5.4.1 SimTraffic Operations

SimTraffic runs were completed for each of the scenarios studied. The results are summarized in this section. Ten (10) SimTraffic runs were completed and the average was taken for reporting purposes. Table 9 provides a summary of the simulated maximum queues for the study intersection key movements.

Table 9: Maximum Queue Length Summary

Maximum Queue Length (feet)		Available Storage (feet)	2019 Existing		2025 No Build		2025 Build w/o Improvements		2025 Build w/ Improvements	
			AM	PM	AM	PM	AM	PM	AM	PM
Rolesville Road at Quarry Road / Young Street PUD Northern Driveway	EBL	275	-	-	206	170	251	206	203	213
	WBR	250	62	51	88	67	102	85	108	77
	NBL	100	-	-	135	122	118	176	121	166
	NBR	100	-	-	167	86	184	111	200	133
	SBL	525	63	52	139	150	136	136	133	147
	SBR	100	-	-	176	192	141	199	175	197
Rolesville Road at Rolesville High School Driveway / Young Street PUD Southern Driveway	WBR	255	256	32	286	68	355	75	355	70
	NBL	50	-	-	21	19	20	26	20	28
	NBR	350	-	-	0	0	0	0	0	0
	SBL	350	126	57	104	76	109	71	118	65
Rolesville Road at Mitchell Mill Road	EBLTR	N/A	-	-	124	125	144	155	157	145
	WBLT	N/A	-	-	154	56	169	57	203	66
	WBR	285	11	11	0	0	0	0	0	0
	NBLTR	N/A	-	-	357	144	827	230	587	189
	SBLTR	N/A	-	-	332	183	663	223	508	267
Rolesville Road at Driveway A	EBL	N/A	-	-	-	-	125	89	82	60
	EBR	100	-	-	-	-	-	-	54	54
	NBLT	100	-	-	-	-	95	152	33	53
Rolesville Road at Driveway B/Wheeler Tract Driveway	EBLTR	N/A	-	-	-	-	50	39	51	34
	WBLTR	N/A	-	-	83	64	102	75	92	77
	NBL	100	-	-	-	-	-	-	25	17
	SBL	N/A	-	-	88	112	104	134	94	135
Rolesville Road at Driveway C	EBL	N/A	-	-	-	-	148	119	101	73
	EBR	100	-	-	-	-	-	-	66	52
	NBLT	100	-	-	-	-	153	190	45	69
	SBTR	100	-	-	-	-	0	12	0	9

The results of the SimTraffic queuing analyses indicate that the recommended storage lengths on Rolesville Road at the site driveways are adequate to accommodate the maximum queues observed during simulation during the peak hours.

5.5 TRAFFIC SIGNAL WARRANT ANALYSIS

Town of Rolesville staff has requested that a signal warrant analysis be performed for the intersection of Rolesville Road at Mitchell Mill Road.

The Manual on Uniform Traffic Control Devices (MUTCD)[9] contains nine warrants for investigating the need for a traffic signal at a particular location. The satisfaction of a signal warrant or warrants may require the installation of a traffic signal. Three of the warrants deal directly with traffic volumes. Two warrants focus on pedestrian issues, one focuses on safety, one on railroad at-grade crossing, one on traffic signal progression, and one on a planning level (non-data based) analysis. Files associated with the volume warrants are contained within the appendix CD.

5.5.1 Data Collection

Turning movement counts collected in 2018 were performed for the peak hour periods only. That is, from 7:00 AM to 9:00 AM and 4:00 PM to 6:00 PM. In-order to perform the warrant analysis, data during the off-peak times is necessary. Therefore, A 16-hour turning movement count was performed by National Data & Surveying Services, Inc. on Tuesday, April 30, 2019 from 6:00 AM to 10:00 PM at the intersection of Rolesville Road at Mitchell Mill Road. The raw count data can be found in the appendix CD.

Crash data for the intersection of Rolesville Road at Mitchell Mill Road was requested from NCDOT. NCDOT staff responded that no crashes were recorded at this intersection between April 1, 2014 and March 31, 2019.

5.5.2 Volume Development

The 16-hour turning movement count was grown by two-percent (2%) per year to the build-out year of 2025 to account for historic growth traffic discussed in section 4.2. Traffic volumes from the Young Street PUD and the proposed development were also added to the intersection. This was achieved by applying the hourly distribution for all 16 hours of entering and exiting vehicle trips contained within Trip Generation[3] with each development's trips and trip distribution.

5.5.3 Warrant 1: Eight-Hour Vehicular Volume

This warrant is intended for application at locations where there is a large volume of intersection traffic. To meet Warrant 1, the major street traffic (total of both approaches) must meet or exceed 350 vehicles per hour while the minor street traffic (one direction only) must meet or exceed 140 vehicles per hour for any eight hours of the day (Condition A – Minimum Vehicular Volume), or the major street traffic (total of both approaches) must meet or exceed 525 vehicles per hour while the minor street traffic (one direction only) must meet or exceed 70 vehicles per hour for any 8 hours of the day (Condition B – Interruption of Continuous Traffic). The warranting volumes were reduced by 30% since the speed limit on Rolesville Road and Mitchell Mill Road exceed 40 mph.

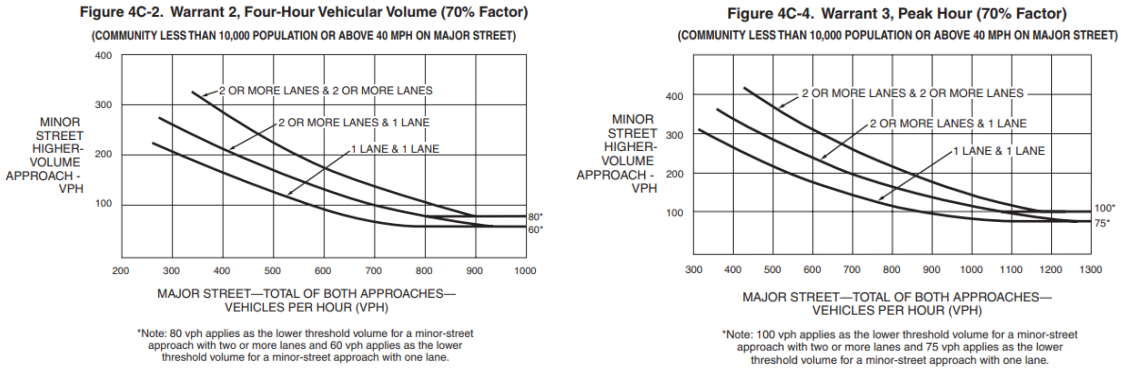
The volumes at the intersection of Rolesville Road and Mitchell Mill Road meet the 1B, 1C-A, and 1C-B sub-sections for the eight-hour vehicular volume warrants for a traffic signal to be installed at the intersection.

5.5.4 Warrant 2: Four-Hour Vehicular Volume

The warrant is intended for locations where, for a short period of the day, minor road traffic experiences excessive delays in attempting to enter or cross the major street. Warrant 2 requires that the combination of the major street traffic (total of both approaches) and minor street traffic (one direction only) reaches a designated minimum volume during any four hours of any average day.

Eight (8) of the hourly vehicular volume combinations meet the minimum criteria set in the "70% conditions" as shown on Figure 15.

Figure 15: Warrant 2 (Four-Hour Vehicular Volume) & Warrant 3 (Peak Hour)



The four-hour vehicular volume meets the warrant for a traffic signal to be installed at the intersection.

5.5.5 Warrant 3: Peak Hour

This warrant is intended to be used where large numbers of vehicles are attracted or discharged for brief periods and minor street traffic suffers excessive delay when entering or crossing the major street. Warrant 3 requires that the combination of the major street traffic (total of both approaches) and the minor street traffic (one approach only) reaches a designated minimum volume during any one hour of an average day.

The peak hour volumes meet the warrant for a traffic signal to be installed at the intersection.

5.5.6 Warrant 4: Pedestrian Volume

The pedestrian volume signal warrant is intended for locations where traffic volumes on the major street are such that pedestrians experience excessive delay in crossing the major street. Warrant 4 requires a minimum of 75 pedestrians for each of any four hours or 93 pedestrians during the peak hour.

Bicycle and pedestrian counts were included in the sixteen-hour turning movement count. In the sixteen-hour period from 6:00 AM to 10:00 PM, eight (8) bicycles and no pedestrians were recorded at the intersection. Therefore, the criteria for this warrant are not met.

5.5.7 Warrant 5: School Crossing

This warrant is intended for application where school children must cross the major street is the principle reason to consider the installation of a traffic control signal. The nearest driveway for Rolesville High School is approximately 1.8 miles north of the intersection of Rolesville Road at Mitchell Mill Road.

The criteria for this warrant are not met.

5.5.8 Warrant 6: Coordinated Signal System

This warrant is intended for intersections that fall within an existing coordinated signal system in order to maintain proper vehicle progression.

The study intersection is not located within or adjacent to an existing coordinated system. Warrant 6 is not met.

5.5.9 Warrant 7: Crash Experience

No crashes were recorded at the intersection of Rolesville Road at Mitchell Mill Road in the five-year period from April 1, 2014 and March 31, 2019. Therefore, the criteria for this warrant is not met.

5.5.10 Warrant 8: Roadway Network

A signal may be justified to encourage concentration and organization of traffic flow on a roadway network. According to the MUTCD, Warrant 8 can be considered when two or more major routes intersect and a minimum total entering volume of at least 1,000 vehicles during the peak hour of a typical weekday and has 5-year projected traffic volumes that meet one or more of Warrants 1, 2, and 3.

Rolesville Road and Mitchell Mill Road are currently classified as a minor arterial and major collector; respectively. Therefore, the criteria for this warrant is not met.

5.5.11 Warrant 9: Intersection Near a Grade Crossing

This warrant is intended for use at a location where the proximity to the intersection of a grade crossing on an intersection approach controlled by a stop or yield sign is the principal reason to consider installing a traffic control signal.

The study intersection is not located near an “at-grade” railroad crossing. Warrant 9 is not met.

5.5.12 Signal Warrant Analysis Conclusions

The signal warrant study met three of the signal warrants, eight-hour vehicular volume, four-hour vehicular volume and peak hour. Table 10 below provides a summary of the results for each warrant.

Table 10: Warrant Summary

Warrant	Description	Results
1	Eight-Hour Vehicular Volume	Criteria Met
2	Four-Hour Vehicular Volume	Criteria Met
3	Peak Hour	Criteria Met
4	Pedestrian Volume	Criteria Not Satisfied
5	School Crossing	Criteria Not Satisfied
6	Coordinated Signal System	Criteria Not Satisfied
7	Crash Experience	Criteria Not Satisfied
8	Roadway Network	Criteria Not Satisfied
9	Intersection Near a Grade Crossing	Criteria Not Satisfied

Beyond the criteria outlined by the warrants, the existing configuration of an all-way stop controlled intersection is anticipated to operate with excessive delays unless a traffic signal or other means of control is installed at this intersection. Due to this and the criteria being met for three of the nine warrants, the installation of a traffic signal is warranted at the intersection of Rolesville Road at Mitchell Mill Road.

6.0 RECOMMENDATIONS

The following improvements are proposed as part of the Young Street PUD development.

Rolesville Road at Quarry Road / Northern Driveway

- Construct a northbound left-turn lane on Young Street (Rolesville Road) with 100 feet of storage and appropriate tapers;
- Construct a northbound right-turn lane on Young Street (Rolesville Road) 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-turn lane on the Northern Driveway; and
- Install a traffic signal when warranted.

Rolesville Road at Rolesville High School Driveway / Southern Driveway

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

Rolesville Road at Mitchell Mill Road

- Install a traffic signal when warranted.

Frontage widening along Rolesville Road will accommodate the recommended turn lanes and associated storage. The following recommended improvements should be constructed as part of the Kalas / Watkins Family Property Development:

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

- 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.

The recommended improvements are illustrated in Figure 16.

Figure 16: Recommended Improvements