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Hills at Harris Creek Traffic Impact Analysis Rolesville, North Carolina



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# TRAFFIC IMPACT ANALYSIS

FOR

# **HILLS AT HARIS CREEK**

#### LOCATED

#### IN

# **ROLESVILLE, NORTH CAROLINA**

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

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RKA Project No. 20498 - 005

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

## **EXECUTIVE SUMMARY**

## 1. Development Overview

A Traffic Impact Analysis (TIA) was conducted for the proposed Hills at Harris Creek development in accordance with the Town of Rolesville (Town) Land Development Ordinance (LDO) and North Carolina Department of Transportation (NCDOT) capacity analysis guidelines. The proposed development is to be located north of Mitchell Mill Road, west of Manly Farm Road, and east of Gro Peg Lane in Rolesville, North Carolina. The proposed development is anticipated to be completed in 2027 and is expected to consist of 211 single-family homes, 109 townhomes, and 3.626 acres of commercial development. It should be noted that the commercial development land use(s) are not known at this time. Therefore, 7,000 square feet (sq. ft.) of general retail space per acre of land [approximately 25,400 sq. ft.] was assumed for the commercial development in this study. Site access is proposed via two (2) full-movement driveway connections to Mitchell Mill Road.

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

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

## 2. Existing Traffic Conditions

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

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



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

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

## 3. Site Trip Generation

The proposed development is assumed to consist of 211 single-family homes, 109 townhomes, and 25,400 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*, 11<sup>th</sup> Edition. Table E-1 provides a summary of the trip generation potential for the site.

Land Use (ITE Code)	Intensity	Daily Traffic	Weekday AM Peak Hour Trips (vph)			Weekday PM Peak Hour Trips (vph)				
		(vpu)	Enter	Exit	Total	Enter	Exit	Total		
Single-Family Home (210)	211 DU	2,010	38	109	147	126	74	200		
Multi-Family Home (Low-Rise) (220)	109 DU	770	14	43	57	42	25	67		
Retail (<40 KSF) (822)	25.4* KSF	1,300	32	21	53	75	76	151		
Total Trips4,080			84	173	257	243	175	418		
Internal Capture (2% AM, 1% PM)**			-2	-3	-5	-5	-3	-8		
Total External Trips			82	170	252	238	172	410		
Pass-By Trips: Shopping Center (34% PM)			-	-	-	-25	-25	-50		
Total Primary	82	170	252	213	147	360				

Table E-1: Site Trip Generation

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

\*\*Utilizing methodology contained in the NCHRP Report 684.



## 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 2027 projected weekday AM and PM peak hour traffic volumes. The following adjacent developments were identified to be considered under future conditions:

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

## 5. Capacity Analysis Summary

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

## 6. Recommendations

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

## **Recommended Improvements by Developer**

Required Frontage Improvements per Rolesville Community Transportation Plan

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

## US 401 Bypass and Jonesville Road

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



## US 401 Bypass and Eastern U-Turn Location

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

### Mitchell Mill Road and Jonesville Road / Peebles Road

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

## Mitchell Mill Road and Site Access 1

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

## Mitchell Mill Road and Site Access 2

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





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



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

## 1. INTRODUCTION

The contents of this report present the findings of the Traffic Impact Analysis (TIA) conducted for the proposed Hills at Harris Creek development in Rolesville, North Carolina. The proposed development, anticipated to be completed in 2027, is located north of Mitchell Mill Road, west of Manly Farm Road, and east of Gro Peg Lane in Rolesville, North Carolina. The purpose of this study is to determine the potential impacts to the surrounding transportation system created by traffic generated by the proposed development, as well as recommend improvements to mitigate the impacts.

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

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

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

## 1.1. Site Location and Study Area

The proposed development is located north of Mitchell Mill Road, west of Manly Farm Road, and east of Gro Peg Lane in Rolesville, North Carolina. Refer to Figure 1 for the site location map. The study area for the TIA was determined through coordination with the North Carolina Department of Transportation (NCDOT) and the Town of Rolesville (Town) and consists of the following existing intersections:



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

Refer to Appendix A for the approved scoping documentation.

### **1.2.** Proposed Land Use and Site Access

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

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

Site access is proposed via two (2) full-movement driveway connections along Mitchell Mill Road. Refer to Figure 2 for a copy of the preliminary site plan.

## 1.3. Adjacent Land Uses

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

## 1.4. Existing Roadways

Existing lane configurations (number of traffic lanes on each intersection approach), 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.



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

**Table 1: Existing Roadway Inventory** 

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









## 2. 2022 EXISTING PEAK HOUR CONDITIONS

#### 2.1. 2022 Existing Peak Hour Traffic Volumes

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

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

Previously collected counts from the year 2021 were projected to the 2022 existing analysis year using a compounded annual growth rate of 2%. Weekday AM and PM traffic volumes were balanced between study intersections, where appropriate. Refer to Figure 4 for 2022 existing weekday AM and PM peak hour traffic volumes. A copy of the count data is located in Appendix B of this report.

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

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





## 3. 2027 NO-BUILD PEAK HOUR CONDITIONS

In order to account for growth of traffic and subsequent traffic conditions at a future year, nobuild 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 2027 projected weekday AM and PM peak hour traffic volumes. Refer to Figure 5 for 2027 projected peak hour traffic.

## 3.2. Adjacent Development Traffic

Through coordination with 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.



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	uisbury Road Assemblage West of Louisbury Road and south of 2025 Stells Road		152 single-family homes	May 2020 by RKA
Kalas / Watkins Family Property	Along the west side of Rolesville Road, nily Property north of Mitchell Mill Road 2025 439 single-family hom		439 single-family homes 96 multi-family homes	August 2019 by Stantec

**Table 2: Adjacent Development Information** 

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 2022), the ultimate cross-section of Jonesville Road is identified as a 2-lane roadway with a center two-way-left-turn-lane (TWLTL) and Mitchell Mill Road is identified as a 4-lane median-divided roadway.



### 3.4. 2027 No-Build Peak Hour Traffic Volumes

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

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

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









### 4. SITE TRIP GENERATION AND DISTRIBUTION

#### 4.1. Trip Generation

The proposed development is assumed to consist of 211 single-family homes, 109 townhomes, and 25,400 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*, 11th Edition. Table 3 provides a summary of the trip generation potential for the site.

Land Use (ITE Code)	Intensity	Daily Traffic	Weekday AM Peak Hour Trips (vph)			Weekday PM Peak Hour Trips (vph)		
		(vpa)	Enter	Exit	Total	Enter	Exit	Total
Single-Family Home (210)	211 DU	2,010	38	109	147	126	74	200
Multi-Family Home (Low-Rise) (220)	109 DU	770	14	43	57	42	25	67
Retail (<40 KSF) (822)	25.4* KSF	1,300	32	21	53	75	76	151
Total Trips		4,080	84	173	257	243	175	418
Internal Capture (2% AM, 1% PM)**			-2	-3	-5	-5	-3	-8
Total External Trips			82	170	252	238	172	410
Pass-By Trips: Shopping Center (34% PM)			-	-	-	-25	-25	-50
Total Primary	82	170	252	213	147	360		

### **Table 3: Trip Generation Summary**

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

\*\*Utilizing methodology contained in the NCHRP Report 684.

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



Internal capture of trips between the retail and residential land uses was considered in this study. Internal capture is the consideration for trips that will be made within the site between different land uses, so the vehicle technically never leaves the internal site but can still be considered as a trip to that specific land use. Based on NCHRP Report 684 methodology, weekday AM and PM peak hour internal capture rates of 2% and 1%, respectively, were applied to the trips generated from the proposed development. The internal capture reductions are expected to account for approximately 5 trips (2 entering and 3 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 50 trips (25 entering and 25 exiting) during the weekday PM peak hour. It should be noted that the pass-by trips were balanced, as it is likely that these trips would enter and exit in the same hour.

The total primary 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 252 trips (82 entering and 170 exiting) during the weekday AM peak hour and 360 trips (213 entering and 147 exiting) during the weekday PM peak hour.

## 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:

- 30% to/from the west via US 401 Bypass
- 15% to/from the east via US 401 Bypass



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- 10% to/from the south via Peebles Road
- 35% to/from the west via Mitchell Mill Road
- 10% to/from the east via Mitchell Mill Road

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.

















## 5. 2027 BUILD TRAFFIC CONDITIONS

## 5.1. 2027 Build Peak Hour Traffic Volumes

To estimate traffic conditions with the site fully built-out, the total site trips were added to the 2027 no-build traffic volumes to determine the 2027 build traffic volumes. Refer to Figure 13 for an illustration of the 2027 build peak hour traffic volumes with the proposed site fully developed.

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

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





#### 6. TRAFFIC ANALYSIS PROCEDURE

Study intersections were analyzed using the methodology outlined in the *Highway Capacity Manual* (HCM), 6<sup>th</sup> 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.

UNSIGNA	ALIZED INTERSECTION	SIGNALIZED INTERSECTION			
LEVEL OF SERVICE	AVERAGE CONTROL DELAY PER VEHICLE (SECONDS)	LEVEL OF SERVICE	AVERAGE CONTROL DELAY PER VEHICLE (SECONDS)		
А	0-10	А	0-10		
В	10-15	В	10-20		
С	15-25	С	20-35		
D	25-35	D	35-55		
Е	35-50	Е	55-80		
F	>50	F	>80		

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

## 6.1. Adjustments to Analysis Guidelines

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



## 7. CAPACITY ANALYSIS

### 7.1. US 401 Bypass and Jonesville Road

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

ANALYSIS	A P P R	LANE	WEEK PEAK LEVEL OI	DAY AM HOUR F SERVICE	WEEKDAY PM PEAK HOUR LEVEL OF SERVICE		
SCENARIO	O A C H	CONFIGURATIONS	Approach	Overall (seconds)	Approach	Overall (seconds)	
	EB	2 TH, 1 RT					
2022 Existing	WB*	1 LT 1 DT	$C^1$	N/A	$E^1$	N/A	
	TND ER**		D <sup>2</sup> F1		C <sup>2</sup>		
	WB	2 TH 1 RT		N/A		N/A	
	SB	1 RT	E <sup>2</sup>	1 1 1 1	B <sup>2</sup>	1 1 / 1 1	
	EB	2 TH, 1 RT					
	WB*	1 LT	$D^1$	N/A	$F^1$	N/A	
2027 No Build	NB	1 RT	B2	-	E <sup>2</sup>	-	
2027 NO-Dullu	EB**	1 LT	$F^1$		E1		
	WB	2 TH, 1 RT		N/A		N/A	
	SB	1 RT	F <sup>2</sup>		B <sup>2</sup>		
	EB	2 TH, 1 RT					
	WB*	1 LT	$D^1$	N/A	$F^1$	N/A	
2027 Build	NB	1 RT	<u>C</u> <sup>2</sup>		F <sup>2</sup>		
	EB**	1 LT	F <sup>1</sup>		$E^1$		
	WB	2 TH, 1 KT 1 PT	 E2	N/A	 D2	N/A	
	SB	1 K1	$F^2$		B²		

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

\*Synchro analyzed the WB left-turns as SB through movements due to the nature of the superstreet and synchro limitations.

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

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

2. Level of service for minor-street approach.

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



the westbound left-turn movement during the weekday PM peak hour (LOS E), and the southbound minor-street approach during the weekday AM peak hour (LOS E).

Under 2027 no-build and 2027 build traffic conditions, the major-street left-turn movements are expected to operate at LOS E/F during the weekday AM and PM peak hours with the exception of the westbound left-turn movement during the weekday AM peak hour (LOS D) under 2027 no-build and 2027 build traffic conditions. The minor-street approaches are expected to operate at LOS E/F during the weekday AM and PM peak hours with the exception of the northbound approach during the weekday AM peak hour (LOS B/C) and the southbound approach during the weekday PM peak hour (LOS B) under 2027 no-build and 2027 build traffic conditions. It should be noted that the proposed development is expected to account for approximately 8% and 7% 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 2027 build traffic conditions to achieve acceptable levels of service. Weekday AM and PM peak hour traffic volumes were utilized in evaluating the potential need for signalization based on the guidelines contained within the Manual on Uniform Traffic Control Devices (MUTCD) and within the Guidelines for Signalization of Intersections with Two or Three Approaches Final Report, published by ITRE. Based on a review of signal warrants at this intersection, the peak hour warrant (warrant 3) from the MUTCD is not expected to be met for either the weekday AM and PM peak hours under 2027 build traffic conditions. It is not expected that this intersection would satisfy the MUTCD 8-hour (warrant 1) or 4-hour (warrant 2) warrants, which NCDOT favors for installation of a traffic signal. These longer period warrants are not typically met for residential areas due to the distinct peak traffic periods for these types of development. Based on a review of ITRE 95<sup>th</sup> percentile queue length calculations, the northbound right-turn movement demand is expected to exceed capacity during the weekday PM peak hour under 2027 no-build and 2027 build traffic conditions. Refer to Appendix J for a copy of the MUTCD warrants and the ITRE 95th percentile queue length calculations.



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

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



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

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

ANALYSIS	A P P R	LANE	WEEKE PEAK LEVEL OF	DAY AM HOUR <sup>:</sup> SERVICE	WEEKDAY PM PEAK HOUR LEVEL OF SERVICE	
SCENARIO	O A C H	CONFIGURATIONS	Approach	Overall (seconds)	Approach	Overall (seconds)
2022 Existing	EB* WB	1 UT 2 TH	C1 	N/A	B <sup>1</sup>	N/A
2027 No-Build	EB* WB	1 UT 2 TH	E1 	N/A	B1 	N/A
2027 Build	EB* WB	1 UT 2 TH	F <sup>1</sup>	N/A	B <sup>1</sup> 	N/A

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

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

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

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

Under 2027 build traffic conditions, the major-street u-turn movement is expected to operate at LOS F during the weekday AM peak hour and at LOS B during the weekday PM peak hour. It should be noted that the proposed development is expected to account for approximately 2% and 7% 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.



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Due to the poor levels-of-service expected at this intersection, a traffic signal was considered under 2027 build traffic conditions to achieve acceptable levels of service. Weekday AM and PM peak hour traffic volumes were utilized in evaluating the potential need for signalization based on the guidelines contained within the *Manual on Uniform Traffic Control Devices* (MUTCD) and within the *Guidelines for Signalization of Intersections with Two or Three Approaches Final Report*, published by ITRE. Based on a review of signal warrants at this intersection, the peak hour warrant (warrant 3) from the MUTCD is expected to be met for the weekday AM peak hour under 2027 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 95<sup>th</sup> percentile queue length calculations, the eastbound u-turn movement demand is expected to exceed capacity during the weekday AM peak hour under 2027 build traffic conditions. Refer to Appendix J for a copy of the MUTCD warrants and the ITRE 95<sup>th</sup> percentile queue length calculations.

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

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



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

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

ANALYSIS	A P P R	LANE	WEEKI PEAK LEVEL OF	DAY AM HOUR SERVICE	WEEKDAY PM PEAK HOUR LEVEL OF SERVICE		
SCENARIO		CONFIGURATIONS	Approach	Overall (seconds)	Approach	Overall (seconds)	
2022 Existing	EB WB NB SB	1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT	$egin{array}{c} B^1 \ B^1 \ B^1 \ B^1 \ B^1 \end{array}$	B (13)	$\begin{array}{c} B^1\\ A^1\\ A^1\\ A^1\end{array}$	B (11)	
2027 No-Build	EB WB NB SB	1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT	$\begin{array}{c} C^1 \\ F^1 \\ B^1 \\ B^1 \end{array}$	F (51)	$\begin{array}{c} C^1 \\ C^1 \\ B^1 \\ B^1 \end{array}$	C (19)	
2027 Build	EB WB NB SB	1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT 1 LT-TH-RT	$\begin{array}{c} C^1 \\ F^1 \\ B^1 \\ C^1 \end{array}$	F (127)	$\begin{matrix} F^1 \\ F^1 \\ C^1 \\ C^1 \end{matrix}$	F (69)	
2027 Build - Improved	EB WB NB SB	1 LT-TH-RT 1 LT-TH, <b>1 RT</b> 1 LT-TH-RT <b>1 LT</b> , 1 TH-RT	$\begin{array}{c} C^1 \\ F^1 \\ C^1 \\ C^1 \end{array}$	F (97)	$F^1$ $E^1$ $C^1$ $C^1$	F (73)	

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

Improvements by the developer are shown in bold.

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

Capacity analysis of 2022 existing and 2027 no-build traffic conditions indicates that the intersection is expected to operate at an overall LOS C or better during the weekday AM and PM peak hours, with the exception of the weekday AM peak hour under 2027 no-build traffic conditions (LOS F). Under 2027 build traffic conditions, this intersection is expected to operate at an overall LOS F during the weekday AM and PM peak hours. It should be noted that the



proposed development is expected to account for approximately 16% and 24% 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. An exclusive left-turn lane on the southbound approach (Jonesville Road) and right-turn lane on the westbound approach (Mitchell Mill Road) are recommended by the developer. It should be noted that an exclusive southbound left-turn lane was also identified in the 5109 Mitchell Mill Road TIA. With these improvements, the intersection is expected to continue operating at an overall LOS F during the weekday AM and PM peak hours.

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

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

Based on the Town's LDO, it is recommended that this intersection be monitored for signalization and a full signal warrant analysis be conducted prior to the full build-out of the



proposed development and install a traffic signal if warranted and approved by the Town and NCDOT. With signalization, it is expected that this intersection will operate at acceptable levels-of-service during the weekday AM and PM peak hours.



### 7.4. Mitchell Mill Road and Site Access 1

The proposed intersection of Mitchell Mill Road and Site Access 1 was analyzed under 2027 build traffic conditions with the lane configurations and traffic control shown in Table 8. Refer to Table 8 for a summary of the analysis results. Refer to Appendix G for the synchro capacity analysis reports.

Α WEEKDAY AM WEEKDAY PM Ρ PEAK HOUR PEAK HOUR Ρ LEVEL OF SERVICE LEVEL OF SERVICE ANALYSIS R LANE **SCENARIO** 0 CONFIGURATIONS Α Overall Overall Approach Approach С (seconds) (seconds) н EB 1 LT ,1 TH  $\mathbf{A}^1$  $\mathbf{A}^1$ 2027 Build N/A N/A WB 1 TH-RT  $C^2$  $B^2$ SB 1 LT-RT

Table 8: Analysis Summary of Mitchell Mill Road and Site Access 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 2027 build traffic conditions indicates that the major-street left-turn movement is expected to operate at LOS A during the weekday AM and PM peak hours. The minor-street approach is expected to operate at LOS C or better during the weekday AM and PM peak hours.

Right and left-turn lanes were considered based on the NCDOT *Policy on Street and Driveway Access to North Carolina Highways* and a left-turn lane is recommended on the 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 I for a copy of the turn lane warrants.



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

The proposed intersection of Mitchell Mill Road and Site Access 2 was analyzed under 2027 build traffic conditions with the lane configurations and traffic control shown in Table 9. Refer to Table 9 for a summary of the analysis results. Refer to Appendix H for the synchro capacity analysis reports.

 Table 9: Analysis Summary of Mitchell Mill Road and Site Access 2

ANALYSIS SCENARIO	A P P R O A C H	LANE CONFIGURATIONS	WEEKDAY AM PEAK HOUR LEVEL OF SERVICE		WEEKDAY PM PEAK HOUR LEVEL OF SERVICE	
			Approach	Overall (seconds)	Approach	Overall (seconds)
2027 Build	EB WB SB	1 LT, 1 TH 1 TH, 1 RT 1 LT-RT	A <sup>1</sup>  C <sup>2</sup>	N/A	A <sup>1</sup>  C <sup>2</sup>	N/A

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

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

2. Level of service for minor-street approach.

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

Right and left-turn lanes were considered based on the NCDOT *Policy on Street and Driveway Access to North Carolina Highways* and are recommended on the westbound and eastbound approaches of Mitchell Mill Road, respectively. Refer to Appendix I for a copy of the turn lane warrants.



## 8. CONCLUSIONS

This Traffic Impact Analysis was conducted to determine the potential traffic impacts of the proposed Hills at Harris Creek development located north of Mitchell Mill Road, west of Manly Farm Road, and east of Gro Peg Lane in Rolesville, North Carolina. The development is expected to consist of 211 single-family homes, 109 townhomes, and 3.626 acres of commercial development and to be built-out in 2027. It should be noted that the commercial development land use(s) and intensity are not known at this time. Therefore, 7,000 sq. ft. of general retail space per acre of land [25,400 sq. ft.] was assumed for the commercial development in this study. Site access is proposed via two (2) full-movement driveway connections along Mitchell Mill Road.

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

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

## Trip Generation

It is estimated that the proposed development will generate approximately 252 primary trips (82 entering and 170 exiting) during the weekday AM peak hour and 360 primary trips (213 entering and 147 exiting) during the weekday PM peak hour.

## Rolesville Community Transportation Plan

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



#### Adjustments to Analysis Guidelines

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

#### Intersection Capacity Analysis Summary

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



## 9. **RECOMMENDATIONS**

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

## **Recommended Improvements by Developer**

Required Frontage Improvements per Rolesville Community Transportation Plan

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

#### US 401 Bypass and Jonesville Road

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

## US 401 Bypass and Eastern U-Turn Location

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

#### Mitchell Mill Road and Jonesville Road / Peebles Road

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



#### Mitchell Mill Road and Site Access 1

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

#### Mitchell Mill Road and Site Access 2

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



