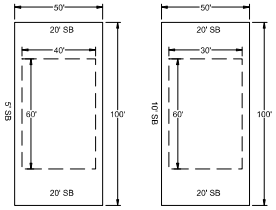
Scale: Not to Scale

PROJECT SUMMARY

TRACT	USE	UNITS
WEST (±55 ACRES)	NON-RESIDENTIAL	8.27 ACRES
	SINGLE FAMILY	69
	TOWNHOMES	129
	OPEN SPACE	±18 ACRES
	RIGHT-OF-/WAY	±9 ACRES
EAST (±86 ACRES)	SINGLE FAMILY	195
	OPEN SPACE	±42 ACRES
	RIGHT-OF-/WAY	±10 ACRES

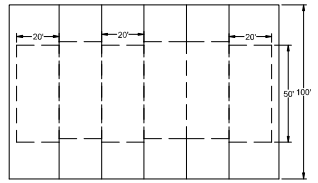
PROJECT NOTES

1	BOUNDARY AND TOPOGRAPHIC INFORMATION TAKEN FROM WAKE COUNTY GIS.
2	THIS PLAN IS CONCEPTUAL IN NATURE AND HAS NOT BEEN REVIEWED BY ANY AGENCY.
3	UNIT COUNT IS SUBJECT TO CHANGE PENDING WETLAND AND STREAM DETERMINATIONS, PERMITTING, GRADING, SEWER AND STORMWATER DESIGN.
4	THIS SITE REQUIRES TOWN OF ROLESVILLE REZONING AND ANNEXATION. THIS LAYOUT ASSUMES A ROLESVILLE NC ZONING DISTRICT WEST OF JONESVILLE RD AND A CLUSTER RMD ZONING EAST OF JONESVILLE RD.
5	VISITOR PARKING IS REQUIRED FOR TOWNHOMES AT A RATIO OF 1 SPACE PER 4 DWELLING UNITS. 129 TOWNHOMES * 1 SPACE / 4 TOWNHOMES = 33 SPACES



TYPICAL CLUSTER LOT DIMENSIONS

TYPICAL NEIGHBORHOOD CENTER LOT DIMENSIONS



TYPICAL LOT DIMENSIONS "TOWNHOUSES"

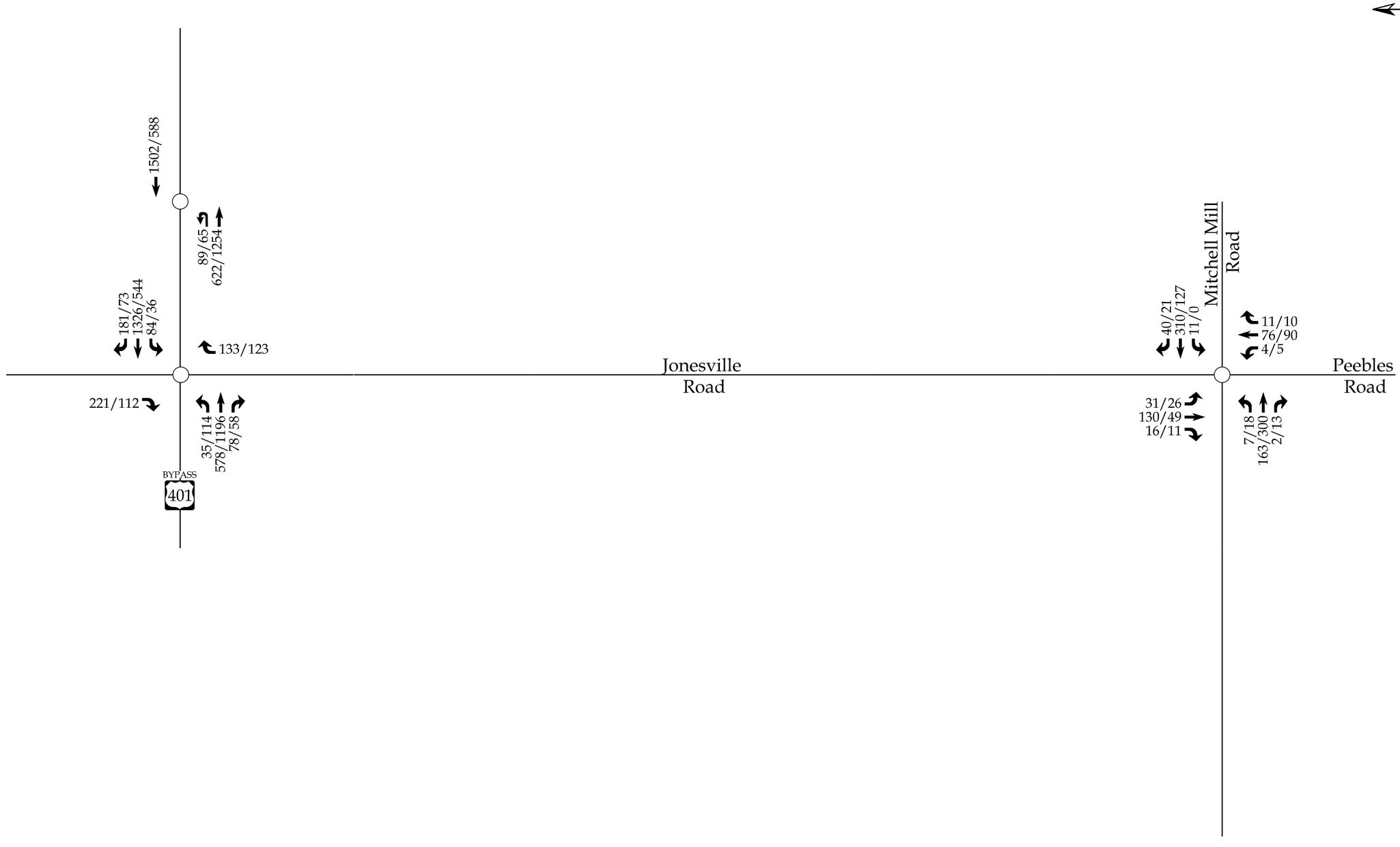
CONCEPTUAL PLAN 7

5109 MITCHELL MILL ROAD - July 2, 2021

0 150 300 Feet

HOPPER COMMUNITIES

TIMMONS GROUP ENGINEERING | DESIGN | TECHNOLOGY



LEGEND

◯ Unsignalized Intersection

X / Y → Weekday AM / PM Peak Hour Traffic

RAMEY KEMP ASSOCIATES

5109 Mitchell Mill Road
Rolesville, NC

2021 Existing
Peak Hour Traffic

Scale: Not to Scale

NCHRP 684 Internal Trip Capture Estimation Tool			
Project Name:	5109 Mitchell Mill Road	**Organization:**	RKA
Project Location:	Rolesville, NC	**Performed By:**	TF
Scenario Description:	Full-Build	**Date:**	12/9/2021
Analysis Year:	2028	**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	820	58	KSF		112	69
Restaurant						
Cinema/Entertainment						
Residential	210,220	69, 129	DU		26	84
Hotel						
All Other Land Uses[2]						
				0	138	153

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	1	0	0		0
Hotel	0	0	0	0	0	

Table 5-A: Computations Summary

	Total	Entering	Exiting
All Person-Trips	320	152	168
Internal Capture Percentage	1%	1%	1%
External Vehicle-Trips[5]	287	136	151
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	1%	1%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	3%	1%
Hotel	N/A	N/A

[1]Land Use Codes (LUCs) from *Trip Generation Manual*, 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 *Trip Generation Manual*).

[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:	5109 Mitchell Mill Road
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	112	123	1.10	69	76
Restaurant	1.10	0	0	1.10	0	0
Cinema/Entertainment	1.10	0	0	1.10	0	0
Residential	1.10	26	29	1.10	84	92
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	22		10	0	11	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	2	1	18	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		39	0	0	0	0
Retail	0		0	0	1	0
Restaurant	0	10		0	1	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	21	0	0		0
Hotel	0	5	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	1	122	123	111	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	1	28	29	25	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	75	76	68	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	1	91	92	83	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses[3]	0	0	0	0	0	0

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

[2]Person-Trips

[3]Total 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:	5109 Mitchell Mill Road	**Organization:**	RKA
Project Location:	Rolesville, NC	**Performed By:**	TF
Scenario Description:	Full-Build	**Date:**	12/9/2021
Analysis Year:	2028	**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	820	58	KSF		174	189
Restaurant						
Cinema/Entertainment						
Residential	210,220	69, 129	DU		89	52
Hotel						
All Other Land Uses[2]						
				0	263	241

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						
Retail					1900	
Restaurant						
Cinema/Entertainment						
Residential		1900				
Hotel						

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	36	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	7	0	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary

	Total	Entering	Exiting
All Person-Trips	554	289	265
Internal Capture Percentage	16%	15%	16%
External Vehicle-Trips[5]	424	223	201
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	4%	17%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	37%	12%
Hotel	N/A	N/A

[1]Land Use Codes (LUCs) from *Trip Generation Manual*, 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 *Trip Generation Manual*).

[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:	5109 Mitchell Mill Road
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	174	191	1.10	189	208
Restaurant	1.10	0	0	1.10	0	0
Cinema/Entertainment	1.10	0	0	1.10	0	0
Residential	1.10	89	98	1.10	52	57
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	4		60	8	36	10
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	2	9	12	0		2
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		15	0	0	4	0
Retail	0		0	0	45	0
Restaurant	0	96		0	16	0
Cinema/Entertainment	0	8	0		4	0
Residential	0	7	0	0		0
Hotel	0	4	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	7	184	191	167	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	36	62	98	56	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)

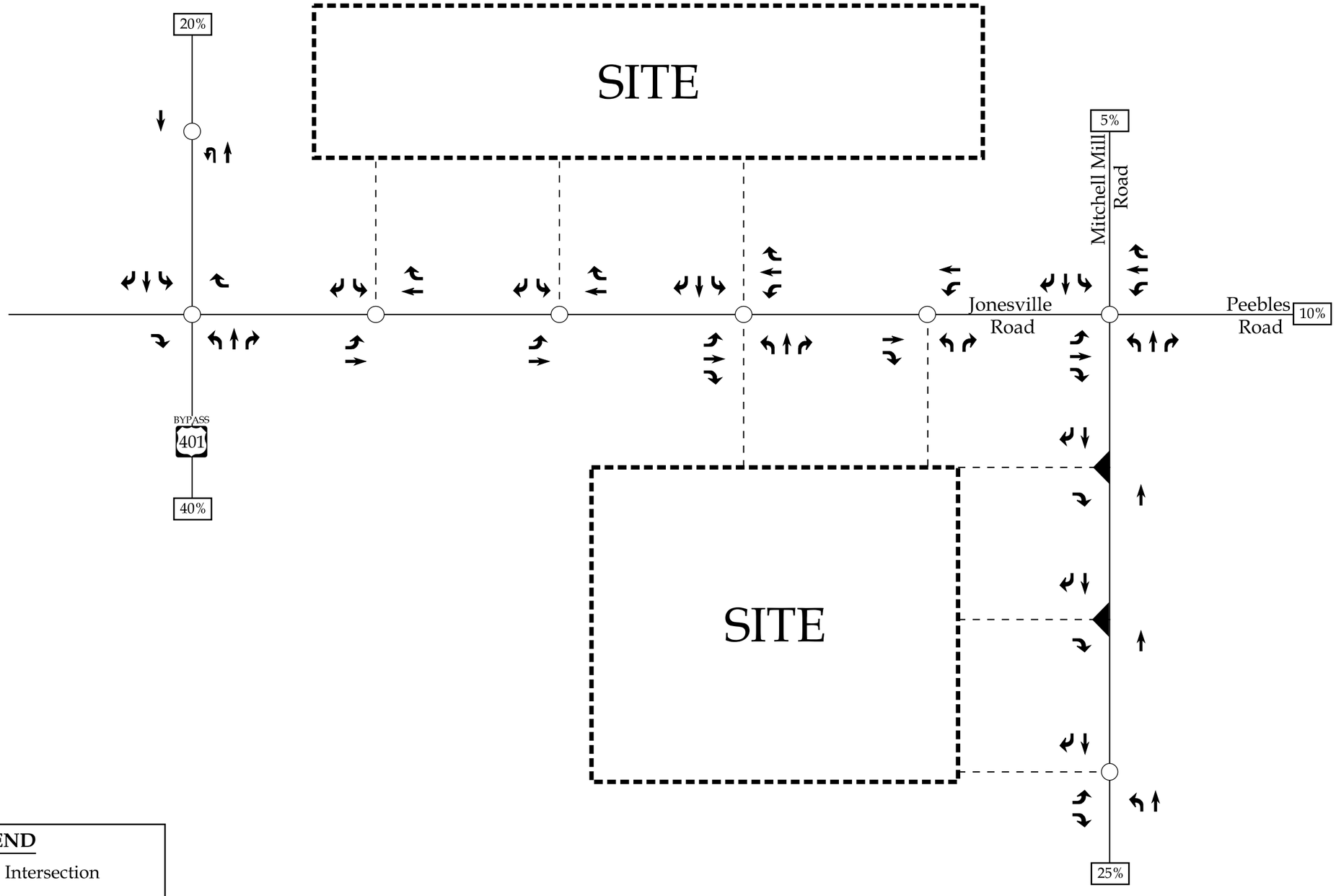
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles[1]	Transit[2]	Non-Motorized[2]
Office	0	0	0	0	0	0
Retail	36	172	208	156	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	7	50	57	45	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses[3]	0	0	0	0	0	0

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

[2]Person-Trips

[3]Total 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

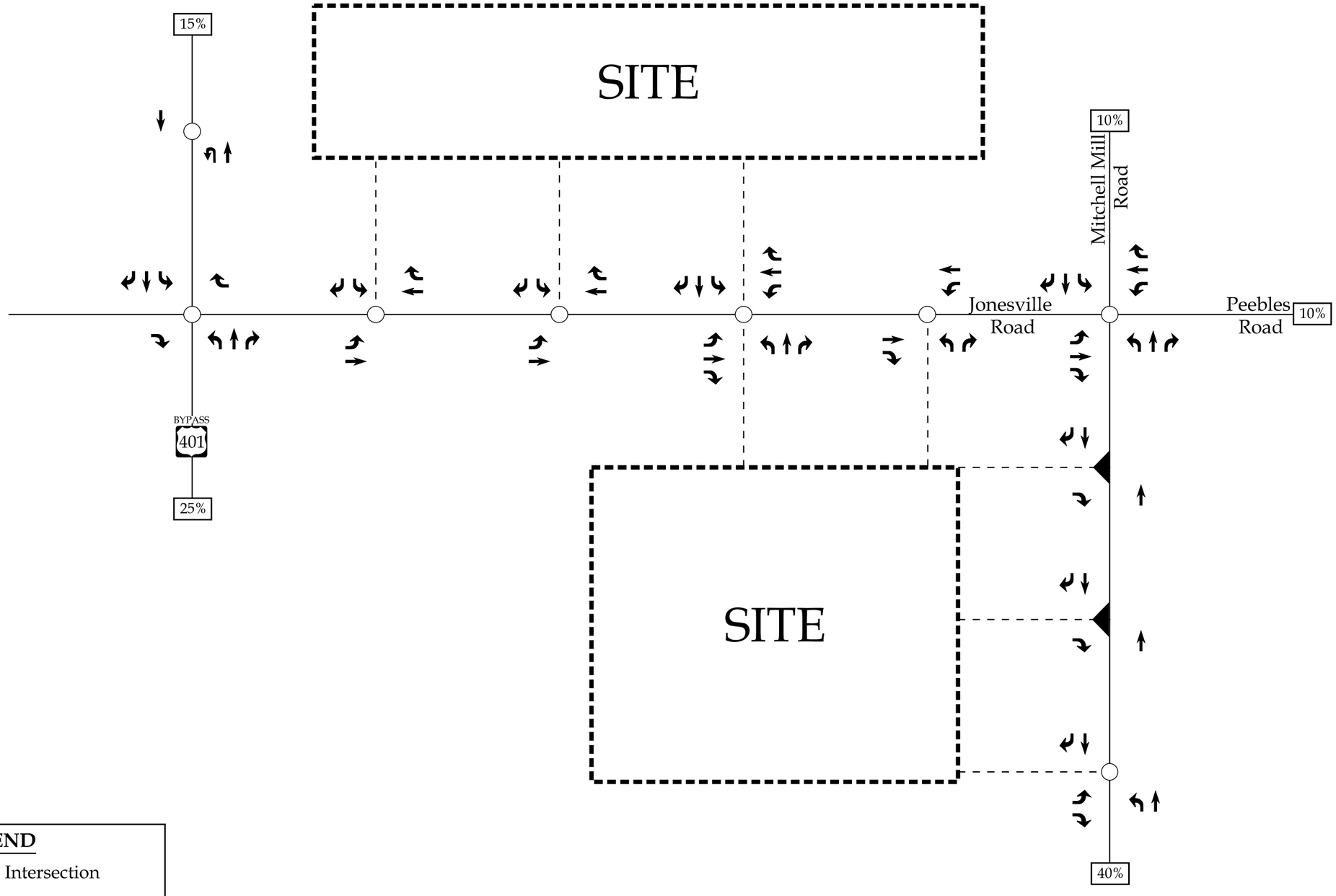
- Unsignalized Intersection
- Right-In/Right-Out Intersection
- X% → Entering Trip Distribution
- (Y%) → Exiting Trip Distribution
- XX% Regional Trip Distribution

RKA
RAMEY KEMP ASSOCIATES

5109 Mitchell Mill Road
Rolesville, NC

Proposed Residential
Site Trip Distribution

Scale: Not to Scale



LEGEND

- ○ Unsignalized Intersection
- ▲ Right-In/Right-Out Intersection
- X% → Entering Trip Distribution
- (Y%) → Exiting Trip Distribution
- [XX%] Regional Trip Distribution

RKA
RAMEY KEMP ASSOCIATES

5109 Mitchell Mill Road
Rolesville, NC

Proposed
Commercial 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

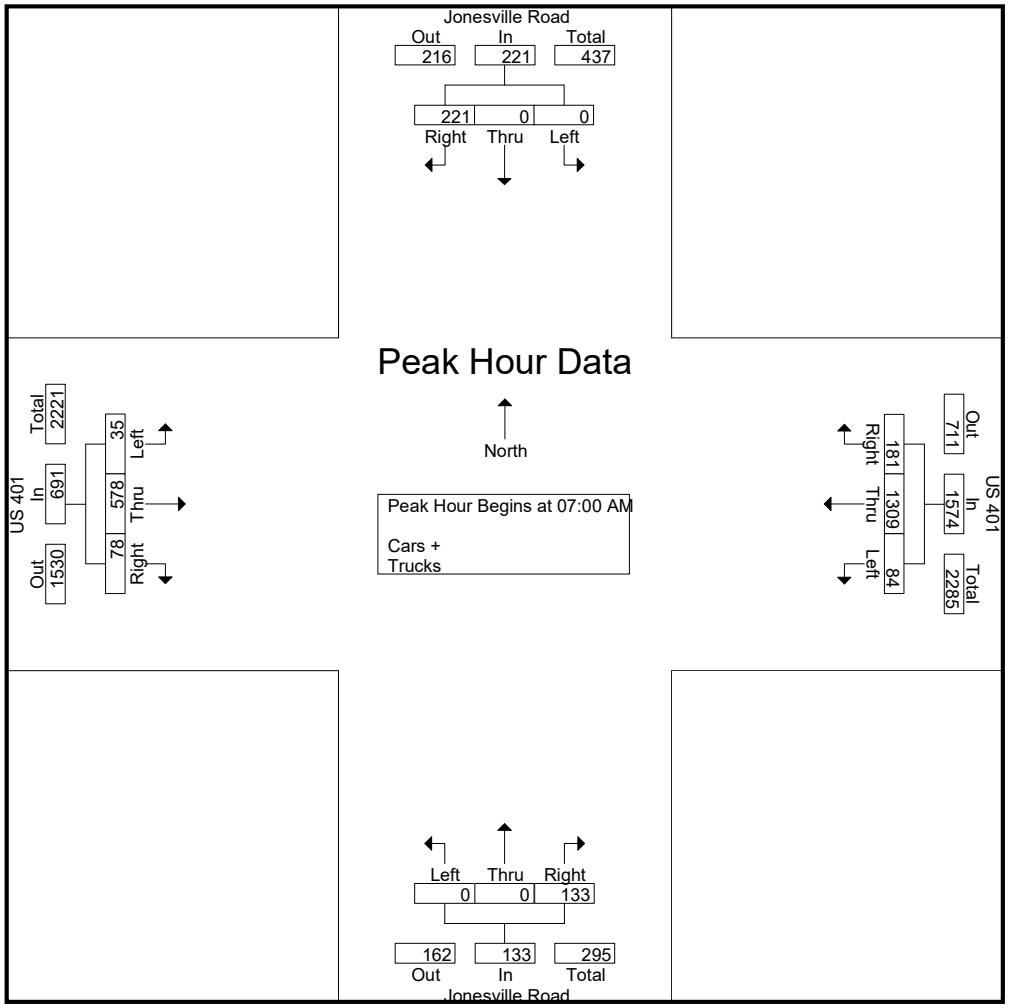
Groups Printed- Cars + - Trucks

	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

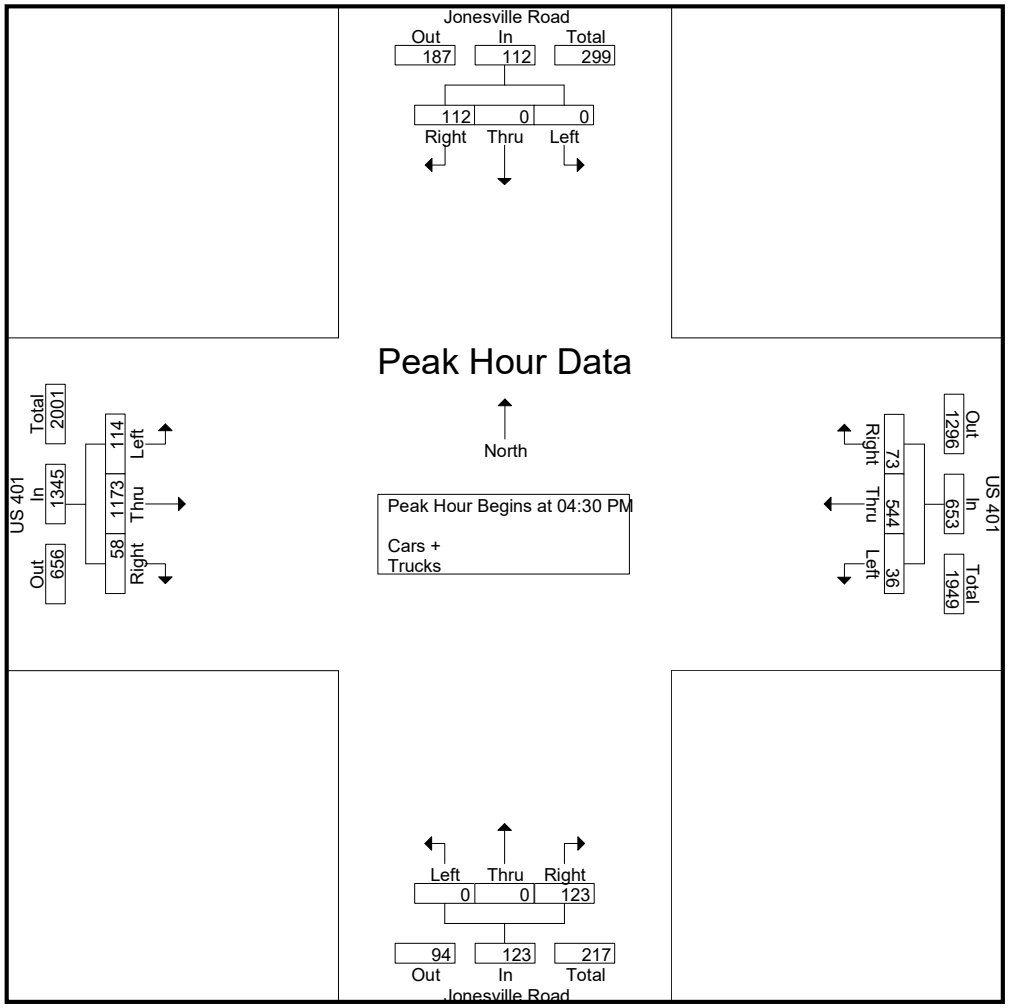
Groups Printed- Cars + - Trucks

	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

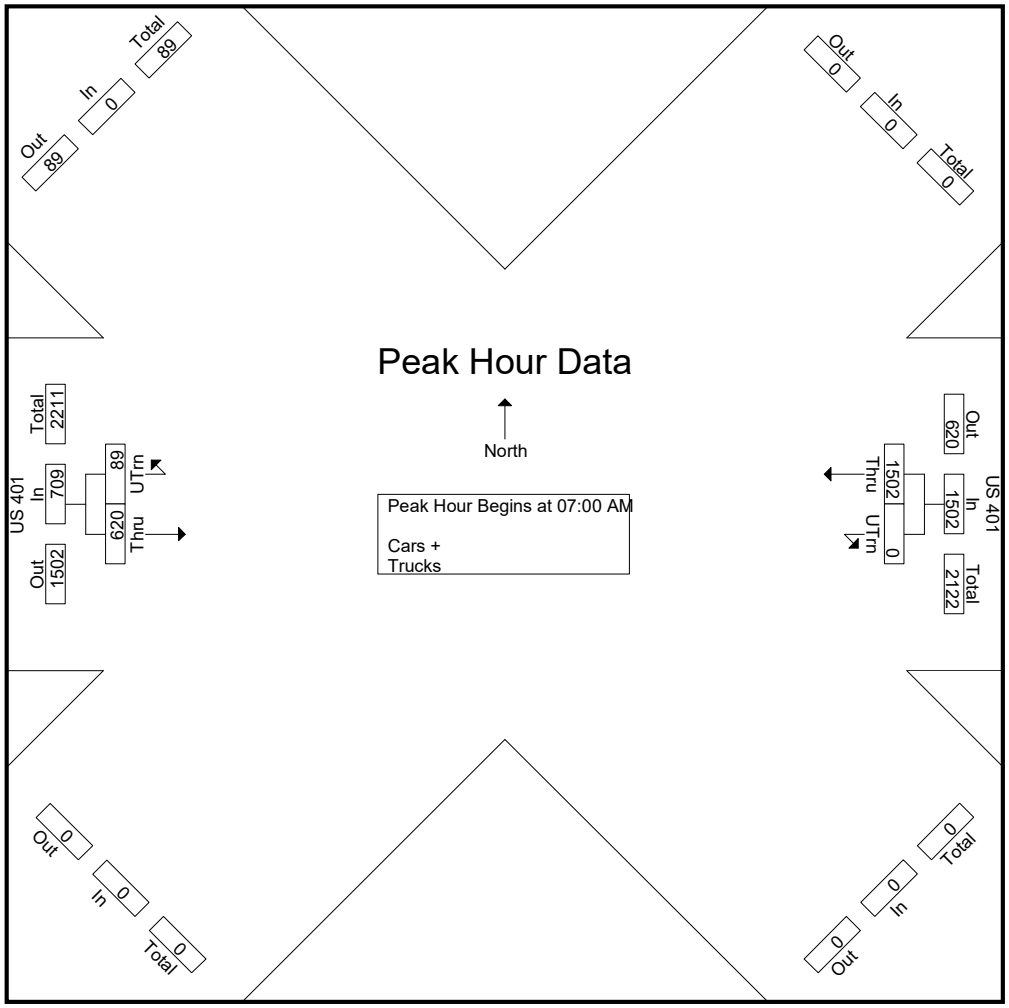
Groups Printed- Cars + - Trucks

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

TRAFFIC DATA COLLECTION

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

	US 401 Westbound			US 401 Eastbound			
Start Time	Thru	UTrn	App. Total	Thru	UTrn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1							
Peak Hour for Entire Intersection Begins at 07:00 AM							
07:00 AM	**421**	0	**421**	**198**	12	**210**	**631**
07:15 AM	410	0	410	136	24	160	570
07:30 AM	392	0	392	149	**36**	185	577
07:45 AM	279	0	279	137	17	154	433
Total Volume	1502	0	1502	620	89	709	2211
% App. Total	100	0		87.4	12.6		
PHF	.892	.000	.892	.783	.618	.844	.876



TRAFFIC DATA COLLECTION

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

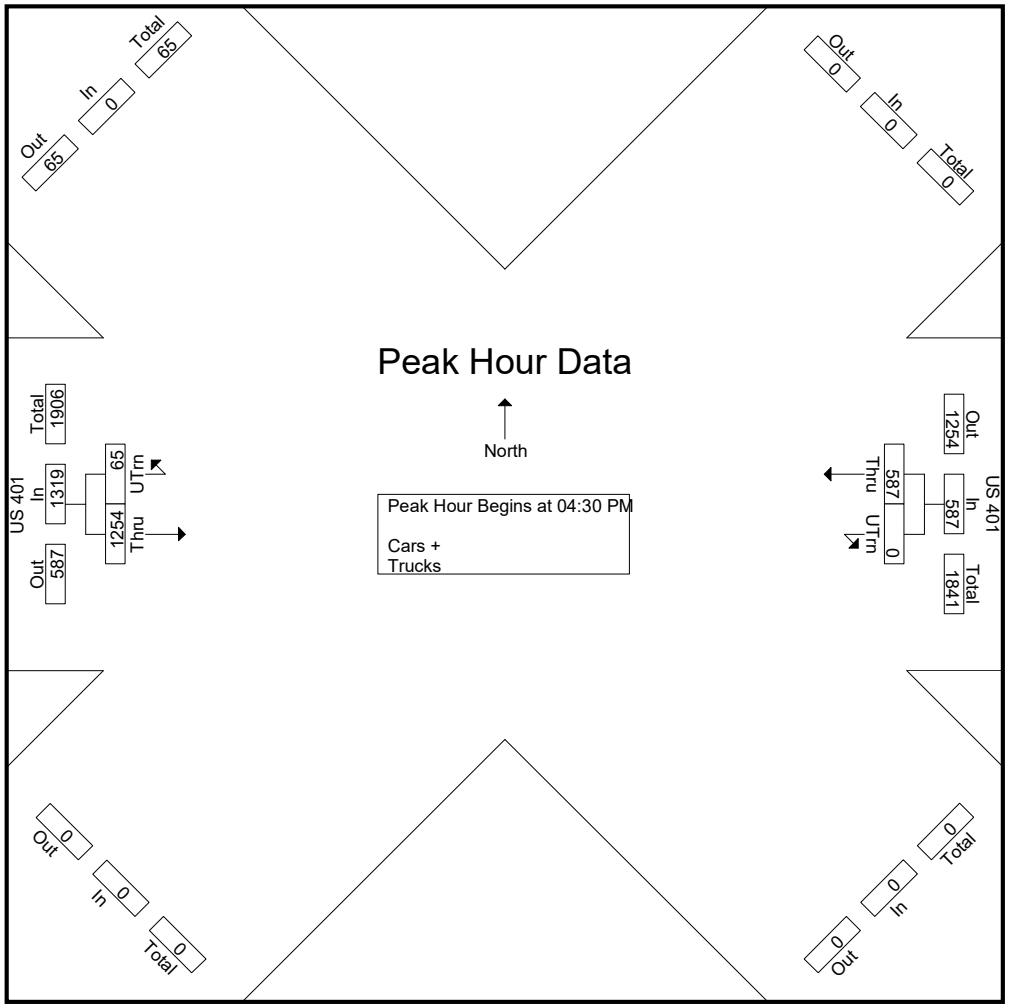
Groups Printed- Cars + - Trucks

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

TRAFFIC DATA COLLECTION

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

	US 401 Westbound			US 401 Eastbound			
Start Time	Thru	UTrn	App. Total	Thru	UTrn	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1							
Peak Hour for Entire Intersection Begins at 04:30 PM							
04:30 PM	129	0	129	311	**19**	330	459
04:45 PM	149	0	149	317	19	336	485
05:00 PM	149	0	149	**342**	8	**350**	**499**
05:15 PM	**160**	0	**160**	284	19	303	463
Total Volume	587	0	587	1254	65	1319	1906
% App. Total	100	0		95.1	4.9		
PHF	.917	.000	.917	.917	.855	.942	.955



TRAFFIC DATA COLLECTION

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

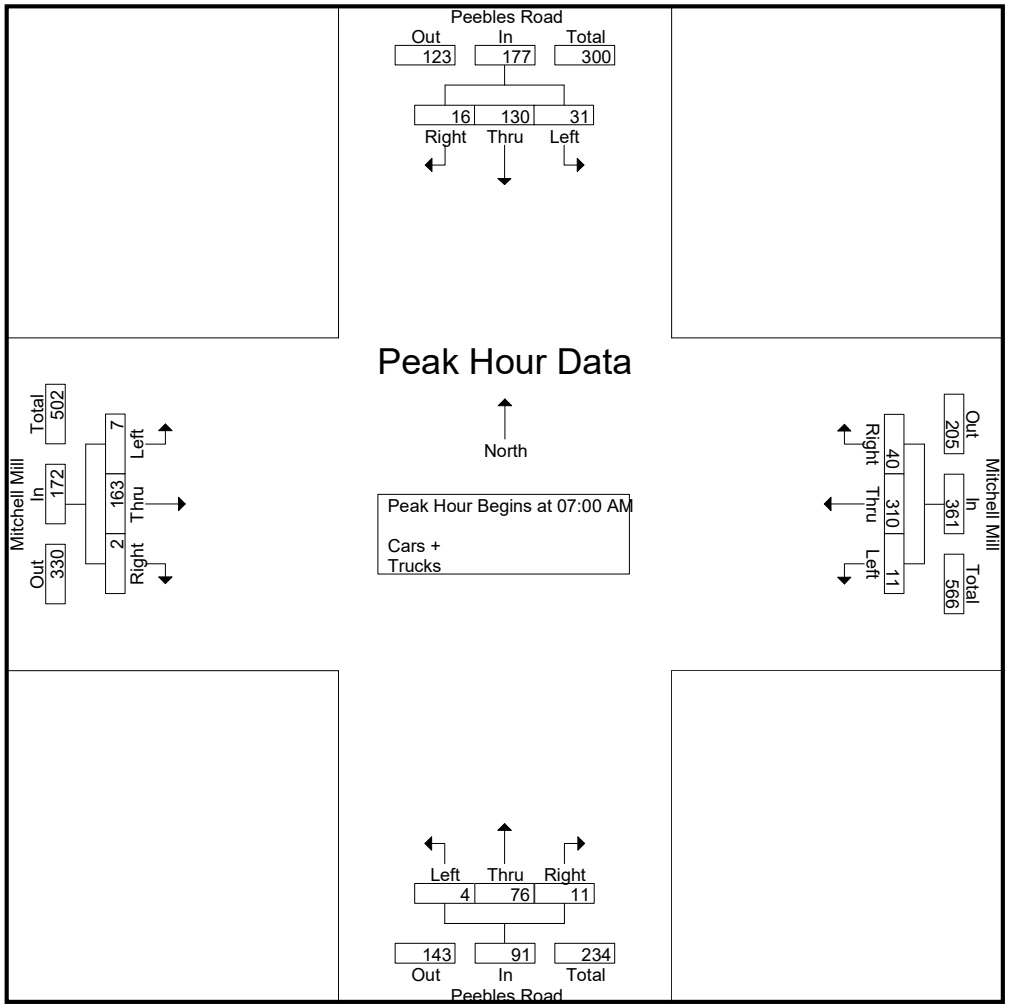
Groups Printed- Cars + - Trucks

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

TRAFFIC DATA COLLECTION

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

	Peebles Road Southbound				Mitchell Mill Westbound				Peebles Road Northbound				Mitchell Mill Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:00 AM																	
07:00 AM	4	17	**13**	34	8	73	**5**	86	**6**	11	**3**	20	0	**74**	1	**75**	215
07:15 AM	4	36	7	47	8	**101**	2	**111**	3	**26**	1	**30**	0	32	1	33	**221**
07:30 AM	**6**	34	5	45	**16**	87	3	106	0	24	0	24	**1**	33	1	35	210
07:45 AM	2	**43**	6	**51**	8	49	1	58	2	15	0	17	1	24	**4**	29	155
Total Volume	16	130	31	177	40	310	11	361	11	76	4	91	2	163	7	172	801
% App. Total	9	73.4	17.5		11.1	85.9	3		12.1	83.5	4.4		1.2	94.8	4.1		
PHF	.667	.756	.596	.868	.625	.767	.550	.813	.458	.731	.333	.758	.500	.551	.438	.573	.906



TRAFFIC DATA COLLECTION

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

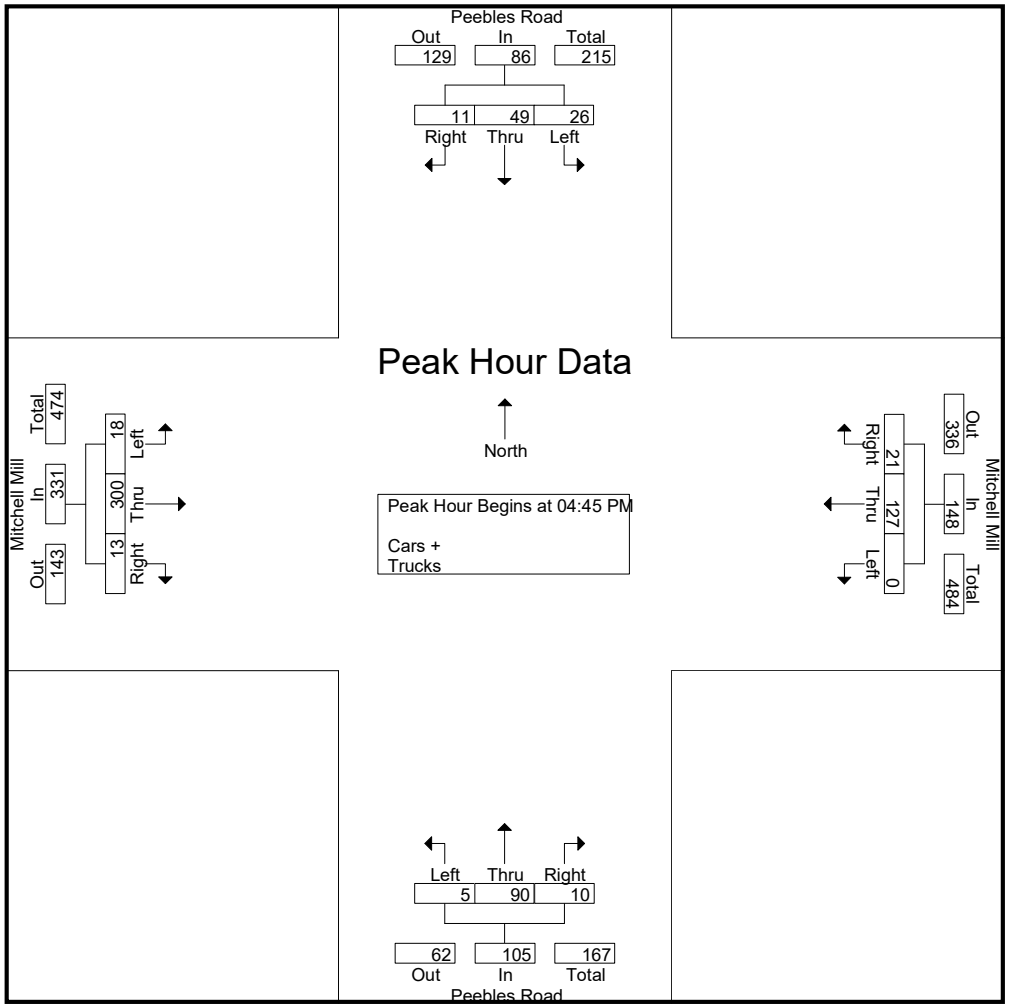
Groups Printed- Cars + - Trucks

	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

3-15-2021

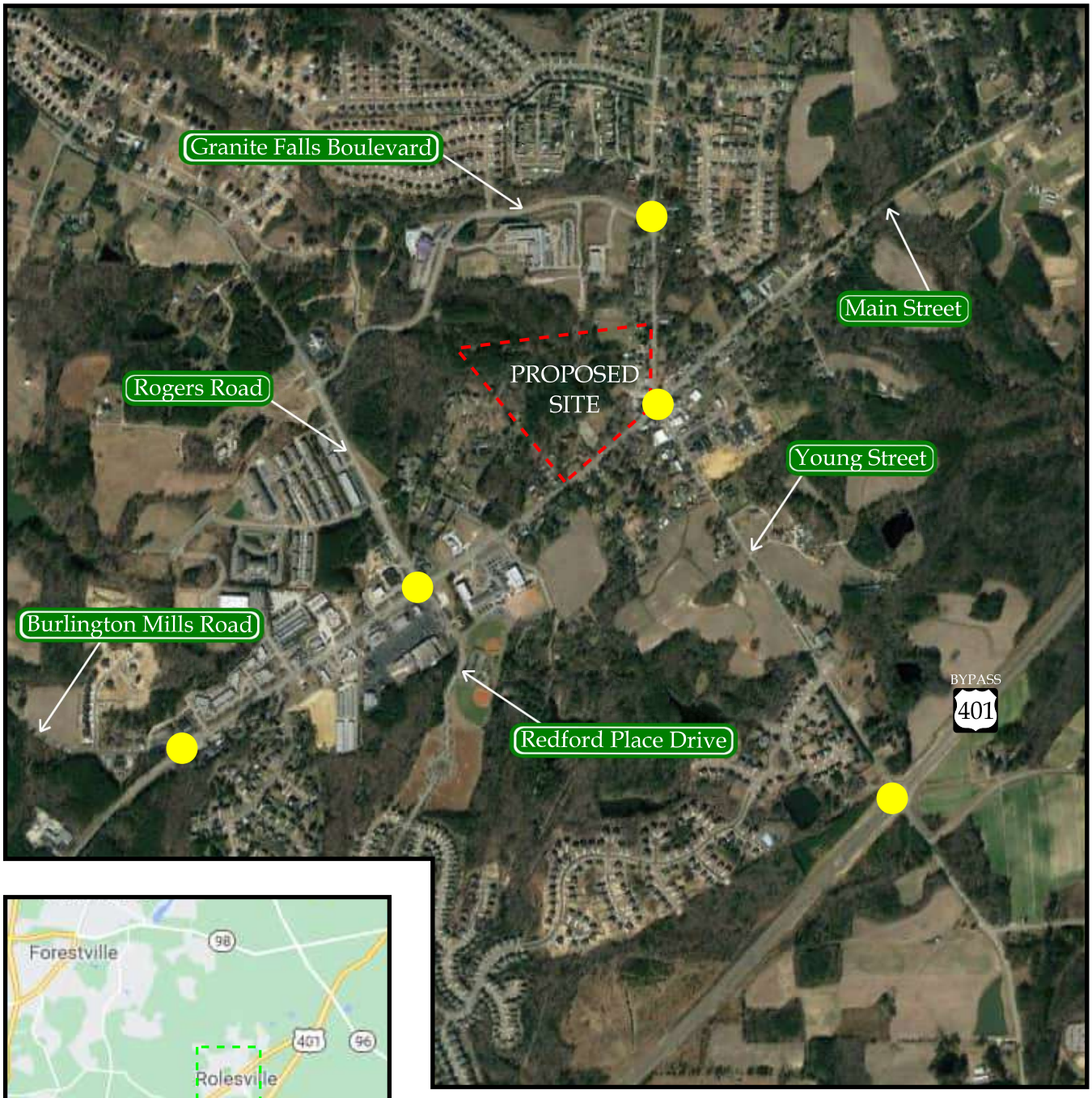
Prepared By:
Ramey Kemp & Associates, Inc.
5808 Faringdon Place, Suite 100
Raleigh, NC 27609
License #C-0910

MARCH 2021

RKA Project No. 20498

Prepared By: TF

Reviewed By: MK

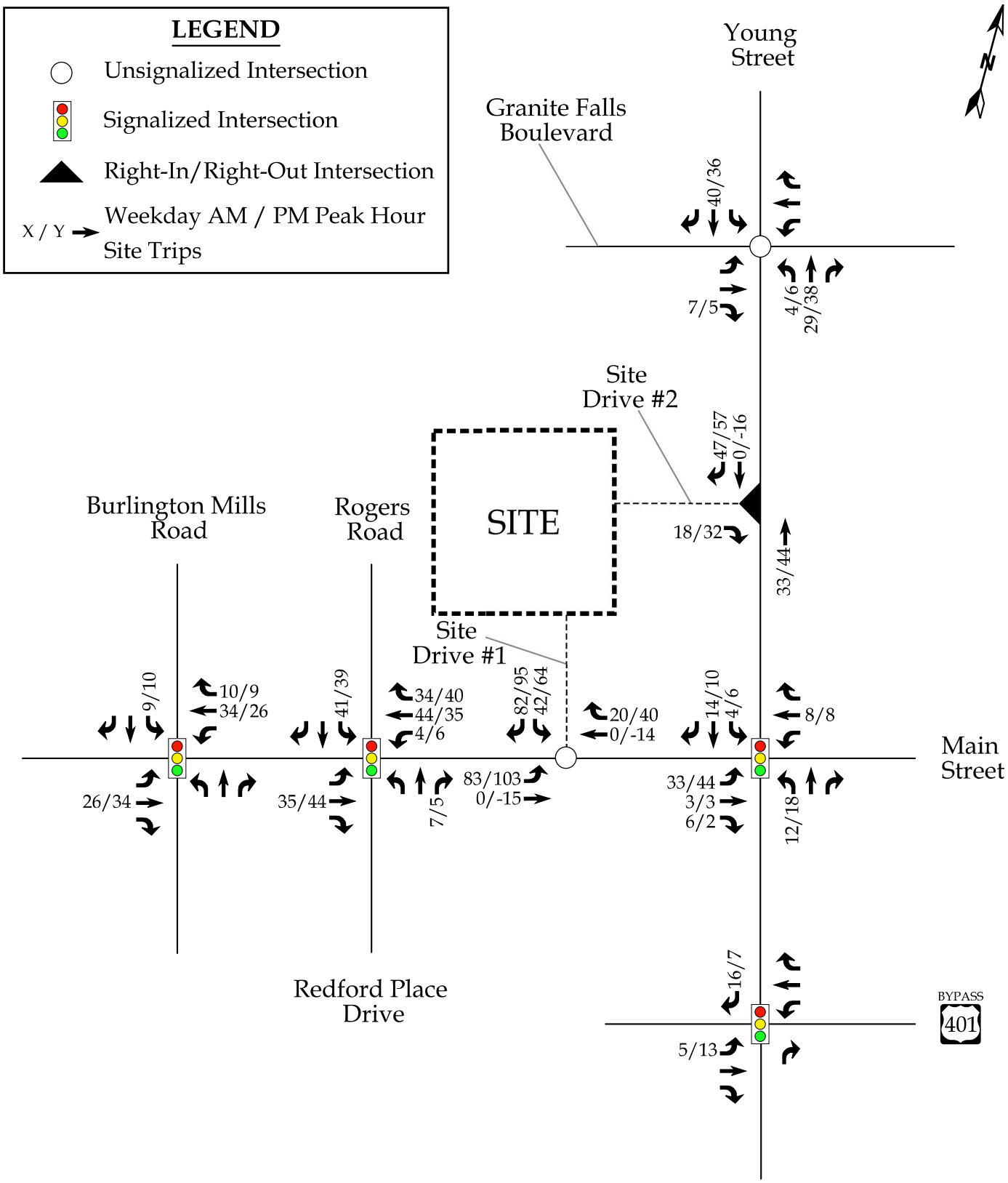


N

LEGEND

- Proposed Site Location
- Study Intersection
- Study Area

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


LEGEND
Unsignalized Intersection
Signalized Intersection
Right-In/Right-Out Intersection
X / Y
Weekday AM / PM Peak Hour Site Trips
Young Street
Granite Falls Boulevard
Site Drive #2
SITE
Site Drive #1
Burlington Mills Road
Rogers Road
Redford Place Drive
Main Street
BYPASS 401
40/36
7/5
4/6
29/38
47/57
0/-16
18/32
33/44
9/10
10/9
34/26
41/39
34/40
44/35
4/6
82/95
42/64
20/40
0/-14
14/10
4/6
8/8
26/34
35/44
7/5
83/103
0/-15
33/44
3/3
6/2
12/18
16/7
5/13
Moving forward.
RKA
RAMEY KEMP ASSOCIATES
Cobblestone Crossing
Mixed-Use
Rolesville, NC
Total Site Trip Assignment
Scale: Not to Scale
Figure 12

9. RECOMMENDATIONS

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

Improvements by STIP U-6241

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

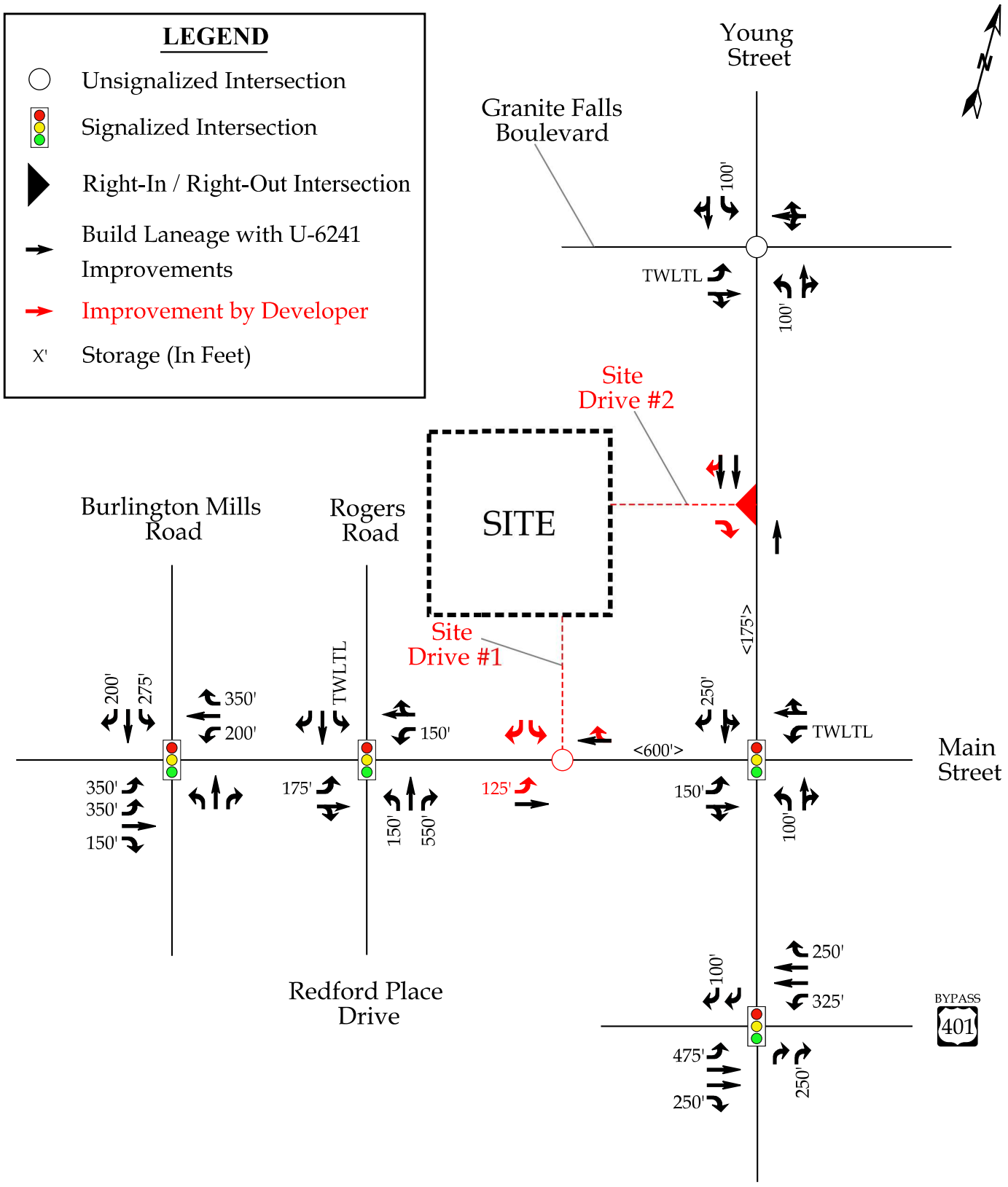
Recommended Improvements by Developer

Main Street and Site Drive 1

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

Young Street and Site Drive 2

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



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

Revised Traffic Impact Analysis for

Young Street PUD

Rolesville, North Carolina

Prepared for:

Ashton Woods
Raleigh, North Carolina

Prepared by:

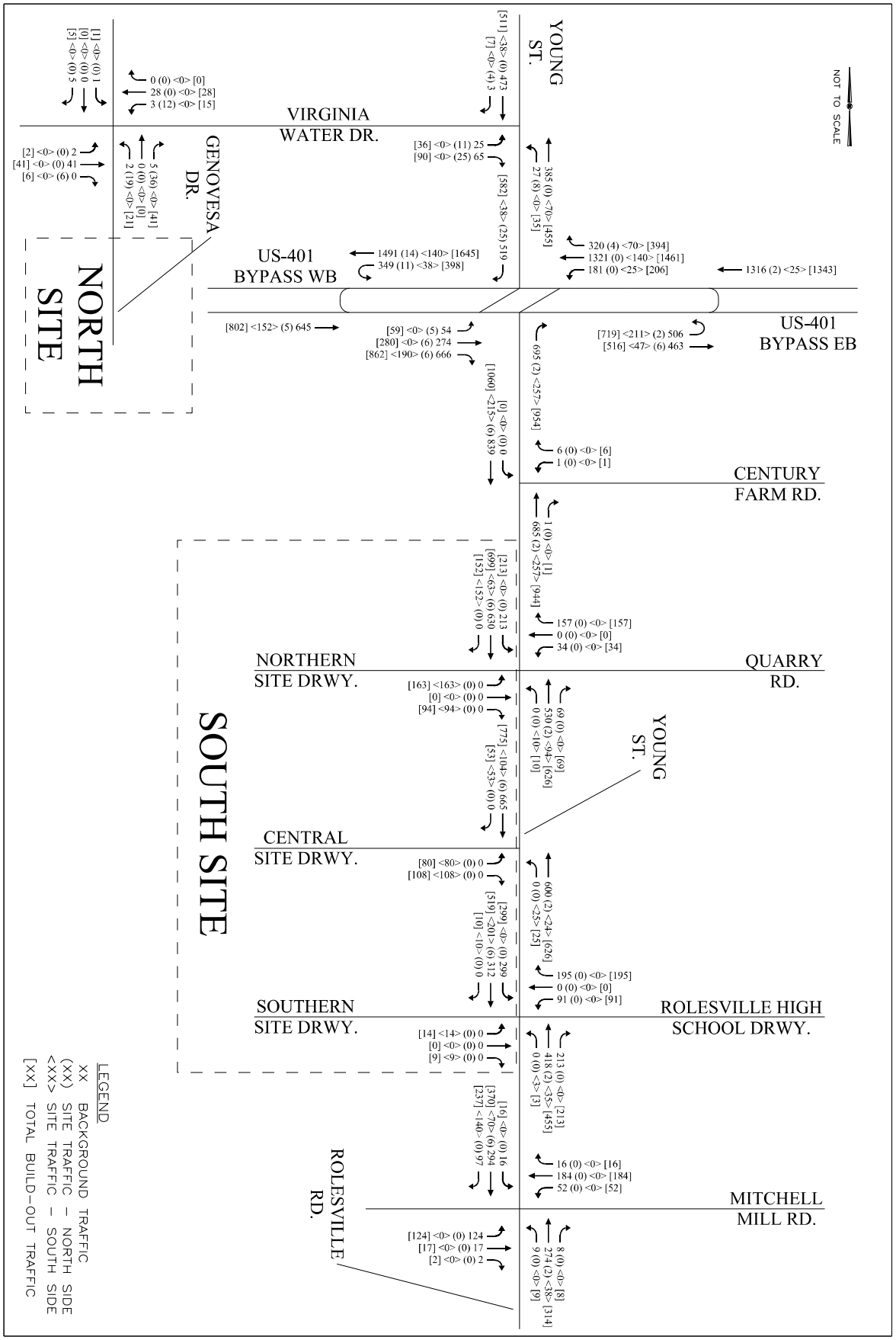
Kimley-Horn and Associates, Inc.
NC License #F-0102
421 Fayetteville Street, Suite 600
Raleigh, NC 27601
(919) 677-2000

June 2019

015956012

6/13/2019

Kimley»Horn	YOUNG STREET PUD ROLESVILLE, NC TRAFFIC IMPACT ANALYSIS	SITE LOCATION	FIGURE 1

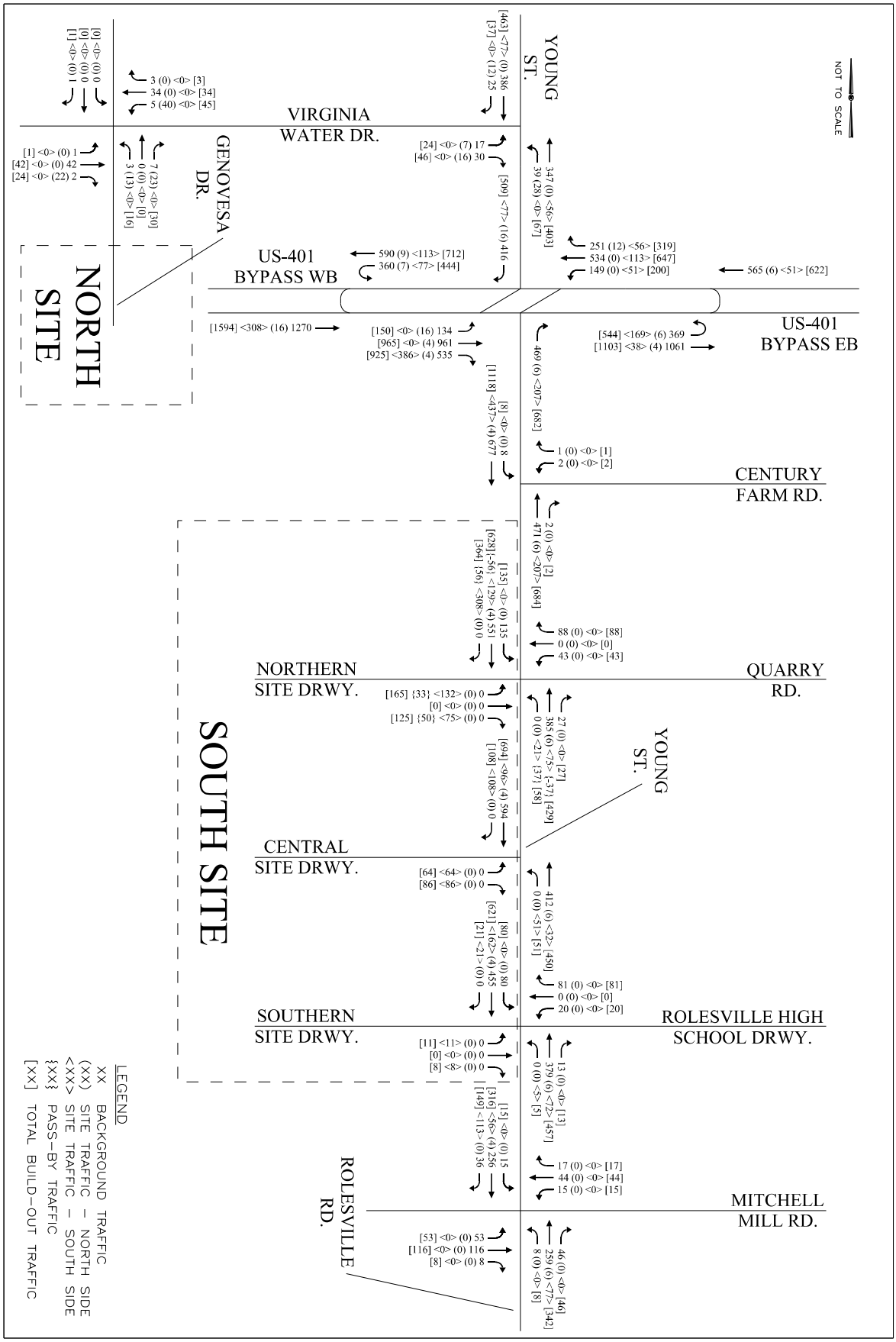


Kimley»Horn

YOUNG STREET PUD
ROLESVILLE, NC
TRAFFIC IMPACT ANALYSIS

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

FIGURE
14



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

7.0 Recommendations

Residential Build-out

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

US 401 Bypass:

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

Young Street at Quarry Road/North Site Driveway:

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

Young Street at Central Site Driveway:

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

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

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

Rolesville Road at Mitchell Mill Road:

- Install a traffic signal when warranted

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

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

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

Commercial Build-out

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

US 401 Bypass Eastbound at Young Street:

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

Young Street at Quarry Road/North Site Driveway:

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

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

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

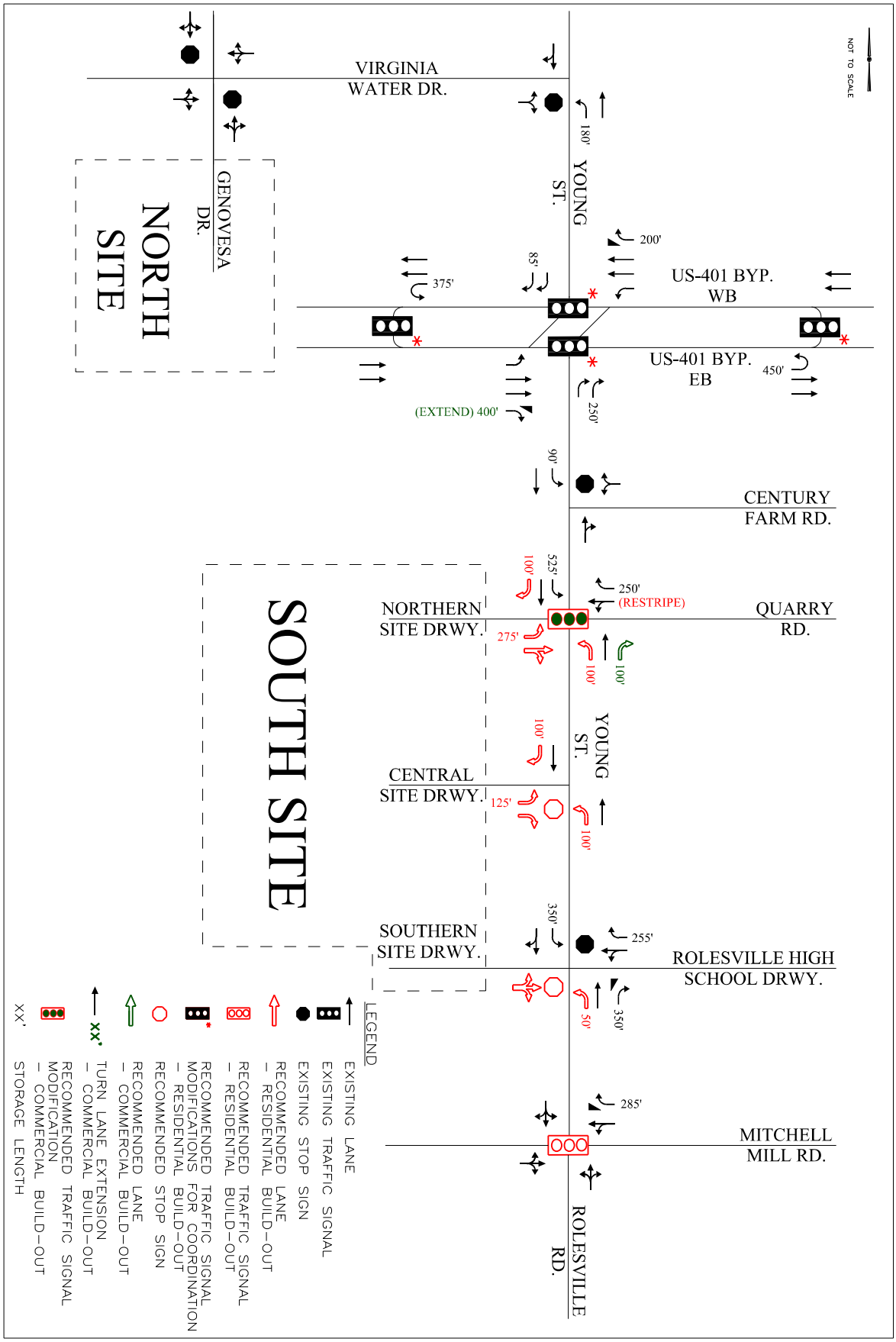
traffic simulations indicate that short queues are likely on the minor street approach in the AM peak hour at commercial build-out.

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

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

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

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



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

TRAFFIC IMPACT ANALYSIS

FOR

WHEELER TRACT

LOCATED

IN

ROLESVILLE, NC

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

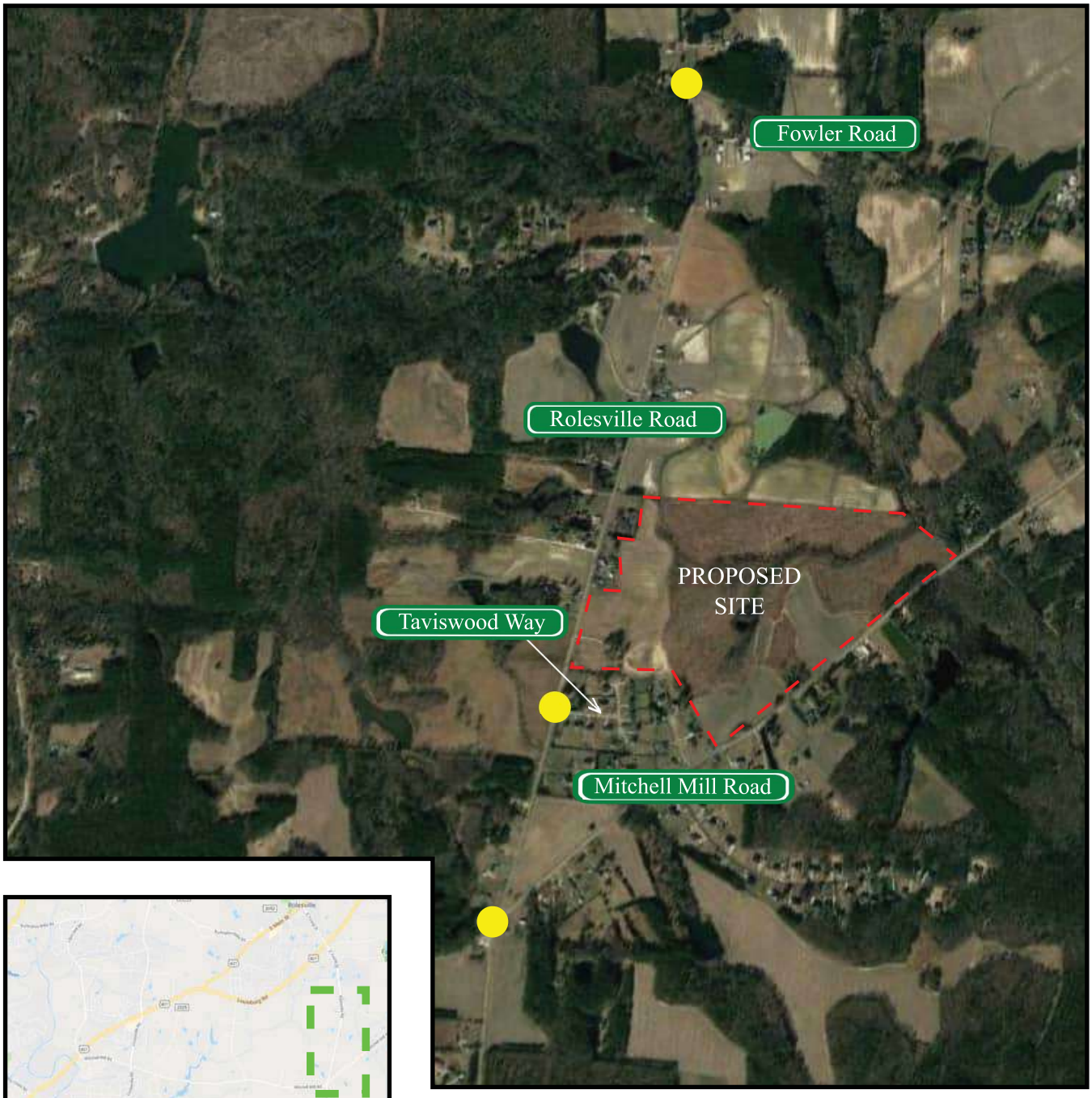
Prepared By:
Ramey Kemp & Associates, Inc.
5808 Faringdon Place, Suite 100
Raleigh, NC 27609
License #C-0910

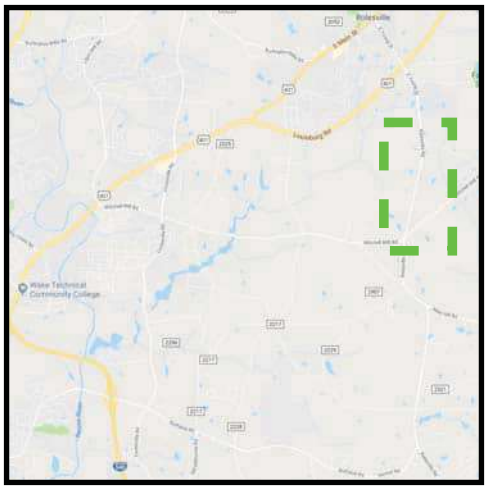
June 2019

RKA Project No. 19045

Prepared By: CAB

Reviewed By: JTR





N

LEGEND

- Proposed Site Location
- Study Intersection
- Study Area

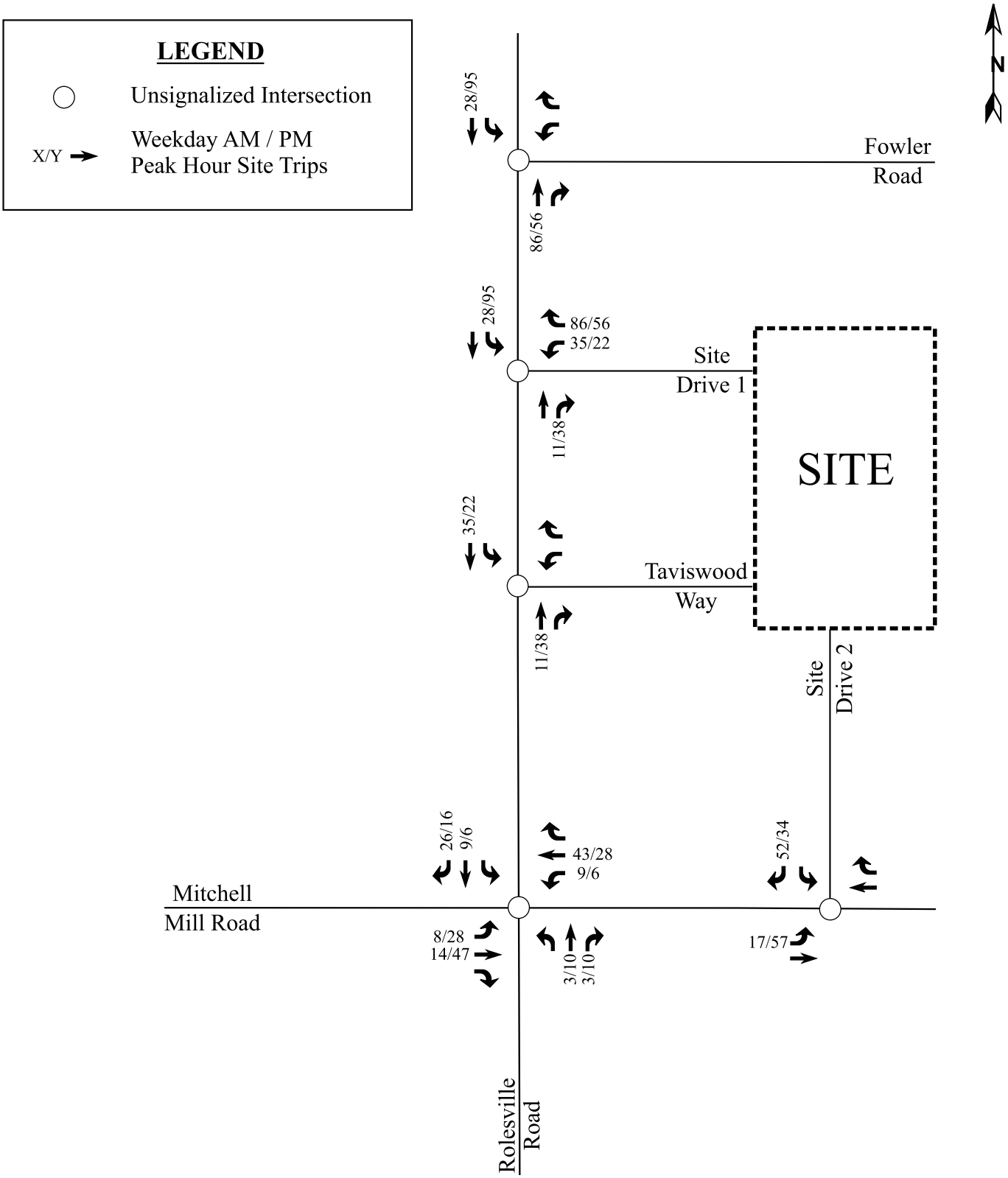
RAMEY KEMP & ASSOCIATES
TRANSPORTATION ENGINEERS

Wheeler Tract
Rolesville, NC

Site Location Map

Scale: Not to Scale

Figure 1



RAMEY KEMP & ASSOCIATES TRANSPORTATION ENGINEERS	Wheeler Tract Rolesville, NC	Site Trip Assignment
		Scale: Not to Scale / Figure 9

9. RECOMMENDATIONS

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

Recommended Improvements by Developer

Rolesville Road and Mitchell Mill Road

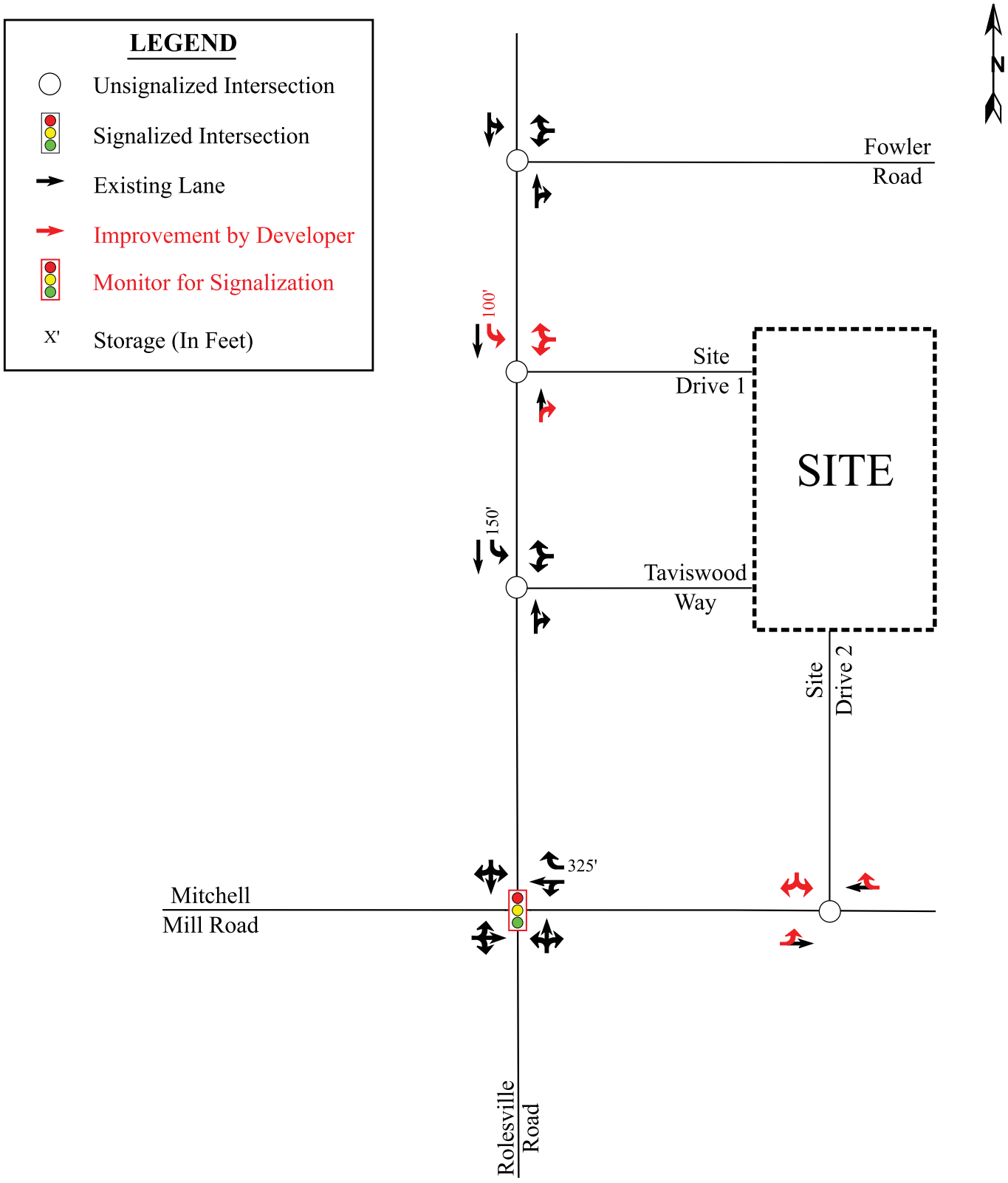
- Monitor intersection for signalization.

Rolesville Road and Site Drive 1

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

Mitchell Mill Road and Site Drive 2

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



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

TRAFFIC IMPACT ANALYSIS

FOR

LOUISBURY ROAD ASSEMBLAGE

LOCATED

IN

RALEIGH, NC

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

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

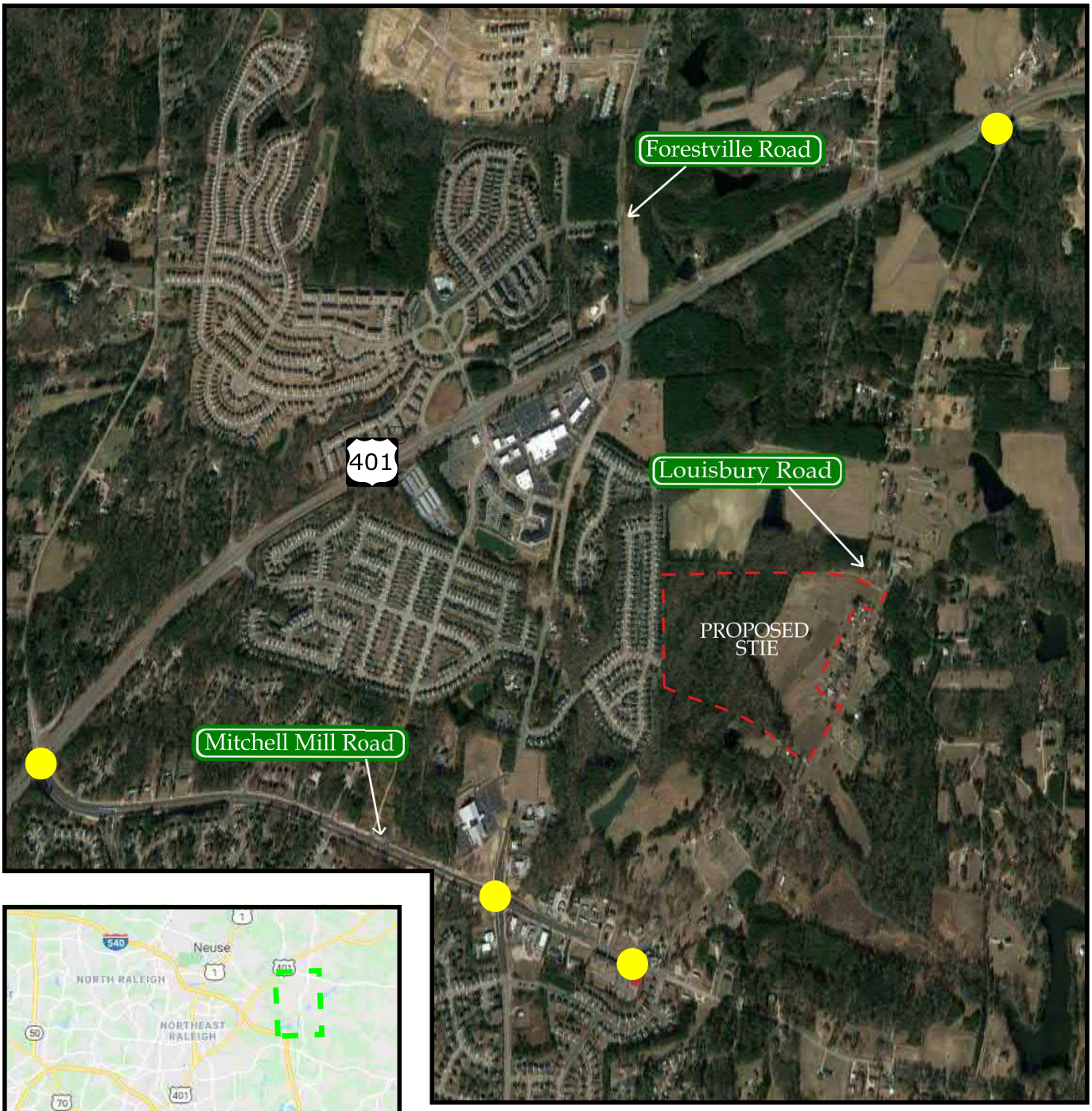
5/8/2020

May 2020

RKA Project No. 19418

Prepared By: DT

Reviewed By: DR



N

LEGEND

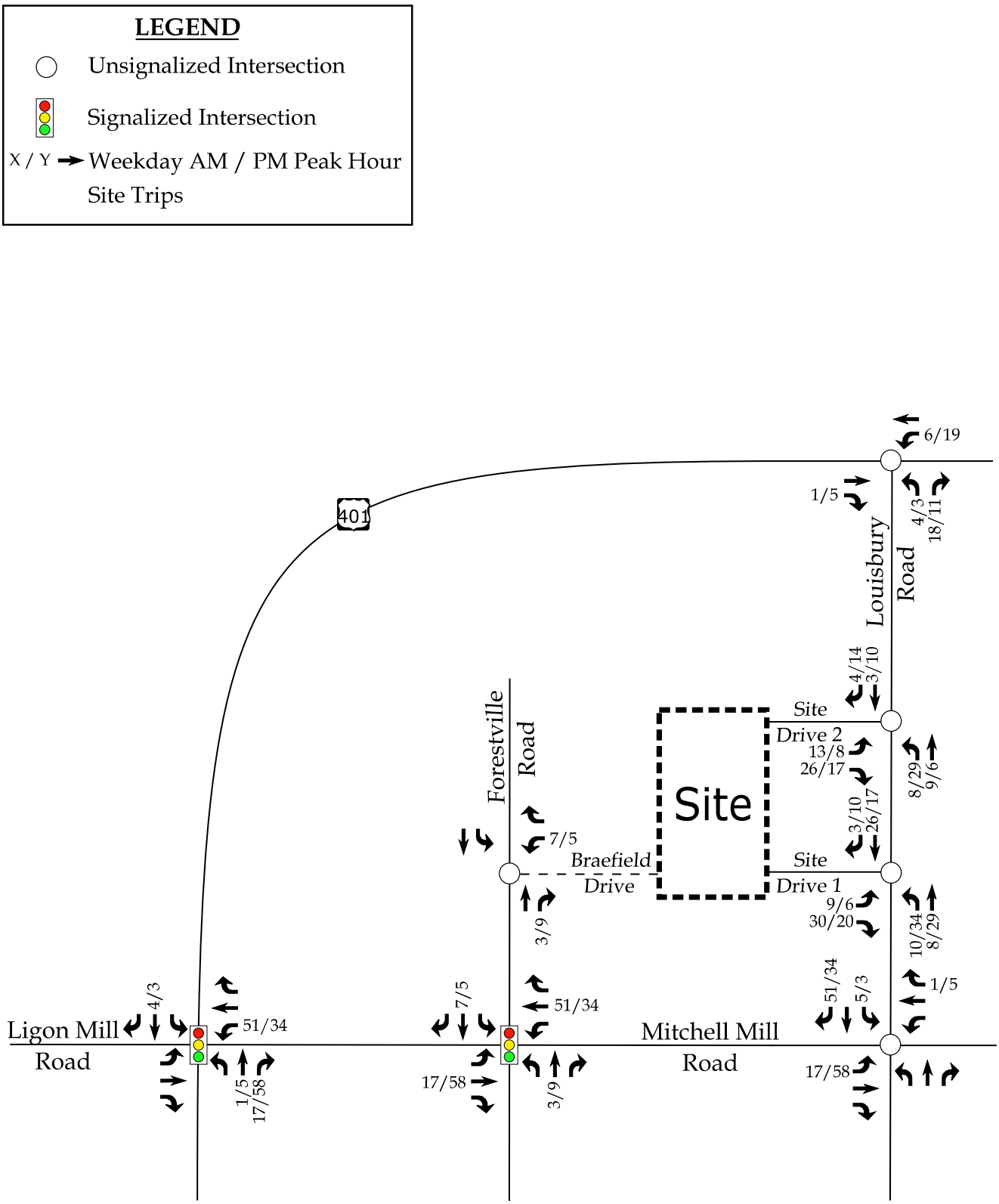
- Proposed Site Location
- Study Intersection
- Study Area

Moving forward.

RKA

RAMEY KEMP ASSOCIATES

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



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

12. RECOMMENDATIONS

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

Recommended Improvements by Developer

Mitchell Mill Road and Louisbury Road

- Monitor for signalization after site is constructed.

US 401 and Louisbury Road

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

Louisbury Road and Site Drive 1

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

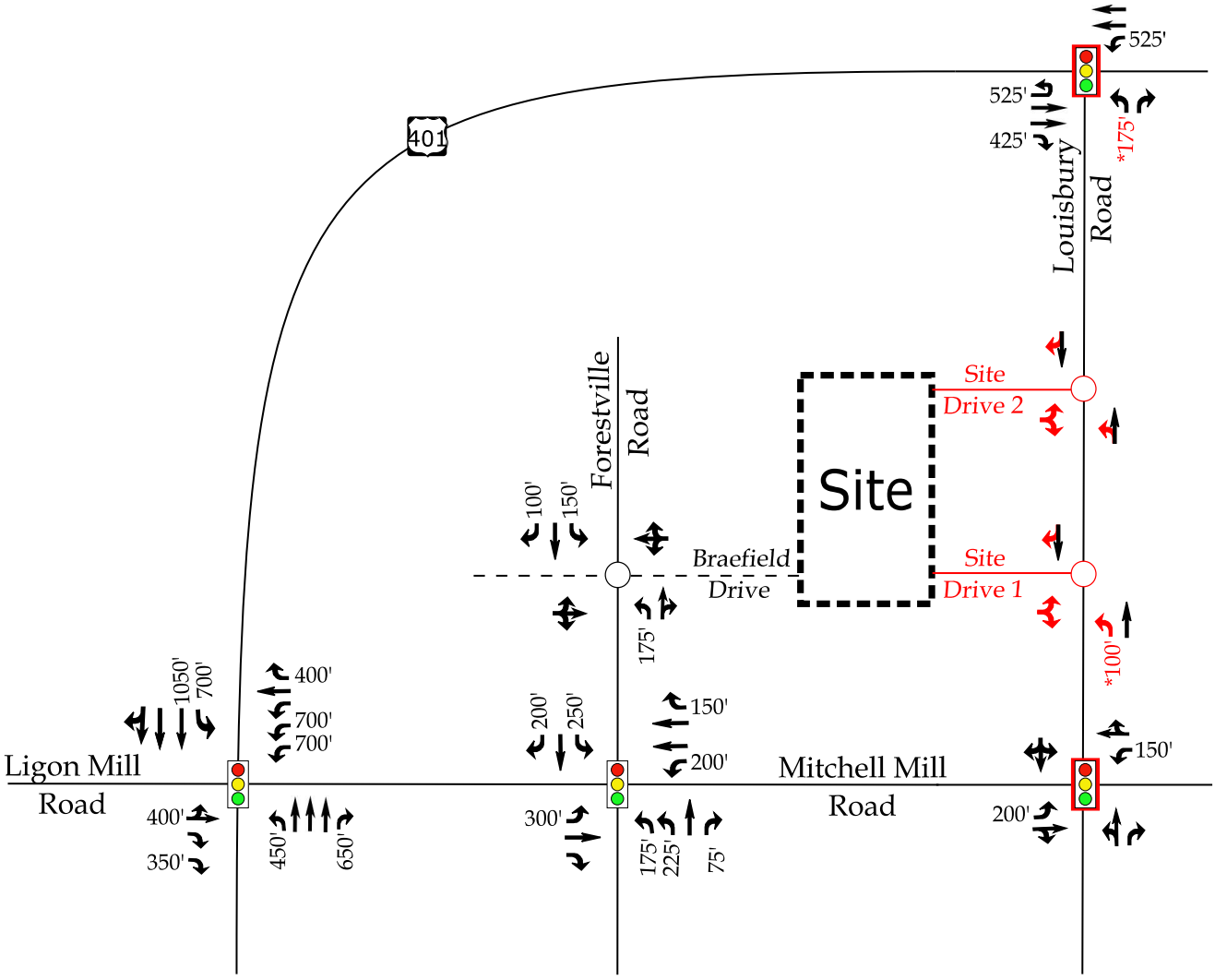
Louisbury Road and Site Drive 2

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

LEGEND

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

*Based on NCDOT Review



Moving forward. RKA RAMEY KEMP ASSOCIATES	Louisbury Road Assemblage Raleigh, NC	Recommended Lane Configurations Scale: Not to Scale | Figure 9

Stantec

Kalas / Watkins Family Property
Traffic Impact Analysis

Rolesville Road, Rolesville, North Carolina

August 24, 2019

Prepared for:

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Sign-off Sheet

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Christa Greene, PE

NORTH CAROLINA PROFESSIONAL SEAL 039265 ENGINEER MATTHEW D. PEACH

8/24/2017

1.0 INTRODUCTION

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

Figure 1: Site Location

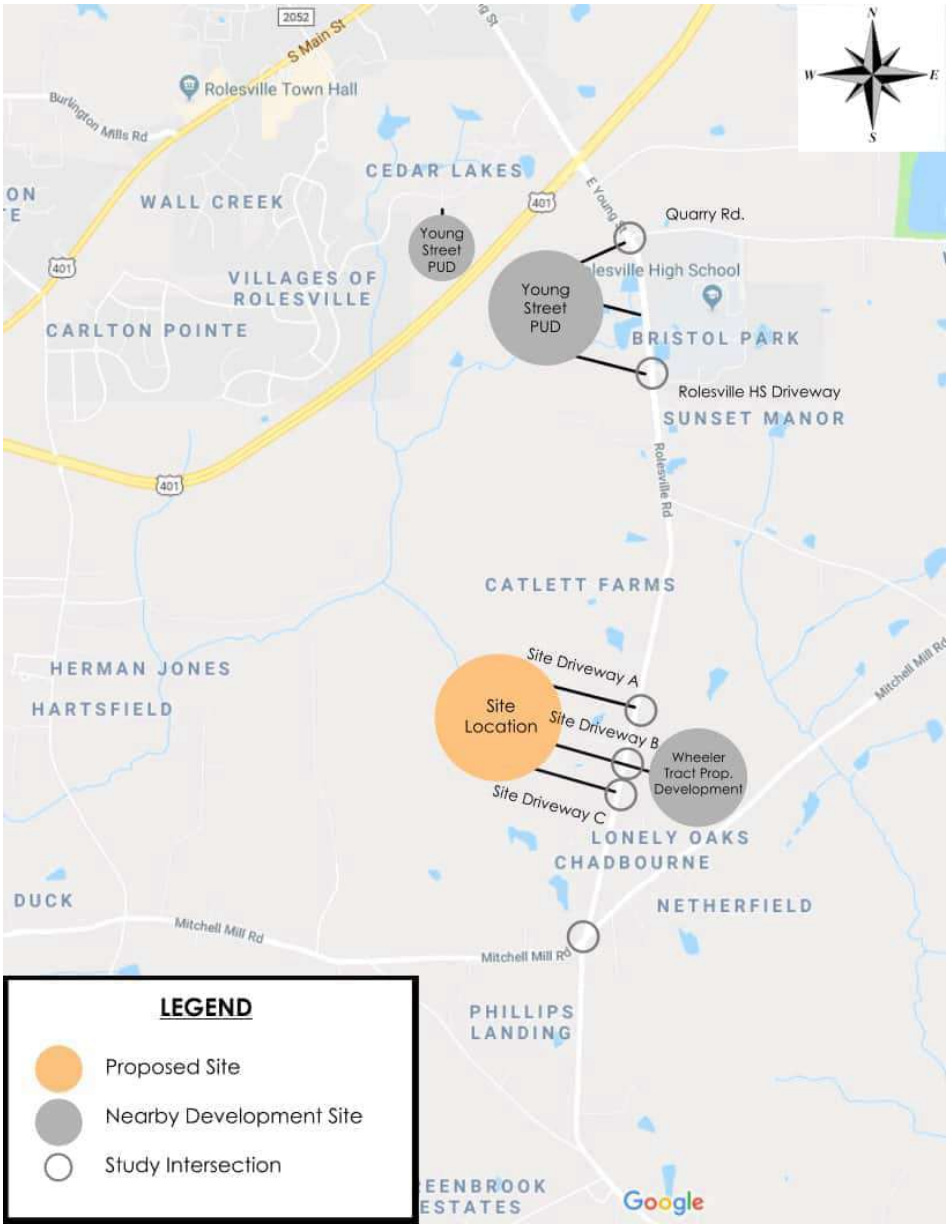
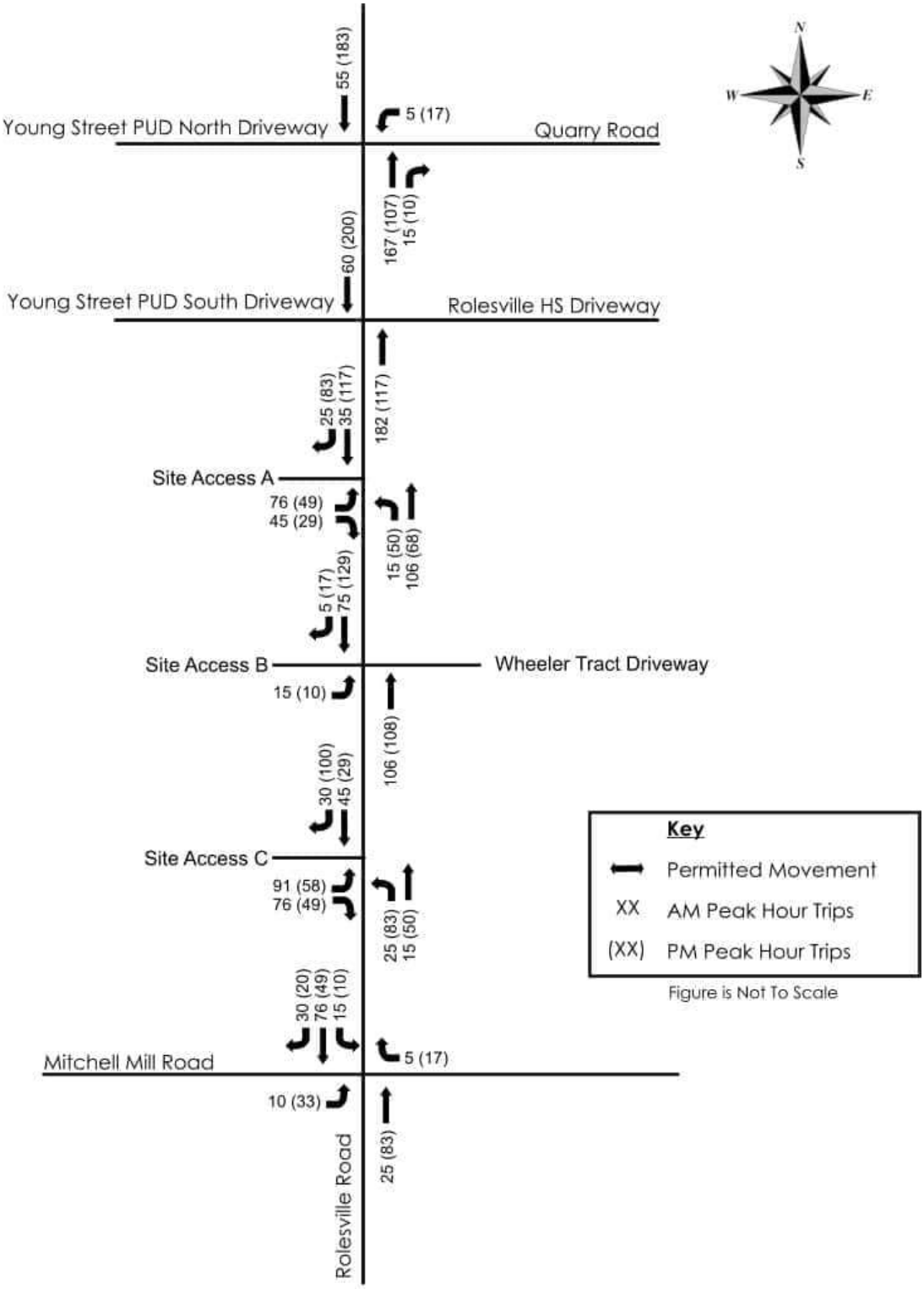


Figure 6: Site Trip Assignment



5.4 2025 BUILD WITH IMPROVEMENTS

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

Rolesville Road at Site Driveway A

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

Rolesville Road at Site Driveway B / Wheeler Tract Driveway

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

Rolesville Road at Site Driveway C

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

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

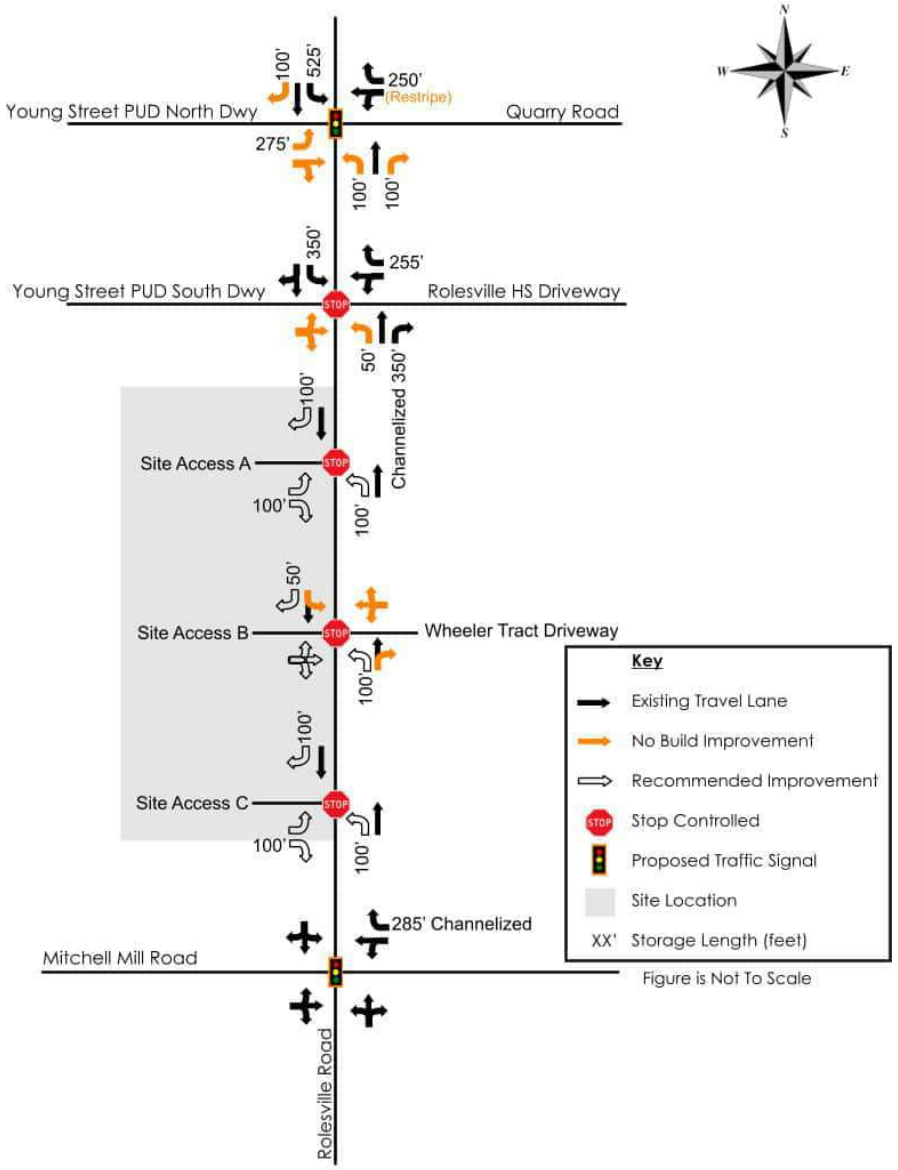
- The east and westbound approaches to the intersection of Rolesville Road at Rolesville High School Driveway / Young Street PUD Southern Driveway operates at LOS F in the AM peak hour. This causes high overall delays at the intersection. Furthermore, the eastbound approach operates at LOS F and westbound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

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

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

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

Figure 14: Recommended Improvements



APPENDIX D

CAPACITY ANALYSIS CALCULATIONS

US 401 BYPASS

&

JONESVILLE ROAD

Intersection	
Int Delay, s/veh	3.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	578	78	0	0	0	0	0	133	0	84	0
Future Vol, veh/h	0	578	78	0	0	0	0	0	133	0	84	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	642	87	0	0	0	0	0	148	0	93	0

Major/Minor	Major1			Minor1			Minor2		
Conflicting Flow All	-	0	0	-	-	321	-	642	-
Stage 1	-	-	-	-	-	-	-	0	-
Stage 2	-	-	-	-	-	-	-	642	-
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	675	0	391	0
Stage 1	0	-	-	0	0	-	0	-	0
Stage 2	0	-	-	0	0	-	0	467	0
Platoon blocked, %		-	-						
Mov Cap-1 Maneuver	-	-	-	-	-	675	-	391	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	391	-
Stage 1	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	467	-

Approach	EB	NB	SB
HCM Control Delay, s	0	11.8	17.1
HCM LOS		B	C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	SBLn1
Capacity (veh/h)	675	-	-	391
HCM Lane V/C Ratio	0.219	-	-	0.239
HCM Control Delay (s)	11.8	-	-	17.1
HCM Lane LOS	B	-	-	C
HCM 95th %tile Q(veh)	0.8	-	-	0.9

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	886	90	0	0	0	0	0	153	0	96	0
Future Vol, veh/h	0	886	90	0	0	0	0	0	153	0	96	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	984	100	0	0	0	0	0	170	0	107	0

Major/Minor	Major1			Minor1			Minor2		
Conflicting Flow All	-	0	0	-	-	492	-	984	-
Stage 1	-	-	-	-	-	-	-	0	-
Stage 2	-	-	-	-	-	-	-	984	-
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	522	0	247	0
Stage 1	0	-	-	0	0	-	0	-	0
Stage 2	0	-	-	0	0	-	0	325	0
Platoon blocked, %		-	-						
Mov Cap-1 Maneuver	-	-	-	-	-	522	-	247	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	247	-
Stage 1	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	325	-

Approach	EB	NB	SB
HCM Control Delay, s	0	15.2	30.2
HCM LOS		C	D

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	SBLn1
Capacity (veh/h)	522	-	-	247
HCM Lane V/C Ratio	0.326	-	-	0.432
HCM Control Delay (s)	15.2	-	-	30.2
HCM Lane LOS	C	-	-	D
HCM 95th %tile Q(veh)	1.4	-	-	2

Intersection	
Int Delay, s/veh	7.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	886	142	0	0	0	0	0	292	0	125	0
Future Vol, veh/h	0	886	142	0	0	0	0	0	292	0	125	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	984	158	0	0	0	0	0	324	0	139	0

Major/Minor	Major1			Minor1			Minor2		
Conflicting Flow All	-	0	0	-	-	492	-	984	-
Stage 1	-	-	-	-	-	-	-	0	-
Stage 2	-	-	-	-	-	-	-	984	-
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	522	0	247	0
Stage 1	0	-	-	0	0	-	0	-	0
Stage 2	0	-	-	0	0	-	0	325	0
Platoon blocked, %		-	-						
Mov Cap-1 Maneuver	-	-	-	-	-	522	-	247	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	247	-
Stage 1	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	325	-

Approach	EB	NB	SB
HCM Control Delay, s	0	22.6	36.8
HCM LOS		C	E

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	SBLn1
Capacity (veh/h)	522	-	-	247
HCM Lane V/C Ratio	0.622	-	-	0.562
HCM Control Delay (s)	22.6	-	-	36.8
HCM Lane LOS	C	-	-	E
HCM 95th %tile Q(veh)	4.2	-	-	3.1

Intersection	
Int Delay, s/veh	2.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	1196	58	0	0	0	0	0	123	0	36	0
Future Vol, veh/h	0	1196	58	0	0	0	0	0	123	0	36	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	1329	64	0	0	0	0	0	137	0	40	0

Major/Minor	Major1			Minor1			Minor2		
Conflicting Flow All	-	0	0	-	-	665	-	1329	-
Stage 1	-	-	-	-	-	-	-	0	-
Stage 2	-	-	-	-	-	-	-	1329	-
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	403	0	154	0
Stage 1	0	-	-	0	0	-	0	-	0
Stage 2	0	-	-	0	0	-	0	222	0
Platoon blocked, %		-	-						
Mov Cap-1 Maneuver	-	-	-	-	-	403	-	154	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	154	-
Stage 1	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	222	-

Approach	EB	NB	SB
HCM Control Delay, s	0	18.4	36.4
HCM LOS		C	E

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	SBLn1
Capacity (veh/h)	403	-	-	154
HCM Lane V/C Ratio	0.339	-	-	0.26
HCM Control Delay (s)	18.4	-	-	36.4
HCM Lane LOS	C	-	-	E
HCM 95th %tile Q(veh)	1.5	-	-	1

Intersection	
Int Delay, s/veh	7.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	1862	67	0	0	0	0	0	141	0	41	0
Future Vol, veh/h	0	1862	67	0	0	0	0	0	141	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	2069	74	0	0	0	0	0	157	0	46	0

Major/Minor	Major1			Minor1			Minor2		
Conflicting Flow All	-	0	0	-	-	1035	-	2069	-
Stage 1	-	-	-	-	-	-	-	0	-
Stage 2	-	-	-	-	-	-	-	2069	-
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	229	0	54	0
Stage 1	0	-	-	0	0	-	0	-	0
Stage 2	0	-	-	0	0	-	0	95	0
Platoon blocked, %		-	-						
Mov Cap-1 Maneuver	-	-	-	-	-	229	-	54	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	54	-
Stage 1	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	95	-

Approach	EB	NB	SB
HCM Control Delay, s	0	49.1	199.4
HCM LOS		E	F

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	SBLn1
Capacity (veh/h)	229	-	-	54
HCM Lane V/C Ratio	0.684	-	-	0.844
HCM Control Delay (s)	49.1	-	-	199.4
HCM Lane LOS	E	-	-	F
HCM 95th %tile Q(veh)	4.4	-	-	3.6

Intersection	
Int Delay, s/veh	41.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	1862	167	0	0	0	0	0	246	0	94	0
Future Vol, veh/h	0	1862	167	0	0	0	0	0	246	0	94	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	2069	186	0	0	0	0	0	273	0	104	0

Major/Minor	Major1			Minor1			Minor2		
Conflicting Flow All	-	0	0	-	-	1035	-	2069	-
Stage 1	-	-	-	-	-	-	-	0	-
Stage 2	-	-	-	-	-	-	-	2069	-
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	~ 229	0	~ 54	0
Stage 1	0	-	-	0	0	-	0	-	0
Stage 2	0	-	-	0	0	-	0	~ 95	0
Platoon blocked, %		-	-						
Mov Cap-1 Maneuver	-	-	-	-	-	~ 229	-	~ 54	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	~ 54	-
Stage 1	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	~ 95	-

Approach	EB	NB	SB
HCM Control Delay, s	0	166	$ 601.5
HCM LOS		F	F

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	SBLn1
Capacity (veh/h)	229	-	-	54
HCM Lane V/C Ratio	1.194	-	-	1.934
HCM Control Delay (s)	166	-	-	$ 601.5
HCM Lane LOS	F	-	-	F
HCM 95th %tile Q(veh)	13.3	-	-	10.2

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

Intersection	
Int Delay, s/veh	5.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	0	1326	181	0	35	0	0	0	221
Future Vol, veh/h	0	0	0	0	1326	181	0	35	0	0	0	221
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	1473	201	0	39	0	0	0	246

Major/Minor	Major2			Minor1			Minor2			
Conflicting Flow All	-	-	0	-	1674	-	-	-	737	
Stage 1	-	-	-	-	0	-	-	-	-	
Stage 2	-	-	-	-	1674	-	-	-	-	
Critical Hdwy	-	-	-	-	6.54	-	-	-	6.94	
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	
Critical Hdwy Stg 2	-	-	-	-	5.54	-	-	-	-	
Follow-up Hdwy	-	-	-	-	4.02	-	-	-	3.32	
Pot Cap-1 Maneuver	0	-	-	0	95	0	0	0	361	
Stage 1	0	-	-	0	-	0	0	0	-	
Stage 2	0	-	-	0	151	0	0	0	-	
Platoon blocked, %		-	-							
Mov Cap-1 Maneuver	-	-	-	-	95	-	-	-	361	
Mov Cap-2 Maneuver	-	-	-	-	95	-	-	-	-	
Stage 1	-	-	-	-	-	-	-	-	-	
Stage 2	-	-	-	-	151	-	-	-	-	

Approach	WB	NB	SB
HCM Control Delay, s	0	67	33.7
HCM LOS		F	D

Minor Lane/Major Mvmt	NBLn1	WBT	WBR	SBLn1
Capacity (veh/h)	95	-	-	361
HCM Lane V/C Ratio	0.409	-	-	0.68
HCM Control Delay (s)	67	-	-	33.7
HCM Lane LOS	F	-	-	D
HCM 95th %tile Q(veh)	1.7	-	-	4.8

Intersection	
Int Delay, s/veh	23.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	0	1826	208	0	40	0	0	0	254
Future Vol, veh/h	0	0	0	0	1826	208	0	40	0	0	0	254
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	2029	231	0	44	0	0	0	282

Major/Minor	Major2		Minor1			Minor2			
Conflicting Flow All	-	-	0	-	2260	-	-	-	1015
Stage 1	-	-	-	-	0	-	-	-	-
Stage 2	-	-	-	-	2260	-	-	-	-
Critical Hdwy	-	-	-	-	6.54	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	5.54	-	-	-	-
Follow-up Hdwy	-	-	-	-	4.02	-	-	-	3.32
Pot Cap-1 Maneuver	0	-	-	0	~ 40	0	0	0	~ 236
Stage 1	0	-	-	0	-	0	0	0	-
Stage 2	0	-	-	0	76	0	0	0	-
Platoon blocked, %		-	-						
Mov Cap-1 Maneuver	-	-	-	-	~ 40	-	-	-	~ 236
Mov Cap-2 Maneuver	-	-	-	-	~ 40	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	76	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	0	$ 333.6	165.1
HCM LOS		F	F

Minor Lane/Major Mvmt	NBLn1	WBT	WBR	SBLn1
Capacity (veh/h)	40	-	-	236
HCM Lane V/C Ratio	1.111	-	-	1.196
HCM Control Delay (s)	$ 333.6	-	-	165.1
HCM Lane LOS	F	-	-	F
HCM 95th %tile Q(veh)	4.4	-	-	13.6

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

Intersection	
Int Delay, s/veh	28.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	0	1918	208	0	40	0	0	0	254
Future Vol, veh/h	0	0	0	0	1918	208	0	40	0	0	0	254
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	2131	231	0	44	0	0	0	282

Major/Minor	Major2		Minor1			Minor2			
Conflicting Flow All	-	-	0	-	2362	-	-	-	1066
Stage 1	-	-	-	-	0	-	-	-	-
Stage 2	-	-	-	-	2362	-	-	-	-
Critical Hdwy	-	-	-	-	6.54	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	5.54	-	-	-	-
Follow-up Hdwy	-	-	-	-	4.02	-	-	-	3.32
Pot Cap-1 Maneuver	0	-	-	0	~ 35	0	0	0	~ 218
Stage 1	0	-	-	0	-	0	0	0	-
Stage 2	0	-	-	0	67	0	0	0	-
Platoon blocked, %		-	-						
Mov Cap-1 Maneuver	-	-	-	-	~ 35	-	-	-	~ 218
Mov Cap-2 Maneuver	-	-	-	-	~ 35	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	67	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	0	$ 418.5	206.2
HCM LOS		F	F

Minor Lane/Major Mvmt	NBLn1	WBT	WBR	SBLn1
Capacity (veh/h)	35	-	-	218
HCM Lane V/C Ratio	1.27	-	-	1.295
HCM Control Delay (s)	$ 418.5	-	-	206.2
HCM Lane LOS	F	-	-	F
HCM 95th %tile Q(veh)	4.7	-	-	15.1

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

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	0	0	0	544	73	0	114	0	0	0	112
Future Vol, veh/h	0	0	0	0	544	73	0	114	0	0	0	112
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	604	81	0	127	0	0	0	124

Major/Minor	Major2		Minor1			Minor2			
Conflicting Flow All	-	-	0	-	685	-	-	-	302
Stage 1	-	-	-	-	0	-	-	-	-
Stage 2	-	-	-	-	685	-	-	-	-
Critical Hdwy	-	-	-	-	6.54	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	5.54	-	-	-	-
Follow-up Hdwy	-	-	-	-	4.02	-	-	-	3.32
Pot Cap-1 Maneuver	0	-	-	0	369	0	0	0	694
Stage 1	0	-	-	0	-	0	0	0	-
Stage 2	0	-	-	0	447	0	0	0	-
Platoon blocked, %		-	-						
Mov Cap-1 Maneuver	-	-	-	-	369	-	-	-	694
Mov Cap-2 Maneuver	-	-	-	-	369	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	447	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	0	19.8	11.3
HCM LOS		C	B

Minor Lane/Major Mvmt	NBLn1	WBT	WBR	SBLn1
Capacity (veh/h)	369	-	-	694
HCM Lane V/C Ratio	0.343	-	-	0.179
HCM Control Delay (s)	19.8	-	-	11.3
HCM Lane LOS	C	-	-	B
HCM 95th %tile Q(veh)	1.5	-	-	0.7

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	855	84	0	131	0	0	0	129
Future Vol, veh/h	0	0	0	0	855	84	0	131	0	0	0	129
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	950	93	0	146	0	0	0	143

Major/Minor	Major2			Minor1			Minor2			
Conflicting Flow All	-	-	0	-	1043	-	-	-	475	
Stage 1	-	-	-	-	0	-	-	-	-	
Stage 2	-	-	-	-	1043	-	-	-	-	
Critical Hdwy	-	-	-	-	6.54	-	-	-	6.94	
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	
Critical Hdwy Stg 2	-	-	-	-	5.54	-	-	-	-	
Follow-up Hdwy	-	-	-	-	4.02	-	-	-	3.32	
Pot Cap-1 Maneuver	0	-	-	0	228	0	0	0	536	
Stage 1	0	-	-	0	-	0	0	0	-	
Stage 2	0	-	-	0	305	0	0	0	-	
Platoon blocked, %		-	-							
Mov Cap-1 Maneuver	-	-	-	-	228	-	-	-	536	
Mov Cap-2 Maneuver	-	-	-	-	228	-	-	-	-	
Stage 1	-	-	-	-	-	-	-	-	-	
Stage 2	-	-	-	-	305	-	-	-	-	

Approach	WB	NB	SB
HCM Control Delay, s	0	45	14.2
HCM LOS		E	B

Minor Lane/Major Mvmt	NBLn1	WBT	WBR	SBLn1
Capacity (veh/h)	228	-	-	536
HCM Lane V/C Ratio	0.638	-	-	0.267
HCM Control Delay (s)	45	-	-	14.2
HCM Lane LOS	E	-	-	B
HCM 95th %tile Q(veh)	3.9	-	-	1.1

Intersection	
Int Delay, s/veh	7.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	0	923	84	0	131	0	0	0	129
Future Vol, veh/h	0	0	0	0	923	84	0	131	0	0	0	129
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	1026	93	0	146	0	0	0	143

Major/Minor	Major2		Minor1			Minor2			
Conflicting Flow All	-	-	0	-	1119	-	-	-	513
Stage 1	-	-	-	-	0	-	-	-	-
Stage 2	-	-	-	-	1119	-	-	-	-
Critical Hdwy	-	-	-	-	6.54	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	5.54	-	-	-	-
Follow-up Hdwy	-	-	-	-	4.02	-	-	-	3.32
Pot Cap-1 Maneuver	0	-	-	0	205	0	0	0	506
Stage 1	0	-	-	0	-	0	0	0	-
Stage 2	0	-	-	0	280	0	0	0	-
Platoon blocked, %		-	-						
Mov Cap-1 Maneuver	-	-	-	-	205	-	-	-	506
Mov Cap-2 Maneuver	-	-	-	-	205	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	280	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	0	56.7	14.9
HCM LOS		F	B

Minor Lane/Major Mvmt	NBLn1	WBT	WBR	SBLn1
Capacity (veh/h)	205	-	-	506
HCM Lane V/C Ratio	0.71	-	-	0.283
HCM Control Delay (s)	56.7	-	-	14.9
HCM Lane LOS	F	-	-	B
HCM 95th %tile Q(veh)	4.6	-	-	1.2

APPENDIX E

CAPACITY ANALYSIS CALCULATIONS

US 401 BYPASS

&

EASTERN U-TURN LOCATION

Intersection	
Int Delay, s/veh	1.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	0	0	0	1502	89	0
Future Vol, veh/h	0	0	0	1502	89	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	1669	99	0

Major/Minor	Major2		Minor1	
Conflicting Flow All	-	-	835	-
Stage 1	-	-	0	-
Stage 2	-	-	835	-
Critical Hdwy	-	-	6.84	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.84	-
Follow-up Hdwy	-	-	3.52	-
Pot Cap-1 Maneuver	0	-	306	0
Stage 1	0	-	-	0
Stage 2	0	-	386	0
Platoon blocked, %		-		
Mov Cap-1 Maneuver	-	-	306	-
Mov Cap-2 Maneuver	-	-	306	-
Stage 1	-	-	-	-
Stage 2	-	-	386	-

Approach	WB	NB
HCM Control Delay, s	0	22.3
HCM LOS		C

Minor Lane/Major Mvmt	NBLn1	WBT
Capacity (veh/h)	306	-
HCM Lane V/C Ratio	0.323	-
HCM Control Delay (s)	22.3	-
HCM Lane LOS	C	-
HCM 95th %tile Q(veh)	1.4	-

Intersection	
Int Delay, s/veh	2.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations				↑↑	↰	
Traffic Vol, veh/h	0	0	0	2028	102	0
Future Vol, veh/h	0	0	0	2028	102	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	2253	113	0

Major/Minor	Major2		Minor1	
Conflicting Flow All	-	-	1127	-
Stage 1	-	-	0	-
Stage 2	-	-	1127	-
Critical Hdwy	-	-	6.84	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.84	-
Follow-up Hdwy	-	-	3.52	-
Pot Cap-1 Maneuver	0	-	198	0
Stage 1	0	-	-	0
Stage 2	0	-	271	0
Platoon blocked, %		-		
Mov Cap-1 Maneuver	-	-	198	-
Mov Cap-2 Maneuver	-	-	198	-
Stage 1	-	-	-	-
Stage 2	-	-	271	-

Approach	WB	NB
HCM Control Delay, s	0	45
HCM LOS		E

Minor Lane/Major Mvmt	NBLn1	WBT
Capacity (veh/h)	198	-
HCM Lane V/C Ratio	0.572	-
HCM Control Delay (s)	45	-
HCM Lane LOS	E	-
HCM 95th %tile Q(veh)	3.1	-

Intersection	
Int Delay, s/veh	12.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	0	0	0	2057	194	0
Future Vol, veh/h	0	0	0	2057	194	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	2286	216	0

Major/Minor	Major2		Minor1	
Conflicting Flow All	-	-	1143	-
Stage 1	-	-	0	-
Stage 2	-	-	1143	-
Critical Hdwy	-	-	6.84	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.84	-
Follow-up Hdwy	-	-	3.52	-
Pot Cap-1 Maneuver	0	-	~ 194	0
Stage 1	0	-	-	0
Stage 2	0	-	266	0
Platoon blocked, %		-		
Mov Cap-1 Maneuver	-	-	~ 194	-
Mov Cap-2 Maneuver	-	-	~ 194	-
Stage 1	-	-	-	-
Stage 2	-	-	266	-

Approach	WB	NB
HCM Control Delay, s	0	148.1
HCM LOS		F

Minor Lane/Major Mvmt	NBLn1	WBT
Capacity (veh/h)	194	-
HCM Lane V/C Ratio	1.111	-
HCM Control Delay (s)	148.1	-
HCM Lane LOS	F	-
HCM 95th %tile Q(veh)	10.4	-

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

Intersection	
Int Delay, s/veh	1.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	0	0	0	588	65	0
Future Vol, veh/h	0	0	0	588	65	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	653	72	0

Major/Minor	Major2		Minor1	
Conflicting Flow All	-	-	327	-
Stage 1	-	-	0	-
Stage 2	-	-	327	-
Critical Hdwy	-	-	6.84	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.84	-
Follow-up Hdwy	-	-	3.52	-
Pot Cap-1 Maneuver	0	-	642	0
Stage 1	0	-	-	0
Stage 2	0	-	703	0
Platoon blocked, %		-		
Mov Cap-1 Maneuver	-	-	642	-
Mov Cap-2 Maneuver	-	-	642	-
Stage 1	-	-	-	-
Stage 2	-	-	703	-

Approach	WB	NB
HCM Control Delay, s	0	11.3
HCM LOS		B

Minor Lane/Major Mvmt	NBLn1	WBT
Capacity (veh/h)	642	-
HCM Lane V/C Ratio	0.112	-
HCM Control Delay (s)	11.3	-
HCM Lane LOS	B	-
HCM 95th %tile Q(veh)	0.4	-

Intersection	
Int Delay, s/veh	1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	0	0	0	905	75	0
Future Vol, veh/h	0	0	0	905	75	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	1006	83	0

Major/Minor	Major2		Minor1	
Conflicting Flow All	-	-	503	-
Stage 1	-	-	0	-
Stage 2	-	-	503	-
Critical Hdwy	-	-	6.84	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.84	-
Follow-up Hdwy	-	-	3.52	-
Pot Cap-1 Maneuver	0	-	498	0
Stage 1	0	-	-	0
Stage 2	0	-	573	0
Platoon blocked, %		-		
Mov Cap-1 Maneuver	-	-	498	-
Mov Cap-2 Maneuver	-	-	498	-
Stage 1	-	-	-	-
Stage 2	-	-	573	-

Approach	WB	NB
HCM Control Delay, s	0	13.7
HCM LOS		B

Minor Lane/Major Mvmt	NBLn1	WBT
Capacity (veh/h)	498	-
HCM Lane V/C Ratio	0.167	-
HCM Control Delay (s)	13.7	-
HCM Lane LOS	B	-
HCM 95th %tile Q(veh)	0.6	-

Intersection	
Int Delay, s/veh	2.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	0	0	0	958	143	0
Future Vol, veh/h	0	0	0	958	143	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	1064	159	0

Major/Minor	Major2		Minor1	
Conflicting Flow All	-	-	532	-
Stage 1	-	-	0	-
Stage 2	-	-	532	-
Critical Hdwy	-	-	6.84	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.84	-
Follow-up Hdwy	-	-	3.52	-
Pot Cap-1 Maneuver	0	-	477	0
Stage 1	0	-	-	0
Stage 2	0	-	553	0
Platoon blocked, %		-		
Mov Cap-1 Maneuver	-	-	477	-
Mov Cap-2 Maneuver	-	-	477	-
Stage 1	-	-	-	-
Stage 2	-	-	553	-

Approach	WB	NB
HCM Control Delay, s	0	16.3
HCM LOS		C

Minor Lane/Major Mvmt	NBLn1	WBT
Capacity (veh/h)	477	-
HCM Lane V/C Ratio	0.333	-
HCM Control Delay (s)	16.3	-
HCM Lane LOS	C	-
HCM 95th %tile Q(veh)	1.4	-

APPENDIX F

CAPACITY ANALYSIS CALCULATIONS

MITCHELL MILL ROAD

&

JONESVILLE ROAD / PEEBLES ROAD

Intersection	
Intersection Delay, s/veh	12.4
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	7	163	4	11	310	40	4	76	11	31	130	16
Future Vol, veh/h	7	163	4	11	310	40	4	76	11	31	130	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	181	4	12	344	44	4	84	12	34	144	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	10.6	14.4	10	11.2
HCM LOS	B	B	A	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	91	174	361	177
LT Vol	4	7	11	31
Through Vol	76	163	310	130
RT Vol	11	4	40	16
Lane Flow Rate	101	193	401	197
Geometry Grp	1	1	1	1
Degree of Util (X)	0.163	0.289	0.562	0.309
Departure Headway (Hd)	5.798	5.389	5.044	5.651
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	618	665	714	635
Service Time	3.846	3.43	3.078	3.693
HCM Lane V/C Ratio	0.163	0.29	0.562	0.31
HCM Control Delay	10	10.6	14.4	11.2
HCM Lane LOS	A	B	B	B
HCM 95th-tile Q	0.6	1.2	3.5	1.3

Intersection	
Intersection Delay, s/veh	55.2
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	8	244	4	13	576	46	5	87	13	36	149	18
Future Vol, veh/h	8	244	4	13	576	46	5	87	13	36	149	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	271	4	14	640	51	6	97	14	40	166	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	15.6	91	12.7	15.3
HCM LOS	C	F	B	C

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	5%	3%	2%	18%
Vol Thru, %	83%	95%	91%	73%
Vol Right, %	12%	2%	7%	9%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	105	256	635	203
LT Vol	5	8	13	36
Through Vol	87	244	576	149
RT Vol	13	4	46	18
Lane Flow Rate	117	284	706	226
Geometry Grp	1	1	1	1
Degree of Util (X)	0.23	0.492	1.106	0.426
Departure Headway (Hd)	7.498	6.491	5.644	7.145
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	482	558	642	507
Service Time	5.498	4.491	3.709	5.145
HCM Lane V/C Ratio	0.243	0.509	1.1	0.446
HCM Control Delay	12.7	15.6	91	15.3
HCM Lane LOS	B	C	F	C
HCM 95th-tile Q	0.9	2.7	20.9	2.1

Intersection	
Intersection Delay, s/veh	86.2
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	64	244	12	13	587	49	13	95	13	53	165	56
Future Vol, veh/h	64	244	12	13	587	49	13	95	13	53	165	56
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	71	271	13	14	652	54	14	106	14	59	183	62
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	24.1	157.3	15.1	21.9
HCM LOS	C	F	C	C

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	11%	20%	2%	19%
Vol Thru, %	79%	76%	90%	60%
Vol Right, %	11%	4%	8%	20%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	121	320	649	274
LT Vol	13	64	13	53
Through Vol	95	244	587	165
RT Vol	13	12	49	56
Lane Flow Rate	134	356	721	304
Geometry Grp	1	1	1	1
Degree of Util (X)	0.291	0.671	1.273	0.601
Departure Headway (Hd)	8.613	7.35	6.354	7.796
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	419	494	570	466
Service Time	6.613	5.35	4.453	5.796
HCM Lane V/C Ratio	0.32	0.721	1.265	0.652
HCM Control Delay	15.1	24.1	157.3	21.9
HCM Lane LOS	C	C	F	C
HCM 95th-tile Q	1.2	4.9	28.4	3.9

Intersection	
Intersection Delay, s/veh	107.1
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	64	244	12	13	587	49	13	95	13	53	165	56
Future Vol, veh/h	64	244	12	13	587	49	13	95	13	53	165	56
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	71	271	13	14	652	54	14	106	14	59	183	62
Number of Lanes	1	1	0	0	1	0	0	1	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	2	2	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	1	2	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	2	1	2
HCM Control Delay	18.7	205.1	16.5	18.3
HCM LOS	C	F	C	C

Lane	NBLn1	EBLn1	EBLn2	WBLn1	SBLn1	SBLn2
Vol Left, %	11%	100%	0%	2%	100%	0%
Vol Thru, %	79%	0%	95%	90%	0%	75%
Vol Right, %	11%	0%	5%	8%	0%	25%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	121	64	256	649	53	221
LT Vol	13	64	0	13	53	0
Through Vol	95	0	244	587	0	165
RT Vol	13	0	12	49	0	56
Lane Flow Rate	134	71	284	721	59	246
Geometry Grp	6	7	7	6	7	7
Degree of Util (X)	0.309	0.152	0.566	1.384	0.134	0.512
Departure Headway (Hd)	9.36	8.371	7.82	6.91	9.083	8.38
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	387	431	464	526	398	432
Service Time	7.36	6.071	5.52	5	6.783	6.08
HCM Lane V/C Ratio	0.346	0.165	0.612	1.371	0.148	0.569
HCM Control Delay	16.5	12.6	20.2	205.1	13.2	19.5
HCM Lane LOS	C	B	C	F	B	C
HCM 95th-tile Q	1.3	0.5	3.4	32.8	0.5	2.8

Intersection	
Intersection Delay, s/veh	10.7
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	18	300	13	4	127	21	5	90	10	26	49	11
Future Vol, veh/h	18	300	13	4	127	21	5	90	10	26	49	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	333	14	4	141	23	6	100	11	29	54	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	9.4	9.5	9.3
HCM LOS	B	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	5%	5%	3%	30%
Vol Thru, %	86%	91%	84%	57%
Vol Right, %	10%	4%	14%	13%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	105	331	152	86
LT Vol	5	18	4	26
Through Vol	90	300	127	49
RT Vol	10	13	21	11
Lane Flow Rate	117	368	169	96
Geometry Grp	1	1	1	1
Degree of Util (X)	0.171	0.478	0.228	0.142
Departure Headway (Hd)	5.281	4.681	4.85	5.345
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	672	765	733	663
Service Time	3.372	2.744	2.927	3.439
HCM Lane V/C Ratio	0.174	0.481	0.231	0.145
HCM Control Delay	9.5	12	9.4	9.3
HCM Lane LOS	A	B	A	A
HCM 95th-tile Q	0.6	2.6	0.9	0.5

Intersection	
Intersection Delay, s/veh	20.4
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	21	443	15	4	341	24	6	103	11	30	56	13
Future Vol, veh/h	21	443	15	4	341	24	6	103	11	30	56	13
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	23	492	17	4	379	27	7	114	12	33	62	14
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	26.3	17.7	12	11.6
HCM LOS	D	C	B	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	5%	4%	1%	30%
Vol Thru, %	86%	92%	92%	57%
Vol Right, %	9%	3%	7%	13%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	120	479	369	99
LT Vol	6	21	4	30
Through Vol	103	443	341	56
RT Vol	11	15	24	13
Lane Flow Rate	133	532	410	110
Geometry Grp	1	1	1	1
Degree of Util (X)	0.249	0.796	0.63	0.209
Departure Headway (Hd)	6.736	5.385	5.53	6.841
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	536	665	648	527
Service Time	4.742	3.468	3.62	4.847
HCM Lane V/C Ratio	0.248	0.8	0.633	0.209
HCM Control Delay	12	26.3	17.7	11.6
HCM Lane LOS	B	D	C	B
HCM 95th-tile Q	1	7.9	4.4	0.8

Intersection	
Intersection Delay, s/veh	51.5
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	117	421	21	4	349	34	20	117	11	68	71	35
Future Vol, veh/h	117	421	21	4	349	34	20	117	11	68	71	35
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	130	468	23	4	388	38	22	130	12	76	79	39
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	88.4	28	15.1	15.9
HCM LOS	F	D	C	C

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	14%	21%	1%	39%
Vol Thru, %	79%	75%	90%	41%
Vol Right, %	7%	4%	9%	20%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	148	559	387	174
LT Vol	20	117	4	68
Through Vol	117	421	349	71
RT Vol	11	21	34	35
Lane Flow Rate	164	621	430	193
Geometry Grp	1	1	1	1
Degree of Util (X)	0.347	1.089	0.763	0.401
Departure Headway (Hd)	7.95	6.311	6.66	7.793
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	456	578	546	464
Service Time	5.95	4.311	4.66	5.793
HCM Lane V/C Ratio	0.36	1.074	0.788	0.416
HCM Control Delay	15.1	88.4	28	15.9
HCM Lane LOS	C	F	D	C
HCM 95th-tile Q	1.5	18.8	6.8	1.9

Intersection	
Intersection Delay, s/veh	34.5
Intersection LOS	D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	117	421	21	4	349	34	20	117	11	68	71	35
Future Vol, veh/h	117	421	21	4	349	34	20	117	11	68	71	35
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	130	468	23	4	388	38	22	130	12	76	79	39
Number of Lanes	1	1	0	0	1	0	0	1	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	2	2	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	1	2	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	2	1	2
HCM Control Delay	42.8	38.8	16.6	13.6
HCM LOS	E	E	C	B

Lane	NBLn1	EBLn1	EBLn2	WBLn1	SBLn1	SBLn2
Vol Left, %	14%	100%	0%	1%	100%	0%
Vol Thru, %	79%	0%	95%	90%	0%	67%
Vol Right, %	7%	0%	5%	9%	0%	33%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	148	117	442	387	68	106
LT Vol	20	117	0	4	68	0
Through Vol	117	0	421	349	0	71
RT Vol	11	0	21	34	0	35
Lane Flow Rate	164	130	491	430	76	118
Geometry Grp	6	7	7	6	7	7
Degree of Util (X)	0.383	0.267	0.934	0.85	0.184	0.262
Departure Headway (Hd)	8.393	7.394	6.848	7.118	8.777	8.021
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	428	485	530	507	408	446
Service Time	6.478	5.156	4.61	5.181	6.554	5.797
HCM Lane V/C Ratio	0.383	0.268	0.926	0.848	0.186	0.265
HCM Control Delay	16.6	12.8	50.7	38.8	13.5	13.6
HCM Lane LOS	C	B	F	E	B	B
HCM 95th-tile Q	1.8	1.1	11.5	8.8	0.7	1

APPENDIX G

CAPACITY ANALYSIS CALCULATIONS

JONESVILLE ROAD

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SITE ACCESS 1

Intersection	
Int Delay, s/veh	0.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	9	9	271	4	4	281
Future Vol, veh/h	9	9	271	4	4	281
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	100	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	10	10	301	4	4	312

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	623	303	0	0	305	0
Stage 1	303	-	-	-	-	-
Stage 2	320	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	450	737	-	-	1256	-
Stage 1	749	-	-	-	-	-
Stage 2	736	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	449	737	-	-	1256	-
Mov Cap-2 Maneuver	543	-	-	-	-	-
Stage 1	749	-	-	-	-	-
Stage 2	734	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11	0	0.1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	625	1256	-
HCM Lane V/C Ratio	-	-	0.032	0.004	-
HCM Control Delay (s)	-	-	11	7.9	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Intersection	
Int Delay, s/veh	0.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	5	6	247	10	10	243
Future Vol, veh/h	5	6	247	10	10	243
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	100	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	6	7	274	11	11	270

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	572	280	0	0	285	0
Stage 1	280	-	-	-	-	-
Stage 2	292	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	482	759	-	-	1277	-
Stage 1	767	-	-	-	-	-
Stage 2	758	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	478	759	-	-	1277	-
Mov Cap-2 Maneuver	564	-	-	-	-	-
Stage 1	767	-	-	-	-	-
Stage 2	751	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.6	0	0.3
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	656	1277	-
HCM Lane V/C Ratio	-	-	0.019	0.009	-
HCM Control Delay (s)	-	-	10.6	7.8	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.1	0	-

APPENDIX H

CAPACITY ANALYSIS CALCULATIONS

JONESVILLE ROAD

&

SITE ACCESS 2

Intersection	
Int Delay, s/veh	0.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	9	9	265	4	4	287
Future Vol, veh/h	9	9	265	4	4	287
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	100	100	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	10	10	294	4	4	319

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	621	294	0	0	298	0
Stage 1	294	-	-	-	-	-
Stage 2	327	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	451	745	-	-	1263	-
Stage 1	756	-	-	-	-	-
Stage 2	731	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	450	745	-	-	1263	-
Mov Cap-2 Maneuver	450	-	-	-	-	-
Stage 1	756	-	-	-	-	-
Stage 2	729	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.7	0	0.1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	561	1263	-
HCM Lane V/C Ratio	-	-	0.036	0.004	-
HCM Control Delay (s)	-	-	11.7	7.9	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Intersection	
Int Delay, s/veh	0.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	5	5	252	10	10	237
Future Vol, veh/h	5	5	252	10	10	237
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	100	100	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	6	6	280	11	11	263

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	565	280	0	0	291	0
Stage 1	280	-	-	-	-	-
Stage 2	285	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	486	759	-	-	1271	-
Stage 1	767	-	-	-	-	-
Stage 2	763	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	482	759	-	-	1271	-
Mov Cap-2 Maneuver	482	-	-	-	-	-
Stage 1	767	-	-	-	-	-
Stage 2	756	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.2	0	0.3
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	590	1271	-
HCM Lane V/C Ratio	-	-	0.019	0.009	-
HCM Control Delay (s)	-	-	11.2	7.9	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.1	0	-

APPENDIX I

CAPACITY ANALYSIS CALCULATIONS

JONESVILLE ROAD

&

SITE ACCESS 3

Intersection	
Int Delay, s/veh	2.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	47	4	10	19	4	38	4	183	6	12	268	16
Future Vol, veh/h	47	4	10	19	4	38	4	183	6	12	268	16
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	100	-	100	100	-	100
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	52	4	11	21	4	42	4	203	7	13	298	18

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	562	542	298	552	553	203	316	0	0	210	0	0
Stage 1	324	324	-	211	211	-	-	-	-	-	-	-
Stage 2	238	218	-	341	342	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	438	447	741	444	441	838	1244	-	-	1361	-	-
Stage 1	688	650	-	791	728	-	-	-	-	-	-	-
Stage 2	765	723	-	674	638	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	409	441	741	430	435	838	1244	-	-	1361	-	-
Mov Cap-2 Maneuver	409	441	-	430	435	-	-	-	-	-	-	-
Stage 1	686	644	-	789	726	-	-	-	-	-	-	-
Stage 2	720	721	-	653	632	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	14.6	11.5	0.2	0.3
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1244	-	-	444	618	1361	-	-
HCM Lane V/C Ratio	0.004	-	-	0.153	0.11	0.01	-	-
HCM Control Delay (s)	7.9	-	-	14.6	11.5	7.7	-	-
HCM Lane LOS	A	-	-	B	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.5	0.4	0	-	-

Intersection	
Int Delay, s/veh	2.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	27	4	6	11	4	22	10	213	20	40	153	49
Future Vol, veh/h	27	4	6	11	4	22	10	213	20	40	153	49
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	100	-	100	100	-	100
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	30	4	7	12	4	24	11	237	22	44	170	54

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	542	539	170	550	571	237	224	0	0	259	0	0
Stage 1	258	258	-	259	259	-	-	-	-	-	-	-
Stage 2	284	281	-	291	312	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	451	449	874	446	431	802	1345	-	-	1306	-	-
Stage 1	747	694	-	746	694	-	-	-	-	-	-	-
Stage 2	723	678	-	717	658	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	420	430	874	425	413	802	1345	-	-	1306	-	-
Mov Cap-2 Maneuver	420	430	-	425	413	-	-	-	-	-	-	-
Stage 1	741	670	-	740	688	-	-	-	-	-	-	-
Stage 2	691	673	-	683	636	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	13.6	11.6	0.3	1.3
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1345	-	-	460	587	1306	-	-
HCM Lane V/C Ratio	0.008	-	-	0.089	0.07	0.034	-	-
HCM Control Delay (s)	7.7	-	-	13.6	11.6	7.9	-	-
HCM Lane LOS	A	-	-	B	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.3	0.2	0.1	-	-

APPENDIX J

CAPACITY ANALYSIS CALCULATIONS

JONESVILLE ROAD

&

SITE ACCESS 4

Intersection	
Int Delay, s/veh	2

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	36	24	52	156	250	47
Future Vol, veh/h	36	24	52	156	250	47
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	100	-	-	100
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	40	27	58	173	278	52

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	567	278	330	0	-	0
Stage 1	278	-	-	-	-	-
Stage 2	289	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	485	761	1229	-	-	-
Stage 1	769	-	-	-	-	-
Stage 2	760	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	462	761	1229	-	-	-
Mov Cap-2 Maneuver	551	-	-	-	-	-
Stage 1	733	-	-	-	-	-
Stage 2	760	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	11.5	2	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1229	-	619	-	-
HCM Lane V/C Ratio	0.047	-	0.108	-	-
HCM Control Delay (s)	8.1	-	11.5	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0.1	-	0.4	-	-

Intersection	
Int Delay, s/veh	3.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	54	54	79	189	120	50
Future Vol, veh/h	54	54	79	189	120	50
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	100	-	-	100
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	60	60	88	210	133	56

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	519	133	189	0	-	0
Stage 1	133	-	-	-	-	-
Stage 2	386	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	517	916	1385	-	-	-
Stage 1	893	-	-	-	-	-
Stage 2	687	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	484	916	1385	-	-	-
Mov Cap-2 Maneuver	559	-	-	-	-	-
Stage 1	836	-	-	-	-	-
Stage 2	687	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	11.3	2.3	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1385	-	694	-	-
HCM Lane V/C Ratio	0.063	-	0.173	-	-
HCM Control Delay (s)	7.8	-	11.3	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0.2	-	0.6	-	-

APPENDIX K

MITCHELL MILL ROAD

&

SITE ACCESS 5

Intersection	
Int Delay, s/veh	0.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑	↱		↱
Traffic Vol, veh/h	0	320	660	5	0	6
Future Vol, veh/h	0	320	660	5	0	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	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	0	356	733	6	0	7

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	-	0	-	0	-	733
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	421
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	-	-	-	-	-	421
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

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

Minor Lane/Major Mvmt	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	-	421
HCM Lane V/C Ratio	-	-	-	0.016
HCM Control Delay (s)	-	-	-	13.7
HCM Lane LOS	-	-	-	B
HCM 95th %tile Q(veh)	-	-	-	0

Intersection	
Int Delay, s/veh	0.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑	↱		↱
Traffic Vol, veh/h	0	559	421	4	0	10
Future Vol, veh/h	0	559	421	4	0	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	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	0	621	468	4	0	11

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	-	0	-	0	-	468
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	595
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	-	-	-	-	-	595
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	11.2
HCM LOS			B

Minor Lane/Major Mvmt	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	-	595
HCM Lane V/C Ratio	-	-	-	0.019
HCM Control Delay (s)	-	-	-	11.2
HCM Lane LOS	-	-	-	B
HCM 95th %tile Q(veh)	-	-	-	0.1

APPENDIX L

MITCHELL MILL ROAD

&

SITE ACCESS 6

Intersection	
Int Delay, s/veh	0.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑	↱		↱
Traffic Vol, veh/h	0	320	663	4	0	4
Future Vol, veh/h	0	320	663	4	0	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	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	0	356	737	4	0	4

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	-	0	-	0	-	737
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	418
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	-	-	-	-	-	418
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

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

Minor Lane/Major Mvmt	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	-	418
HCM Lane V/C Ratio	-	-	-	0.011
HCM Control Delay (s)	-	-	-	13.7
HCM Lane LOS	-	-	-	B
HCM 95th %tile Q(veh)	-	-	-	0

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑	↱		↱
Traffic Vol, veh/h	0	559	421	10	0	4
Future Vol, veh/h	0	559	421	10	0	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	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	0	621	468	11	0	4

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	-	0	-	0	-	468
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	595
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	-	-	-	-	-	595
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	11.1
HCM LOS			B

Minor Lane/Major Mvmt	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	-	595
HCM Lane V/C Ratio	-	-	-	0.007
HCM Control Delay (s)	-	-	-	11.1
HCM Lane LOS	-	-	-	B
HCM 95th %tile Q(veh)	-	-	-	0

APPENDIX M

MITCHELL MILL ROAD

&

SITE ACCESS 7

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	11	553	421	4	6	6
Future Vol, veh/h	11	553	421	4	6	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	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	12	614	468	4	7	7

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	472	0	-	0	1108	470
Stage 1	-	-	-	-	470	-
Stage 2	-	-	-	-	638	-
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	1090	-	-	-	232	594
Stage 1	-	-	-	-	629	-
Stage 2	-	-	-	-	526	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1090	-	-	-	229	594
Mov Cap-2 Maneuver	-	-	-	-	229	-
Stage 1	-	-	-	-	622	-
Stage 2	-	-	-	-	526	-

Approach	EB	WB	SB
HCM Control Delay, s	0.2	0	16.3
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1090	-	-	-	331
HCM Lane V/C Ratio	0.011	-	-	-	0.04
HCM Control Delay (s)	8.3	-	-	-	16.3
HCM Lane LOS	A	-	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	4	310	663	4	10	10
Future Vol, veh/h	4	310	663	4	10	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	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	4	344	737	4	11	11

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	741	0	-	0	1091	739
Stage 1	-	-	-	-	739	-
Stage 2	-	-	-	-	352	-
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	866	-	-	-	238	417
Stage 1	-	-	-	-	472	-
Stage 2	-	-	-	-	712	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	866	-	-	-	237	417
Mov Cap-2 Maneuver	-	-	-	-	237	-
Stage 1	-	-	-	-	470	-
Stage 2	-	-	-	-	712	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	17.9
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	866	-	-	-	302
HCM Lane V/C Ratio	0.005	-	-	-	0.074
HCM Control Delay (s)	9.2	-	-	-	17.9
HCM Lane LOS	A	-	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.2

APPENDIX N

MITCHELL MILL ROAD

&

SITE ACCESS 8

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑	↱		↱
Traffic Vol, veh/h	0	320	645	11	0	20
Future Vol, veh/h	0	320	645	11	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	-	-	-	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	0	356	717	12	0	22

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	-	0	-	0	-	717
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	430
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	-	-	-	-	-	430
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	13.8
HCM LOS			B

Minor Lane/Major Mvmt	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	-	430
HCM Lane V/C Ratio	-	-	-	0.052
HCM Control Delay (s)	-	-	-	13.8
HCM Lane LOS	-	-	-	B
HCM 95th %tile Q(veh)	-	-	-	0.2

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑	↱		↱
Traffic Vol, veh/h	0	559	386	18	0	39
Future Vol, veh/h	0	559	386	18	0	39
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	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	0	621	429	20	0	43

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	-	0	-	0	-	429
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	626
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	-	-	-	-	-	626
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	11.2
HCM LOS			B

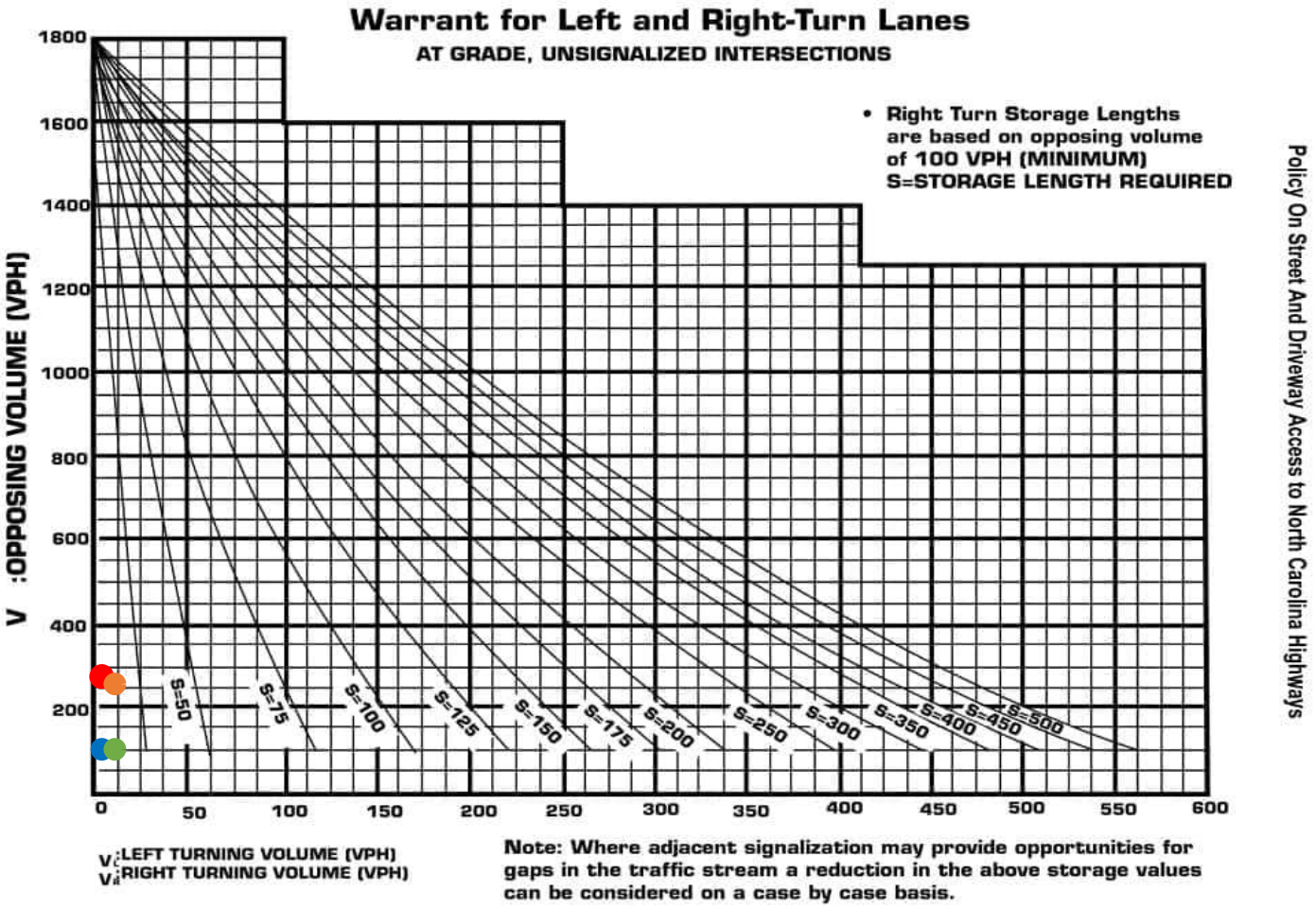
Minor Lane/Major Mvmt	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	-	626
HCM Lane V/C Ratio	-	-	-	0.069
HCM Control Delay (s)	-	-	-	11.2
HCM Lane LOS	-	-	-	B
HCM 95th %tile Q(veh)	-	-	-	0.2

APPENDIX O

TURN LANE WARRANTS

5109 MITCHELL MILL ROAD - ROLESVILLE, NC

TURN LANE STORAGE WARRANTS



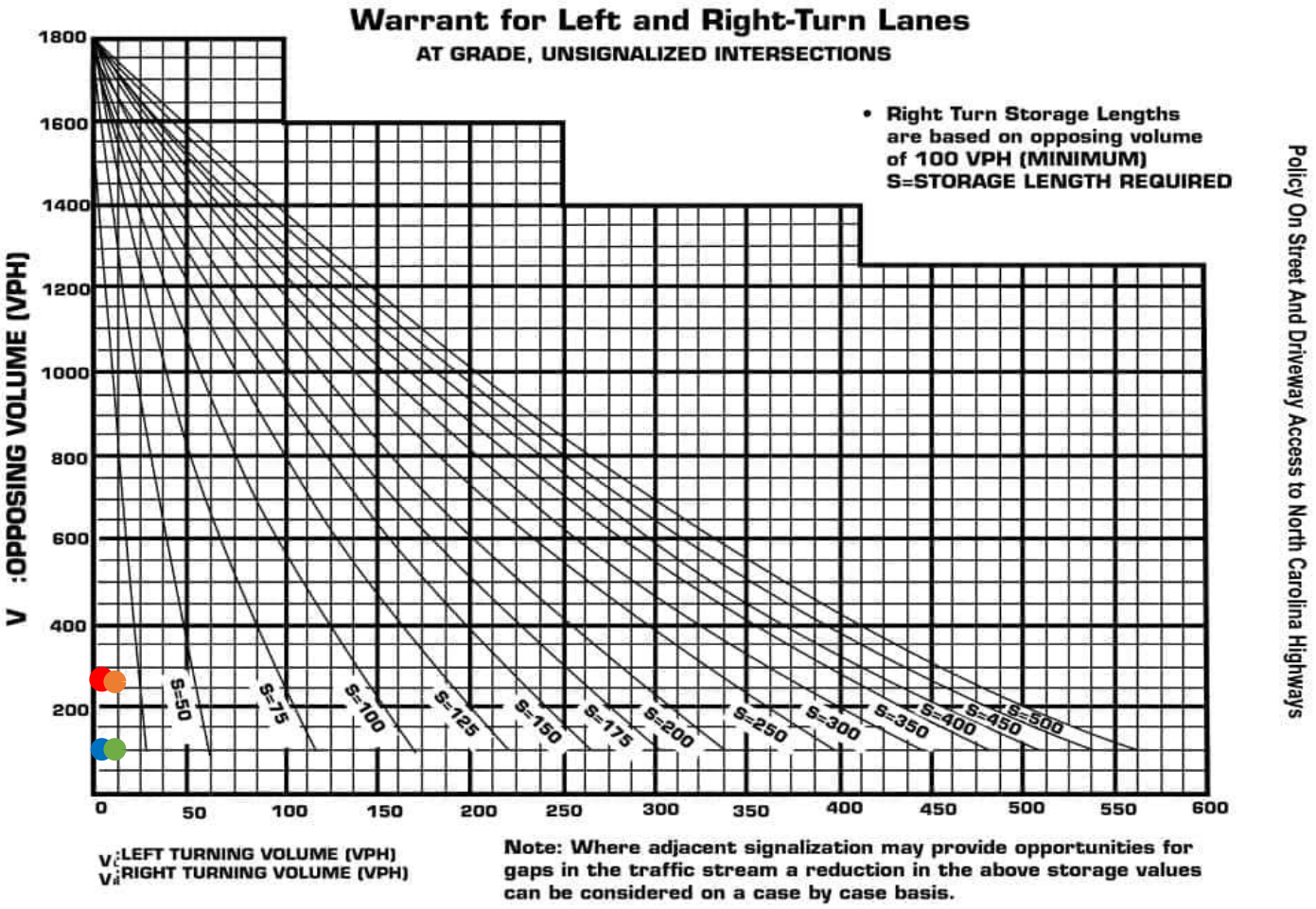
INTERSECTION: Jonesville Road & Site Access 1

SCENARIO	Movement	Turn Lane	Turning Volume (V_R/V_L)	Approach / Opposing Volume (V_A/V_O)	Symbol
AM Build	SBL	Left	3	274	
AM Build	NBR	Right	3	100	
PM Build	SBL	Left	10	257	
PM Build	NBR	Right	10	100	

RAMEY KEMP ASSOCIATES
TOGETHER WE ARE LIMITLESS

5109 MITCHELL MILL ROAD - ROLESVILLE, NC

TURN LANE STORAGE WARRANTS

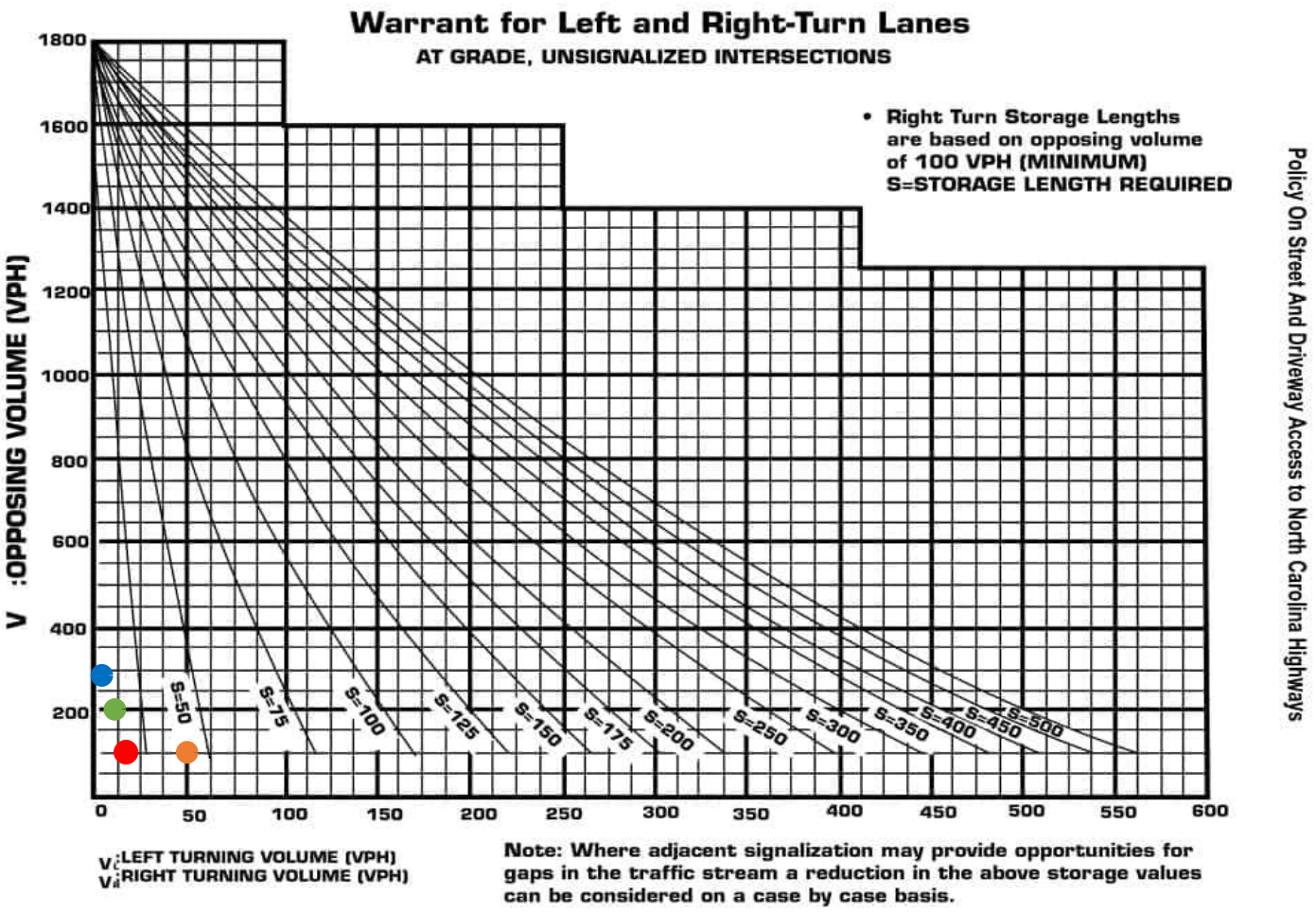


INTERSECTION: Jonesville Road & Site Access 2

SCENARIO	Movement	Turn Lane	Turning Volume (V_R/V_L)	Approach / Opposing Volume (V_A/V_O)	Symbol
AM Build	SBL	Left	3	268	
AM Build	NBR	Right	3	100	
PM Build	SBL	Left	10	262	
PM Build	NBR	Right	10	100	

5109 MITCHELL MILL ROAD - ROLESVILLE, NC

TURN LANE STORAGE WARRANTS



INTERSECTION: Jonesville Road & Site Access 3 [EB Approach]

SCENARIO	Movement	Turn Lane	Turning Volume (V_R/V_L)	Approach / Opposing Volume (V_A/V_O)	Symbol
AM Build	SBR	Right	16	100	
AM Build	NBL	Left	3	284	
PM Build	SBR	Right	49	100	
PM Build	NBL	Left	10	202	

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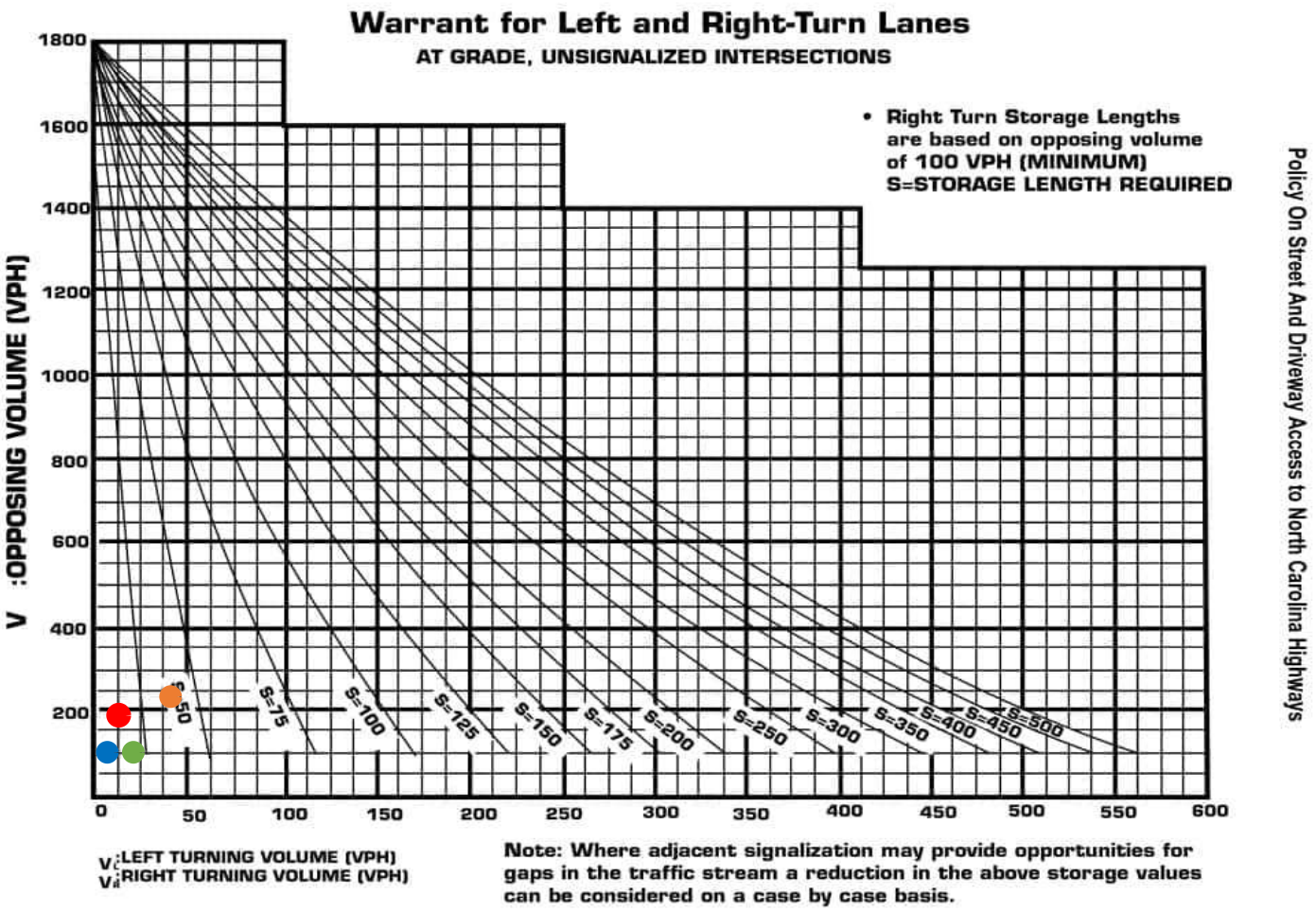
TURN LANE STORAGE WARRANTS



INTERSECTION: Jonesville Road & Site Access 3 [WB Approach]

SCENARIO	Movement	Turn Lane	Turning Volume (V_R/V_L)	Approach / Opposing Volume (V_A/V_O)	Symbol
AM Build	SBL	Left	12	189	
AM Build	NBR	Right	6	100	
PM Build	SBL	Left	40	233	
PM Build	NBR	Right	20	100	

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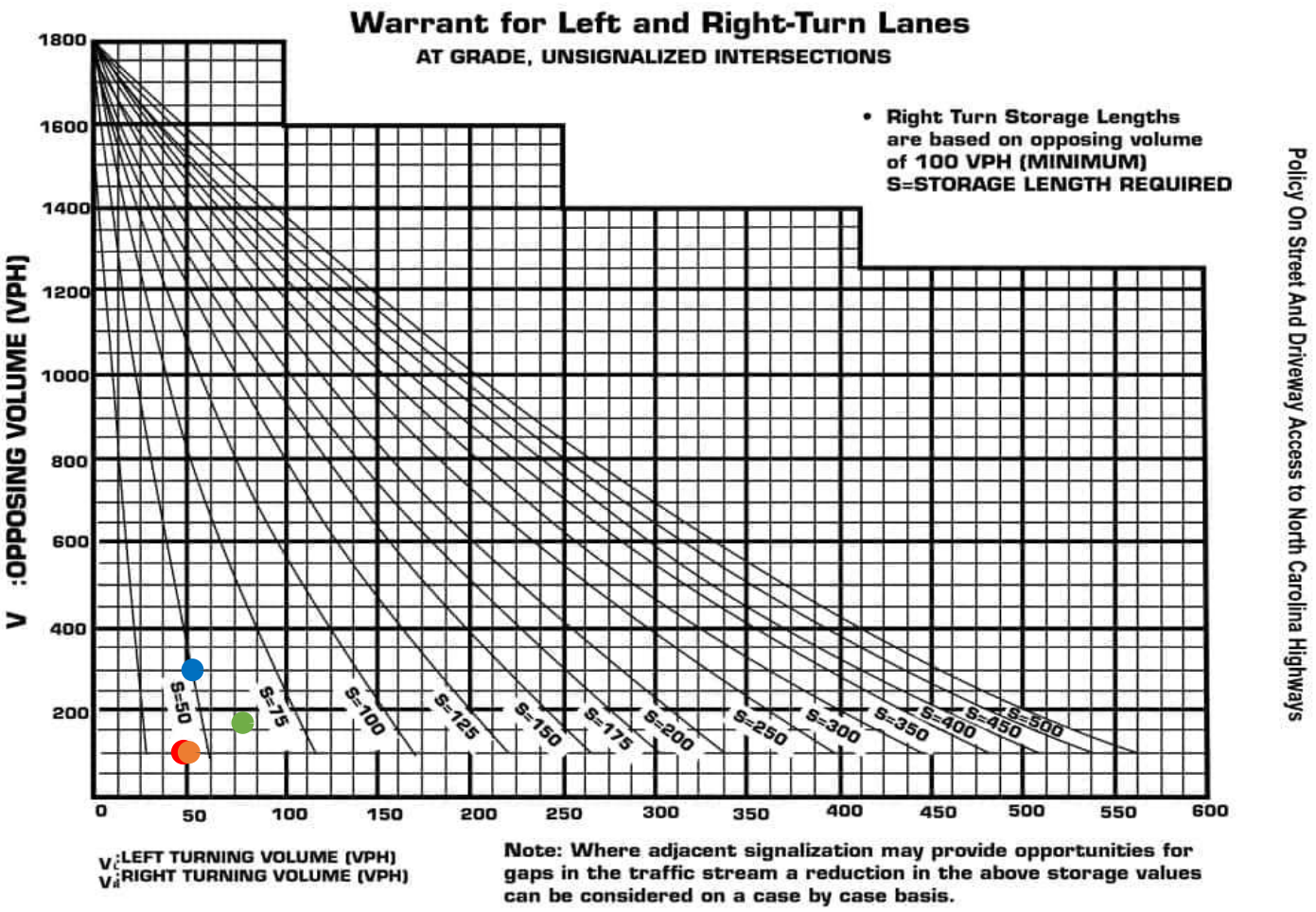
TURN LANE STORAGE WARRANTS



INTERSECTION: Jonesville Road & Site Access 4

SCENARIO	Movement	Turn Lane	Turning Volume (V_R/V_L)	Approach / Opposing Volume (V_A/V_O)	Symbol
AM Build	SBR	Right	47	100	
AM Build	NBL	Left	52	297	
PM Build	SBR	Right	50	100	
PM Build	NBL	Left	79	170	

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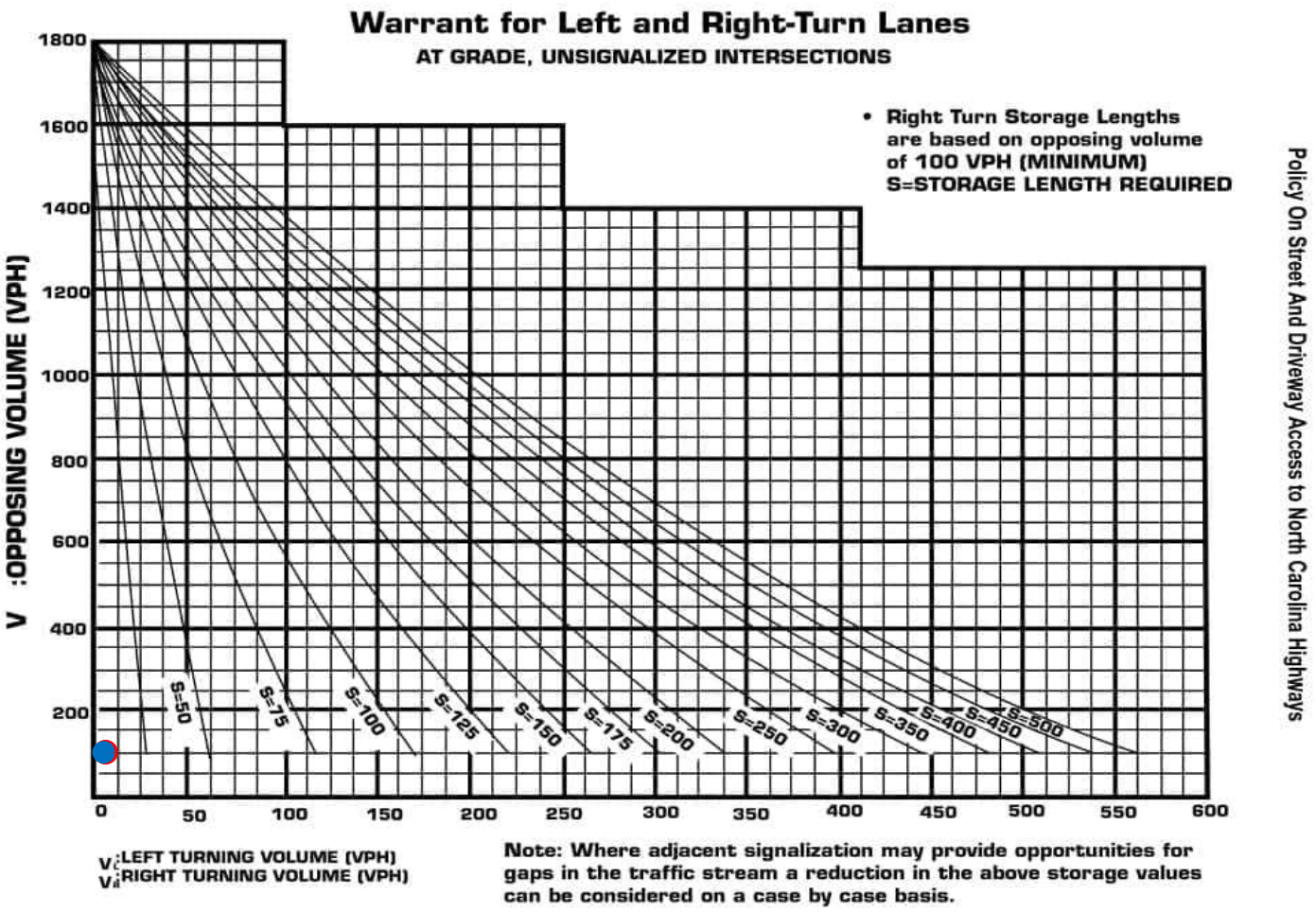
TURN LANE STORAGE WARRANTS



INTERSECTION: Mitchell Mill Road & Site Access 5

SCENARIO	Movement	Turn Lane	Turning Volume (V_R/V_L)	Approach / Opposing Volume (V_A/V_O)	Symbol
AM Build	WBR	Right	5	100	
PM Build	WBR	Right	4	100	

RAMEY KEMP ASSOCIATES
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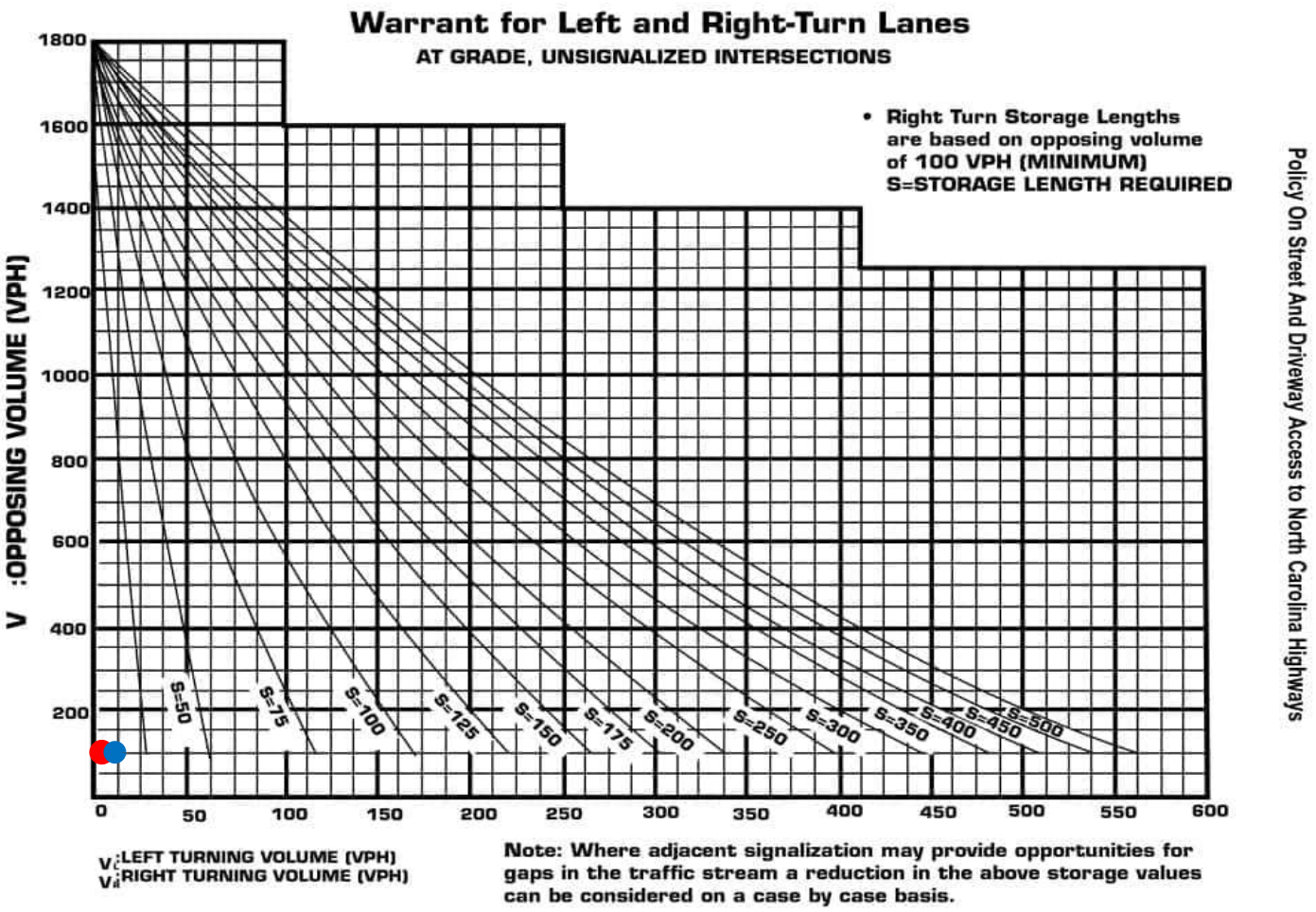
TURN LANE STORAGE WARRANTS



INTERSECTION: Mitchell Mill Road & Site Access 6

SCENARIO	Movement	Turn Lane	Turning Volume (V_R/V_L)	Approach / Opposing Volume (V_A/V_O)	Symbol
AM Build	WBR	Right	3	100	
PM Build	WBR	Right	10	100	

RAMEY KEMP ASSOCIATES
TOGETHER WE ARE LIMITLESS

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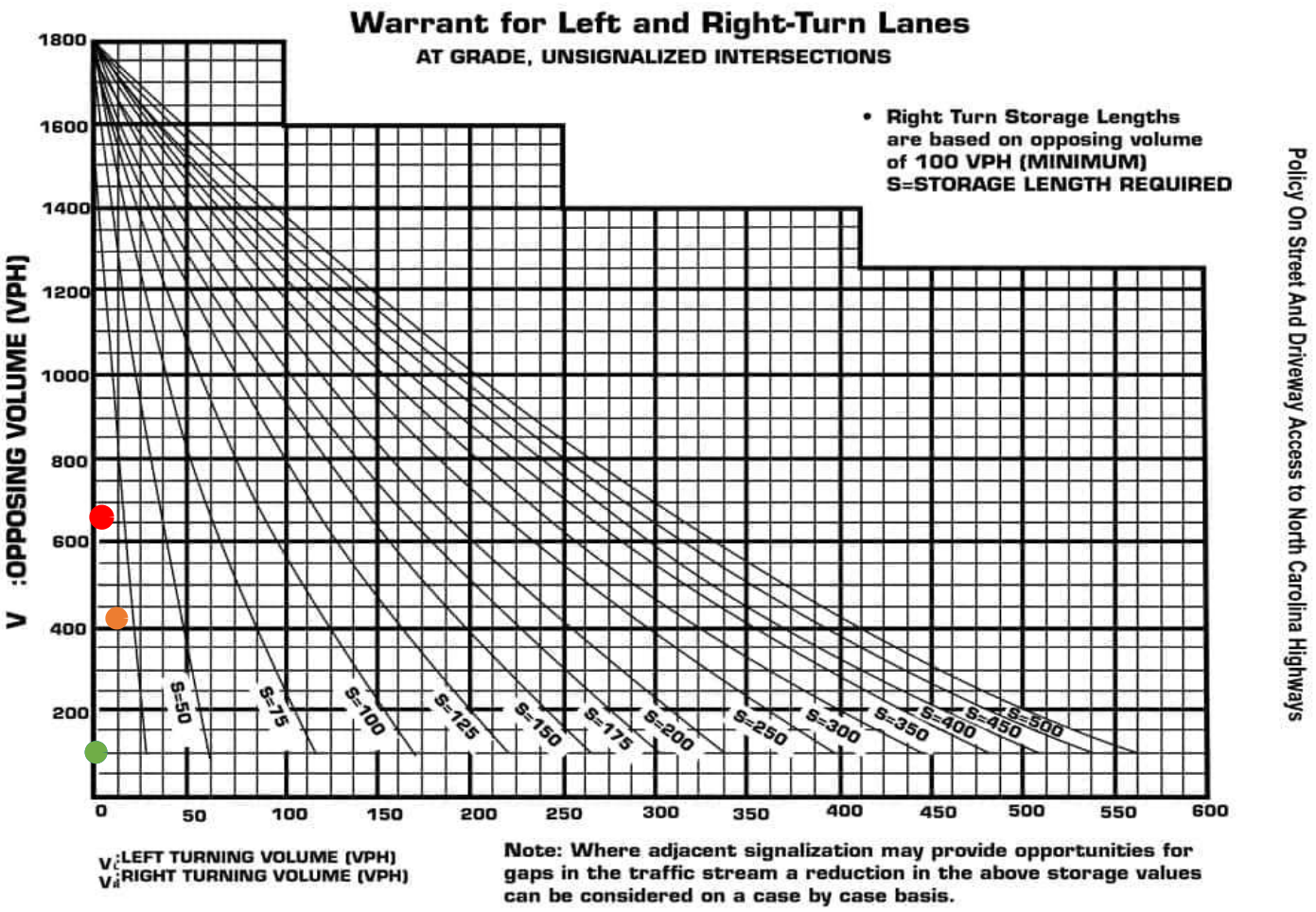
TURN LANE STORAGE WARRANTS



INTERSECTION: Mitchell Mill Road & Site Access 7

SCENARIO	Movement	Turn Lane	Turning Volume (V_R/V_L)	Approach / Opposing Volume (V_A/V_O)	Symbol
AM Build	EBL	Left	3	663	
AM Build	WBR	Right	0	100	
PM Build	EBL	Left	11	421	
PM Build	WBR	Right	0	100	

RAMEY KEMP ASSOCIATES
TOGETHER WE ARE LIMITLESS

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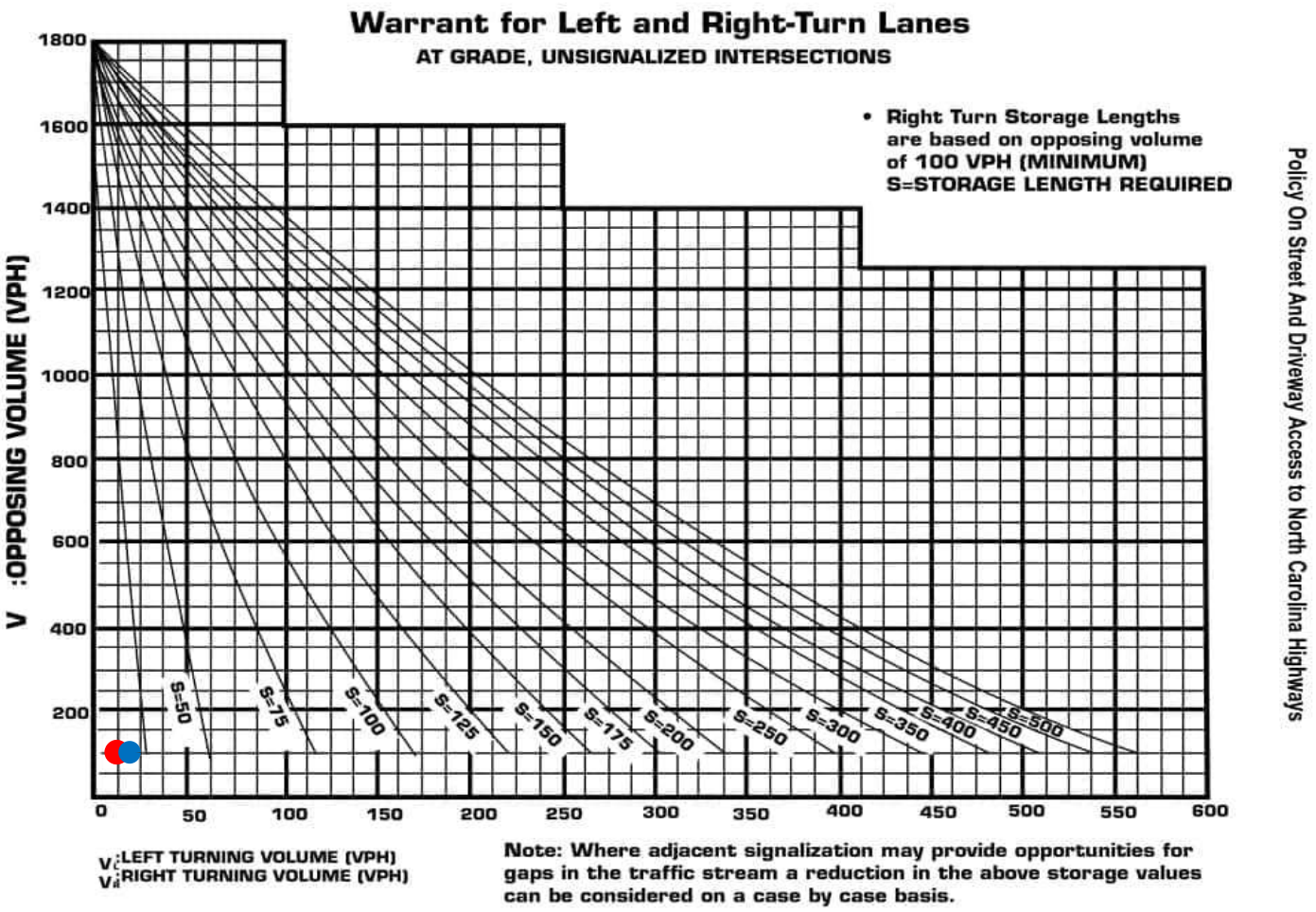
TURN LANE STORAGE WARRANTS



INTERSECTION: Mitchell Mill Road & Site Access 8

SCENARIO	Movement	Turn Lane	Turning Volume (V_R/V_L)	Approach / Opposing Volume (V_A/V_O)	Symbol
AM Build	WBR	Right	11	100	
PM Build	WBR	Right	18	100	

RAMEY KEMP ASSOCIATES
TOGETHER WE ARE LIMITLESS

APPENDIX P

MUTCD / ITRE

SIGNAL WARRANT ANALYSIS

Traffic Signal Warrant Analysis

Warrants 1 - 3 (Volume Warrants)

Project Name	5109 Mitchell Mill Road
Project/File #	20498 - 04
Scenario	2028 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	3057 vehicles	Total Approach Volume	757 vehicles
Total Ped/Bike Volume	0 crossings	Total Ped/Bike Volume	0 crossings
Right turn reduction of	0 percent applied	Right turn reduction of	100 percent applied

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

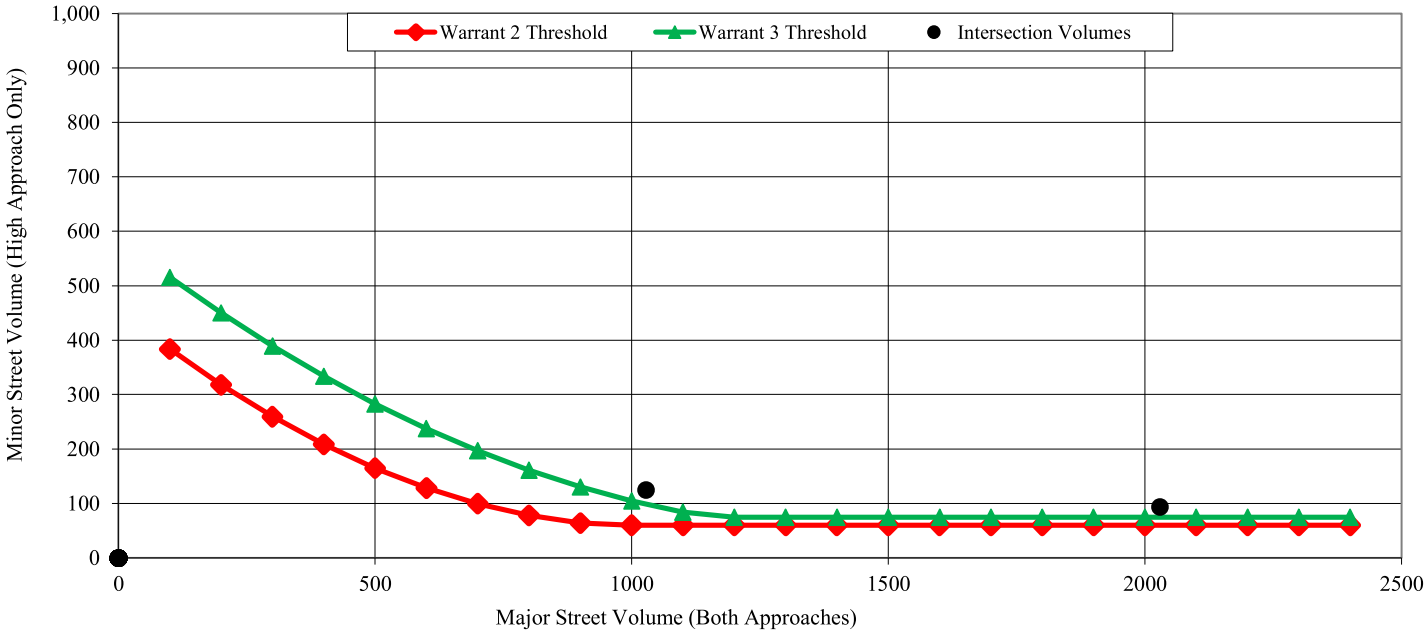
Warrant 1, Eight Hour Vehicular Volume			
	Condition A	Condition B	Condition A+B*
Condition Satisfied?	Not Satisfied	Not Satisfied	Not Satisfied
Required values reached for	1 hour	2 hours	2 (Cond. A) & 2 (Cond. B)
Criteria - Major Street (veh/hr)	420	630	336 (Cond. A) & 504 (Cond. B)
Criteria - Minor 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	2369 total, 246 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	

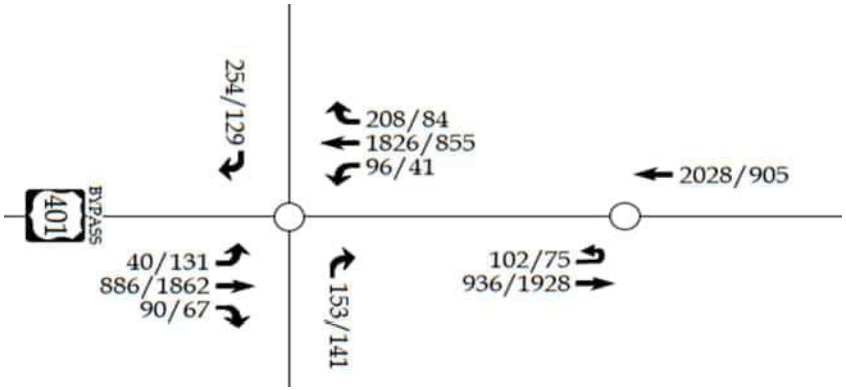
Figure 4C-2 (Warrant 2 - 70% Factor) & Figure 4C-4 (Warrant 3 - 70% Factor)



Pedestrian Crossing Volume

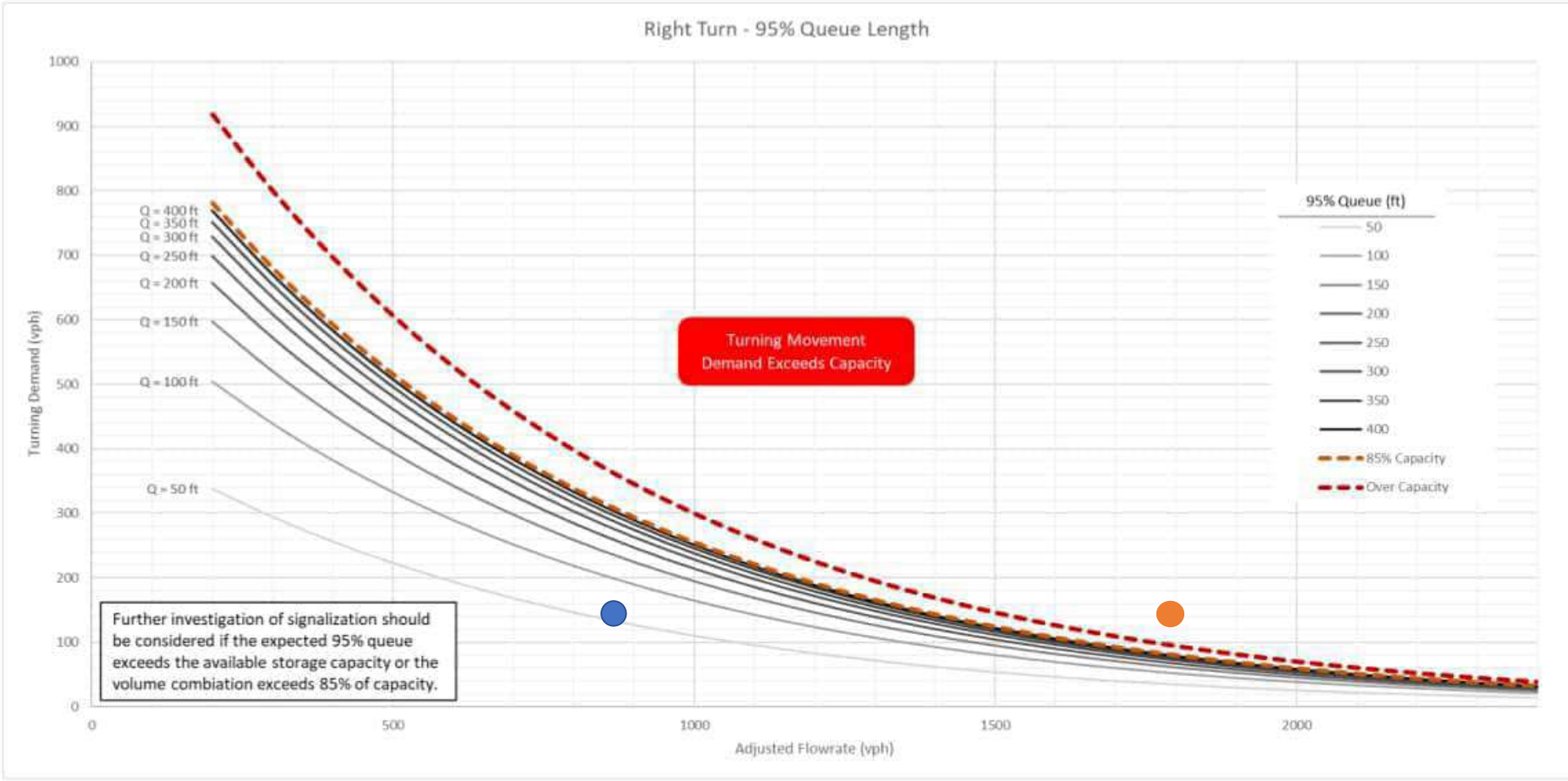
US 401 & Jonesville Road

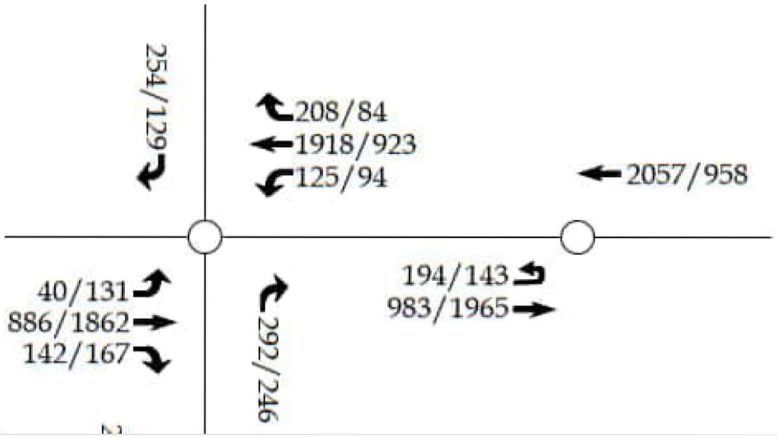
2028 No-Build Traffic Conditions



CVAF =	1
Conflicting =	886
ACV =	886
Turn Vol =	153

CVAF =	1
Conflicting =	1862
ACV =	1,862
Turn Vol =	141



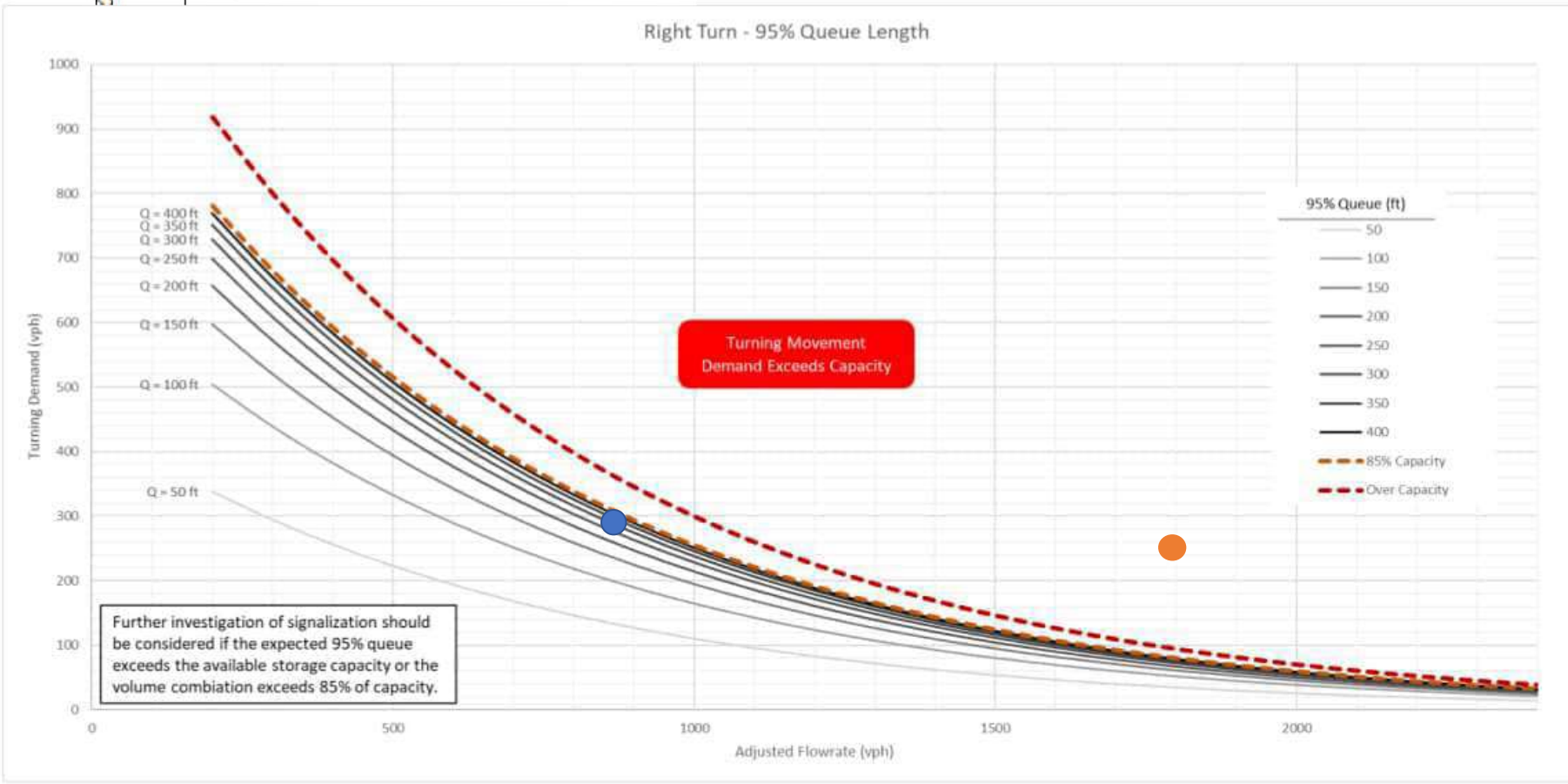


CVAF =	1
Conflicting =	886
ACV =	886
Turn Vol =	292

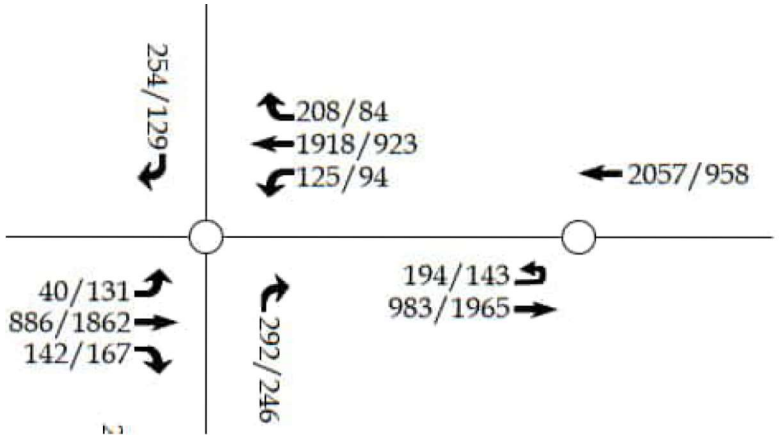
CVAF =	1
Conflicting =	1862
ACV =	1,862
Turn Vol =	246

US 401 & Jonesville Road

2028 Build Traffic Conditions

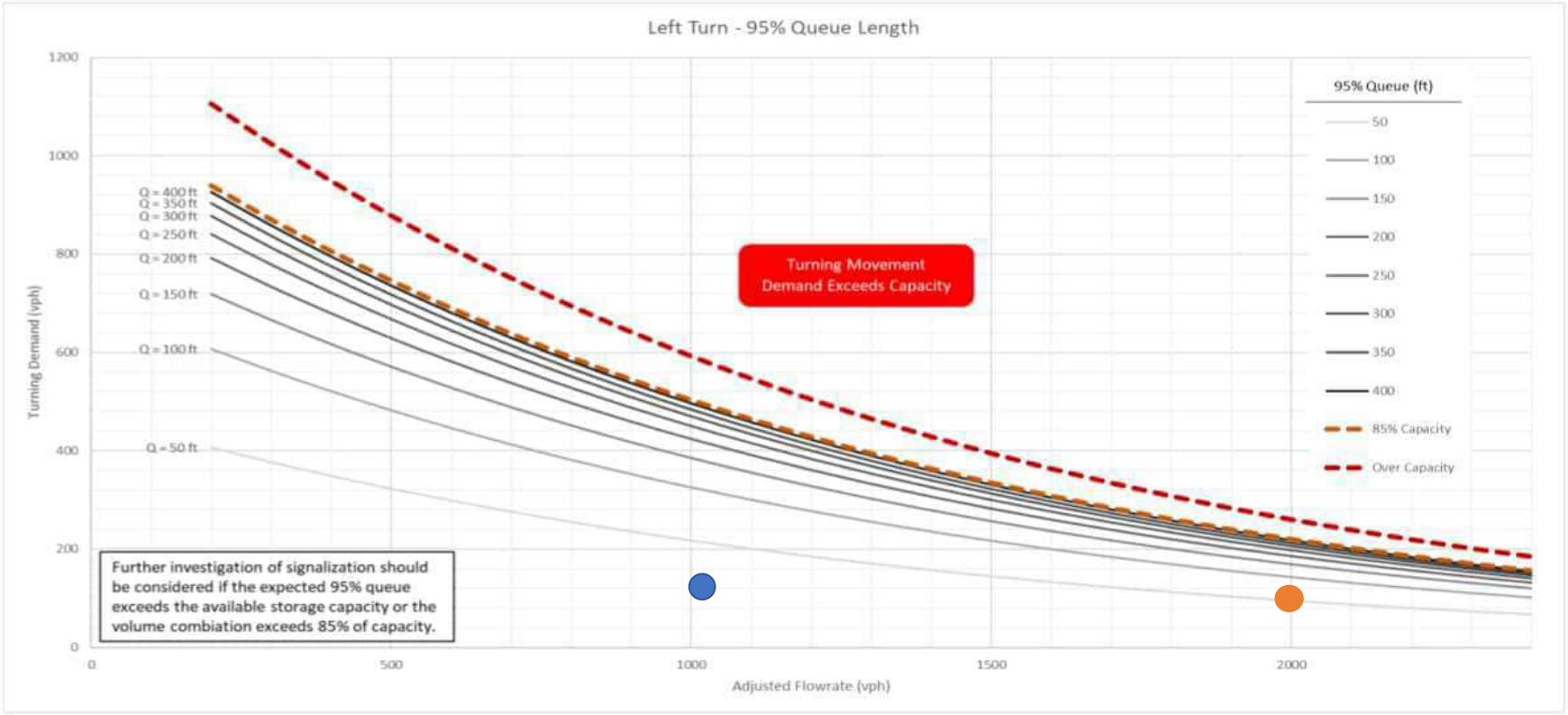


US 401 & Jonesville Road
2028 Build Traffic Conditions



CVAF =	1
Conflicting =	1028
ACV =	1028
Turn Vol =	125

CVAF =	1
Conflicting =	2029
ACV =	2029
Turn Vol =	94



Traffic Signal Warrant Analysis

Warrants 1 - 3 (Volume Warrants)

Project Name	5109 Mitchell Mill Road
Project/File #	20498 - 04
Scenario	2028 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	3015 vehicles	Total Approach Volume	337 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.

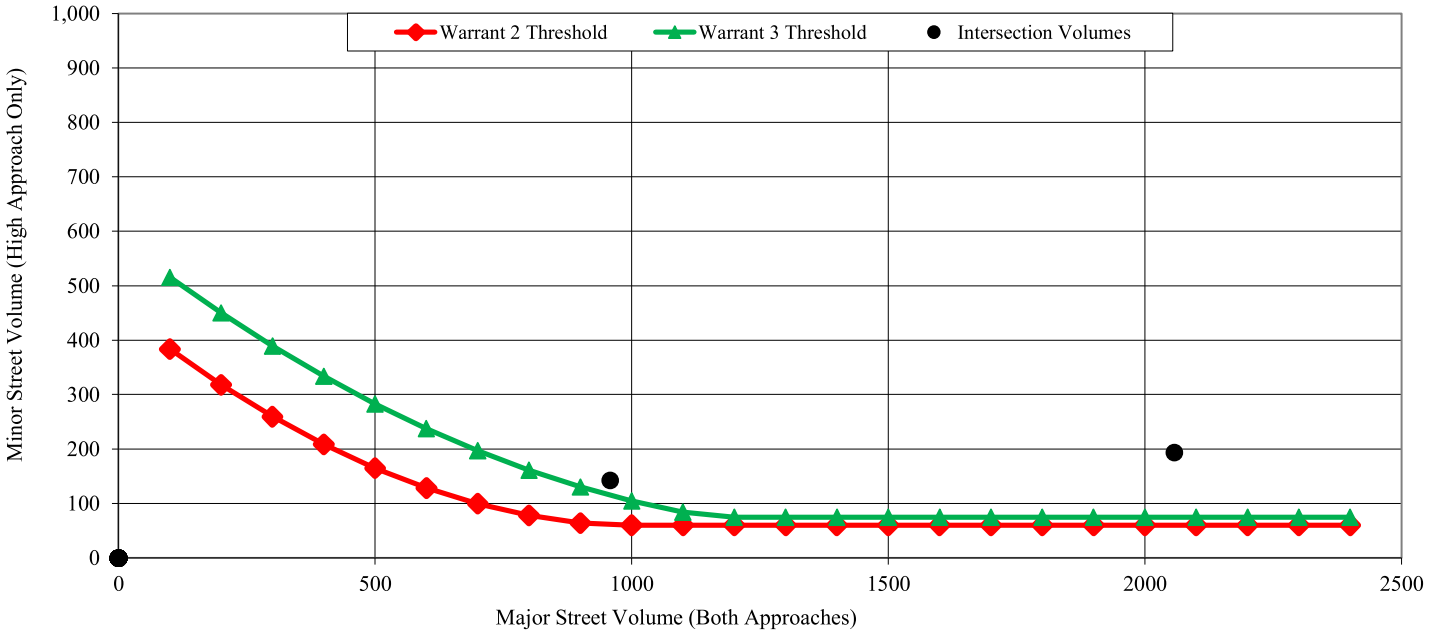
Warrant 1, Eight Hour Vehicular Volume			
	Condition A	Condition B	Condition A+B*
Condition Satisfied?	Not Satisfied	Not Satisfied	Not Satisfied
Required values reached for	2 hours	2 hours	2 (Cond. A) & 2 (Cond. B)
Criteria - Major Street (veh/hr)	420	630	336 (Cond. A) & 504 (Cond. B)
Criteria - Minor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

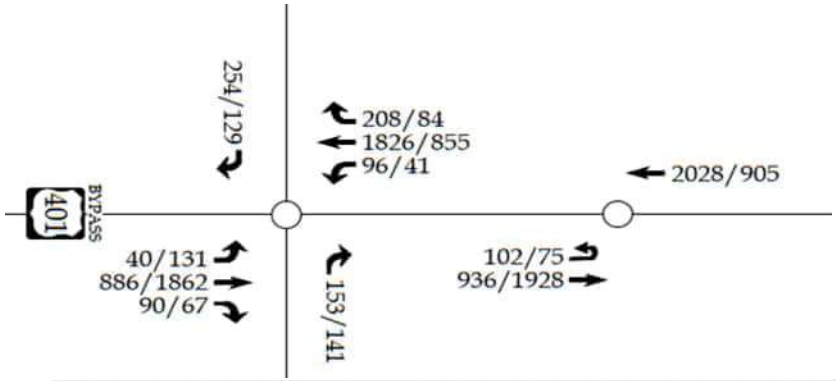
Warrant 2, Four Hour Vehicular Volume	
Condition Satisfied?	Not Satisfied
Required values reached for	2 hours
Criteria	See Figure Below

Warrant 3, Peak Hour Vehicular Volume		
	Condition A	Condition B
Condition Satisfied?	Not Satisfied	Satisfied
Required values reached for	2251 total, 194 minor, 0 delay	2 hours
Criteria - Total Approach Volume (veh in one hour)	650	See Figure Below
Criteria - Minor Street High Side Volume (veh in one hour)	100	
Criteria - Minor Street High Side Delay (veh-hrs)	4	

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



Pedestrian Crossing Volume

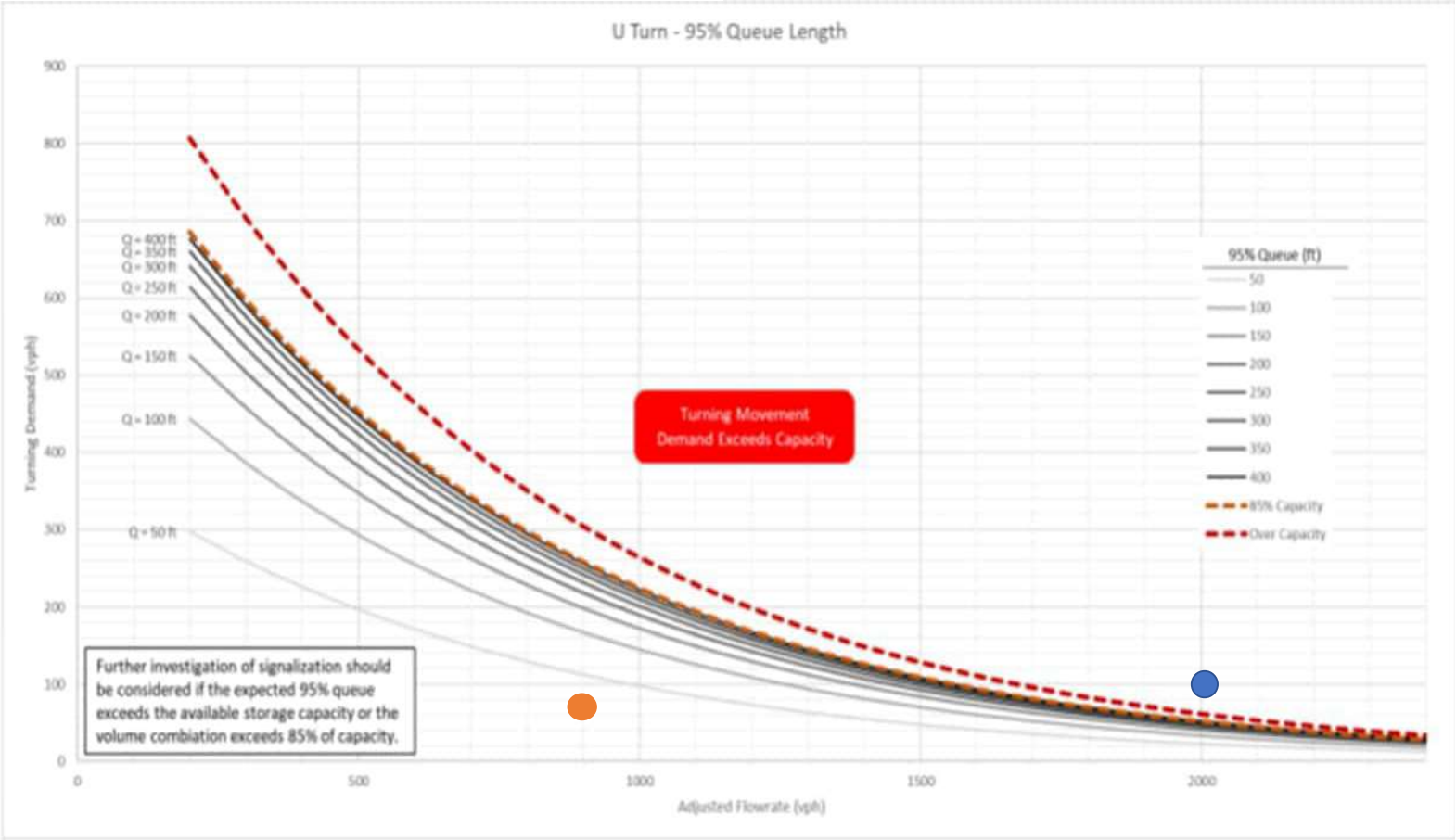


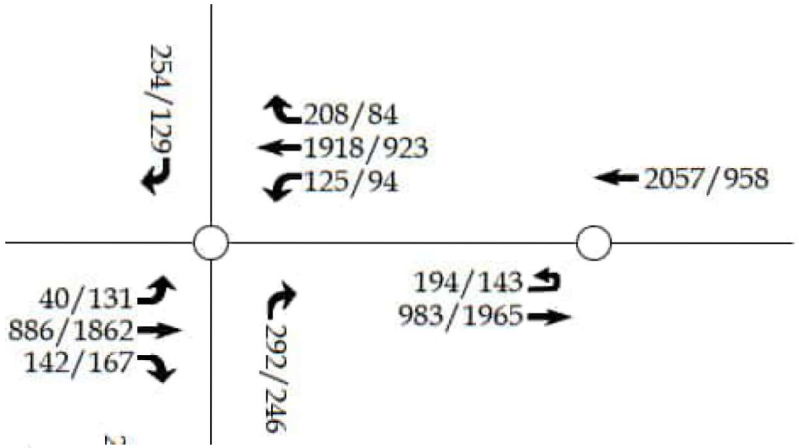
CVAF =	1
Conflicting =	2028
ACV =	2028
Turn Vol =	102

CVAF =	1
Conflicting =	905
ACV =	905
Turn Vol =	75

US 401 & Eastern U-Turn

2028 No-Build Traffic Conditions



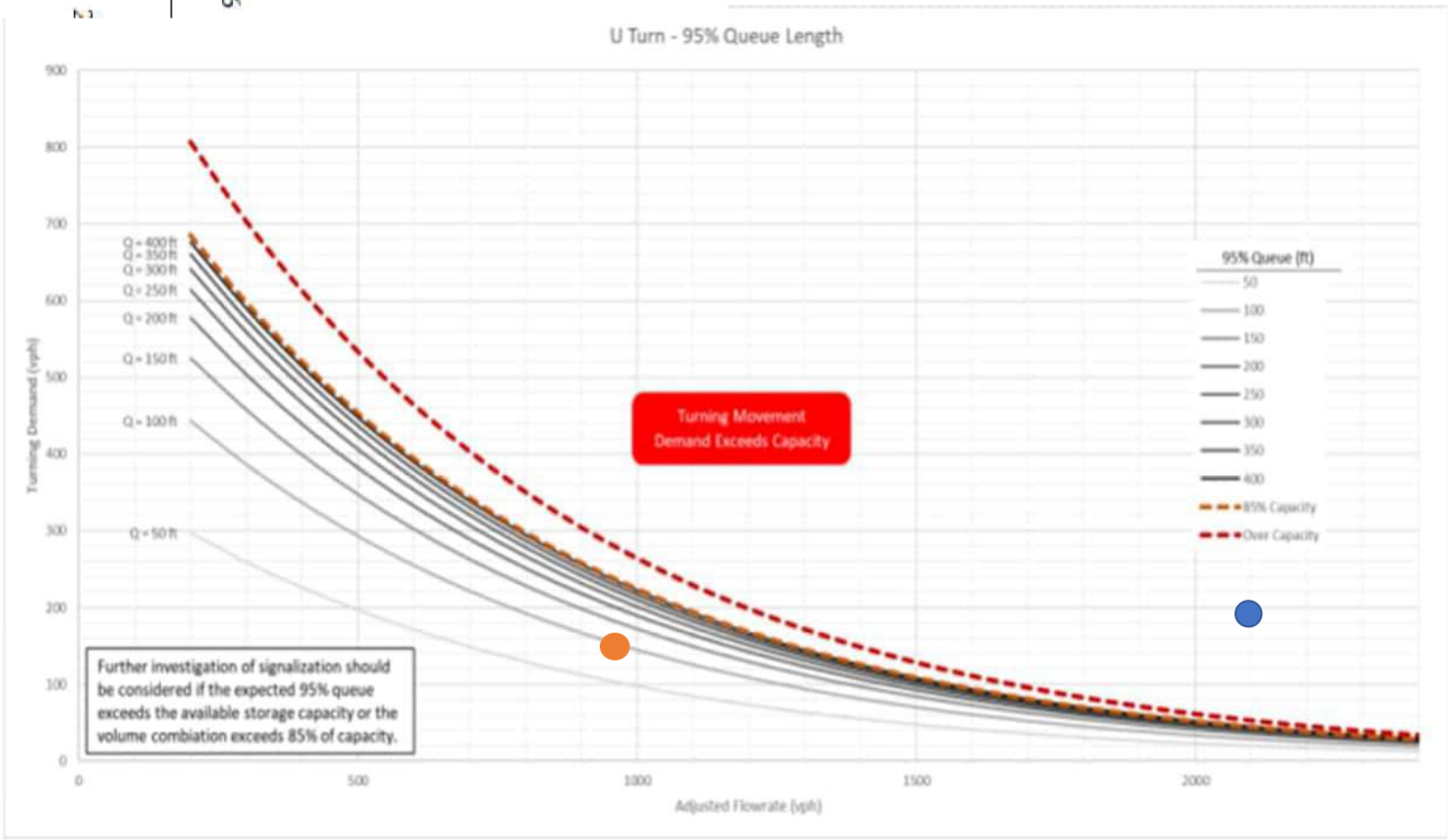


CVAF =	1
Conflicting =	2057
ACV =	2057
Turn Vol =	194

CVAF =	1
Conflicting =	958
ACV =	959
Turn Vol =	143

US 401 & Eastern U-Turn

2028 Build Traffic Conditions



Traffic Signal Warrant Analysis

Warrants 1 - 3 (Volume Warrants)

Project Name	5109 Mitchell Mill Road
Project/File #	20498 - 04
Scenario	2028 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	1733 vehicles	Total Approach Volume	527 vehicles
Total Ped/Bike Volume	0 crossings	Total Ped/Bike Volume	0 crossings
Right turn reduction of	0 percent applied	Right turn reduction of	0 percent applied

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

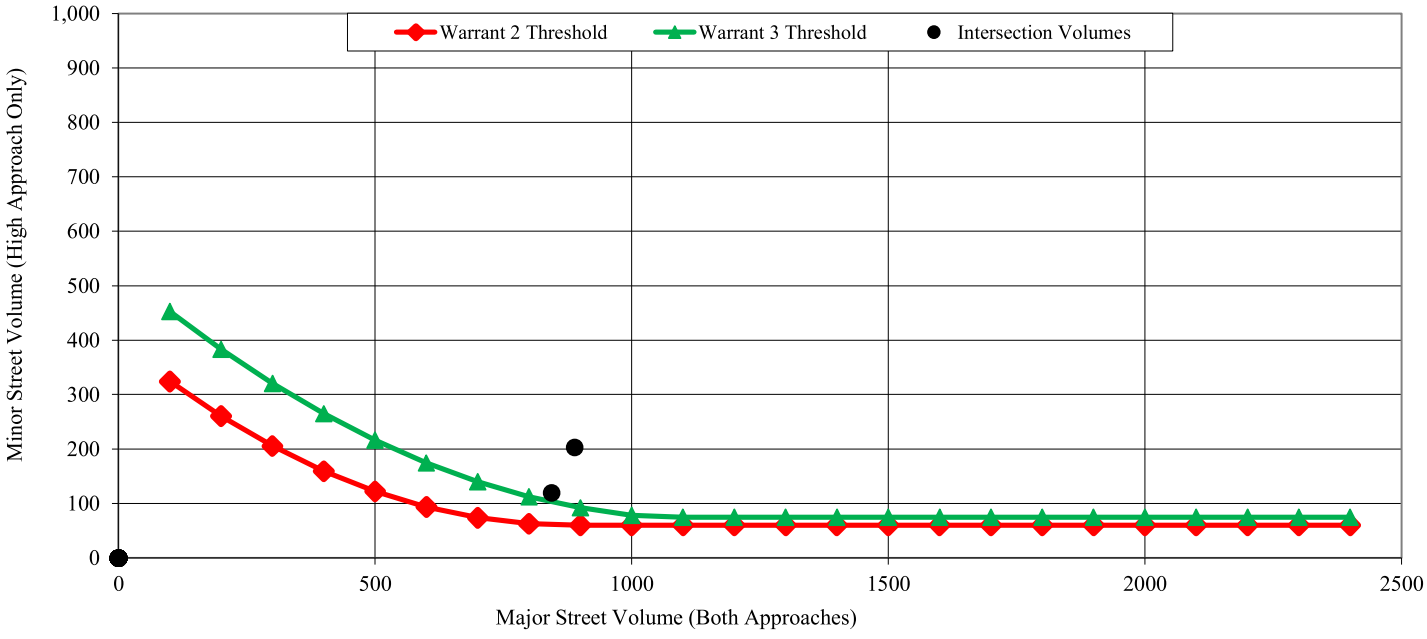
Warrant 1, Eight Hour Vehicular Volume			
	Condition A	Condition B	Condition A+B*
Condition Satisfied?	Not Satisfied	Not Satisfied	Not Satisfied
Required values reached for	2 hours	2 hours	2 (Cond. A) & 2 (Cond. B)
Criteria - Major Street (veh/hr)	350	525	280 (Cond. A) & 420 (Cond. B)
Criteria - Minor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

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

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

Warrant 3, Peak Hour Vehicular Volume		
	Condition A	Condition B
Condition Satisfied?	Not Satisfied	Satisfied
Required values reached for	1197 total, 203 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)



Pedestrian Crossing Volume

Traffic Signal Warrant Analysis

Warrants 1 - 3 (Volume Warrants)

Project Name	5109 Mitchell Mill Road
Project/File #	20498 - 04
Scenario	2028 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	1911 vehicles	Total Approach Volume	717 vehicles
Total Ped/Bike Volume	0 crossings	Total Ped/Bike Volume	0 crossings
Right turn reduction of	0 percent applied	Right turn reduction of	0 percent applied

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

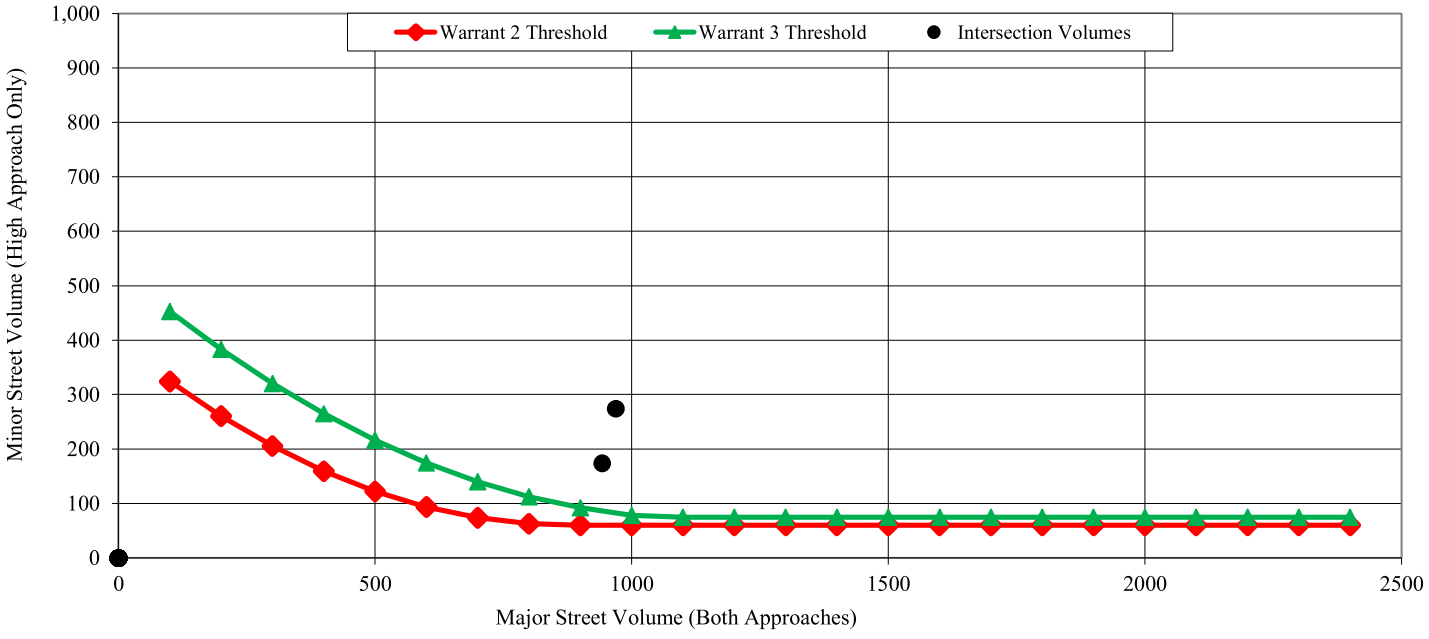
Warrant 1, Eight Hour Vehicular Volume			
	Condition A	Condition B	Condition A+B*
Condition Satisfied?	Not Satisfied	Not Satisfied	Not Satisfied
Required values reached for	2 hours	2 hours	2 (Cond. A) & 2 (Cond. B)
Criteria - Major Street (veh/hr)	350	525	280 (Cond. A) & 420 (Cond. B)
Criteria - Minor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

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

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

Warrant 3, Peak Hour Vehicular Volume		
	Condition A	Condition B
Condition Satisfied?	Not Satisfied	Satisfied
Required values reached for	1264 total, 174 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)



Pedestrian Crossing Volume