

# TRAFFIC IMPACT ANALYSIS

## PINEVILLE TOWNHOMES

NC 51 (Rock Hill-Pineville Road) & Downs Road  
Pineville, North Carolina



for

LandDesign  
(On Behalf of Kaplan Residential)

May 2019

387-024 (C-2165)







## **TABLE OF CONTENTS**

<b>EXECUTIVE SUMMARY</b>	<b>1</b>
<b>PROPOSED DEVELOPMENT</b>	<b>3</b>
<b>AREA CONDITIONS</b>	<b>6</b>
<b>PROJECTED TRAFFIC</b>	<b>9</b>
<b>TRAFFIC ANALYSIS</b>	<b>11</b>
<b>CONCLUSION</b>	<b>17</b>
<b>APPENDIX</b>	<b>18</b>

## **LIST OF TABLES**

<b>TABLE 1: AVERAGE ANNUAL DAILY TRAFFIC VOLUMES (VEH. PER DAY)</b>	<b>6</b>
<b>TABLE 2: SITE TRIP GENERATION</b>	<b>9</b>
<b>TABLE 3: DOWNS ROAD &amp; DOWNS CIRCLE LEVELS OF SERVICE</b>	<b>13</b>
<b>TABLE 4: 2021 VEHICLE QUEUE LENGTHS</b>	<b>14</b>

## **LIST OF FIGURES**

<b>FIGURE 1: AREA OF INFLUENCE</b>	<b>4</b>
<b>OVERALL MASTERPLAN</b>	<b>5</b>
<b>FIGURE 2: 2019 EXISTING/2021 NO BUILD PEAK HOUR VOLUMES + SITE DIRECTIONAL DISTRIBUTION</b>	<b>8</b>
<b>FIGURE 3: 2021 AM/PM PEAK BUILD TRAFFIC VOLUMES</b>	<b>10</b>
<b>FIGURE 4: EXISTING/RECOMMENDED LANEAGE</b>	<b>15</b>
<b>FIGURE 5: CONCEPTUAL IMPROVEMENTS</b>	<b>16</b>



## **EXECUTIVE SUMMARY**

Kaplan Residential proposes to construct 175 townhomes located on the northwest quadrant of NC 51 (Rock Hill-Pineville Road) and Downs Road in Pineville, NC (see Figure 1). The townhome (multi-family low-rise) development is expected to be completed in 2021.

This report provides analysis of the traffic operations within the area of influence, according to the standards set by the North Carolina Department of Transportation's (NCDOT) "Policy on Street and Driveway Access to North Carolina Highways, Chapter 4 Part C" and the Town of Pineville's requirements. It provides intersection improvements needed for mitigating traffic impacts. This study evaluates the following scenarios:

- 2019 Existing Conditions
- 2021 No Build
- 2021 Build

The area of influence of the study site as indicated by Pineville and NCDOT staff includes the following one existing intersection and one proposed right-in/right-out only (RI/RO) intersection:

1. Downs Road & Downs Circle/Proposed Access "A" (unsignalized)

According to the site plan (see Overall Master Plan), access to the development is expected to occur via two unsignalized locations:

- Proposed Full Movement Access "A" – located on Downs Road opposite Downs Circle (forming a four-legged intersection). It is assumed that this access will be secondary in nature – the Proposed RI/RO access on NC 51 (described below) will be the main entrance to the project.
- Proposed Right-in/Right-out (RI/RO) Access – located on NC 51 approximately 475 feet west of Downs Road (not required to be analyzed)

The proposed trip generation results indicate that the residential development is expected to generate 82 AM peak hour trips and 97 PM peak hour trips.

Per NCDOT and Pineville, no nearby approved (offsite) developments are located within the area of influence.

Currently, the existing Downs Road & Downs Circle unsignalized intersection operates at an HCM 6<sup>th</sup> TWSC LOS "A" in both peak hours. Typically, an intersection is said to be operating at capacity at a volume-to-capacity (v/c) ratio of 1.00 and acceptable at a LOS "D" or better.

**NCDOT ANALYSIS REQUIREMENTS** - In order to determine the mitigation responsibility of the developer, this study compares 2018 Build results to the 2018 No Build results.



**Rock Hill-Pineville Road  
Facing West Along Site**





Chapter 5, Section J of the *July 2003 NCDOT Policy on Street and Driveway Access to North Carolina Highways*, the applicant shall be required to identify mitigation improvements to the roadway network if at least one of the following conditions exists when comparing base network conditions to project conditions:

- *The total average delay at an intersection or an individual approach increases by 25% or greater, while maintaining the same level of service,*
- *The Level of Service (LOS) degrades by at least one level at an intersection or an individual approach,*
- *Or the Level of Service is “F” for an intersection or an individual approach.*

This section of the access policy also states that, *mitigation improvements shall be identified when the analysis indicates that the 95<sup>th</sup> percentile queue exceeds the storage capacity of the existing lane.*

With the results of our analyses (specifics are described in the Traffic Analysis section of this report) we recommend the following configurations/modifications at the study intersection/proposed accesses:

### **2021 Build Suggested Configuration/Modifications:**

#### **1. Downs Road & Downs Circle/Proposed Access “A” (unsignalized)**

We propose the following intersection configuration:

- Re-mark the existing westbound right turn lane on Downs Circle to a combined thru-right turn lane
- Re-mark the existing northbound TWLTL on Downs Road at Downs Circle/Proposed Access “A” with a 50-foot left turn lane
- Proposed Access “A” should include the following cross-section:
  - A westbound receiving lane
  - An eastbound left turn lane with 50 feet of storage
  - An eastbound combined thru-right turn lane

#### **NC 51 (Rock Hill-Pineville Road) & Proposed RI/RO Access (unsignalized)**

- Construct a westbound right turn lane on NC 51 with 100 feet of storage and appropriate bay taper. The existing median on NC 51 at the Proposed RI/RO Access will prohibit left entering and left exiting movements

**In summary, the proposed residential townhome development is not expected to create extensive roadway/intersection issues, especially with the anticipated minimal amount of traffic associated with the residential development.**



## **PROPOSED DEVELOPMENT**

Kaplan Residential proposes to construct 175 townhomes located on the northwest quadrant of NC 51 (Rock Hill-Pineville Road) and Downs Road in Pineville, NC (see Figure 1). The townhome (multi-family low-rise) development is expected to be completed in 2021.

According to the site plan (see Overall Master Plan), access to the development is expected to occur via two unsignalized locations:

- Proposed Full Movement Access “A” – located on Downs Road opposite Downs Circle (forming a four-legged intersection). It is assumed that this access will be secondary in nature – the Proposed RI/RO access on NC 51 (described below) will be the main entrance to the project.
- Proposed Right-in/Right-out (RI/RO) Access – located on NC 51 approximately 475 feet west of Downs Road (not required to be analyzed)



**Rock Hill-Pineville Road  
Facing West Along Site**



**PINEVILLE TOWNHOMES TIA**  
 PINEVILLE, NC

**AREA of  
 INFLUENCE**



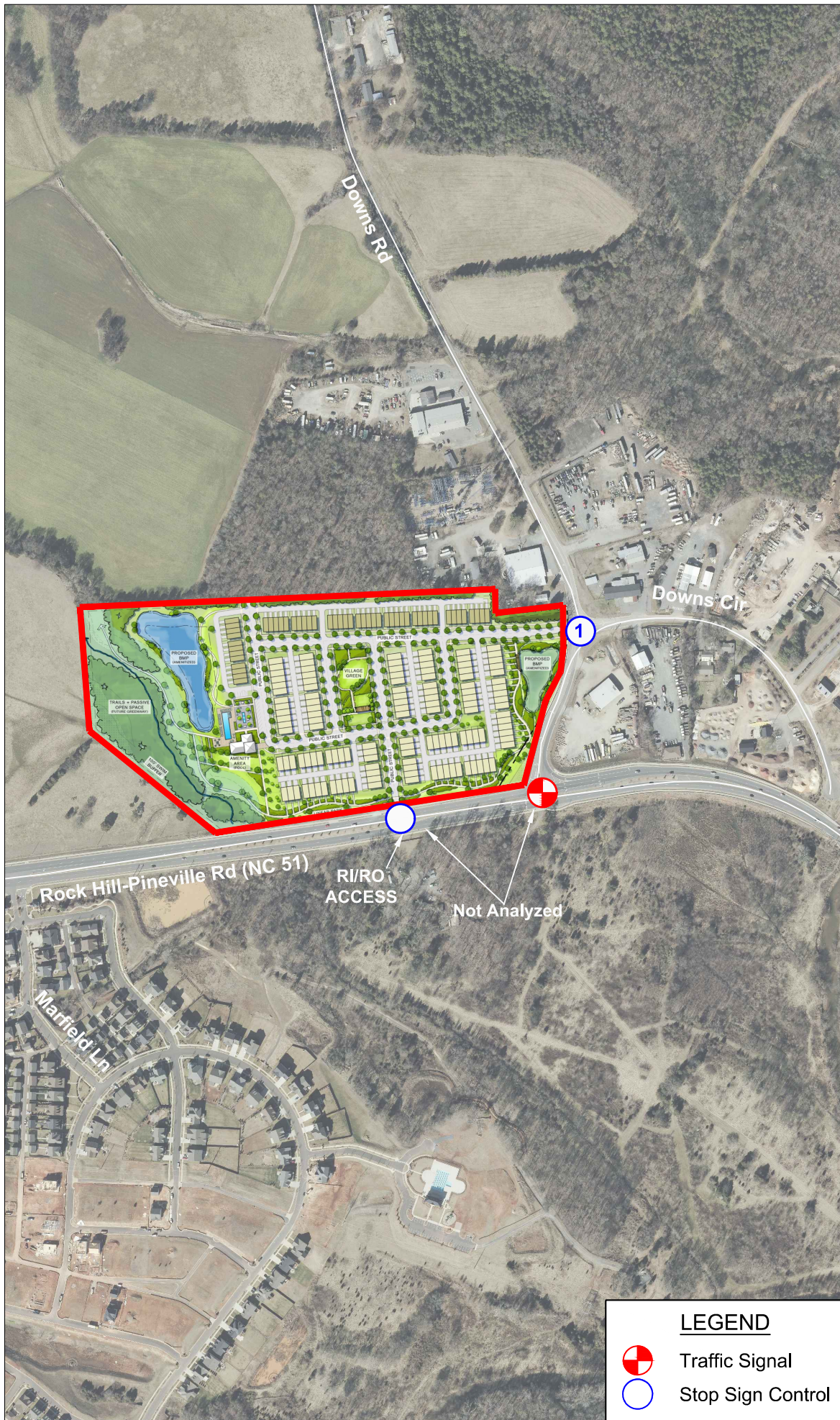
PROJECT #: 387-024  
 DRAWN BY: SSA  
 CHECKED BY: REG

MARCH 2019

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**LEGEND**

- Traffic Signal
- Stop Sign Control

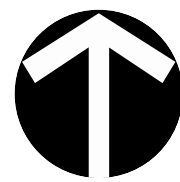




DEVELOPMENT DATA

TOTAL: 175 UNITS  
22' x 50': 125 UNITS  
18' x 50': 50 UNITS

TOTAL PARKING REQUIRED: 569 SPACES (3.25 SPACES/UNIT)  
TOTAL PARKING PROVIDED: 787 SPACES (5.06 SPACES/UNIT)  
GARAGE: 300 SPACES  
DRIVEWAY: 300 SPACES  
ON-STREET: 187 SPACES





## **AREA CONDITIONS**

The area of influence of the study site as indicated by Pineville and NCDOT staff includes the following one existing intersection and one proposed (right-in/right-out only [RI/RO]) intersection:

1. Downs Road & Downs Circle/Proposed Access "A" (unsignalized)



**Downs Road Facing South  
Toward Downs Circle/  
Proposed Access**



**Downs Circle Facing West  
Toward Downs Road/  
Proposed Access**



**Rock Hill-Pineville Road  
Facing East Along Site**

As indicated on the most current NCDOT Functional Classification information, NC 51 (Rock Hill-Pineville Road) is a minor arterial roadway with a posted speed limit of 45 mph in the vicinity of the Pineville Townhome site (located along the south side of the development). The roadway is a four-lane median-divided facility (two lanes in each direction) with appropriate left and right turn lanes. The roadway includes curb/gutter, planting strip, and sidewalk on both sides of the corridor.

Downs Road is classified as a local roadway, with a posted speed limit of 45 mph (located along the east side of the development). The roadway is a two-lane facility with a left turn lane/two-way left-turn lane at Downs Circle. Curb/gutter is located on both sides of the street along the site frontage.

Morning (7:00-9:00 AM) and afternoon (4:30-6:30 PM) peak period turning movement counts were conducted at the existing unsignalized intersection on Tuesday April 2, 2019 (while school was in session).

In addition to the intersection turning movement counts, NCDOT is the source for average annual two-way daily traffic (AADT) volumes within the area of influence. The latest (2016) AADT volumes are depicted in Table 1.

**Table 1: Average Annual Daily Traffic Volumes (veh. per day)**

<b>Roadway</b>	<b>2016</b>
Downs Rd. along site	5,400
NC 51 west of site	15,000
NC 51 east of site	17,000



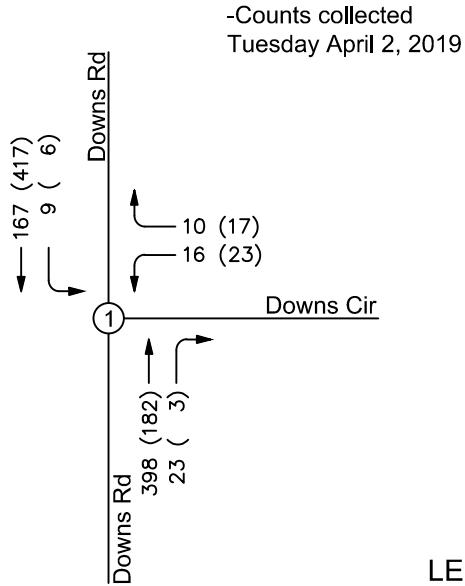


According to the latest online crash data collected by NCDOT for 2014-2018 there is no reported crash data in the vicinity of the proposed site.

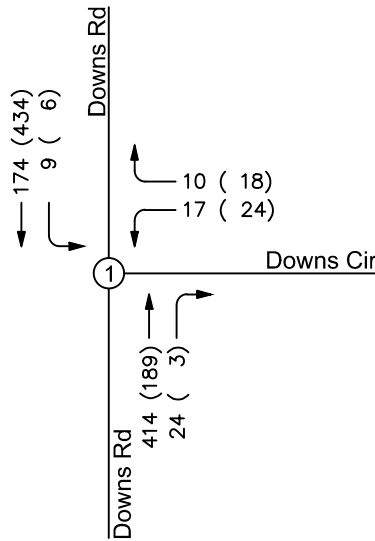
Figure 2 shows the 2019 existing and 2021 No Build traffic volumes for the AM and PM peak hours as well as the directional distribution for the site traffic. These directional distribution percentages were derived from the existing traffic volumes and the AADT volumes described previously (and approved in the previous TIA for the proposed site).



## 2019 EXISTING PEAK HOUR TRAFFIC VOLUMES



## 2021 NO BUILD PEAK HOUR TRAFFIC VOLUMES

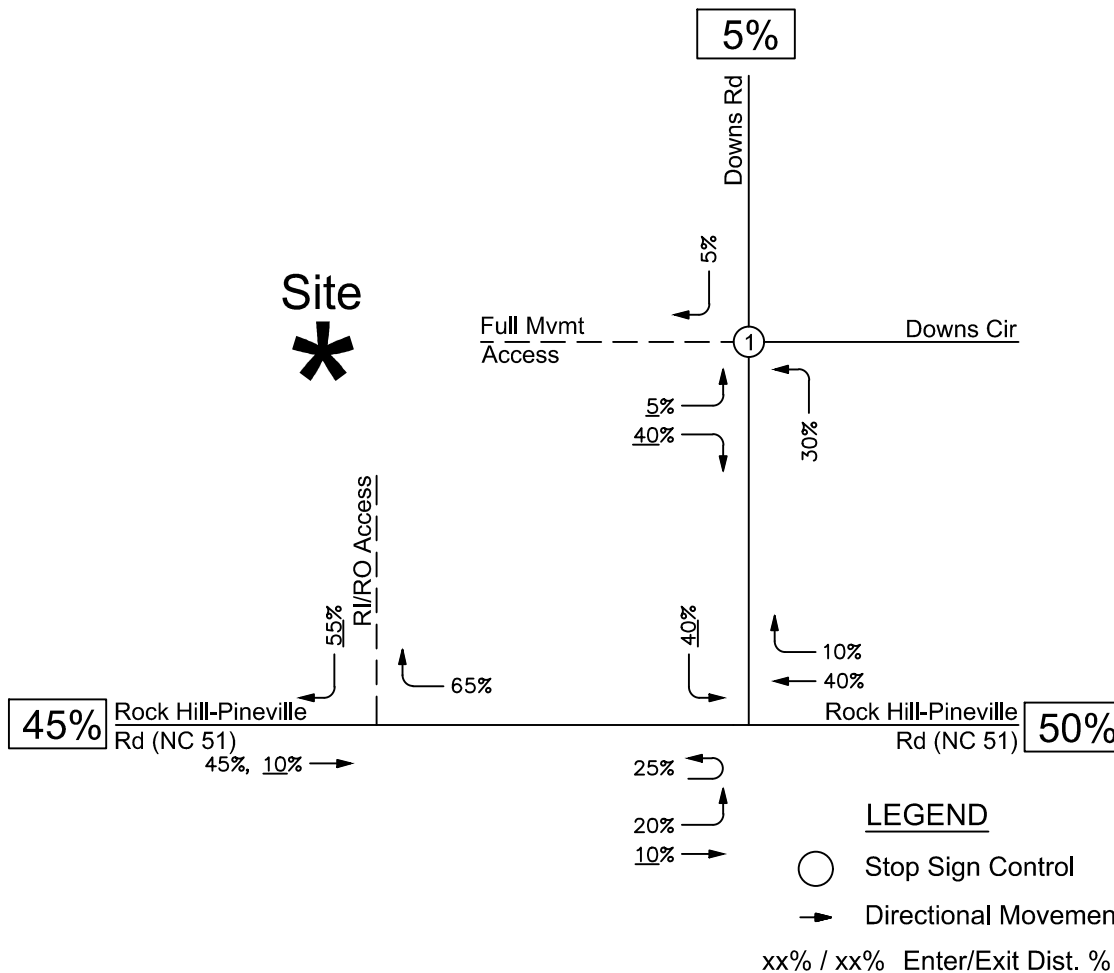


### LEGEND

- Stop Sign Control
- ➔ Directional Movement

VOLUMES: AM (PM)

## SITE DIRECTIONAL DISTRIBUTION



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PINEVILLE, NC

## EXISTING/NO BUILD PEAK HOUR TRAFFIC VOLUMES & SITE DIRECTIONAL DISTRIBUTION

0 NTS N  
SCALE: NTS

PROJECT #: 387-024  
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CHECKED BY: REG

MAY 2019

REVISIONS:





## **PROJECTED TRAFFIC**

The projected background traffic volumes used in the analyses were developed from the existing (year 2019) peak-hour-turning-movement-count data. Per Pineville, a 2% per year growth rate was used for the 2021 background volumes.

The daily and peak-hour-trip-generation data for the site is presented in Table 2. The values for the trips generated by the land uses are obtained from the Institute of Transportation Engineers, Trip Generation Manual, 10<sup>th</sup> Edition, 2017.

**Table 2: Site Trip Generation**

Land Use [ITE Code]				Weekday Daily	AM Peak Hour			PM Peak Hour		
					Enter	Exit	Total	Enter	Exit	Total
Proposed Development										
Townhomes [220] (Multi-Family Low-Rise)	175	DU	1,282	19	63	82	61	36	97	

References:

Trip Generation, 10th Edition, Institute of Transportation Engineers, Washington, DC. 2017.

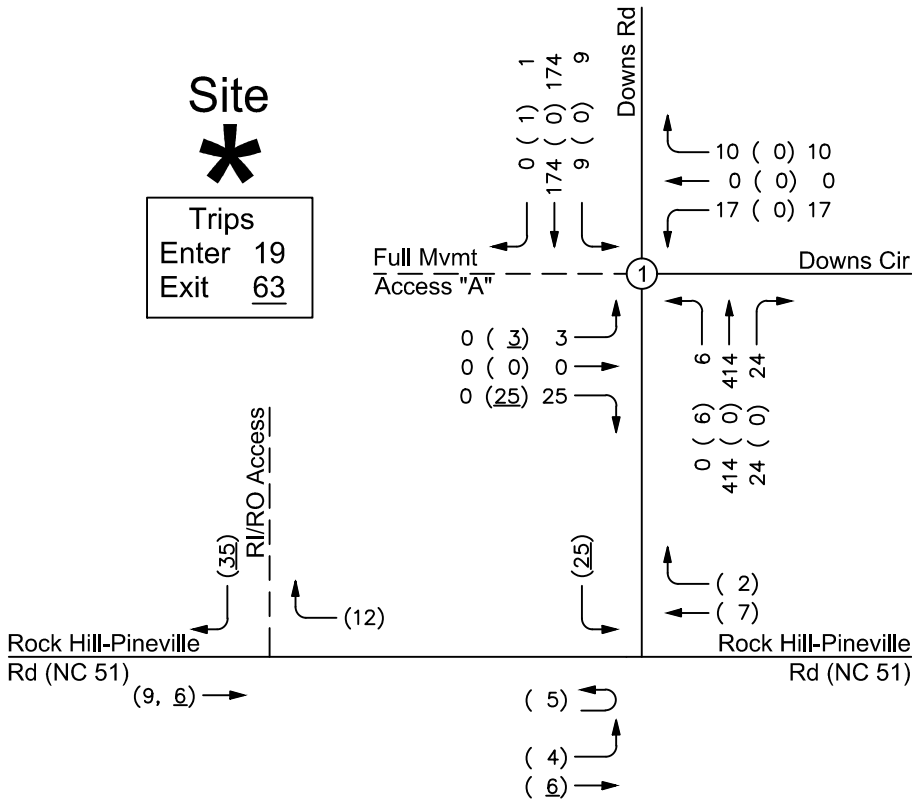
The proposed trip generation results indicate that the residential development is expected to generate 82 AM peak hour trips and 97 PM peak hour trips.

Per Pineville, no nearby approved (offsite) developments are located within the area of influence.

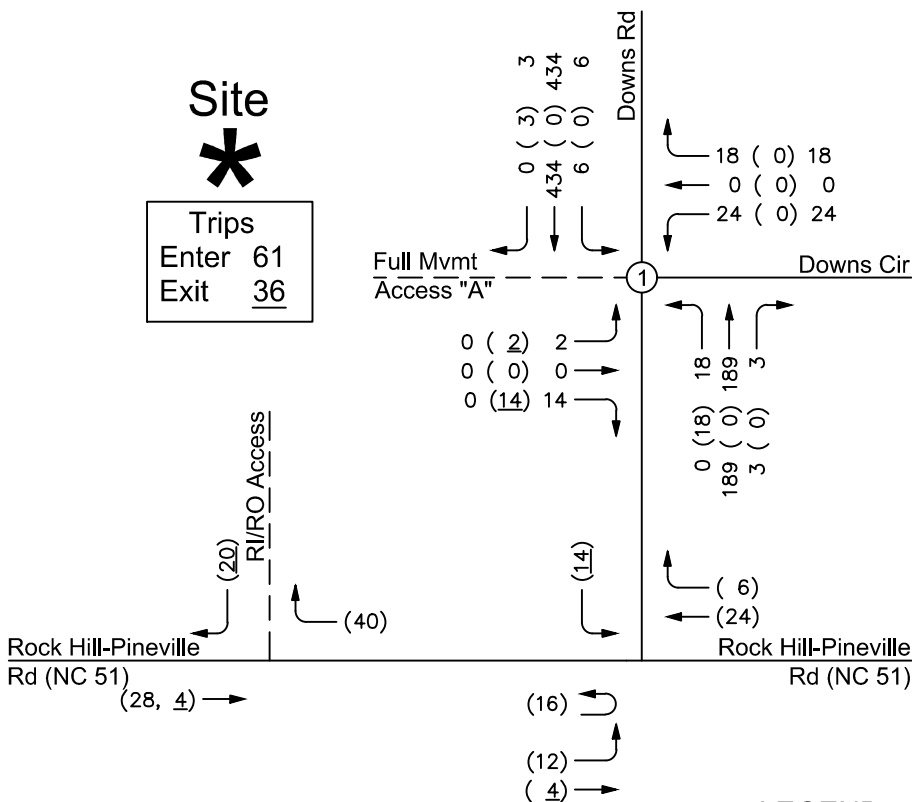
The trip assignments for the 2021 morning and afternoon peak hour traffic volumes are presented in Figure 3. The background traffic is indicated to the far left of the movement arrows followed by the site traffic in parentheses. The two volumes are added to obtain the projected total traffic for that movement: Background + (Site) = Total.



## 2021 AM PEAK BUILD TRAFFIC VOLUMES



## 2021 PM PEAK BUILD TRAFFIC VOLUMES



### LEGEND

○ Stop Sign Control

→ Directional Movement

VOLUMES: Bkgd. (Site) Total



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2021 BUILD  
PEAK HOUR  
TRAFFIC  
VOLUMES

0 NTS N  
SCALE: NTS

PROJECT #: 387-024  
DRAWN BY: SSA  
CHECKED BY: REG

MAY 2019

REVISIONS:

Figure 3





## **TRAFFIC ANALYSIS**

The intersections identified within the area of influence were analyzed to identify the traffic impact that the site development has under the build scenario. The traffic analysis is based on the LOS analysis at the identified intersection. The intersection was analyzed assuming the buildout of the site in 2021.

LOS is a qualitative measurement of traffic operations. It is a measure of delay time. The Transportation Research Board's Highway Capacity Manual<sup>1</sup> (HCM) defines six levels of service for intersections with LOS "A" representing the best operating condition and LOS "F" the worst.

SYNCHRO 10.3 was the software tool used in determining the delay, capacity and corresponding level of service at the study intersection. The intersection worksheet reports are provided in the Appendix.

For the analysis of unsignalized intersections, the vehicular movements that must stop at the intersection experience delay (i.e. the minor leg of the intersection). For descriptive purposes:

- LOS results between "A" and "C" for the side (minor) street approach are assumed to represent short vehicle delays
- LOS results between "D" and "E" for the side (minor) street approach are assumed to represent moderate delays
- LOS results of "F" for the side (minor) street approach is assumed to represent long delays.

It should be noted that stop sign controlled streets/driveways intersecting major streets typically 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. Table 17-2 gives the criteria for unsignalized intersections.

HCM 6 <sup>th</sup> For Two-Way-Stop-Controlled (TWSC) Intersection Table 17-2		
Unsignalized Int. LOS	Stopped Delay per Vehicle (sec/vehicle)	Delay Description
A	$\leq 10.0$	Short Vehicle Delays
B	$> 10.0$ and $\leq 15.0$	
C	$> 15.0$ and $\leq 25.0$	
D	$> 25.0$ and $\leq 35.0$	Moderate Vehicle Delays
E	$> 35.0$ and $\leq 50.0$	
F	$> 50.0$	Long Vehicle Delays

This report provides analysis of the traffic operations within the area of influence, according to the standards set by the North Carolina Department of Transportation's (NCDOT) "Policy on Street and Driveway Access to North Carolina Highways, Chapter 4 Part C". It provides intersection improvements needed for mitigating traffic impacts. This study evaluates the following scenarios:

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<sup>1</sup> National Research Council. Transportation Research Board. Highway Capacity Manual, Washington, DC. 2002. Chapters 2, 16, and 17.





- 2019 Existing Conditions
- 2021 No Build
- 2021 Build

Currently, the existing Downs Road & Downs Circle unsignalized intersection operates at an HCM 6<sup>th</sup> TWSC LOS “A” in both peak hours. Typically, an intersection is said to be operating at capacity at a volume-to-capacity (v/c) ratio of 1.00 and acceptable at a LOS “D” or better.

**NCDOT ANALYSIS REQUIREMENTS** - In order to determine the mitigation responsibility of the developer, this study compares 2021 Build results to the 2021 No Build results (see Table 3).

Chapter 5, Section J of the *July 2003 NCDOT Policy on Street and Driveway Access to North Carolina Highways*, the applicant shall be required to identify mitigation improvements to the roadway network if at least one of the following conditions exists when comparing base network conditions to project conditions:

- *The total average delay at an intersection or an individual approach increases by 25% or greater, while maintaining the same level of service,*
- *The Level of Service (LOS) degrades by at least one level at an intersection or an individual approach,*
- *Or the Level of Service is “F” for an intersection or an individual approach.*

This section of the access policy also states that, *mitigation improvements shall be identified when the analysis indicates that the 95<sup>th</sup> percentile queue exceeds the storage capacity of the existing lane.*

Base assumptions for the analysis scenarios include:

- A 2% per year background growth rate between the existing and future 2021 conditions
- All study intersections and movements assume a 0.90 peak hour factor
- A 2% heavy vehicle percentage was used in all analysis for all approached at the study intersection

In addition to the Synchro 10.3 analysis results SimTraffic 10.3, a traffic simulation software application for unsignalized and signalized intersections, was used to calculate the maximum queue lengths at the study intersections. The Synchro and SimTraffic results of the analysis scenarios are displayed per intersection and presented in Tables 3 and 4.





## 1. Downs Road & Downs Circle

**Table 3: Downs Road & Downs Circle Levels of Service**

Intersection	Intersection/ Approach	AM Peak			PM Peak		
		Delay (sec/veh)	Capacity (v/c)	LOS	Delay (sec/veh)	Capacity (v/c)	LOS
2019 Existing Conditions							
1. Downs Rd. & Downs Cir.	Intersection	0.6	-	A	0.8	-	A
	Northbound	0.0	-	A	0.0	-	A
	Southbound	0.4	-	A	0.1	-	A
	Westbound	11.8	-	B	11.2	-	B
2021 No Build							
1. Downs Rd. & Downs Cir.	Intersection	0.6	-	A	0.8	-	A
	Northbound	0.0	-	A	0.0	-	A
	Southbound	0.4	-	A	0.1	-	A
	Westbound	12.0	-	B	11.3	-	B
2021 Build							
1. Downs Rd. & Downs Cir./Prop. Access "A"	Intersection	1.2	-	A	1.4	-	A
	Northbound	0.1	-	A	0.7	-	A
	Southbound	0.4	-	A	0.1	-	A
	Eastbound	10.1	-	B	12.0	-	B
	Westbound	14.6	-	B	14.2	-	B

### Existing Conditions

Currently the worst leg of the intersection (westbound) operates with a LOS "B" in both peak hours.

### 2021 No Build Conditions

With the inclusion of the grown background traffic, the worst leg of the intersection (westbound) operates with a LOS "B" in both peak hours.

### 2021 Build Conditions

We propose the following intersection configuration:

- Re-mark the existing westbound right turn lane on Downs Circle to a combined thru-right turn lane
- Re-mark the existing northbound TWLTL on Downs Road at Downs Circle/Proposed Access "A" with a 50-foot left turn lane
- Proposed Access "A" should include the following cross-section:
  - A westbound receiving lane
  - An eastbound left turn lane with 50 feet of storage
  - An eastbound combined thru-right turn lane

Assuming this configuration, the worst leg of the intersection (westbound) operates at a LOS "B" during both peak hours.





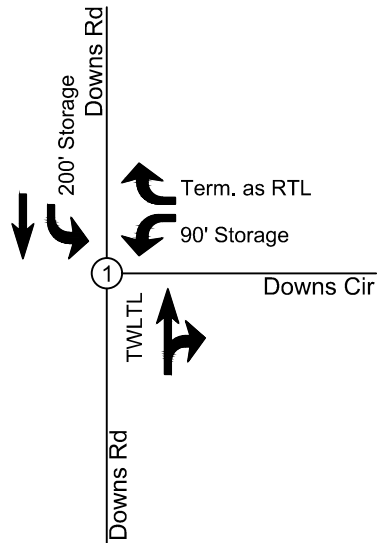
**Table 4: 2021 Vehicle Queue Lengths**

Intersection and Approach		Existing/Proposed Storage		AM Peak Queue Length (feet)			PM Peak Queue Length (feet)		
		Left	Right	Left	Thru	Right	Left	Thru	Right
<b>2021 No Build</b>									
1. Downs Rd. & Downs Cir.	NB	-	-	-	0'	-	-	0'	-
	SB	200'	-	28'	0'	-	18'	0'	-
	WB	90'	Term.	38'	-	30'	45'	-	38'
<b>2021 Build</b>									
1. Downs Rd. & Downs Cir./Prop. Access "A"	NB	50'+TWLTL	-	18'	0'	-	27'	0'	-
	SB	200'	-	28'	0'	-	20'	0'	-
	EB	50'	-	31'	62'	-	16'	31'	-
	WB	90'	-	46'	30'	-	36'	30'	-

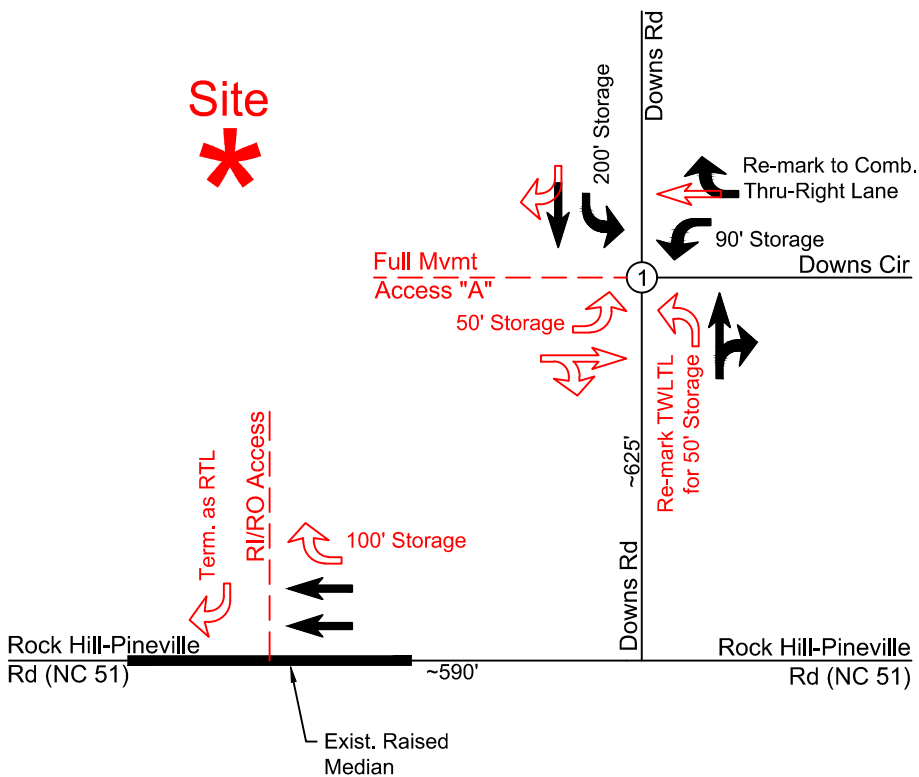
The existing and recommend laneage is shown on Figure 4. Figure 5 shows the conceptual designs of the suggested improvements.



## EXISTING LANEAGE



## SUGGESTED LANEAGE



### LEGEND

- Stop Sign Control
- ➡ Existing Laneage
- ➡ Suggested Laneage



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EXISTING/  
SUGGESTED  
LANEAGE

0 NTS N  
SCALE: NTS

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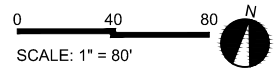
Figure 4





PINEVILLE TOWNHOMES TIA  
PINEVILLE, NC

CONCEPTUAL  
IMPROVEMENTS



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MAY 2019

REVISIONS:

Figure 5





## **CONCLUSION**

**In conclusion, the proposed residential townhome development is not expected to create extensive roadway/intersection issues, especially with the anticipated minimal amount of traffic associated with the residential development.**

The suggested mitigation for the study/access intersections are illustrated in detail conceptually on Figure 5.





## **APPENDIX**