TRAFFIC IMPACT STUDY
FOR
HAWTHORNE AT HOLBROOK
BUNCOMBE COUNTY, NORTH CAROLINA

Prepared For

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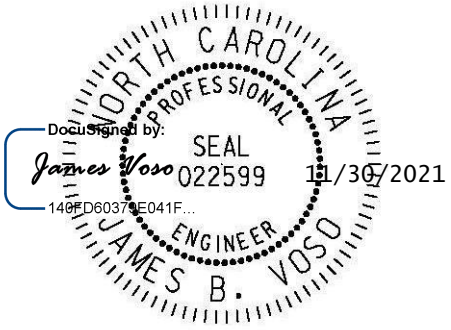
November 30, 2021
Commission No: 4223



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Executive Summary

A proposed development consisting of 350 residential apartment units (ITE land used code 221) is being considered near the intersection of Holbrook Road and Monte Vista in Buncombe County, North Carolina near Exit # 44. The site, which includes about 33 acres, is bounded by I-40, SR 1224 (Monte Vista Road), and SR 1238 (Holbrook Road). The study area for the traffic impact study (TIS) included ten (10) nearby intersections during a typical weekday morning and afternoon peak hours with school in session.

Several intersections in the study area, particularly around the I-40/Smokey Park Highway interchange, are currently experiencing failing levels-of-service, excessive delays and significant queues during the peak periods of the day. Significant improvements are needed and planned by NCDOT at this interchange and the surrounding intersections to address existing operational deficiencies. I-2513 which is scheduled to begin right-of-way acquisition in 2022 and construction in 2024 addresses these existing operational deficiencies (See Appendix I). It is not the intent of this TIA to identify the necessary improvements required by others to address these existing deficiencies.

The following **developer-responsible mitigation improvements** are recommended for consideration as a result of this proposed development:

Intersection of SR 1238 (Holbrook Road) and Marathon Lane / Proposed Access Point 1

- Align proposed access point across from Marathon Lane
- Provide minimum 100' IPSL

Intersection of SR 1238 (Holbrook Road) and Homestead Way / Proposed Access Point 2

- Align proposed access point across from Homestead Way
- Provide exclusive right turn lane along eastbound approach (Holbrook Road) with 50' full storage
- Provide minimum 100' IPSL

Intersection of SR 1224 (Monte Vista Road) and SR 1238 (Holbrook Road) / SR 1247 (Edgewood Road)

- Provide a left-turn lane (100' full storage) along the southbound (Holbrook Road) approach
- Modify existing traffic signal operation to accommodate additional left turn lane

Intersection of SR 1224 (Monte Vista Road/Sandhill Road) and SR 1245 (Acton Circle Road)

- Traffic signal timing optimization upon full build-out of proposed development

Intersection of US 19-23 (Smoky Park Highway) and SR 1245 (Acton Circle Road)

- No improvements recommended

Intersection of US 19-23 (Smoky Park Highway) and I-40 Eastbound On/Off Ramps/SR 1245 (Acton Circle Road)

- No reasonable mitigation improvements can be identified (future improvements by NCDOT needed)

Intersection of US 19-23 (Smoky Park Highway) and I-40 Westbound On/Off Ramps

- No reasonable mitigation improvements can be identified (future improvements by NCDOT needed)

Intersection of US 19-23 (Smoky Park Highway) and SR 1404 (Old Haywood Road)/Burger King

- No improvements recommended

Intersection of and SR 1404 (Old Haywood Road) and SR 1255 (Starnes Cove Road)

- No improvements recommended

Intersection of SR 1238 (Holbrook Road) and SR 1255 (Starnes Cove Road

- No improvements recommended

The suggested possible mitigation improvements are subject to more review and discussion with the developer, Buncombe County, and the North Carolina Department of Transportation before becoming part of the conditions for the necessary driveway permit applications. Since some of the possible mitigation improvements could involve obtaining additional right-of-way, and be part of the state-maintained highway system, the final approval rests with the North Carolina Department of Transportation.

A summary of these mitigation improvements can be found on Figure 8 of this report and a more detailed description/discussion of each intersection and the subsequent recommended improvements can be found in the Conclusions/Suggestions Section of this report.

Introduction

A proposed development consisting of 350 apartment units (ITE land use code 221) is being considered near the intersection of (SR 1238) Holbrook Road and SR 1224 (Monte Vista) in Buncombe County, North Carolina. The site, which includes about 33 acres, is bounded by I-40, SR 1224 (Monte Vista Road) and SR 1238 (Holbrook Road).

According to current North Carolina Department of Transportation regulations, a traffic impact analysis (TIA) might be required for all projects that would result in total daily trips equal to or greater than 3,000 vehicles per day as determined by the current edition of the ***Trip Generation Manual*** that is published by the Institute of Transportation Engineers (ITE). In addition, Buncombe County's threshold for a traffic impact analysis (TIA) is 75 residential units. The proposed development is expected to generate 1,623 vehicles per day during a typical weekday. A TIA is not warranted based on NCDOT criteria. However, since the development is proposing in excess of 75 residential units, a TIA is warranted by Buncombe County. Since a TIA is warranted by local government, a study meeting NCDOT requirements, review, and ultimate approval is required. A copy of the NCDOT Screening – Scoping- and Submittal Document is included as Appendix A to this report.

During the scoping of this project, the study area was identified as the following intersections:

1. SR 1238 (Holbrook Road and Marathon Lane
2. SR 1238 (Holbrook Road and Homestead Way)
3. SR 1224 (Monte Vista Road) and SR 1238 (Holbrook Road)/SR 1247 (Edgewood Road)
4. SR 1224 (Monte Vista Road) and SR 1245 (Acton Circle Road)
5. US 19-23 (Smoky Park Highway) and SR 1245 (Acton Circle Road)
6. US 19-23 (Smoky Park Highway) and I-40 Eastbound On/Off Ramps/SR 1245 (Acton Circle Road)
7. US 19-23-74A (Smoky Park Highway) and I-40 Westbound On/Off Ramps
8. US 19-23-74A (Smoky Park Highway) and SR 1404 (Old Haywood Road)/Burger King
9. SR 1404 (Old Haywood Road) and SR 1255 (Starnes Cove Road)
10. SR 1238 (Holbrook Road) and SR 1255 (Starnes Cove Road)

In addition, the proposed access points onto SR 1238 (Holbrook Road) would be included in the study (See Appendix G).

The development is proposed to be constructed in one phase and is expected to be built-out by the end of 2023. TIP project I-2513 is in the vicinity of this proposed development and recommends several improvements to the Smokey Park Highway/I-40 interchange and surrounding area. However, construction of this TIP project is post 2023. A new residential development has recently been constructed across from the proposed site along Marathon Lane.

Background

The subject site is located on the north side of I-40 west of Exit # 44 and is bounded by SR 1224 (Monte Vista Road) and SR 1238 (Holbrook Road), Monte Vista Road is a collector-type road that provides access to and from a large residential area in the western part of the county. This road provides a direct link to US 19-23 (Smoky Park Highway) and I-40. According to the traffic volume maps provided by the North Carolina Department of Transportation, the 2018 annual average daily traffic (AADT) volumes are about 11,500 vehicles per day along SR 1224 (Monte Vista Road) and 2,700 vehicles per day along SR 1238 (Holbrook Road) in the immediate area (See Figure 1 for the site location).

SR 1224 Northbound Approach

This section of SR 1224 (Monte Vista Road) consists of a two-lane shoulder section with a posted speed limit of 35 mph. The only sidewalk in place in the immediate area of the subject site is the one that was installed as a result of the Home Depot project near the intersection of SR 1224 (Monte Vista Road) and SR 1245 (Acton Circle Road).

SR 1224 Southbound Approach

SR 1238 (Holbrook Road) consists of a two-lane shoulder section with a posted speed limit of 35 mph.

SR 1238 Westbound Approach

SR 1238 Eastbound Approach

A residential development was recently constructed along Marathon

Lane across Holbrook Road from the proposed site.

The existing lane geometry and storage lengths along the approaches to the ten (10) study intersections are shown on Figure 2.

2-hour full-turning movement traffic counts were taken at all of the study intersections during the weeks of October 4 – October 15, 2021 on a Tuesday, Wednesday and Thursday from 7:00 am until 9:00 am and 4:00 pm until 6:00 pm in order to determine the actual am and pm peak hours and their existing traffic volumes. School was in session during all traffic count collection times. Existing traffic volumes are depicted on Figure 3 of this report.

Minor volume imbalances exist due to actual peak hours being used at each individual intersection to present a "worst-case" scenario and the presence of multiple sources/sinks located between study intersections throughout the network.

SITE LOCATIONS

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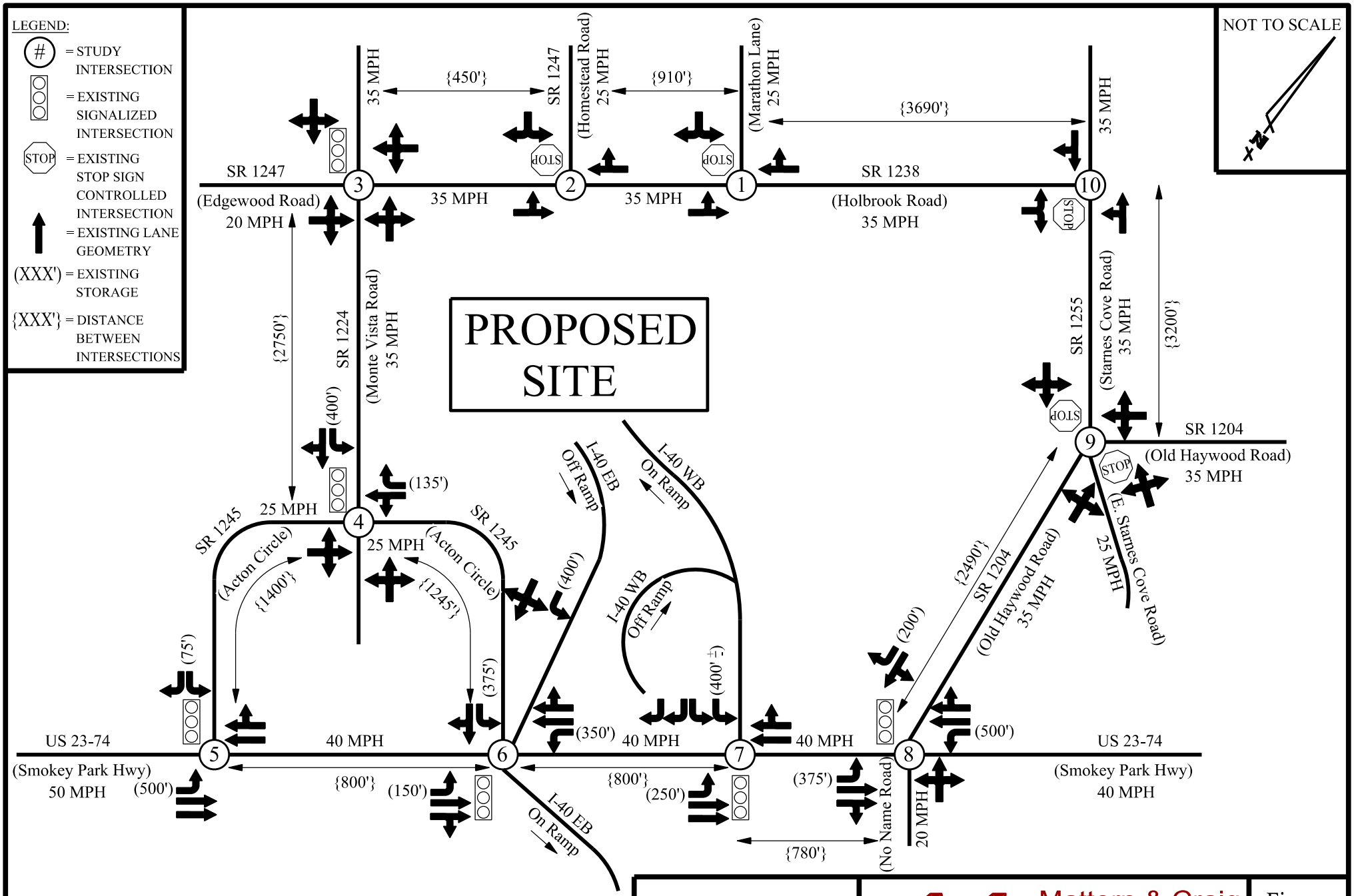
Figure: 1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= EXISTING SIGNALIZED INTERSECTION
STOP = EXISTING STOP SIGN CONTROLLED INTERSECTION
= EXISTING LANE GEOMETRY
(XXX') = EXISTING STORAGE
{XXX'} = DISTANCE BETWEEN INTERSECTIONS
NOT TO SCALE
PROPOSED SITE
SR 1247 (Edgewood Road) 20 MPH
SR 1247 35 MPH
(Homestead Road) 25 MPH
(Marathon Lane) 25 MPH
SR 1238 (Holbrook Road) 35 MPH
SR 1224 (Monte Vista Road) 35 MPH
SR 1255 (Starnes Cove Road) 35 MPH
SR 1204 (Old Haywood Road) 35 MPH
SR 1245 (Acton Circle) 25 MPH
(E. Starnes Cove Road) 25 MPH
I-40 EB Off Ramp
I-40 WB On Ramp
I-40 WB Off Ramp
I-40 EB On Ramp
US 23-74 (Smokey Park Hwy) 50 MPH
US 23-74 (Smokey Park Hwy) 40 MPH
(No Name Road) 20 MPH
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{2490'}
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EXISTING CONDITIONS
Hawthorne at Holbrook
Buncombe County, NC
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Figure:
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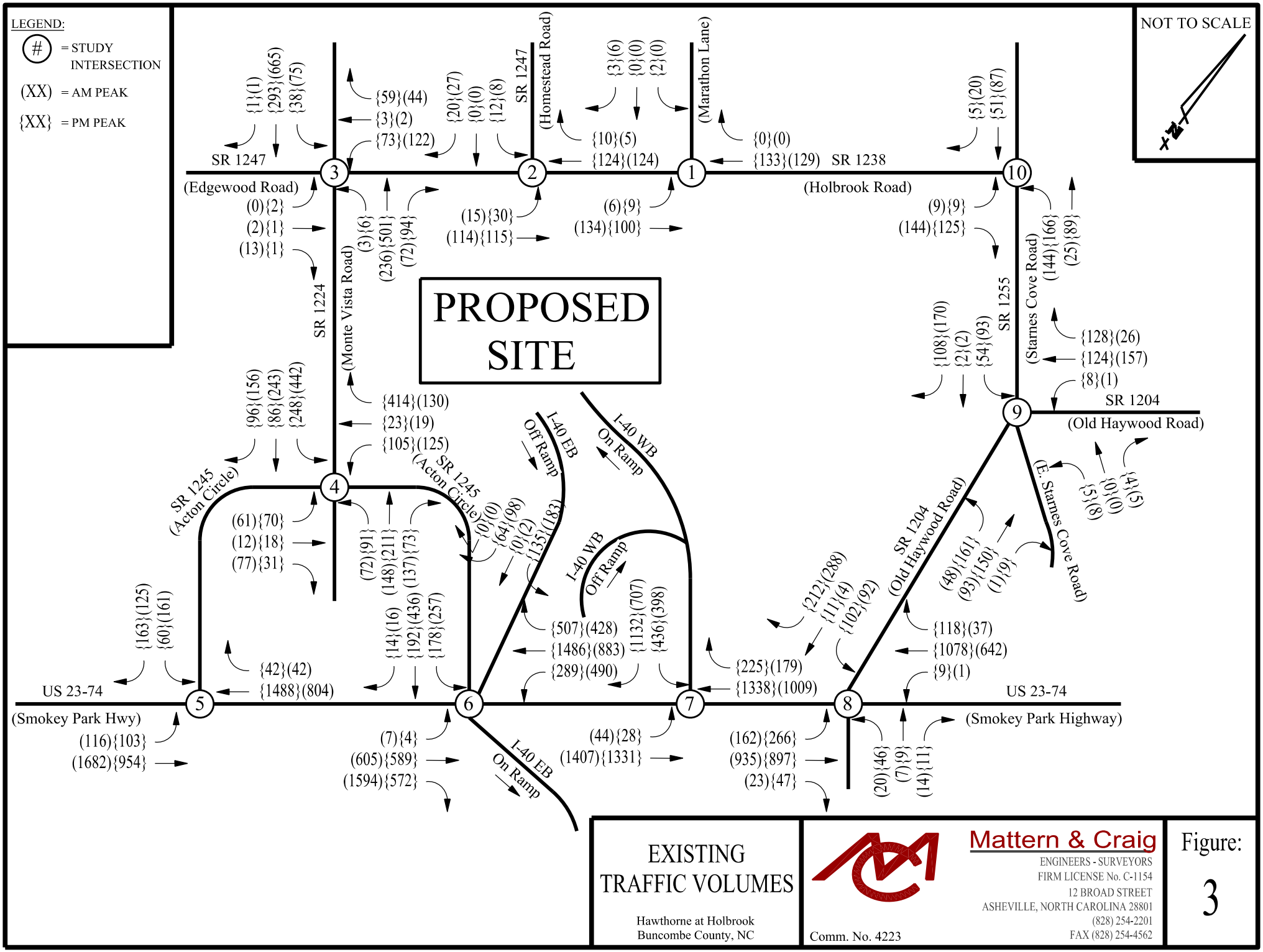
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PROPOSED SITE
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SR 1224 (Monte Vista Road)
SR 1247 (Homestead Road)
(Marathon Lane)
SR 1255 (Starnes Cove Road)
SR 1204 (Old Haywood Road)
(E. Starnes Cove Road)
SR 1245 (Acton Circle)
I-40 EB Off Ramp
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US 23-74 (Smokey Park Hwy)
US 23-74 (Smokey Park Highway)
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EXISTING TRAFFIC VOLUMES
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Figure:
3

Trip Generation

The proposed development consists a maximum of 350 residential apartment units (ITE land use code 221). The estimated trips that would be generated by the development were determined using methodology contained in the ***Trip Generation Manual – 11th Edition*** that is published by the Institute of Transportation Engineers (ITE) and the ***Trip Generation Handbook – 3nd Edition*** (June 2017) also published by the Institute of Transportation Engineers (ITE). Specifically, the software program ***OTISS Pro*** was used to calculate the trips (See Appendix C). The equations were used to estimate the trips for land use code 221 in accordance with NCDOT Congestion Management guidelines.

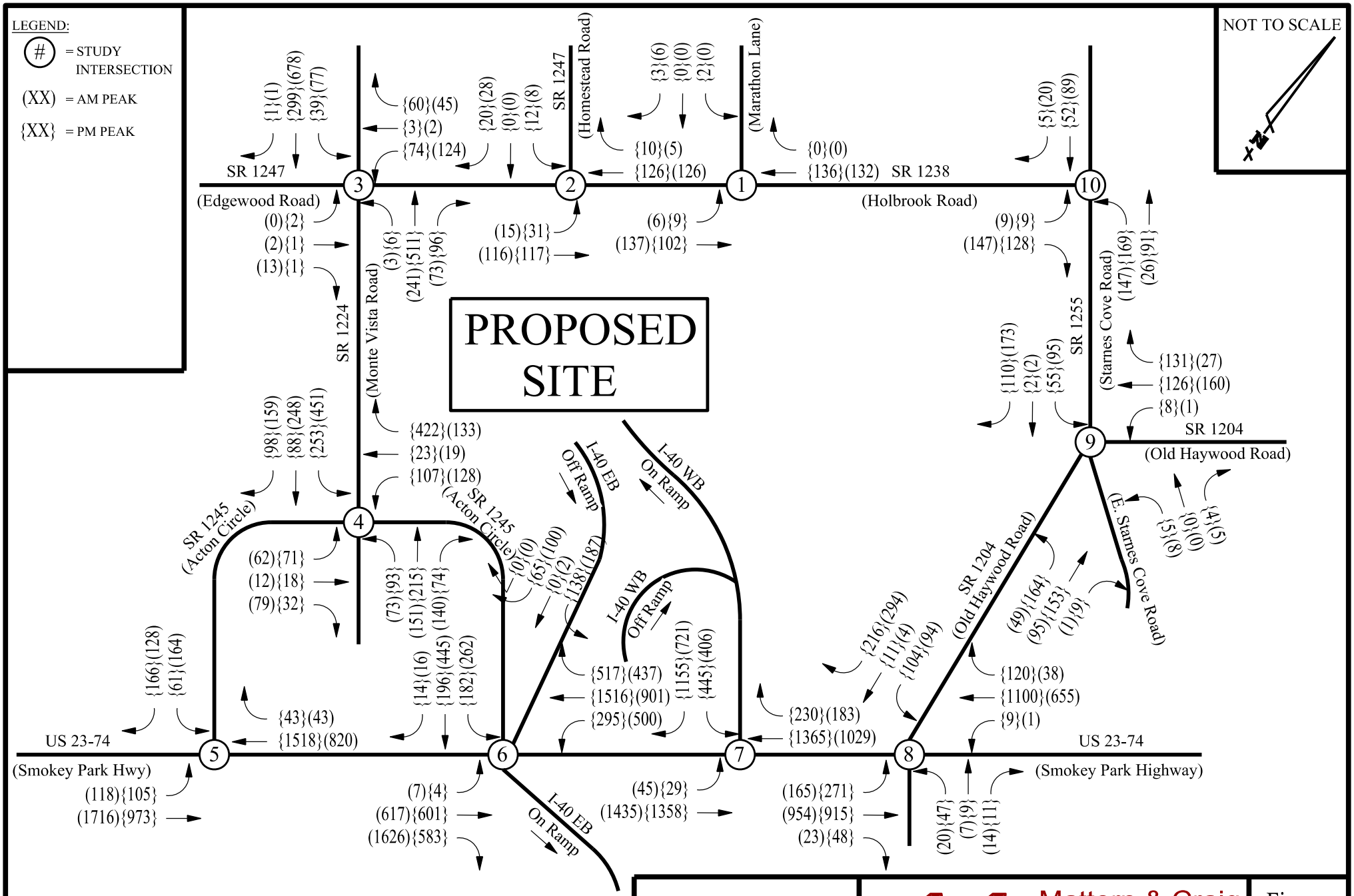
An annual traffic growth rate of one percent was used for the background traffic volumes *(The NCDOT approved the growth rate during the Scoping of the project).* For purposes of this study, the anticipated opening date is in late 2023, therefore the one percent growth rate was applicable for two years (See Figure 4).

Given the anticipated land use types, neither pass-by trips nor internal capture will be a factor and are therefore not considered in this study.

Land use code 221 is defined and described as apartments and condominiums located in a building that has between three and ten floors of living space.

Table 1 - Trip Generation Summary

Land Use (ITE Code)	Intensity	Unit	Typ. Weekday				
			ADT (vpd)	AM In (vph)	AM Out (vph)	PM In (vph)	PM Out (vph)
MULTI-FAMILY (221)	350	units	1,623	32	110	83	54
Anticipated New Trips =			1,623	32	110	83	54
				142		137	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SR 1247 (Homestead Road)
(Marathon Lane)
SR 1238 (Holbrook Road)
SR 1224 (Monte Vista Road)
SR 1255 (Starnes Cove Road)
SR 1204 (Old Haywood Road)
SR 1245 (Acton Circle)
I-40 EB Off Ramp
I-40 WB On Ramp
I-40 WB Off Ramp
I-40 EB On Ramp
US 23-74 (Smokey Park Hwy)
US 23-74 (Smokey Park Highway)
(E. Starnes Cove Road)
(Old Haywood Road)
{1}(1) {299}(678) {39}(77)
{60}(45) {3}(2) {74}(124)
{20}(28) {0}(0) {12}(8)
{3}(6) {0}(0) {2}(0)
{10}(5) {126}(126)
{0}(0) {136}(132)
{5}(20) {52}(89)
(0){2} (2){1} (13){1}
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(15){31} (116){117}
(6){9} (137){102}
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{110}(173) {2}(2) {55}(95)
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BACKGROUND TRAFFIC VOLUMES
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Figure:
4

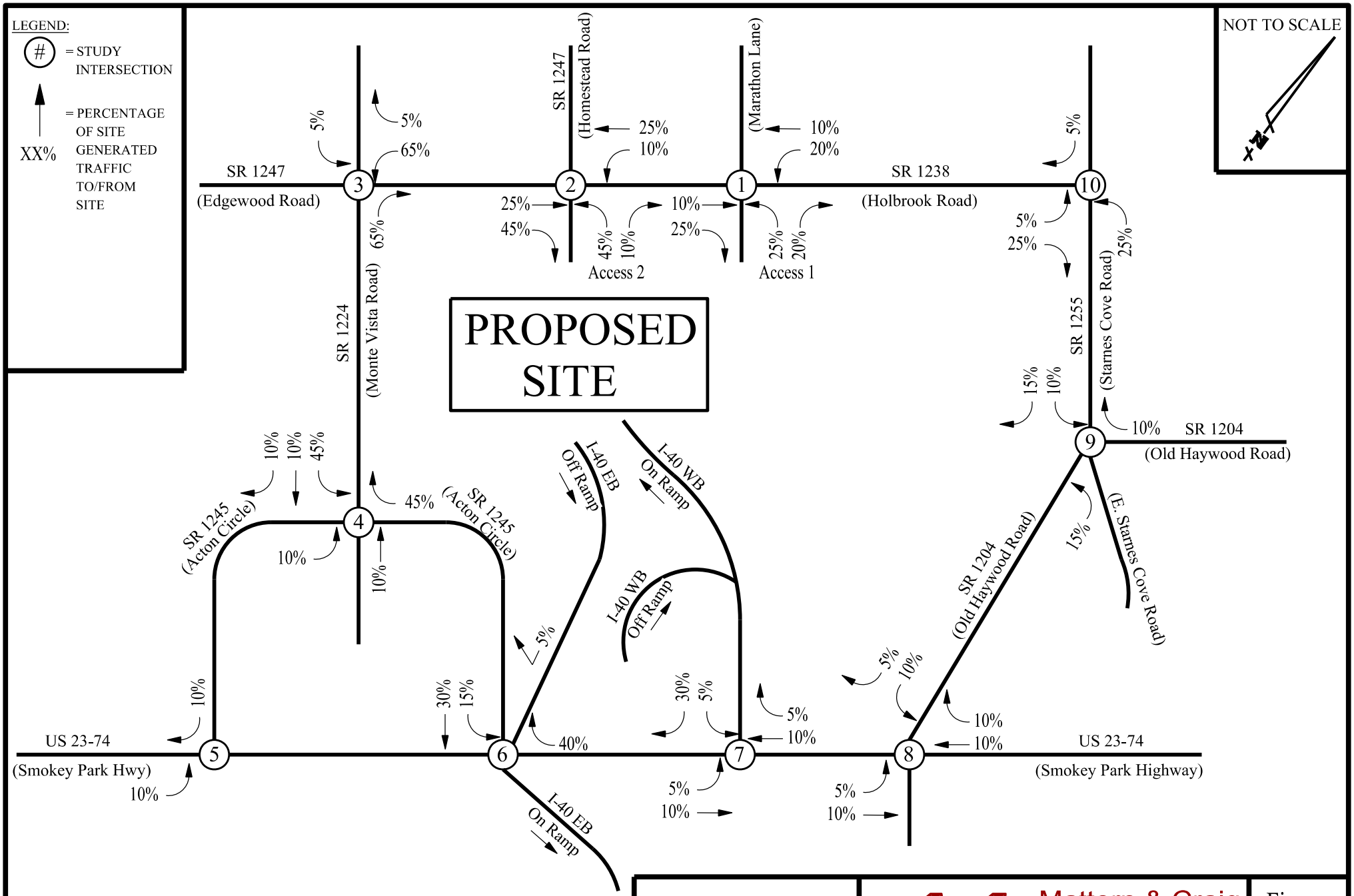
Trip Distribution

Two full-movement access points are proposed to serve the development. Both access points are located along 1238 (Holbrook Road). The first proposed access point is located across from Marathon Lane and the second proposed access point is located across from Homestead Road.

Given the site location and proposed layout of the residential community, it is reasonable to conclude that the trip distribution would follow existing traffic patterns with minor adjustments to avoid heavily congested areas.

Consulting the location of the proposed development, the study area and roadway network, and the existing traffic counts, it was determined that approximately 30% of the site traffic would come from Smokey Park Highway southbound. Of this 30%, 10 percent is anticipated to use Old Haywood Road north of the study area. The remaining 20% would continue along Smokey Park Highway and be distributed throughout the study area. 10% of the site traffic is expected to come from northbound Smokey Park Highway and 10% is expected to come from Sand Hill Road. 5% of the site traffic was assigned to eastbound Monte Vista Road and Starnes Cove Road respectively. The remaining 40% of the site traffic was assigned to the I-40 ramps. This distribution is shown on Figure 5.

Using the distribution rates from Figure 5, the traffic generated by the proposed site during the weekday am, and pm peak hours are shown on Figure 6. The future *(background plus build-out)* traffic volumes during the weekday am and pm peak hours are shown on Figure 7.



TRIP DISTRIBUTION

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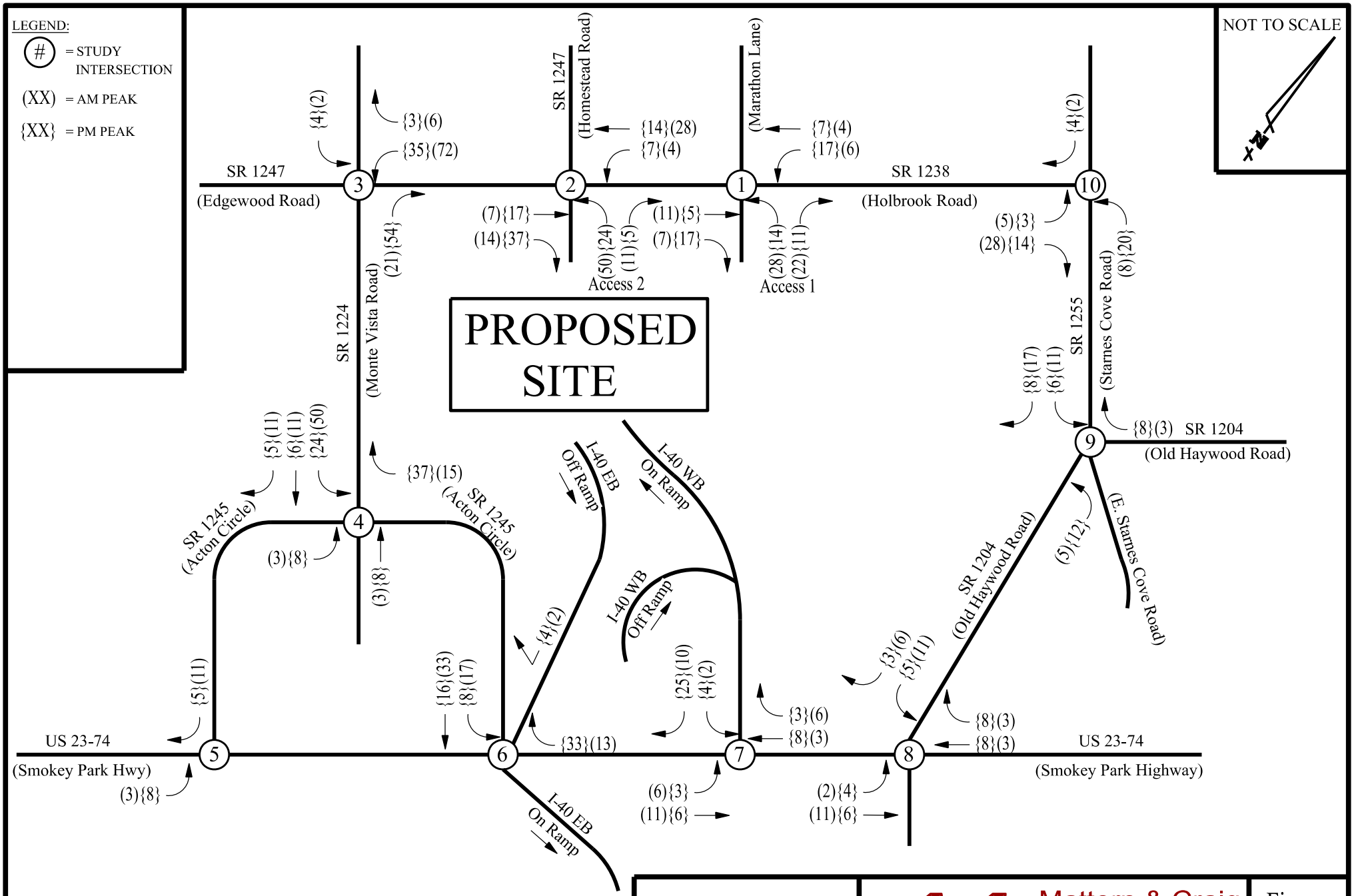
Figure: 5



TRIP GENERATED TRAFFIC VOLUMES

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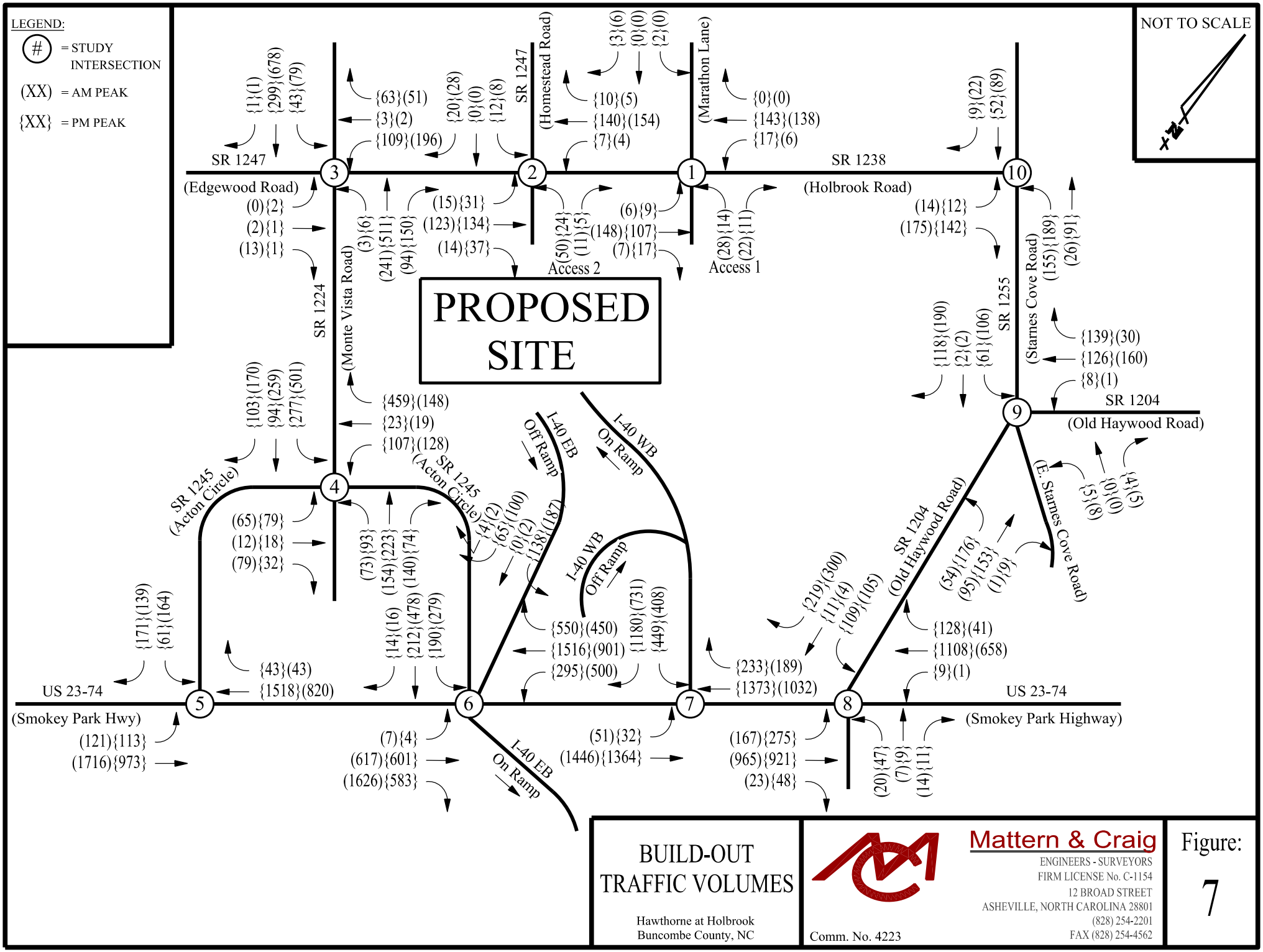
Figure: 6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PROPOSED SITE
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(Marathon Lane)
SR 1238 (Holbrook Road)
SR 1224 (Monte Vista Road)
SR 1255 (Starnes Cove Road)
SR 1204 (Old Haywood Road)
SR 1245 (Acton Circle)
I-40 EB Off Ramp
I-40 WB On Ramp
I-40 WB Off Ramp
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Access 1
Access 2
US 23-74 (Smokey Park Hwy)
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(E. Starnes Cove Road)
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BUILD-OUT TRAFFIC VOLUMES
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Figure:
7

Capacity/Levels of Service (LOS)

Capacity analyses at all study intersections were completed according to NCDOT Congestion Management guidelines.

Unsignalized Intersections

Capacity, levels of service, and queue length analyses were completed using methodology contained in the *Highway Capacity Manual (HCM), 6th Edition* published by the Transportation Research Board. Specifically, the software program Synchro (version 10.3) was used in this study and the worksheets are included in Appendix D.

Table 2
Level of Service Criteria

LEVEL OF SERVICE	CONTROL DELAY (seconds per vehicle)
	Unsignalized Intersections
A	0 - 10
B	10 - 15
C	15 - 25
D	25 - 35
E	35 - 50
F	>50

Source: Highway Capacity Manual, 6th Edition

Factors affecting the capacity and level of service (LOS) at two-way, stop controlled intersections (TWSC) include number and use of lanes, channelization, two-way left-turn lane (TWLTL) or raised or striped median storage *(or both)*, approach grade, and existence of flared approaches on the minor street. Level of service (LOS) for these intersections is defined for each minor movement and not for the intersection as a whole. The LOS criteria are somewhat different from the criteria used for signalized intersections because most drivers expect to find higher traffic volumes and greater delay at signalized intersections. Levels of service still range from "A" describing best operating conditions to "F" describing worst operating conditions (See Table 2).

Signalized Intersections

Performance measures used to analyze the operating conditions at signalized intersections include lane group capacities, critical volume to capacity ratios, average back of queues, and levels of service. The lane group capacity is defined as the maximum hourly rate at which vehicles can reasonably be expected to pass through the intersection under prevailing traffic, roadway, and signalization conditions. The critical v/c ratio, which is the volume to capacity ratio for the intersection as a whole, is an approximate indicator of the overall sufficiency of an intersection. *(It represents an absolute prediction of the total sufficiency of capacity in all critical lane groups – **Traffic Engineering, Third Edition**, Roess, Prassas, and McShane)*. The back of queue is defined as the number of vehicles that are queued depending on arrival patterns of vehicles and vehicles that do not clear the intersection during a given green interval. Levels of service is defined in terms of control delay, which is a measure of driver discomfort, frustration, fuel consumption, and increased travel time. Levels of service range from "A" that describes the best operating conditions to "F" that describes the worst operating conditions (See Table 3).

It is widely accepted in the traffic engineering profession that signalized intersections in urbanized areas be designed to operate at a level of service "D" or better.

Table 3
Level of Service Criteria

LEVEL OF SERVICE	CONTROL DELAY (seconds per vehicle)
	Signalized Intersections
A	0 - 10
B	10 - 20
C	20 - 35
D	35 - 55
E	55 - 80
F	>80

Source: Highway Capacity Manual, 6thEdition

The results of the capacity analyses at the intersection of **SR 1238 (Holbrook Road) and Marathon Lane / Site Access #1** for the future am and pm peak hour traffic volumes indicate that the levels of service (LOS) for the northbound and southbound minor approaches is "B" with a control delay of less than 11 seconds per vehicle (See Table 4).

The results of the capacity analyses at the intersection of **SR 1238 (Holbrook Road) and Homestead Road / Site Access #2** for the future with improvements (addition of eastbound right turn lane) am and pm peak hour traffic volumes indicate that the levels of service (LOS) for the northbound and southbound minor approaches is "B" with a control delay of less than 12 seconds per vehicle (See Table 5).

The results of the capacity analyses at the intersection of **SR 1224 (Monte Vista Road) and SR 1238 (Holbrook Road)/SR 1247 (Edgewood Road)** for the existing am peak hour traffic volumes indicate that the level of service (LOS) for the intersection is "B" with a control delay of 15.9 seconds per vehicle. During background conditions *(existing traffic volumes plus a growth rate of one percent for two years to the build-out year of 2023)*, the background traffic volumes indicate that the levels of service (LOS) for the intersection is "B" with a control delay of 16.4 seconds per vehicle. For this study, the background conditions are the baseline conditions that the future conditions *(background plus build-out)* are compared to (See Table 6).

The future traffic volumes *(background plus build-out)* during the am peak hour indicate that the level of service (LOS) for the intersection is "C" with a control delay of 23.2 seconds per vehicle (See Table 6).

The future with improvements (addition of westbound left turn lane) results during the am peak hour indicate that the level of service (LOS) for the intersection is "B" with a control delay of 18.3 seconds per vehicle (See Table 6).

The results of the capacity analyses at the intersection of **SR 1224 (Monte Vista Road) and SR 1238 (Holbrook Road)/SR 1247 (Edgewood Road)** for the existing pm peak hour traffic volumes indicate that the level of service (LOS) for intersection is "B" with a control delay of 10.5 seconds per vehicle. During background conditions *(existing traffic volumes plus a growth rate of one percent for two years to the build-out year of 2023)*, the background traffic volumes indicate that the level of service (LOS) for the intersection is "B"

with a control delay of 10.6 seconds per vehicle. For this study, the background conditions are the baseline conditions that the future conditions *(background plus build-out)* are compared to (See Table 6).

The future traffic volumes *(background plus build-out)* during the pm peak hour indicate that the level of service (LOS) for the intersection is "C" with a control delay of 14.1 seconds per vehicle (See Table 6).

The future with improvements (addition of westbound left turn lane) results during the pm peak hour indicate that the levels of service (LOS) for the intersection is "B" with a control delay of 10.5 seconds per vehicle (See Table 6).

The results of the capacity analyses at the intersection of **SR 1224 (Monte Vista Road/Sandhill Road) and SR 1245 (Acton Circle Road)** for the existing am peak hour traffic volumes indicate that the level of service (LOS) for the intersection as a whole is "D" with a control delay of 36.1 seconds per vehicle. Similar results are obtained for background conditions *(existing traffic volumes plus a growth rate of one percent for two years to the build-out year of 2023)* where the background traffic volumes indicate that the level of service (LOS) for the intersection as a whole is still "D" with a control delay of 37.8 seconds per vehicle. For this study, the background conditions are the baseline conditions that the future conditions *(background plus build-out)* are compared to (See Table 7).

The future *(background plus build-out)* traffic volumes during the am peak hour indicate that the level of service (LOS) for the intersection as a whole is "D" with a control delay of 41.8 seconds per vehicle (See Table 7).

The results of the capacity analyses at the intersection of **SR 1224 (Monte Vista Road/Sandhill Road) and SR 1245 (Acton Circle Road)** for the existing pm peak hour traffic volumes indicate that the level of service (LOS) for the intersection as a whole is "C" with a control delay of 25.2 seconds per vehicle. Similar results are obtained for background conditions *(existing traffic volumes plus a growth rate of one percent for two years to the build-out year of 2023)* where the background traffic volumes indicate that the level of service (LOS) for the intersection as a whole is still "C" with a control delay of 25.7 seconds per vehicle. For this study, the background conditions are the baseline conditions that the future conditions *(background plus build-out)* are compared to (See Table 7).

The future *(background plus build-out)* traffic volumes during the pm peak hour indicate that the level of service (LOS) for the intersection as a whole is "C" with a control delay of 28.0 seconds per vehicle (See Table 7).

The results of the capacity analyses at the intersection of **US 19-23 (Smoky Park Highway) and SR 1245 (Acton Circle Road)** for the existing am peak hour traffic volumes indicate that the level of service (LOS) for the intersection as a whole is "B" with a control delay of 15.6 seconds per vehicle. Similar results are obtained for background conditions *(existing traffic volumes plus a growth rate of one percent for two years to the build-out*

year of 2023) where the background traffic volumes indicate that the level of service (LOS) for the intersection as a whole is still "B" with a control delay of 15.5 seconds per vehicle. For this study, the background conditions are the baseline conditions that the future conditions *(background plus build-out)* are compared to (See Table 8).

The future *(background plus build-out)* traffic volumes during the am peak hour indicate that the level of service (LOS) for the intersection as a whole is "B" with a control delay of 15.9 seconds per vehicle (See Table 8).

The results of the capacity analyses at the intersection of **US 19-23 (Smoky Park Highway) and SR 1245 (Acton Circle Road)** for the existing pm peak hour traffic volumes indicate that the level of service (LOS) for the intersection as a whole is "A" with a control delay of 7.8 seconds per vehicle. Similar results are obtained for background conditions *(existing traffic volumes plus a growth rate of one percent for two years to the build-out year of 2023)* where the background traffic volumes indicate that the level of service (LOS) for the intersection as a whole is still "A" with a control delay of 7.6 seconds per vehicle. For this study, the background conditions are the baseline conditions that the future conditions *(background plus build-out)* are compared to (See Table 8).

The future *(background plus build-out)* traffic volumes during the pm peak hour indicate that the level of service (LOS) for the intersection as a whole is "A" with a control delay of 7.6 seconds per vehicle (See Table 8).

The results of the capacity analyses at the intersection of **US 19-23 (Smoky Park Highway) and I-40 Eastbound On/Off Ramps/SR 1245 (Acton Circle Road)** for the existing am peak hour traffic volumes indicate that the level of service (LOS) for the intersection as a whole is "F" with a control delay of 267.3 seconds per vehicle. Similar results are obtained for background conditions *(existing traffic volumes plus a growth rate of one percent for two years to the build-out year of 2023)* where the background traffic volumes indicate that the level of service (LOS) for the intersection as a whole is "F" with a control delay of 284.9 seconds per vehicle. For this study, the background conditions are the baseline conditions that the future conditions *(background plus build-out)* are compared to (See Table 9).

The future *(background plus build-out)* traffic volumes during the am peak hour indicate that the level of service (LOS) for the intersection as a whole is "F" with a control delay of 287.8 seconds per vehicle (See Table 9).

The results of the capacity analyses at the intersection of **US 19-23 (Smoky Park Highway) and I-40 Eastbound On/Off Ramps/SR 1245 (Acton Circle Road)** for the existing pm peak hour traffic volumes indicate that the level of service (LOS) for the intersection as a whole is "D" with a control delay of 54.9 seconds per vehicle. Similar results are obtained for background conditions *(existing traffic volumes plus a growth rate of one percent for two years to the build-out year of 2023)* where the background traffic volumes indicate that the level of service (LOS) for the intersection as a

whole drops to "E" with a control delay of 62.7 seconds per vehicle. For this study, the background conditions are the baseline conditions that the future conditions *(background plus build-out)* are compared to (See Table 9).

The future *(background plus build-out)* traffic volumes during the pm peak hour indicate that the level of service (LOS) for the intersection as a whole is "E" with a control delay of 64.3 seconds per vehicle (See Table 9).

The results of the capacity analyses at the intersection of **US 19-23 (Smoky Park Highway) and I-40 Westbound On/Off Ramps** for the existing am peak hour traffic volumes indicate that the level of service (LOS) for the intersection as a whole is "C" with a control delay of 25.2 seconds per vehicle. Similar results are obtained for background conditions *(existing traffic volumes plus a growth rate of one percent for two years to the build-out year of 2023)* where the background traffic volumes indicate that the level of service (LOS) for the intersection as a whole is still "C" with a control delay of 25.5 seconds per vehicle. For this study, the background conditions are the baseline conditions that the future conditions *(background plus build-out)* are compared to (See Table 10).

The future *(background plus build-out)* traffic volumes during the am peak hour indicate that the level of service (LOS) for the intersection as a whole is "C" with a control delay of 25.6 seconds per vehicle (See Table 10).

The results of the capacity analyses at the intersection of **US 19-23 (Smoky Park Highway) and I-40 Westbound On/Off Ramps** for the existing pm peak hour traffic volumes indicate that the level of service (LOS) for the intersection as a whole is "D" with a control delay of 48.2 seconds per vehicle. Similar results are obtained for background conditions *(existing traffic volumes plus a growth rate of one percent for two years to the build-out year of 2023)* where the background traffic volumes indicate that the level of service (LOS) for the intersection as a whole is "D" with a control delay of 52.7 seconds per vehicle. For this study, the background conditions are the baseline conditions that the future conditions *(background plus build-out)* are compared to (See Table 10).

The future *(background plus build-out)* traffic volumes during the pm peak hour indicate that the level of service (LOS) for the intersection as a whole is "E" with a control delay of 56.2 seconds per vehicle (See Table 10). Although the LOS dropped a letter grade, the control delay only increased by 3.5 seconds, well below a 25% increase warranting mitigation.

The results of the capacity analyses at the intersection of **US 19-23 (Smoky Park Highway) and SR 1404 (Old Haywood Road)/Burger King** for the existing am peak hour traffic volumes indicate that the level of service (LOS) for the intersection as a whole is "B" with a control delay of 19.7 seconds per vehicle. Similar results are obtained for background conditions *(existing traffic volumes plus a growth rate of one percent for two years to the build-out year of 2023)* where the background traffic volumes indicate that the level of service (LOS) for the intersection as a whole is "C" with a control delay of 20.3

seconds per vehicle. For this study, the background conditions are the baseline conditions that the future conditions *(background plus build-out)* are compared to (See Table 11).

The future *(background plus build-out)* traffic volumes during the am peak hour indicate that the level of service (LOS) for the intersection as a whole is "C" with a control delay of 20.4 seconds per vehicle (See Table 11).

The results of the capacity analyses at the intersection of **US 19-23 (Smoky Park Highway) and SR 1204 (Old Haywood Road)/Burger King** for the existing pm peak hour traffic volumes indicate that the level of service (LOS) for the intersection as a whole is "C" with a control delay of 26.0 seconds per vehicle. Similar results are obtained for background conditions *(existing traffic volumes plus a growth rate of one percent for two years to the build-out year of 2023)* where the background traffic volumes indicate that the level of service (LOS) for the intersection as a whole is still "C" with a control delay of 27.8 seconds per vehicle. For this study, the background conditions are the baseline conditions that the future conditions *(background plus build-out)* are compared to (See Table 11).

The future *(background plus build-out)* traffic volumes during the pm peak hour indicate that the level of service (LOS) for the intersection as a whole is "C" with a control delay of 29.5 seconds per vehicle (See Table 11).

The results of the capacity analyses at the intersection of **SR 1204 (Old Haywood Road) and SR 1255 (Starnes Cove Road)** for the existing am peak hour traffic volumes indicate that the levels of service (LOS) for the eastbound minor approach is "B" with a control delay of 14.0 seconds per vehicle and for the westbound minor approach the level of service is "B" with a control delay of 12.9 seconds per vehicle (See Table 12). During background conditions *(existing traffic volumes plus a growth rate of one percent for two years to the build-out year of 2023)*, the background traffic volumes indicate that the levels of service (LOS) for the eastbound and westbound minor approaches is "B" with a control delay of 14.3 seconds per vehicle and 13.0 seconds per vehicle respectively. For this study, the background conditions are the baseline conditions that the future conditions *(background plus build-out)* are compared to (See Table 12).

The future traffic volumes *(background plus build-out)* during the am peak hour indicate that the levels of service (LOS) for the eastbound and westbound minor approaches is "C" and "B" with a control delay of 15.4 seconds per vehicle and 13.4 seconds per vehicle respectively (See Table 12).

The results of the capacity analyses at the intersection of **SR 1204 (Old Haywood Road) and SR 1255 (Starnes Cove Road)** for the existing pm peak hour traffic volumes indicate that the levels of service (LOS) for the eastbound and westbound minor approaches is "C" with a control delay of 16.8 seconds per vehicle and 17.6 seconds per vehicle respectively (See Table 12). During background conditions *(existing traffic volumes plus a growth rate of one percent for two years to the build-out year of 2023)*, the background traffic volumes indicate that

the levels of service (LOS) for the eastbound and westbound minor approaches is "C" with a control delay of 17.2 seconds per vehicle and 17.9 seconds per vehicle respectively. For this study, the background conditions are the baseline conditions that the future conditions *(background plus build-out)* are compared to (See Table 12).

The future traffic volumes *(background plus build-out)* during the pm peak hour indicate that the levels of service (LOS) for the eastbound and westbound minor approaches is "C" with a control delay of 18.9 seconds per vehicle and 18.8 seconds per vehicle respectively (See Table 12).

The results of the capacity analyses at the intersection of **SR 1238 (Holbrook Road) and SR 1255 (Starnes Cove Road)** for the existing am peak hour traffic volumes indicate that the levels of service (LOS) for the northbound minor approach is "A" with a control delay of 9.9 seconds per vehicle (See Table 13). During background conditions *(existing traffic volumes plus a growth rate of one percent for two years to the build-out year of 2023)*, the background traffic volumes indicate that the levels of service (LOS) for the northbound minor approach is "B" with a control delay of 10.0 seconds per vehicle. For this study, the background conditions are the baseline conditions that the future conditions *(background plus build-out)* are compared to (See Table 13).

The future traffic volumes *(background plus build-out)* during the am peak hour indicate that the levels of service (LOS) for the northbound minor approach is "B" with a control delay of 10.4 seconds per vehicle (See Table 13).

The results of the capacity analyses at the intersection of **SR 1238 (Holbrook Road) and SR 1255 (Starnes Cove Road)** for the existing pm peak hour traffic volumes indicate that the levels of service (LOS) for the northbound minor approaches is "A" with a control delay of 9.7 seconds per vehicle (See Table 13). During background conditions *(existing traffic volumes plus a growth rate of one percent for two years to the build-out year of 2023)*, the background traffic volumes indicate that the levels of service (LOS) for the northbound minor approach is "A" with a control delay of 9.7 seconds per vehicle. For this study, the background conditions are the baseline conditions that the future conditions *(background plus build-out)* are compared to (See Table 13).

The future traffic volumes *(background plus build-out)* during the pm peak hour indicate that the levels of service (LOS) for the northbound minor approach is "B" with a control delay of 10.0 seconds per vehicle (See Table 13).

Holbrook Road at Marathon Lane													
Table 4													
Approach/Movement	Peak Hour	Existing			Background			Buildout			Buildout with Improvements		
		LOS	Delay	Queue	LOS	Delay	Queue	LOS	Delay	Queue	LOS	Delay	Queue
Eastbound/Left Turn	AM	A	7.5	0	A	7.5	0	A	7.5	0			
Westbound/Left Turn		-	-	-	-	-	-	A	7.6	0			
Northbound		NA	NA	NA	NA	NA	NA	B	10.9	7.5			
Southbound		A	9.6	0	A	9.6	0	B	10.5	2.5			
Intersection		-	-	-	-	-	-	-	-	-			
Eastbound/Left Turn	PM	A	7.5	0	A	7.5	0	A	7.6	0			
Westbound/Left Turn		-	-	-	-	-	-	A	7.5	0			
Northbound		NA	NA	NA	NA	NA	NA	B	10.6	2.5			
Southbound		A	9.6	0	A	9.6	0	B	10.7	2.5			
Intersection		-	-	-	-	-	-	-	-	-			

Exceeds NCDOT Thresholds
(LOS degrades by at least one level)
(LOS is "F")
(Delay increases by 25% or greater while maintaining same LOS)

Delay is Control Delay and is measured in seconds per vehicle.
Queue is the Synchro 95th percentile is recorded in feet. "#" means queue may be longer than reported. "m" means metered.
LOS is Level of Service and is based on HCM 6th Edition methodology.

Although the Southbound approach drops from LOS "A" ato "B", the increase in Control Delay is a maximum of 1.1 seconds.
LOS "B" is a very acceptable LOS for peak conditions. Therefore, **no mitigation improvments are recommended** as a result of this proposed development.

Holbrook Road at Homestead Way												
Table 5												
Approach/Movement	Peak Hour	Existing			Background			Buildout			Buildout with Improvements		
		LOS	Delay	Queue	LOS	Delay	Queue	LOS	Delay	Queue	LOS	Delay	Queue
Eastbound/Left Turn	AM	A	7.5	0	A	7.5	0	A	7.6	0	A	7.6	0
Westbound/Left Turn		-	-	-	-	-	-	A	7.5	0	A	7.5	0
Northbound		NA	NA	NA	NA	NA	NA	B	12.0	10	B	11.9	10
Southbound		A	9.5	2.5	A	9.5	2.5	B	10.1	5	B	10.1	0
Intersection		-	-	-	-	-	-	-	-	-	-	-	-
Eastbound/Left Turn	PM	A	7.6	0	A	7.6	0	A	7.6	2.5	A	7.6	2.5
Westbound/Left Turn		-	-	-	-	-	-	A	7.6	0	A	7.6	0
Northbound		NA	NA	NA	NA	NA	NA	B	12.1	5	B	11.9	5
Southbound		A	9.8	2.5	A	9.8	2.5	B	10.7	5	B	10.7	5
Intersection		-	-	-	-	-	-	-	-	-	-		-

Exceeds NCDOT Thresholds
(LOS degrades by at least one level)
(LOS is "F")
(Delay increases by 25% or greater while maintaining same LOS)

Delay is Control Delay and is measured in seconds per vehicle.
Queue is the Synchro 95th percentile is recorded in feet. "#" means queue may be longer than reported. "m" means metered.
LOS is Level of Service and is based on HCM 6th Edition methodology.

Although the Southbound approach drops from LOS "A" ato "B", the increase in Control Delay is less than 1.0 seconds.
LOS "B" is a very acceptable LOS for peak conditions. Therefore, **no mitigation improvments are recommended** Base on LOS or Delay.
A **right turn deceleration lane with 50 feet of full storage** is marginally warranted based on volumes along the eastbound Holbrook Road approach.

Edgewood Road/Holbrook Road at Monte Vista													
Table 6													
Approach	Peak Hour	Existing			Background			Buildout			Buildout with Improvements		
		LOS	Delay	Queue	LOS	Delay	Queue	LOS	Delay	Queue	LOS	Delay	Queue
Eastbound	AM	B	15.4	316	B	16.1	333#	C	23.6	463#	B	17.9	396#
Westbound		A	6.3	83	A	6.3	85	A	8.1	108	A	6.9	67
Northbound		B	19.8	23	B	19.9	23	B	17.7	21	B	19.3	22
Southbound		C	34.8	151#	D	36	154#	D	43	216#	C	34.7	171#
Intersection		B	15.9	-	B	16.4	-	C	23.2	-	B	18.3	-
Eastbound	PM	A	7.2	100	A	7.2	101	A	8.1	104	A	6.4	92
Westbound		A	9.8	212	A	9.9	217	B	13.5	255	A	9.6	225
Northbound		B	16.1	15	B	16.5	15	B	17.5	15	B	18.3	16
Southbound		C	21.0	95	C	21.5	99	C	27.9	145	C	21.5	85
Intersection		B	10.5	-	B	10.6	-	C	14.1	-	B	10.5	-

Exceeds NCDOT Thresholds
(LOS degrades by at least one level)
(LOS is "F")
(Delay increases by 25% or greater while maintaining same LOS)

Delay is Control Delay and is measured in seconds per vehicle.
Queue is the Synchro 95th percentile is recorded in feet. "#" means queue may be longer than reported. "m" means metered.
LOS is Level of Service and is based on HCM 6th Edition methodology.

Recommended Improvements: Widen Holbrook Road to provide an **exclusive westbound left turn lane with 100' full storage**.
Modify traffic signal operation to accommodate westbound left turn lane.

Monte Vista at Acton Circle													
Table 7													
Approach	Peak Hour	Existing			Background			Buildout			Buildout with Improvements		
		LOS	Delay	Queue	LOS	Delay	Queue	LOS	Delay	Queue	LOS	Delay	Queue
Eastbound	AM	C	27.2	[1]448#	C	28.7	[1]461#	C	31.6	[1]512#			
Westbound		D	44.2	340#	D	45.2	352#	D	52.1	378#			
Northbound		E	59.7	202#	E	63.7	209#	E	74.1	217#			
Southbound		D	39.9	[2]71	D	42.3	[2]74	D	44.3	[2]76			
Intersection		D	36.1	-	D	37.8	-	D	41.8	-			
Eastbound	PM	C	21.2	[1]229	C	21.5	[1]234	C	23.9	[1]261#			
Westbound		C	29.2	289	C	29.7	296	D	35.0	312			
Northbound		D	36.9	128	D	37.8	130	D	41.3	139			
Southbound		C	23.1	[2]286	C	23.6	[2]295	C	23.8	[2]324			
Intersection		C	25.2	-	C	25.7	-	C	28.0	-			

Exceeds NCDOT Thresholds
(LOS degrades by at least one level)
(LOS is "F")
(Delay increases by 25% or greater while maintaining same LOS)

Delay is Control Delay and is measured in seconds per vehicle.
Queue is the Synchro 95th percentile is recorded in feet. "#" means queue may be longer than reported. "m" means metered.
LOS is Level of Service and is based on HCM 6th Edition methodology.

[1] indicates left turn lane queue.
[2] indicates right turn lane queue.

Although the Westbound approach drops from LOS "C" to "D" during the PM peak hour, the increase in Control Delay is less than 25%. LOS "D" is the design level of service for peak conditions. Therefore, **no mitigation improvements are recommended** other than future optimization of the traffic signal timing upon buildout of the development.

Smokey Park Highway at Acton Circle													
Table 8													
Approach	Peak Hour	Existing			Background			Buildout			Buildout with Improvements		
		LOS	Delay	Queue	LOS	Delay	Queue	LOS	Delay	Queue	LOS	Delay	Queue
Eastbound	AM	D	45.7	[1]201	D	46.1	[1]204	D	45.3	[1]205			
Westbound		NA	NA	NA	NA	NA	NA	NA	NA	NA			
Northbound		B	12.8	[1]157	B	12.9	[1]160	B	13.2	[1]162			
Southbound		B	11.3	140m	B	10.8	132m	B	11.1	136m			
Intersection		B	15.6	-	B	15.5	-	B	15.9	-			
Eastbound	PM	D	50.1	[1]99	D	50.4	[1]100	D	49.6	[1]100			
Westbound		NA	NA	NA	NA	NA	NA	NA	NA	NA			
Northbound		A	7.8	[1]146	A	7.9	[1]149	A	8.2	[1]157			
Southbound		A	1.6	43m	A	1.2	33m	A	1.0	33m			
Intersection		A	7.8	-	A	7.6	-	A	7.6	-			

Exceeds NCDOT Thresholds
(LOS degrades by at least one level)
(LOS is "F")
(Delay increases by 25% or greater while maintaining same LOS)

Delay is Control Delay and is measured in seconds per vehicle.
Queue is the Synchro 95th percentile is recorded in feet. "#" means queue may be longer than reported. "m" means metered.
LOS is Level of Service and is based on HCM 6th Edition methodology.

[1] indicates left turn lane queue.

No degradation in LOS or Control Delay exceeding NCDOT Thresholds from proposed development site traffic.
Therefore, **no mitigation improvements are recommended**.

Smokey Park Highway at Acton Circle/I-40 EB Ramps													
Table 9													
Approach	Peak Hour	Existing			Background			Buildout			Buildout with Improvements		
		LOS	Delay	Queue	LOS	Delay	Queue	LOS	Delay	Queue	LOS	Delay	Queue
Eastbound	AM	F	273.4	[1]409#	F	297.0	[1]420#	F	294.1	[1]443#			
Northbound		F	395.5	[1]6m	F	428.9	[1]6m	F	428.9	[1]6m			
Southbound		F	113.1	[1]855#	F	118.4	[1]875#	F	128.5	[1]887#			
Southeast bound		F	234.2	[1]324#	F	193.0	[1]322#	F	193.0	[1]322#			
Intersection		F	267.3	-	F	284.9	-	F	287.8	-			
Eastbound	PM	F	101.7	[1]294#	F	91.3	[1]289#	F	103.4	[1]306#			
Northbound		C	34.8	[1]6m	D	41.0	[1]6m	D	41.0	[1]6m			
Southbound		D	51.1	[1]237m	E	63.2	[1]236m	E	63.6	[1]231m			
Southeast bound		F	123.1	[1]222m	F	127.0	[1]229m	F	127.0	[1]229m			
Intersection		D	54.9	-	E	62.7	-	E	64.3	-			

Exceeds NCDOT Thresholds
(LOS degrades by at least one level)
(LOS is "F")
(Delay increases by 25% or greater while maintaining same LOS)

Delay is Control Delay and is measured in seconds per vehicle.
Queue is the Synchro 95th percentile is recorded in feet. "#" means queue may be longer than reported. "m" means metered.
LOS is Level of Service and is based on HCM 6th Edition methodology.

[1] indicates left turn lane queue.

No degradation in LOS or Control Delay exceeding NCDOT Thresholds from proposed development site traffic.
Intersection is currently over capacity and experiencing significant queues, excessive delays and failing levels of service.
Substantial improvements (by NCDOT via I-2513) are scheduled at this interchange to address existing operational issues.
Therefore, **no mitigation improvements are recommended as a result of this proposed development**.

Smokey Park Highway at I-40 WB Ramps													
Table 10													
Approach	Peak Hour	Existing			Background			Buildout			Buildout with Improvements		
		LOS	Delay	Queue	LOS	Delay	Queue	LOS	Delay	Queue	LOS	Delay	Queue
Eastbound	AM	D	42.2	[1]221	D	42.9	[1]228	D	42.6	[1]230			
Westbound		NA	NA	NA	NA	NA	NA	NA	NA	NA			
Northbound		B	11.4	[1]36m	B	11	[1]36m	B	11.3	[1]39m			
Southbound		C	26.3	571	C	26.9	587	C	27.2	600			
Intersection		C	25.2	-	C	25.5	-	C	25.6	-			
Eastbound	PM	F	93.3	[1]308#	F	94.4	[1]317#	F	101.8	[1]333#			
Westbound		NA	NA	NA	NA	NA	NA	NA	NA	NA			
Northbound		A	3.3	[1]29m	A	3.3	[1]29m	A	3.3	[1]32m			
Southbound		D	41.8	863#	D	53.8	907#	E	56.1	917#			
Intersection		D	48.2	-	D	52.7	-	E	56.2	-			

Exceeds NCDOT Thresholds
(LOS degrades by at least one level)
(LOS is "F")
(Delay increases by 25% or greater while maintaining same LOS)

Delay is Control Delay and is measured in seconds per vehicle.
Queue is the Synchro 95th percentile is recorded in feet. "#" means queue may be longer than reported. "m" means metered.
LOS is Level of Service and is based on HCM 6th Edition methodology.

[1] indicates left turn lane queue.

Although the Southbound approach and Intersection drops from LOS "D" to "E" durig the PM peak, the Control Delay increase is less than 4.0 seconds.
The intersection is currently experiencing failing levels of service, excessive delays and substantial queues during the PM peak periods.
Substantial improvements (by NCDOT via I-2513) are scheduled at this interchange to address existing operational issues.
Therefore, **no mitigation improvements are recommended as a result of this proposed development**.

Smokey Park Highway at Old Haywood Road													
Table 11													
Approach	Peak Hour	Existing			Background			Buildout			Buildout with Improvements		
		LOS	Delay	Queue	LOS	Delay	Queue	LOS	Delay	Queue	LOS	Delay	Queue
Eastbound	AM	B	13.4	[1]203m	B	13.8	[1]198m	B	14.1	[1]200m			
Westbound		B	16.3	[1]15	B	16.6	[1]15	B	17.5	[1]15			
Northbound		D	46.8	65	D	46.6	65	D	45.1	64			
Southbound		D	41.2	[2]248	D	41.2	[2]251	D	40.7	[2]249			
Intersection		B	19.7	-	C	20.3	-	C	20.4	-			
Eastbound	PM	B	17.3	[1]290m	B	17.5	[1]299m	B	17.7	[1]302m			
Westbound		C	30.3	[1]25	C	34.2	[1]25	D	37.7	[1]25			
Northbound		D	52.2	95	D	52.4	97	D	52.3	97			
Southbound		D	37.3	[2]170	D	37.7	[2]176	D	38.0	[2]178			
Intersection		C	26.0	-	C	27.8	-	C	29.5	-			

Exceeds NCDOT Thresholds
(LOS degrades by at least one level)
(LOS is "F")
(Delay increases by 25% or greater while maintaining same LOS)

Delay is Control Delay and is measured in seconds per vehicle.
Queue is the Synchro 95th percentile is recorded in feet. "#" means queue may be longer than reported. "m" means metered.
LOS is Level of Service and is based on HCM 6th Edition methodology.

[1] indicates left turn lane queue.
[2] indicates right turn lane queue.

Although the Westbound approach drops from LOS "C" to "D" during the PM peak hour, the increase in Control Delay is only 3.5 seconds.
LOS "D" is the design level of service for peak conditions. Intersection scheduled for future improvements (by NCDOT via I-2513).
Therefore, **no mitigation improvements are recommended as a result of this proposed development**.

Old Haywood Road at Starnes Cove Road													
Table 12													
Approach/Movement	Peak Hour	Existing			Background			Buildout			Buildout with Improvements		
		LOS	Delay	Queue	LOS	Delay	Queue	LOS	Delay	Queue	LOS	Delay	Queue
Eastbound	AM	B	14.0	52.5	B	14.3	55	C	15.4	67.5			
Westbound		B	12.9	2.5	B	13.0	2.5	B	13.4	2.5			
Northbound/Left Turn		A	7.7	2.5	A	7.8	2.5	A	7.8	2.5			
Southbound/Left Turn		A	7.4	0	A	7.4	0	A	7.4	0			
Intersection		-	-	-	-	-	-	-	-	-			
Eastbound	PM	C	16.8	42.5	C	17.2	45	C	18.9	55			
Westbound		C	17.6	5	C	17.9	5	C	18.8	5			
Northbound/Left Turn		A	8.3	12.5	A	8.3	12.5	A	8.4	12.5			
Southbound/Left Turn		A	7.6	0	A	7.6	0	A	7.6	0			
Intersection		-	-	-	-	-	-	-	-	-			

Exceeds NCDOT Thresholds
(LOS degrades by at least one level)
(LOS is "F")
(Delay increases by 25% or greater while maintaining same LOS)

Delay is Control Delay and is measured in seconds per vehicle.
Queue is the Synchro 95th percentile is recorded in feet. "#" means queue may be longer than reported. "m" means metered.
LOS is Level of Service and is based on HCM 6th Edition methodology.

Although the Eastbound approach drops from LOS "B" to "C" during the AM peak, the increase in Control Delay is only 1.1 seconds.
LOS "C" is a very acceptable LOS for peak conditions. Therefore, **no mitigation improvments are recommended** as a result of this proposed development.

Holbrook Road at Starnes Cove Road													
Table 13													
Approach/Movement	Peak Hour	Existing			Background			Buildout			Buildout with Improvements		
		LOS	Delay	Queue	LOS	Delay	Queue	LOS	Delay	Queue	LOS	Delay	Queue
Eastbound	AM	-	-	-	-	-	-	-	-	-			
Westbound/Left Turn		A	7.8	10.0	A	7.8	10.0	A	7.8	10.0			
Northbound		A	9.9	19.5	B	10.0	17.5	B	10.4	22.5			
Southbound		NA	NA	NA	NA	NA	NA	NA	NA	NA			
Intersection		-	-	-	-	-	-	-	-	-			
Eastbound	PM	-	-	-	-	-	-	-	-	-			
Westbound/Left Turn		A	7.7	10.0	A	7.7	10.0	A	7.7	12.5			
Northbound		A	9.7	15.0	A	9.7	15.0	B	10.0	17.5			
Southbound		NA	NA	NA	NA	NA	NA	NA	NA	NA			
Intersection		-	-	-	-	-	-	-	-	-			

Exceeds NCDOT Thresholds
(LOS degrades by at least one level)
(LOS is "F")
(Delay increases by 25% or greater while maintaining same LOS)

Delay is Control Delay and is measured in seconds per vehicle.
Queue is the Synchro 95th percentile is recorded in feet. "#" means queue may be longer than reported. "m" means metered.
LOS is Level of Service and is based on HCM 6th Edition methodology.

Although the Northbound approach drops from LOS "A" to "B" during thePM peak, the increase in Control Delay is only 0.3 seconds.
LOS "B" is a very acceptable LOS for peak conditions. Therefore, **no mitigation improvments are recommended** as a result of this proposed development.

Queue Length and Turn Lanes

Queue Length Analysis

In addition to the Synchro analyses that report 95th percentile queue lengths, NCDOT Congestion Management guidelines recommend performing a Sim-Traffic simulation of build-out conditions to determine maximum queue lengths. The maximum queue length represented in Sim-Traffic can be more accurate under certain conditions and scenarios than the Synchro 95th percentile queue. NCDOT Congestion Management recommends considering the higher of the two reported queues for design purposes.

The study area identified for this TIA is currently experiencing significant queues during peak periods, particularly around the Smokey Park Highway interchange with I-40. During the AM peak hour, substantial traffic volumes are using Smokey Park Highway to access I-40 eastbound resulting in queues exceeding storage lengths and backing into adjacent intersections. During the PM peak, substantial traffic volumes are exiting westbound I-40 resulting in queues extending onto the interstate. These problems currently exist and are expected to continue to exist through background and built-out conditions. Improvements are needed at this interchange (by NCDOT via TIP Project I-2513) to address the current operational constraints.

Sim-Traffic analyses were performed on each analysis scenario (See Appendix E). Visual observations of the study area confirm intersections operating at failing levels of service with significant queues under existing conditions. However, the Sim-Traffic simulation appears to over-estimate the extent of these queues and the subsequent impact on the surrounding roadway network and study intersections. The Sim-Traffic maximum queue results should be considered with caution.

Turn Lane Warrants

The Policy on Street and Driveway Access to North Carolina Highways (Driveway Manual) published by the North Carolina Department of Transportation (NCDOT) contains information on when auxiliary left and/or right turn lanes should be provided at new access (driveway) locations. This information is based on anticipated turning volumes and opposing volumes and is not based on capacity analyses. Consulting the turn lane warrants presented in the Driveway Manual, **a right turn deceleration lane with 50 feet of full storage is marginally warranted along eastbound Holbrook Road at the proposed access #2** (See Appendix F).

Conclusions/Suggestions

As stated in the Introduction section of this report, the proposed development of 350 apartment units exceeds the threshold for a traffic impact analysis (TIA) by Buncombe County. As such, the TIA was screened, scoped, and prepared in accordance with North Carolina Department of Transportation (NCDOT) guidelines and regulations.

General Comments

Several intersections in the study area are currently experiencing failing levels of service, excessive delays, and substantial queues, particularly around and in the vicinity of the interchange between Smokey Park Highway and I-40. Significant improvements are needed at these locations to alleviate the existing operational deficiencies. These improvements should be planned, designed and constructed by NCDOT as a future TIP project (I-2513) in order to address the congestion being experienced in the area. While this TIA identifies the study intersections where these failing conditions are occurring, it is not the intent of this TIA to identify the specific mitigation needed (by others) to address these existing concerns.

Specific Comments

Several intersections within the defined study area are predicted to experience a drop in level of service or an increase in control delay exceeding 25% due to proposed development traffic. As a result, the following mitigation improvements are recommended for consideration:

At the intersection of SR 1238 (Holbrook Road) and Marathon Lane / Proposed Access #1, the access point should be located across from Marathon Lane in order to create a 4-legged intersection. Additionally, the driveway should provide a minimum of 100' of internal protected stem length (IPSL) before conflicting movements are introduced. Finally, appropriate intersection sight distance triangles should be maintained to preserve adequate sight distance.

At the intersection of SR 1238 (Holbrook Road) and Homestead Road / Proposed Access #2, the access point should be located across from Homestead Road in order to create a 4-legged intersection. Additionally, the driveway should provide a minimum of 100' of internal protected stem length (IPSL) before conflicting movements are introduced. Also, a right turn deceleration lane with 50' of full storage is marginally warranted along eastbound Holbrook Road. Finally, appropriate intersection sight distance triangles should be maintained to preserve adequate sight distance.

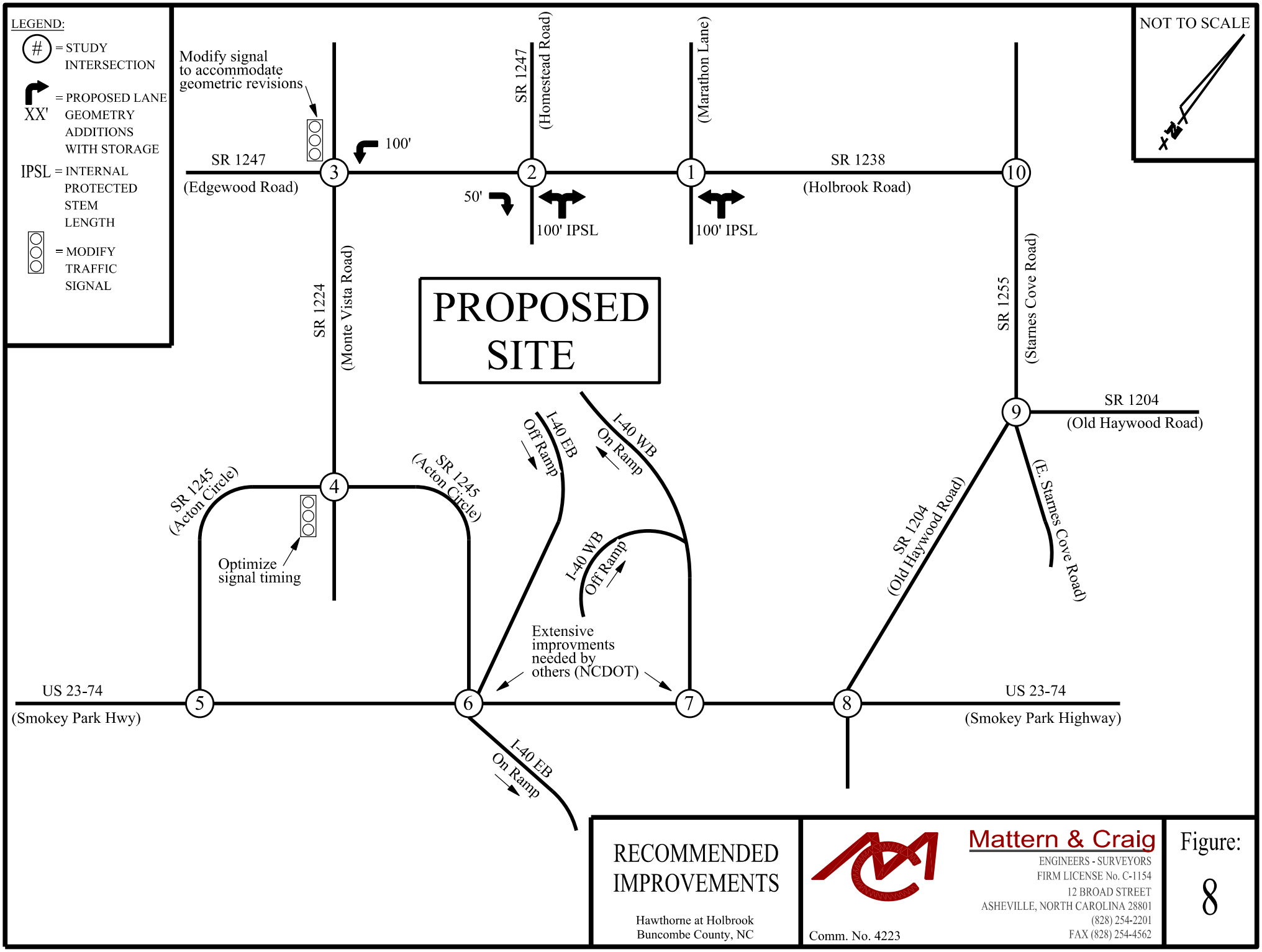
At the intersection of SR 1224 (Monte Vista Road) and SR 1238 (Holbrook Road) / SR 1247 (Edgewood Road), a left turn lane with 100' of full storage should be provided along westbound Holbrook Road. The traffic signal operation should be revised/modified to accommodate the addition of this exclusive left turn lane.

At the intersection of **SR 1224 (Monte Vista Road/Sandhill Road) and SR 1245 (Acton Circle Road)**, the traffic signal timing should be optimized upon full buildout of the development in

order to assure proper timing and phasing is providing the most efficient operation possible.

All of the suggested mitigation improvements above are subject to more review and discussion with the developer, Buncombe County, and the North Carolina Department of Transportation (NCDOT) before becoming part of the conditions for the necessary driveway permit applications. Since some of the possible mitigation improvements could be contingent upon the ability to obtain additional right-of-way and would be part of the state-maintained highway system, the final approval for these mitigation measures rests with the North Carolina Department of Transportation (NCDOT).

An overview of the suggested mitigation improvements the developer should be responsible for can be found on Figure 8 of this report.



RECOMMENDED IMPROVEMENTS

Hawthorne at Holbrook
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