



**LINCOLN COUNTY PLANNING & INSPECTIONS DEPARTMENT**  
302 NORTH ACADEMY STREET, SUITE A, LINCOLNTON, NORTH CAROLINA 28092  
704-736-8440 OFFICE 704-736-8434 INSPECTION REQUEST LINE 704-732-9010 FAX

To: Board of Commissioners  
Planning Board

From: Randy Hawkins, Zoning Administrator

Date: August 24, 2018

Re: PD #2018-1  
Cambridge Commons MF, LLC, applicant  
Parcel ID# 30400 and 90176 (portion)

*The following information is for use by the Lincoln County Board of Commissioners and Planning Board at their joint meeting/public hearing on September 10, 2018.*

**REQUEST**

The applicant is requesting the rezoning of 10.3 acres from R-T (Transitional Residential) to PD-R (Planned Development-Residential) to permit 260 multi-family dwelling units (apartments). This would be the third phase of a larger development area that includes a retail center and a planned office park.

A concept plan and a PD-R report with conditions for the proposed development have been submitted as part of the rezoning application and would serve as the master plan for the development if the rezoning request is approved. A traffic impact analysis is also included as part of the application. In addition, the applicant has provided minutes from a community involvement meeting that was held on March 6.

**SITE AREA AND DESCRIPTION**

The subject property is located of the west side of North Pilot Knob Road and the north and south sides of Cresset Dellinger Road. It is adjacent to the Cambridge Village retail center, a 16-acre site that includes a Publix grocery store, and to a planned 5-acre office park. Adjoining properties are zoned PD-C (Planned Development Commercial) and R-T. Land uses in this area include business and residential.

**ENVIRONMENTAL**

A portion of this property is located in the WS-IV Protected Area watershed district. The remainder, the larger portion, is located in an area subject to state stormwater regulations and permitting.

## LAND USE PLAN CONFORMANCE

This property is part of an area designated by the Lincoln County Land Use Plan as a Walkable Activity Center, suitable for a mix of commercial and residential uses with a residential density of 6-24 dwelling units per acre. Including the commercial center and planned office park as part of an activity center, the proposed residential density is 8.3 dwelling units per acre. Counting only the area for the apartments, the proposed density is 25 units per acre.

## SEWER AVAILABILITY

The applicant has been advised that Lincoln County currently cannot allocate sewer capacity for the proposed development. Total allowable capacity at the Killian Creek Wastewater Treatment Plant is limited to 90% of the maximum permitted flow of 3.35 million gallons per day. The Board of Commissioners has reserved 8% of the permitted flow for nonresidential development. In July, actual flow plus allocated capacity reached 82%, triggering a temporary halt to any additional residential allocations.

If the N.C. Department of Environmental Quality approves, the county can begin allocating the remaining 10% of capacity once construction begins on an expansion of the plant. That project, scheduled to start in June 2019, will double the capacity of the plant. The expansion is forecast to be completed in December 2020.

The applicant has also been advised of a flow-capacity issue with a sewer main that serves the area that includes the proposed apartment site.

## STAFF'S RECOMMENDATION

Staff recommends that the rezoning request be approved. See proposed statement on following page.



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704-736-8440 OFFICE    704-736-8434 INSPECTION REQUEST LINE    704-732-9010 FAX

### **Zoning Amendment Staff's Proposed Statement of Consistency and Reasonableness**

Case No. **PD #2018-1**

Applicant **Cambridge Commons MF, LLC**

Parcel ID# **30400 and 90176 (portion)**

Location **west side of North Pilot Knob Road and north and south sides of Cresset Dellinger Road**

Proposed amendment **rezone from R-T to PD-R to permit 260 multi-family dwelling units**

This proposed amendment **is consistent** with the Lincoln County Comprehensive Land Use Plan and other adopted plans in that:

**This property is part of an area designated by the Land Use Plan as a Walkable Activity Center, suitable for a mix of commercial and residential uses with a residential density of 6-24 dwelling units per acre. This is the third phase of a 31-acre development area that includes a retail center and a planned office park.**

This proposed amendment **is reasonable and in the public interest** in that:

**This property is suitable for higher density development because it's located near two main highways and in an area where an internal road network and other traffic improvements, including a signal on N.C. 16 Business at Cresset Dellinger Road, have been provided to mitigate the impact. The proposed apartment complex will provide a housing option that's in short supply in eastern Lincoln County.**



## **Planned Development Rezoning Application**

Lincoln County Planning and Inspections Department  
Zoning Administrator  
302 N. Academy St., Lincolnton, NC 28092  
Phone: (704)736-8440 Fax: (704)732-9010

### **PART I**

Applicant Name Cambridge Commons MF, LLC

Applicant Address 6021 Connemara Court, Denver, NC 28037

Applicant Phone Number (571) 220-4829

Property Owner Name Cecil M Dellinger Jr. / Doris D. Keever

Property Owner Address 307 North Pilot Knob Road, Denver, NC 28037

Property Owner Phone Number (828) 461-1260

### **PART II**

Property Location North Pilot Knob Road and Cresset Dellinger Road

Property ID (10 digits) 4602-64-7391, 4602-74-1002 Property size 14.08, 2.52

Parcel # (5 digits) 90176, 30400 Deed Book(s) 89E, 2236 Page(s) 327, 779

### **PART III**

Existing Zoning District RT Proposed Zoning District PD-R

Briefly describe how the property is being used and any existing structures.

One parcel is currently used as a single-family dwelling and the other as a vacant lot.

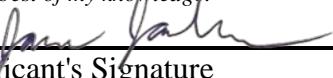
Briefly described the proposed planned development.

The proposed development will consist of roughly 10-acres for a multi-family project.

The development is to consist of approximately 260 units and will include a centralized amenity clubhouse.

### **\*SEE PLANNING DEPT. FOR PLANNED DEVELOPMENT FEES.**

*I hereby certify that all knowledge of the information provided for this application and attachments is true and correct to the best of my knowledge.*

  
\_\_\_\_\_  
Applicant's Signature

01/31/2018

\_\_\_\_\_  
Date

---

# **PD-R REPORT**

**AUGUST 20, 2018**

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**PREPARED FOR:**  
LINCOLN COUNTY  
PLANNING AND INSPECTIONS DEPARTMENT  
302 NORTH ACADEMY STREET  
LINCOLNTON, NC 28092

FOR  
CAMBRIDGE COMMONS MULTI-FAMILY  
AT  
NORTH PILOT KNOB ROAD AND  
CRESSET DELLINGER ROAD

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**PREPARED BY:**  
BOHLER ENGINEERING NC, PLLC



1927 South Tryon Street, Suite 310, Charlotte, NC 28203

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# **PD-R CONDITIONS**

## **NORTH PILOT KNOB ROAD**

## **AND CRESSET DELLINGER ROAD**

### **1. PROJECT INFORMATION**

The proposed multi-family complex is located 2,000 linear feet north of North Pilot Knob Road and Cresset Dellinger Road. The total site area is approximately 10.4 acres. This Planned District Plan proposes up to 260 apartment units.

The project will include Property ID number 4602-64-7391 and 4602-74-1002.

The development will be split between Cresset Dellinger Road with at least two (2) access points. This roadway provides service from North Pilot Knob Road and from NC 16 Business Highway. Recent rezoning approvals on adjacent land for Cambridge Properties, Inc., include up to 90,000 square feet of commercial space, a 50,000 square foot grocery store, 12,500 square feet of shops, three (3) outparcels, and up to 55,000 square feet of office space. Land uses surrounding the site include existing office space and single family residential homes.

The property is currently zoned R-T, with proposed zoning to be PD-R. The property does not have any flood zones. A portion of the property lies within the WS-IVP Watershed and the remaining portion lies within the State Permitting Authority.

### **2. GENERAL PROVISIONS**

The Planned District Plan is intended to reflect a generalized arrangement of the site in terms of layout, building orientation, street network, parking and open space areas. Final configuration, placement and size of individual site elements, street alignments, etc. may be altered or modified within the limits of the Ordinance as described in Section 9.5.13, and the standards established within these conditional notes during the design development (platting) and construction phases. The Petitioner reserves the right to make minor modifications and adjustments to the approved Planned District Plan, subject to staff approval, provided that the total number of residential units does not exceed the maximum permitted. Any major modifications will require submittal to the Board of Commissioners.

### **3. DEVELOPMENT STANDARDS**

Pursuant to Sections 2.4.9 and 9.5 of the Lincoln County Unified Development Ordinance (UDO) entitled Planned Development Districts and Planned Development Review respectively; the Petitioner seeks to obtain approval of the use of the following Development Standards concurrently with the approval of the Rezoning Petition. These standards, as established both by the conditional notes as set out below and as depicted on the Preliminary Concept Plan shall be followed for the development of the property. Unless otherwise approved as part of these conditional notes, the Lincoln County Unified Development Ordinance shall prevail when developing the site.

#### **4. PERMITTED USES/DENSITIES**

The project shall be limited to 260 multi-family apartment dwellings and any incidental or accessory uses.

Uses on the Common Open Space (COS) may include landscaping, fences, walls, berms, pedestrian trails, recreational uses, entry signage, monuments and storm water BMPs.

#### **5. AMENITIES**

The Apartment area will include a Pool and Clubhouse.

#### **6. OPEN SPACE, BUFFER YARDS, AND LANDSCAPING**

The Cambridge Commons multi-family site will exceed the required 12.5% open space.

A Class “B” Buffer yard is required along project boundaries per section 2.4.9.B.3(b) of the UDO.

Landscaping for the development shall meet or exceed all requirements of the UDO. A detailed landscaping plan will be submitted to County staff along with the construction plans.

#### **7. PARKING, LIGHTING AND SIGNAGE**

Parking, lighting, and signage shall comply with all requirements in the UDO.

#### **8. STORM WATER COMPLIANCE**

The Cambridge Commons multi-family site shall comply with all required storm water management regulations. This development reserves the right to treat its storm water by a master pond shared with the adjacent property.

#### **9. PERMITTING**

The Petitioner understands that all permits from the appropriate agencies must be obtained prior to commencement of related construction activities.

#### **10. WATER AND SEWER AVAILABILITY**

This property is located in the East Lincoln Water and Sewer District and the Petitioner understands that water and sewer availability must be approved by Lincoln County prior to development. It is the Petitioner’s responsibility to incur fees and infrastructure costs for providing water and sewer throughout the development. The Petitioner will comply with all district water and sewer standards.

#### **11. DEVELOPMENT PHASING**

The Apartments may be developed in multiple phases. Each building constitutes a potential phase.

## **12. VEHICULAR ACCESS AND ROAD IMPROVEMENTS**

The Traffic Impact Analysis (TIA) has been updated from the original analysis performed for Cambridge Village. The intersections reviewed for the Cambridge development have been determined to be sufficient for this phase of the overall development.

## **13. DIMENSIONAL STANDARDS**

Apartment buildings shall maintain a minimum building separation of 16'. The Cambridge Commons development is to be constructed to a maximum of 4-story structures with a height not to exceed 60 Feet per section 2.6.6.A of the UDO.

## **14. ARCHITECTURAL STANDARDS**

Multi-family Apartment buildings shall meet the requirements of the UDO.



**Cambridge Commons  
Multi-Family | N Pilot Knob Road  
Lincoln County Community Meeting  
BE #NCC172159  
March 6, 2018 at 7:00 PM**

## **Attendees**

Jim Gamble – Bohler Engineering  
Brian Rosenfeld – Bohler Engineering  
Albert Schillinger – Bohler Engineering  
Shane Seagle – Cambridge Commons MF, LLC  
Robert Davis – Representation of Property Owner  
Randy Hawkins – Planning Director  
Keith Gaskill – Planning Board  
Mark Ebersold – Planning Board  
Christine Forsette – Previous Planning Director  
Milton Sigmor – Planning Board

## **General Sequence of Discussion**

### **Introduction:**

- Mr. Davis welcomes everyone, introduces all important people, and gives a quick summary of the overall development.

### **Presentation:**

- Jim Gamble and Brian Rosenfeld present the proposed development using a PowerPoint presentation. There are scattered questions throughout the presentation.
- Robert Davis wraps up the presentation with key transportation topics and states that this is the continuation of the development that has been known for some time.

### **Questions asked:**

1. Is there only one access of N Pilot Knob Road?
  - a. There will only be one access from N Pilot Knob Road but there are five access locations for the overall development.
2. How many units?
  - a. 260 total units with an anticipated 240 being constructed
3. What is the shown parking count for the development in the rendering?
  - a. There are 405 spaces shown on the rendering but will be updated to meet code when unit count is finalized.
4. Will there be open activity area?
  - a. There is no planned open activity area but the pond to the North will be open area. There is a planned Club House and Pool for the community.
5. When will it be built once it has been rezoned?
  - a. Once the rezoning has been approved it will start about 6 months later.
6. Is there emergency access?
  - a. The development has been planned for emergency access.
7. Is water and sewer available to the site?
  - a. Water and sewer is available to the site and was taken into account when the Publix was developed. Water has been constructed through Cresset Delling and Sewer has been extended to the rear of the Small Shops and to the property boundary.

# Community Meeting Minutes



8. Will there be lane extensions?
  - a. All existing roads were planned with this development in mind. In addition, there are NCDOT project to widen N Pilot Knob road within the 5-year plan.
9. Will additional garage and storage areas be provided?
  - a. It is something that is currently being looked into and shows promise from past projects. Garage spaces may be incorporated into the project but individual storage spaces will most likely not move forward.

SIGN IN SHEET

Cambridge Commons Multi-Family – Community Meeting 3/6/18



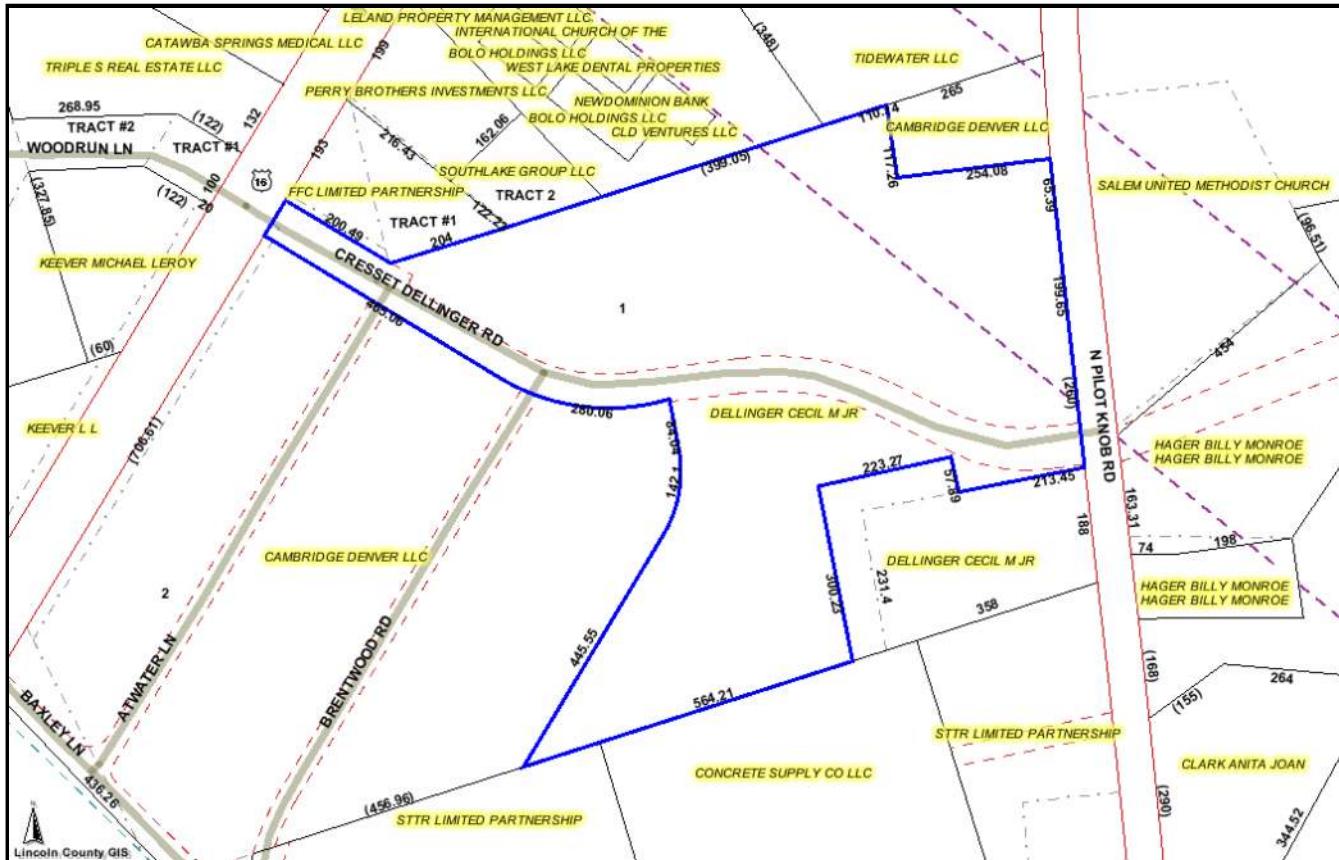
## Lincoln County, NC

Office of the Tax Administrator, GIS Mapping Division

Lincoln County and its mapping contractors assume no legal responsibility for the information contained on this map. This map is not to be used for land conveyance. The map is based on NC State Plane Coordinate System 1983 NAD.



Date: 2/6/2018 Scale: 1 Inch = 300 Feet



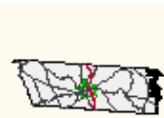
PHOTOS		PARCEL INFORMATION FOR 4602-64-7391									
 Photo Not Available		Parcel ID	90176	Owner	DELLINGER CECIL M JR KEEVER DORIS D						
Map	4602-04	Mailing		202 HWY 16N							
Account	0127179	Address		DENVER NC 28037							
Deed	89E-327	Last Transaction Date	9/27/1989		Sale Price	0					
Land Value	\$401,911	Total Value	\$401,911		Previous Parcel	30106					
----- All values are for tax year 2017. -----											
Subdivision	Lot 1 CAMBRIDGE VILLAGE					Plat	16-490				
Description	#1 CAMBRIDGE VILLAGE					Deed Acres	0				
Address	N NC 16 BUSINESS HWY					Tax Acres	14.08				
Township	CATAWBA SPRINGS					Tax/Fire District	EAST LINCOLN				
Improvement	No Improvements										
Zoning District	Calculated Acres	Voting Precinct	Calculated Acres								
R-T	9.09	COWANS FORD (CF19)	14.09								
PD-C	4.95										
B-G	0.05										
<b>Watershed Class</b>											
Not in a watershed											
WS-IVP	10.85										
2000 Census County	3.24										
37109											
Flood	Zone Description	Tract	Block								
X	NO FLOOD HAZARD	071100	2021	14.09							
		Panel		3710460200			14.09				



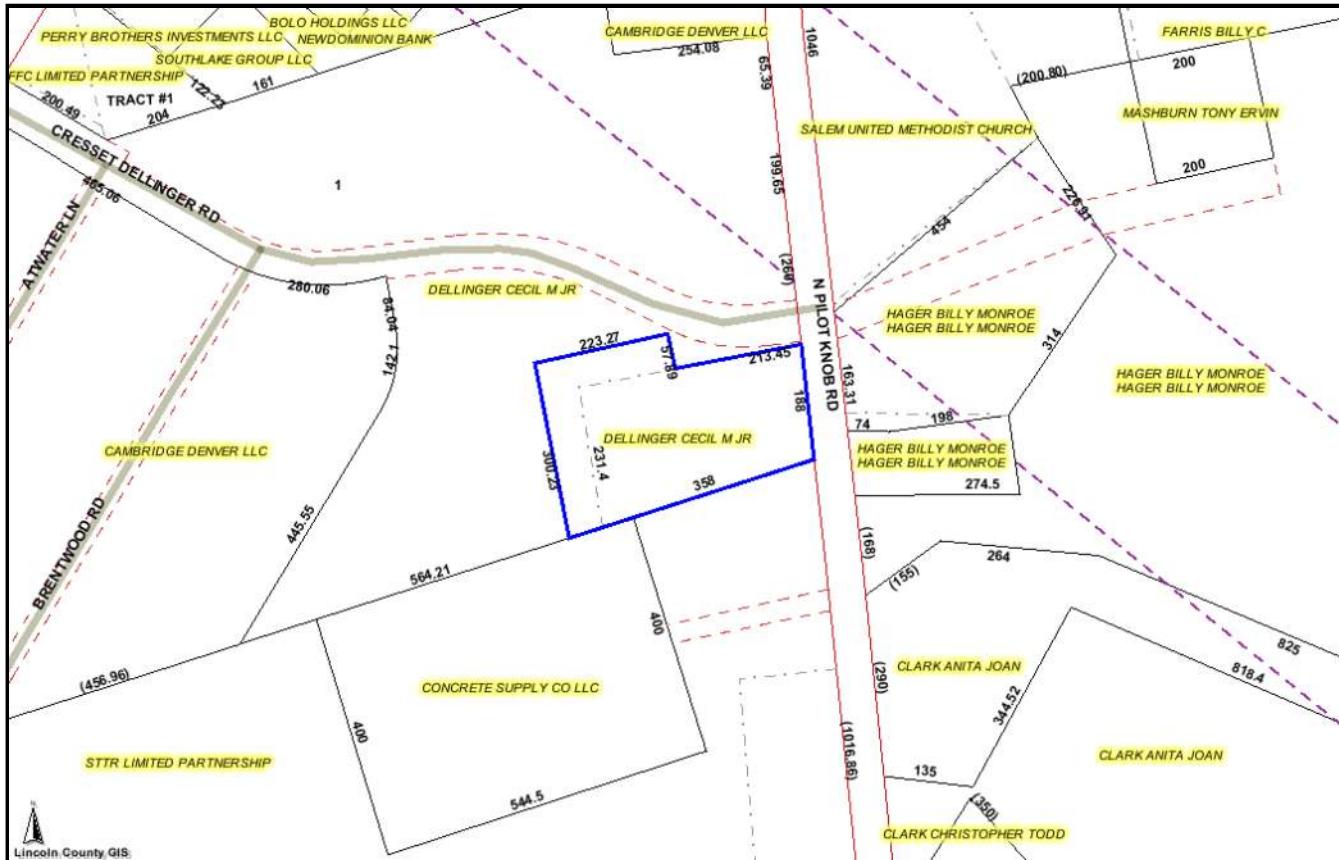
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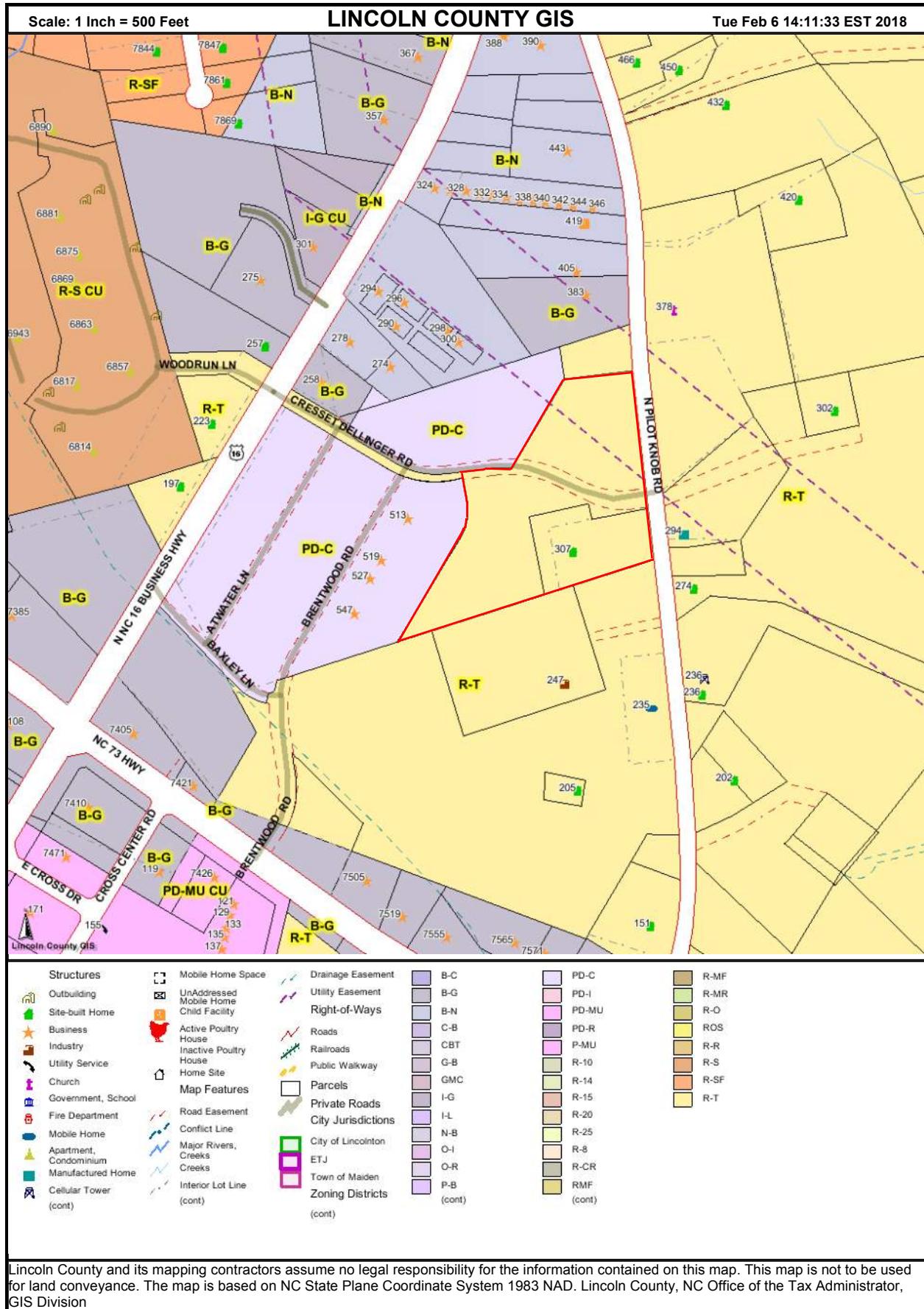


Date: 2/6/2018 Scale: 1 Inch = 300 Feet



PHOTOS		PARCEL INFORMATION FOR 4602-74-1002					
		Parcel ID	30400	Owner	DELLINGER CECIL M JR DELLINGER DEBORAH L		
		Map	4602-04	Mailing Address	351 COUNTRYTYME LN IRON STATION NC 28080		
		Account	29270	Deed	2236-779	Last Transaction Date	2/23/2011
		Land Value	\$50,238	Total Value	\$231,350	Sale Price	0
		----- All values are for tax year 2017. -----					
		Description	DELLNGR LD/HM RD1394			Deed Acres	2.52
		Address	307 N PILOT KNOB RD			Tax Acres	2.37
		Township	CATAWBA SPRINGS			Tax/Fire District	EAST LINCOLN
		Main Improvement		RANCH		Value	\$169,580
		Main Sq Feet	1856	Stories			
		Unfinished Basement	1856	1 Year Built	1980		
	30400	Zoning District	Calculated Acres	Voting Precinct	Calculated Acres		
		R-T	2.38	COWANS FORD (CF19)	2.38		
		Watershed Class		Sewer District			
		Not in a watershed	1.59	Not in the sewer district			
		WS-IVP	0.79				
		2000 Census County		Tract			
		37109		071100	2021		
		37109		071100	2022		
		Flood	Zone Description	Panel			
		X	NO FLOOD HAZARD	3710460200			

PD #2018-1  
subject property is outlined in red



Cambridge Commons MF, LLC

1 in. = 250 ft.



Suburban  
Commercial

Single-Family  
Neighborhood

ATWATER LN

VENTWOOD RD

CRESSET DELLINGER RD

N PILOT KNOB RD

**Land Use Plan**

- Open Space
- Rural Living
- Industrial Center
- Large Lot Residential
- Single-Family Neighborhood
- Multifamily Neighborhood
- Rural Crossroads
- Suburban Commercial
- Suburban Office
- Special District
- Walkable Neighborhood
- Walkable Activity Center

**WALKABLE  
ACTIVITY CENTER**



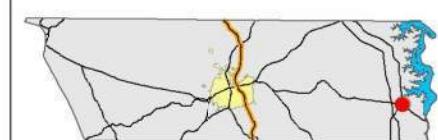
Lincoln County  
Planning & Inspections  
302 N. Academy St.  
Suite A  
Lincolnton, NC 28092

**PD #2018-1**

- Property Location(s)

See Attached Application for Parcel Information  
Property Location(s) Outlined in Green

LOCATION MAP



1:1,000,000

● Property Location(s)

# Traffic Impact Analysis Cambridge Village Apartments

PROJECT No. 188984A  
LINCOLN COUNTY

Prepared by  
WSP  
434 Fayetteville Street, Suite 1500  
Raleigh, North Carolina 27601  
License Number: F-0165

For the  
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION  
Division 12



August 2018

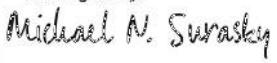


# Traffic Impact Analysis Cambridge Village Apartments

PROJECT No. 188984A  
LINCOLN COUNTY

Prepared by  
WSP  
434 Fayetteville Street, Suite 1500  
Raleigh, North Carolina 27601  
License Number: F-0165



DocuSigned by:  
  
8/21/2018 2:00:30 PM PDT

For the  
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION  
Division 12



August 2018



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## 1 EXECUTIVE SUMMARY

The proposed Cambridge Village Apartments are projected to be located on approximately 14 acres between Pilot Knob Road and NC 16 Business near Denver, NC. The proposed development will consist of a residential land use comprised of 260 apartments, and will be accessed via site access connections previously approved as a part of the Cambridge Commercial Development. This TIA is an update, due to the increase in proposed apartment units from 240 to 260, to the original TIA for the Cambridge Apartments performed by A. Morton Thomas & Associates Inc dated April 13, 2017.

Traffic analysis will consider future build conditions at the build-out year. The development is assumed to be fully built out by 2019. This report summarizes the analyses of Existing Conditions, 2019 No-Build Conditions (without proposed development), 2019 Build conditions (with the proposed development in place), and 2019 Build Improved Conditions (with proposed development and recommended improvements in place) during the AM and PM peak hours.

WSP USA, Inc. (hereafter referred to as WSP) was retained to determine the potential traffic impacts of this development in accordance with the traffic study guidelines set forth by Lincoln County and the North Carolina Department of Transportation (NCDOT) and the transportation improvements that may be required to accommodate these impacts. This report presents trip generation, distribution, capacity analyses, and recommendations for transportation improvements required to meet anticipated traffic demands.

Lincoln County and NCDOT were contacted to obtain background information and to establish the elements to be covered in this traffic impact analysis (TIA).

As approved by Lincoln County and NCDOT and included in the MOU (Memorandum of Understanding), the following seven (7) existing and two (2) proposed intersections are included as part of the area of influence for the development.

Existing:

- NC 73 & N. Pilot Knob Road (Signalized four-legged intersection)
- NC 73 & The Shoppes & Waterside/Site Access 3 (Proposed four-legged intersection)
- NC 16 Bus. & NC 73 (Signalized four-legged intersection)
- NC 16 Bus. & Riverwalk Apartments/Site Access 1 (Proposed four-legged intersection)
- NC 16 Bus. /Hagers Ferry Road/N. Pilot Knob Ints. (Three unsignalized intersections)
- NC 16 Bus. & Site Access 2 (Proposed three-legged right-in/right out)
- N. Pilot Knob Road & Site Access 4 (Proposed three-legged full-movement)

Proposed:

- NC 16 Bus. & N. Pilot Knob Road (Planned signalized four-legged intersection)
- N. Pilot Knob Road & Hagers Ferry Road (Planned unsignalized three-legged intersection)

Below is a detailed description of the existing study area roadway network. All Average Annual Daily Traffic (AADT) information provided in this description was obtained from the NCDOT via the [www.ncdot.gov](http://www.ncdot.gov) website.

- NC 16 Business is a three-lane undivided roadway facility with a center two-way left-turn lane (TWLTL) near the development that travels north-south, paralleling NC 16 between Lucia and Denver in eastern Lincoln County. The land use along NC 16 Business is mixed use with areas of commercial, industrial, and residential. The posted speed on this section of NC 16 Business is 45 miles per hour (mph). NCDOT indicates that NC 16 Business in the study area is a minor arterial and the AADT is 17,000 vehicles per day (vpd) within the study area in 2016.
- NC 73 is a two-lane undivided roadway facility that travels east/west in Lincoln County. It has a TWLTL for most of this segment with several dedicated left-turn lanes in the project vicinity. The land use along NC 73 is mostly commercial in the project vicinity transitioning to residential and open space to the east and commercial to the west towards NC 16. The posted speed on this section of NC 73 is 45 mph. NCDOT indicates that NC 73 in the study area is another principal arterial and the AADT is 17,000 vpd in 2016.
- N. Pilot Knob Road (SR 1394) is a two-lane undivided roadway with no shoulders that runs north-south near the development, diagonally connecting NC 73 to NC 16 Business. The land use on N. Pilot Knob Road is mixed between residential and commercial. The posted speed on N. Pilot Knob Road is 45 mph. NCDOT indicates that N. Pilot Knob Road is a local road and the AADT is 5,700 vpd in 2016.

The purpose of this Traffic Impact Analysis (TIA) is to assess the traffic carrying capacity of surrounding roadway network. There is a total of four (4) types of analyses for the intersections affected by the proposed development. The “Existing Conditions” analysis uses the traffic counts available to evaluate the current intersection operational performance. Traffic counts were performed by National Data & Surveying Services on February 23, 2016. Traffic counts were collected while traditional calendar schools were in-session.

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## 1.1 SITE TRIP GENERATION AND DISTRIBUTION

The proposed site will be a residential development in Lincoln County. It is anticipated that the site will consist of 260 apartment dwelling units. Trip generation equations for the land use types are provided in the ITE Trip Generation Manual, 9th Edition. It was estimated that a total of 131 new trips (26 in, 105 out) will be generated from the proposed site in the AM peak hour and 161 trips (04 in, 56 out) will be generated in the PM peak hour. The site generated trips to and from the proposed site were distributed in accordance with the apparent traffic patterns by the users of the proposed facility and the existing traffic patterns and land uses in the vicinity as follows:

- 40% to/from the west on NC 73
- 20% to/from the east on NC 73
- 20% to/from the north on NC 16 Business
- 15% to/from the south on NC 16 Business
- 5% to/from the east on Hagers Ferry Road

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## 1.2 2017 EXISTING CONDITIONS

Traffic counts were performed by National Data & Surveying Services on February 23, 2016. Traffic counts were collected while traditional calendar schools were in-session.

The results of this analysis indicate that the southbound approach of Pilot Knob Road at NC 73 is operating at LOS E in the AM peak hour. The intersection overall however is currently operating at acceptable levels of service in the AM and PM peak hours. The westbound approach at NC 16 Business at Hagers Ferry Road operates at LOS E during the AM peak hour.

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## 1.3 2019 NO-BUILD CONDITIONS

As agreed upon in the memorandum of understanding (MOU), existing traffic volumes were increased by 1 percent per year to reflect 2019 background traffic volumes. Approved developments were indicated in the study area as discussed in the MOU:

- Cambridge Commercial Development
- Carrington Subdivision
- Cottonwood Village
- Rivercross Subdivision

As such, the 2019 background traffic represents the 2016 existing traffic increased by 1 percent per year and the addition of approved development traffic. The committed improvements associated with these developments were also assumed to be in place in the 2019 conditions.

The operating conditions for the 2019 No-Build Analysis are similar to Existing conditions with most movements showing increases in delay. The NC 73 at Pilot Knob Road intersection overall LOS drops to LOS D during the AM and PM peak periods primarily due to the increase in the southbound Pilot Knob Road delay. The eastbound approach of NC 16 Business at NC 73 declines to LOS E in the PM peak period. The overall intersection LOS degrades to LOS D at this intersection in the PM peak period.

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## 1.4 2019 BUILD CONDITIONS

The total build traffic volumes include both the site traffic and traffic volumes from the No-Build Analysis. The Build Analysis evaluates the traffic conditions before any improvements are implemented.

Analysis indicates that the addition of traffic anticipated to be generated by the proposed development, the intersection of NC 73 at Pilot Knob Road operates LOS E during the AM peak, LOS D during the PM peak. While the level of service is expected to degrade from the LOS D to LOS E during the AM peak, it should be noted that the delay increase is expected to only be extended by 7.7 seconds when compared to no-build conditions.

The NC 16 Business at NC 73 intersection will operate at LOS D and LOS E during the AM and PM peak hours, respectively. The eastbound NC 16 Business approach will operate at LOS F during the PM peak hour. The re-aligned intersection at NC 16 Business and N. Pilot Knob Road will operate at acceptable LOS during both peak hours under the 2019 Build conditions.

---

## 1.5 2019 BUILD IMPROVED CONDITIONS

With minor signal timing modifications to the traffic signal at the intersections of NC 73 at Pilot Knob Road and NC 16 Business at NC 73, the levels of service overall are expected to return to similar witnessed in the no-build conditions. The intersection of NC 73 and Pilot Knob is projected to operate at LOS D in the AM and PM peak. The intersection of NC 16 Business at NC 73 will operate at LOS D during the AM peak hour and LOS E during the PM peak hour. Other intersections within the study are expected to operate at acceptable LOS.

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## 1.6 RECOMMENDATIONS

The 2019 Build with Improvements analysis shows recommended improvements that will improve the effectiveness of the system. Those improvements are stated below:

- **NC 73 at N. Pilot Knob Road:** consider minor adjustments to signal timing plan along the NC 73 corridor to accommodate new traffic patterns due to nearby development.
- **NC 16 Business at NC 73:** consider minor adjustments to signal timing plan along the NC 73 corridor to accommodate new traffic patterns due to nearby development.
- **N. Pilot Knob Road at Proposed Site Access 4:** construct an eastbound right turn lane along Site Access 4 for egressing vehicles. The turn lane is recommended to consist of a minimum of 150 feet of storage.

With timing modifications to the traffic signals at the intersections of Pilot Knob Road at NC 73 and NC 16 Business at NC 73, the analysis indicates that the operational results are expected to be similar to those of no-build conditions. Poor LOS/excessive queuing is anticipated to continue one or more approaches at these intersections beyond the buildout of the site. The future NC 73 widening projects are anticipated to provide improvements to existing LOS/queuing issues along this corridor.

Based on the findings of this study, specific improvements have been identified and should be completed as part of the proposed development. It is also recommended that all improvements be completed in accordance to NCDOT, and Lincoln County standards where applicable.

The Recommended Improvements are shown in **Figure 10: Recommended Improvements**.

## 2 INTRODUCTION

The proposed Cambridge Village Apartments are proposed to be located on approximately 14 acres between Pilot Knob Road and NC 16 Business near Denver, NC. The proposed development will consist of a residential land use comprised of 260 apartments, and will be accessed via site access connections previously approved as a part of the Cambridge Commercial Development. This TIA is an update, due to the increase in proposed apartment units from 240 to 260, to the original TIA for the Cambridge Apartments performed by A. Morton Thomas & Associates Inc dated April 13, 2017.

Traffic analysis will consider future build conditions at the build-out year. The development is assumed to be fully built out by 2019. This report summarizes the analyses of Existing Conditions, 2019 No-Build Conditions (without proposed development), 2019 Build conditions (with the proposed development in place), and 2019 Build-Improved Conditions (with proposed development and recommended improvements in place) during the AM and PM peak hours.

WSP was retained to determine the potential traffic impacts of this development in accordance with the traffic study guidelines set forth by Lincoln County and the North Carolina Department of Transportation (NCDOT) and the transportation improvements that may be required to accommodate these impacts. This report presents trip generation, distribution, capacity analyses, and recommendations for transportation improvements required to meet anticipated traffic demands.

Lincoln County and NCDOT were contacted to obtain background information and to establish the elements to be covered in this traffic impact analysis (TIA).

## 3 AREA CONDITIONS

As approved by Lincoln County and NCDOT and included in the MOU, the following intersections are included as part of the area of influence for the development (**Figure 1: Study Area**):

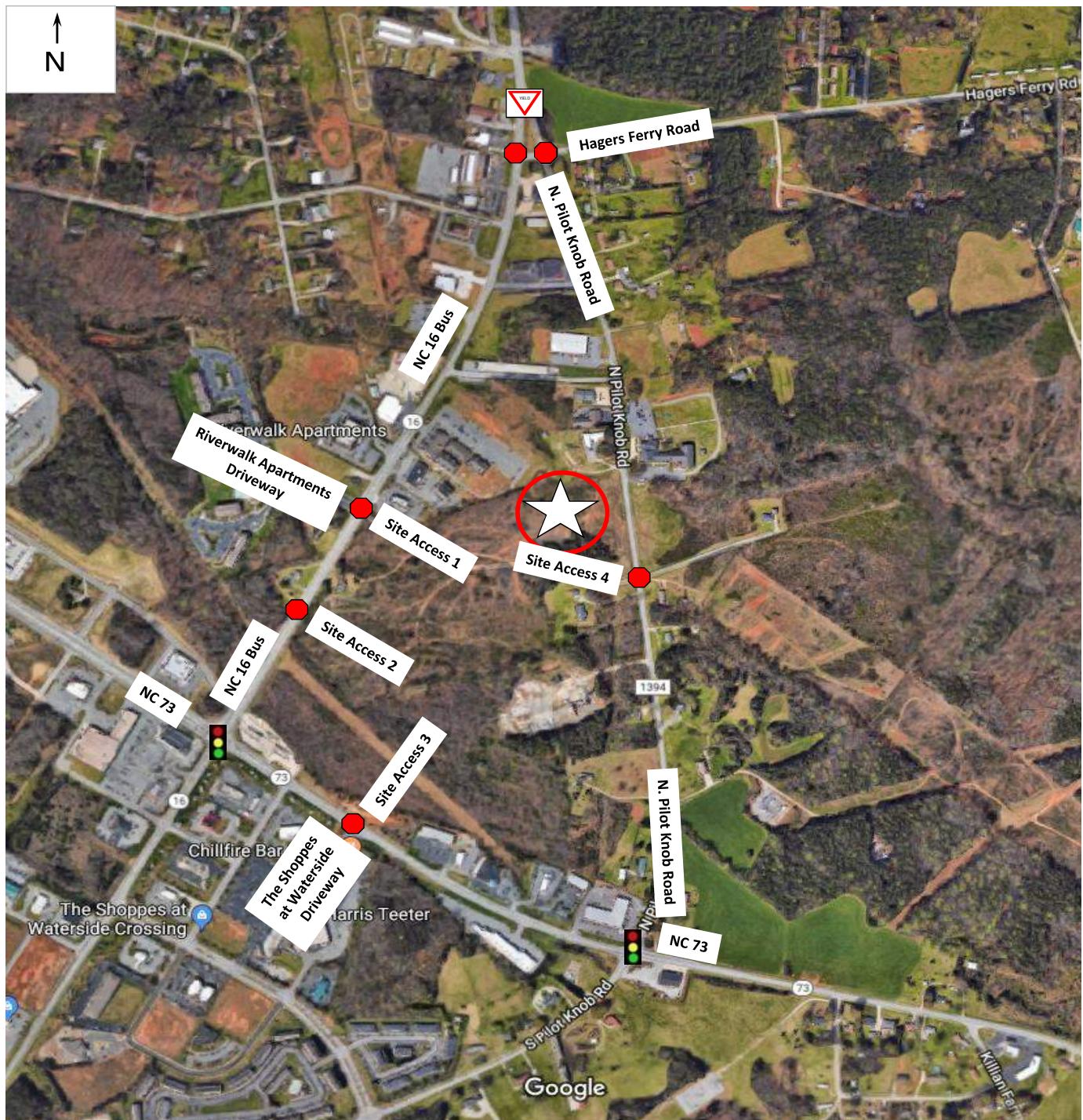
- NC 73 & N. Pilot Knob Road (Signalized four-legged intersection)
- NC 73 & The Shoppes at Waterside/Site Access 3 (Proposed four-legged intersection)
- NC 16 Bus. & NC 73 (Signalized four-legged intersection)
- NC 16 Bus. & Riverwalk Apartments/Site Access 1 (Proposed four-legged intersection)
- NC 16 Bus. /Hagers Ferry Road/N. Pilot Knob Ints. (Three unsignalized intersections)
- NC 16 Bus. & Proposed Site Access 2 (Proposed three-legged right-in/right out)
- N. Pilot Knob Road & Proposed Site Access 4 (Proposed three-legged full-movement)

It should be noted that the traffic study includes the project planned to reconfigure the intersections of NC 16 Business at Hagers Ferry Road, NC 16 Business at N. Pilot Knob Road and N. Pilot Knob Road at Hagers Ferry Road. It is envisioned that this project will be completed in 2019 ahead of the opening of the proposed development. Therefore, the following two (2) planned intersections will replace the existing three intersections:

- NC 16 Bus. & N. Pilot Knob Road (Planned signalized four-legged intersection)
- N. Pilot Knob Road & Hagers Ferry Road (Planned unsignalized three-legged intersection)

The proposed site plan is shown in **Figure 2: Site Plan** and is for illustrative purposes only for this traffic study. Access to the site is proposed to be provided by four driveways as previously proposed as part of the Cambridge Commercial Development. Each of these accesses are detailed below:

- Site Access 1- The first access point is proposed for NC 16 Business across from the Riverwalk Apartments driveway. This access point is approximately 1,450 feet north of the NC 16 Business at NC 73 intersection. This will create a four-legged, full movement intersection.
- Site Access 2- The second access point is proposed for NC 16 Business approximately 500 feet north of the NC 16 Business at NC 73 intersection. This will create a three-legged, right-in/right-out only access point.
- Site Access 3- The third access point is proposed for NC 73 across from The Shoppes at Waterside driveway. This access point is approximately 850 feet east of the NC 16 Business at NC 73 intersection. This will create a four legged, intersection with a proposed left-over and right-in/right-out access in both directions.
- Site Access 4- The fourth access point is proposed for N. Pilot Knob Road approximately 2,100 feet north of the NC 73 at N. Pilot Knob Road intersection. This site access point will create a three-legged, full movement intersection.

**Intersections:**

- 1 NC 73 & N. Pilot Knob Road
- 2 NC 73 & The Shoppes at Waterside/Site Access 3
- 3 NC 16 Bus. & NC 73
- 4 NC 16 Bus. & Riverwalk Apartments/Site Access 1
- 5 NC 16 Bus. & Hagers Ferry Road
- 6 NC 16 Bus. & Private Driveway/Pilot Knob Road
- 7 Pilot Knob Road & Hagers Ferry Road
- 8 NC 16 Bus. & Proposed Site Access 2
- 9 N. Pilot Knob Road & Proposed Site Access 4

**Legend**

	Signalized Intersection
	Unsignalized Intersection
	Yield Intersection
	Future Site



434 Fayetteville Street  
Suite 1500, Raleigh, NC 27601  
Tel: (919) 836-4040  
<http://www.wsp.com/en-US>

### Cambridge Village Apartments Traffic Impact Analysis

**Figure 1**  
**Study Area**

Figure 2: Site Plan



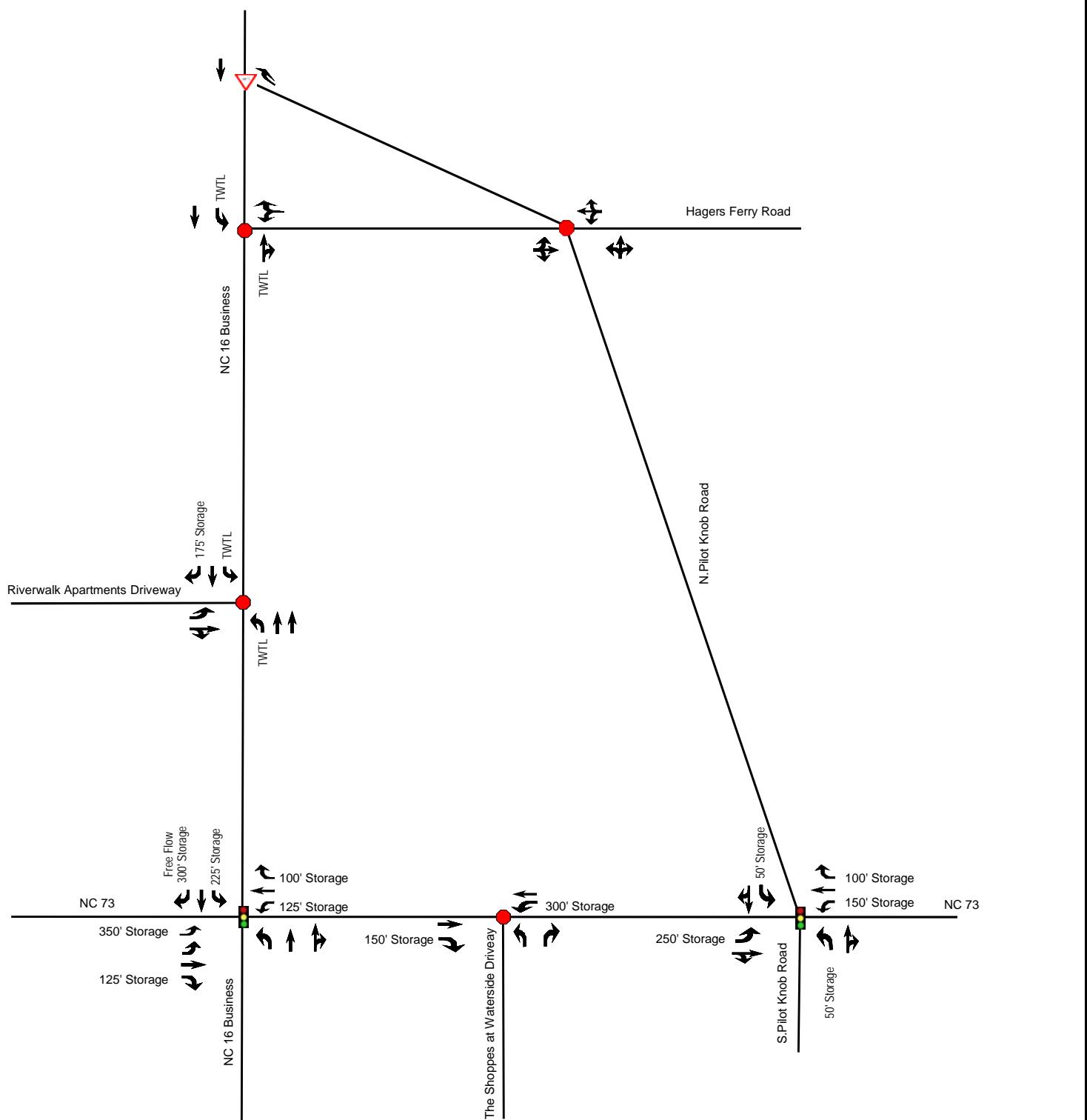
## 4 EXISTING ROADWAY CONDITIONS

Below is a detailed description of the existing study area roadway network. All Average Annual Daily Traffic (AADT) information provided in this description was obtained from the NCDOT via the [www.ncdot.gov](http://www.ncdot.gov) website.

- NC 16 Business is a three-lane undivided roadway facility with a center two-way left-turn lane near the development that travels north-south, basically paralleling NC 16 between Lucia and Denver in eastern Lincoln County. The land use along NC 16 Business is mixed use with intermittent areas of residential and open space. The posted speed on this section of NC 16 Business is 45 miles per hour (mph). NCDOT indicates that NC 16 Business in the study area is a minor arterial and the AADT to be 17,000 vehicles per day (vpd) within the study area in 2016.
- NC 73 is a two-lane undivided roadway facility that travels east/west in Lincoln County. It has a center turn lane and intermittent dedicated left turn lanes in the project vicinity. The land use along NC 73 is mostly commercial properties in the project vicinity transitioning to residential and open space to the east and commercial to the west towards NC 16. The posted speed on this section of NC 73 is 45 mph. NCDOT indicates that NC 73 in the study area is another principal arterial and the AADT to be 17,000 vpd in 2016.
- N. Pilot Knob Road (SR 1394) is a two-lane undivided roadway with no shoulders that runs north-south near the development, diagonally connecting NC 73 to NC 16 Business. The land use on N. Pilot Knob Road is mixed between residential and low-density commercial. The posted speed on N. Pilot Knob Road is 45 mph. NCDOT indicates that N. Pilot Knob Road is a local road and the AADT to be 5,700 vpd in 2016.

The traffic signal at the intersection of NC 73 and NC 16 Business is maintained under the jurisdiction of NCDOT. The existing intersection geometrics are shown in **Figure 3: Existing Lane Configuration**.

The purpose of this Traffic Impact Analysis Report is to assess the traffic carrying capacity of surrounding roadway network. There is a total of four (4) types of analyses for the intersections affected by the proposed development. The “Existing Conditions” analysis uses the traffic counts available to evaluate the current intersection operational performance. Traffic counts were performed by National Data & Surveying Services on February 23, 2016. Traffic counts were collected while traditional calendar schools were in-session.



Legend	
—	Existing Roadway
■	Signalized Intersection
▽	Yield
●	Unsignalized Intersection

## 5 TRIP GENERATION

The proposed site will be a residential development in Lincoln County. It is anticipated that the site will consist of 260 apartment dwelling units. Trip generation equations for the land use types are provided in the ITE Trip Generation Manual, 9th Edition. It was estimated that a total of 131 new trips (26 in, 105 out) will be generated from the proposed site in the AM peak hour and 161 trips (104 in, 56 out) will be generated in the PM peak hour.

**Table 1: Trip Generation**

ITE Code	Land Use	Size		Average Daily Trips (24 Hours)			AM Peak Hour (one hour between 7 and 9am)			PM Peak Hour (one hour between 4 and 6pm)		
				Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	Total
220	Multifamily Housing	260	DU	850	850	1,699	26	105	131	104	56	161
Total Trips							26	105	131	104	56	161

## 6 TRIP DISTRIBUTION

The site generated trips to and from the proposed site were distributed in accordance with the apparent traffic patterns by the users of the proposed facility and the existing traffic patterns and land uses in the vicinity as follows:

- 40% to/from the west on NC 73
- 20% to/from the east on NC 73
- 20% to/from the north on NC 16 Business
- 15% to/from the south on NC 16 Business
- 5% to/from the east on Hagers Ferry Road

## 7 TRAFFIC VOLUMES

Traffic counts were performed by National Data & Surveying Services on February 23, 2016. Traffic counts were collected while traditional calendar schools were in session. A growth rate of 1% was applied to these 2016 counts to represent 2017 existing conditions.

There are two signalized intersections in the study area. These are NC 73 at NC 16 Business and N. Pilot Knob Road. The phasing and timing parameters were based on the signal plans and timing / coordination plans that were obtained from the NCDOT. The two project signals on NC 73 are interconnected and contained within the NC 73 closed loop system. The Existing Traffic Volumes are shown in **Figure 6: 2017 Existing Traffic Volumes AM** and **Figure 7: 2017 Existing Traffic Volumes PM**

## 8 HISTORICAL GROWTH

Historical growth traffic is the increase in existing traffic volumes due to general usage increases and non specific growth throughout the area. As directed by the MOU, existing traffic volumes were increased by 1 percent per year. Historical Growth Traffic volumes are shown in [Error! Reference source not found.](#) and **Figure 5: 2016 Historical Traffic Volumes PM.**

## 9 APPROVED DEVELOPMENT TRAFFIC

Approved developments were indicated by the County and NCDOT during the MOU approval process. These Future Traffic Volumes were added to the existing volumes to determine the 2019 No-Build Traffic Volumes. Approved Development Traffic volumes are shown in **Figure 8: Approved Development Traffic Volumes AM** and **Figure 9: Approved Development Traffic Volumes PM.**

The traffic expected to be generated by four (4) approved adjacent developments is included as part of the future traffic scenarios and is included in the No-Build, Build, and Build Improved scenarios. These developments are as follows:

- Cambridge Commercial Development
- Carrington Subdivision
- Cottonwood Village
- River cross Subdivision

Traffic generated from these developments, as well as their committed improvements have been taken from the approved studies. At this time, no other approved developments are known to the project team. NCDOT provided information regarding the funded project to revise the intersections of NC 16 Business at Hagers Ferry Road, NC 16 Business at N. Pilot Knob Road and N. Pilot Knob Road at Hagers Ferry Road. It is envisioned that this project will be completed in 2019 ahead of the opening of the proposed development.

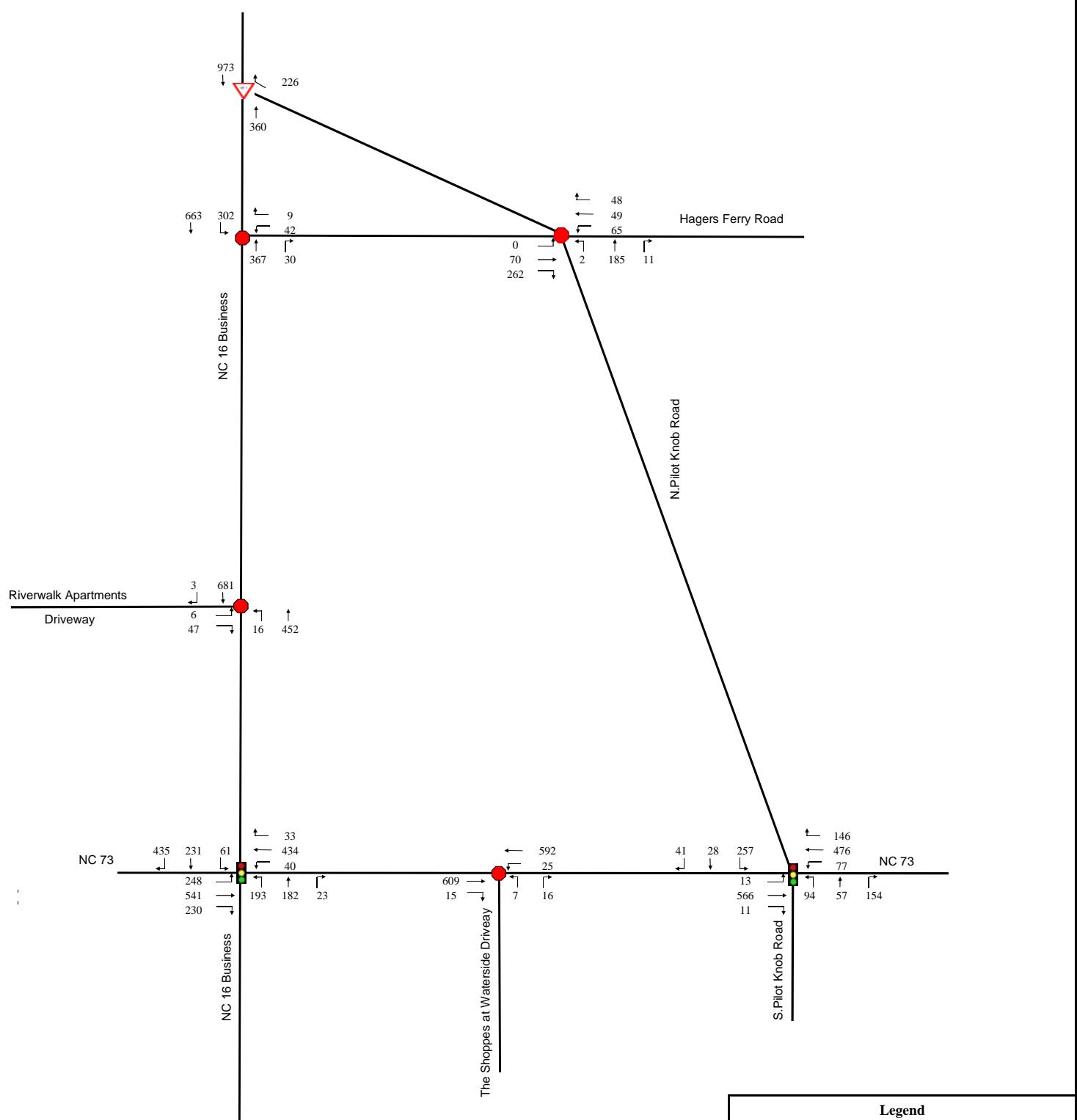
The 2019 laneage is shown in **Figure 10: Recommended Improvements** and Rerouted Traffic Volumes are shown in **Figure 11: Rerouted Traffic Volumes AM** and **Figure 12: Rerouted Traffic Volumes PM.** 2019 No-Build Traffic Volumes containing Historical Growth, Approved Development and Rerouted Traffic are shown in **Figure 13: 2019 No-Build Traffic Volumes AM** and **Figure 14: 2019 No-Build Traffic Volumes PM.**

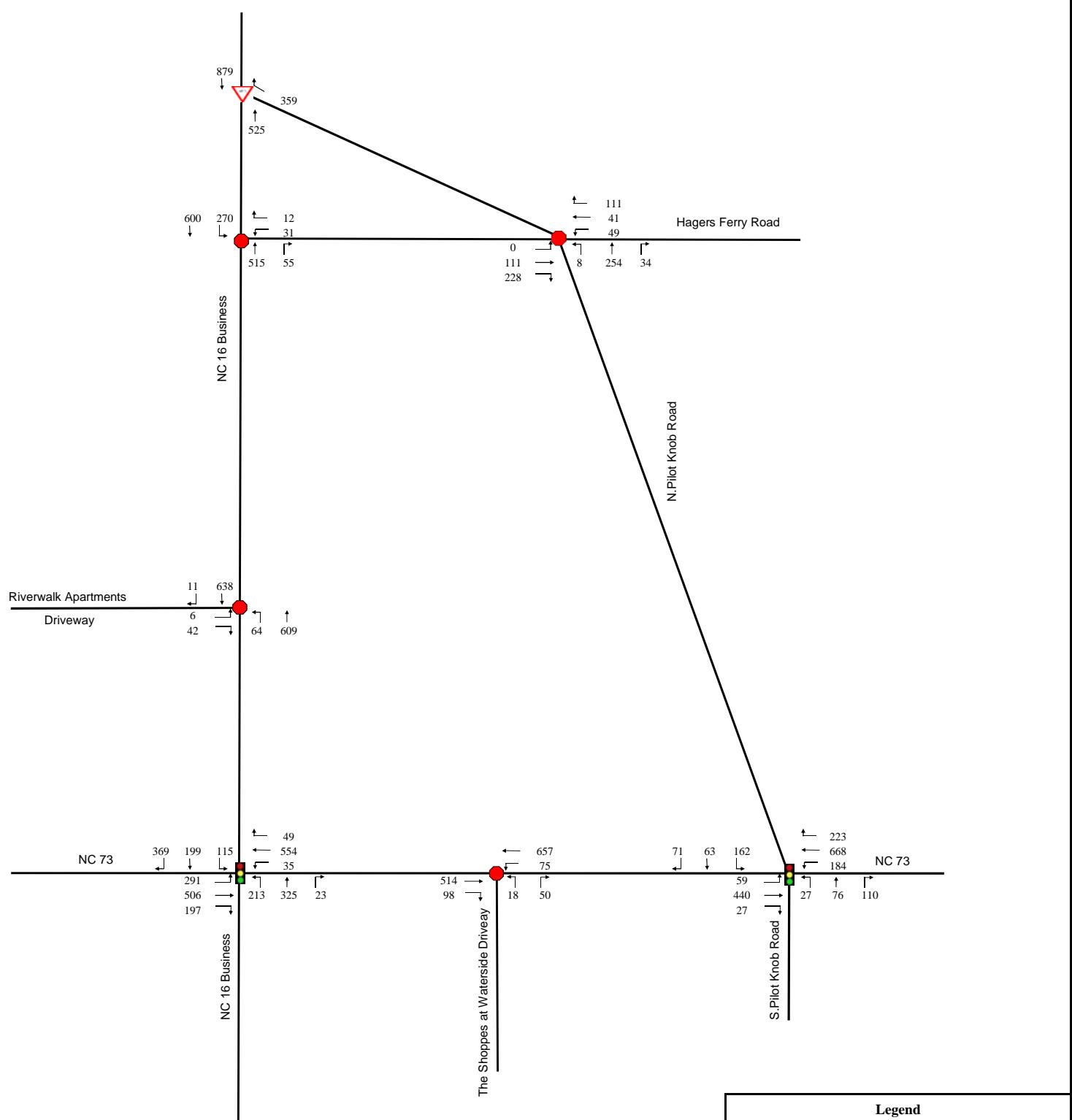
## 10 PROPOSED DEVELOPMENT TRAFFIC

The proposed development traffic was generated, distributed, and assigned to the adjacent roadway network as discussed previously. The Site Trip Distribution Percentages are shown in **Figure 15: Site Trip Distribution** and the Proposed Site Trip Assignments are shown in **Figure 16: 2019 Site Trips AM** and **Figure 17: 2019 Site Trips PM**

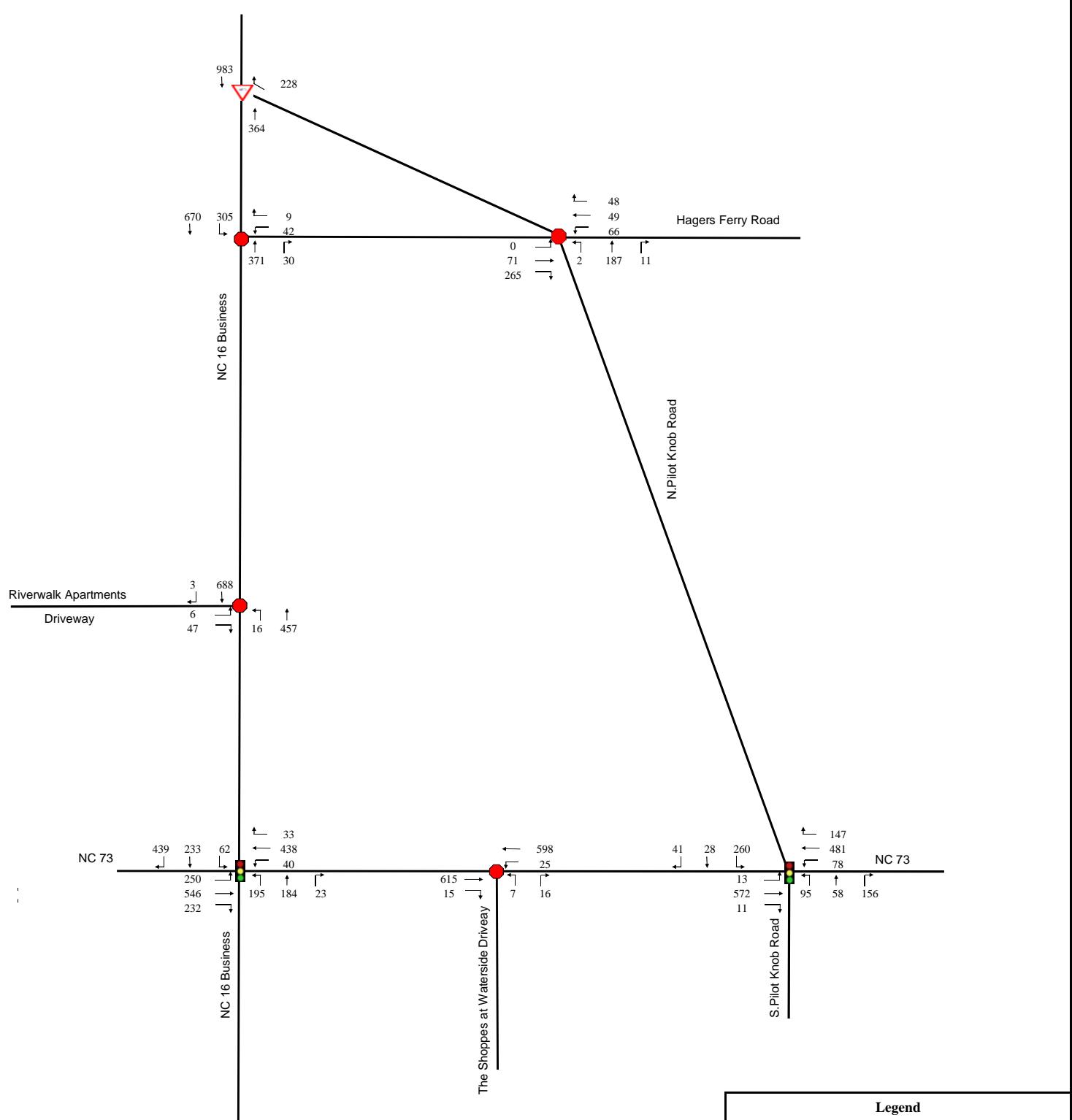
## 11 2019 BUILD-OUT TRAFFIC

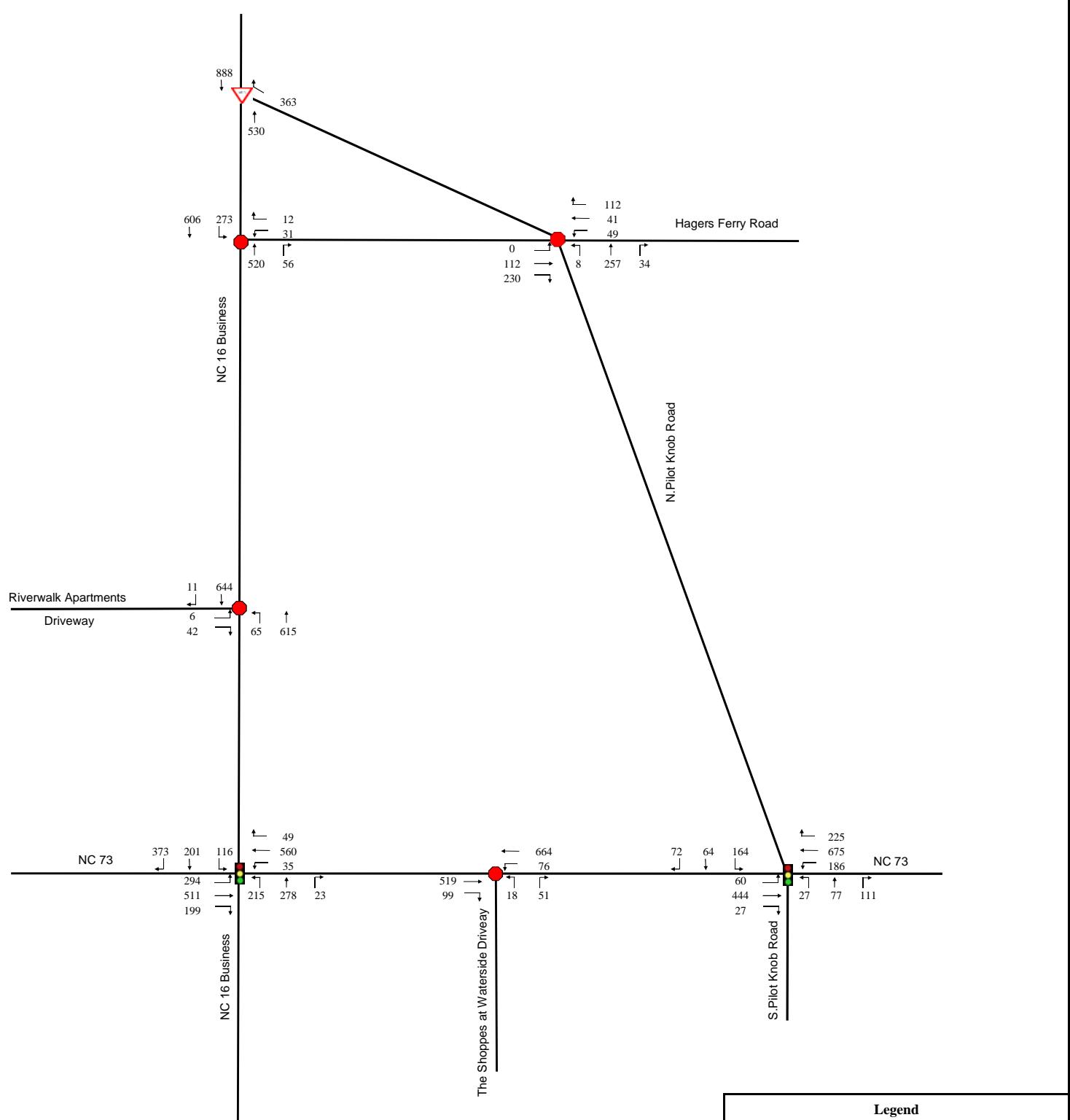
The 2019 build-out traffic volumes include the 2019 No-Build traffic and the proposed development traffic. The AM peak-hour 2019 Build Traffic Volumes are shown in **Figure 18: 2019 Build Traffic Volumes AM** and the PM peak-hour Build Traffic Volumes are shown in **Figure 19: 2019 Build Traffic Volumes PM.**

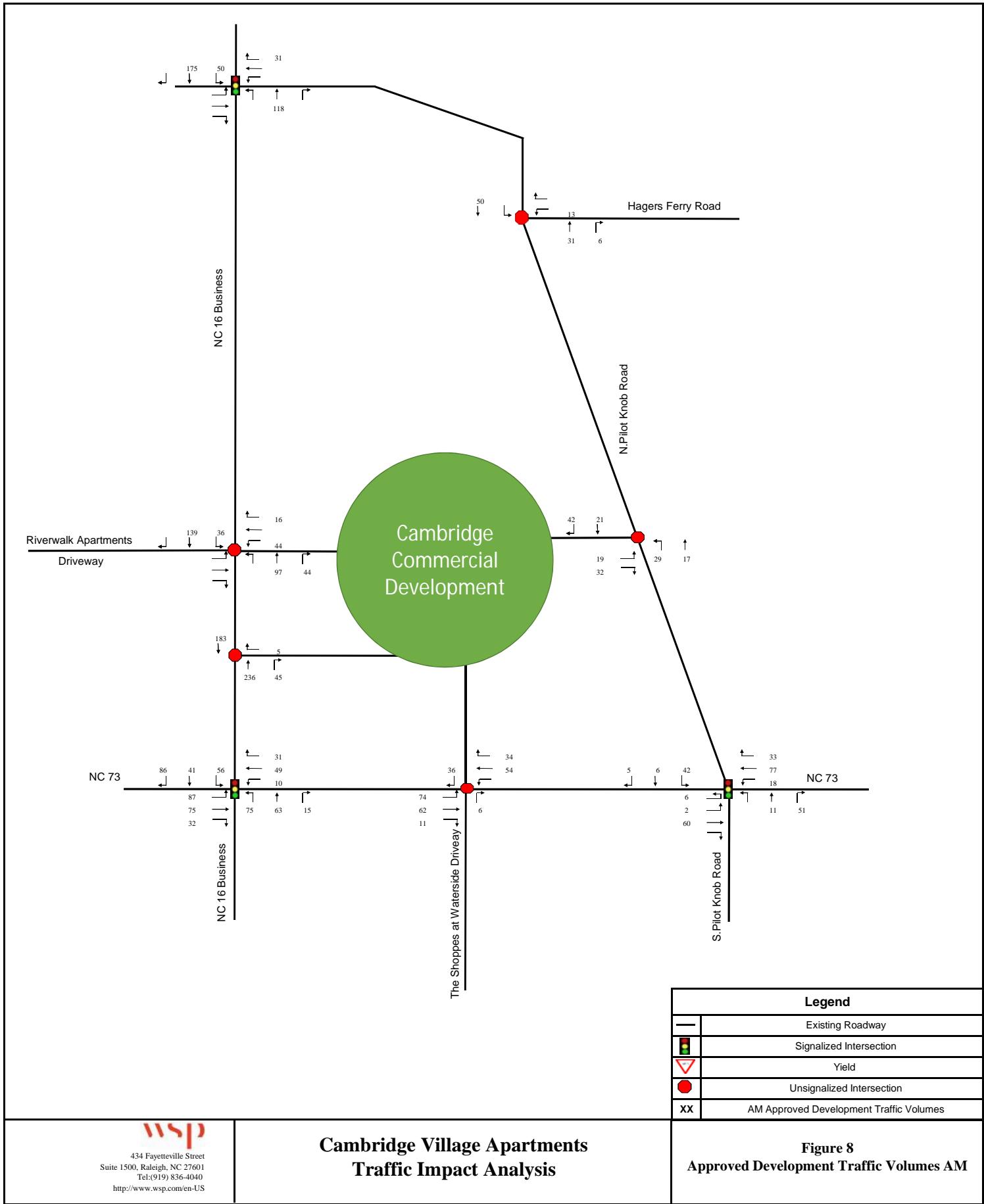


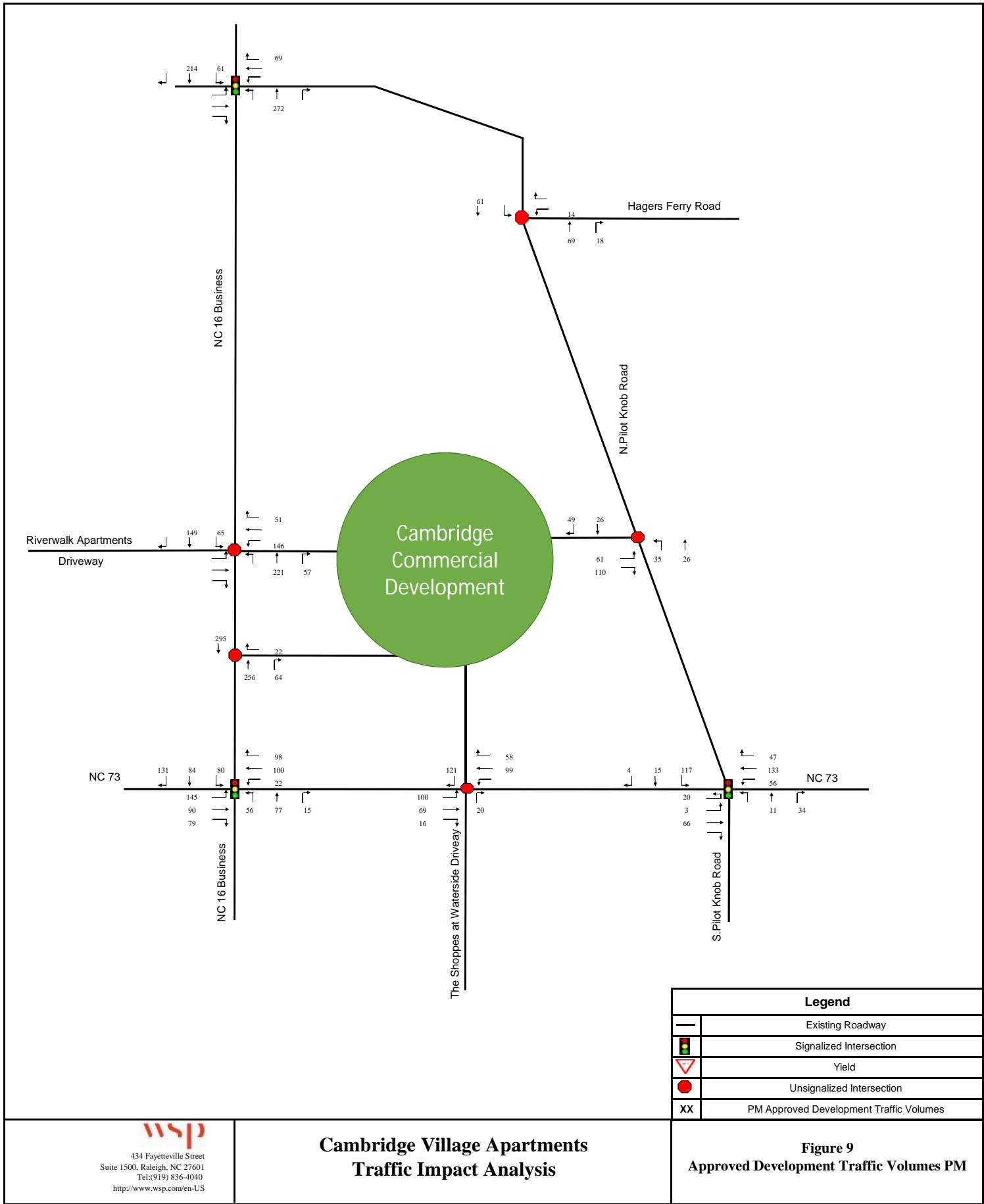


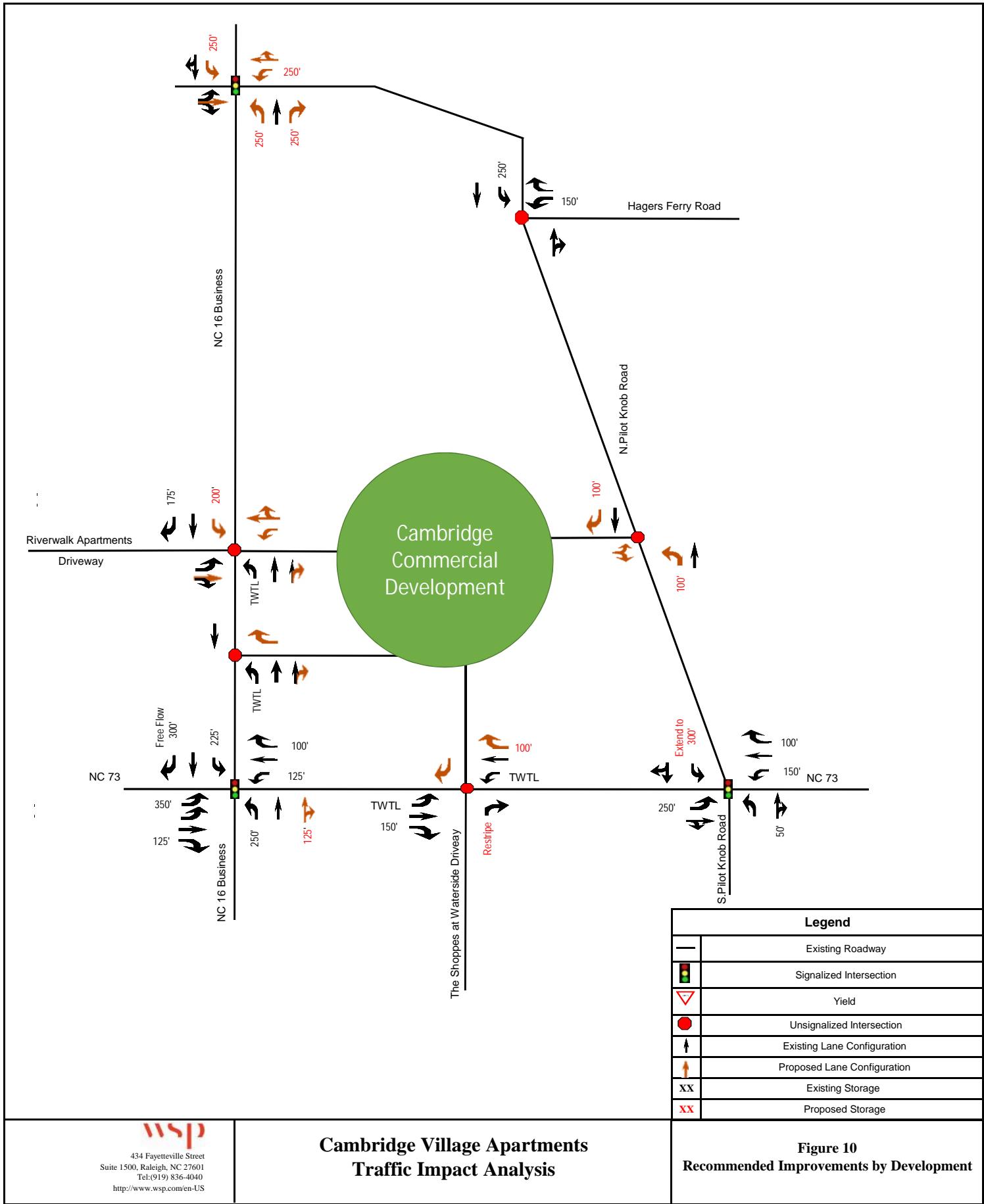
Legend	
—	Existing Roadway
Signalized Intersection	
Yield	
Unsignalized Intersection	
XX	PM Traffic Volumes

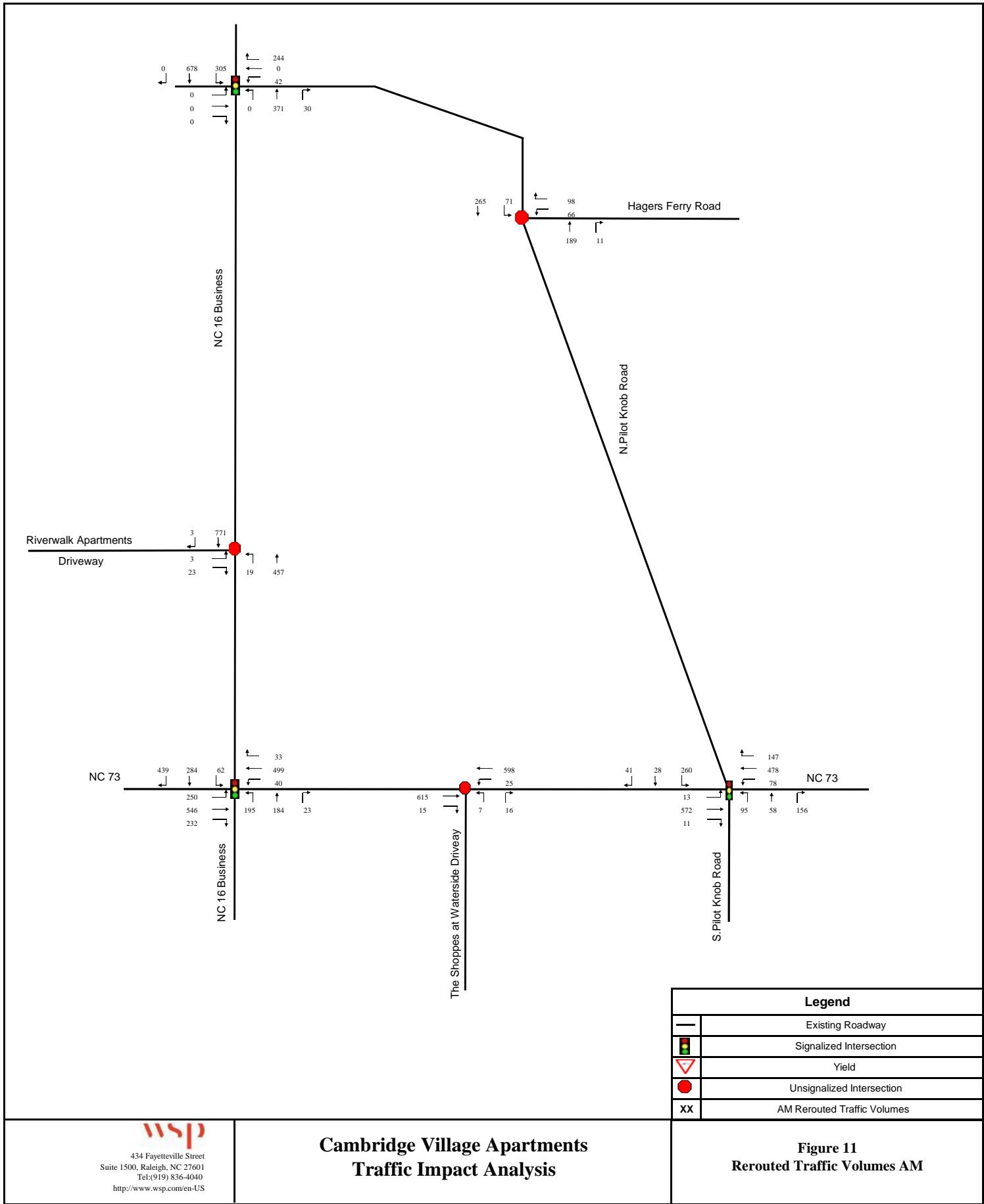


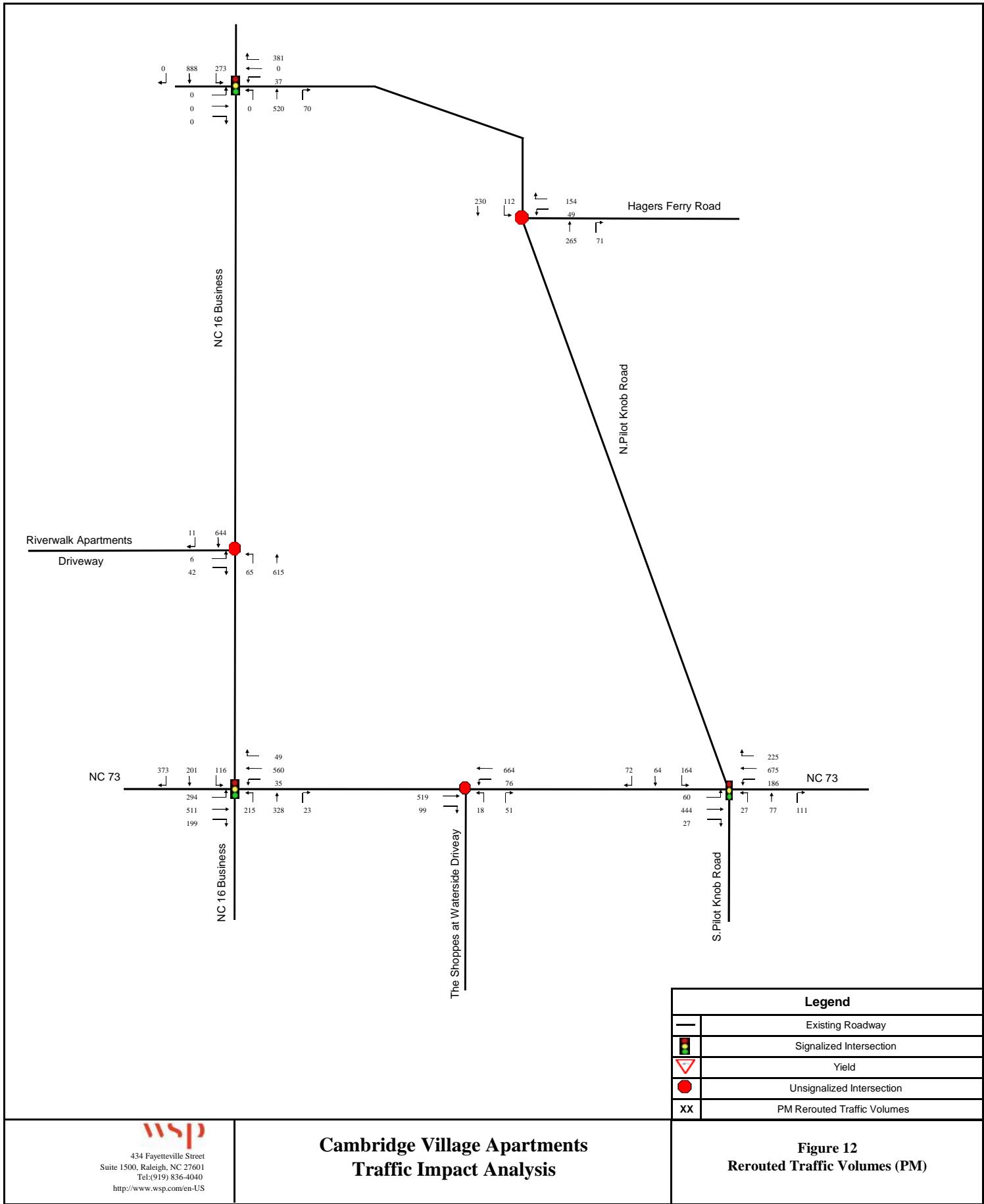


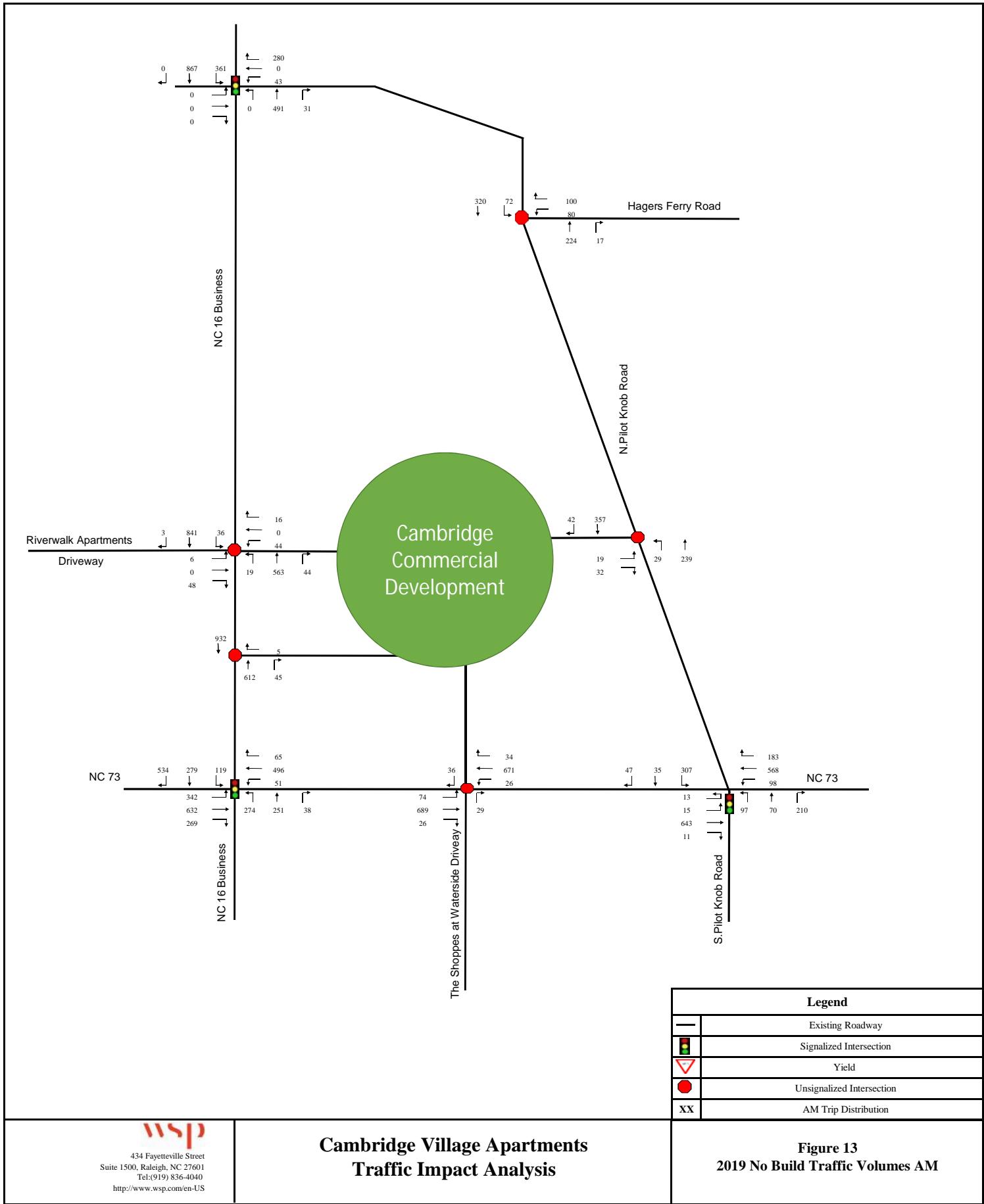


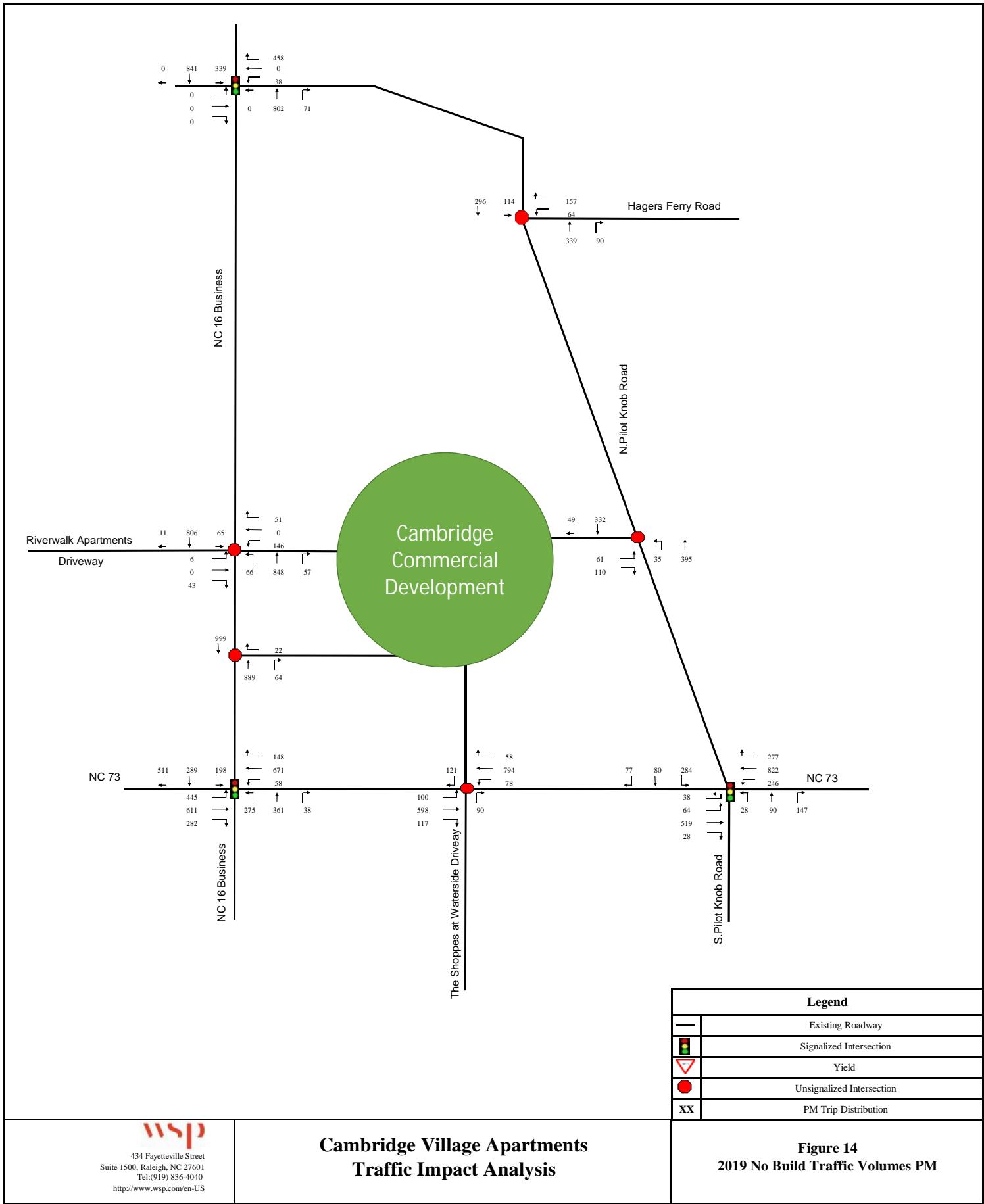


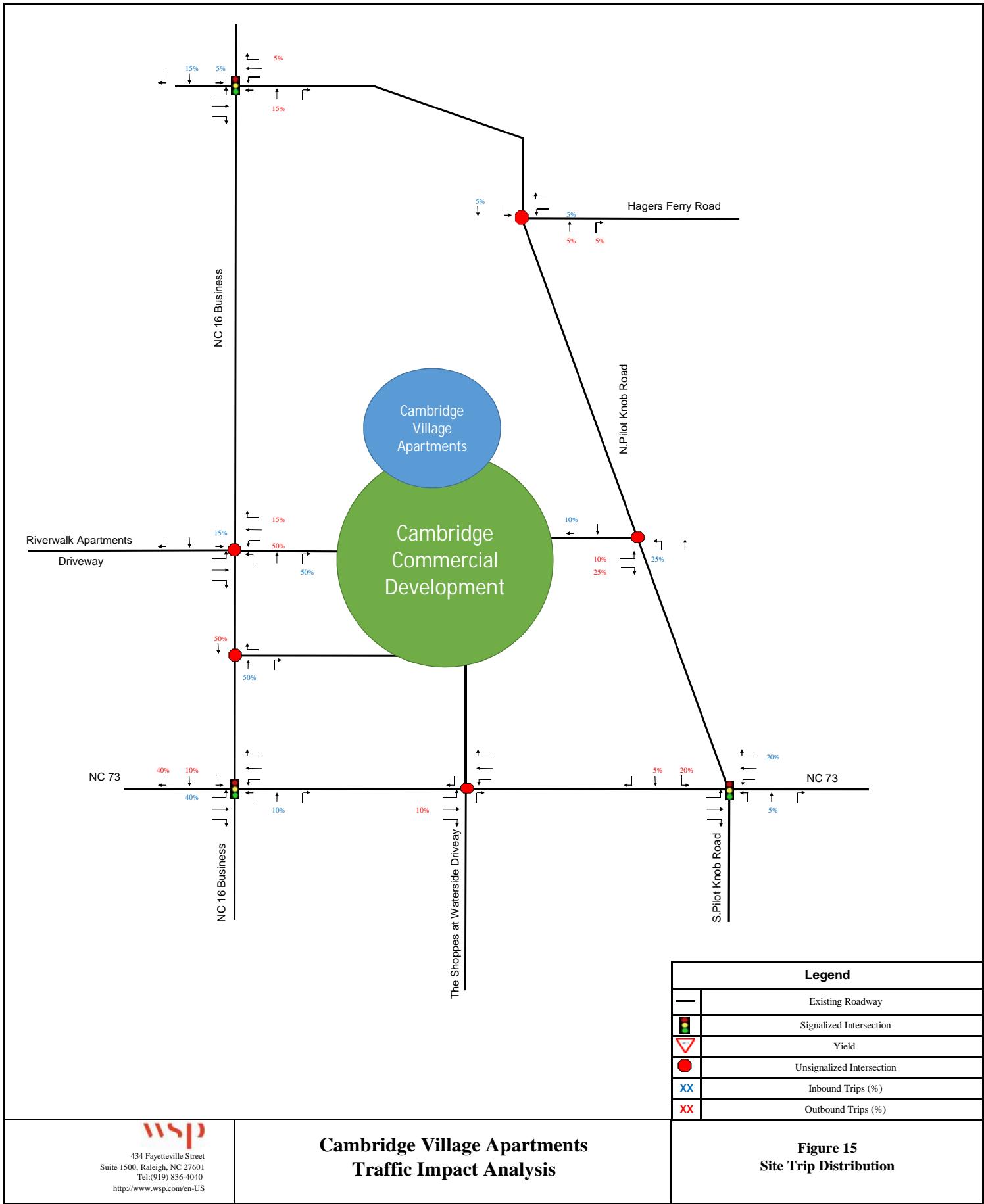


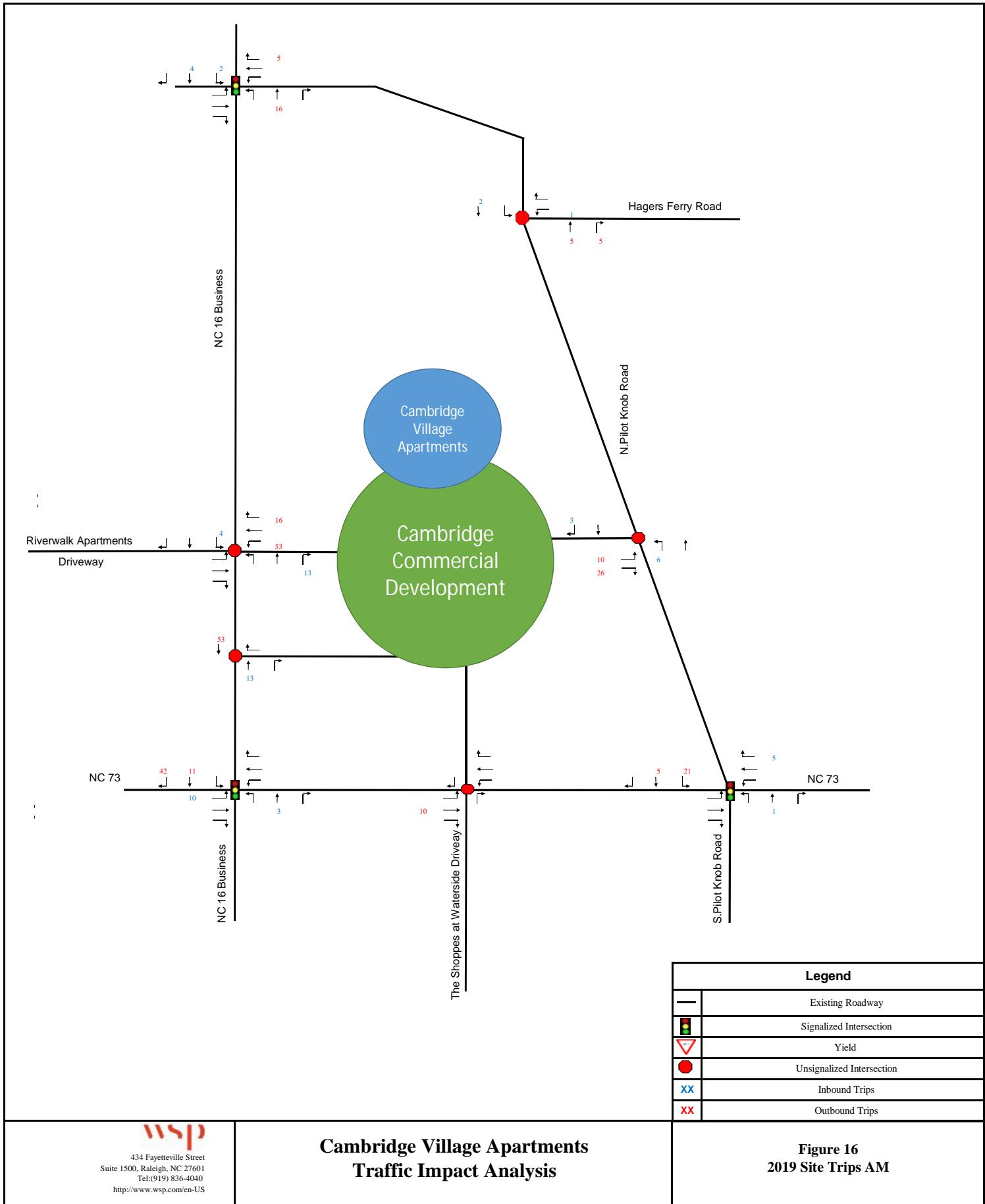


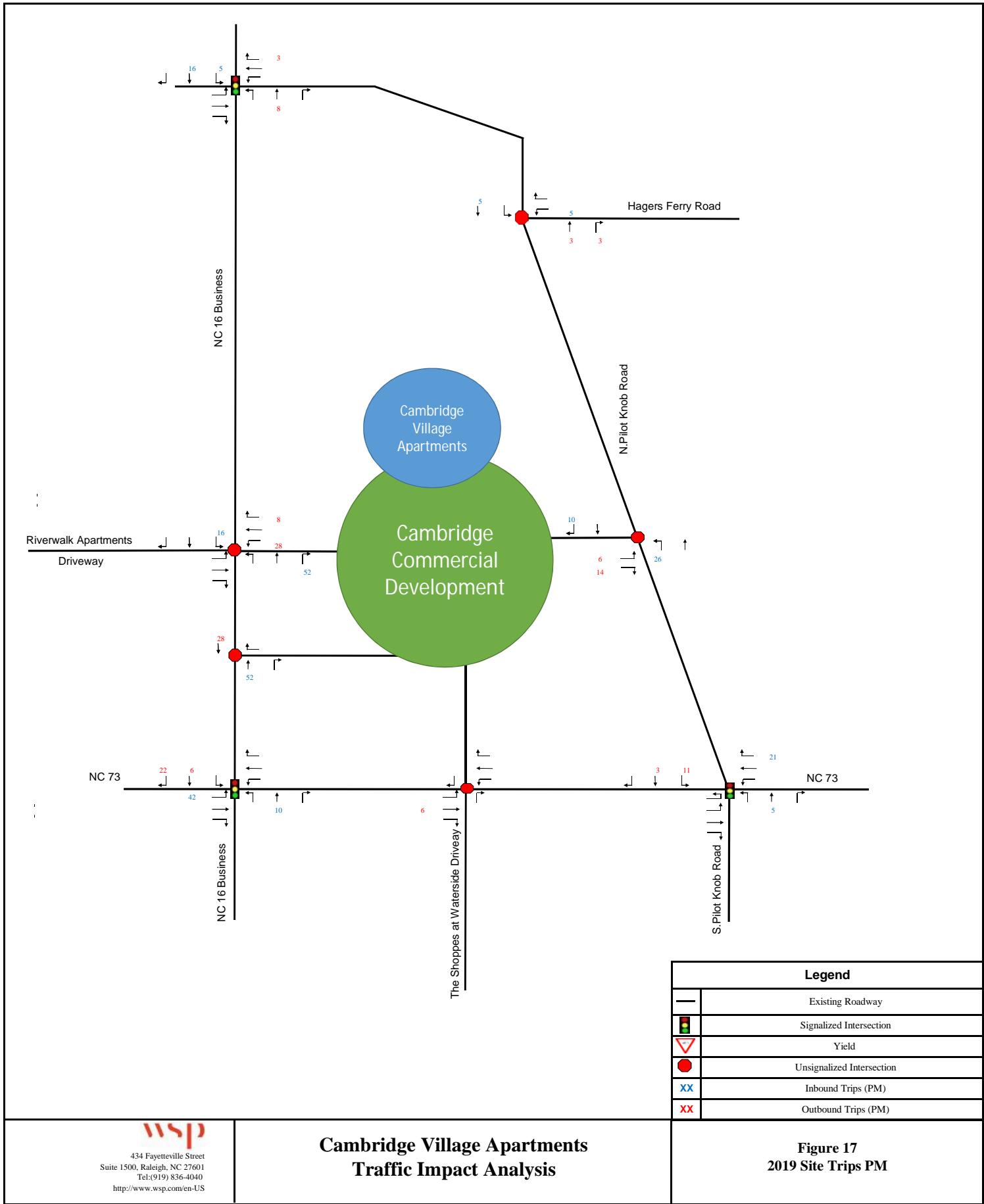


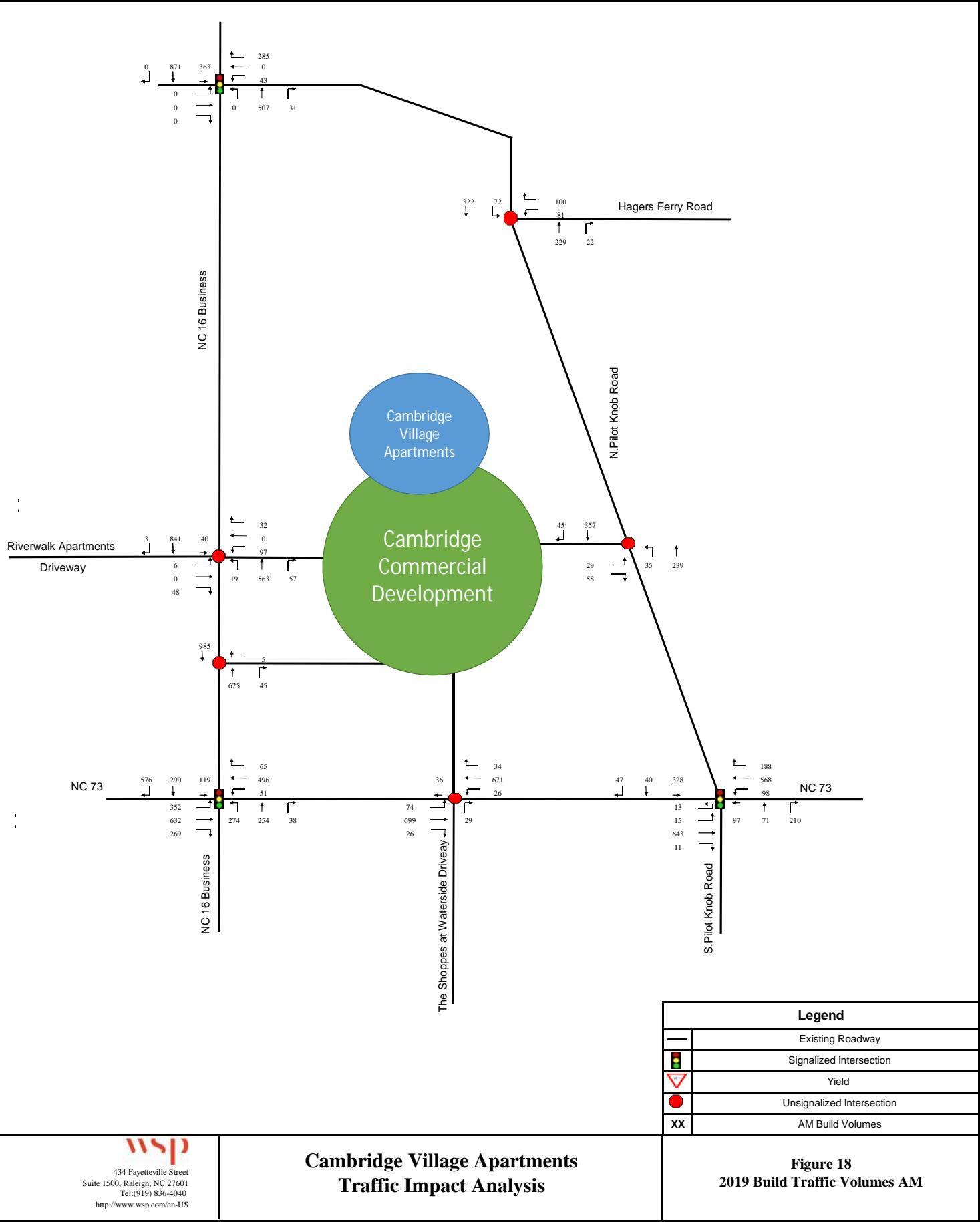


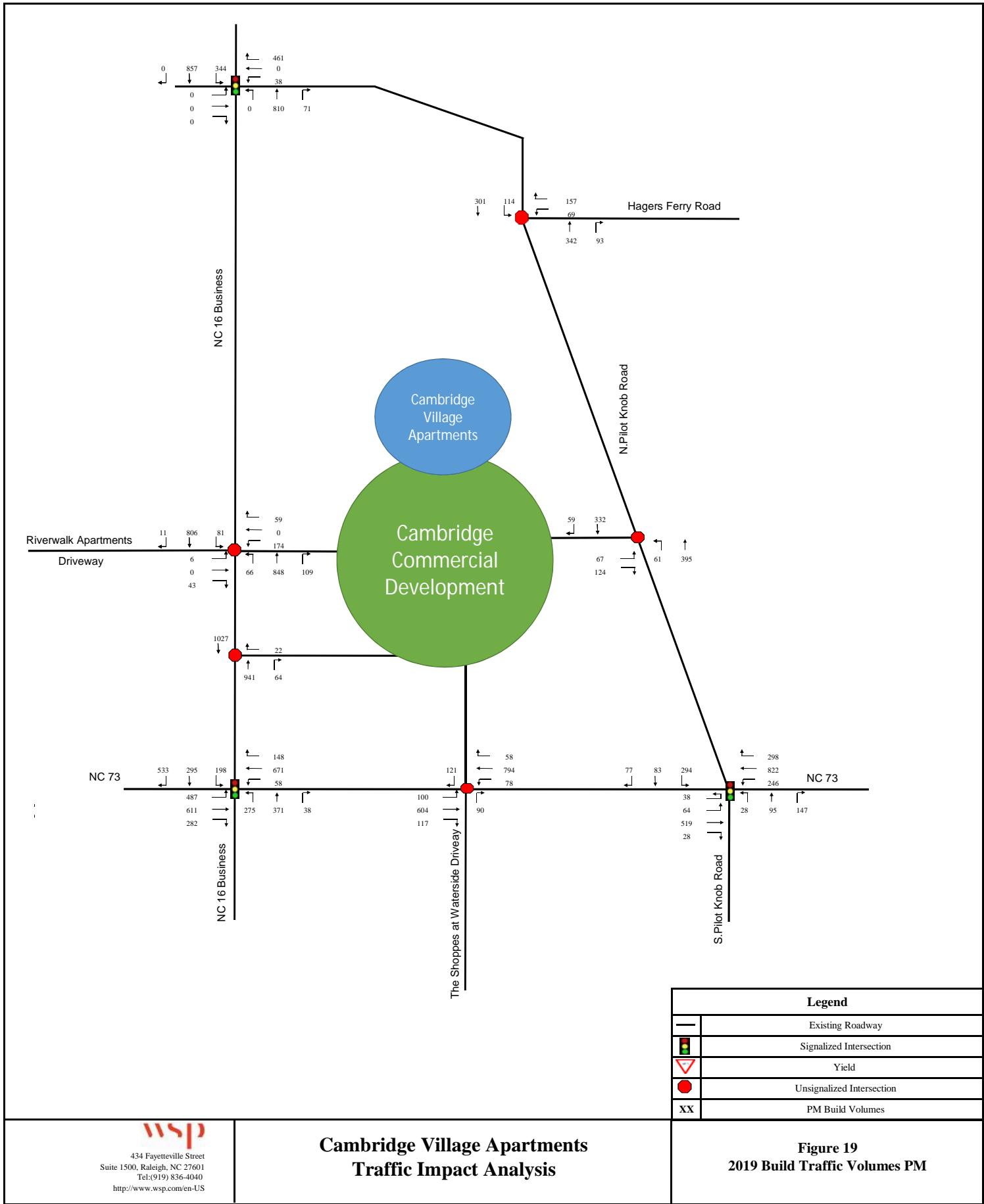












## 12 CAPACITY ANALYSIS

### 12.1 2017 EXISTING ANALYSIS

The Highway Capacity Manual defines capacity as the maximum suitable flow rate at which vehicles reasonably can be expected to traverse a point during a specified period. Capacity uses the measure of efficiency, Level-of-Service (LOS), to describe the traffic performance at intersections. LOS is defined for the overall intersection delay for signalized intersections. An acceptable LOS for a signalized intersection is LOS D or better (i.e. A, B, C or D).

At unsignalized intersections, the LOS is defined by the control delay for the movement that must yield right-of-way. It may be typical for stop-controlled minor streets to experience long delays during the peak periods, while most the traffic flows through the intersection on the major street experiencing little or no delay.

The procedures outlines in the Highway Capacity Manual, 2010 Update were used as guidelines for the analysis of the study area intersections. This manual provides procedures for the analysis of both signalized and unsignalized intersections. LOS categories range from LOS "A" (best) to "F" (worst) as shown in **Table 2**.

**Table 2: Level of Service (LOS) Criteria**

Signalized Intersections		Unsignalized Intersections	
LOS	Delay per Vehicle (seconds)	LOS	Delay per Vehicle (seconds)
A	£10	A	£10
B	>10 and £20	B	>10 and £15
C	>20 and £35	C	>15 and £25
D	>35 and £55	D	>25 and £35
E	>55 and £80	E	>35 and £50
F	>80	F	>50

The LOS analysis was completed using Synchro, version 9.2. The software package categorizes the LOS based on HCM methodology and criteria. According to industry standards, any signalized intersection or any approach of an unsignalized intersection is considered acceptable if the average delay is at LOS D or better with the LOS A representing little or no delay. At signalized intersection or approach with a LOS of E or F is considered substandard and may need solutions to improve the operational performance. For all scenarios, the peak hour factor (PHF) was set to 0.90 throughout the network for the normal traffic in all analysis scenarios

The Synchro output for the analyses performed are included in [Appendix A: Synchro Reports](#).

**Table 3** lists the LOS results from the Synchro capacity analysis for the 2017 Existing Traffic Conditions.

**Table 3: Level of Service Analysis- 2017 Existing Traffic Conditions**

Intersection	Approach	AM Peak		PM Peak	
		Delay (sec)	LOS	Delay (sec)	LOS
Pilot Knob Road & NC 73 (Signalized)	<b>Overall</b>	<b>21.6</b>	<b>C</b>	<b>15.8</b>	<b>B</b>
	Eastbound	10.7	B	8.9	A
	Westbound	9.7	A	10.8	B
	Northbound	20.7	C	26.4	C
	Southbound	67.6	E	38.3	D
The Shoppes at Waterside Driveway/ Site Access 3 & NC 73 (Unsignalized)	<b>Overall</b>	<b>14.9</b>	<b>B</b>	<b>14.8</b>	<b>B</b>
	Eastbound	0		0	
	Westbound	.4		.9	
	Northbound	14.9	B	14.8	B
	Southbound				
NC 16 Business & NC 73 (Signalized)	<b>Overall</b>	<b>30.2</b>	<b>C</b>	<b>34.8</b>	<b>C</b>
	Eastbound	32.9	C	35.1	D
	Westbound	25.8	C	37.7	D
	Northbound	42.1	D	50.9	D
	Southbound	23.1	C	19.6	B
NC 16 Business & Riverwalk Apts Driveway/ Site Access 1 (Unsignalized)	<b>Overall</b>	<b>17.1</b>	<b>C</b>	<b>14.8</b>	<b>B</b>
	Eastbound	17.1	C	14.8	B
	Westbound				
	Northbound	.3		.9	
	Southbound	0		0	
NC 16 Business & Hagers Ferry Rd (Unsignalized)	<b>Overall</b>	<b>48.9</b>	<b>E</b>	<b>33.6</b>	<b>D</b>
	Eastbound				
	Westbound	48.9	E	33.6	D
	Northbound	0		0	
	Southbound	3.1		3.3	
NC 16 Business & Private Driveway/ Pilot Knob Road (Unsignalized)	<b>Overall</b>	<b>17.5</b>	<b>C</b>	<b>34.1</b>	<b>D</b>
	Eastbound				
	Westbound	17.5	C	34.1	D
	Northbound	0		0	
	Southbound	0		0	
Pilot Knob Road & Hagers Ferry Road (Unsignalized)	<b>Overall</b>	NA	NA	NA	NA
	Eastbound				
	Westbound				
	Northbound				
	Southbound				

The results of this analysis indicate that the southbound approach of Pilot Knob Road at NC 73 is operating at LOS E in the AM peak hour. The intersection overall however is currently operating at acceptable levels of service in the AM and PM peak hours. The westbound approach at NC 16 Business at Hagers Ferry Road operates at LOS E during the AM peak hour.

## 12.2 2019 NO-BUILD ANALYSIS

The site is proposed to be completed by year 2019. As directed by the MOU, existing traffic volumes were increased by 1 percent per year to reflect 2019 background traffic volumes. Approved developments were indicated in the area. Therefore, the 2019 background traffic consists of 2017 existing traffic with the addition of the historic growth and approved development traffic. Additionally, NCDOT provided information regarding the funded project to revise the intersections of NC 16 Business at Hagers Ferry Road, NC 16 Business at N. Pilot Knob Road and N. Pilot Knob Road at Hagers Ferry Road. It is envisioned that this project will be completed in 2019 ahead of the opening of the proposed development. The 2019 laneage is shown in **Figure 10: Recommended Improvements** and Rerouted Traffic Volumes are shown in **Figure 11: Rerouted Traffic Volumes AM** and **Figure 12: Rerouted Traffic Volumes PM**.

The intersection and individual approach LOS results from the 2019 No-Build Analysis are displayed in **Table 4**.

**Table 4: Level of Service Analysis- 2019 No-Build Traffic Conditions**

Intersection	Approach	AM Peak		PM Peak	
		Delay (sec)	LOS	Delay (sec)	LOS
Pilot Knob Road & NC 73 (Signalized)	Overall	<b>49.7</b>	D	<b>38.9</b>	D
	Eastbound	11.3	B	28.7	C
	Westbound	11.5	B	21.9	C
	Northbound	25.1	C	24.7	C
	Southbound	<b>224.3</b>	F	<b>113.9</b>	F
The Shoppes at Waterside Driveway/ Site Access 3 & NC 73 (Unsignalized)	Overall	<b>14.7</b>	B	<b>21.9</b>	C
	Eastbound	.9		1.3	
	Westbound	.3		.8	
	Northbound	14.7	B	15.0	C
	Southbound	14.6	B	21.9	C
NC 16 Business & NC 73 (Signalized)	Overall	<b>37.6</b>	D	<b>53.5</b>	D
	Eastbound	43.1	D	<b>66.1</b>	E
	Westbound	29.0	C	47.9	D
	Northbound	49.0	D	54.3	D
	Southbound	29.0	C	41.0	D
NC 16 Business & Riverwalk Apts Driveway/ Site Access 1 (Signalized)	Overall	<b>4.6</b>	A	<b>14.2</b>	B
	Eastbound	25.0	C	30.2	C
	Westbound	26.0	C	45.1	D
	Northbound	3.0	A	7.1	A
	Southbound	2.8	A	13.9	B

NC 16 Business & Private Driveway/ Pilot Knob Road (Signalized)	<b>Overall</b>	<b>18.3</b>	<b>B</b>	<b>26.5</b>	<b>C</b>
	Eastbound	22.5	C	38.2	D
	Westbound	16.7	B	41.7	D
	Northbound	19.3	B	32.2	C
	Southbound	18.3	B	15.7	B
Pilot Knob Road & Hagers Ferry Road (Unsignalized)	<b>Overall</b>	<b>14.3</b>	<b>B</b>	<b>16.9</b>	<b>C</b>
	Eastbound				
	Westbound	14.3	B	16.9	C
	Northbound	0		0	
	Southbound	1.5		2.4	
NC 16 Business & Site Access 2 (Unsignalized)	<b>Overall</b>	<b>10.7</b>	<b>B</b>	<b>596.4</b>	<b>F</b>
	Eastbound				
	Westbound	10.7	B	596.4	F
	Northbound	0		0	
	Southbound	0		0	
Pilot Knob Road & Site Access 4 (Unsignalized)	<b>Overall</b>	<b>12.9</b>	<b>B</b>	<b>17.7</b>	<b>C</b>
	Eastbound	12.9	B	17.7	C
	Westbound	.9		.7	
	Northbound				
	Southbound	0		0	

The operating conditions for the 2019 No-Build Analysis are similar to Existing conditions with most movements showing increases in delay. The NC 73 at Pilot Knob Road intersection overall LOS drops to LOS D during the AM and PM peak periods primarily due to the increase in the southbound Pilot Knob Road delay. The eastbound approach of NC 16 Business at NC 73 declines to LOS E in the PM peak period. The overall intersection LOS degrades to LOS D at this intersection in the PM peak period.

### 12.3 2019 BUILD ANALYSIS

The total future build traffic volumes include both the site traffic and traffic volumes from the No-Build Analysis. The Build Analysis evaluates the traffic conditions before any improvements are implemented. **Table 5** shows the LOS results for the intersections within the study area.

**Table 5: Level of Service Analysis- 2019 Build Traffic Conditions**

Intersection	Approach	AM Peak		PM Peak	
		Delay (sec)	LOS	Delay (sec)	LOS
Pilot Knob Road & NC 73 (Signalized)	<b>Overall</b>	<b>58.2</b>	<b>E</b>	<b>42.1</b>	<b>D</b>
	Eastbound	11.4	B	28.7	C
	Westbound	11.5	B	21.8	C
	Northbound	25.2	C	24.9	C
	Southbound	<b>261.8</b>	<b>F</b>	<b>132.3</b>	<b>F</b>

The Shoppes at Waterside Driveway/ Site Access 3 & NC 73 (Unsignalized)	Overall	14.9	B	21.9	C
	Eastbound	.9		1.3	
	Westbound	.3		.8	
	Northbound	14.9	B	15.1	C
	Southbound	14.6	B	21.9	C
NC 16 Business & NC 73 (Signalized)	Overall	38.6	D	59.6	E
	Eastbound	44.8	D	82.5	F
	Westbound	29.0	C	47.9	D
	Northbound	49.0	D	54.4	D
	Southbound	30.8	C	42.3	D
NC 16 Business & Riverwalk Apts Driveway/ Site Access 1 (Signalized)	Overall	7.9	A	15.6	B
	Eastbound	25.0	C	29.4	C
	Westbound	44.3	D	48.0	D
	Northbound	3.7	A	8.0	A
	Southbound	4.3	A	14.9	B
NC 16 Business & Private Driveway/ Pilot Knob Road (Signalized)	Overall	18.6	B	26.9	C
	Eastbound	22.5	C	38.2	D
	Westbound	16.8	B	42.1	D
	Northbound	20.0	B	33.1	C
	Southbound	18.4	B	16.0	B
Pilot Knob Road & Hagers Ferry Road (Unsignalized)	Overall	14.4	B	17.6	C
	Eastbound				
	Westbound	14.4	B	17.6	C
	Northbound	0		0	
	Southbound	1.5		2.4	
NC 16 Business & Site Access 2 (Unsignalized)	Overall	10.8	B	596.4	F
	Eastbound				
	Westbound	10.8	B	596.4	F
	Northbound	0		0	
	Southbound	0		0	
Pilot Knob Road & Site Access 4 (Unsignalized)	Overall	13.5	B	20.1	C
	Eastbound	13.5	B	20.1	C
	Westbound				
	Northbound	1.0		1.1	
	Southbound	0		0	

Analysis indicates that the addition of traffic anticipated to be generated by the proposed development, the intersection of NC 73 at Pilot Knob Road operates LOS E during the AM peak, LOD D during the PM peak. While the level of service is expected to degrade from the LOS D to LOS E during the AM peak, it should be noted that the delay increase is expected to only be extended by 7.7 seconds when compared to no-build conditions.

The NC 16 Business at NC 73 intersection will operate at LOS D and LOS E during the AM and PM peak hours, respectively. The eastbound NC 16 Business approach will operate at LOS F during the PM peak

hour. The re-aligned intersection at NC 16 Business and N. Pilot Knob Road will operate at acceptable LOS during both peak hours under the 2019 Build conditions.

## 12.4 2019 BUILD IMPROVED ANALYSIS

With the noted recommendation of minor signal timing adjustments along NC 73, and the additional egress lane along Site Access 4 in place, **Table 6** shows the analysis results at all intersections within the study area.

**Table 6: Level of Service Analysis- 2019 Build Improved Traffic Conditions**

Intersection	Approach	AM Peak		PM Peak	
		Delay (sec)	LOS	Delay (sec)	LOS
Pilot Knob Road & NC 73 (Signalized)	Overall	<b>42.4</b>	D	<b>38.9</b>	D
	Eastbound	15.0	B	34.4	C
	Westbound	14.4	B	29.2	C
	Northbound	20.6	C	22.0	C
	Southbound	<b>165.2</b>	F	<b>84.5</b>	F
The Shoppes at Waterside Driveway/ Site Access 3 & NC 73 (Unsignalized)	Overall	<b>14.9</b>	B	<b>21.9</b>	C
	Eastbound	.9		1.3	
	Westbound	.3		.8	
	Northbound	14.9	B	15.1	C
	Southbound	14.6	B	21.9	C
NC 16 Business & NC 73 (Signalized)	Overall	<b>38.4</b>	D	<b>56.9</b>	E
	Eastbound	44.8	D	<b>72.2</b>	E
	Westbound	27.9	C	51.8	D
	Northbound	49.0	D	54.4	D
	Southbound	30.8	C	42.3	D
NC 16 Business & Riverwalk Apt Driveway/ Site Access 1 (Signalized)	Overall	<b>7.9</b>	A	<b>15.6</b>	B
	Eastbound	25.0	C	29.4	C
	Westbound	44.3	D	48.0	D
	Northbound	3.7	A	8.0	A
	Southbound	4.3	A	14.9	B
NC 16 Business & Private Driveway/ Pilot Knob Road (Signalized)	Overall	<b>18.6</b>	B	<b>26.9</b>	C
	Eastbound	22.5	C	38.2	D
	Westbound	16.8	B	42.1	D
	Northbound	20.0	B	33.1	C
	Southbound	18.4	B	16.0	B
Pilot Knob Road & Hagers Ferry Road (Unsignalized)	Overall	<b>14.4</b>	B	<b>17.6</b>	C
	Eastbound	14.4		17.6	
	Westbound	0		0	
	Northbound	1.5		2.4	
	Southbound				

NC 16 Business & Site Access 2 (Unsignalized)	Overall	10.8	B	596.4	F
	Eastbound	10.8	B	596.4	F
	Westbound	0		0	
	Northbound	0		0	
	Southbound				
Pilot Knob Road & Site Access 4 (Unsignalized)	Overall	12.6	B	15.7	C
	Eastbound	12.6	B	15.7	C
	Westbound	1.0		1.1	
	Northbound	0		0	
	Southbound				

With minor signal timing modifications to the traffic signal at the intersections of NC 73 at Pilot Knob Road and NC 16 Business at NC 73, the levels of service overall are expected to return to similar witnessed in no-build conditions. The intersection of NC 73 and Pilot Knob is projected operate at LOS D in the AM and PM peak. The intersection of NC 16 Business at NC 73 will operate at LOS D during the AM peak hour and LOS E during the PM peak hour.

Other intersections are expected to operate at acceptable LOS. The recommended improvements are illustrated in **Figure 20: Recommended Improvements**.

## 13 QUEUE LENGTH

To verify queue lengths at locations which may warrant the installation or storage extension of turn lanes, a simulation of traffic was performed per NCDOT Congestion Management Capacity Analysis Guidelines. The results of this simulation are shown in **Table 7-Table 14**. These simulations results are presented by intersection and include corresponding Synchro 95th percentile queues. Synchro 95th percentile queues are reports in terms of vehicles under HCM 2010 methodology. To account for this, the 95th percentile vehicle result was multiplied by 25 to approximate a footage length. SimTraffic queuing and blocking reports are shown in **Appendix B: SimTraffic Reports**.

Table 7: Queuing Analysis Results- 2017 Existing Traffic Conditions

Intersection	Approach	95th Queue Length (ft)		Maximum Queue Length (ft)		Existing Storage Length (ft)	
		AM	PM	AM	PM		
Pilot Knob Road & NC 73	signalized	EBL	33	79	40	80	250
		FBTR	213	207	245	235	
		WBL	73	166	88	242	150
		WBT	156	278	194	368	
		WBR	71	161	82	200	100
		NBL	107	47	124	80	50
		NBTR	169	148	218	179	
		SBL	193	161	175	174	50
The Shoppes at Waterside Driveway/Site Access 3 & NC 73	unsignalized	SBTR	2298	151	1938	213	
		EBR	*	12	*	19	150
		WBL	30	56	38	63	300
		NBL	26	45	32	53	
NC 16 Business & NC 73	signalized	NBR	35	54	37	64	
		EBL	161	181	180	197	350
		EBL	144	153	168	170	
		EBT	326	349	374	458	
		EBR	234	231	275	275	125
		WBL	101	131	198	187	125
		WBT	290	293	359	250	125
		WBR	93	484	180	542	
		NBL	178	235	199	278	250
		NBTR	208	294	252	342	
		SBL	123	153	208	225	225
		SBT	247	230	303	260	
NC 16 Business & Riverwalk Apts Driveway/Site Access 1	unsignalized	EBL	28	20	31	30	
		EBR	54	55	62	71	
		NBLT	71	112	124	150	
		NBT	21	14	46	30	
NC 16 Business & Hagers Ferry Road	unsignalized	WBLR	74	66	73	72	
		NBTR	18	83	44	189	
		SBL	117	107	139	110	15
		SBT	71	117	143	179	
NC 16 Business & Pilot Knob Road	unsignalized	WBR	126	325	157	290	
		SBT	8	*	12	*	
Pilot Knob Road & Hagers Ferry Road	unsignalized	EBLTR	81	85	80	91	
		WBLTR	109	441	175	499	
		NBLTR	19	87	41	145	

\* SimTraffic did not generate results

Table 8: Queuing Analysis Results- 2019 No-Build Traffic Conditions

Intersection	Approach	95th Queue Length (ft)		Maximum Queue Length (ft)		Existing Storage Length (ft)	
		AM	PM	AM	PM		
Pilot Knob Road & NC 73	signalized	EBUL	33	149	40	185	250
		EBTR	247	210	260	224	
		WBL	92	331	113	300	150
		WBT	172	633	191	776	
		WBR	93	183	115	269	
		NBL	110	81	125	111	50
		NBTR	199	198	258	239	
		SBL	425	430	425	425	300
The Shoppes at Waterside Driveway/Site Access 3 & NC 73	signalized	SBTR	2972	2980	2504	2508	
		EBL	58	71	78	80	150
		EBR	*	4	*	4	
		WBL	31	53	39	63	300
		WBT	*	197	*	261	
		WBR	2	76	4	109	100
		NBR	41	55	55	68	
		SBR	46	345	57	288	
NC 16 Business & NC 73	signalized	EBL	371	508	335	450	350
		EBL	374	1072	331	880	
		EBT	448	1130	554	888	
		EBR	285	301	275	275	125
		WBL	149	180	107	107	125
		WBT	293	255	249	250	125
		WBR	403	870	423	753	
		NBL	291	304	319	323	250
		NBT	249	273	348	343	
		NBTR	128	228	162	249	125
		SBL	303	314	250	250	225
		SBT	483	546	438	446	
		SBR	416	553	428	428	300
		EBL	22	29	30	41	
NC 16 Business & Riverwalk Apts Driveway/Site Access 1	unsignalized	EBTR	77	81	96	102	
		WBL	65	240	89	252	
		WBTR	44	108	46	171	
		NBL	29	113	31	207	200
		NBT	139	272	173	331	
		NBTR	50	167	91	230	
		SBL	32	308	49	236	200
		SBT	166	655	208	475	
		SBR	5	131	8	207	175
		EBL	36	43	46	57	
NC 16 Business & Private Driveway/Pilot Knob Road	signalized	WBL	65	69	81	86	
		WBR	154	362	169	347	
		NBL	19	15	28	21	200
		NBT	241	307	272	362	
		NBR	71	46	130	65	250
		SBL	250	294	273	274	250
		SBTR	424	600	626	630	
		WBL	130	67	167	93	150
Pilot Knob Road & Hagers Ferry Rd	unsignalized	WBR	212	115	317	139	
		NBTR	3	71	6	94	
		SBL	124	89	193	104	250
		SBT	222	5	294	8	
		WBR	22	49	30	57	
NC 16 Business & Site Drive Access 2	unsignalized	NBTR	3	47	5	69	
		SBT	488	1171	541	861	
		WBL	345	422	387	414	
Pilot Knob Road & Site Access 4	unsignalized	NBL	25	32	36	41	100
		SBT	1736	1025	1738	988	
		SBR	196	152	200	150	100
		EBLR	130	67	167	93	

\* SimTraffic did not generate results

Table 9: Queuing Analysis Results- 2019 Build Traffic Conditions

Intersection	Approach	95th Queue Length (ft)		Maximum Queue Length (ft)		Existing Storage Length (ft)	
		AM	PM	AM	PM		
Pilot Knob Road & NC 73	signalized	E8UL	33	149	40	185	250
		EBTR	247	210	280	224	
		WBL	92	331	113	300	150
		WBT	172	633	191	776	
		WBR	93	183	115	269	
		NBL	110	81	125	111	50
		NBTR	189	198	258	239	
		SBL	425	430	425	425	300
		SBTR	2972	2980	2504	2506	
The Shoppes at Waterside Driveway/Site Access 3 & NC 73	unsignalized	EBL	52	80	62	107	150
		EBT	*	28	*	44	
		EBR	*	4	*	8	150
		WBL	30	56	39	61	300
		WBT	*	158	*	182	
		WBR	*	34	*	59	100
		NBR	41	58	48	72	
		SBR	44	359	49	253	
		EBL	474	463	442	450	350
NC 16 Business & NC 73	signalized	EBL	558	1018	591	903	
		EBT	483	1124	611	896	
		EBR	295	298	275	275	125
		WBL	182	162	187	187	125
		WBT	276	253	2449	250	125
		WBR	295	868	404	749	
		NBL	237	302	253	328	250
		NBT	173	328	218	411	
		NBTR	136	220	164	248	125
		SBL	291	300	250	260	225
		SBTR	473	523	440	446	
		SBR	357	603	428	428	300
		EBL	20	21	36	35	
		EBTR	73	82	79	96	
NC 16 Business & Riverwalk Apts Driveway/ Site Access 1	signalized	WBL	114	308	149	304	
		WBTR	54	155	67	165	
		NBL	33	118	42	202	200
		NBT	159	289	167	346	
		NBTR	68	198	110	288	
		SBL	67	329	114	257	200
		SBT	225	671	289	465	
		SBR	5	132	10	210	175
		EBLTR	32	38	36	51	
NC 16 Business & Private Driveway/Pilot Knob Road	signalized	WBLT	73	68	78	80	
		WBR	187	388	212	350	
		NBL	16	16	28	27	200
		NBT	241	258	272	328	
		NBTR	34	37	46	56	250
		SBL	281	310	274	274	250
		SBTR	659	832	708	783	
		WBL	182	76	196	110	150
Pilot Knob Road & Hagers Ferry Road	unsignalized	WBR	484	106	566	138	
		NBTR	-	72	-	129	
		SBL	115	86	199	116	250
		SBT	302	81	351	88	
		WBR	21	47	22	57	
NC 16 Business & Site Access 2	unsignalized	NBTR	4	35	6	68	
		SBT	485	1181	756	851	
		EBLR	472	470	415	426	
		NBL	20	35	28	42	100
Pilot Knob Road & Site Access 4	unsignalized	SBT	1993	1065	1738	1333	
		SBR	214	160	200	200	100

\* SimTraffic did not generate results

Table 10: Queuing Analysis Results- 2019 Build Improved Traffic Conditions

Intersection	Approach	95th Queue Length (ft)		Maximum Queue Length (ft)		Existing Storage Length (ft)	
		AM	PM	AM	PM		
Pilot Knob Road & NC 73	signalized	EBUL	37	175	46	198	250
		EBTR	258	211	285	238	
		WBL	110	369	162	300	150
		WBT	208	1052	258	1029	
		WBR	91	583	104	797	
		NBL	83	67	124	108	50
		NBTR	148	175	181	213	
		SBL	427	443	425	425	300
		SBTR	2981	2929	2493	2397	
The Shoppes at Waterside Driveway/Site Access 3 & NC 73	unsignalized	EBL	50	85	60	105	150
		ESR	2	11	4	20	150
		WBL	37	165	48	318	300
		WBT	*	521	*	611	
		WBR	*	113	*	154	100
		NBR	41	60	48	79	
		SBR	38	594	45	507	
NC 16 Business & NC 73	signalized	EBL	325	495	324	450	350
		EBL	328	1071	328	896	
		EBT	410	1129	483	894	
		EBC	277	301	275	275	125
		WBL	131	185	187	187	125
		WBT	278	265	249	250	125
		WBR	319	914	399	750	
		NBL	248	270	289	310	250
		NBT	161	244	191	294	
		NBTR	138	222	170	233	125
		SBL	328	316	250	250	225
		SBT	517	478	440	446	
		SBR	499	600	427	428	300
		EBL	25	21	31	30	
		EBTR	80	75	96	89	
NC 16 Business & Riverwalk Apts Driveway/ Site Access 1	signalized	WBL	153	298	178	294	
		WBTR	64	81	81	88	
		NBL	37	115	43	208	200
		NBT	149	275	178	282	
		NBTR	77	181	119	235	
		SBL	162	359	167	300	200
		SBT	502	695	348	551	
		SBR	102	132	140	275	175
NC 16 Business & Private Driveway/ Pilot Knob Road	signalized	EBLTR	44	38	51	52	
		WBTL	62	113	78	205	
		WBR	166	376	197	353	
		NBL	16	55	33	77	200
		NBT	254	307	317	405	
		NBTR	70	111	132	278	250
		SBL	258	294	271	275	250
		SBTR	324	572	515	810	
Pilot Knob Road & Hagers Ferry Road	unsignalized	WBL	103	84	102	114	150
		WBR	152	159	195	219	
		NBTR	*	129	*	224	
		SBL	77	88	130	117	250
		SBT	138	26	115	41	
NC 16 Business & Site Access 2	unsignalized	WBR	22	50	30	62	
		NBTR	*	41	*	59	
		SBT	914	1130	558	858	
Pilot Knob Road & Site Access 4	unsignalized	EBL	327	339	377	325	
		EBR	148	211	200	199	150
		NBL	24	40	29	47	100
		SBT	1391	855	1535	1037	
		SBR	183	139	200	156	100

\* SimTraffic did not generate results

## 14 FUTURE NC 73 WIDENING

Currently the NCODT has funding to provide improvements to the NC 73 corridor in Lincoln County. STIP R-5710, and R-5721 are two projects that will be constructed in the Cambridge Apartments vicinity. R-5710 would provide improvements to the intersection of NC 73 and NC 16 Business, while R-5721 would consist of improving NC 73 to a multi-lane facility from NC 16 Business to West Catawba Avenue (Mecklenburg County). The specifics of these improvements are still in development at the time of this study. To date the future traffic forecasting has yet to be completed, and the final design parameters have not been solidified. As such, any impacts this development may have to future roadway network cannot be assessed at this time.

## 15 RECOMMENDATIONS

The 2019 Build with Improvements analysis shows recommended improvements that will improve the effectiveness of the system. Those improvements are stated below:

- **NC 73 at N. Pilot Knob Road:** consider minor adjustments to signal timing plan along the NC 73 corridor to accommodate new traffic patterns due to nearby development.
- **NC 16 Business at NC 73:** consider minor adjustments to signal timing plan along the NC 73 corridor to accommodate new traffic patterns due to nearby development.
- **N. Pilot Knob Road at Proposed Site Access 4:** construct an eastbound right turn lane along Site Access 4 for egressing vehicles. The turn lane is recommended to consist of a minimum of 150 feet of storage.

With timing modifications to the traffic signals at the intersections of Pilot Knob Road at NC 73 and NC 16 Business at NC 73, the analysis indicates that the operational results are expected to be similar to those of no-build conditions. Poor LOS/excessive queuing is anticipated to continue one or more approaches at these intersections beyond the buildup of the site. The future NC 73 widening projects are anticipated to provide improvements to existing LOS/queuing issues along this corridor.

Based on the findings of this study, specific improvements have been identified and should be completed as part of the proposed development. It is also recommended that all improvements be completed in accordance to NCDOT, and Lincoln County standards where applicable.

The Recommended Improvements are shown in **Figure 20: Recommended Improvements**.

